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CHAPTER 2

WHAT CAN DEVELOPING COUNTRIES GAIN FROM A GREEN TRANSFORMATION?

Emilio Padilla
1. INTRODUCTION

This chapter reviews the reasons for developing countries to green their economies and to resist deferring action on environmental concerns for later phases of development. It first examines the relationship between economic growth and environmental pressures. The findings do not support a defence of growing first and cleaning later or a justification of inaction based on differentiated responsibilities for environmental degradation. These two arguments are elaborated in subsections 2.1 and 2.2, respectively.

2. THE RELATIONSHIP BETWEEN ECONOMIC GROWTH AND ENVIRONMENTAL PRESSURES

This section discusses two main arguments. First, a hypothesis based on the environmental Kuznets curve has frequently been used to support that economic growth will generate the solution to environmental problems, so emphasis on environmental and green industrial policies can be addressed later in developing countries. Second, developing countries’ lesser responsibility for historical environmental degradation, especially for global problems, is used to suggest that poor countries should not make efforts to green their economies.

2.1. IS IT SMART TO GROW FIRST AND CLEAN UP LATER? THE ENVIRONMENTAL KUZNETS CURVE-ARGUMENT

The relationship between economic growth and environmental degradation is a very complex one. The debate on this relationship was dominated for many years by the hypothesis—based on an environmental version of the classic Kuznets curve—that emerged in the early 1990s with the seminal study of Grossman and Krueger (1991) on the potential environmental effects of the North American Free Trade Agreement. That study was followed by a series of empirical articles analysing the relationships on economic growth and environmental consequences for different pollutants and countries (Shafik and Bandyopadhyay 1992; Panayotou 1993).

**SCALE EFFECT VERSUS COMPOSITION AND TECHNOLOGY EFFECTS**

According to the environmental Kuznets curve hypothesis, economic growth increases environmental pressures at early stages of development; but, after a turning point, high per capita income levels enable societies to reduce their environmental impact. To explain this relationship, Grossman and Krueger (1991) identify three effects: scale, composition and technology. In this scenario, the size of the economy, the scale effect, would increase environmental pressures. At the same time, the environmental pressures would be reduced by the structural change that accompanies economic growth, the composition effect, and by ongoing technological improvements, the technology effect. If the composition and technology effects progress in the same direction and are strong enough to compensate the scale effect, a turning point could appear in the trend tracking environmental degradation and economic growth. Beyond that turning point, environmental degradation would decrease as the economy grows.

Assumptions about structural change of an economy explain the compositional effect: Industrialisation—the increased relevance of manufacturing and extractive activities and the mechanisation of agriculture—involves more intensive exploitation of natural resources and subsequent generation of waste. However, there is a point where the relevance of services starts to increase. The technology effect assumption is that technologies improve, in ways that bring environmental benefits, with economic development. Supposedly, in combination these two effects would reduce environmental pressure.

This argument has, however, several flaws. An increased share of services in total production does not necessarily entail a lower environmental impact. Some services demand inputs and pull emissions and material resources from other sectors. Such services include wholesale and retail trade, public administration, and hotels and...
As for the assumptions about technological change, the rebound effect is uncertain, due to a tendency of consumers to use more of a resource when the services obtained from it become less expensive through improved efficiencies, called a rebound effect (Schipper and Grubb 2000; Gillingham et al. 2013).

**ENVIRONMENTAL QUALITY AS A LUXURY GOOD**

Another interpretation of the environmental Kuznets curve hypothesis presents environmental quality as a luxury good (Selden and Song 1995; Martinez-Alier 1995). In other words, as incomes increase, demands for environmental quality increase and environmental degradation will be remedied. This explanation ignores that poor populations, disproportionately composed of women, often directly depend on the quality of environmental resources to meet their basic needs (UN 1995). Another flaw of this approach is that environmental quality is not a private good that can be bought in the market. Instead, it depends on environmental policies that are decided in the political arena (Roca and Padilla 2003). Therefore, environmental quality strongly depends on countries’ political systems and the strength of their institutions.

