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Access to Environmentally Sound Technology in the Developing World: A Proposed Alternative to Compulsory Licensing

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**ACCESS TO ENVIRONMENTALLY SOUND TECHNOLOGY IN THE DEVELOPING WORLD –
A PROPOSED ALTERNATIVE TO COMPULSORY LICENSING**

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I. INTRODUCTION

In 2008, a report published by McKinsey & Co. predicted that a successful program of action on climate change would require the reduction of greenhouse gas emissions by 76% by the year 2050.¹ In order to achieve this seemingly daunting target, the report recognized that the transfer of environmentally sound technologies (ESTs) from the developed to the developing world was an urgent necessity.² The report cited other sources to acknowledge that such technology transfer was unlikely to be achieved even by a combination of market incentives and funding from developed-world governments.³

If market-oriented means, supported by governments, do not suffice to achieve the deployment of ESTs in the developing world, what steps might be necessary to facilitate such technology transfers? A resolution adopted by the European Parliament in 2007 spells out one significant method. The Parliament recommended changes to the WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) “in order to allow for the compulsory licensing of environmentally necessary technologies...”⁴

This emphasis on compulsory licensing as a means of ensuring the deployment of ESTs through the developing world has increasingly gathered strength from various quarters. The prominent civil society activist, Martin Khor, recently went so far as to say that “...the fact that a country requires a product or technology in order to meet its objectives or responsibilities to mitigate climate change or to adapt to climate change is a most valid ground for compulsory licensing.”⁵

The disparate nature of the sources cited above; a prominent private firm, a supra-national legislature dominated by developed countries and a leading activist from the developing world, indicate the breadth of the growing support for compulsory licensing as a means of ensuring the deployment of ESTs through the developing world.⁶ In other words, entities ranging from governments to private firms are now considering, if not actively encouraging, the use of solutions where patent holders are legally compelled to allow the use of their patents by other producers for a specified fee. In support of this position, civil society activists as well as the governments of a number of developing nations point to the Doha Declaration on the TRIPS Agreement and Public Health on the compulsory licensing of certain life-saving pharmaceuticals as a suitable precedent.

For the leading developing nations, the Doha compromise on pharmaceuticals could serve as a blueprint for a future deal on ESTs. Their demands derive added force from Article 4.3 and 4.7 of the UNFCCC which require developed nations to undertake their best efforts to transfer technology to the developing world and expressly links the

¹ McKinsey & Co., *The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth*, 30-33, (2008).

² *Id* at 35.

³ *Id*

⁴ European Parliament resolution on trade and climate change adopted on 29 November 2007, available at <http://www.europarl.europa.eu/sides/getDoc.do?Type=TA&Reference=P6-TA-2007-0576&language=EN>.

⁵ Martin Khor, Note on Access to Technology, IPR and Climate Change (May 2008) available at <http://www.epo.org/about-us/events/archive/2008/epf2008/forum-1/details1/kohr.html>.

⁶ The views above are merely a sampler. Developing country governments have also been strong supporters of compulsory licensing as a means of technology transfer. For one prominent example see the remarks of Celso Amorim, Minister of Foreign Relations for Brazil at the plenary of the Bali Climate Conference in December 2007 which cites the compulsory licensing of pharmaceuticals as “a source of inspiration” in dealing with climate change.

performance of obligations by developing nations to the adequate transfer of technology and financial resources.

The compulsory licensing debate represents an important issue for corporations, innovators, venture capitalists and financial institutions, all of whom hold valuable intellectual property rights in ESTs.⁷ In terms of the quality and monetary potential of the property rights at stake, any attempt to compulsorily license ESTs may be met with fierce opposition from across a range of sources.

This paper will argue that compulsory licensing is not the best way to ensure access to ESTs for the developing world. However, it will also go further and suggest a possible alternative to compulsory licensing – one that may be more sensitive to voluntary nature of global cooperation on climate change.

Part II of this paper provides a brief overview of the two major international regulatory frameworks which bear on the compulsory licensing of ESTs. First, I provide a brief account of the international regulatory regime on climate change and the regulatory preferences it embodies. This is followed by a brief description of the Agreement on Trade-Related Aspects of Intellectual Property Rights (*TRIPS*), the major international agreement governing the compulsory licensing of patents. This description of the two principal international regulatory frameworks aims at providing some sense of the legal background. More importantly, however, it seeks to discern a set of regulatory preferences which might help give shape to a solution on how ESTs might best be diffused through the developing world.

In Part III, two lines of argument are used to resist the idea of compulsory licensing. In the least developed countries, compulsory licensing of ESTs will probably fail because it is, taken by itself, an inadequate measure. By contrast, in the leading developing countries, compulsory licensing is unnecessary. ESTs, I argue, are sufficiently different from pharmaceuticals that Doha should not serve as an applicable precedent. In this part, as with the rest of the paper, I will focus primarily on three kinds of ESTs – photovoltaic (solar), wind and biofuels.

A possible alternative to compulsory licensing is then presented in two distinct parts. Part IV attempts to provide a brief account of the regulatory choices or aspects of regulatory design that should shape solutions in this area. In Part V, I then provide a concrete solution based on the regulatory principles identified in Part IV. The principal attraction of this solution is that it may be preferable, both politically and economically, to compulsory licensing. However, another virtue of the proposed solution might be its harmony with the underlying principles of the existing international regime on climate change and with the general structure of international law.

II MAPPING THE INTERNATIONAL REGULATORY LANDSCAPE

II.1 *The International Regulation of Climate Change*

Although the international regulation of climate change often appears to take place through a confusing network of agreements, the two principal mechanisms for regulation can be ordered according to their levels of generality. At the most general level, the

⁷ To provide just one example, almost \$22 billion were invested in renewable energy capacity during 2003 – nearly four times as much as in 1995. See Eric Martinot, *Indicators of Investment and Capacity for Renewable Energy*, RENEWABLE ENERGY WORLD, Sept.-Oct. 2004.

United Nations Framework Convention on Climate Change (UNFCCC)⁸ acts as the foundational document for the international regulation of climate change while the Kyoto Protocol to the UNFCCC imposes more specific obligations which elaborate on the UNFCCC. As its name suggests, the UNFCCC merely serves as a basic agenda or framework for further international action and cooperation on the issue of climate change.⁹ The UNFCCC's stated objective is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system." In order to achieve this, the UNFCCC provides a list of commitments ranging from the implementation of national plans to mitigate climate change and international cooperation in scientific research and technology transfer. However, of equal importance are the principles that the UNFCCC sets out in seeking to reach this goal. Prominent amongst these is the principle of common but differentiated responsibilities, discussed immediately below.

Common but Differentiated Responsibilities

The principle of common but differentiated responsibilities and respective capabilities is a recurrent theme of both the UNFCCC as well as its subsidiary legal instruments. This principle is essentially the acknowledgment of a historical truth, namely that developed countries are both principally responsible for the accumulation of greenhouse gases in the atmosphere and, as a result of their developed status, have greater capacity to take action against climate change. Accordingly, the UNFCCC divides the states party to it into two groups; Annex 1 countries which are developed countries and non-Annex 1 countries which are almost entirely developing countries.¹⁰ Annex 1 countries are required to adopt national policies aimed at mitigating climate change,¹¹ but this is now recognized to be a "soft" or non-binding obligation.

This principle of common but differentiated responsibilities serves to link progress on climate change to actions by developed countries. The emphasis on differentiated responsibility is evident in provisions of the UNFCCC which require that:

- developed countries shall provide the financial resources needed by developing countries to meet their agreed full incremental costs of implementing measures,¹²
- developed countries shall take all practicable steps to facilitate and finance transfer of and access to environmentally sound technologies and know-how to developing countries; and shall support the development and enhancement of endogenous capacities and technologies of developing countries,¹³ and

⁸ United Nations Framework Convention on Climate Change art. 2, *opened for signature* May 9, 1992, 1771 U.N.T.S. 107, S. Treaty Doc. No. 102-38.

⁹ Art. 3 of the UNFCCC provides a set of these basic principles.

¹⁰ In 1992, when the UNFCCC was opened for signature, the question of whether certain post-communist countries of Eastern Europe should be treated as developed or developing was unclear. Most of these, however, are treated as non-Annex I countries today.

¹¹ UNFCCC, art. 4.2, (1992).

¹² UNFCCC, art. 4.3, (1992).

¹³ *Id.*

- most importantly, the extent to which developing countries will implement their commitments will depend on effective implementation by developed countries of their commitments on financial resources and technology transfer.¹⁴

The principle of common but differentiated responsibility has been justified as a political necessity in order to ensure the participation of the developing world in the UNFCCC¹⁵ but there are also vocal critics who charge that the principle does not go as far as it should. These critics, among them prominent U.S. senators,¹⁶ argue that while the UNFCCC acknowledges the historical role of the developing world in creating the climate change crisis, it does not sufficiently account for future projections which identify major developing nations such as India and China as leading sources of greenhouse gas emissions.¹⁷ This tension between the UNFCCC's assignment of responsibility based on historic roles and its silence on future emission projections has sometimes been seen as a major failure in the attempt to create an international regulatory structure for climate change and has been blamed, in part, for the United States' reluctance to ratify the Kyoto Protocol. Others, however, see the need to bring in leading developing world emitters such as China and India as a significant future opportunity to expand the scope of the UNFCCC and the Kyoto Protocol.¹⁸

Notwithstanding the question of whether the responsibilities assigned should extend to major future emitters as well as those of the past, the UNFCCC posits the principle of common but differentiated responsibility as one that must be central to the global fight against climate change. It follows, therefore, that any attempt to craft a solution to the issue of the equitable transfer of ESTs to the developing world should hew as closely as possible to this fundamental principle.

