

MAC Protocol Economic Assessment

An Economic Assessment of the Fourth Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Mining, Agricultural and Construction Equipment



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Warwick Economics and Associates

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The MAC Protocol Economic Assessment in one page

1. The Mining, Agriculture and Construction (MAC) Protocol is an international instrument that will provide a global legal framework for the financing of MAC equipment. The MAC Protocol is an extension of the 'Cape Town Convention', a treaty already implemented by 77 states. The MAC Protocol will provide uniform rules governing the creation, registration and priority of legal interests in MAC equipment, as well as facilitating enforcement of remedies in the event of a default or insolvency.
2. This study presents an independent economic assessment of the proposed MAC Protocol and an estimate of its potential impact, prepared by Warwick Economics and Associates. It has been commissioned by the International Institute for the Unification of Private Law (UNIDROIT) to help states understand the costs and benefits of adopting and ratifying the agreement.
3. The assessment's analytical framework is based on a theory of change which assesses how implementation of the MAC Protocol may affect different economic variables. The methodology focuses on direct impacts of reduced risks and improved lending terms in the credit and product markets with some assessment of the indirect effects and the implications for the wider economy. A spreadsheet model illustrates how a given reduction in the cost of credit and an increase in its supply may ease finance constraints and boost spending on MAC equipment, with positive impacts on GDP.
4. The Protocol will apply to MAC equipment accounting for approximately \$100 billion a year of international trade. The MAC sectors tend to operate with less capital equipment in countries with poorer access to credit. This constrains productivity, profits and economic growth. The MAC Protocol will improve access to finance and reduce credit risk by removing some of the key uncertainties around asset recovery in the event of default or insolvency, as well as providing clear priority rules. It should enable more buyers to access credit and/or to borrow on better terms, whether that means lower interest rates, longer loan duration or higher loan-to-value ratios.
5. **The assessment estimates that over a ten year period, the MAC Protocol may increase the stock of MAC equipment in developing countries by \$90 billion. The MAC Protocol is predicted to have a positive impact of \$23 billion on GDP in developing countries and of \$7 billion in developed countries, for a total impact on GDP equivalent to \$30 billion a year.** A series of sensitivity tests demonstrate the wide range of uncertainty around the central estimate of \$30 billion (varying the estimated annual GDP impact estimate from \$8 billion to \$86 billion), but benefits are still highly likely to exceed costs.
6. The assessment also finds that the costs of the MAC Protocol (including the costs involved in setting up the registry, implementation and enforcement costs and the compliance costs for business) would appear to be low in relation to the value of the assets covered and the likely benefits.
7. The estimates in this assessment are focused on the potential economic benefits in the 63 UNIDROIT member states. The estimated global benefits would be greater if, as expected, non-member countries also ratify the Protocol.

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1. Executive summary and main findings

1.1 Background and context

8. This study presents an economic assessment of the proposed 'MAC Protocol' to the 2001 Cape Town Convention and an estimate of its potential impact. It has been commissioned by the International Institute for the Unification of Private Law (UNIDROIT) to help potential contracting states understand the costs and benefits of adopting and ratifying the Protocol. The MAC Working Group, which represents private sector interests in the project, has financially supported the study.

9. The principal objective of the Cape Town Convention (more formally, the Convention on International Interests in Mobile Equipment)¹ is to facilitate the efficient financing and leasing of mobile equipment. The Convention provides an international legal regime for the protection of secured creditors, conditional sellers and lessors of certain categories of high value mobile equipment. The Convention is designed to reduce risks to finance providers and lower the costs of borrowing.

10. The Convention is applied to specific categories of mobile equipment through various Protocols. The Aircraft Protocol, adopted in 2001, is the first and most widely ratified. The Convention was further extended to railway rolling stock in 2007 and to space assets in 2012. The fourth Protocol, the subject of the present study, will extend the application of the Convention to Mining, Agriculture and Construction (MAC) equipment. Further detail on the background and context is set out in paragraphs 36 - 48.

1.2 What does the MAC Protocol do?

11. Finance for the acquisition of MAC equipment is constrained in many countries, particularly developing economies, because of risks and imperfections in the credit market, leading to under-investment in plant and equipment essential for economic development. The MAC Protocol aims to address this by increasing the supply of secured finance for MAC equipment supplied across borders. It does so by making it quicker, easier and cheaper to recover mobile assets in the event of default or insolvency and redeploy them.

12. Paragraphs 49 - 60 set out the key legal changes and objectives of the MAC Protocol. Crucially, the CTC and its MAC Protocol together promote greater legal certainty for asset-based financing for mobile equipment by providing for:

- The creation of a right for creditors, known as an international interest, which enjoys cross-border effectiveness where the debtor is located in a contracting state.
- The creation of a prospective international interest, a mechanism that allows a creditor to register a potential interest during loan negotiations.
- An online International Registry for the registration of actual and prospective international interests.
- Priority of a registered international interest granting the secured creditor the power to satisfy its obligation ahead of competing claims in the case of the debtor's default.
- A set of remedies that the creditor can exercise in the event of a default by the debtor.

¹ Hereafter, referred to as 'the Convention'.

- Protection of international interests in the event of a debtor's insolvency, which is further discussed in Annex A.

13. If effectively implemented, the provisions of the MAC Protocol should result in a legal system that is predictable and provides more effective protections to creditors, substantially reducing legal risks and due diligence costs and thereby reducing the cost of credit and improving its availability. In addition to the gains from uniform international standards, there may also be significant benefits from accelerating domestic reform of general secured transactions laws.

14. Moreover, a significant benefit of the MAC Protocol is that it should increase access to credit not only in relation to secured lending for sales to end-users, but also in relation to leasing and other forms of conditional sale (paragraph 55 and Annex B).

15. Based on experience with the Aircraft Protocol and a preliminary qualitative assessment, the costs of the MAC Protocol (including the costs involved in setting up the registry, implementation and enforcement costs and the compliance costs for business) would appear to be low in relation to the value of the assets covered and the likely benefits (paragraphs 61 - 70).

1.3 Why is MAC equipment so important?

16. Mining, Agriculture and Construction (MAC) equipment within the scope of the MAC Protocol is hugely important (paragraphs 73 - 79), accounting for around \$100 billion a year of world trade. It is a major employer, source of profit and earner of foreign exchange. It enables economic growth and development in critical sectors of the world economy. The MAC sectors tend to operate with less capital equipment in countries with poorer access to credit. This constrains productivity, profits and economic growth.



17. The MAC equipment sector is highly diverse (paragraphs 80 - 89), much more so than the aircraft or rail sectors. There are thousands of companies producing MAC equipment; for example, there are over 277 brands of tractor alone. Some equipment, such as tractors and diggers, can be used for multiple applications in the MAC sectors. Demand and supply conditions for products vary markedly depending on the product, the intended application and the end-user (paragraphs 90 - 102). The degree of competition and trading arrangements also vary from market to market. There are multiple business models and sales routes. Leasing companies are major buyers in some product markets and an important supplier to end-users.



18. Ideally, a full assessment of the impact of the MAC Protocol would take account of this diversity. However, the data and resource requirements preclude this for the current study. Estimates are therefore presented on the basis of a broader, indicative assessment of international impact. The focus is on trade and production data for UNIDROIT members (the ‘international impact’) unless otherwise stated. The estimated benefits would be greater if, as expected, non-member countries ratify the Protocol as well.

1.4 What are the impacts in the credit market?

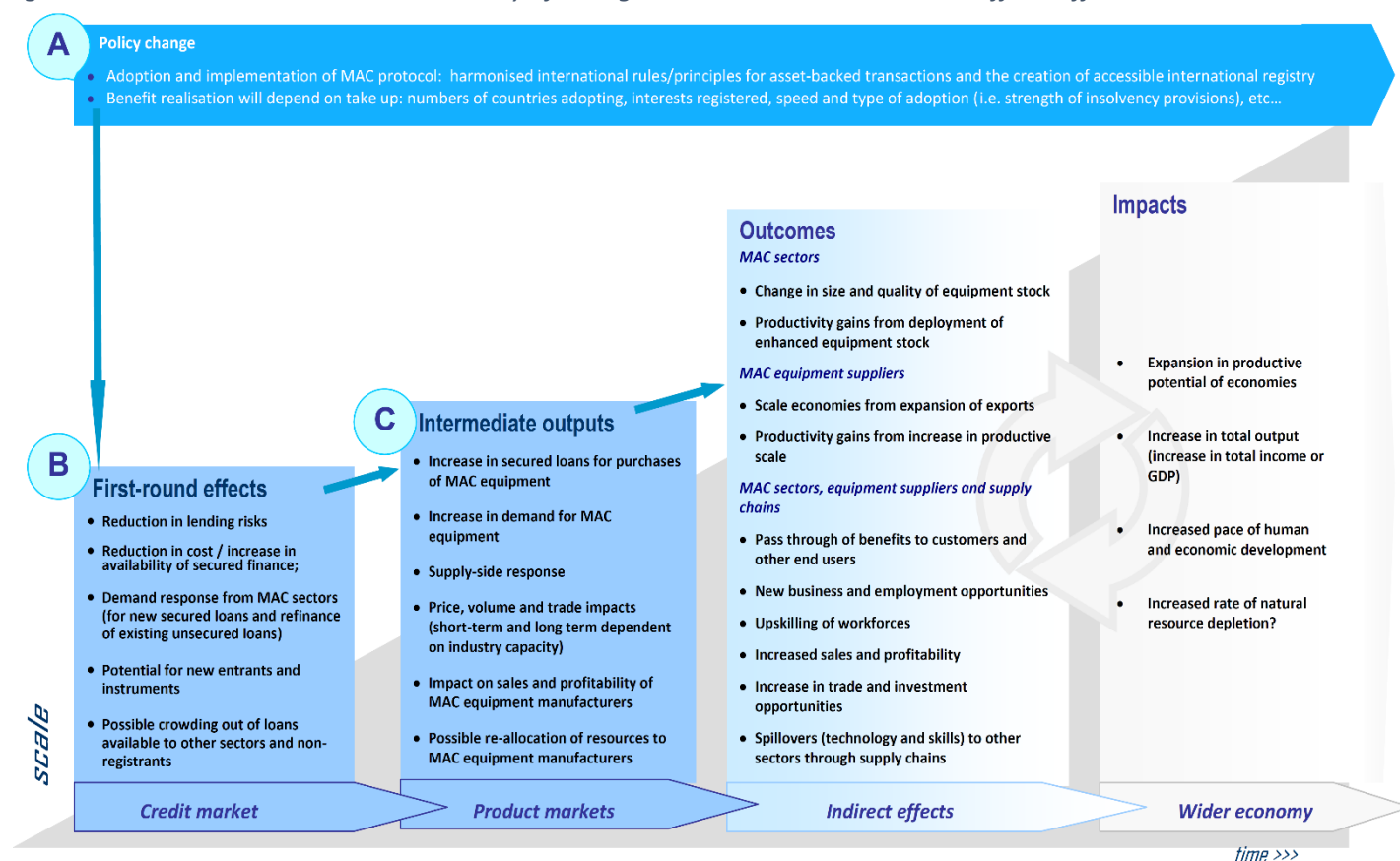
19. Credit availability in the MAC sector varies very widely (paragraphs 105 - 113). In some developed country markets, particularly in North America, most machinery, new or used, is acquired with a finance package. In other countries, credit, if available at all, may cover as little as 20% of product value. In high risk markets, most sales have to be predominantly self-financed.



20. Where credit is unavailable, restricted or expensive, borrowers find that they are finance-constrained and unable to purchase or acquire the equipment they need to improve productivity and performance. If cash flow can be eased and the amount of capital tied up in acquiring MAC equipment reduced, then these end-users stand to benefit (paragraphs 114 - 119). But this will only happen if credit risk can be reduced, making creditors more willing to lend and easing the finance constraint (paragraphs 120 - 143).

21. The MAC Protocol helps reduce credit risk (paragraphs 144 - 148) by removing some of the key uncertainties around asset recovery in the event of default or insolvency, as well as providing clear priority rules. It should therefore enable more buyers to access credit and/or to borrow on better terms, whether that means lower interest rates, longer loan duration or higher loan-to-value ratios. However, for some countries or market sectors, there may well be other risk factors that prevent borrowers benefiting to the full extent. The MAC Protocol should therefore be seen as an important element in improving access to credit, but not the only necessary action.

Figure 1 - The economic assessment's theory of change: how the MAC Protocol will affect different economic variables



1.5 Methodology for assessing the international impact

22. Our analytical framework (see Figure 1, fully explained in paragraphs 161 - 171) first rests on a logic model or 'theory of change', setting out how implementation of the MAC Protocol (the 'policy change') will affect different economic variables. The framework seeks to capture the interactions between the product market (MAC equipment) and the credit market (finance to acquire MAC equipment), and ultimately the impact on economic performance in the equipment-using sectors, as well as GDP and wider measures of economic impact.

23. The economic assessment methodology (paragraphs 172 - 185) focuses on direct impacts in credit markets and product markets with some assessment of the indirect effects and the implications for the wider economy. A spreadsheet model (summarised in Annexes C and D), illustrates how a given reduction in the cost of credit and an increase in its supply may ease finance constraints and boost spending on MAC equipment, with positive impacts on GDP. The modelling approach, which elaborates on an earlier assessment by Fleisig (2013), assumes that buyers are typically cash-constrained and that a reduction in the cost of debt service would free up funds for them to use to acquire more MAC equipment or spend on other things. There are, however, many factors that are likely to continue to constrain credit availability for many potential borrowers and in some specific countries and regions post-reform. We attempt to control for these in our estimate of the international impact.

24. The data on MAC equipment stocks and loan terms and conditions that would be needed to make a precise estimate of the overall impact of the MAC Protocol is simply not available at a global or international level. We have constructed estimates of the capital stock of MAC equipment using trade and production data and made informed assumptions about representative lending terms before and after reform and about other key parameters required for the model. These assumptions have been drawn up on the basis of earlier work, including Fleisig (2013), and consultations with industry, finance, academic and other experts during stakeholder interviews. Further detail on the data and assumptions used is provided in Annex D.

1.6 How big are the benefits?

25. The starting point for assessing the benefits is an estimate of the size of the equipment stock in the emerging and developing economies most likely to benefit from successful reform. Using international trade data, we estimate this at \$480 billion in 2015, just under 2% of GDP on average, and we further assume that in the absence of reform this stock would grow in line with GDP over the ten year assessment period (paragraphs 186 - 193).

26. As regards loan terms and conditions (paragraphs 194 - 198), market participants interviewed were reluctant to share details of commercial terms and interviewees emphasised that no loan is typical, but they did not suggest our assumptions were out of scope or discuss any alternatives. We have, therefore, assumed that a representative loan for buyers of MAC equipment in developing economies would be 8.5 per cent over four years without the MAC Protocol and 7.5 per cent over six years with the MAC Protocol as lenders are able to make loans with enhanced security. This reduction of 100 basis points (bps) is consistent with earlier work on the Aircraft Protocol and evidence from interviews with stakeholders. Interviews also lent support to our assumption that secured lending could allow extension of loan duration because credit risk is reduced. However, the assumed improvement in loan terms is indicative, not a precise estimate.

27. The improvement in loan terms results in savings of debt servicing costs as existing loans are refinanced during their term or replaced at the end of their term with new secured loans. In turn these savings can be used to leverage additional or larger loans to fund additional equipment acquisitions.

28. However, it is unlikely that all existing debt would be refinanced or replaced with new secured loans at the improved terms, or that the entire saving in debt servicing costs would be used to fund additional debt-financed equipment acquisitions. We therefore make adjustments (paragraph 199) to take account of factors that would reduce the scope of the impact (e.g markets that remain high risk, lenders' country limits, partial adoption of reform, borrowers' lack of credit history, ongoing autonomous financial reform) and to recognise that not all savings will be reinvested back into MAC equipment purchase. We considered whether leasing might be an additional factor limiting the scope of the reform but concluded that many leasing transactions will also benefit and that the impact of leasing on the potential gains is neutral, or even slightly positive.

29. Table 1 summarises the results (paragraph 200). By the end of the ten year assessment period, the stock of MAC equipment in developing countries is estimated to be some \$90 billion higher than in the absence of reforms associated with the MAC Protocol. This is the investment impact estimated in the spreadsheet model as a result of an assumed 100 basis points reduction in interest rates and an extension of loan duration

by two years, taking account of finance constraints, alternative uses of the savings and other real world factors that might limit the potential response.

Table 1 - Loan terms, debt take-up and impact on debt-funded MAC equipment stock

Key variables:	Assessment period without policy change	Assessment period with policy change	Impact of Protocol
Average interest rate %	8.5% pa	7.5% pa	- 100 bps
Average loan period	4 years	6 years	+ 2 years
Total debt at end of assessment period invested in MAC equipment	\$760 billion (100% of baseline stock)	\$850 billion (112% of baseline stock)	+ \$90 billion (+12%)

30. The additional investment will have wider impacts on the economy (paragraphs 201 - 205). The acquisition and deployment of an additional \$90 billion of MAC equipment will not happen immediately and it will take time for the investment to be reflected in GDP. We therefore assume a gradual investment response over a ten year period and a lagged impact on GDP.

31. On this basis, we derive the estimates of GDP impact shown in Table 2 for emerging and developing economies. In the long run, the impact of the larger equipment stock would be to add \$45 billion a year to GDP, but this takes time to build up, so the annualised equivalent over the ten year assessment period, after discounting, is lower, at \$23 billion a year.

Table 2 - Estimated GDP impacts, annualised present values

Economic grouping	Additional MAC equipment acquired due to policy change	Assumed GDP multiplier	Annualised GDP impact pa
Emerging and developing economies	\$90 billion	0.5 (based on an assumed incremental capital to GDP ratio of 2)	\$23 billion
MAC equipment exporting economies	\$90 billion	1.0 (Export 'value added' multiplier)	\$7 billion
Combined international impact :			\$30 billion

32. Countries hosting MAC equipment manufacturers will also benefit from a boost to growth in their economic output through the increased production and export of an additional \$90 billion of equipment over the ten year assessment period. This would be equivalent to additional GDP of \$7 billion a year in exporting economies. Some of these countries might also benefit from the insolvency provisions in the MAC Protocol but these gains are not quantified in the present study. Combining the GDP gains in emerging and developing economies with those in equipment exporting countries, the total impact on GDP would be the equivalent of \$30 billion a year over ten years.

1.7 How sensitive are the results?

33. Many of the assumptions used in the analysis are subject to large margins of uncertainty. It is therefore important to carry out sensitivity tests on our estimates of the international impact (paragraphs 206 - 208, Table 14). This analysis confirms that the estimates are most sensitive to assumptions about the MAC Protocol's impact on average loan periods and the elasticity of demand for loans with respect to changes in debt servicing costs.

34. In combination, the sensitivity tests produce a wide range of potential impacts around our central estimates, with the estimated combined GDP impact varying from \$8 billion to \$86 billion. The sensitivity analysis suggests that the MAC Protocol could still deliver a significant stream of future economic benefits that will far exceed the likely costs associated with its implementation and enforcement in those economies undertaking the necessary reforms.

35. Finally, it should be noted that, while the basic analytical framework and model can also be applied at the region, country or sector level, country-specific and regional variations in impact are likely to be pronounced (paragraphs 209 - 210 and Figure 11). Assessing these will require a deeper analysis of legal, economic, financial and trading conditions specific to different regions and states.



2. Introduction

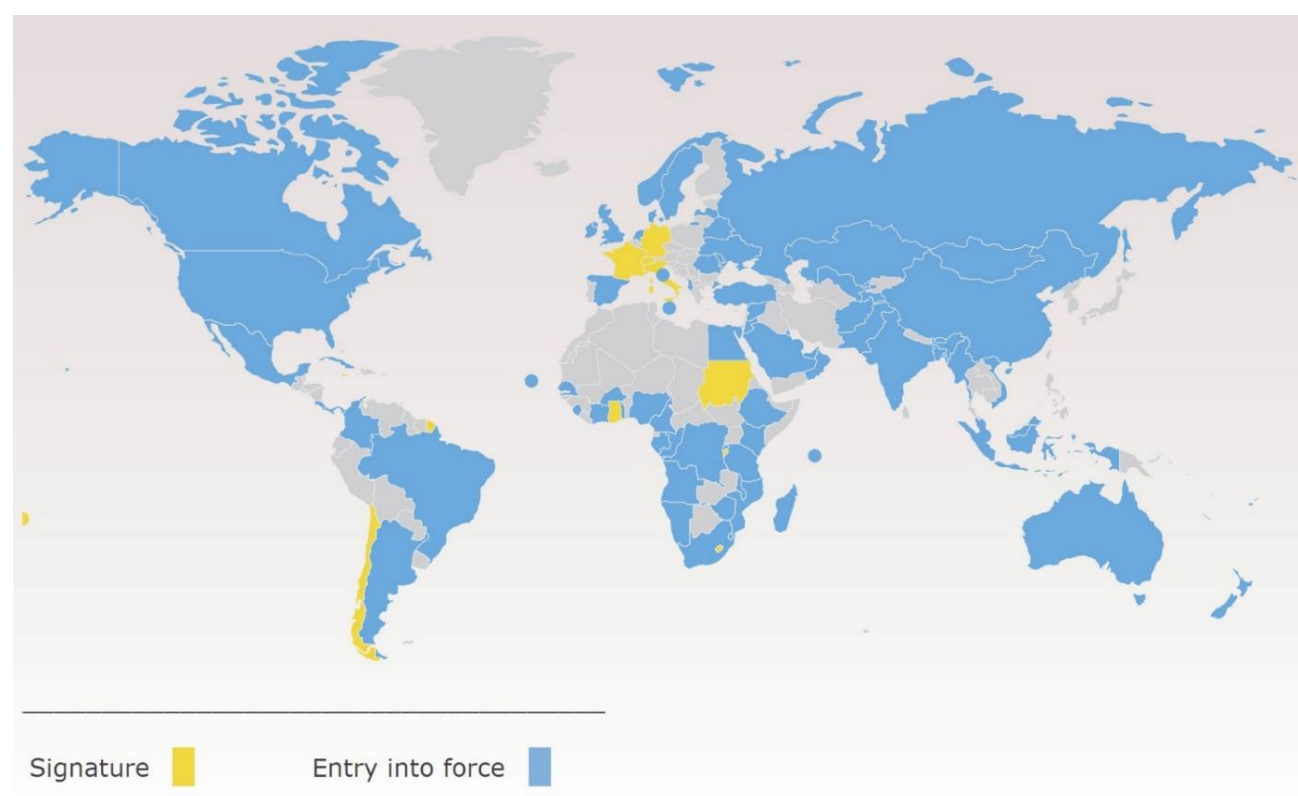
2.1 Background and context

36. Negotiated under the auspices of the International Institute for the Unification of Private Law (UNIDROIT) and concluded in Cape Town on 16 November 2001, the Convention on International Interests in Mobile Equipment (the ‘Cape Town Convention’) has been widely adopted by governments around the world.