**EMPIRICAL EVIDENCE**

The empirical evidence for the hypothesis is not conclusive. While the environmental Kuznets curve seems more relevant to local pollutants with clearly perceived consequences for health and local environments, such as particulate matter or sulphur dioxide, it seems less applicable to global pollutants. There is empirical evidence that different countries follow different paths in this relationship, so what is found to hold for a group of countries may not be valid for the path followed by individual country (Piaggio and Padilla 2012). Some authors also argue that the environmental Kuznets curve could appear to improve in developed economies because they have exported their polluting activities to developing countries (Suri and Chapman 1998).

**IMPORTANCE OF ENVIRONMENTAL POLICIES**

Even in the case of evidence supporting the hypothesis, the level of pollution estimated to produce the turning point is usually too high for most countries to risk and would deliver unbearable environmental degradation with irreversible damages if developing countries followed the projected path (Stern et al. 1996). Many environmental damages cannot be reversed and so the previous level of environmental quality cannot be recovered (Arrow et al. 1995). Examples of these irreversible environmental losses include soil erosion, aquifer destruction, or extinction of species or ecosystems. Other problems with unpredictable consequences include irreversible changes to the Earth’s climate system, with associated impacts that will confound us for centuries at a minimum.

Therefore, the solution to environmental problems requires appropriate and prompt political action because economic growth alone will not solve environmental problems. In fact, one of the most relevant conclusions from the debate on the environmental Kuznets curve is precisely the importance of resolute environmental policies in making economic growth compatible with sustainable development (Ekins 1997). Appropriate environmental policies can determine less damaging paths for the industrialisation of developing countries, paths than can benefit from lessons learned and avoid mistakes experienced by countries that industrialised at an earlier stage (Dasgupta et al. 2002). Thus, appropriate environmental policies can help less developed countries to pass over environmental degradation phases. Just as some societies have skipped the phase of using landline telephones or desktop computers, smart policies will move
directly to the use of clean technologies and efficient processes, without repeating polluting processes and mistakes of environmental degradation that industrialised countries experienced. These cleaner technologies and efficient processes have already been researched, developed and demonstrated in more developed countries, so they are ready to be adopted and adapted to developing countries’ needs.

2.2. HISTORICAL RESPONSIBILITY FOR ENVIRONMENTAL DEGRADATION?

Inequalities in the contribution to environmental degradation have served to suggest that less developed countries should grow first and leave environmental concerns for a more affluent future. These differences in the contribution to environmental degradation have been referred to as historical responsibility, or differentiated responsibility, for the current degradation of natural resources and environmental services: developed countries industrialised through intense consumption of fossil fuels, minerals, forests, food and fibre and other natural resources. They also burdened the carrying capacity of the environment by dumping waste into the air, water and land. In contrast, developing nations have started only recently to industrialise. As well, given this legacy, today’s poorer countries are under strong pressure to reduce poverty and improve the livelihoods of their citizens. Therefore, some proponents of the concept of differentiated responsibilities argue that developing countries are not in the position to make economic sacrifices for environmental reasons—and that it would not be fair to ask them to. However, neither limited historical liability nor pressing economic needs are good reasons for developing countries to reject development and implementation of sound environmental policies.

First, projections and experience suggest that many developing countries are most threatened by global environmental problems (IPCC 2014). Therefore, they should have a strong interest in the strength and enforcement of global environmental agreements so the remedies to these problems can be applied. However, to succeed, these global environmental agreements need developing countries to participate. This can be well illustrated with the case of climate change: it is now evident that no international agreement can be effective if emerging economies do not take part. This fact became explicit in the negotiations that achieved the Paris Agreement, to which they committed. The same evidence of commitment to finding solutions applies for most global environmental problems, such as biodiversity loss or ozone depletion. Global environmental agreements can also provide additional benefits for developing countries.

Second, local environmental pressures—such as air and water pollution, soil erosion and resource depletion—produce immediate repercussions on the welfare of developing countries’ citizens, due to their higher dependence on natural resources for direct consumption and income generation and their greater vulnerability to environmental risks. Future development cannot be sustained by following the same path of environmental degradation as the one adopted by industrialised countries.