Market Mechanisms

The Kyoto Protocol to the UNFCCC¹⁹ puts into operation the general commitments given by parties to the UNFCCC. In creating an operational model for climate change regulation, the Protocol seeks to adhere to the principles espoused by the UNFCCC, especially the principle of common but differentiated responsibilities. To this end, the Protocol specifies limits on the quantities of greenhouse gases that the Annex 1 Parties to the UNFCCC are permitted to emit although no such emission limits are imposed on the developing countries, the non-Annex I parties to the UNFCCC.

Although the emission limits specified in the Kyoto Protocol are binding obligations for the Annex 1 parties, the Protocol has been praised by several commentators for adopting creative, market-oriented means by which to enforce these emission limits.²⁰ The adoption of such market mechanisms over more coercion or the imposition of sanctions is believed to have lent flexibility to the Kyoto Protocol and hastened the Protocol's

¹⁴ UNFCCC, art. 4.7, (1992).

¹⁵ Daniel Bodansky, *The United Nations Framework Convention on Climate Change: A Commentary*, 18 YALE J. INT'L L. 451 (1993).

¹⁶ See for instance, the discussion on the Byrd-Hagel Resolution on p. *infra*.

¹⁷ See for instance, Opening Statement of U.S. Senator Chuck Hagel at the Joint Hearing of the Senate Foreign Relations Committee and the Environment and Public Works Committee, July 24, 2002.

¹⁸ David G. Victor, *How to Slow Global Warming*, 349 NATURE 451, 452 (1991).

¹⁹ Kyoto Protocol to the UNFCCC, UN Doc FCCC/CP/1997/7/Add. 1, Dec. 10, 1997; 37 I.L.M.22 (1998).

²⁰ See for instance, Andrew Schatz, *Discounting the Clean Development Mechanism*, 20 GEO. INT'L ENVTL. L. REV. 703, 704 (2008) (going on to criticize host countries under the Clean Development Mechanism for misusing it.)

acceptance by the overwhelming majority of developed countries, although developing countries and NGOs voiced strong opposition.²¹

Amongst the prominent market mechanisms adopted by the Kyoto Protocol are:

International Emissions Trading: The limited quantity of greenhouse gases which Annex 1 countries are allowed to emit is termed the “Assigned Amount”.²² Under the Protocol, each party’s Assigned Amount can be subdivided into Assigned Amount Units or AAUs with each AAU corresponding to the right to emit one carbon dioxide ton of greenhouse gas emissions.²³ The Protocol allows parties to trade AAUs amongst each other so that parties with excess emissions can buy emission rights in the form of AAUs from parties whose emission levels are lower than their Assigned Amounts.²⁴

Joint Implementation: The Kyoto Protocol also allows a developed nation under Annex 1 to fund a transaction concerning a project in another Annex 1 country which will have the effect of reducing emissions.²⁵ The Annex 1 country hosting the project can then transfer a proportional share of its Assigned Amount to the funding country as Emission Reduction Units (ERUs) which the funding country can then add to its Assigned Amount.²⁶

Clean Development Mechanism (CDM): The CDM is essentially a variation on the Joint Implementation Mechanism discussed above. Here, instead of funding a project in another Annex 1 country, the host countries for the CDM are developing countries or non-Annex 1 countries, many of which present abundant opportunities for the execution of low-cost projects.²⁷ Once again, the emissions reduced by a successful project are credited to the funding nation in the form of Certified Emission Reductions (CERs) which the funding nation can add to its Assigned Amount.²⁸

These market mechanisms are central to the efficient operation of the Kyoto Protocol. Moreover, what they evidence is the Protocol’s marked preference for such market-oriented mechanisms over more directly coercive means. Future additions or amendments to the Kyoto Protocol will be less disruptive of international obligations and expectations where they successfully reproduce or utilize mechanisms which resemble the market mechanisms already present under the Protocol.

What emerges from this brief overview of the structure of international climate change regulation is a regime that seeks to allocate responsibility based on both conduct and capacity, although opinions diverge on whether responsibilities should be allocated solely on the basis of past conduct or on projected future conduct as well. Furthermore, the existing regulatory structure prefers market-based solutions to the imposition of

²¹ Axel Michaelowa, *The Kyoto Protocol and its Flexibility Mechanisms* (2003) at <http://www.ecoeco.org/pdf/kyotoandflex.pdf>.

²² This term is first used in art. 3.1 of the Kyoto Protocol.

²³ Kyle W. Danish, *The International Regime* in *GLOBAL CLIMATE CHANGE AND US LAW* 31, 43 (Michael Gerrard ed., American Bar Association 2007).

²⁴ *Id.*

²⁵ See art. 6 of the Kyoto Protocol. The funding country will probably undertake such a project if the cost of implementation of the project is cheaper in the host country than in its own.

²⁶ Danish, *The International Regime*, *supra* note 18 at 44-45.

²⁷ *Id.*

²⁸ *Id.*

sanctions. Ideally, future regulatory developments in the area should remain consistent with these overarching themes.

II.2 TRIPS, Compulsory Licensing and Doha

The other element of the regulatory landscape is provided by the TRIPS Agreement, one of the several treaties administered by the World Trade Organization (WTO).²⁹ TRIPS represents the prevailing international consensus on patent rights and situations where derogation from such rights is permitted. In particular, TRIPS provides detailed provisions on situations where compulsory licensing³⁰ of patents is allowed and the methods by which such compulsory licensing is to be carried out.

Under Article 28 of TRIPS, a patent confers the exclusive rights to make, use, sell, and import patented products.³¹ TRIPS does provide for certain situations where these exclusive rights may be limited, but limitations must be applied so as not to discriminate on the basis of the product's place of invention, the field of technology in which it applies or whether the products in question are imported or locally produced".³² Article 7 of TRIPS further provides that patents should be protected in a manner "conducive to social and economic welfare" and should balance a patent holder's "rights and obligations."³³

Article 30 of TRIPS provides guidance for situations where the exclusive rights conferred by the Agreement are sought to be set aside. It allows for member-states to provide for limited exceptions so long as these do not "unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties."³⁴ This very general, almost deliberately ambiguous formulation is given shape by the following Article 31, which provides specific guidance on cases where the compulsory licensing of patents is permissible.

Through a compulsory license under Article 31, a third party (including a government), may use the subject matter of a patent without the patent-holder's authorization. In general, before compulsory licensing is allowed, the proposed user must have unsuccessfully attempted to obtain the patent from the holder on reasonable commercial terms.³⁵ However, this requirement of such a prior attempt to secure the patent on commercial terms may be waived in cases of "national emergency or other circumstances of extreme urgency".³⁶

The use of a compulsory license imposes several requirements on a licensee. The licensee may only use the license on a non-exclusive basis and only for the purpose for which it was authorized.³⁷ The licensee cannot assign the use of the subject matter of the patent to another party and the use shall be predominantly for the supply of the domestic

²⁹ Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, 33 I.L.M. 81 (1994) [hereinafter "TRIPS" or "Agreement"].

³⁰ By compulsory licensing, I mean "[a] statutorily created license that allows certain people to pay a royalty and use an invention without the patentee's permission." Black's Law Dictionary (8th ed. 2004). The term is undefined in TRIPS.

³¹ TRIPS, *supra* note 30, art. 28.

³² TRIPS, *supra* note 30, art. 27.1.

³³ TRIPS, *supra* note 30, art. 7.

³⁴ TRIPS, *supra* note 30, art. 30.

³⁵ TRIPS, *supra* note 30, art. 31(b).

³⁶ *Id.*

³⁷ TRIPS, *supra* note 30, art. 31(c) and (e).

market of the Member authorizing such use.³⁸ Most importantly, the patent holder continues to be “adequately” remunerated for the use of the patent, based on the economic value of the authorization granted.³⁹ The idea of “adequate remuneration”, however, is not spelt out further in TRIPS – in particular, it is unclear whether adequate remuneration must be at a level which allows the patent-holder to recoup his costs.

One major motivation for compulsory licensing often arises from extraction concerns. Extraction is a “form of private taxation that aims to raise revenue”⁴⁰ and ensures compliance with such demands for revenue by an implicit threat of exclusion. Thus, since a patent confers a limited monopoly on a patent-holder, the patent-holder usually expects to extract a monopoly premium by controlling the use of the patent and the supply of the relevant product. Compulsory licensing aims to increase access to the desired products by eliminating the patent-holder’s ability to extract a monopoly premium. Following compulsory licensing, the patent-holder can generally expect to receive only a very limited return on invested capital.

The apparently arcane provisions on compulsory licensing gained global prominence following the Ministerial Declaration of November 14, 2001 (the “Doha Declaration”).⁴¹ In the run-up to the Declaration, various international organizations, governments and corporations had been faced with a range of civil-society demands relating to public access to patented medicine in countries with high incidence of diseases such as AIDS.⁴² Recognizing the legitimacy of the underlying needs, the Declaration noted that the terms of the TRIPS Agreement were sufficiently flexible to address public-health emergencies and that member-states could interpret the agreement so as to promote public access to essential medicines.