37. The principal objective of the Convention is to facilitate the efficient financing and leasing of mobile equipment. The Convention provides an international legal regime for the protection of secured creditors, conditional sellers and lessors of certain categories of high value mobile equipment through a set of basic default remedies and the protection of creditors’ interests by registration in an International Registry (Goode, 2013). In doing so, the Cape Town Convention is designed to reduce risks in providing credit and reduce the costs of borrowing.

38. The Convention currently has 77 contracting states² and has been approved by the European Union. The Convention is applied to specific categories of mobile equipment through the creation of Protocols to the Convention. The Aircraft Protocol, which was negotiated alongside the Convention, is the first and most widely adopted of the existing Protocols with 73 contracting states. The application of the Convention was further extended to railway rolling stock through the Luxembourg Rail Protocol in 2007 and to space assets through the Space Protocol in 2012. Importantly, each Protocol also provides specific insolvency remedies which complement the other default and insolvency rules contained in the Convention itself.

Figure 2 - Map of Cape Town Convention contracting states



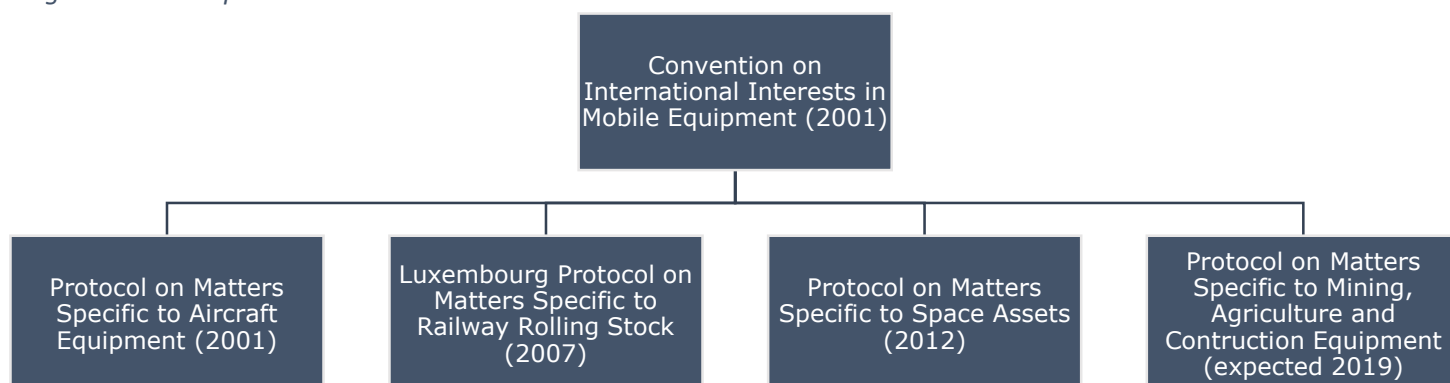
² Accurate as of August 2018.

39. Other things being equal, the Convention and its Protocols should have a positive net impact on equipment financing by reducing the risk of debt finance and increasing its availability. There is evidence of this already for the Aircraft Protocol.

40. A fourth Protocol to the Cape Town Convention on matters specific to mining, agriculture and construction equipment (the 'MAC Protocol') is currently under negotiation. This future instrument will extend the Cape Town Convention's application to mining, agricultural and construction (MAC) equipment, and is designed to reduce the cost and increase the availability of credit for the lease or purchase of MAC equipment, most notably in developing countries where it can be challenging to acquire such equipment and/or use it as collateral.

41. Negotiations for the MAC Protocol are at an advanced stage. Over two sessions in 2017, the substance and operation of the treaty were considered by a Committee of Governmental Experts comprising 126 representatives from 51 countries. At its second session in October 2017, the Committee approved the draft instrument and recommended that the MAC Protocol be adopted at a Diplomatic Conference in 2019.³

Figure 3 - The Cape Town Convention and its Protocols



42. In advance of the Diplomatic Conference, countries involved in negotiations requested that UNIDROIT commission an independent assessment of the potential international economic impact of the MAC Protocol, to assist countries to better understand the costs and benefits of adopting and ratifying the agreement. The MAC Working Group, which represents private sector interests in the project, has financially supported the production of this assessment.

2.2 Project scope and objectives

43. This economic assessment examines the likely scale and main channels of the economic impact the MAC Protocol might have on contracting states. A preliminary appraisal of international impact was undertaken in 2013 by CEAL (the Center for the Economic Analysis of Law), providing valuable insights (Fleisig, 2013). However, the intended scope of the draft Protocol has since evolved and further work is now required to refine the assessment of the potential impact of the Protocol on the international credit and products market for MAC equipment and the economies of UNIDROIT member states. The paper focuses on the impact on UNIDROIT members and data is for current UNIDROIT members unless otherwise stated.

³ <https://www.unidroit.org/english/documents/2017/study72k/cge02/s-72k-cge02-report-e.pdf>

44. This economic assessment has the following objectives:
- The development and demonstration of a robust and evidence-based assessment framework that reflects best practice and is capable of being broadly applied in different countries.
 - To identify the various ways in which the MAC Protocol will have an effect on contracting states' economies and, where feasible, assist in assessing how its impacts might vary between countries and markets and over time.
 - To help UNIDROIT build its evidence base to demonstrate to countries the effect of adopting the MAC Protocol.
 - To assist countries in their preparation for the Diplomatic Conference by providing an overview of the issues that need to be considered, key findings and options for further work.
 - Where appropriate, to review and build on the work already undertaken by CEAL.
45. Warwick Economics and Associates have been commissioned to deliver these objectives. The team comprising Ken Warwick (Warwick Economics and project lead), Peter Dodd (Vital Economics) and Brian Titley (Brian Titley Consulting Ltd) combines over 90 years of professional experience developing economic impact assessments and assessment methodologies and addressing complex economic issues and policy options.
46. The project objectives are intended to complement the existing legal analysis and expertise considering the impact of the MAC Protocol.
47. The production of this economic assessment was conducted over three stages:

Figure 4 - Stages of study



48. Phases one and two were completed between August and September 2017 and were included in a preliminary report presented to the second session of the Committee of Governmental Experts in October 2017. This final report represents the completion of Phase three.



3. The MAC Protocol: key legal changes, objectives and potential costs

3.1 The Cape Town Convention

49. By reducing the risk of debt finance and increasing its availability, the MAC Protocol is expected to increase financing, sales, and leases of MAC equipment, most notably in those countries that have not yet modernised their secured transactions laws and where equipment needs currently exceed availability due to finance constraints.

50. According to Goode (2002), the Cape Town Convention (CTC) should ‘provide lenders greater confidence in their decisions to extend credit, enhance the credit rating of equipment receivables, and reduce the borrowing costs to the advantage of all interested parties’. It operates by providing a clear framework for asset-based financing for mobile equipment. Specifically, the Convention facilitates the use of mobile capital equipment as high-quality collateral against loans where national laws would otherwise make such transactions challenging or costly.

51. Key to its success is the Convention’s ability to provide legal certainty for creditors, especially in cross-border transactions. The legal problem it addresses is that a security interest in mobile equipment perfected under the law of origin cannot guarantee effectiveness in other jurisdictions if the asset is relocated. The widely adopted principle associated with tangible assets (*lex rei sitae*) is that the applicable law will be the law where the property is situated. This principle is not well suited to equipment that moves, or could be moved, from one jurisdiction to another in the course of its operation, such as aircraft, railway rolling stock or MAC equipment. The CTC aims to address this.

3.2 How is greater certainty achieved?

52. The CTC promotes greater legal certainty for asset-backed financing because it provides for⁴:

- The creation of a right that secures the obligation owed to the creditor, known as an international interest, which enjoys cross-border effectiveness where the debtor is located in a contracting state.⁵
- The creation of a prospective international interest, a mechanism that allows a creditor to register a potential interest during loan negotiations in order to secure priority for the eventual international interest should the loan transaction be concluded.
- An online International Registry for the registration of actual and prospective international interests. Provided the debtor is located in a country that has ratified the CTC, a registered international interest created under the MAC Protocol will be effective and have priority against existing security interests under domestic law or any subsequently registered international interests.⁶

⁴ The list is based on Mooney et al (2016).

⁵ Under Article 2 of the Convention, international interests in relevant types of equipment can be created in relation to security agreements, title reservation agreements and leases.

⁶ Over an international interest, such as where an interest under domestic law was created before entry into force of the Convention in the relevant jurisdiction (Article 60) or where a non-consensual interest such as unpaid repair work has been declared by a

- Specifically, the granting of priority to a registered international interest granting the secured creditor the power to satisfy its obligation ahead of competing claims in the case of the debtor's default. The Convention also makes provision for agreeing how default should be determined.
- A set of remedies that the creditor can exercise in the event of a default by the debtor. The CTC and MAC Protocol contain provisions allowing the creditor to obtain relief pending final determination of a claim and also require countries to specify whether a creditor must apply to a court to exercise a remedy or can exercise "self-help" in enforcing their rights.
- Protection of international interests in the event of a debtor's insolvency. Article 30 of the CTC provides that an international interest is effective where it was properly registered prior to the commencement of the insolvency proceedings. Accordingly, the insolvency administrator may not challenge the effectiveness of the international interest on the grounds that the creditor has not satisfied all of the requirements applicable to a comparable interest under the domestic law. Additional insolvency protections are set out in the relevant Protocols.

3.3 The relationship between the MAC Protocol and general secured transactions laws

53. Protocols already exist in relation to aircraft, railway rolling stock and space assets. The MAC Protocol, however, differs from the other three in its relationship to general secured transactions laws. In particular, Mooney et al (2016) point out that aircraft, space, and railway rolling stock assets are often excluded from general secured transactions laws or subject to special provisions on perfection of security interests, such as registration in an aircraft registry. In contrast, MAC equipment is generally subject to secured transactions laws in the same fashion as other assets. As a result, the interaction between the MAC Protocol and the general secured transactions law will be much closer than in the case of the other three Protocols.

54. There are a number of ways in which gains arise as a result of implementation of the legal reforms entailed in the MAC Protocol. Foreign lenders, including banks and the finance companies of major manufacturers, incur significant costs when they have to investigate the domestic secured transactions law of every country in which they contemplate providing financing. If the MAC Protocol results in a legal system for the relevant assets that is predictable and provides more effective protections to creditors than an otherwise applicable domestic regime, it will substantially reduce legal risks and due diligence costs, thereby reducing the cost of credit and improving its availability. In addition to the gains from uniform international standards, there will also be significant benefits from accelerating the reform of general secured transactions laws and creating a framework that is more cost-efficient and more protective of creditors' rights.

3.4 Application of the Protocol to conditional sales and leases

55. Article 2 of the Cape Town Convention provides that international interests, which can be perfected to enjoy protection against third parties by registration in the international registry, can be created in relation to security agreements, title reservation agreements and leases. As such, one of the significant benefits of the introduction of the MAC Protocol is that it should increase access to credit not only in relation to secured

Contracting state to retain priority over the international interest (Article 39). However, in the majority of circumstances, an international interest will maintain its priority over a domestic law interest.

lending under a security agreement, but also in relation to leasing. Generally, the three types of agreement that can constitute an international interest are treated equivalently under the Convention and Protocol. However, there are differences in relation to default remedies, as the main remedy in the event of a default under a title reservation agreement or lease is termination of the agreement and repossession of the asset.



3.5 Insolvency provisions of the Protocol

56. Consistent with the previous CTC Protocols, the MAC Protocol allows contracting states a number of options in terms of insolvency remedies. Article X of the draft MAC Protocol allows contracting states to apply one of three rules (Alternatives A, B and C) in determining creditors' remedial rights in the event of a debtor's insolvency. Alternative A is generally considered to give creditors holding an international interest the highest level of protection in the case of insolvency. As such, it is an additional mechanism lowering borrowing costs, other things being equal, by making it easier for creditors to repossess assets, thereby reducing debt finance risks.

57. It is noteworthy that, of the 73 contracting states to the Aircraft Protocol, almost all have applied Alternative A, and we assume the same will happen for the MAC Protocol. Moreover, the OECD Aircraft Sector Understanding on Export Credits (OECD, 2011) provides that contracting states can benefit from lower export bank premium rates if they ratify the CTC and Aircraft Protocol, provided they make certain declarations, including adopting Alternative A in relation to insolvency remedies. Although the MAC Protocol cannot necessarily be assumed to result in comparable discounts, the Aircraft Sector Understanding demonstrates that the OECD recognises the substantive impact of the CTC, including its insolvency provisions, in reducing risk.

3.6 Scope of international and domestic impacts

58. The greatest benefits are expected to accrue from additional sales of MAC equipment to countries where the Protocol allows a greater number of finance transactions to occur. Most of these are expected in developing countries. Benefits will accrue to sellers and to buyers.

59. There is also a question of whether the MAC Protocol will have an impact if implemented in the more advanced OECD countries. As explained above, there could be significant beneficial economic impacts if the

provisions of the CTC on insolvency law take effect, and in particular if countries adopt Alternative A, where the banks have indicated that they may be prepared to give a discount on the cost of finance. However, as explained in Annex A, these impacts are uncertain and as a result have not been included in the estimate of the international impact in this study.

60. The draft MAC Protocol contains a number of mechanisms designed to ensure clarity in its scope and predictability in its operation. The Protocol uses the HS classification system⁷ to define its application by identifying Harmonized System codes that predominantly cover high value MAC equipment. The draft Protocol also contains an article allowing contracting states to clarify the relationship between an international interest in a MAC asset and a domestic law interest arising out of immovable property law.

3.7 Implementation Costs of the Protocol

61. Detailed analysis of implementation costs of the MAC international registry lies outside of the scope of this study. However, there is enough information available to make some preliminary observations. A more detailed analysis of costs will be needed before a fully informed cost benefit assessment of the MAC Protocol can be made for individual countries. The precise costs will depend on the exact form of the MAC registration scheme, but the consensus is that the likely scale is modest.

62. There are four main groups of direct costs:

- i. set-up and operational costs;
- ii. costs to governments in assessing the case for reform, negotiating internationally and implementing domestically;
- iii. compliance and access costs; and
- iv. costs of transition / adjustment.

3.7.1 Set-up and operational costs

63. The MAC Protocol will benefit from the experience gained in implementing the international registry for aircraft. The costs associated with administering the Aircraft Protocol registry are known. Set-up costs for the Registry were \$2.12 million. Annual operating costs are significantly less than annual revenue⁸ from registrations (\$1.88 million) and searches (\$2.23 million). The Registry has accumulated a surplus of around \$6m. These figures give a starting point for assessing the likely costs and possible revenues for the MAC international registry.

64. The costs of a MAC international registry may differ from those of the aircraft international registry. Determining where costs will be similar and where they will diverge comes from understanding the number and characteristics of the products to be covered and the precise role contracting states want the registry to fulfil.

⁷ The Harmonized Commodity Description and Coding System (HS System) is used by more than 200 countries to classify goods for purposes of customs tariffs covering approximately 98% of international trade.

⁸ International Registry of International Interests in Aircraft Equipment (2016).

3.7.2 Costs to governments: assessment and implementation

65. The expertise tied up in assessing the impact of the MAC Protocol, negotiating an international agreement and transposing it into domestic law will have a cost, not just in direct time and legal advice but also in resource costs which may have to be diverted from other activities within government. The time taken to arrive at an agreement can be significant. A long-term commitment to negotiate, ratify and implement may involve several years' work, but the costs will be more than justified if, as expected, there are significant benefits.

3.7.3 Compliance and access costs

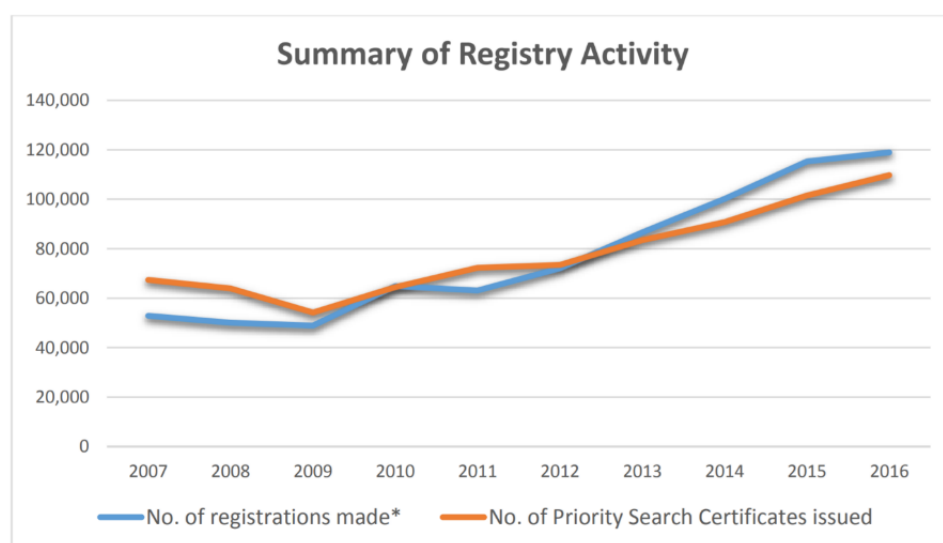
66. Compliance and access costs will vary depending on how the scheme is designed and operated, i.e. coverage of the scheme and the degree of monitoring/checking/policing. For the International Registry under the Aircraft Protocol, costs have been very low relative to the value of the assets registered. It focuses completely on ownership, which keeps documentation costs down. One reason for this is the wealth of information, which is available and verified by other sources, particularly regulators.

67. The characteristics of aircraft and MAC equipment assets differ in several respects: numbers, diversity of size/cost, mobility, regulation etc. Each of these may have an impact on the optimal design and operation of the registry for MAC products. A key decision will be whether the MAC international registry will only capture information related to security interests in MAC equipment, or whether there may be ambitions to capture other information that could help to indicate likely value if an asset has to be recovered. Several lenders noted that the MAC Protocol international registry would have additional value if it allowed details, such as maintenance logs, to be recorded. The number of registrations in the aircraft international registry has been high (see Figure 5).⁹

68. The number of registrations in the future MAC international registry may vary, depending on the value of the information and registration costs relative to product value. In all cases, registration costs are unlikely to be high.

Figure 5 - Registration and searches made in the Aircraft Registry 2007-2016

** This figure is the total number of registrations made and, from 2012, includes transfers of a right to consent to the discharge of a registration.*



⁹ Aviareto Annual Statistical Report 2016 - <https://www.aviareto.aero/wp-content/uploads/2018/05/International-Registry-Annual-Statistical-Report-2016.pdf>

69. Set-up costs will be driven by the scope of the MAC registry scheme, i.e. what kind of information it tries to capture. Average operating costs will be driven down as the take-up increases. The scheme may be able to become self-financing like the Aircraft Protocol. That does not make it costless. Charges on first registration are likely to be modest relative to the cost of most MAC assets, but whether this is seen as an administrative burden or an investment depends on the value attached to the data by users, based on the legal protection it provides. Ensuring that the needs of users of various different types of MAC equipment are factored in may have a big impact on the success of the scheme.

3.7.4 Costs of transition / adjustment

70. All stakeholders will need to familiarise themselves with the implications of the Protocol once it enters into force. For example, lenders will face learning costs in extending credit into markets where they previously did not operate and in learning new procedures in existing markets that become party to the MAC Protocol. Where the Protocol leads to additional deployment of MAC equipment, workers will take time to learn how to deploy it and maintain it effectively. Some of these adjustment costs are relatively visible, such as training. Other examples include damaged crops, lower than expected mining yields and slower construction through ineffective use of new machinery, as workers learn how to use it.

3.8 Conclusion

71. This chapter has set out the key legal changes introduced by the MAC Protocol and a brief analysis of the likely costs. The cost analysis is based on experience with the Aircraft Protocol registry and a preliminary qualitative assessment of the costs for the MAC Protocol, including the costs of setting up the MAC registry, policy implementation and enforcement costs and the costs to business of compliance and access.

72. Based on this initial analysis, the costs associated with the MAC Protocol would appear to be low in relation to the value of the assets covered and the likely benefits. This is in line with the consensus of most commentators. Further analysis of costs will be needed at the country level once more is known about the registration scheme and associated costs.