The next section analyses the opportunities that may be associated with green industrial policies and the actions oriented to green the economy of developing countries.
3. THE BENEFITS THAT INTRODUCING GREEN INDUSTRIAL POLICIES AND TRANSFORMING TO A GREEN ECONOMY WILL DELIVER TO DEVELOPING COUNTRIES

As subsection 2.1 demonstrated, the ‘grow first, clean up later’ argument rests on weak empirical grounds, has several conceptual flaws, and ignores the risk of irreversible ecological damages and dependence on natural resources, especially by the poor. However, a concern of many developing countries is that the cost involved to achieve a green transformation is too high and cannot be afforded by low-income countries with more pressing needs than greening their economies. However, this need not be the case. Instead, many policy measures are affordable and deliver significant co-benefits in association with transforming to a green economy. This can be attributed to a large part to market failures, such as environmental or knowledge externalities, for example, or to government failures, such as subsidies to environmentally harmful activities. These failures lead to poor natural resource management, industry inefficiencies, or unexploited opportunities in the development and diffusion of industries or technologies. Correcting these problems pays off from an economic point of view for consumers, but also for industrial producers. Governments should explore the potential synergies between development and environmental protection that would facilitate their particular transition to a sustainable development path. The following subsections describe twelve good reasons for considering the introduction of green industrial policies and transforming to a green economy.

3.1. ENVIRONMENTAL IMPROVEMENT BRINGS HIGH QUALITY ENVIRONMENTAL GOODS AND SERVICES AND BETTER HUMAN HEALTH

The first obvious benefit of policies promoting a green transformation of the economy is to have better access to high quality environmental goods and services and better conditions for human health. The welfare of low-income populations in developing countries is closely related to their access to, and the quality of, environmental goods and services and they are therefore the most seriously affected by environmental degradation (Broad 1994; Jehan and Umana 2003; Bowen and Fankhauser 2011; World Bank 2012). In addition, the lack of resources and proper institutions limits these citizens’ capacity to react and adapt to environmental degradation and makes them more vulnerable to it (IPCC 2014). Lack of clean freshwater availability and health problems associated with pollution are clear examples of how environmental degradation imposes a high burden on the welfare of poor populations. According to the World Health Organization (2016a), around 3 billion people in low and middle-income countries cook and heat their homes using solid fuels of biomass and coal, highly inefficient sources that produce indoor pollution. As a consequence, 4.3 million people a year die prematurely (WHO 2016a). This affects especially women and children, due to their gender roles and household responsibilities, such as cooking and spending a lot of time indoors (World Bank 2003). Measures that provide access to clean fuel and technologies could reduce this death toll at a moderate cost and improve the welfare and the economy of these low-income populations. Estimates suggest that, in addition, outside air pollution caused 3 million premature deaths worldwide in 2012, with 88 per cent occurring in low and middle-income countries (WHO 2016b). In general, measures to improve air quality, as well as the availability and quality of fresh water, will reduce negative health effects that could help to increase labour force productivity (OECD 2001).

3.2. DETERIORATION OF ENVIRONMENTAL RESOURCES AND SERVICES UNDERMINES THE POTENTIAL FOR FUTURE GROWTH OF DEVELOPING COUNTRIES

Degrading the environment for the sake of increased economic growth is not a rational policy because economic growth is highly dependent on the availability of natural resources and on the environment’s capacity to assimilate waste. This is particularly true for developing countries, given their citizens’ dependency on natural resources and services for direct consumption and income generation. Environmental degradation is already imposing high costs on several developing countries: averaging at 8 per cent of GDP across a sample of countries that represented 40 per cent of the developing world’s population in a World Bank analysis (World Bank 2012). An improvement in the management of natural resources and services can certainly increase their economic productivity, such as when the stock of a renewable resource has recovered, and can contribute...
to improve both the environment and economic opportunities. Tackling market and government failures in natural resource management would improve environmental quality, worker productivity and public welfare.