³⁸ TRIPS, *supra* note 30, art. 31(f).

³⁹ TRIPS, *supra* note 30, art. 31(h).

⁴⁰ C. Scott Hemphill, *Network Neutrality and the False Promise of Zero-Price Regulation*, 25 YALE J. ON REG. 135, 138 (2008).

⁴¹ For the full text of the declaration, *see*

http://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.htm

However, Paragraphs 4, 5 and 6 of the Declaration are central to the issue of compulsory licensing and provide, in relevant part, that:

...

(b) *Each Member has the right to grant compulsory licences and the freedom to determine the grounds upon which such licences are granted.* (Emphasis added).

(c) *Each Member has the right to determine what constitutes a national emergency or other circumstances of extreme urgency, it being understood that public health crises, including those relating to HIV/AIDS, tuberculosis, malaria and other epidemics, can represent a national emergency or other circumstances of extreme urgency.* (Emphasis added).

(

...

6. We recognize that WTO Members with insufficient or no manufacturing capacities in the pharmaceutical sector could face difficulties in making effective use of compulsory licensing under the TRIPS Agreement. We instruct the Council for TRIPS to find an expeditious solution to this problem and to report to the General Council before the end of 2002.”

⁴² For an account of the strategies used, *see* Amy Kapczynski, “The Story of *Minister of Health v. Treatment Action Campaign*” in HUMAN RIGHTS ADVOCACY STORIES (2009) (Deena R. Hurwitz, Margaret L. Satterthwaite, Douglas B. Ford, eds.).

Doha also marked an important advance on the existing text of the TRIPS provisions on compulsory licensing in its recognition of the varying abilities of TRIPS member-states. Even amongst the various member-states from the developing world, some countries were clearly better than others in their ability to work patents, use technology and produce pharmaceuticals. Accordingly, the Declaration stated that it recognized “that WTO members with insufficient or no manufacturing capacities in the pharmaceutical sector could face difficulties in making effective use of compulsory licensing under the TRIPS Agreement. We instruct the Council for TRIPS to find an expeditious solution to this problem...”⁴³

Expediently or not, by August 30, 2003, a solution was put in place. On that date, the WTO General Council adopted the Decision on the Implementation of Paragraph 6 of the Doha Declaration on the TRIPS Agreement and Public Health.⁴⁴ Negotiated as it was against the backdrop of a number of raging public health emergencies in South Africa and elsewhere, the WTO Decision encompassed “all pharmaceutical products” and provided three temporary waivers.⁴⁵ The cumulative effect of the waivers was to allow WTO member-states to grant compulsory licenses, either acting individually or in groups, and to export pharmaceuticals manufactured under such licenses to countries which had inadequate manufacturing capacity. Most importantly, the holder of the underlying patent would receive remuneration only once – i.e., payment for using the compulsory license would be made by both the exporting as well as the importing countries.⁴⁶ This temporary waiver was made permanent on December 6, 2005. Thus, following the WTO Decision, Article 31(f) of the TRIPS Agreement which required that the compulsory license be used to predominantly supply the domestic market of the Member granting the license, has essentially been eclipsed as far as pharmaceutical products were concerned.

The dramatic nature of the developing world’s victory at Doha cannot be underestimated. Precisely because of their success in Doha, however, it is possible that developing nations and civil society groups will see Doha as the paradigm case for struggles over intellectual property for the future. Indeed, there is existing academic writing to suggest that the Doha Declaration and the WTO Decision were viewed by a number of civil-society groups as being not only a major victory in the effort to secure access to medicines but also a vital step in the quest to fundamentally reshape ideas of intellectual property.⁴⁷ Without questioning the validity of this broader claim, I will suggest only that whatever else Doha and the WTO Decision may represent, they do not serve as appropriate models by which to secure the flow of ESTs to the developing world. This is partly because ESTs are fundamentally unlike pharmaceuticals and the market for ESTs is radically different from the market for pharmaceutical products. More importantly, I contend that the nature of the market for ESTs has important political consequences which are likely to prevent international negotiations on EST transfers

⁴³ Doha Declaration, 14 November, 2001, para 6.

⁴⁴ Decision of the General Council of 30 August 2003, *Implementation of Paragraph 6 of the Doha Declaration on the TRIPS Agreement and Public Health* (“The WTO Decision”).

⁴⁵ WTO Decision, para 1(a).

⁴⁶ WTO Decision, para 3.

⁴⁷ Amy Kapczynski, *The Access to Knowledge Mobilization and the New Politics of Intellectual Property Law*, 117 YALE L.J. 804, 806 (2008).

going the way of the Doha Declaration. To insist on compulsory licensing for ESTs would therefore be both inappropriate and inefficient.

III WHY COMPULSORY LICENSING WON'T WORK

III.1 *Divisions in The Developing World: A Background Fact*

In order to argue that compulsory licensing is an inappropriate means of facilitating technology transfer from the developed to the developing world, it may first be necessary to recognize the widely disparate technical and scientific capabilities of the many nations that comprise the developing world. As recent scholarship suggests, that there are certain developing nations which enjoy appreciable levels of “technical proficiency”,⁴⁸ although their abilities to innovate may be more limited than that of developed nations.⁴⁹

This diversity has been recognized by a Report released in 2002 by the Commission on Intellectual Property Rights which noted that

“...China and India, along with several other smaller developing countries, have world class capacity in a number of scientific and technological areas including, for instance, space, nuclear energy, computing, biotechnology, pharmaceuticals, software development and aviation. By contrast, 25% of poor people live in Sub-Saharan Africa (excluding South Africa), mainly in countries with relatively weak technical capacity.”⁵⁰

Nor need the inquiry be restricted to the question of relative technical proficiency. There are a variety of other factors which will significantly impact a nation’s ability to use, modify or acquire new technology - these may range from *per capita* incomes and GDP growth rates to “softer” factors such as education levels. This has led two scholars to suggest that some developing countries, such as Russia, China, India, Brazil, Mexico, Turkey and Chile, may be classified as Technically Proficient Developing Countries (TPDCs) based on two factors:

- (i) the share of medium or high level technology products in total manufacturing value added; and
- (ii) Research and development expenditure as a percentage of GDP.⁵¹

This classification of developing countries into TPDCs and others need not be endorsed to be recognized as valuable, for it points to the remarkable technological heterogeneity of the developing world. Acknowledging such heterogeneity allows the argument against compulsory licensing to be nuanced so that the inappropriateness of compulsory licensing is addressed at two distinct levels; one for TPDCs and one for other developing nations with markedly lower levels of technological proficiency. Based on this classification, I will argue that compulsory licensing is not required in TPDCs while for other developing countries, compulsory licensing is insufficient to ensure the flow of technology.

⁴⁸ Shamnad Basheer & Annalisa Primi, *The WIPO Development Agenda: Factoring in the “Technologically Proficient” Developing Countries*, in IMPLEMENTING WIPO’S DEVELOPMENT AGENDA 118 (Jeremy DeBeer ed., 2009).

⁴⁹ *Id.* at 119.

⁵⁰ JOHN H. BARTON *ET AL*, THE COMMISSION ON INTELLECTUAL PROPERTY RIGHTS, INTEGRATING INTELLECTUAL PROPERTY RIGHTS AND DEVELOPMENT POLICY 191 (2002).

⁵¹ Basheer & Primi, *supra* note 48 at 121.

III.2 *The Ineffectiveness of Compulsory Licensing in TPDCs*

Compulsory licensing is likely to be unnecessary in TPDCs because the nature of the market for ESTs is substantially different from that of the market for pharmaceuticals. Further differences in the technical abilities and possible political inclinations of the players also make it unlikely that compulsory licensing will be seen as a necessary, or even a feasible, solution.

Lower Costs of Intellectual Property for ESTs

The grant of a patent on a pharmaceutical product is essentially a grant of a limited monopoly - a drug may therefore have no functional substitutes for the term of the patent. In such situations, the owner of the pharmaceutical patent is strongly placed and may seek to extract monopoly rents.⁵² The extraction of monopoly rents may be particularly detrimental to national interests when it takes place during a public health emergency.

The situation for ESTs is, however, substantially different from that of pharmaceutical products in three key respects. First in three EST sectors, the basic processes are not subject to patent. Photovoltaic (solar), biofuels and wind technology each exhibit relatively few intellectual property concerns. Thus for instance, most established firms have a somewhat different patented technology, each geared towards the same end - harnessing photovoltaic energy.⁵³ Similarly, for biofuels, the underlying intellectual property rights are not a significant concern since several relevant technologies are traditional and are not subject to patent.⁵⁴ In both the biofuel and photovoltaic sectors, the existence of a number of competing firms within the markets indicates that licenses may likely be had on reasonable terms, driving the costs of acquiring intellectual property down.⁵⁵

Wind energy represents a slightly different scenario in that the industry is comparatively more concentrated and key patents do exist. Nevertheless, licenses are regularly granted and firms from at least two TPDCs, India and China, have succeeded in entering the market alongside older firms. Existing data suggests that the major barrier to acquiring intellectual property may be a small royalty.⁵⁶

These sector-specific findings illustrate a more general truth. ESTs are mature technologies and in many cases, even previously patented technologies are no longer subject to protection. In this sense, the market is very different from the market for pharmaceuticals, where the boundaries of basic research continue to shift rapidly.