4. Characteristics of the MAC equipment market

4.1 Global market size

73. The global product market for mining, agricultural and construction equipment is currently worth around \$200 billion per year¹⁰ (Table 3), bigger than the annual revenue of BP or General Motors.

74. Equipment types traded on the global market and within the scope of the MAC Protocol range from high volume items such as balers, tractors and back loaders to highly specialised, low volume equipment. Some MAC equipment can have a high unit cost, such as ‘ultra-class’ quarry trucks which are worth approximately \$3 million each.

75. At its broadest definition, the market extends beyond manufacture and supply to include its supply chain, spare parts, maintenance and servicing, resale and refurbishment. There are numerous data sources quoting different figures. To develop a comprehensive picture of the global market it is therefore important to be clear about the types of equipment expected to be covered by the MAC Protocol. This paper refers to new or used complete equipment unless otherwise specified, in categories covered by the MAC Protocol.

Table 3 - Global production and trade in MAC equipment, 2015

Category	Value (\$ billion)
Estimated annual global production of MAC equipment ¹¹	200
World imports of MAC equipment	101
UNIDROIT members’ annual exports of MAC equipment	92
UNIDROIT members’ annual imports of MAC equipment	80
UNIDROIT members’ annual imports of MAC equipment from other UNIDROIT members	76

Source: UN Comtrade data via WITS database and industry estimates.¹²

76. International trade in MAC equipment is significantly lower than global production. The difference between the two figures is due to domestic sales of equipment in its country of manufacture. These are very substantial in many markets.

77. The introduction of the MAC Protocol is envisaged to reduce the costs of the flow of MAC equipment between countries, and to some extent within countries. The subset of equipment types to be covered by the Protocol is defined in detail in UNIDROIT (2017).¹³ The codes covered tend to be higher value items, typically involving equipment valued above \$20,000, usually much more.

¹⁰ 2015 estimated global production and trade in MAC equipment in categories covered by the MAC Protocol.

¹¹ Industry estimates validated by extrapolation from trade data.

¹² UN Comtrade database unless otherwise specified. MAC equipment categories defined in UNIDROIT spreadsheet <https://www.unidroit.org/english/documents/2017/study72k/cge02/s-72k-cge02-05-e.pdf>

¹³ Spreadsheet detailing Harmonised System codes proposed by the study group for inclusion in the annexes to the draft MAC Protocol, available at: <https://www.unidroit.org/english/documents/2017/study72k/cge02/s-72k-cge02-05-e.pdf>

78. If all UNIDROIT member countries were to sign the MAC Protocol, this would account for around 90% of global exports and 80% of global imports¹⁴ of MAC equipment covered by the Protocol. The substantial gap between UNIDROIT members' exports to the world and UNIDROIT members' imports from the world is sales of MAC equipment to non-members. These are around \$16 billion per year.¹⁵ As stated earlier, in this report we focus on trade and production data for UNIDROIT members unless otherwise stated. While not all UNIDROIT members will necessarily sign the Protocol, other non-member states may choose to implement it. The estimates therefore should be seen as indicative of the global impact.

Table 4 - The importance of MAC equipment imports to selected countries, 2015

Country	MAC imports as % of GDP	MAC imports as % of total imports
Highest		
Bulgaria	1.3	2.1
Bolivia	1.2	3.9
Paraguay	0.9	2.4
Other relatively high		
Australia	0.3	1.8
Russia	0.2	1.3
Saudi Arabia	0.4	1.5
UNIDROIT member average	0.2	0.8

Source: UN Comtrade data via WITS database and IMF World Economic Outlook database

79. For some members, imports of MAC equipment form a relatively large proportion of a country's imports (see Table 4). The same is true for non-members. For those countries, there may be a greater benefit to be gained from ratifying the Protocol if it results in a reduction in the cost of financing MAC equipment imports.

4.2 Market segmentation

80. The global market is diverse and can be segmented by equipment type, application, end-user and region. For example, Table 5 illustrates UNIDROIT member states' imports in 2015 of certain types of MAC equipment within the scope of the Protocol.

81. There are thousands of companies producing MAC equipment. Numbers are particularly large amongst those producing widely used agricultural and construction equipment. For example, there are over 277 brands of tractor alone.¹⁶

82. Some equipment, such as tractors and diggers, can be used for multiple applications in the MAC sectors. Demand and supply conditions for products that superficially appear to be homogeneous can vary markedly depending on intended application and end-user. For example, farmers in the prairies of Canada,

¹⁴ Authors' calculation based on UN Comtrade trade data.

¹⁵ Authors' calculation based on UN Comtrade trade data.

¹⁶ Brands of tractor listed on Wikipedia.

part-time farmers in Germany and small farmers in India all buy tractors, but their needs may differ so dramatically that the specification of the machine will look very different.

Table 5 - MAC equipment imports by UNIDROIT members, 2015

Product code (HS code)	Equipment type ¹⁷	Imports (\$ billion)
870190	Tractors	15.5
842952	Excavators (revolving)	12.5
842951	Front-end shovel loaders	7.7
870410	Off-highway dump trucks	4.5
847982	Mixing and crushing equipment	3.5
843351	Combine harvesters	2.8
842959	Excavators	2.5
843049	Stationary and mobile scraping and digging equipment	2.4
870510	Lorry cranes	2.3
	Other	26.3
	Total	79.8

Source: UN Comtrade data via WITS database



83. In some market segments there are only a handful of manufacturers. In many cases, competition is driven by productivity improvements through innovation rather than lowest purchase cost.

84. A relatively small number of companies have become truly global in their reach (Table 6). They are hugely important, particularly in the manufacture of sophisticated high cost equipment developed through investment in innovation. Each of the large companies has their own sales and marketing strategy to determine pricing, credit provision, bundled services etc.

¹⁷ Category headings are shorthand and do not fully describe all products listed under that heading.

Table 6 - Top 5 global construction equipment manufacturers, by sales in 2015

Manufacturer	Construction equipment sales (\$ billion)	% of company's total sales
CAT (US)	24.1	circa 50%
Komatsu (Japan)	14.0	>75%
Terex (US)	6.5	>75%
Hitachi (Japan)	6.5	<10%
Liebherr (Switzerland)	6.2	>50%

Source: Ritchie Bros (2016)

85. Construction equipment is a big proportion of their business for the majority of the world's biggest construction equipment makers, with the exception of Hitachi Group, which is part of a vast conglomerate. Firms with a large presence in the construction equipment sector, such as CAT, are often major players in mining so overall their concentration in the MAC equipment sector is extremely high.

86. The same is true in agricultural equipment where market-leading firms such as Deere, AGCO, CLAAS, Kubota, CNH and SDF are highly focused on the sector.

87. Some of the largest producers globally are located in the US, China, Japan, Russia, Western Europe, Korea and India. Table 7 shows the leading exporters. US, Japanese and some European producers have very strong market shares in the highest technology/performance segments of the market, while Chinese exports have increased very rapidly in the MAC sector.

88. Producers in Russia and India have large domestic markets but are not currently major exporters, although this could change. Countries such as Japan, UK and Netherlands export a high proportion of their production.

Table 7 - The major MAC equipment exporting countries, 2015

Country	Exports (\$ billion)
Germany	15.2
USA	12.2
Japan	11.2
China	9.4
UK	5.0
Italy	4.8
Korea	3.8
Mexico	3.5
Netherlands	1.8
India	1.0

Source: UN Comtrade data via WITS database

89. Many low/medium cost products such as truck-mounted cement mixers are produced in dozens of countries worldwide. In many cases these products are primarily intended for their domestic markets.

4.3 Market conditions

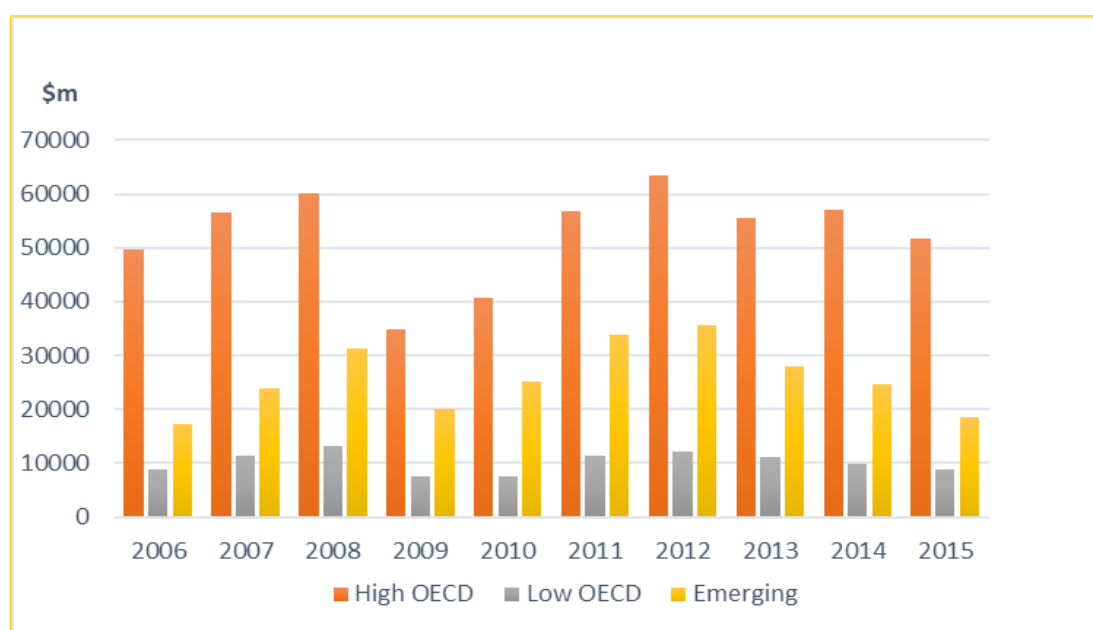
90. Demand, supply and prices in each equipment market segment will be determined by a range of factors.

91. Commodity prices have a strong impact on agricultural and mining equipment demand while construction equipment demand is typically correlated with growth in GDP and particularly with developments in the property market.

92. Demand for MAC equipment, particularly construction and mining can, however, be particularly volatile (Figure 6). The reduction in the flow of imports of MAC equipment to UNIDROIT members between 2007 and 2009, at the time of the global financial crisis, was around 45%.

93. Markets can change very dramatically and very quickly. The contraction in Chinese construction equipment sales from a peak of over 430,000 units in 2011 to just 131,000 units in 2015 was followed by a sharp rebound in 2017. This was primarily driven by variations in Chinese economic growth.¹⁸

Figure 6 - MAC equipment imports by UNIDROIT members, 2006 - 2015



Source: Trade data from UN Comtrade via World Bank WITS interface, GDP data from IMF World Economic Outlook. Categories seek to replicate CEAL groupings. High OECD are those countries with GDP per head over \$25,000, typically with highly developed credit markets. Low OECD are those countries with GDP below \$25,000, with less extensive or less developed credit markets.

¹⁸ Off Highway Research, Global Volume and Value Service estimates, cited widely.

94. How supply responds to changes in demand and price signals is also unlikely to be uniform across the different equipment market segments. In some cases, there may be considerable spare capacity but less so in others.

95. In the short run, installed capacity will determine responses but in the medium term many manufacturers may be able to gear up to supply relatively generic products, meaning that the market will respond to an increase in demand with more production by existing suppliers and possibly by market entry by new suppliers.

96. The situation may be different for more specialised equipment. The huge R&D input and specialist expertise needed to develop and produce niche products makes it more difficult for new firms to enter the market, so the supply response is likely to be restricted to market incumbents.

97. Similarly, competition for the market will be stronger in some segments than other. Typically, where technology and innovation are critical factors, buyers' choice may be driven by performance more than cost.

98. Existing studies have found very varying evidence of equipment supply elasticities for MAC equipment. For example, Edgerton (2010) found that prices do not increase significantly during booms, suggesting that if something increases demand, supply can respond without upward pressure on prices. However, previous research was less positive. Goolsbee (1998) argues that equipment suppliers do not pass on cost savings to customers, suggesting that they might respond to an increase in demand by raising prices rather than increasing supply.

4.4 Sales routes for MAC equipment

99. Interviews and surveys undertaken with equipment manufacturers¹⁹ suggest that they are open-minded about the impact of the MAC Protocol and would increase supply if demand increased. All expected it to have either a positive impact or little impact. No one expected there to be any negative effect.

100. The majority of manufacturers who responded to our survey do not bundle finance with their products when selling into developing countries, some of which may be significant beneficiaries of the MAC Protocol. Interviews indicated that many equipment manufacturers do not have a deep understanding of the MAC Protocol's operation. Even in some of the largest firms, the level of knowledge regarding the MAC Protocol project varied greatly depending on the interviewee. An awareness raising campaign may be required to increase their engagement with the Protocol.

101. The business models of some companies involve bundling together equipment with maintenance and other services including credit while others supply equipment and services separately. Along with issues of durability, maintenance costs and productivity this makes comparison between different products difficult. For firms that did bundle credit with products it was not always easy to separate out prices and cost of credit as it appeared both were flexible in order to make deals appear attractive and to accommodate buyers' requirements. This may make separating out product market and credit market effects very difficult.

¹⁹ A small self-selecting sample of firms of varying sizes in Europe, Asia and North America.

102. While most attention is given to the new equipment market, reconditioned and used equipment sales remain hugely important. While production data covers only new equipment, trade data does not discriminate between new and used equipment. Data on used and reconditioned vehicle sales tends to be harder to access and verify. However, the second-hand market is very substantial including extensive cross-border transactions. The MAC Protocol will apply to both new and used equipment, which will allow the participants in the secondary market for MAC equipment to benefit from the same legal protections and lower risks provided by the Protocol.

4.5 Conclusion

103. The global market for MAC equipment is large and diverse, with a variety of players and business models. Ideally, a full assessment of the impact of the MAC Protocol would take account of the diversity of types of equipment, suppliers and business models, as well as the market conditions and trading arrangements affecting trade in MAC equipment. However, the data and resource requirements preclude this for the current study.

104. Estimates will instead be presented on the basis of a broader assessment of the international impact, but the diversity and complexity of the market need to be borne in mind in considering the results.



5. Credit for MAC equipment: market characteristics

5.1 How MAC equipment is acquired and financed

105. The starting point for assessing the likely impact of the MAC Protocol is an understanding of how the credit market for MAC equipment currently works. This chapter outlines factors that determine access to finance for MAC equipment and its cost and to specify how the MAC Protocol might affect some of them.

106. There are substantial differences in the provision of credit depending on the country, product and borrower. A detailed assessment of the impact of the Protocol on a particular country or sector would require data and analysis at a disaggregated level. For this report, we focus on global data to give an overall picture of the impact of the Protocol.

107. There are also very large differences between size and types of lender. Some firms operate only in their domestic market. Others will be global multinationals. Most are private sector owned while some may have links to the state. Some, such as specialist agricultural banks, have built strong links to customers and suppliers, while for others MAC lending is just one of many sectors in which they operate. Several interviewees, who had not been closely involved with the MAC Protocol to date, felt that it would only be relevant to and beneficial for large (particularly American) banks who want easier access to capital markets and want to export their model of doing business globally. The MAC Protocol has the potential to change lending conditions for all types of financial institutions. Conditions will change and risks will be affected to some degree in all countries where the Protocol is ratified. There may be new opportunities and challenges such as increased competition in some markets.

108. Based on interviews with financiers, it appears to be very rare for a single bank to undertake a large MAC loan in isolation. It is far more common to form syndicates to share risk. One consequence of the Protocol may be a willingness of new participants to enter syndicates, or to commit larger amounts to deals. How the relations between funding partners might change is not considered here, but should form part of country level impact assessment.

109. Many MAC equipment transactions, especially those relating to consumers purchasing low value equipment for non-commercial use, will lie outside of the coverage of the Protocol. The Protocol's primary impact is on international loans for mobile, high unit cost items. In some markets, this will form a minority of equipment purchases. However, the MAC Protocol will also apply to domestic loans, as long as the debtor is located in a contracting state.

110. Not all purchases of MAC equipment are made using credit. In some cases, this will be a matter of choice. In many more, however, it is due to a constrained supply of credit or because individual borrowers do not meet the lenders' criteria. Table 8 outlines the different finance routes available and their cost to borrowers. Non-purchase options such as short-term hire and longer-term leasing are also available. Here, equipment is bought by leasing firms who then provide it to end users.

Table 8 - Different methods of acquisition and financing for MAC equipment

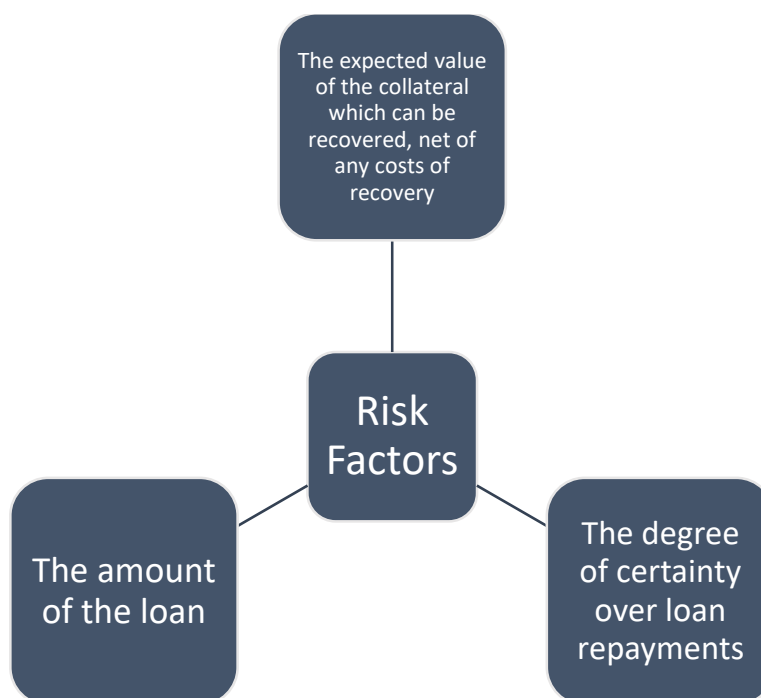
Method of finance	Domestic	International	Cost to borrower
Grant-financed often as part of a wider project	National or local government, NGO etc	Aid	Nil
Concessional credit	State bank or state body with access to concessional funds	IFI, Aid donor agency	Low or very low, but scarce
Cash purchase	Company self-finance	Multinational self-finance	Very high as capital tied up
Commercial loan, unsecured	Possibly in a small number of cases	Unlikely	Highest risk credit = highest cost credit
Commercial loan, secured on a range of assets.	Loan secured on other assets e.g. bank accounts or land as well or instead of MAC asset	loan secured on other assets, such as receivables often outside risky country	Premium depends on risk and due diligence costs. Biggest problem is that it ties up/risks lots of capital
Commercial loan, secured primarily on MAC asset. Hereafter referred to as Secured Credit	Secured on MAC asset where banking system is large enough and sophisticated.	Secured on MAC asset where international bank feels risk is acceptable, which may be improved by MAC Protocol	Lowest risk to lender so cost of credit should be lower than other commercial loans. Far more capital efficient.
Equipment leasing, right to use equipment, not ownership.	Depends on decision making of leasing firm, not regulated in same way as banks	More likely on more expensive equipment or via domestic intermediary.	High cost/year to user but less capital required

Source: Industry interviews

5.2 Types of credit and terms

111. If a loan is granted, secured on a piece of equipment, the risk to the lender depends on the factors outlined in Figure 7 below.

Figure 7 - Risk factors for a loan



112. The MAC Protocol impacts on the ‘collateral value’ factor by seeking to increase the expected value of the recovered asset, firstly by making recovery more certain and quicker and secondly by allowing the creditor to realise that asset value by redeploying it wherever there is demand. This is explained in more detail below.

5.3 MAC financing and refinancing

113. The MAC Protocol will not affect all initial acquisition of MAC equipment, as some is not acquired on a commercial basis (Table 8). However, during the lifespan of a product, it may be sold on, requiring finance, or re-financed, both of which may be cheaper if the MAC Protocol is adopted.

5.4 The buyer’s perspective

114. From the buyer’s perspective, their demand for credit will depend crucially on the financing costs of acquiring the equipment. These costs may include upfront cash payments, any interest payments over time and the capital that needs to be committed to acquire the equipment.

115. Cash purchases are an unattractive option for many businesses as they tie up capital that could be employed elsewhere, making it an inefficient use of resources. Further, firms often do not have sufficient cash to pay the full purchase price for new equipment. Even if they did have sufficient cash, few firms would choose to fund all equipment purchases by paying cash unless they had no other choice.

116. Truly unsecured loans (i.e. where there is no collateral), if available at all, are very expensive because they are the riskiest. The creditor is exposed to the entire loan amount. As a result, they may be very reluctant to offer any significant credit if it is completely unsecured.

117. Loans secured on something other than the MAC asset are likely to be cheaper than truly unsecured, because the creditor faces less risk. However, such loans are often complex and expensive to arrange and impose more risk on the borrower if property is used as the collateral. Deals structured on, for example, commodity income or other receivables are likely to be a more attractive option for buyers as they reduce the amount of capital tied up, but remain less desirable than loans primarily secured on the MAC asset.

118. Loans that are primarily or solely secured on MAC assets are likely to be the most attractive to the buyer in that they are likely to be cheaper than unsecured loans and loans secured on other assets.