3.3. MEASURES TO AVOID THE OVERUSE OF COMMON-POOL RESOURCES WILL INCREASE RESOURCE PRODUCTIVITY

Environmental goods can be common-pool resources. These are limited resources that are shared, when there is rivalry over consumption and it is difficult to exclude users. These resources frequently suffer from the open access problem: there are no clear owners and there is no management system restricting the use of the resources (Ostrom 1990; Aguilera 1994). When the resource is overexploited, the benefits accrue to those who overused the resources and the costs accrue to those who did not. Many low-income people around the world depend on common-pool resources in the form of fisheries, forests or pastureland. Proper management of these common-pool resources would reverse their deterioration and increase their economic productivity. According to the nature of the resource and the institutional framework, different measures could combine to induce proper management. The enforcement of property rights or of clear social norms is usually required for a solution.

In some cases the introduction of economic incentives can help to recognise the value of the resource and its scarcity. An example of these incentives is the payment for environmental services, an approach that can reverse degradation of ecosystem services and help alleviate poverty (Pagiola et al. 2008), if applied in an appropriate manner. However, economic incentives are not always the solution: in some cases they may conflict with existing values and social incentives for conservation, so any such incentives should be carefully adapted to each context. In the case of fisheries, the open access problem has led to overfishing and the exhaustion of resources, with a strong decrease in the yield and associated jobs and income. An efficient way to manage the problem of overfishing would be through the distribution of tradable quotas—limiting total resource capture. This tool seems highly effective in preventing fisheries collapse and increasing the productivity of the resource. Costello et al. (2008) and Heal and Schlenker (2008) found empirical evidence supporting this hypothesis through the analysis of more than 11,000 fisheries. Chu (2009) found evidence of a positive effect in 12 of the 20 analysed fish stocks where individual tradable quotas were implemented. These findings suggest that tradable quotas can be a beneficial element in the management of some fisheries while alternative or complementary measures would be required in others. Another example that seemed to deliver positive results is the Chilean Jack Mackerel Individual Transferable Quotas System (Kroetz et al. 2016). Some authors suggest, however, that community rights-based management that limits the harvest would be more successful in contributing to poverty alleviation in the context of small-scale fisheries in developing countries (FAO 2005).

These are examples of measures that, besides their environmental benefit of resource sustainability, pay for themselves in economic terms by solving the previous mismanagement of environmental resources. Hence, they can be seen as no-cost measures, at least over the longer term. In addition, achieving more stable and sustainable harvests could make the development of resource processing industries more feasible.

3.4. MEASURES TO INCREASE RESOURCE EFFICIENCY OFTEN PAY FOR THEMSELVES

Key improvements from the application of market instruments and complementary measures designed for green economic transformations are found in environmental efficiency gains. These are realized as lower resource use and lower pollution per unit of production that also may produce significant short-term economic gains. Improvements in production processes that save resources can pay off the initial costs in a short period of time. In some situations resources are simply wasted, as many economic processes are inefficient due to market distortions, inertia, lack of proper information or bad management. In many industrial processes, existing technologies could reduce energy consumption and pollution. These savings could provide net economic benefits rapidly, besides having a positive environmental impact. According to the World Bank (2010) energy efficiency investments can produce a triple dividend: greater energy savings, fewer emissions and more jobs. Worldwide, every additional dollar spent on energy efficiency saves more than twice that investment on the supply side with higher savings in developing countries (Bosseboeuf et al. 2007; World Bank 2010). Thus, energy efficiency can present not only a ‘no-cost’ measure in many cases but often constitutes a ‘negative-cost’ thus saving money over the mid to long-term (Figure 2.1).
There are great potential savings to be gained through energy efficiency in buildings. This is a particularly powerful point for developing countries, as their building standards are yet to be formulated and they will soon be building most of the infrastructure they will be depending on for the next few decades (World Bank 2010). In the case of manufacturing, the potential for energy savings is significant for developing countries because of their current lower efficiency levels and early phase of industrialisation. According to the IEA (2008), energy consumption in the industrial sector could be reduced by 20 to 25 per cent with existing technologies and best practices contributing to growth.