Competition Between and Across Sectors

Apart from the comparatively lower costs of intellectual property, the EST market is also remarkably dissimilar from the pharmaceutical market in that products compete not only against other products within their own sector but also against products from other sectors.⁵⁷ A major solar producer will not only aim to produce solar energy more cheaply

⁵² JOHN H. BARTON, INTERNATIONAL CENTRE FOR TRADE AND SUSTAINABLE DEVELOPMENT, *INTELLECTUAL PROPERTY RIGHTS AND ACCESS TO CLEAN ENERGY TECHNOLOGIES IN DEVELOPING COUNTRIES* viii (2002).

⁵³ *Id.* at 10.

⁵⁴ *Id.* at 12.

⁵⁵ *Id.* at 10, 13.

⁵⁶ *Id.* at 18.

⁵⁷ *Id.* at viii.

than its competitors but will also seek to ensure that its prices are competitive against local wind and biofuel producers - the substitutability of sources of supply may be markedly higher, preventing producers from exploiting monopoly positions.

These two general observations also provide valuable clues as to two other crucial respects in which the market for ESTs operates significantly differently from the market for pharmaceuticals.

Relatively Lower Market Concentrations and Barriers to Entry

The relatively lower costs of intellectual property for EST markets may also have contributed towards lowering the costs of entry to these markets. The lower barriers to entry, in turn, have ensured that the markets are not considered highly concentrated in terms of an antitrust analysis. Even the market for wind energy, the most concentrated of the three EST markets, has seen the entry of several Chinese firms and at least one major Indian firm over the last decade.⁵⁸ This is not to suggest that barriers to entry are entirely absent in EST markets or that ESTs are cheaply deployable. For instance, acquiring land and avoiding land-use restrictions may significantly drive up the costs of wind energy production⁵⁹ - but the fact that the costs of intellectual property are low in EST markets seriously dents the argument for compulsory licensing as a solution to the difficulties of technology diffusion.

Once again, the lower costs of intellectual property serve to distinguish the EST market from markets for pharmaceuticals. Once a pharmaceutical product has received a patent, it may effectively prevent competitors from producing competing products until the term of the patent is over or may permit such production only upon the payment of monopoly rents in the form of license fees. Since the basic intellectual property is often unprotected for ESTs, EST producers are unable to extract such monopoly rents and the licensing of such patents as do exist is quite common.

The Importance of Government-funded Research

The expenses and uncertainty involved in the early stages of research into ESTs has often resulted in government intervention to support such research, both in developed countries as well as in TPDCs.⁶⁰ Such government support has certainly contributed towards driving down the costs of intellectual property, at least in a domestic context. Governments will often be legally bound to ensure that licenses to government-held technologies be granted on non-discriminatory terms. State research facilities, or even state-owned corporations, are unlikely to be motivated by the same profit motives as private actors in allowing licensing by domestic corporations.

On the other hand, government ownership of intellectual property may also make it harder for foreign firms to acquire such intellectual property within that state's

⁵⁸ *Id.* at 17.

⁵⁹ AMERICAN WIND ENERGY ASSOCIATION, 10 STEPS IN BUILDING A WIND FARM (2008); Thijs Westerbeek Van Eerten, *Big Companies Keen on Wind Energy* (2008), <http://static.rnw.nl/migratie/www.radionetherlands.nl/currentaffairs/region/netherlands/080901-wind-energy-mc-redirected>.

⁶⁰ Eric Martinot *et al*, *Renewable Energy Markets in Developing Countries*, 27 *Ann. Rev. Energy Env.* 309, 330 (2002); BARTON, *INTELLECTUAL PROPERTY RIGHTS AND ACCESS TO CLEAN ENERGY TECHNOLOGIES IN DEVELOPING COUNTRIES*, *supra* note 52 at 15, 20.

jurisdiction.⁶¹ Governments may simply have a policy of favoring domestic producers or may decline to allow licensing by foreign firms on grounds of national security. However, this is quite unlike a private pharmaceutical firm's refusal to grant a license on reasonable terms - the private firm seeks to extract a monopoly rent for the license whereas the government may be motivated by a range of other concerns and may decline a foreign firm's license application even if the price offered for the license is higher than a monopoly price.

The two points examined above - markets that are relatively low intellectual property barriers and government support for investment by private firms - also have a crucial political consequence which might serve to show why the equivalent of a Doha Declaration is unlikely to take place for the EST sector.

The Political Consequences of Ownership of Intellectual Property by TPDC Firms

Countries such as India were prominent supporters of the Doha Declaration for reasons which may well have gone beyond the altruistic. As a major producer of generic drugs, India and Indian firms stood to gain substantially from the grant of a right to operate compulsory licenses so as to produce generic versions of patented drugs.⁶² The nature of the market for ESTs may ensure that this scenario is not repeated.

The comparatively lower intellectual property barriers to entry to EST markets have resulted in the substantial participation of TPDC firms in the EST markets - particularly in the photovoltaic and wind sectors. India's Suzlon, for instance, is a major producer of wind energy and has consolidated that position following its 2007 acquisition of Germany's REPower⁶³ - in combination, the two firms held over 10% of marketshare.⁶⁴ Similarly, major Chinese players in the wind and photovoltaic sectors such as Goldwind and Suntech may have already acquired a substantial amount of intellectual property - some of it, like Suzlon, by the acquisition of competitor firms.⁶⁵

The fact that these TPDC firms hold appreciable quantities of intellectual property makes it increasingly unlikely that such TPDCs will collaborate in any future Doha-style compromise which requires the compulsory licensing of ESTs. In this respect, the situation is considerably different from Doha where India, as a major manufacturer of generic drugs, stood to lose little from a decision to require compulsory licensing.

III.3 The Inadequacy of Compulsory Licensing in Other Developing Countries

If compulsory licensing is unnecessary in TPDCs, it is inappropriate as a solution to the technical problems of other developing countries for entirely different reasons. Compulsory licensing fails as a strategy in the least developed countries primarily because it is an inadequate remedy. Least developed countries which seek to use compulsory licensing to achieve climate change objectives are likely to be disappointed by its limited effects. Given the low purchasing power and poor business prospects in many such least developed countries, prominent EST manufacturers may avoid conflicts

⁶¹ BARTON, INTELLECTUAL PROPERTY RIGHTS AND ACCESS TO CLEAN ENERGY TECHNOLOGIES IN DEVELOPING COUNTRIES, *supra* note 52 at 20.

⁶² DELOITTE TOUCHE TOHMATSU, INDIA MEETS DOHA – CHANGING PATENT PROTECTION: CHALLENGES AND OPPORTUNITIES FACING INDIA'S PHARMACEUTICAL INDUSTRY 2 (2005).

⁶³ *Suzlon Energy Acquires REPower*, THE HINDU, May 26, 2007.

⁶⁴ BARTON, INTELLECTUAL PROPERTY RIGHTS AND ACCESS TO CLEAN ENERGY TECHNOLOGIES IN DEVELOPING COUNTRIES, *supra* note 52 at 20.

⁶⁵ *Id.* at 11, 17.

arising out of compulsory licensing by simply deciding not to register a patent within the least developed country.⁶⁶ The least developed countries which seek to compulsorily license patents may not have any patents to license in the first place.

Even where a patent exists and is compulsorily licensed by the least developed countries, increased production may not follow. The operation of various “hard” technologies represented by the patents may require considerable “soft” technologies in the form of know-how.⁶⁷ Both soft and hard technologies are likely to be in short supply in the least developed countries. Licensees in the least developed countries who seek to avail of the compulsory license may also be intimidated by the prospect of having to compete with an established brand-name with significant experience in the relevant market (the original patent-holder) and may therefore be deterred from market entry.

In response to this seeming bind, proponents of compulsory licensing might once again reach for their experiences in Doha as a guide. They might urge the merits of a Doha-style solution where TPDCs obtain compulsory licenses to manufacture and export ESTs to the least developed countries.⁶⁸ In this scenario, TPDCs (such as China) might have an interest in seeking the compulsory licensing of certain ESTs for export to the least developed countries. The simplicity of importing the Doha framework is, however, belied in this case by the particular complexities which characterize markets for ESTs.

First, it is worth noting again that the existing intellectual property framework specifically disallows compulsory licensing for the purposes of export. Article 31(f) specifically states that the use of a compulsory license shall be “predominantly for the supply of the domestic market of the Member authorizing such use”.⁶⁹ The exception created by the Doha Declaration to Article 31(f) was limited to the specific case of pharmaceuticals. In other words, compulsory licensing for the purpose of the export to the least developed countries would require the negotiation of yet another industry-specific exemption to TRIPS, this time in favor of ESTs.

For reasons which have been mentioned earlier, the political feasibility of yet another Doha-style deal on ESTs is low. For one thing, TPDCs own intellectual property in the form of EST patents. This sets the situation apart from Doha, where TPDCs were primarily engaged in the manufacture of generic drugs. If TPDCs did allow the compulsory licensing of EST patents for export to the least developed countries, it is quite likely that firms in developed countries would retaliate by seeking to compulsorily license patents held by TPDCs for similar exports. There is a prisoner’s dilemma here which might require TPDCs to forego such export opportunities in order to protect their intellectual property.

On the other hand, it is certainly possible that some TPDC firms may be willing to run the risk of retaliatory compulsory licensing. They may reason that their own holdings of intellectual property are sufficiently low and that the opportunity represented by lost

⁶⁶ CYNTHIA CANNADY, INTERNATIONAL CENTRE FOR TRADE AND SUSTAINABLE DEVELOPMENT, ACCESS TO CLIMATE CHANGE TECHNOLOGY BY DEVELOPING COUNTRIES: A PRACTICAL STRATEGY 5 (2009).