119. The MAC Protocol should be beneficial to buyers as it has the potential to reduce the interest charged and to dramatically reduce the capital tied up in equipment purchase. The added confidence derived from legal certainty under the MAC Protocol reduces loan exposure, which may also allow longer duration lending. There is a particular advantage if the loan duration can match the asset's payback period so that it can become self-financing. Some firms who do not meet loan criteria may still be able to benefit from greater availability of secured credit as it may enable leasing companies to acquire more equipment and to lease it. Leasing is covered in more detail in Annex B.



5.5 The lender's perspective: how credit decisions are made

120. Loan decisions are made on the basis of assessing credit risk, i.e. the risk that the borrower defaults and does not meet required payments. A credit decision is based on whether the lender believes there is a sufficiently high probability of being repaid, which is in turn determined by a combination of two factors: (i) credit quality and (ii) the lender's confidence in accessing collateral to cover the exposure if the borrower defaults.

121. Credit quality is an assessment of the factors that determine the likelihood of the debt being serviced and the loan repaid. It is not affected by the MAC Protocol. If credit quality is not high enough, lenders will still be reluctant to lend. However, the MAC Protocol may make it possible to reduce the lender's exposure by increasing the expected asset recovery value.

122. If the borrower defaults, the lender stands to lose their exposure to a loan, where:

$$\text{Exposure} = \text{Loan value} \text{ less expected asset recovery}$$

Expected asset recovery depends on confidence that the lender has first claim on the asset used as collateral, that it can be recovered and confidence that the collateral can be re-sold to recover some of the loan value. Determining priority among creditors after a default is likely to be challenging. Measures which make this clear and unambiguous ex ante are valuable as they enable all lenders to understand the risks they face and to price accordingly. Measures such as a registry should help to decrease due diligence costs verifying the existence of other claims.

123. The quicker and cheaper an asset can be recovered, the more potential value remains and the lower the lender's exposure. The MAC Protocol helps by clarifying the law to ensure that the asset can be recovered quickly with clear and predictable priority rules and at a lower cost. In the absence of the Protocol, the due diligence that would be required to assess the likelihood, time and cost involved in recovery is potentially huge where states have complex and inefficient domestic laws. This can prevent deals completely or increase the cost of credit.

124. Value can be recovered more quickly if there is a domestic market for the object, or freedom to export it to a larger and more liquid market. The MAC Protocol facilitates this by simplifying exportation of the recovered object to another country where it may be easier to sell.

125. The situation is even more complicated when taking into account the risk of both default and insolvency. Slow or unpredictable and complex insolvency rules and practices can lead to additional legal costs, time delays and residual risk, all of which feed through to higher lending costs. Contracting states that make the necessary insolvency declarations under the MAC Protocol may therefore benefit from significant reductions in risk. If a country commits to the predictable, creditor friendly approach to insolvency in Article X Alternative A of the Protocol, it can expect to reduce the risk of borrowing. In a competitive market, at least some of this should be passed on to borrowers in improved loan terms. Against this, some countries are concerned that reforms of this type might have an adverse impact on recovery rates for creditors of insolvent firms or negative development or social impacts. These issues are discussed in more detail in Annex A.

5.6 Factors that impact on credit availability and cost

126. Credit availability in the MAC sectors varies very widely. In some developed country markets, particularly in North America, most machinery, new or used, is acquired with a finance package. In some cases, this can be for up to 100% of the asset value.²⁰ In other countries, where credit is scarcer or harder to access, it may be as low as 20% of product value for the minority who can access credit.²¹ In high risk markets, most sales have to be predominantly self-financed. The cost and availability of credit may also depend on specific features of the product. Table 9 shows how product characteristics can affect credit decisions.

Table 9 - Determining factors of credit availability for different types of equipment

Determining factors	Aircraft	Large quarry truck	Small back loader	Farm tractor
Cost	\$10 - 100m	\$1 - 5m	\$40 - 200k	\$20 - 400k
Lifespan	Long, predictable, maintenance is critical to certification	Depends on maintenance and use	Depends on maintenance and use	Depends on maintenance and use
Buyers	Relatively homogeneous firms, globally distributed	Small number, limited locations	Very varied, everywhere	Very varied, everywhere
Maintenance documented	Definitely	Highly likely	Possible	Unlikely
Duty cycle	Predictable	Predictable	Unpredictable	Unpredictable
Cost of re-possession	Even if significant amount, it is likely to be a low % of value	May be significant amount. Modest to significant % of value	Significant to high % of value	Significant to high % of value
Re-sale market	Liquid (international) but highly cyclical	Sometimes none domestically, may be illiquid internationally	Liquid national	Liquid national
Predictability of asset re-sale value if recovered	High due to maintenance records and international standards	Depends on maintenance and use recorded	Uncertain	Uncertain
Borrower's income	Some cyclical	Can be very volatile, driven by commodity prices and volatile demand	Depends on sector. Construction can be very volatile, sharp growth and contraction	Depends on harvests and commodity prices
Borrower's credit history	Highly likely to have verifiable credit history and detailed audited accounts	likely to have verifiable credit history and accounts	May have verifiable credit history and accounts in some markets. Key barrier to lending if not.	May be documented in some markets - key barrier to lending if not

Source: Based on industry interviews

²⁰ <http://equipmentfinanceservices.com/heavy-duty-truck-finance>.

²¹ Information based on transactions in Africa. Source: interviews with practitioners.

127. More generally, the factors that determine the availability and cost of credit for the finance of MAC equipment will depend on some or all of the following factors:

5.6.1 Total supply of credit

128. In some markets, the supply of credit in the market is far lower than potential borrowers could productively invest, even after taking account of alternative financing mechanisms, for example leasing. This may be due to general features of the economic and business environment, for example very high risks, a weak banking system, macroeconomic problems or poor-quality regulation.

5.6.2 Size of the MAC sectors relative to the domestic banking sector

129. In some countries or sectors, demand for MAC equipment may be large relative to the size of the banking sector as a whole or the capital base of local banks. Potentially these scale problems can be overcome by the formation of lending consortia or attracting foreign secured lending.

130. Domestic credit availability is likely to be easier for less specialist and lower cost items such as tractors and diggers with multiple potential users and transparent resale markets. Highly specialised equipment is likely to be harder to finance domestically as it is typically more expensive per unit and domestic options for resale are far more limited.

131. A substantial advantage of secured lending from international sources is that lenders are not as likely to be as capital-constrained as domestic banks, so if they find the credit risk acceptable, they can lend large amounts. In some markets, domestic banks may also use their market dominance to charge higher interest rates than justified by the level of risk. International lenders can introduce greater competition, which is likely to keep prices under control.

5.6.3 Credit risk information

132. The quality of credit information reporting is hugely important to determining creditworthiness. Without good information on credit risk, lenders must assume very high risk and will price loans accordingly. Improving information on credit risk is therefore complementary to the MAC Protocol. Both are necessary but not sufficient conditions for efficient lending in the MAC sector. Some domestic leasing firms may be able to augment whatever credit reporting is available with knowledge of customers to provide lease equipment where secured lending isn't feasible. As lessors continue to own the equipment they are not exposed to as many risks as banks. A leasing company is likely to be in a better position to demonstrate its creditworthiness and therefore benefit from secured credit.

133. Even within the same country there is scope for huge variation between MAC purchasers or lessees. These variations will affect the ease of assessing credit quality. It will be easier to assess the credit quality of a multinational corporation with revenue streams in many locations, a strong credit history and possibly a long-established relationship with an equipment supplier than a new start-up. Even if both are operating in the same market sector, e.g. mining, the start-up will not have a long credit history, may only have domestic currency revenue streams and will lack the long-term relationship with a MAC equipment supplier. Each of these factors may make it harder for them to access credit and more expensive if they are able to do so.

134. In a situation where ratification of the Protocol eases the availability of secured credit within a country, lenders may initially be relatively conservative, starting by offering secured credit to the best credit risks, then expanding provision as their experience of secured lending in that market grows.

5.6.4 Property rights (certainty of ownership and recovery)

135. Property rights are fundamental to provision of secured credit. Credit is easier to secure on an asset where the borrower can be proven to be the owner or the creditor can establish a priority interest in the asset, there is proof no other claims exist now and no other creditors can prevent asset recovery in the event of non-payment or insolvency. Every country has laws covering these issues, but some do not appear to give lenders the confidence they need. Clarity over what the law says is one issue, however finding out how it has been applied in the past and how it might be applied in the specifics of a particular transaction is quite separate and potentially costly.

136. The MAC Protocol should lead to greater certainty of rights of secured creditors and recovery by promoting:

- i. clarity over rights to objects via a predictable legal regime supported by a global registry system;
- ii. clarity over the position of creditors and where they sit in the hierarchy of claims in the event of insolvency;
- iii. the right to recover the asset rapidly in the event of default, with very few exceptions; and
- iv. once recovered, the right to export the asset to recover value.²²

5.6.5 Insolvency law and its application

137. As outlined in Annex A, insolvency laws affect risk and therefore loan availability and the cost of credit. Inadequate insolvency provisions can limit the supply of credit and increase its cost. The insolvency law remedies set out in Article X Alternative A of the MAC Protocol seek to minimise creditor risk. It aims to reduce both risks and due diligence costs for lenders. At the margin, it should enable secured lending that otherwise would not proceed. In those countries where the law was previously unattractive to creditors, the potential benefits of ratifying the Protocol and adopting Alternative A will be far higher than those where bankruptcy and insolvency laws are already predictable, quick and low cost.

5.6.6 Right to export

138. In some countries foreign lenders may face legal issues that generate uncertainty about the right to take assets out of a country. Some countries have a 'National Interest' rule to prevent critical equipment leaving the country even if a creditor needs to do so to recover an outstanding loan. The political issue behind such a rule is not trivial, particularly if there is a perception of unfair treatment. The great advantage of an international treaty is that all parties commit to the same rules. The MAC Protocol will improve creditors' ability to export equipment in a timely manner.

5.6.7 Size and complexity of the loan

139. Due diligence costs are likely to be similar in monetary terms whether a loan is large or small. This is because there is a minimum amount of checking needed whether a loan is \$50,000 or \$500,000. This leads to

²² Article VIII of the draft MAC Protocol allows for creditors to procure the export and physical transfer of equipment from the territory in which it is situated where the debtor has agreed to this remedy.

due diligence costs being relatively lower for larger loans than for smaller ones. In some cases, with sufficient research it is possible to structure complex finance packages in which receivables in other countries provide security on loans into markets that are high risk. Clearly this is not an option for smaller loans. A loan secured on MAC equipment should be simpler and therefore have lower due diligence costs than one that relies on other forms of collateral.

5.6.8 Credit Pricing

140. The pricing of credit within the banking sector may well be affected considerably by a range of external factors, ranging from monetary policy to competition rules and social policy obligations of the banking sector.²³ To assess the current availability and cost of finance in particular markets would require a detailed study of transactions on a country-by-country and sector-by-sector basis.

141. Comparing the pricing of credit is more complex than it may first appear. In the UK, leading manufacturers such as John Deere offer rates from 2.5% APR on new equipment, which is 225 basis points over base rate,²⁴ with deposits/down payments from 10% of purchase price. In the same market, other types of loan, with less certainty over an object's value, are significantly more expensive, e.g. 5.95%, or 570 basis points over base rate, for a used tractor loan. The range within a country can be very substantial.

142. Comparing loan rates between countries is not always easy. Wesbank in South Africa offers agricultural equipment loans at 12%, a spread of 525 bps over base rate.²⁵ However, this rate appears to be dependent on installing trackers and other expenses that would need to be priced in for full comparability.

5.6.9 Loan duration and capital efficiency

143. For many equipment users, the loan duration and payment schedule may be at least as important as the interest rate charged. If the loan duration is shorter than the asset's payback period, then capital from elsewhere in the business will need to be reallocated to finance it. Inefficient allocation of capital is a significant impediment to business performance and to economic growth and development. The MAC Protocol may give lenders more confidence, which may encourage them into longer term lending. This will be an important issue to assess when looking at national impact.

5.7 Opportunities and limits: the impact of the Protocol

144. The overall impact of the Protocol will depend on the difference between the market's perception of the current situation, i.e. the effectiveness of the domestic legal regime and its application, and the market's perception of the legal regime after ratifying and implementing the Protocol. Even if the current domestic regime affords the same rights as the Protocol, there may be differences in perception.

145. Such a perception may not be grounded in fact but may nevertheless be significant. Even where there are no substantive legal differences in the rights and protections between the existing domestic regime and the Protocol, there may be additional due diligence costs to check domestic law, regulation and enforcement, compared to checking Protocol ratification and enforcement.

²³ Some countries expect banks to offer services to a portion of the population that is unprofitable. They recoup this cost from other customers.

²⁴ John Deere UK website and Bank of England for interest rates, July 2018.

²⁵ Wesbank Website and SARB interest rate of 6.75% late Sept 2017.

146. The CEAL analysis (Fleisig, 2013) suggested that a very large shift from ‘unsecured’ (i.e. not primarily secured on the MAC asset) to secured lending (i.e. primarily or solely secured on the MAC asset) would take place, with both price and quantity benefits across a large range of countries. There is no doubt that there is a vast amount of currently unsatisfied demand for lower cost credit for MAC equipment in many parts of the world. On the basis of our analysis and evidence gathering, it appears that the MAC Protocol will have an impact in certain specific circumstances, but that in others, there will continue to be factors blocking the expansion of credit. Progress on these barriers will allow further benefits from the MAC Protocol to be enjoyed over time. This suggests that adopting the MAC Protocol and domestic reforms are likely to be complementary, not substitutes.

147. In some circumstances, lenders will enjoy greater certainty/lower risk on existing loans and face reduced due diligence costs on new ones. They are likely to find that a new tranche of opportunities will meet their criteria for secured lending. However, it cannot be assumed that creditors will automatically pass on the risk reduction in the form of lower cost credit to customers, higher lending or loans with longer duration. They may choose to take some or all of the benefit in the form of higher returns.

148. The extent to which benefits are passed through by lenders will depend on the degree of competition in credit provision. The MAC Protocol should make competition more likely as it should lead to a reduction in nation-specific barriers to entry.



5.8 Identifying factors affecting the scale of impact of the Protocol

149. Understanding the impact of the MAC Protocol in credit markets could be enhanced by undertaking detailed case studies of specific countries or sectors. In assessing the actual benefits, the following issues will need to be considered and tested:

5.8.1 Secured lending is likely to develop gradually

150. The benefits of the MAC Protocol are likely to accrue gradually, as it and lenders grow in confidence as they observe a growing body of court rulings predictably and rapidly enforcing creditor rights. This will give them greater certainty, which will decrease their perception of risk exposure and may trigger an expanding supply of credit. Borrowers’ ability to access credit may increase, particularly in markets that are undertaking wider supporting credit market reforms. Credit decisions are not purely binary. The degree of risk the lender can take is shaped by a wide range of issues.

5.8.2 Reductions in interest rates will not be uniform across all markets

151. Some countries will already have easy access to domestic and international credit, thanks in part to strong insolvency laws, a good track record of asset recovery and freedom to export. Other countries face additional challenges in maximising the benefits from the Protocol, because a range of macroeconomic, regulatory and other risk factors will continue to deter secured lending.

5.8.3 The Protocol (and associated policy changes) may enable large scale secured lending on MAC equipment for the first time in some markets

152. Candidate countries identified by industry experts are in Southern Europe, North Africa, South Asia, Southeast Asia, Central Asia, Latin America and some countries in Sub-Saharan Africa. A high proportion of equipment sales have either been cash or secured on other assets, making them expensive and capital inefficient. This means there is a substantial pent up demand for credit secured on MAC assets.

153. Whether international lenders offer credit in these markets will depend on their view of the opportunities for profit and the risks. They may not wish to enter smaller and higher risk markets. Some analysts have suggested that these markets may benefit from the MAC Protocol via a growing pool of niche and non-traditional lenders who are willing to finance relatively low risk projects, but only if adequate information and comfort over creditor rights are available.²⁶ A crucial barrier, which has been addressed in some countries, is the availability of reliable credit history reporting. This is completely independent of the Protocol but will be one of many external factors that will influence its success.

5.8.4 The benefit of the Protocol to borrowers in some markets will be a shift from credit secured on another asset to credit secured on the MAC equipment purchased

154. Initially this appears to be a minor change but may offer some firms a significant increase in capital efficiency and increase their borrowing capacity. It also means that access to capital is not restricted to the most established owners of assets in a society, who are not necessarily the most entrepreneurial.

5.8.5 Not all borrowers in a market will be able to shift to secured lending

155. In those markets where secured lending becomes available to the best credit risk customers, others will not meet the criteria for it because of: varying credit quality, limited lender confidence and varying asset recovery costs. Only part of the market will be able to benefit from a switch to secured lending.

5.8.6 Increased banking regulation may affect the gains from the MAC Protocol

156. Reduced risk and lower due diligence costs incentivise banks to increase the supply of credit, but this expansion comes against the backdrop of tighter banking regulation and accounting standards around the world. This does not diminish the importance of the Protocol, particularly in countries where financial liberalisation and development are still taking place, but complicates its utilisation in practice. Specific changes in capital requirements specified in Basel III will affect the impact of the Protocol.

²⁶ Views of a finance specialist operating in Latin American markets.

5.8.7 It will remain easier to get secured credit on some MAC assets than others

157. Those assets with a high and predictable recovery value and those countries with quick, reliable and enforceable creditor rights are less risky for lenders than those where value is uncertain and where recovery may be slow, physically difficult and expensive relative to asset value, for example some assets that are underground or in remote locations or have high transport costs. This is likely to have an impact on loan pricing.

5.8.8 Secured lending may lead to a substantial improvement in capital allocation

158. The interest rate is only part of the benefit created by a move to secured lending. Reallocation of capital tied up in buying MAC equipment is a big benefit too. In some countries, most MAC equipment is currently bought cash or majority cash, which ties up a great deal of capital. Where the Protocol makes secured lending possible, it will dramatically reduce this capital requirement. If risk allows loan duration to match asset payback times, assets can become self-financing.

5.9 Conclusion

159. This chapter has argued that the cost and ease of accessing finance for MAC equipment depend on a large number of factors. In some markets, secured finance is scarce or unavailable even to low credit risk firms.

160. The MAC Protocol addresses this problem by removing some of the key uncertainties around asset recovery in the event of default or insolvency, as well as providing clear priority rules. However, there may well be other factors that prevent borrowers benefiting to the full extent. The MAC Protocol should be seen by signatories as an important element in improving access to credit, but not the only necessary action.



6. Estimating the impact of the MAC Protocol: methodology and results

6.1 A theory of change: economic relationships and channels of impact

161. The development of a robust analytical framework to assess the potential international impact of the MAC Protocol first requires an accessible and meaningful logic model or ‘theory of change’, setting out how implementation of the MAC Protocol (the ‘policy change’) will affect different economic variables.

162. A well-specified theory of change identifies long term economic goals, outcomes and impacts and maps out the necessary preconditions. In so doing, it sets out the key economic relationships and channels of impact as well as helping to identify evidence requirements for a priori assessment and ex post evaluation. Figure 8 summarises our theory of change for the economic assessment of the MAC Protocol and is described in more detail below.

6.1.1 First-round effects (credit market)

163. The most immediate and direct effects of the policy change will be in the credit market for MAC equipment. In countries that undertake to reform their secured transactions laws and where equipment needs currently exceed availability due to financial constraints, the anticipated effects of the policy change are:

- an increase in the overall volume of credit available;
- a reduction in the cost of secured debt relative to unsecured debt and in absolute terms; and
- a switch from unsecured credit to lower cost secured credit.²⁷

164. However, the scale and timing of these effects are likely to vary significantly across countries depending on how quickly they are able to implement the Protocol and ensure full compliance and on whether there are other regulations or country-specific risks that might limit its effectiveness.

6.1.2 Intermediate outputs (product or equipment markets)

165. The most important second-round effects of the policy change are in the product or equipment markets. An increase in the availability of credit should enable suppliers of MAC equipment to take advantage of a latent demand for equipment from firms active in the MAC sector whose ability to fund equipment purchases is currently constrained by their lack of capital/collateral or by the cost of secured credit. Assuming that other aspects of the economic environment are sufficiently favourable, successful enactment of the reforms will facilitate the purchase of new equipment with secured debt. The biggest impact on sales is expected to be in those markets where a substantial number of customers can access secured finance more readily than in the past. Most new purchases are likely to be from overseas suppliers.

166. Following the entry into force of the Protocol, therefore, there should be an increase in both the total amount of credit and the amount secured against moveable equipment in previously unreformed countries.

²⁷ In reality, most current sales of MAC equipment will have some security, perhaps in the form of an uncertain or difficult to enforce claim on the MAC asset, with other security, for example the lender’s home, as a backstop. The characterisation of the change as a switch from unsecured to secured credit is therefore a stylised assumption, used as shorthand for ease of exposition. The economic impacts are, however, similar.

167. Suppliers of MAC equipment will respond to the increase in demand by raising their output if it is profitable to do so. There may be price changes in addition to volume effects depending on the capacity of the global industry to increase supply at the same rate at which demand expands. Competition between equipment and credit suppliers and leasing companies will determine how much of the benefit accrues to final users.

6.1.3 Outcomes (indirect effects)

168. These are the effects of the policy change on the mining, agriculture and construction sectors, and subsequent effects on their supply chains and on equipment manufacturers. An increase in both the stock and quality of equipment in countries that have implemented the MAC Protocol should help to boost productivity and output in their MAC sectors as well as creating new business and employment opportunities both directly and indirectly in domestic supply chains.