**Figure 2.1:** Key areas of regulation

![Abatement cost vs. Abatement potential graph](image)

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In their report “Pathways to a low-carbon economy: Version 2 of the global greenhouse gas abatement cost curve”, McKinsey and Company identify four key areas of regulation to reduce CO2 emissions at the lowest cost. The graph demonstrates that Policy area (1) Energy efficiency regulation will result in a net economic benefit or ‘negative cost’ for the economy: This is the case as energy efficiency regulation, such as standards or technical norms, can overcome market imperfections that currently prevent the private sector from realising energy efficiency measures that would result in a net profit (for which the cost savings of reducing energy consumption are higher than the initial investment in energy efficiency measures) (McKinsey & Company 2009).

Various measures in the power sector could pay for themselves, of which one is the utilisation of off-grid electricity systems. Rural areas in low-income countries have scattered demand and low consumption levels that challenge the logic of providing grid electricity. Off-grid solar power systems can provide modern energy services at lower costs than diesel generators, while reducing the noise and fumes (IFC 2007; Bowen and Fankhauser 2011). Very small scale units can replace commonly used kerosene lanterns improving indoor air quality and reducing fire hazards (REN21 2016).

3.5. **ONCE LOCKED IN TO RESOURCE-INTENSE AND POLLUTING ENERGY AND TO UNSUSTAINABLE URBAN INFRASTRUCTURE DEVELOPMENT, COUNTRIES WILL FIND IT DIFFICULT TO SWITCH TO GREEN PATHWAYS IN THE FUTURE**

A way to improve environmental and economic efficiency is through better urban planning, avoiding city sprawl models, because more dense and compact city layouts reduce energy consumption and pollution, especially in transport (Rickwood et al. 2008; OECD 2012a). Poor countries are still developing most of their infrastructure and are rapidly urbanising. Besides the tragedy of irreversible environmental damages, the economic...
costs of greening the economy at a later stage of development may be too high due to infrastructure, sectoral and technological lock-in. The costs of replacing long-lived fossil-fuelled machinery and infrastructure or of reversing inefficient urbanisation models may be too high. Present technological and infrastructure decisions may lock countries into a high-carbon economy that can involve much greater costs in a future world of decarbonisation (World Bank 2012). The risk of stranded assets, relinquished because of sudden or premature write-downs, devaluations or conversion to liabilities, as well as divestment pressures, highlight these financial pressures and point towards the benefits of a low-carbon transition (Baron and Fischer 2015; Caldecott et al. 2016).

Focusing on economic growth, following the same path as developed countries and greening later would be much more costly than following a path now to transform to a green economy. Developing countries have the advantage, from the environmental point of view, that so much of their infrastructure is yet to be built, so they can use current knowledge of best practice to minimise environmental and economic costs in their development paths. They can take advantage of current knowledge to avoid carbon intensive development and to adopt cheaper, cleaner, and more efficient production options. This would also avoid the high costs of replacement as these carbon-intensive technologies and processes become obsolete, likely long before they break down.

3.6. Reducing Inefficient and Harmful Incentives Can Improve the Environment and Provide Positive Economic Impacts

In some cases governments introduce inefficient, or perverse, incentives that encourage or accelerate environmental deterioration. A direct way to improve the environment while enhancing economic efficiency is by eliminating the incentives to overexploit resources or to produce and consume polluting processes. These perverse incentives are highly inefficient as they distort market values away from the actual values of environmental resources and the material costs of environmental degradation.

These incentives often take the form of subsidies and are maintained because of the pressure of special interest groups or the fear that eliminating them would lead to social unrest. As an example, world fisheries subsidies were estimated at around US$ 35 billion in 2009 (Sumaila et al. 2016). According to the International Monetary Fund, fossil fuel and electricity subsidies reached US$ 4.9 trillion in 2013 and 5.3 trillion in 2011, or 6.5 per cent of that year’s global GDP (Coady et al. 2017). Other types of support that lead to the overuse of natural resources include mineral extraction, water irrigation and agriculture. Dobbs et al. (2011) and the World Bank (2012) estimate the total annual economic support to natural resource overexploitation to be between US$ 1 trillion and US$ 1.2 trillion annually. Eliminating fossil fuel subsidies alone would have reduced fossil fuel air pollution deaths by 55 per cent, raised revenue by 4 per cent, and increased social welfare by 2.2 per cent of global GDP in 2013, while at the same time cutting global carbon emissions by 21 per cent (Coady et al. 2017). Some estimates suggest that three quarters of global energy subsidies are provided by the governments of developing countries (Coady et al. 2017).