⁶⁷ Carlos M. Correa, *Can the TRIPS Agreement Foster Technology Transfer to Developing Countries?*, in International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Regime, 227, 230 (Keith E. Maskus & Jerome H. Reichman eds., 2005).

⁶⁸ For a discussion of the “framing effects” which the Doha compromise might induce, see the text at *infra* note 99.

⁶⁹ TRIPS, *supra* note 30, art. 31(f).

export earnings is sufficiently high to run the risk of retaliation. The decision to create an EST exemption to the TRIPS Agreement will not, however, be left to firms – it will be a decision taken by nation states for the benefit of their EST industries in general, rather than for specific firms.

Leading TPDCs such as China and India each have firms which have acquired technology from abroad and which they will seek to protect.⁷⁰ Further, TPDCs may see a compulsory licensing framework as inhibiting research investments by their member-firms over the long term. As leading TPDC firms consolidate their presence in the market, research investments will go up and more intellectual property is likely to be generated. It is therefore unlikely that leading TPDCs will agree to any general commitment which will have the effect of rendering vulnerable the research advances made by member-firms in the EST industry over an indefinite period of time.

A final factor which might discourage pressure on compulsory licensing from TPDCs is the comparatively more remote and uncertain nature of the harms. While the prospect of major climate change is undoubtedly a reality – the precise range of the harms it poses for specific countries is not yet completely clear. In this sense, the situation is also different from the crisis which precipitated the Doha Declaration.

From the beginning of the 1990s, HIV infection rates had begun to rise to significant levels in India and by 2006, the number had been estimated at approximately 2.5 million people.⁷¹ In other words, the harms arising from the public health crisis in developing countries was real and present by 1999 and allowed TPDCs to take a considered decision on where they stood on the compulsory licensing debate. The climate change situation, while grave, has fortunately not yet begun to directly affect similar numbers in developing countries in as visible a way. Perversely, this may have the effect of making TPDCs slower to react to the situation. It may also have the effect of making TPDCs more reluctant to take the significant step of allowing compulsory licensing.

IV ASSESSING THE FEATURES OF AN ALTERNATIVE REGULATORY MECHANISM

If compulsory licensing is not the solution, is there an alternative proposal which would facilitate the flow of technology to the developing world? The immediate aim here may be to produce a plan that is superior to compulsory licensing – however, even this would be impossible if we did not have some idea of the elements of the optimal legal framework. It might therefore be appropriate to first identify the elements we might want to see reflected in a tentative solution. For instance, we might seek some degree of fidelity to the existing regulatory framework of climate change law since this would display adherence to the existing international consensus and thus add legitimacy to the plan. In addition, however, we might want a plan which comports with values of efficiency and fairness – though we might have to unpack these values further to assess more precisely what we would expect our alternative plan to do.

In addition to these general requirements for a preferred regulatory framework, we might also seek a solution that works well within the structure of international law and is sensitive to the mechanisms and participants who create and comply with international law. In particular, an ideal solution should recognize the fact the international legal

⁷⁰ See *supra* text accompanying notes 63-65.

⁷¹ National Aids Control Organisation, Ministry of Health and Family Welfare, India HIV Estimates – 2006 11 (2007).

system generally operates on consensus and that the players within the system are sovereign nations which can be openly coerced only in extreme circumstances.

We might also have to choose from between general kinds of regulatory instruments, each of which would have a different set of consequences and create a different set of incentives or disincentives, some of them capable of being perverse. Thus, for instance, we might use *conduct instruments*, i.e. regulations specifying technology or performance standards or design standards or other forms of command-and-control rules.

Alternatively, we might prefer to employ *price instruments* more extensively. These would not explicitly permit or prohibit various forms of conduct but would instead choose to encourage or discourage them by levying a price on activities based on their perceived social costs or benefits. We could also use *quantity instruments*, a species of property rules which allocate entitlements to generate or be free from external harms – tradeable carbon allowances, for instances.⁷² Of course, the choice of any one of these instruments is not to the exclusion of the other – they are often used in combination.

The following paragraphs will briefly set out some of the features which an optimal regulatory instrument should possess and the nature of the problems which it should ideally seek to address.

IV.1 *The Nature of the Challenges Posed by Climate Change*

An alternative proposal would also have to consider the factors that make climate change a particularly difficult problem for international cooperation. This is not to suggest that these factors are unique to climate change – they are present across a range of global environmental problems such as trans-boundary pollution. However, climate change does represent a particularly extreme example of a global collective action problem which is compounded by three factors.⁷³

First, like other global environmental problems, climate change will have global impacts. This creates a free-rider problem since extensive abatement efforts by one nation or a small group of nations will have benefits for the global collective. Causality is also complicated by the fact that a nation's efforts, no matter how extensive, will not necessarily benefit itself to the exclusion of others – indeed, there is no guarantee that even extensive efforts will protect any single nation if the global collective does not cooperate. In this sense, a stable climate is a universal good in that a nation cannot exclude others from enjoying it. A regulatory instrument which seeks to address climate change through technology transfer must overcome the free-rider problem which climate change represents.

Second, climate change arises from a variety of sources which are mobile and are distributed globally. This phenomenon will often give rise to a “leakage” problem where sub-global regulation simply prompts the problem to locate itself outside the regulatory umbrella.⁷⁴ Thus, if the United States were to impose emission limits on industries located within its territorial borders, industries might, after weighing the costs and benefits, decide to legally and physically relocate themselves to China or India or some other jurisdiction which poses no such regulatory costs. The problem of leakage can only

⁷² For this classification, see Jonathan Baert Wiener, *Global Environmental Regulation: Instrument Choice in Legal Context*, 108 YALE L.J. 677, 705 (1999).

⁷³ Id at 689-700.

⁷⁴ On the problem of leakage, see, Hilary Sigman, *Legal Liability as Climate Change Policy*, 155 U. PENN. L. REV. 1953, 1956 (2007).

be addressed by a solution that is truly global – i.e., the subjects of regulation are not permitted to indulge in regulatory arbitrage.

Third, although carbon-emitting sources are distributed all over the world (with marked concentrations in highly industrialized countries), the costs of abatement vary widely and may often be highest in countries that contribute relatively little to the problem. Differences in industrial and technical capacity and developmental factors will often lead to major differences in the ability to abate the effects of climate change and the costs of such abatement.⁷⁵

Similarly, just as the ability to abate diverges widely across nations, so various nations stand to gain very differently from such abatement exercises. For instance, certain countries with vast stretches of tundra might even believe that they stand to gain from climate change. Others may take the position that the costs of abatement are not justified by the level of benefit expected to accrue from preventing climate change.⁷⁶

As a consequence of the wide disparities in the costs and benefits of abatement, a global regulatory instrument must be cost-efficient across countries and must seek to distribute benefits as evenly as possible across countries.

IV.2 Existing Regulatory Frameworks

The existing regulatory framework for climate change, as represented by the UNFCCC and the Kyoto Protocol, displays specific preferences in terms of regulatory structures and policy goals. For instance, as shown earlier, these international agreements use market structures (price or quantity instruments) in combination with command-and-control regulations. The Kyoto Protocol does not forbid a nation from emitting carbon above a certain level – instead, it merely require that nations compensate for excess emissions in specified ways, such as by purchasing credits or by implementing offset programs.⁷⁷ The UNFCCC and the Kyoto Protocol also represent a global consensus on the position that climate change imposes common but differentiated responsibilities and that developed nations must bear abatement costs in some relation to their history of high emissions.⁷⁸

A regulatory instrument which hews closely to these two positions will derive legitimacy from the degree to which it represents principles arrived at by consensus. This close adherence to established principles makes the instrument easier to support and diminishes the ability of its opponents to attack the regulatory initiative on principled grounds. Similarly, an instrument which generally honors intellectual property and free trade will accord with the trade obligations undertaken by a number of nations under the WTO framework. Regulatory instruments which comport with such trade obligations is less vulnerable to charges that they require nations to violate pre-existing commitments.

IV.3 The Structure of International Law

The choice of regulatory instrument must also account for the peculiar character of the international legal framework within it operates. Domestic instruments may be issued

⁷⁵ Wiener, *supra* note 72 at 697.

⁷⁶ At one point, some statistics suggested that the United States might be a minor loser from climate change and that other countries such as China or Russia would similarly stand to lose very little or even gain. It was speculated that this might serve to fuel further opposition to the Kyoto Protocol. See Cass R. Sunstein, *Of Montreal and Kyoto: A Tale of Two Protocols*, 31 Harv. Env. L. Rev. 1, 29-36, 48 (2007).

⁷⁷ See *supra* text accompanying notes 22-26.

⁷⁸ See *supra* text accompanying notes 12-14.

by a unitary fiat which compels obedience – international law works quite differently. The economist James Buchanan once observed that economists tended to proffer policy advice “as if they were employed by a benevolent despot.”⁷⁹ It is an assumption which does not survive scrutiny as a matter of public international law.