169. The deployment of an equipment stock that is enhanced both in terms of quantity and incorporated technology will enable greater operational flexibility, increased process and product innovation and a more efficient allocation of resources within and between firms. For example, the development and deployment of high-performance mining equipment has made it possible to extract ores of declining grades without increasing costs and has assisted transition from underground to innovative open pit mining.

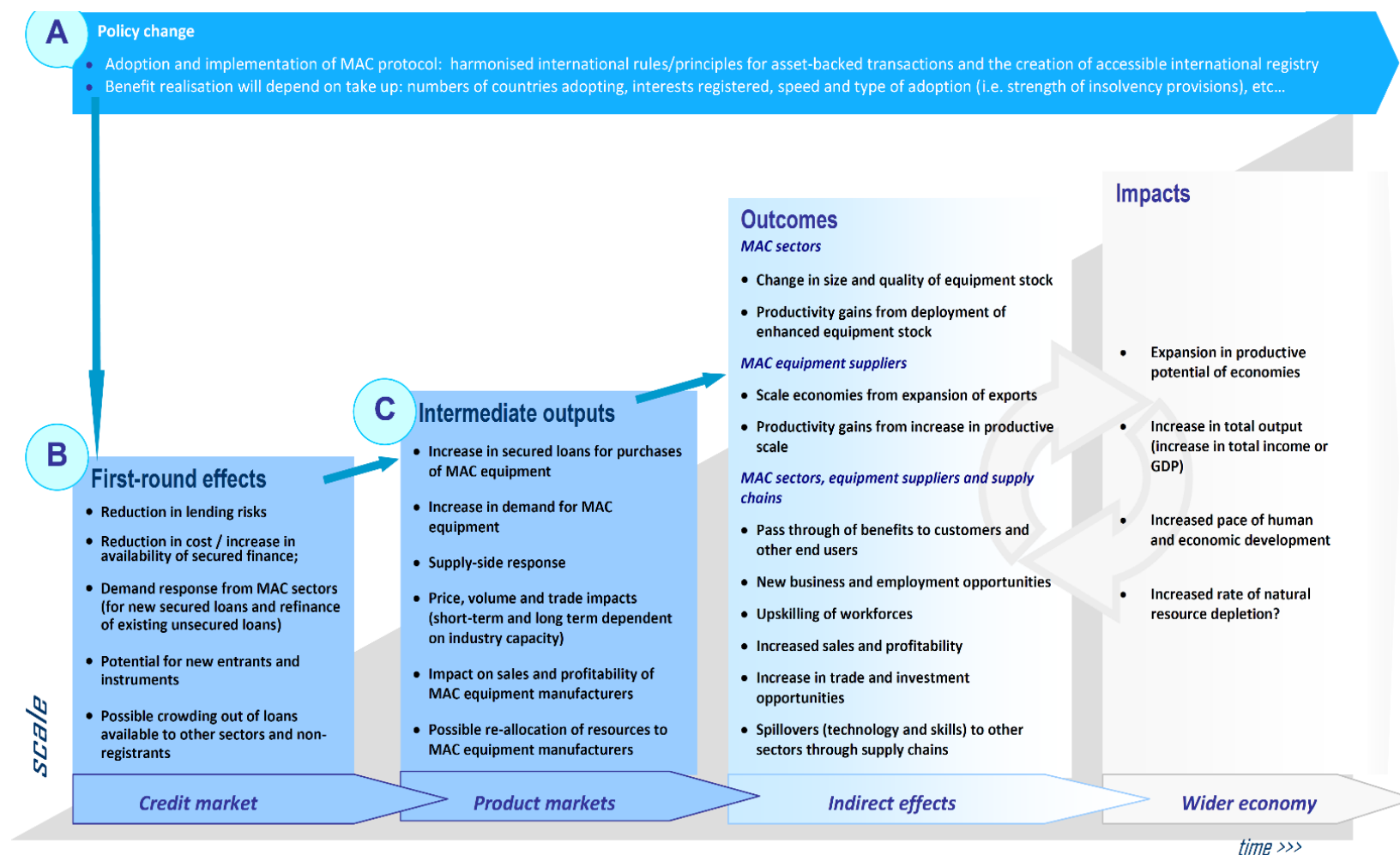


170. Manufacturers of MAC equipment that benefit directly from an increase in demand for the machinery they supply internationally may be able to use their existing capacity more efficiently or expand their operations to leverage further technical, financial, marketing and other economies associated with increased productive scale. This in turn may allow further gains in productivity and profit margins to be secured from reconfiguring their production lines and processes. Similar gains should flow both upstream and downstream to customers and suppliers as manufacturers increase their production.

6.1.4 Impacts (wider economy)

171. Further positive impacts on both prices and quantities in other sectors should result from the increased activity in MAC sectors and equipment suppliers through 'multiplier' effects as increased profits and employment incomes are spent in the wider economy. Final impacts will be reflected in higher real GDP and increased prosperity. In addition, there may be impacts on the natural environment, positive or negative, and on the resource base of the economy.

Figure 8 - Theory of change / channels of impact



6.2 Economic assessment of impact: aims, scope and evidence requirements

172. The primary aim of the assessment is to identify and quantify what is likely to happen to a defined set of economic variables following the introduction of the MAC Protocol (the policy change) relative to what would have happened in its absence (the ‘counterfactual’). Additionally and where possible, assessment should also consider how these changes will affect different groups of net beneficiaries in different economies, specifically:

- MAC sector creditors / investors;
- MAC equipment users;
- MAC sector supply chains;
- MAC sector customers and other end users;
- MAC equipment manufacturers, exporters, investors and suppliers; and
- Governments (for example, through the displacement of state funding for MAC equipment and impacts on tax revenues and other transfers).

Figure 9 - Simple alternative assessment framework for legal reforms

A simple ‘framework’ for assessing the net economic benefit of legal reforms of the type embodied within the MAC Protocol has been presented by Jeffrey Wool of the Commercial Law Centre, Harris Manchester College, University of Oxford (Wool, 2017). It expresses the net benefit to countries implementing an international commercial law instrument as:

$$\underline{\mathbf{EI}} = [(\underline{\mathbf{A}} + \underline{\mathbf{B}} + \underline{\mathbf{C}}) \times \underline{\mathbf{D}}] - \underline{\mathbf{E}}$$

where:

- EI** = the overall net economic impact of the new rules;
- A** = the net microeconomic impact of the new rules, rather than those applicable in the absence of reform;
- B** = the net microeconomic impact of the new rules as a network, that is, the existence of international rules;
- C** = the net macroeconomic, including developmental, impact of the new rules, rather than those applicable in the absence of reform;
- D** = the extent, measured from 0 to 1, that the new rules are effectively applied by courts and authorities (eg political/institutional risk); and
- E** = the net cost of creating and transitioning to the new rules.

Expressed in the terminology used in this paper, **A** and **B** are measures of the impact on GDP resulting from changes in conditions in the MAC product or equipment markets, mediated through the credit market. The term **C** includes indirect effects in related sectors and wider economic impacts. **D** is a measure of the extent to which improved rules governing secured transactions will be adopted and effectively implemented. Finally, **E** represents the transitional costs of implementing and adjusting to the new rules.

173. Figure 9 presents a possible alternative framework developed by Wool (2017) for determining the net benefits of legal reform. Although the precise categorisation of impacts, costs and benefits may differ between the Wool framework and the theory of change presented in Figure 8, the two approaches are fundamentally consistent. What is important is how such impacts are estimated, including the underpinning data, analysis and assumptions. Guiding principles for cost benefit analysis and economic impact assessments are well established and widely recognised.²⁸ Our proposed approach follows these principles.

174. The incidence, scale and timing of any costs and benefits arising from the Protocol will vary from economy to economy, principally dependent on whether countries are net importers or net exporters of MAC equipment or if they are providers of finance or equipment leasing services. For importers it will depend on their existing legal frameworks governing asset-backed transactions and the extent to which they assist or impede access to MAC equipment through their effect on the cost and availability of secured credit.

175. The net benefits of increased exports of MAC equipment will be the additional profits and employment incomes they generate. Similarly, the benefit of increased holdings of MAC equipment in importing countries will be the stream of additional profits and employment incomes they are able to generate through their deployment, net of the costs of their purchase and use.

176. The overall net economic benefit generated from implementation of the Protocol will therefore be reflected in changes in factor incomes (profits, wages, rent and interest) in different economies relative to what would have happened in those incomes had the policy change not occurred. However, it is impossible to observe and measure directly such longer-term impacts.

177. Monetisation of relevant costs and benefits is difficult and in some cases may be impossible. Where feasible, their assessment would also need to account for the different time periods over which they occur and for any displacement, leakage, substitution, spillover and multiplier effects. Accounting for all of these effects in any detail is well beyond the scope of existing data and analysis.

178. Positive responses in the credit and product markets for MAC equipment underpin our assessment framework and are the necessary preconditions in the theory of change for subsequent economic gains. However, each area of analysis presents definitional, data and measurement challenges. Some we have been able to address in part using existing evidence and analyses but many require potentially significant new primary data collection and analysis beyond the scope of this project. We return to this below.

179. Estimation of the potential impact of the MAC Protocol at the level of the global economy is therefore difficult and will require a number of simplifying assumptions to be made.



²⁸ See for example, HM Treasury (2018).

6.3 Assessing the international economic impact: methodology and key assumptions

180. The methodology focuses on direct impacts in credit markets and product markets (the left hand panels of Figure 8) with some assessment of the indirect effects and the implications for the wider economy. A spreadsheet model (summarised in Annexes C and D), was constructed to illustrate how a given reduction in the cost of credit and an increase in its supply may ease finance constraints and boost spending on MAC equipment, with positive impacts on GDP.

181. We began our assessment by reviewing previous studies (for example Saunders and Walter, 1998; Linetsky, 2009 and 2010; National Law Center, 2014) and in particular undertaking an extensive review of a preliminary economic assessment of the international impact of the MAC Protocol developed by Heywood Fleisig of the Center for the Economic Analysis of Law (CEAL). Fleisig (2013) gives an expert account of the likely benefits of reforming collateral laws drawing on the detailed treatise he co-authored on the subject (Fleisig et al, 2006).

182. Although the CEAL analysis provided a useful starting point, many of its assumptions were unclear and/or problematic. We therefore used the analysis to demonstrate the effect of modifying a number of key assumptions on its estimates of international impact and, therefore, the potential range of uncertainty in those results. We also adapted the model and the assumptions used in order to arrive at a more realistic central estimate of likely impact.

183. Our critique of the CEAL analysis and the sensitivity tests we performed were presented to UNIDROIT in a preliminary report in September 2017. Our critique is reproduced in Annex C. The annex demonstrates the origins of many of the simplifying assumptions that we have adopted and refined in our own analysis, consistent with the analytical framework and principles expounded above.

184. At the core of the analysis is an assumption that economies in need of reform of their secured transactions laws are unable to acquire a desired or efficient stock of mobile MAC sector equipment due to financial constraints. Buyers are typically cash-constrained and a reduction in the cost of debt service would free up funds for them to use to acquire more MAC equipment or spend on other things. Policy reform could therefore release the credit these economies require and on more cost effective terms to grow their equipment stock to a desired or efficient level. As stated earlier, there are, however, many factors that are likely to continue to constrain credit availability to many potential borrowers and some specific countries and regions post-reform. We attempt to control for these in our estimate of international impact.

185. The data on MAC equipment stocks and loan terms and conditions that would be needed to make a precise estimate of the overall impact of the MAC Protocol is simply not available at a global level. We have constructed estimates of the capital stock of MAC equipment using trade and production data and made informed assumptions about representative lending terms before and after reform and about other key parameters required for the model. These assumptions have been drawn up on the basis of earlier work, including Fleisig (2013), and consultations with industry, finance, academic and other experts during stakeholder interviews.

6.4 Assessing the international economic impact: key estimates

186. In order to arrive at a refined estimate of international impact, we have developed a flexible model that allows us to examine the implications of different assumptions about a wide range of international or country-specific scenarios and parameters.²⁹ The key areas of analysis are those set out in Table 10 below. Tables 19 - 23 in Annex D list and explain in more detail the key variables, assumptions and values we have used in each area of analysis and their interdependencies.

Table 10 - Key areas for the assessment of impact

Key areas	Estimates required	Basis (See Annex D)
1. Baseline or counterfactual (without policy change)	The stock of MAC equipment held in relevant economies 'now' (base year) and at the end of the assessment period, total value and as a proportion of their combined GDP	Derived from international trade data + assumptions about growth relative to GDP (Table 19)
2. Scope for impact (with policy change)	The maximum potential incremental impact the policy change may have on the stock of MAC equipment by the end of the assessment period	Limiting the potential demand response to plausible values (Table 20)
3. First round effects in the credit market	Credit availability and loan terms with and without policy change and how demand for debt is likely to respond	Assumptions on 'typical' loan terms pre- and post-reform, alternative use of savings and other factors attenuating the impact of reform (Table 21)
4. The intermediate outputs in MAC equipment markets	How changes in credit conditions may affect the demand for MAC equipment and the capacity of MAC equipment suppliers to respond	Build-up over time of the investment response and GDP impact (Table 22)
5. Impact on GDP	The potential impact on MAC sector output and the GDP of MAC equipment exporting countries following the policy change	Assumed GDP benefit to importing and exporting countries over time (Table 23)

²⁹ The Excel spreadsheet model is described more fully in Annex D and is available from the authors on request.

6.4.1 Baseline without policy change and scope for impact

187. Amongst users of MAC equipment, there are two groups of economies that are the main potential beneficiaries: (i) emerging and developing economies and (ii) advanced economies in need of reform.³⁰ The CEAL analysis estimated the value of MAC equipment stock held in each group of economies as 2.83% of their combined GDP. This is based on data that the US stock of MAC equipment was 2.83% of US GDP in 2010 (based on US Bureau of Economic Analysis Fixed Asset Accounts data, 2011). It seems implausible that the figure would be so high, especially in emerging and developing economies (see Annex C for our critique of this starting assumption).

188. In contrast, in our assessment, we:

- use international trade data to estimate the value of the stock of imported MAC equipment accumulated by 2015 in UNIDROIT member states classified as ‘emerging and developing economies’ and ‘advanced economies in need of reform’;
- assume there is some upper limit to the desired or efficient level of MAC equipment stock such countries would ‘aspire’ to hold and deploy. We take as our benchmark for this upper limit the ratio of MAC equipment stock to GDP observed in the US economy, 2.83% of GDP.

189. Our stock estimates both in absolute terms and how they compare as a proportion of the combined GDP for each group of economies are shown in Table 11 below.

Table 11 - Estimates of MAC equipment stock by economic grouping, base year 2015

Economic grouping	Estimated value of MAC equipment stock	Stock as % of GDP
Emerging and developing	\$480 billion	1.94%
Advanced in need of reform	\$175 billion	5.25%

Source: Authors' estimates

190. Although these estimates are subject to a number of limitations and simplifying assumptions, they appear to suggest that the acquisition of capital equipment is not unduly constrained by a lack of finance in advanced economies in need of reform. At 5.25% of their combined GDP, the estimate might instead suggest that mining, agriculture and construction activities account for a much larger proportion of their economic output than the same sectors within the US economy and/or that their MAC equipment is less efficiently deployed than in the US.³¹ In contrast, the data in Table 11 is consistent with the idea that the acquisition of MAC equipment in emerging and developing economies may be held below efficient levels due to a lack of suitable finance.

³⁰ The terminology ‘advanced economies in need of reform’ is borrowed from Fleisig (2013). The group consists of low-income OECD countries where there is still significant scope for the reform of the legal framework for secured lending.

³¹ Advanced economies in need of reform may, however, benefit from lower risk and improved credit allocation but these gains are harder to quantify and are not included in our estimate of global impact.

191. We therefore focus our assessment on the potential impact of the policy change in emerging and developing economies. We assume that, in the absence of policy change, their stock of equipment will grow in line with their real GDP over time as disposable incomes increase, demand for MAC equipment rises and their banking systems and other economic institutions continue to expand and develop. The projected increase in MAC equipment due to economic growth therefore provides a baseline or ‘counterfactual’ for comparison.

192. Based on World Bank forecasts we assume real GDP in the group of emerging and developing economies expands annually by an average of 4.7% over a ten year assessment period to 2025. At a constant 1.94% of GDP this would expand the base year equipment stock over the ten year period from \$480 billion to \$760 billion.

193. The impact of the policy change can therefore be measured in terms of how much additional growth above baseline it facilitates in their stock of imported MAC equipment through an expansion in secured credit and the relaxation of interest rates and other terms.

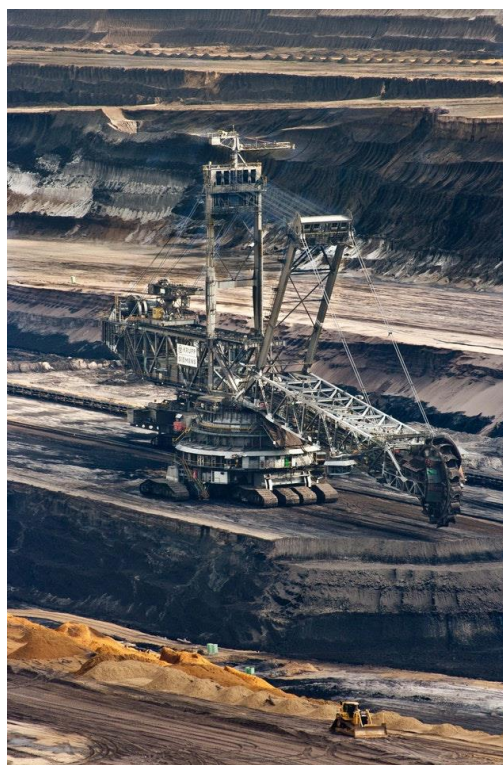
6.4.2 First round effects in the credit market

194. Debt take-up and therefore acquisition of additional MAC equipment will be dependent on the secured debt terms available compared to existing debt. The greater the difference between interest rates and loan maturities with and without the policy change, the greater the take-up of debt to invest in additional MAC equipment is likely to be with the policy change.

195. In common with the CEAL analysis, we assume the typical average interest rate charged on loans taken out in the counterfactual to finance new and replacement equipment is 8.5% per annum. Similarly we adopt the same stylised assumption that the representative period for loans taken out to purchase MAC equipment is four years.

196. The assumption in the CEAL study of a post-reform reduction in the interest rate of 350 bps for MAC equipment appears large compared to the changes to interest rates incorporated into assessments of the impact of the Aircraft Protocol. Unlike mobile MAC equipment, aircraft are more readily identifiable, have longer average service lives and must undergo regular, rigorous and certificated maintenance and inspections. Repossession risks should therefore be lower for aircraft than for post-reform MAC equipment.

197. Saunders & Walter (1998), for example, assume a reduction of 100 basis points as a result of the Aircraft Protocol. On the basis of this and other evidence from interviews with stakeholders, we therefore model the impact on demand for debt to finance MAC equipment acquisition following the policy change on the assumption that it results in a lowering of the typical average interest rate by 100 basis points to 7.5% pa and an increase in the average loan maturity period from four years to six years.



198. The improvement in loan terms results in savings of debt servicing costs as existing loans are refinanced during their term or replaced at the end of their term with new secured loans to fund the replacement of old and worn-out baseline equipment. In turn these savings can be used to leverage additional or larger loans to fund additional equipment acquisitions. As a result, total demand for debt at the improved terms is likely to expand. We considered whether the presence of leasing might attenuate the impact of reform but concluded that many leasing transactions will also benefit and that the impact of leasing on the potential gains is neutral, or even slightly positive (see Annex B).

199. The CEAL analysis assumes that (i) 100% of existing unsecured debt will be refinanced or replaced with new secured loans at the improved terms and (ii) 100% of the savings of debt servicing costs realised will be used to expand the stock of debt to fund additional equipment acquisitions. However, both outcomes appear unlikely for the following reasons:

- i. Not all markets or borrowers will be able to benefit from the policy change due to remaining country and/or borrower specific risks that will preclude access to secured credit on improved terms. Chapter 5 discussed a number of relevant risk factors that are likely to continue to limit both eligibility for secured credit and its supply. The factors we have taken into account, with an indication of the assessed impact we have assumed, are:
 - **High-risk markets.** Country specific risks including sovereign risks and other factors such as actual and perceived levels of security, crime and fraud will mean that some markets will continue to find it difficult to attract new lending, even with the MAC Protocol in place. [Assessed impact -25%].
 - **Country limits/market size.** Lenders' sectoral/asset class limits, driven by a portfolio policy, may lead to certain countries or sectors being excluded. In some cases, these can be the result of regulator's capital requirements. Some markets may also just be too small to interest prospective lenders. For example, small countries with complex regulatory environments and language barriers will always be less attractive to some lenders. [Assessed impact -10%].
 - **Failure to adopt strong insolvency options.** In some equipment importing countries, failure to adopt the stronger version of the MAC Protocol's insolvency provisions may continue to constrain the supply of credit. [Assessed impact -5%].
 - **Lack of credit history** and other borrower-specific factors affecting creditworthiness can limit the response of lenders in any market. In particular, in many emerging markets and some formerly centrally planned economies, a lack of credit reporting is a huge barrier to lending as borrowers cannot prove they are a good risk by conventional measures. [Assessed impact - 20%].
 - **Ongoing development of domestic financial sectors.** Over time, it is likely that, even without the MAC Protocol, financial sector development and reform will occur in many countries for domestic reasons. If so, the scope for the MAC Protocol to benefit the economy will reduce somewhat over the assessment period, reducing the annual average impact we assess on the cost of lending and acquisition of additional equipment. [Assessed impact - 15%].