In addition to their direct damage, energy subsidies lock economies into inefficient technologies that will be more difficult and costly to replace in the future. This possibility makes perverse incentives even more toxic for the futures of developing countries, where infrastructure is to a great extent still to be built, despite the immediate attraction they offer to quell potential social unrest. While the poor are credited as the source of such unrest, the actual benefits of these perverse incentives most often accrue to the elites in developing countries, perpetuating inequities (Clements et al. 2014). Examination of evidence gathered between 2005 and 2009 in twenty developing countries found that the richest 20 per cent of households capture an average of six times more in fuel subsidies than the poorest 20 per cent (Arze del Granado et al. 2012).

The environmental and economic benefits of subsidy reform have been widely discussed (Coady et al. 2017). However, with a restructuring of benefits, there will always be winners and losers and sometimes any change can incite political and social resistance. Historically, and more recently through the networks of social media, this resistance arises from misleading information about the value of the environmental damage and the need for subsidies. The most responsible remedy is better information presenting the short and long term benefits of the reforms, and explaining the damages imposed by perverse incentives especially in terms of inequity and injustice. To reinforce the message, reforms should also entail compensation measures targeting the groups most affected, especially lower and middle-income populations, so that the reduction of subsidies is not seen as an unfair policy (Jakob
et al. 2015). In return, newly available public revenues could be used to finance programmes aimed to increase political acceptance of these reforms, including information campaigns, social cushioning or additional measures to facilitate the transition to a greener economy (Clements et al. 2014; Jakob et al. 2015).

3.7. DEVELOPING COUNTRIES MAY LEVERAGE NEW COMPETITIVE ADVANTAGES IN ENVIRONMENTAL GOODS AND TECHNOLOGIES BY ADAPTING/PRODUCING GREEN PRODUCTS

Several emerging economies and developing countries have been very successful in developing new exporting sectors based on green products. Specific industrial policies have been successfully implemented in China, Brazil, Ethiopia, Indonesia, Tunisia, Mexico or Morocco to develop new sectors with green aspects (OECD 2012b). For the most part, developing countries cannot afford the risk at the cutting edge of new technologies. However, they can adapt the best available technologies to their circumstances and promote the development of green sectors with the appropriate support, leading to increased exports and jobs. Green industrial policies should focus on untapped but clear comparative advantages, and many developing countries have very rich natural endowments that could inspire development of green industries, such as solar energy in North Africa (Vidican Auktor 2017, this volume). While high-income countries have traditionally pioneered green innovations, developing countries are catching up, particularly East and South Asia as represented by China and India (Dutz and Sharma 2012; World Bank 2012). In 2010, green goods and services constituted 3.4 per cent of exports from developing countries compared to 6 per cent from high-income regions (Dutz and Sharma 2012). The current production structure of developing countries already indicates that they could catch up gradually. One indicator for this is the share of ‘green and close-to-green products’ that amounted to about 13 per cent of developing countries’ exports in 2010, compared to about 15 per cent in high-income countries. Compared to the export percentages for green goods and services in developing countries and high-income countries, the shares for green and close-to-green product exports are much more alike in the two country groups (Dutz and Sharma 2012).

This indicates substantial opportunity for developing countries in regard to increasing export volumes of environmental goods. Many opportunities are linked with the export of green goods and services, including tapping into a growing market of environmentally aware customers in high-income countries. Countries should also bear in mind that environmental awareness and international policy stringency grow over time, thus increasing demand for green products and services. Not investing in that growth market might therefore be associated with high opportunity costs. On the risk side, there may be the possibility of losing part of domestic demand, at least short-term, if this reorientation of production involves changes in cost.