The international legal structure generally operates on the principle of *pacta sunt servanda* – agreements must be kept, or, more implicitly, agreements must be kept in good faith.⁸⁰ Nations will, in the general case, voluntarily assume the obligations which they wish to honor. There are certainly exceptions along the edges – for instance, nations are obliged to refrain from genocide or slavery, irrespective of their choice in these matters. In the main, however, international law and international agreements operate on the basis of consent freely given.⁸¹ This feature of international law – its existence as a network of voluntarily assumed obligations – has two major consequences for the choice of a global regulatory instrument to facilitate technology transfer.

First, the free assumption of obligation by nations may often imply that price or quantity or command instruments which would have been efficient under conditions of unitary fiat may no longer be efficient under a voluntary regime. Thus, for instance, individuals who do not have an option under a unitary fiat mechanism will regularly pay their taxes, but nations, operating under the voluntary framework of international law, will simply refuse to join arrangement which imposes heavy taxes on them.

Second, since consent is the bedrock of international law, global regulatory instruments must attain participatory efficiency – i.e., participation in the international agreement by the sources of the negative externality must be “attracted rather than coerced.” However, a nation must be attracted to participate at the lowest cost possible. This ensures that the participation by the nation in the international agreement is efficient. As a consequence, Jonathan Wiener suggests in a different context, a regulatory instrument operating on a global level which is arrived at through processes of international treaty-making should operate on a “Beneficiaries Pay Principle.”⁸² Under this model, those nations which benefit from an international agreement will make side payments to those nations which do not so benefit in order to induce them to join an international agreement. However, as I will show, there are some important limitations which apply to the Beneficiaries Pay Principle in the context of EST transfers.

As noted earlier, the costs and benefits of climate change will be widely spread out and some nations may actually benefit, or may perceive that they will benefit from transferring ESTs to combat climate change. Alternatively, some nations may stand to lose so little that they may not think it beneficial to engage in EST transfer on any but the most profitable terms. These nations are the non-beneficiaries from EST transfer and since technology transfer regulation requires global coverage, they must somehow be induced to join an international regulatory framework or an international regulatory agreement. The inducements to join will flow from those nations which stand to benefit

⁷⁹ James M. Buchanan, *The Constitution of Economic Policy*, 77 AM. ECON. REV. 243, 243 (1987).

⁸⁰ Sir Gerald Fitzmaurice, *The Law and Procedure of the International Court of Justice, 1954-59; General Principles and Sources of International Law*, 35 B. Y.B. INT’L L. 183, 196 (1959) (recognizing *pacta sunt servanda* as a *jus cogens* norm in international law).

⁸¹ Lord McNair, *THE LAW OF TREATIES* 162 (1961) (on the primacy of the need for state consent).

⁸² Wiener, *supra* note 72 at 752.

most significantly from EST transfer. Alternatively, beneficiaries of EST transfers may seek to impose costs on non-beneficiaries if they will not join an international agreement to transfer ESTs on relatively favorable terms.

Thus far, we might think that EST transfer is merely a direct application of Wiener's Beneficiaries Pay Principle. In reality, however, the situation is not quite as simple. The major beneficiaries of EST transfer are the poorest nations – under the existing international agreements governing climate change, developed nations have an affirmative obligation to supply them with technology. The poorest nations might rightfully balk at making further payments to secure what they have already been promised on broadly favorable terms under international law. More importantly, these poorest nations may simply lack the capacity to make side payments to induce the flow of ESTs from the developed world and the principle of “common but differentiated responsibilities” under international climate change law requires that their relative incapacity be understood and accommodated by the developed world.

This does not imply that developed nation firms have no right to recoup their costs from EST transfers to the developing world. In fact, there is every reason why such firms should even seek to make a profit from such transfers. The obligations of developed countries do not, absent some further domestic legislation, necessarily translate to the obligations of private firms within such developed countries.⁸³ What this does imply is that there may be some form of obligation for developed countries to bear the burden of providing these profits to the private firms instead of allowing the firms to extract them from developing countries.

What emerges, then, is a situation where Wiener's Beneficiaries Pay Principle no longer directly applies, largely because the basic negotiations are already over. Under existing international climate change regulations, developed nations have already committed to facilitate EST transfer to developing ones. As a result, they can no longer insist on side payments for facilitating these transfers. At the same time, whatever regulatory framework does emerge must still adhere to the principle of participatory efficiency – there must be some incentive for nations to join an instrument which promotes the funding of EST transfer to the developing world instead of allowing the present *ad hoc* approach to continue. What follows is one suggestion for an international regulatory mechanism which might accommodate the structure of international law, existing international climate laws and the global character of the problem posed by climate change.

V. A TENTATIVE FRAMEWORK FOR EST TRANSFERS

The diverse nature of the many nations of the developing world makes it unlikely that a uniform solution will exist. However, to agree that solutions must be nuanced to account for a nation's particular circumstances is not to concede that the present disorganized array of one-off transactions is necessarily the best way forward. A system which allows for differences in the technical and scientific capacity of countries need not compromise on values of efficiency, accountability or equity.

⁸³ Although exceptions certainly exist and are rapidly increasing in number, traditionally international law addresses itself to states and binds only states. See Carlos M. Vazquez, *Direct vs. Indirect Obligations of Corporations Under International Law*, 43 COLUM. J. TRANSNAT'L L. 927, 931 (2005). However, the endorsement of private acts may amount to their adoption by states as the International Court of Justice recognized in *United States Diplomatic and Consular Staff in Tehran* (U.S. v. Iran), 1980 I.C.J. 3 (May 24).

V.1 *The Two Fund System: A Proposal*

Accordingly, one solution may involve the setting up of two global funds with distinct purposes. For the purposes of this paper, they have, after prolonged deliberation, been given the names Fund 1 and Fund 2. Fund 1 is the more complex of the two funds. Its mission is to facilitate the actual transfer of ESTs. Its contributing members would primarily be the Annex 1 countries to the Kyoto Protocol and its proposed beneficiaries, the non-Annex 1 countries.

Fund 1

The limited aim of Fund 1 is to provide ESTs at cost price or lower, to developing countries. Private firms are encouraged to make sales of technology or to license technology at fully commercial terms, i.e., at market rates, to the various nations of the developing world. These developing countries can then present proof of these purchases or licenses to the overseers of Fund 1 and receive specified subsidies in exchange for such presentation of proof.

Not every beneficiary nation will receive the same subsidy under Fund 1. Indeed for the leadings TPDCs such as China or India, the subsidy may be very significantly smaller than for the Small Island Developing States, whose extreme vulnerability to climate change is compounded by their low technical capacities. The calibration of the subsidy would therefore likely turn on a complex mix of factors. *First*, for instance, economic and developmental indicators such as *per capita* incomes and literacy rates would almost certainly have to be part of the mix. *Second*, Fund 1 must also accommodate the expected needs and vulnerabilities of dependent nations – countries which can expect to bear disproportionate costs arising from climate change or countries whose mitigation and abatement costs are particularly high should qualify for higher subsidies, provided such countries have taken steps to render mitigation or abatement efforts as efficient as possible. *Third*, factors relating to a nation's scientific and technical capacity would be equally important in determining the level of subsidy.

Following academic suggestions, for instance, the subsidy-setters might seek to determine the share of medium or high technology products in total manufacturing value added, research expenditures as a percentage of GDP,⁸⁴ the number of patents granted within a specified time period,⁸⁵ the existence of research institutions which have attained a specified level of accreditation⁸⁶ or the number of doctoral or advanced degrees awarded in scientific or technical fields in a given academic year.

If consensus is obtained amongst the Annex 1 countries, the calibration of subsidy could also seek to influence conduct amongst beneficiary nations in other ways. Nations with a good record of protection of intellectual property could be rewarded by the grant of higher level of subsidy than others. Nations which have a strong record of abatement or mitigation activities could be similarly incentivized to continue in the same vein.

Subsidies awarded under Fund 1 would not be set in stone. Rather, they would be shifting and dynamic, with each nation's record assessed on an annual or other suitable chronological basis. The continued grant of subsidies could be made conditional upon the attainment of climate targets within a given time period – in other words, beneficiaries

⁸⁴ Basheer & Primi, *supra* note 48 at 122.

⁸⁵ D. Archibugi & A. Coco, *Measuring Technological Capabilities at the Country Level: A Survey and a Menu for Choice*, 34 RESEARCH POLICY 175 (2005).

⁸⁶ *Id.*

would be required to show that they were making good use of the technology provided. Similarly, subsidies would shift in relation to economic developments that had the effect of making a nation better or worse off. Over time, Annex 1 countries may even look to the gradual phasing-out of subsidies on a country-by-country basis. Leading TPDCs could be removed from the subsidy list fastest, with other nations to follow, based on their evolving technical capacities.

A dynamic system of subsidies is also necessary in order to combat the perverse incentives which Fund 1 might give rise to. Thus, for instance, nations which persistently violate intellectual property, engage in fraud upon the system through collusion, misrepresentation, non-disclosure of essential data could be penalized by a system of lower subsidies or even by expulsion from the system, following a vote to that effect. By contrast, nations which offer acceptable reasons for non-compliance with certain conditions on which the subsidies are predicated will receive no sanctions. A nation which can justify its inability meet climate targets by pointing to *force majeure* events such as foreign acts of aggression or unpredictable natural calamities such earthquakes or epidemics, will not be subjected sanction under the system.