The cumulative impact of these ‘market adjustment’ factors, which are subject to a high margin of uncertainty, is considered to limit the ability to refinance and replace old unsecured debt with new secured debt at improved terms to about 45% of the total stock of baseline debt. That is, we assume only around \$330 billion of the total baseline stock of debt of \$760 billion will benefit from improved terms following implementation of the MAC Protocol. This estimate is a very rough approximation at the global level and the specific adjustment will vary significantly from country to country.

- ii. In countries that remain income and capital constrained, it is likely that some of the savings will be used to fund the acquisition of other capital or consumer goods and/or to widen investment portfolios. That is, only a proportion of savings realised from the improvement in loan terms will be recycled into additional debt funded equipment purchases for the MAC sector. We model this behaviour by assuming every 10% reduction in debt servicing costs will only expand the total demand for secured debt by 7%, i.e an elasticity factor of 0.7. The lower the elasticity, the fewer savings are recycled back into servicing additional debt to fund MAC equipment.

200. The combined impact of (i) and (ii) above is therefore to limit the expansion in total debt over the assessment period and therefore the acquisition of additional debt financed equipment to \$90 billion (Table 12). Assuming real equipment prices are unchanged, this increase in debt would fund an additional 12% of MAC equipment by value over and above baseline.

Table 12 - Loan terms, debt take-up and impact on debt-funded MAC equipment stock

Key variables	Assessment period without policy change	Assessment period with policy change	Impact of Protocol
Average interest rate %	8.5% pa	7.5% pa	- 100 bps
Average loan period	4 years	6 years	+ 2 years
Total debt at end of assessment period invested in MAC equipment	\$760 billion (100% of baseline stock)	\$850 billion (112% of baseline stock)	+ \$90 billion (+12%)

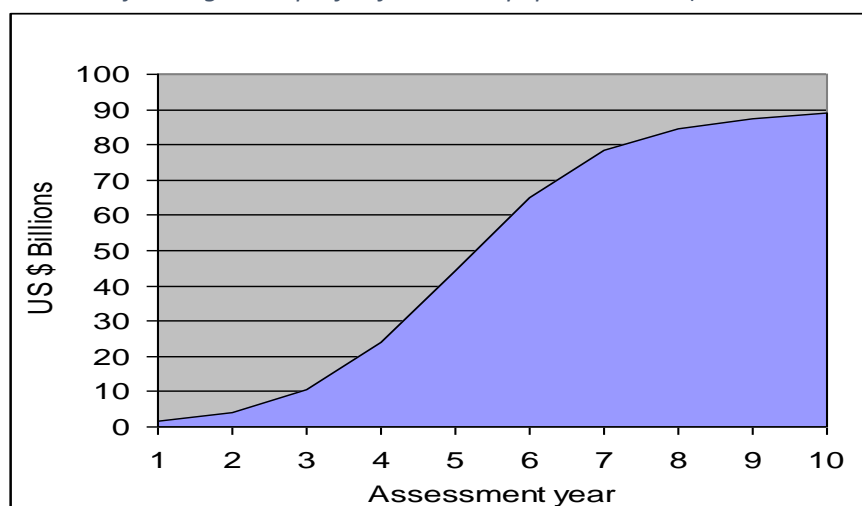
Source: Authors' estimates

6.4.3 Intermediate outputs of the MAC Protocol in equipment markets and impacts on GDP

201. The deployment of an additional \$90 billion of MAC equipment will facilitate an increase in economic output. However, effective implementation of the Protocol will take time. Acquisition and deployment of additional equipment over the assessment period is likely to be slow at first as creditors assess risks and eligibility for secured loans and as markets adjust to the reforms. The pace of refinancing and reinvestment will also affect the speed of uptake. The pace of incremental equipment acquisition and deployment may however be expected to pick up over time before slowing down again towards the end of the period as it reaches its new steady state.

202. The pace and profile of the acquisition and deployment of an additional \$90 billion of MAC equipment over time will also determine the impact it has on output, both in the economies deploying the new equipment and those supplying it. As set out in more detail in Annex D, we assume a gradual investment response over a ten year period and a lagged impact on GDP, resulting in a non-linear 'S-shaped' profile (Figure 10) for the equipment investment and GDP impact in reforming economies over ten years.

Figure 10 - Projected growth profile for MAC equipment stock (additional to baseline)



Source: Authors' estimates

203. We derive the estimates of GDP impact shown in Table 13 for emerging and developing economies, equivalent to an annualised \$23 billion per annum, following the phased deployment of an additional \$90 billion of debt financed imports of MAC equipment following the policy change. With a capital-output ratio of 2, the long-run impact of the larger equipment stock would be to add \$45 billion a year to GDP, but this takes time to build up, so the annualised equivalent over ten years, taking account of discounting, would be \$23 billion per annum.

204. Countries hosting MAC equipment manufacturers will similarly benefit from additional growth in their economic output through the increased production and export of an additional \$90 billion of equipment over the ten year assessment period. This would be equivalent to an additional GDP of \$7 billion a year over ten years assuming value added content of 80% and an export multiplier of 1 (see Annex D). Some of these countries might also benefit from the insolvency provisions in the MAC Protocol but, as explained in Annex A, these gains are not quantified in the present study.

Table 13 - Estimated GDP impacts, annualised present values

Economic grouping	Additional MAC equipment acquired due to policy change	Assumed GDP multiplier	Annualised GDP impact pa
Emerging and developing economies	\$90 billion	0.5 (based on an assumed incremental capital to GDP ratio of 2)	\$23 billion
MAC equipment exporting economies	\$90 billion	1.0 (Export 'value added' multiplier)	\$7 billion
Combined international impact:			\$30 billion

Source: Authors' estimates³²

³² Discounted at 3.5% real pa

205. The combined impact in emerging and developing economies and in MAC equipment exporting economies is therefore an estimated \$30 billion a year. Over the ten year assessment period therefore, the export and deployment of an additional \$90 billion of MAC equipment could boost international GDP by a total of some \$250 billion in present value terms.

6.5 Assessing the international economic impact: sensitivity tests

206. In order to assess the robustness of our estimate of the international impact, we have tested the sensitivity of our central estimates to a number of key assumptions notably loan terms with and without the MAC Protocol, the demand response to changes in loan terms and factors that may continue to limit the availability of credit to specific markets.

207. The results of the sensitivity tests are presented in Table 14 below. Individually they show that estimates of impact are most sensitive to assumptions about the difference in average loan periods with and without the MAC Protocol and the elasticity of demand for loans with respect to changes in debt servicing costs. This finding is unsurprising given that debt affordability based on current and anticipated future income or revenue streams remains a key determinant in income-constrained economies and therefore in the modelling approach we have adopted.

208. In combination, the sensitivity tests produce a significant range of potential impacts around our central estimates, with the estimated annualised GDP impact varying from \$8 billion to \$86 billion. The sensitivity analysis suggests that the MAC Protocol could still deliver a significant stream of future economic benefits that will far exceed the likely costs associated with its implementation and enforcement in those economies undertaking the necessary reforms.



Table 14 - Sensitivity analysis

Sensitivity test	Additional MAC equipment acquired due to policy change	Difference from central estimate	Impact on annualised international GDP	Difference from central estimate
Central estimate	\$90 billion	---	\$30 billion	---
Average interest rate for secured loans is 8% (difference reduced to 50 bps)	\$85 billion	-\$5 billion	\$29 billion	-\$1 billion
Average interest rate for secured loans is 7% (difference increased to 150 bps)	\$93 billion	+\$3 billion	\$31 billion	+\$1 billion
Average secured loan period is 5 years (difference reduced to 1 year)	\$51 billion	-\$39 billion	\$17 billion	-\$13 billion
Average secured loan period is 7 years (difference increased to 3 years)	\$121 billion	+\$31 billion	\$41 billion	+\$11 billion
Elasticity factor wrt savings in debt servicing costs is 0.4	\$46 billion	-\$44 billion	\$16 billion	-\$14 billion
Elasticity factor wrt savings in debt servicing costs is 1	\$143 billion	+\$53 billion	\$48 billion	+\$18 billion
Market adjustment factors increased by -20%	\$71 billion	-\$19 billion	\$24 billion	-\$6 billion
Market adjustment factors reduced by +20%	\$107 billion	+\$17 billion	\$36 billion	+\$6 billion
Combined downside tests	\$23 billion	-\$57 billion	\$8 billion	-\$22 billion
Combined upside tests	\$257 billion	+\$167 billion	\$86 billion	+\$56 billion

Source: Authors' estimates

6.6 Assessing impacts at the country and sector level

209. Our basic analytical framework and model can also be applied at the region, country or sector level. However, country-specific and regional variations in impact are likely to be pronounced and to assess these will require a deeper analysis of legal, economic, financial and trading conditions specific to different regions and member states.

210. Figure 11, therefore, sets out a number of relevant questions and issues that could be used as the basis for future, more extensive 'deep-dive' analyses to investigate country and region specific risks, institutional factors and potential gains from reform, including:

- how their current legal rules governing asset backed transactions and the use of collateral compare with international standards, for example, which goods and transactions they cover and the ease and speed with which creditors have recourse to secured assets;
- equipment stocks and needs in their MAC sectors, including how levels of productivity and capital/output ratios compare to more advanced economies;
- the stage of development of their banking systems, credit risks and sources of finance available for MAC equipment; and
- their international trading arrangements and how these enable or may restrict the cross-border movement of MAC equipment.

6.7 Conclusion

211. Using our analytical framework and a spreadsheet model that takes account of finance constraints and other real world factors, we estimate that, by the end of the ten year assessment period, the stock of MAC equipment in developing countries could be some \$90 billion higher with the MAC Protocol and associated reforms than without.

212. The estimate takes account of the presence of leasing, which we assess to have a broadly neutral impact. Assuming a gradual investment response over a ten year period and a lagged impact on GDP, we derive estimates of a GDP impact in emerging and developing economies at an annualised \$23 billion per annum. Equipment exporting economies benefit by an estimated \$7 billion per annum and may also benefit from improvements in credit conditions as a result of the insolvency provisions of the Convention and Protocol but this latter impact has not been quantified.

213. Sensitivity tests suggest that the central estimate of \$30 billion per annum is subject to a high degree of uncertainty but benefits are still highly likely to exceed costs. Our report also explores the factors that would need to be considered in undertaking a deeper analysis of the economic impacts at country or regional level.

Figure 11 - 'LEFT' field analysis - regional context, benchmarking and analysis

LEGAL	ECONOMIC	FINANCIAL	TRADE
<p>Current national legal rules for asset backed transactions and the use of collateral, including:</p> <ul style="list-style-type: none"> • What goods and transactions they cover? • Do assets require specific identification or are floating asset descriptions permitted? • Cost, accessibility and quality of asset registry? • Are there clear rules for ranking priority among different creditors or different systems for registering security interests? • Is there a unified system for establishing priority? • Ease and speed with which providers of credit have recourse to the value of underlying assets? • Ability to enforce rights against assets in the context of insolvency? • Number of procedures and costs required to enforce collateral? 	<p>Macroeconomic and microeconomic conditions relevant to MAC sectors including:</p> <ul style="list-style-type: none"> • Price stability, economic growth, consumer confidence, wages and labour market conditions, etc; • Degree of concentration in MAC sectors and financial health of major MAC companies; • Contribution of MAC sectors (and sub-sectors) to GDP, employment and trade; • Productivity and growth rates in MAC sectors; • Capital/output ratios in MAC Sectors; • Equipment stock and needs by MAC sub-sectors; • Rate of technological change in MAC sectors; • Presence and scale of domestic manufacturers of MAC equipment if any? 	<p>Sources of finance for MAC equipment and development of banking/financial system, including:</p> <ul style="list-style-type: none"> • Degree of competition in banking sector; • Regulation and supervision of banking sector; • Sources of funding available to MAC sector organisations to finance their capital needs; • Ratio of secured to unsecured transactions in MAC sectors; • Loan to equipment value ratios; • Spreads over mortgage rates for loans secured by real estate holdings, movable assets and unsecured loans; • Evidence of credit rationing (e. g. applications for loans rejected and reasons why)? • Financial support(s) available from government and relative importance; • Other regulations and risks that may continue to constrain credit and actions that could reform them? 	<p>System and scale of international trade in moveable MAC equipment, including:</p> <ul style="list-style-type: none"> • Value of imports / exports of MAC capital equipment by equipment type and sector? Changes over time? • MAC equipment imports / exports as a % of total imports/exports; • Major trading partners (MAC equipment)? • Trading agreements and other rules, standards or restrictions governing the cross-border movement of MAC equipment.

Annex A: Insolvency and its impact on the cost of credit

214. If a borrower can no longer service loans, lenders will need to (a) prove their claim, (b) reclaim and (c) dispose of the asset to recoup the loan exposure. How risky, difficult, time consuming and therefore expensive this is will depend primarily on the legal regime and how it is implemented.

215. The first challenge is to prove a claim and to ensure it is the sole or highest priority claim on that asset. An international registry will assist in resolving potential conflicts between competing interests.

216. However, having proof that a claim is valid may not be sufficient in itself to make it practically enforceable. The difficulty, time and cost of proving and enforcing a claim will be determined by the effectiveness of the legal system, including the insolvency regime. While it is recognised that a creditor seeking to exercise a claim in repossessing MAC equipment is different from full resolution of insolvency, measures of speed, cost and effectiveness of the latter can give a useful indicator. The clearest data for international comparisons comes from the World Bank Ease of Doing Business Survey (World Bank, 2018a). Table 15 gives a clear indication of the huge variation in time, cost and success in recovering value.

Table 15 - Insolvency: World Bank Ease of Doing Business Survey findings

Country	Resolving insolvency years	Resolving insolvency % recovery	Resolving insolvency cost % of total estate
Argentina	2.4	21.5	16.5
Botswana	1.7	65.5	18
Brazil	4	12.7	12
Canada	0.8	87.5	7
China	1.7	36.9	22
Estonia	3	40.6	9
France	1.9	73.5	9
Greece	3.5	34.9	9
Japan	0.6	92.4	4.2
Romania	3.3	35.6	10.5
South Africa	2	34.4	18
Turkey	5	15.3	7
UK	1	85.2	6
US	1	82.1	10

Source: World Bank (2018a)

217. There appears to be very little correlation between the time taken to resolve insolvency and the recovery rate, which might justify the additional time. If anything, the opposite appears to be true, based on World Bank data. Those insolvency regimes that resolve relatively quickly (under 18 months) appear to have significantly higher recovery rates than the slowest jurisdictions (those over three years). This is not purely a prosperity or development issue. Botswana manages a higher recovery rate than South Africa, while China resolves insolvency quicker than Greece or Romania. However, it should be noted that the World Bank resolving insolvency data under the Ease of Doing Business index measures only the recovery rate of secured creditors, who can often foreclose separately from the main insolvency procedure.

i. Unpredictability

218. There are some countries in which insolvency actions have been rejected or delayed because courts have not interpreted existing insolvency laws predictably, or the existing law is unclear or prioritises other interests. The MAC Protocol should bring greater clarity but it cannot fully overcome all difficulties. There is likely to be a gradual build-up of confidence as judgements create precedents. Many interviewees believed this would be rapid, expecting substantial progress over 18 months or so in larger countries, where there are likely to be more cases.

219. It seems unlikely that a common set of insolvency laws for MAC Protocol signatories by itself would be enough to ensure all countries take an identical approach and implement it with equal efficiency. It is likely that wider domestic insolvency reforms, such as those under consideration by the EU³³ and measures being implemented with the help of the World Bank Group and the United Nations Commission on International Trade Law (UNCITRAL), will also contribute to a more uniform and predictable approach to insolvency. If those reforms do not proceed and the MAC Protocol does, the striking difference between international legal obligations and domestic practice could lead to a lack of alignment between MAC sector court rulings and insolvency implementation.

ii. The impact of uncertainty

220. The expected impact of risk events on the creditor and the probability of them occurring determine one element of the risk premium creditors charge when pricing loans. The expected impact is difficult for lenders to estimate as it is unlikely that they will have sufficient evidence on which to build an accurate pricing model for asset recovery due to insolvency/bankruptcy. Instead, they will have to base their pricing of the risk on whatever information they have. Where this is uncertain, it is likely that prudence may lead to an over-estimation of the risk. This will lead to a higher premium.

221. The difficulty and time taken to recover and if necessary export an asset so it can be disposed of depend on the insolvency laws and practices (and in some cases other legislation covering issues such as money laundering) of the country where the asset is located and /or where the contract was registered.

222. Complexity of insolvency and bankruptcy procedures imposes a cost by requiring extensive legal representation and also extending the period in which capital is tied up in a non-performing loan, requiring balance sheet allowances for it. Simplicity and clarity are likely to lead to more rapid or at least more predictable asset recovery. If assets need to be exported for sale as the local market is too illiquid to secure a rapid sale, different laws and regulations may apply, some of which may generate a different category of uncertainty and cost.

223. A move to quicker resolution of an insolvency situation is a clear reduction in risk exposure that should have significant cost benefits. Who benefits from these savings depends fundamentally on competition between credit providers and the overall scarcity of credit. Where there is little competition between

³³ See the proposed Directive on preventive restructuring frameworks, second chance and measures to increase the efficiency of restructuring, insolvency and discharge procedures of 22 November 2016: (http://ec.europa.eu/information_society/newsroom/image/document/2016-48/proposal_40046.pdf).

providers and credit is in short supply there is a risk that lenders use the risk saving to increase their margin. Conversely, in markets with active competition and ready access to credit, borrowers are likely to benefit substantially.

iii. Options for reform of insolvency law

224. Options that leave ongoing uncertainty will be riskier, leading to higher risk premiums for borrowers. These options may nevertheless be chosen because of concerns that other insolvency provisions could in some circumstances lead to the premature closure of firms that might be able to recover. It is very important to differentiate between firms where there is a realistic chance of rescue or orderly wind up to protect value and those where there is no such possibility.

225. Typically opponents of insolvency reform have raised concerns that reforms can leave domestic firms vulnerable to foreign banks “pulling the plug” too quickly, thereby destroying value. In many countries there is an equivalent to US Chapter 11 that gives the opportunity for a firm that is unable to repay all of its creditors to continue to operate under supervision of courts. In the UK, when a company is in administration, creditors do not have the right to repossess assets as long as the state appointed administrator continues to service loans and to seek resolution. However, this is a relatively quick process with a focus on resolution.

226. The evidence collected in this study, in the form of interviews and publicly available data suggests that, notwithstanding the concerns expressed by some, it should be possible in many regimes to make improvements to creditors’ rights and to improve insolvency practice, specifically to achieve higher recovery rates and faster resolution.



227. Consistent with the previous CTC Protocols, the MAC Protocol allows contracting states a number of options in terms of insolvency remedies. Article X of the draft MAC Protocol allows contracting states to apply one of three rules (Alternatives A, B and C) in determining creditors’ remedial rights in the event of a debtor’s insolvency. The insolvency alternatives in the MAC Protocol are optional declarations, and states may decide not to elect any of the rules, in which case their domestic insolvency laws will apply. Alternative A is generally considered to give creditors holding an international interest the highest level of protection in the case of insolvency. As such, it is an additional mechanism lowering borrowing costs, other things being equal, by reducing debt finance risks.

228. It is noteworthy that, of the 73 contracting states to the Aircraft Protocol, almost all have applied Alternative A, and we assume the same will happen for the MAC Protocol. Moreover, the OECD Aircraft Sector Understanding on Export Credits (OECD, 2011) provides that contracting states can benefit from lower export bank premium rates if they ratify the CTC and Aircraft Protocol, provided they make certain declarations,

including adopting Alternative A in relation to insolvency remedies. Although the MAC Protocol cannot necessarily be assumed to result in comparable discounts, it shows that the OECD recognises the substantive impact of the CTC, including its insolvency provisions, in reducing risk.

229. Many countries have evolved insolvency procedures over many decades that work in practice, but are significantly different to the simplest, clearest and quickest insolvency rules. If these markets choose to adopt the MAC Protocol and to reform, they will ultimately generate significant benefits. However there is often a great deal of tradition and precedent that make such a change politically difficult. The cost benefit assessment will vary dramatically from country to country. In some countries, where the current system is respected and there is general confidence that court rulings and enforcement are predictable, even if this is not obvious from the written law, the risk premium reduction available if insolvency laws are modified to a more standard and overtly creditor friendly form is likely to be very modest. In other markets the existing system will have greater problems, so the benefits of reform will be larger and more obvious.

230. Even a relatively modest saving per transaction is likely to aggregate up to create a substantial national impact. Incumbents within the market may resist changes as they have invested in gaining the expertise to operate in the current opaque system. This is a barrier to entry that may deter international competition. An increase in competition in provision of finance is likely to be key to driving down finance costs.



231. It is worth noting that the counterfactual for an impact assessment of the Protocol is not necessarily a continuation of the current unreformed regime. In some countries and regions, notably the EU, reforms are under consideration which could have a similar clarifying effect to the MAC Protocol. However they may not generate the same benefits as there will still be a due diligence cost in understanding the regime adopted and if/how it differs from international best practice (MAC Protocol).

iv. Conclusion

232. A fast and predictable approach to insolvency reduces the risk of loss and the time before assets can be recovered to mitigate losses. Of the MAC Protocol insolvency options, 'Alternative A' offers the best chance of achieving better outcomes for creditors. This should reduce the cost of providing credit, some of which should be seen in lower credit prices. For developing and emerging economies, we assume that the adoption of Alternative A is one of the factors leading to lower credit prices and better credit provision.

233. The benefits of insolvency reform will vary depending on how far the current regime diverges from the performance that Alternative A is likely to deliver. In some countries the difference is very large because

the current regime is either very creditor unfriendly or under-resourced and subject to interference. In others it is very modest and may not be noticeable.

234. Moreover, multilateral insolvency reform via the MAC Protocol is not the only route to clearer and more predictable insolvency practices. Domestic and plurilateral reforms supported by other bodies are also under way and offer opportunities to make progress.

235. This paper does not attach a specific benefit figure to bankruptcy and insolvency reforms in advanced economies because insufficient information is available to separate out the various reforms under way in each market. That does not mean that there are no benefits, but their size is uncertain and the contribution of the MAC Protocol on its own is difficult to assess.



Annex B: Leasing market for MAC equipment

236. Leasing is a very substantial portion of the MAC equipment market. Several factors drive this - it is capital-efficient, gives cost certainty and is flexible, as it may not require long term commitment. These characteristics are very attractive, particularly in those sectors where demand for equipment varies significantly over time, for example in construction projects where a firm won't need the same machinery in the same quantities throughout the project lifespan.

i. The growth of leasing

237. Leasing is expanding dramatically across many sectors, of which MAC is just one. Across all sectors globally it is now worth more than \$1.1 trillion annually.³⁴ It has continued to grow despite historically low interest rates, which might have been expected to favour stronger growth in loan-based purchases. Like most other methods to access capital equipment, leasing is much more common in wealthier countries (Table 16).

Table 16 - Percentage of global new business leasing market 2015

	Share of global leasing market (%)
North America	40.6
Europe	32.1
Asia	22.2
Australia/New Zealand	3.1
Latin America	1.4
Africa	0.7

Source: White Clarke Group (2017), cited in IFC (2018)

238. The World Bank Group, in particular through the International Finance Corporation (IFC), have been a major force in developing legal conditions to facilitate leasing. Their reforms have been implemented in 96 countries so far. However, leasing companies like any other form of business are constrained by access to credit.³⁵ In some cases, in effect the leasing company becomes an intermediary that qualifies for credit and makes equipment available, albeit at a price, to firms that are a reasonable risk but do not meet bank credit standards.

239. Around 70% of small and medium-sized companies worldwide do not have access to finance at all and another 15% or so are under-financed.³⁶ In much of the world credit reporting is not widespread, for example in the Middle East and North Africa less than a quarter of the population are covered by credit reporting, but many of those not covered are running businesses, some of which need MAC equipment.³⁷ This will not be an issue for bigger buyers of MAC equipment, but it is for many smaller firms, particularly in agriculture in the developing world. If this barrier can be at least partially overcome, there is considerable scope for market growth.

240. IFC (2018) suggests that Africa and Latin America have lagged behind other markets but there is huge scope for growth. In their view, leasing of moveable assets (e.g. aircraft, MAC equipment, cars, vans etc) in

³⁴ White Clarke Group (2018).

³⁵ IFC (2018), page 8.

³⁶ World Bank (2018b), page 4.

³⁷ World Bank (2018b), page 8.

Africa is currently worth \$42 billion a year with the potential to more than double to \$83 billion. Leasing in Africa is currently dominated by large markets in South Africa, Nigeria and Morocco. It is quite possible that international and domestic leasing firms in the lower risk markets elsewhere in Africa may be significant beneficiaries if they can access secured credit once the MAC Protocol is adopted.

241. The equipment purchased by leasing companies may be financed and refinanced in the same way as other purchases of MAC equipment. Leasing companies will benefit from increased availability of secured credit in some markets thanks to the MAC Protocol.

242. Unlike banks, which have to operate entirely to regulated lending criteria, leasing companies have more scope to rely on their own judgement and detailed knowledge of customers. Typically, the leasing market is not as regulated and structured as banking, although in many economies many leasing companies are owned by banks and operate under banking regulation. Leasing companies have the freedom to use local market information and relationships as well as conventional credit scoring.

243. As credit quality and credit reporting improve, this particular advantage of leasing may gradually become less important, but its other benefits will remain. If the increased availability of secured credit leads to more competition amongst leasing companies as well as lower costs for them, it may also lead to lower leasing prices.

ii. Conclusion

244. The fact that leasing makes a significant and growing contribution to the financing of MAC equipment therefore does not mean that the impact of the Protocol will be attenuated. On the contrary, leasing companies may also benefit from the Protocol and some of these gains may be passed on to end users. We therefore make the conservative assumption that the impact of leasing on our estimate of the international impact is neutral.



Annex C: Assessment methodology

245. The methodology used to derive a quantitative estimate of the international impact of the MAC Protocol focuses on direct impacts in credit markets and product markets with some assessment of the indirect effects and the implications for the wider economy. A spreadsheet model (Annex D) was constructed to illustrate how a given reduction in the cost of credit and an increase in its supply may ease finance constraints and boost spending on MAC equipment, with positive impacts on GDP. The modelling approach, which elaborates on an earlier assessment by Fleisig (2013), assumes that buyers are typically cash-constrained and that a reduction in the cost of debt service would free up funds for them to use to acquire more MAC equipment or spend on other things. There are, however, many factors that are likely to continue to constrain credit availability for many potential borrowers and in some specific countries and regions post-reform. We attempt to control for these in our estimate of the international impact.

246. The data on MAC equipment stocks and loan terms and conditions that would be needed to make a precise estimate of the overall impact of the MAC Protocol is simply not available at a global level. We have constructed estimates of the capital stock of MAC equipment using trade and production data and made informed assumptions about representative lending terms before and after reform and about other key parameters required for the model. These assumptions have been drawn up on the basis of earlier work, including Fleisig (2013), and consultations with industry, finance, academic and other experts during stakeholder interviews. Further detail on the data and assumptions used is given in Annex D.

i. The preliminary assessment by the Center for the Economic Analysis of Law

247. Heywood Fleisig of the Center for the Economic Analysis of Law (CEAL) provided a preliminary economic assessment of the impact of the MAC Protocol in 2013. Fleisig (2013) gives an expert account of the likely benefits of reforming collateral laws, drawing on the detailed treatise he co-authored on the subject in Fleisig (2006).

248. The 2013 CEAL study estimates the potential impact of the MAC Protocol on the global equipment stock, exports and on total output or income measured by the impact on world GDP (see Table 17). Underpinning its estimates of impact is an assumption that the Protocol is ‘widely adopted’ and ‘equivalent in economic impact to the legal frameworks of secured lending in Canada, New Zealand, the United States and Romania’.

249. The starting point for the analysis is an estimate of \$1,978 billion for the global stock of MAC equipment in 2011 (see Table 3 in Fleisig, 2013). The estimate is narrowly based. It is derived from an estimate of \$424.3 billion for the value of the US stock of MAC equipment (US Bureau of Economic Analysis, 2011). This is compared with a US GDP of some \$15 trillion to produce a ratio of MAC equipment to total output of 2.83% that is then applied to all other countries to produce regional estimates of their holdings of MAC equipment.

250. The author acknowledges the use of a fixed capital/output ratio is likely to produce a substantial error for any single country but argues ‘it is reasonable for larger regional groupings’. However, this justification ignores the following factors:

- Capital to output ratios tend to be much higher in more advanced economies (resulting in an overestimate of the global stock).
- The proportion of total output generated by MAC sectors tends to be higher in many emerging and developing economies (as a result stock held in these economies may be underestimated).
- The rationale for legal reform is that the availability of secured credit for investments in mobile MAC equipment is constrained in economies that are less advanced than the US and other developed nations.

251. The use of standardised estimates of regional GDP in international dollars based on purchasing power parity (PPP) methodology stock may also overstate likely levels of the value of MAC equipment in developing countries.

252. A second deficiency in the CEAL analysis is that the suggested 77% increase in the post-reform stock of MAC equipment in 'emerging and developing economies' is no more than an assumption and lacks empirical underpinning. It appears to be derived from a worked example related to motor vehicles in which the ability to use a vehicle as collateral would facilitate a 77% increase in the amount of credit that a lender is willing to advance and at a reduced interest rate.



253. There are a number of sources of bias in this estimate:

- It is based on the US market and there is no discussion of whether it is realistic or representative of the credit market(s) for different types of MAC equipment in different regions.
- It contrasts a situation of no collateral with full collateral cover. In practice the difference is likely to be less extreme. For example, at least part of any increase in debt secured against MAC equipment may be at the expense of loans secured on real estate or other assets held in MAC sectors.
- No account is taken of the likely demand for credit of the borrower.
- No allowance is made for the presence of other credit risks that may limit debt availability and cap any reduction in the cost of finance. These may include country risks as well as borrower specific risks.

Table 17 - Estimated economic benefits of MAC Protocol from the CEAL study (Fleisig, 2013)

Category of Benefit	'Emerging and developing economies' + 'Advanced economies in need of reform'	Advanced economies	Details
Sales of MAC equipment	<p>Reflected in an increase of \$604 billion in the stock of MAC equipment over 5 - 7 years, distributed as follows:</p> <ul style="list-style-type: none"> • \$541 billion (+77%) increase in the equipment stock in 'emerging and developing economies'; and • \$62 billion (+38%) increase in the equipment stock in 'advanced economies in need of reform'. 	Exports increase by \$60 - 85 billion per annum over a 7 - 10 year period.	<p>Baseline is an estimate of the global equipment stock in 2011 of \$1,978 billion.</p> <p>Global and regional stock estimates assume a MAC equipment/GDP ratio of 2.83% as observed in US economy.</p>
GDP / output	<p>Deployment of an additional \$604 billion of equipment increases MAC sector output by \$1.2 trillion to \$1.8 trillion over 7 - 10 years.</p> <p>Total GDP by \$1 trillion to \$2 trillion.</p>	<p>Increased export sales boosts GDP</p> <ul style="list-style-type: none"> - annually by \$120 - 170 billion; and - by \$1 trillion over 7 - 10 years. 	<p>MAC sector output and GDP estimates are present values. Time profile of benefits and discount rate not provided.</p> <p>Estimates for emerging and developing economies appear to be based on an assumed capital to output ratio of between 2 and 3.</p> <p>Derivation of GDP estimates for exporting countries is unclear.</p>

254. A projected increase of 38% in the post-reform stock of MAC equipment in ‘advanced economies in need of reform’ appears equally arbitrary. It is simply half the assumed percentage increase in the value of stock held in ‘emerging and developing economies’.

255. Fleisig argues, correctly, that the benefit of additional equipment should be measured by its impact on output and estimates an increase in global GDP two to three times greater (in present value terms) than the increase in MAC equipment. The principal mechanism is through deployment of the expanded equipment stock in low-income countries (initially defined in the paper as ‘emerging and developing economies’ and ‘advanced economies in need of reform’).

256. The CEAL paper suggests the additional stock in low-income countries will boost output in their MAC sectors by between \$1.2 and \$1.8 trillion in present values over a seven to ten year period. However, no details are provided of the expected stream of annual gains in output that could be expected as the deployed equipment stock expands over time or the discount rate used to derive the present values of the benefit streams.

257. The GDP estimates appear to have been derived from an assumption that average capital to output ratios generally fall between two and three based on a study by Nehru and Dhareshwar (1993) among others cited in the CEAL paper. If so, an increase in the stock of MAC equipment in low-income countries by \$604 billion over a five to seven year period could be expected by Fleisig to generate additional output of between \$200 billion and \$300 billion a year, but this could only occur once the new stock has been accumulated and deployed in full.

258. It is difficult to uncover the assumptions used in CEAL from its results. There are many different combinations of time profiles for GDP benefit streams and discount rates that would yield present values of between \$1.2 trillion and \$1.8 trillion over seven to ten years. For example, if we assume a simple linear build up in the additional equipment stock over five years and similarly in the accumulation of associated GDP benefits over ten years, then a discount rate of around 4.8% per annum will be required to replicate these results.

259. While there are various supply-side channels by which increased investment in MAC equipment may increase GDP, it is unlikely that an increase up to three times greater than the increase in the capital stock in many developing economies would occur. It is important to note that the estimates in the CEAL study are expressed as the present value of GDP gains over seven to ten years, and not as an annual flow.

260. Even less clear in the CEAL study is why an increase in exports of MAC equipment estimated to be between \$60 billion and \$85 billion each year should produce a rise in GDP annually of about \$120 billion - \$170 billion across exporting countries. This suggests that each dollar of gross revenue received from equipment exports, as opposed to the net gain in profits, and employment incomes from those exports will generate \$2 of additional output. Unless there is significant spare capacity in the exporting economies, this appears unlikely. Any expansion in exporting industries will therefore require a reallocation of resources within these economies away from other activities, albeit less profitable ones. Some of the increased income from exports will also leak into higher spending on imports.

Table 18 - Critique of CEAL study - summary

Assessment variable	CEAL study	Discussion
Protocol set-up, adjustment and learning costs	Not included	The resource costs of amending relevant complementary national laws and procedures may be significant at an individual country level and may slow the rate of adoption, implementation and effectiveness of the Protocol.
Level and rate of adoption of the Protocol	Unclear - assumption appears to be all 'low-income countries in need of reform' ratify and adopt Protocol	It is unlikely that all member states will adopt the Protocol with immediate effect. There may also be transition costs and lags in equipment registration. No counterfactual is considered in terms of how many countries would have reformed their collateral rules in absence of the Protocol.
Benefits realisation	Immediate following adoption	
Baseline data	Global and regional estimates of the MAC equipment stock in 2011	All regional values are calculated as 2.83% of GDP equal to the 'observed' ratio in the USC. This is likely to overstate the MAC equipment stock in many emerging and developing economies. Estimates take no account of the relative size, capital efficiency or equipment needs of MAC sectors in different economies.
Credit market reaction (supply-side)	Availability of credit for MAC equipment expands by 77% over the assessment period Average loan maturity increases from four to seven years Interest rate spread between unsecured and secured credit post-reform is 350 bps	Values appear to be based on a single, simple example of a motor vehicle loan. Unlikely to be relevant to MAC equipment and different regional markets. Changes in supply and cost of credit unlikely to be uniform. Countries likely to benefit the most over time will be those without effective rules and procedures governing the use of and recourse to collateral, and without other significant country or region specific regulations or risks that will continue to constrain credit and limit the repossession and cross-border movement of mobile equipment. There may be some crowding out of credit for other economic sectors.
Credit market reaction (demand-side)	Implicitly assumes demand for credit is constrained only by its supply	<ul style="list-style-type: none"> • Other factors (country and borrower specific) can constrain demand. • There may be some substitution in demand in MAC sectors between secured and unsecured credit and credit secured against other assets. • Some of the increase in demand may be for credit to be secured against pre-owned equipment rather than new purchases only.

Assessment variable	CEAL study	Discussion
Equipment market response	MAC equipment exports to 'developing and low income OECD countries' increase by \$60 - 85 billion per annum over 7 - 10 years	<ul style="list-style-type: none"> • Appears broadly in line with the estimate of the increase in the global stock of MAC equipment but no justification is provided. • Implicitly assumes supply-side of the global equipment markets is unconstrained. Compared to baseline of \$142 billion in 2010, the range represents an increase by 42 - 60% in value of annual exports even before allowing for any increase in exports to developed countries over same period. • Any short-term supply constraint could increase prices. Longer-term would require a reallocation of resources from other activities so the net increase in exports and GDP would be less. • No distinction is made between increased exports of equipment to replace obsolete equipment and new additions to the stock. Increase in stock of MAC equipment may be less than the increase in exports over the same period. • May increase the rate at which old equipment is retired and replaced. This will expand the second-hand market and may increase the demand for credit for pre-owned equipment. • No segmentation of equipment market by type, application or end-user. • No counterfactual for export sales is considered.
Assessment period	5 - 7 years (equipment stock) 7 - 10 years (exports and GDP)	<ul style="list-style-type: none"> • Assessment periods up to ten years initially appear sensible but likely to be significant lags between adoption of the Protocol and realisation of benefits. • The difference in assessment periods for stock and GDP is explained by an assertion that it will take time for countries to adjust to their new capital stocks. Again, appears broadly sensible but some gains in GDP may occur early and some additions to stock may continue well after 5 - 7 years. • Paper states that choice of seven year adjustment period for GDP is based on a 'rough evaluation of Romania's reform'. No further details are given. Speed of adjustment may be the result of many interdependent factors.
Implied GDP multipliers	For low-income countries, based on estimated global average capital to output ratio of between 2 and 3	<ul style="list-style-type: none"> • Incremental and MAC sector specific ratios are likely to differ. • For advanced economies, the implied export (gross revenue) to GDP multiplier is 2. No justification is provided and likely to be overstated.
Discount rate	Not explicit but possibly circa 4.8% pa	<ul style="list-style-type: none"> • GDP benefits are presented in present values but their time profile and the discount rate used to calculate their present values are not revealed.

261. Fleisig may have intended the CEAL estimates to be illustrative and upper bound. He clearly acknowledges the assessment is a simple one but in so doing provides very few details of the simplifying assumptions used to derive the results.

262. Against this background, we have reviewed and tested the CEAL estimates and their underpinning assumptions and constructed a more refined model. Table 18 summarises our critique, while the remainder of this annex sets out how we have extended the analysis and adjusted the assumptions to produce an assessment that is more considered and more fully evidence based, but still illustrative, given the inevitable uncertainties.

ii. How our approach differs

263. Although the CEAL study provides a useful initial model, many of its assumptions are unclear and/or problematic. We therefore extend the model and use it to derive a more refined and realistic assessment of the international impact and to demonstrate the potential range of uncertainty in those results.

264. The technical model used in our assessment is set out more fully in Annex D and the Excel spreadsheet is available from the authors on request. While it builds on the simple model developed for the CEAL study, it differs from it in the following principal respects:

a. Baseline MAC equipment stock

265. We make more realistic estimates of the stock of MAC equipment in emerging and developing and emerging economies using international trade data and based on revised equipment classifications specified by UNIDROIT since the 2013 CEAL study. We estimate this at \$480 billion in 2015, just under 2% of their combined GDP and we further assume that in the absence of reform this stock will grow in line with GDP over the ten year assessment period.

266. Underpinning our estimates is an assumed average useful equipment life of ten years. This means that, on average, one tenth of the equipment stock held is replaced each year. The stock of equipment held in emerging and developing economies at the end of the base year 2015 will therefore reflect the value of its equipment imports over the previous ten years.

267. In the same way we derive an estimate of \$175 billion for the stock of equipment held in advanced economies in need of reform in 2015. However, as this figure represents more than 5% of their combined GDP we exclude advanced economies in need of reform from our analysis. Our rationale for exclusion is discussed in further detail in Chapter 6, paragraphs 187 - 191.

b. Credit availability

268. The CEAL model assumes credit is unconstrained post-reform. This we have argued is unrealistic and we therefore make a number of adjustments for factors that are likely to continue to limit the supply of debt on improved terms (see paragraphs 199 - 200 and Table 21 in Annex D). These factors will limit the scope of

the reform in terms of the countries, sectors and borrowers that will benefit, the extent depending on other factors determining their creditworthiness.

c. Loan terms pre- and post-reform

269. Assumptions about typical or average lending terms across all borrowers with and without reform are key input parameters. The CEAL model assumes loans without secured transactions reform will typically be offered over four years at an interest rate of 8.5% per annum. With reform, the interest rate improves to 5% per annum and loan maturity increases to seven years.

270. However, an assumed post-reform reduction in the average interest rate by 350 bps appears high compared to spreads incorporated into earlier assessments of the impact of the Aircraft Protocol and more recently in the assessment of the Rail Protocol undertaken for the Rail Working Group (Oxera, 2018).

271. Unlike mobile MAC equipment, aircraft are more readily identifiable, have longer average service lives and must undergo regular, rigorous and certificated maintenance and inspections. Repossession risks should therefore be lower for aircraft than for post-reform MAC equipment.

272. Saunders & Walter (1998), for example, assume a reduction of 100 bps as a result of the Aircraft Protocol. It might be expected that this would be an upper limit for the interest rate reduction resulting from the MAC protocol and we therefore adopt this assumption in our own model. Additionally, we reduce the difference in typical or average loan maturities to two years. That is, post reform we assume average loan lengths increase on average by two years from four years to six.

273. We tested our assumptions in interviews with a range of market participants. Although they were generally reluctant to share details of commercial terms and emphasised that no loan is typical, they did not suggest our assumptions were out of scope or discuss any alternatives. We therefore stress that the assumed improvements in loan terms incorporated into our model are indicative, not precise estimates.

d. Debt take-up and growth in the stock of MAC equipment above baseline

274. In the CEAL model, Fleisig assumes that the amount borrowers will spend each period on servicing debt raised to acquire MAC equipment is fixed, regardless of loan terms. Any savings in debt servicing costs resulting from an improvement in loan terms post-reform are therefore recycled in full into additional debt to grow their stock of MAC equipment.

275. In contrast, we depart from the ‘unitary elasticity’ assumption of Fleisig, under which the amount spent on debt service always remains the same. Instead we assume an elasticity of 0.7 with respect to changes in debt servicing costs. As interest rates fall, borrowers spend less on debt service using some of the savings for other purposes, whether for alternative investments or for current consumption.

276. There is also no limit on how much debt or therefore the stock of MAC equipment could increase in the CEAL model. That is, borrowers will continue to accumulate debt to fund additional MAC equipment as debt-servicing costs are reduced. We also depart from this assumption by introducing an upper limit on the amount of MAC equipment by value that emerging and developing economies will accumulate by the end of the assessment period to meet their requirements. This, for simplicity, is set at 2.83% of their combined GDP

based on the 'observed' stock to GDP ratio in the US economy (see paragraphs 187 -191 and Table 19 in Annex D).