Before closing this brief description of Fund 1, it is essential to discuss the actual funding of Fund 1. As mentioned earlier, the majority of Fund 1 contributors will be Annex 1 countries. However, leading TPDCs such as China should also be offered the chance to join Fund 1. These TPDCs would simultaneously be contributors and beneficiaries under Fund 1 – they would receive a comparatively small subsidy for their purchases of technology or their payment of license fees and they would pay higher subsidies for their sales to poorer, less technically proficient countries.

Tentatively, I also propose that the ideal source of funding for Fund 1 should be provided by the nations whose private firms make the sales to the developing world. The level of subsidy would also be linked in direct proportion to the level of sales. Here, it is important to clarify that I do not mean that the mere fact of incorporation should trigger the obligation to provide subsidies – that would create a perverse incentive as private firms might flock to formally incorporate in the nation most capable of providing subsidies while retaining their principal places of operation in other states. Instead of incorporation, I propose that the subsidy should be paid by the jurisdiction with the legal right to collect corporate income tax on the operations of the private firm.

In many cases, private firms will pay, or will be liable to pay, corporate income tax in more than one jurisdiction. In such cases, each country assessing corporate income tax will incur the obligation to pay subsidies. Here, however, one caveat may be necessary. If it can be shown that the corporation's activities in the jurisdiction have no connection with EST sales, then that jurisdiction will bear no obligation to provide subsidies.

Tying subsidies to corporate performance may have certain beneficial or virtuous consequences. It is certainly true that subsidies will be an expense on the home state of the firm but this does not mean that states will necessarily react by seeking to exile EST firms in order to avoid paying the subsidy. The activities of a firm within a jurisdiction may provide multiple benefits to the home state in terms of new employment generated, contributions to the public exchequer in the form of taxes, licensing fees and regulatory payments, the deepening of capital and credit markets and other forms of wealth-creation. There would therefore be every reason for states to set off the expected payment of subsidy against these variegated benefits.

Fund 2

Fund 2 has more general aims than Fund 1 and operates against a longer time-horizon. Fund 2 is a development fund which aims to augment the technical capacities of the least developed nations. The membership of Fund 2 is smaller – TPDCs, for instance, are not members of this Fund. Every donor to Fund 1 is a donor to Fund 2 but not every beneficiary of Fund 1 is a beneficiary of Fund 2. Instead, the beneficiaries of Fund 2 are only to the poorest countries, both measured economically as well as against technical or scientific indicators. The application of two measures is unlikely to generate much controversy as economic poverty is often accompanied by a very low level of technical proficiency.⁸⁷

Fund 2 operates on the basis of direct grants or loans rather than subsidies and it aims to create the kind of implementation capacity which would make it meaningful to supply ESTs to these least developed countries. Here, it might be useful to provide a broad categorization of the range of tasks that Fund 2 might undertake.

Broadly, Fund 2 is engaged in the medium-to-long term approach of what Cynthia Cannady calls “climate change innovation strategy” (CCTIS).⁸⁸ A CCTIS approach is an application of general innovation strategy in the field of climate change in that its ultimate goal is success in technology development and commercialization. In the private sector, this is sometimes referred to as “Intellectual Property Asset Management” and its overall goals are strengthening research, increasing IP ownership by national firms or public institutions and the creation of long-term capacity. Fund 2 could assist these rather ambiguous goals in the following ways:

- 1) Subsidizing the hiring of developed country professionals and the training of developing country professionals engaged in abatement or mitigation activities or in general scientific or technical education.⁸⁹
- 2) Strengthening domestic research institutions, providing funds for laboratories and research facilities and technical education institutions.⁹⁰
- 3) Preparing Fund 2 beneficiaries for life beyond the existence of the funds by assisting in the creation of a conducive foreign investment climate. This could take the form of strengthening domestic intellectual property protection, streamlining local legal systems, providing tax and subsidy benefits to foreign investors and developing domestic antitrust enforcement so as to discourage predatory conduct against nascent local firms.⁹¹ The overall goal here is to ensure the free flow of foreign investment over the long term, a factor that is itself a guarantor of technology transfer over a sustained period of time.⁹²

⁸⁷ Basheer & Primi, *supra* note 48 at 122.

⁸⁸ Cannady, *supra* note 66 at 15.

⁸⁹ *Id.* at 21.

⁹⁰ *Id.*

⁹¹ Gaetan Verhoosel, *Beyond the Unsustainable Rhetoric of Sustainable Development: Transferring Environmentally Sound Technologies*, 11 GEORGETOWN ENV'TL. L. REV. 49, 72 (1998). Verhoosel does not mention antitrust enforcement but makes the same general point about taking measures which could encourage foreign investment, such as protecting intellectual property.

⁹² *Id.* at 72.

Fund 2 contributions are not tied to EST sales in the way that Fund 1 contributions. Instead, they may mimic the proportions specified for national commitments under the Kyoto Protocol or may seek to

A crucial aspect of the tentative framework under discussion here is that the two funds operate in tandem to achieve distinct goals. Fund 1 is a complex mechanism which is expected to bridge the technology gap over a shorter term. Fund 2, by contrast, is essentially a development fund whose entire aim is to ensure developing world self-sufficiency in EST manufacture and deployment.

V.2 Some Possible Objections Considered

The two-fund framework suggested here fulfills some of the requirements of an international regulatory framework that are suggested in Part IV. One might begin by noting that Fund 1 is essentially a market-based mechanism which uses a price instrument in the form of subsidies. As such, it is in harmony with the existing climate regime's general preference for market mechanisms.

Further, Fund 1's use of a calibrated subsidy and Fund 2's restricted membership are acknowledgments of the diversity of developing world nations and of the international climate change regime's requirement of "common but differentiated responsibilities." Clearly, if developing nations receive according to both their needs and abilities, this goes some way towards meeting the UNFCCC's background principles. Similarly, tying subsidies to corporate sales and the liability to pay corporate tax will ensure that the bulk of subsidies are borne by the states with the greatest industrial capacity.

At the same time, this form of differentiation amongst Fund 1 contributors is not perfect. Fund 1 contributors who favor ESTs over dirtier technologies will bear the burden of paying subsidies that nations which use dirtier technologies will not. However, the international climate change regime may act as a corrective to this drawback since it imposes limits on nations that use dirtier technologies in the form of carbon caps.⁹³

Participatory Efficiency

One objection might be advanced under the requirement of participatory efficiency. Clearly, the Fund 1 framework imposes costs on nations that have developed EST sectors. What, then, incentivizes nations to participate in Fund 1? One major incentive might lie in the fact that participation in Fund 1 is strongly likely to encourage EST sales by national firms. Fund 1 contributors can be assured of a loyal clientele of developing nations who will find fund-subsidized ESTs cheaper than unsubsidized ESTs. Over a longer term, this may have other benefits for Fund 1 contributors as private firms from Fund 1 donor countries develop brand loyalty or lock-in effects in developing country markets. Fund 1's biggest incentive is its promise of developing country market access. As countries develop sophisticated EST sectors, Fund 1 will provide their private firms easy access to new markets – often markets in the greatest need of their technologies. In this way, Fund 1 creates incentives for new participants but strictly within the voluntary framework of international law.

Writing in a different context, Jonathan Wiener suggests a more sophisticated objection to the use of subsidies within the international law context.⁹⁴ Wiener suggests that the provision of subsidies may often encourage risky behavior in three ways. Risk-takers may begin to behave as if they are insured against the consequences of their risk-

⁹³ See *supra* text accompanying notes 22-26.

⁹⁴ Wiener, *supra* note 72 at 724.

taking conduct. Sources may posture to secure larger subsidies by worsening their situation in the relevant ways. Worst of all, capital markets may respond to abatement subsidies by increasing investment in the subsidized industry so that the industry has no incentive to discontinue the conduct subsidized. Thus, an abatement subsidy may reduce pollution at an individual firm but may increase it across the entire polluting industry.⁹⁵

Wiener's objections carry weight in the context of pollution-abatement subsidies but the specific kinds of subsidies envisaged under Fund 1 are not vulnerable to Wiener's criticisms for several reasons. In Fund 1, the subsidies are actively policed by contributors – collusive, fraudulent or posturing conduct is penalized by the reduction or removal of the subsidy. Further, the subsidies shift in response to several variables – if a nation cannot provide good cause for not meeting its climate targets, the subsidy disappears, thereby disincentivizing the kind of conduct that seeks to perpetuate subsidies. Lastly, it is certainly true that EST firms which have high sales revenues will attract investment in capital markets,⁹⁶ but this is a virtue rather than a vice. A world in which ESTs sell better than dirtier technologies is a world with a more stable climate.

The Inefficiency of a Centralized Administration

This does not exhaust Wiener's criticisms of subsidies. Wiener views subsidies as particularly problematic when they are administered by a centralized aid institution which enjoys market power.⁹⁷ Since these funds do not have to compete aggressively to sign up projects, they have fewer incentives to be cost-effective. Accordingly, their performance in selecting projects and policing targets will often be lackadaisical.⁹⁸

This is a serious criticism of a fund such as Fund 1. To add to this, Wiener also makes the charge that beneficiaries may view such funds as being monopsonists, choosing or rejecting funds seemingly at whim. Over time, beneficiaries come to distrust such institutions, placing the future of the entire enterprise at risk.