277. Total debt to fund the acquisition of additional MAC equipment over and above baseline cannot therefore expand beyond this limit in our model.

e. Debt take-up, investment profiles and GDP impacts

278. Finally, we model more explicitly potential lags between reform, investment response and GDP impact so that the benefits of reform in terms of higher levels of productivity and output build up over time rather than being felt immediately as in the CEAL study.

279. We do this by assuming incremental debt take up and equipment acquisition follow non-linear 'S-curve' profiles over our ten year assessment period rather than a linear progression over five to seven years in CEAL (see paragraphs 202 - 204).



Annex D: Model, key assumptions and data sources

Figure 12 - Model screen shot #1 (baseline and scope of impact)

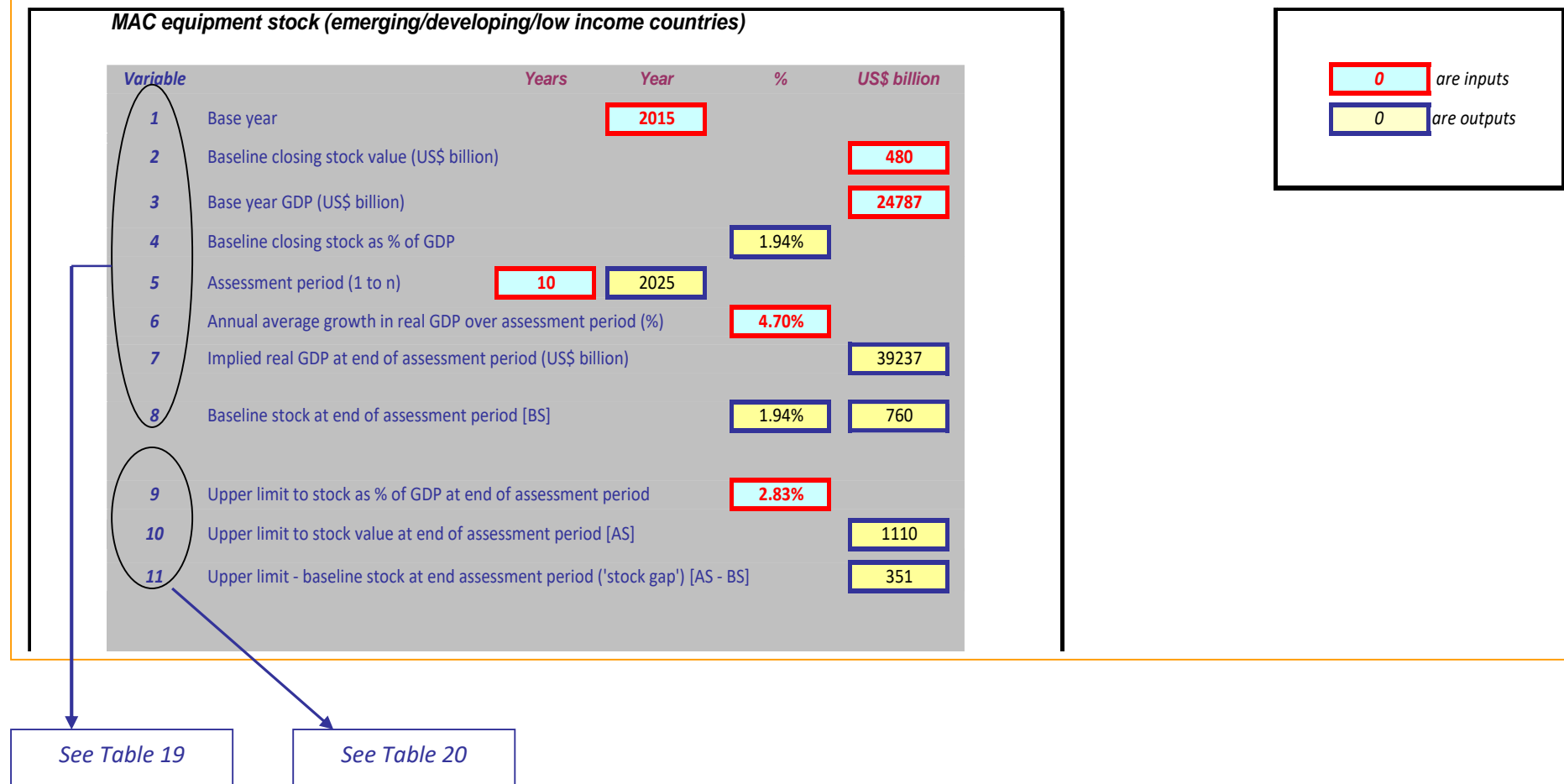


Table 19 - Baseline or counterfactual (without policy change)

Variable	Description / Simplifying assumptions	Value
(1) Base year	The starting point for our analysis	2015
(2) Base year value of MAC equipment stock within scope of Protocol	<p><u>UN Comtrade HS harmonised 6 digit import data</u> (comtrade.un.org/data 2006 - 2015) is used to estimate the global MAC equipment stock held in UNIDROIT member states classified as emerging and developing economies.</p> <p>We assume an average useful equipment life of ten years. This means that, on average, one tenth of the equipment stock held in a country is replaced each year. The stock of equipment held in each economy at the end of the base year will therefore reflect the value of its equipment imports accumulated over the ten year period 2006 to 2015.</p>	\$480 billion
(3) Base year GDP	GDP in UNIDROIT member states classified as emerging and developing economies was compiled from <u>World Bank data</u> . (data.worldbank.org/indicator/NY.GDP.MKTP.CD)	\$24.8 trillion
(4) Base year value of MAC equipment stock as % of base year GDP	The estimated base year MAC equipment stock of \$480 billion represents 1.94% of base year GDP in UNIDROIT member states classified as emerging and developing economies.	1.94%
(5) Assessment period	The period chosen to assess the potential impact of the MAC Protocol	10 years
(6) Annual average growth in real GDP over assessment period	Based on <u>World Bank growth projections</u> for emerging and developing economies. (data.worldbank.org/indicator/NY.GDP.MKTP.KD)	4.7% pa
(7) Projected real GDP at end of assessment period	Assuming an annual average growth rate of 4.7%, real GDP in UNIDROIT member states classified as emerging and developing will reach and estimated \$39.2 trillion by the end of 2025.	\$39.2 trillion
(8) Projected 'baseline' value of MAC equipment stock at end of assessment period	The value of the MAC equipment stock held in emerging and developing economies within scope is assumed to grow in line with GDP over the assessment period, reaching \$760 billion by 2025, i.e. 1.94% of the projected GDP of \$39.2 trillion.	\$760 billion

Table 20 - Scope of impact (with policy change)

Variable	Description / Simplifying assumptions	Value
(9) Assumed upper limit on debt-funded MAC equipment stock as a proportion of the projected GDP for emerging and developing economies at the end of the assessment period	<p>This assumes there is an upper limit to the value of MAC equipment emerging and developing economies aim to secure and deploy equivalent to 2.83% of their combined GDP.</p> <p>The parameter value is based on the observed ratio of the value of MAC equipment stock in the US as proportion of US GDP (<i>US Bureau of Economic Analysis, 2011</i>) that provided the starting point for the estimate of the global MAC equipment stock used in the CEAL analysis (see Annex C).</p>	2.83%
(10) Assumed upper limit on debt-funded MAC equipment stock (\$ billion) for emerging and developing economies at the end of the assessment period	With a projected real GDP in 2025 of \$39.2 trillion, emerging and developing economies would need to grow their debt funded MAC equipment stock by 2025 to \$1,110 billion to achieve the 2.83% of GDP.	\$1,110 billion
(11) Assumed upper limit on expansion in MAC equipment stock above baseline with policy change over assessment period	Difference between output values for variables (10) and (8)	\$351 billion

Figure 13 - Model screen shot #2 (first round effects in credit market)

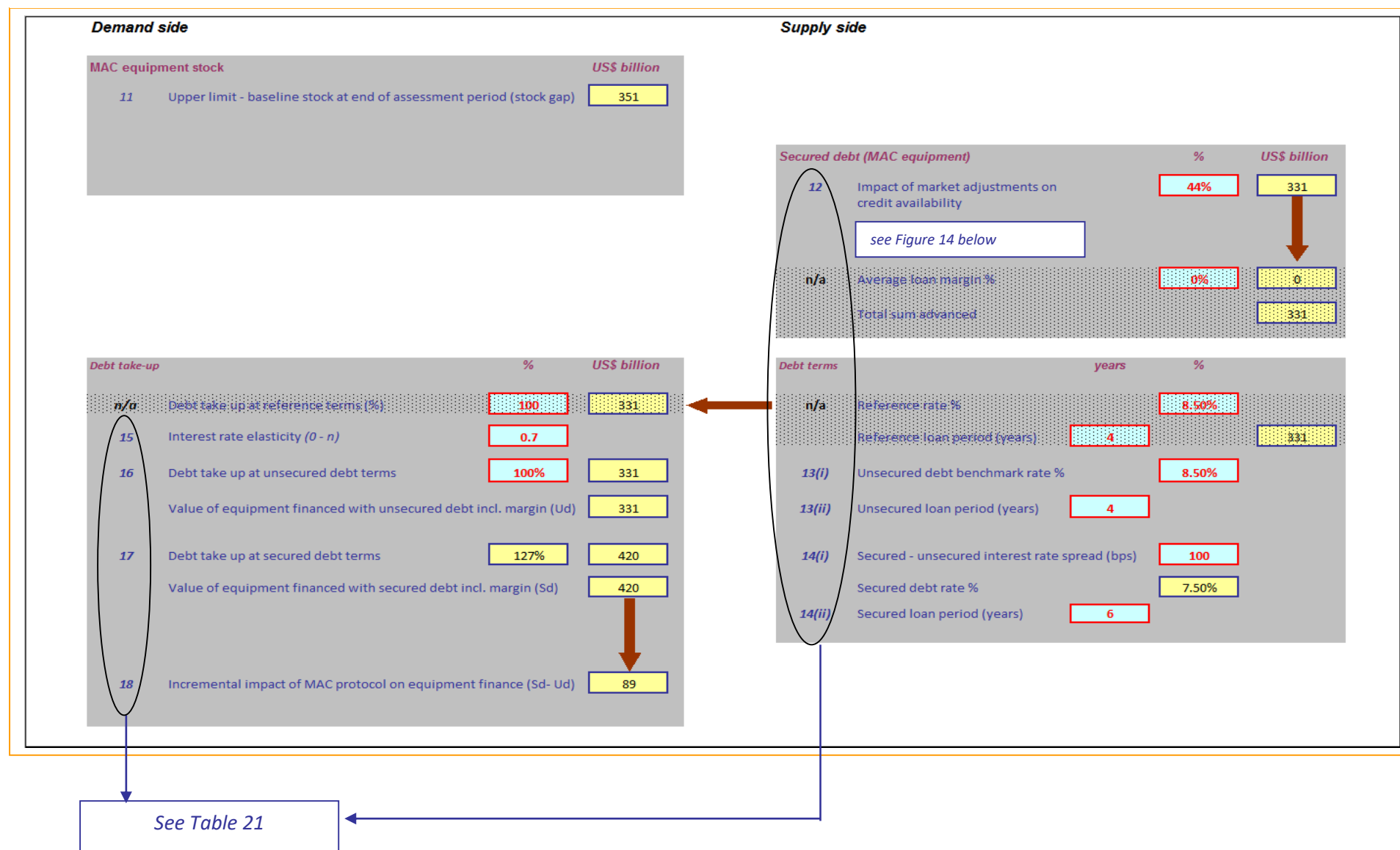


Figure 14 - Model screen shot #3 (market adjustment factors)

Market adjustment factors				
		%	US\$ billion (impact)	US\$ billion (outcome)
			760	
a1	High risk markets	-25%	-190	570
a2	Country limits/market too small	-10%	-57	513
a3	Failure to adopt strong bankruptcy options	-5%	-26	487
a4	Lack of credit history	-20%	-97	390
a5	Ongoing development of financial sectors	-15%	-58	331
n/a			0	331
12	Cumulative impact	44%		331

See Table 21

Table 21 - First round effects in the credit market

Variable	Description / Simplifying assumptions	Value
(12) Impact of market adjustment factors (a1 - a5) on credit availability	<p>Factors that may continue to limit access to credit to and its supply following policy change:</p> <p>(a1) High-risk markets: country specific risks including sovereign risks and other factors such as actual and perceived levels of security, crime and fraud.</p> <p>(a2) Country limits/market size: including the specific sectoral/asset class limits of lenders plus some markets may be too small and/or have complex regulatory environments to interest prospective lenders.</p> <p>(a3) Failure to adopt strong insolvency options in some countries will increase risk and reduce incentives to lend.</p> <p>(a4) Lack of credit history and other borrower specific factors affecting creditworthiness.</p> <p>(a5) Ongoing development of domestic financial sectors: this will have the effect of narrowing the average interest rate and loan period deltas between the baseline and with policy change scenario over time.</p> <p>The market adjustment factors are applied cumulatively to the value of the baseline MAC equipment stock (8) to derive a value for the maximum amount of credit that would be made available to refinance the existing stock without policy change, i.e. 44% of \$760 billion = \$331 billion. There is a high margin of uncertainty around these assumptions.</p>	<p>-25%</p> <p>-10%</p> <p>-5%</p> <p>-20%</p> <p>-15%</p>
(13) Average loan terms over assessment period and across all borrowers without policy change (baseline)	Average interest rate of 8.5% and average loan length of four years over assessment period and across all loans, principally unsecured, used to fund the acquisition of MAC equipment. These were the 'without Protocol' assumptions used in the CEAL model (see Annex C) and tested with market participants in interviews.	<p>(i) Interest rate $r = 0.085$</p> <p>(ii) Loan length $n = 4$</p>
(14) Average loan terms over assessment period and across all borrowers with policy change	<p>We assume, with policy change, the average interest rate over the assessment period and across all loans secured against MAC equipment falls by 100 bps, i.e. to 7.5%. This is in line with assessments made for other Protocols and evidence from interviews (see Annex C).</p> <p>In addition we assume the average loan length increases to six years following policy change.</p>	<p>(i) Interest rate delta = 100 bps; Interest rate $r = 0.075$</p> <p>(ii) Loan length $n = 6$</p>

Variable	Description / Simplifying assumptions	Value
(15) Debt servicing costs - elasticity factor	A measure of how borrowers respond to a fall in debt servicing costs following a reduction in loan interest rates and/or extension of loan maturity periods. An elasticity of 1 assumes all savings resulting from a fall in debt servicing costs will be recycled into additional debt secured against MAC equipment (this was the implicit assumption used in the <u>CEAL model</u>). An elasticity of less than 1 assumes some of those savings are used to purchase other goods, or to leverage debt or invest in other economic sectors. We assume an elasticity of 0.7.	0.7
(16) Debt take up % without policy change	We assume debt take up of the constrained credit supply (12) on loan terms (13) without policy change will be 100%.	100% (of \$331 billion)
(17) Debt take up % with policy change	<p>This is a function of the % in change in debt servicing costs following policy change, i.e. the deltas between (14) and (13), and the assumed elasticity factor (15).</p> <p>The output value is 127% assuming an elasticity factor of 0.7. That is, reinvestment of a proportion of total savings of debt servicing costs following policy change allows borrowers to expand their total debt exposure by 27% post policy change (i.e. from \$331 billion to \$420 billion). We assume the supply of credit post-policy change is no longer constrained.</p>	127% (\$420 billion)
(18) Incremental impact of policy change on total debt take up	The difference between the debt take up values for (17) and (16), i.e. \$420 billion - \$331 billion = \$89 billion	\$89 billion

Figure 15 - Model screen shot #4 (MAC equipment markets and GDP impacts)

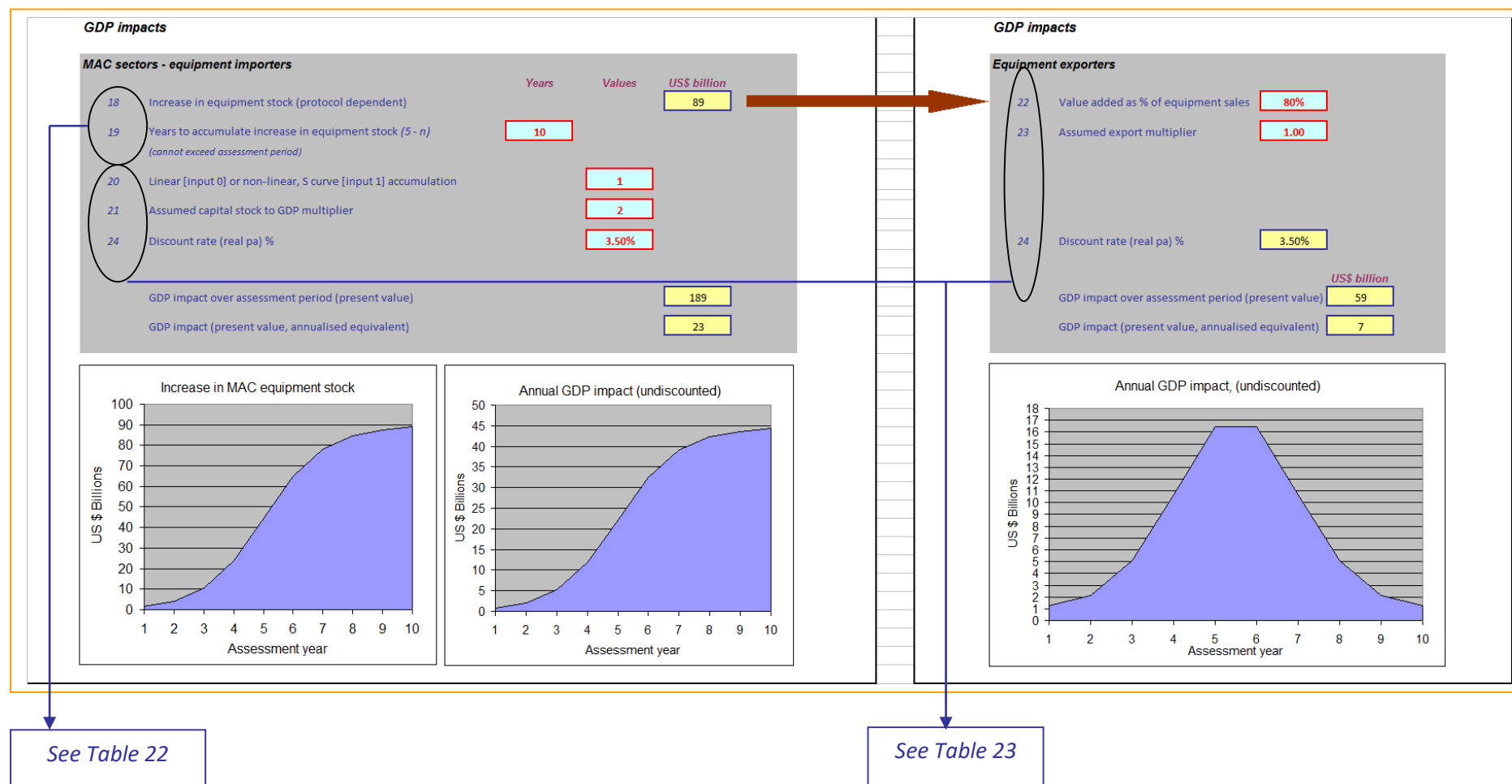


Table 22 - Intermediate outputs in MAC equipment markets

Variable	Description / Simplifying assumptions	Input value
(19) Number of years required to accumulate additional MAC equipment	Logistically, it is likely to take some time for emerging and developing economies to acquire the additional equipment they require. We assume it takes ten years for these economies to reach the new, higher level of equipment stock they are able to finance with secured debt.	10 years
(20) Profile of accumulation of additional MAC equipment over time	We assume the accumulation of new equipment follows a non-linear 'S' curve pattern over time. Benefits realisation in terms of GDP generated from the deployment of the additional equipment will similarly, therefore, be non-linear reaching its new 'steady state' at the end of the ten year accumulation period.	Non-linear
Capacity of equipment suppliers to respond to the increase in demand	An implicit assumption that the increase in demand for MAC equipment can be satisfied from existing capacity within the equipment suppliers, i.e. there are no supply side constraints and real prices are therefore assumed to remain constant over the assessment period.	No supply side constraints

Table 23 - Impact on GDP

Variable	Description	Input value
(21) Equipment investment impact on GDP in emerging and developing economies	<p>The deployment of additional MAC equipment above baseline has the potential to boost output in the MAC sectors.</p> <p>A 'multiplier' value of 0.5 is consistent with a capital stock to GDP ratio of 2 used in the CEAL model (see Annex C). This means that every \$2 invested in additional MAC equipment would generate \$1 in additional GDP each year during its deployment.</p>	0.5
(22) Value added as a % of total equipment export sales	Profits and wages as a proportion of the total revenue from the export of additional MAC equipment	80%
(23) Export GDP multiplier in equipment exporting countries	The value of the additional income or GDP generated by the production and export of the additional MAC equipment. A multiplier of 1 assumes there are no wider industry effects, but also no displacement of resources from other activities in exporting economies.	1.0
(24) Discount rate %	<p>We assume a rate of 3.5% real pa to discount the stream of projected future GDP impacts to their present value equivalents, i.e. what they would be worth to society to receive today.</p> <p>This value is consistent with the annual rate of social time preference (STPR) recommended by the UK HM Treasury to discount future cash flows in order to trade-off the value society attaches to present, as opposed to future, consumption.</p>	3.5% pa

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