Fortunately, Fund 1 is a much more modest enterprise than the omnipotent funds of Wiener's description. First, Fund 1 is not in the business of identifying or selecting projects. Instead, all transactions are between private firms operating within the jurisdiction of Fund 1 contributors and developing nations or developing nation member-entities. Upon presentation of receipts and accounting, Fund 1 merely pays out a subsidy based on the volume of sales. Corruption and collusion are certainly possible in the representation of accounts for subsidy payments but here the Fund 1 contributor, or its nominees on the Fund, will have every incentive to police these demands closely to ensure that it is not overpaying. The converse problem is also accounted for – if a Fund 1 contributor challenges too many subsidy demands, its firms will no longer be preferred providers for developing countries which cannot recoup the promised subsidy payments. The appropriate analogy might be an insurance provider which refuses to honor its coverage – over time, customers will defect to other providers in the same market.

⁹⁵ *Id.*

⁹⁶ Indeed, this has moved from hypothesis to reality, even for some companies which may not as yet have high sales (or any sales at all). Venuri Siriwardene, *Cashing in on Clean Technology*, INC., Jan. 2, 2009, <http://www.inc.com/articles/2009/01/clean-tech.html>.

⁹⁷ Wiener, *supra* note 72 at 725.

⁹⁸ *Id.*

Since Fund 1's activities are modest, it is also unlikely to be perceived as a monopsonist by its beneficiaries. Instead, it is closer to a kind of clearing house which endorses and provides payments on the basis of transactions already concluded.

The Feasibility of Subsidizing Competitors

Even if we manage to account for the various theoretical arguments regarding efficiency and equity, we might still face one further issue – that of political feasibility. Is it really possible, the Funds' opponents might ask, that we could convince developed countries and their elected representatives to subsidize technology transfers to developing countries? In particular, is it at all politically possible that we could persuade developed countries to fund countries such as China and India which are already competing with them in the same technological markets? This is a potent argument but it might be possible to develop reasons as to why fund transfers to enable EST purchases might surmount these apparent political obstacles. I will advance three reasons for why this suggestion might be politically feasible.

Pressure from Private Actors – As Mancur Olson once famously pointed out, only a benefit reserved strictly for group members will motivate one to join and contribute to the group.⁹⁹ Thus, individuals may act collectively to provide private goods, but will not act similarly to provide public goods. If this is true, what incentives are there for public political bodies in one nation to fund technology transfer to another? By contrast, however, fund transfers may have significant proponents from amongst private interest groups. Most predictable, of course, will be support from domestic EST producers, once they are assured that EST exports will not compromise their intellectual property or other ownership rights. Similarly, labor lobbies, shippers and financing groups can all be expected to exert political pressure since guaranteed sales of ESTs at subsidized rates will allow manufacturers to hire and train more workers, ship more goods and avail of financing more regularly. These groups may therefore extract subsidies for technology flows in the same ways that other pressure groups extract payments from public bodies and legislatures.¹⁰⁰

Countering the First Mover Advantage – This analysis based on the collective action problem might yield another reason why legislatures may act, typically on the prodding of private lobbies. The member-firms of nations which provide subsidies would typically be at a significant advantage compared to member firms of nations which do not. This can be expected to increase not only the pressure on countries to provide subsidies for EST exports but also to ensure that its accession to the international convention on subsidies is not significantly later than that of other members.

Measuring Costs and Benefits – If one prefers a less cynical, non-Olsonian explanation, one might expect legislatures, acting collectively, to make a rational decision after assessing the relative costs and benefits. Legislatures might rationally believe that the increases in income and employment which investments in EST production would generate might justify the subsidies paid out to developing countries. Similarly, legislatures might see the developments of markets abroad for its domestic private firms as being a legislative goal to be attained. Legislatures may also see this as being a

⁹⁹ See generally, MANCUR OLSON, THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS (1965).

¹⁰⁰ Gary S. Becker, *Public Policies, Pressure Groups and Dead Weight Costs*, 28 J. PUB. ECON. 329 (1983).

relatively cost-effective way of meeting commitments under the Kyoto Protocol while simultaneously locking in developing world markets for domestic firms.

Policing: A Residual Objection

Much of Fund 1's activities involve a natural system of checks and balances – private players want to be able to make sales to developing nations who want to be able to collect on their promised subsidies. By contrast, the developed countries which are the home jurisdictions of these private firms want to pay as little as possible in subsidies while simultaneously ensuring that their member firms remain competitive in the international market.

What ensues is a model in which each player has an incentive to ensure that the system is being used fairly by the other players. A nation which pays out on subsidies without policing them adequately may not only face criticism from domestic taxpayers, it may be sanctioned by other nations which see its lax subsidy-payment policies as unfairly damaging the competitive abilities of their own member firms.

Nevertheless, there remain significant policing problems which Fund 1 must account for. Chief amongst these is what I will call the end-user problem. One of Fund 1's most attractive features is its use of calibrated subsidies – nations receive according to both their needs as well as their ability to pay. However, the use of a differentiated subsidy will necessarily mean that ESTs are available more cheaply to some nations than others. This creates a perverse incentive for certain nations and its member-firms to try to defraud the system by routing EST sales through the most heavily subsidized nation. To provide an example, a Chinese user of solar technology may seek to route its purchase of solar panels through an entity in Chad. The Chadian entity then collects a subsidy based on the purported sale from the home state of the firm which supplied the solar technology and pays a portion of the subsidy collected to the Chinese firm. What results is a distortion of Fund 1's entire model of subsidized sales – resources are diverted to countries which do not use them, subsidies are provided to countries which are not in the most pressing need and ultimately, climate change targets are not achieved.

This certainly approximates a nightmare scenario for Fund 1. However, even in this deeply problematic use of Fund 1 resources, there are certain internal checks which may serve to prevent large-scale fraud.

One major check on such diversion of subsidies is the tying of subsidies to climate goals or targets. If even after years of purchasing ESTs, Chad is unable to show good cause for the non-attainment of climate goals, it is liable to be sanctioned by the removal or reduction of its subsidy. Fund 1 contributors may also consider other forms of penal sanction or seek the recovery of subsidies paid.

Private firms also have good reason to actively police the end-use of the technologies that they supply. For instance, firms may be wary about supplying sophisticated technologies to countries which have a poor record of intellectual property protection or which actively circumvent their international obligations. Fund 1 contributors may also implement domestic legislation which penalizes private firms which collude in the diversion of subsidies or fail to take reasonable care to prevent its occurrence. One

possible model for such policing might be the extensive restrictions imposed on the export of military hardware or dual-use items to certain countries.¹⁰¹

As a final point, while acknowledging the serious nature of the policing problem that the issue of end-use gives rise to, it is worth noting that similar issues could arise under compulsory licensing. If a compulsory license was exploited primarily in order to supply a foreign market rather than the domestic one, it would amount to a violation of Article 31(f) of TRIPS. As with the issue of end-use by Fund 1 beneficiaries, private firms would have to aggressively police the working of these licenses to ensure that they were not being used for the purpose of illegal exports.

VI CONCLUSION

The use of Fund 1 and Fund 2 in tandem provides an alternative to the use of compulsory licensing which is sensitive to the different positions of various developing countries. In the preceding paragraphs, this paper has attempted to set out some of the reasons which make compulsory licensing an inappropriate solution to the complex issue of ensuring the flow of ESTs to the developing world.

In conclusion, however, it might be important to note a significant political benefit which this alternative solution confers – it allows us to avoid a potentially ugly confrontation about compulsory licensing.

Compulsory licensing is a somewhat drastic step – indeed, in the context of intellectual property, it might be likened to a nuclear option. It risks relations between foreign investors and host countries and may jeopardize future investment prospects.

At the risk of speculation, it also seems unlikely that TPDCs would take the decision to confront developed nations who are valuable suppliers of capital and foreign investment over compulsory licensing in any but the most extreme cases where the gains are significant and the costs negligible. This was certainly the case in Doha but it is not the case with ESTs

A battle over technology transfer along the lines of Doha would be disastrous, especially because the remarkably different structure of markets for clean technologies makes it unlikely that the alliances that led to the Doha compromise would be repeated in the context of ESTs. Nations which hastened to authorize compulsory licensing might face considerable retaliation, not only from the developed world but also from TPDCs whose member-firms owned appreciable quantities of intellectual property.

Writing in the recent past, Amy Kapczynski noted that battles over intellectual property can have a “framing effect”¹⁰² so that future disputes are analyzed through the prism of past conflicts. The use of “frames” to view disputes involves a “diagnosis” (the identification of a problem and the attribution of blame), “prognosis” (the identification of a solution and the allocation of responsibility for it) and “motivation” (calling on others for action against the problem).¹⁰³

The significance of the developing world’s victory at Doha might have led to a similar framing effect so that any dispute regarding access to knowledge or the transfer of technology is necessarily viewed through the lenses of past battles over pharmaceuticals.

¹⁰¹ The reference is to the system of Export Administration Regulations (EAR) currently in force in the United States under 15 C.F.R. § 730.1 (2000). Sanctions for violation of the EAR may include the revision, suspension or revocation of a license (15 C.F.R. 750.8 (2000)).

¹⁰² Kapczynski, *The Access to Knowledge Mobilization*, *supra* note 47 at 809.

¹⁰³ *Id.* at 815.

It may be just this framing effect which explains why civil society activists and some developing world politicians see compulsory licensing as a solution to EST transfer, and ultimately to climate change itself. It would be dangerous to allow the continuation of a misconception which suggests that EST transfer is just like Doha without the medicines. ESTs are far too valuable as resources and climate change is far too grave a challenge to be considered on any terms other than their own.