3.8. DEVELOPING COUNTRIES CAN SIGNIFICANTLY PROFIT FROM THE ADAPTATION AND DEPLOYMENT OF ALREADY PROVEN GREEN TECHNOLOGIES

Some emerging economies can successfully compete in green innovation sectors. However, lower-income countries may not be in the position to invest in cutting-edge green innovation research and development due to their lack of resources, human capital and technological capacity. They may rather focus on facilitating the diffusion and adaptation of existing green technologies, to make their own industry more competitive and to reduce environmental impacts. There is much to be gained in promoting the adoption of green innovation and technologies. To accelerate this process of adoption, adaptation, and deployment, international openness is a relevant factor (World Bank 2012). This requires trade and investment policies that encourage the import and deployment of foreign green technologies. Imports play an important role in transferring the green technology embodied in green products. Foreign direct investment also plays a relevant role in technology transfer (Moran 2015). To facilitate the adoption of green technologies it will be necessary to build local receptivity in the form of capacity development. To maximise the co-benefits obtained in the adoption of developed green technologies, capacity development should be customised to local needs and environments (World Bank 2012). Low-income countries should also focus on innovations that can be adapted to meet the needs of poor consumers at very low costs per unit (World Bank 2012). These include formal or informal innovations that seek to provide more product with less resources for more people (Prahalad and Mashelkar 2010; World Bank 2012). A good example is the wide adoption
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of off-grid solar electricity enabled and made affordable through business models based on responsive community-oriented customer service, mobile phone credit accounts, units that can be de-activated remotely upon default and profit gains as the customer pool increases in volume (REN21 2016).

3.9. GREEN ENERGY POLICIES INCREASE ENERGY SECURITY, REDUCING THE VULNERABILITY OF ECONOMIES TO OIL PRICE SHOCKS AND DEPENDENCE ON FUEL IMPORTS

According to Awerbuch and Sauter (2006), oil price increases and ongoing instabilities depress economic growth by raising inflation and unemployment and devaluing financial and other assets. The deployment of renewables could help countries to avoid costly economic losses by displacing fossil fuels.

Increased efficiencies and renewable energy sources provide additional co-benefits by increasing energy security and reducing the vulnerability of economies to oil price shocks as well as the dependence on fossil fuel imports.

3.10. POSITIVE EMPLOYMENT EFFECTS DUE TO GREEN SECTORS AND TECHNOLOGY INSTALLATION AND SERVICING MAY PRODUCE MORE DECENT JOBS AND PROVIDE A POSSIBLE DOUBLE DIVIDEND

Green sectors and technologies are likely to be more labour-intensive in the short term and then to provide more jobs in total over the long term, so the change in focus from conventional to renewable energy sources could also create jobs (Fankhauser et al. 2008). Job creation could also increase through public investment that develops green production and technologies. There may also be a double dividend when changing from taxing labour to taxing environmental damages—an environmental benefit plus an increase in labour demand resulting from environmental fiscal reforms that make labour cheaper relative to energy (Pearce 1991; Schlegelmilch et al. 2017, this volume).

The change to a greener economy may also involve transition costs in terms of employment when the induced change in relative prices temporarily leads to a situation in which polluting industries and jobs are phased out while new green alternatives emerge incrementally (World Bank 2012; UNIDO and GGGI 2015).

3.11. NOT PARTICIPATING IN INTERNATIONAL ENVIRONMENTAL AGREEMENTS AND FOLLOWING THE HIGH-POLLUTION DEVELOPMENT PATH COULD UNDERMINE THE LONG-TERM POTENTIAL FOR EXPORTS AND INDUSTRIAL DEVELOPMENT OF DEVELOPING COUNTRIES

More stringent environmental policies in the international context may have a series of consequences for developing countries. Some governments are concerned that enforcing environmental policies in their countries could affect the external competitiveness of their industry. In some cases, pressure from industry lobbies have led to introduction of exemptions to resource or pollution-intensive sectors, which introduce distortions and clearly reduce the efficiency and effectiveness of environmental policies (Ekins and Speck 1999; Baranzini et al. 2017). An option to deal with competitiveness concerns that is gaining weight in the academic and policy debate on international environmental agreements is to introduce trade sanctions on those countries not adopting similar environmental measures. These could take the form of compensatory taxes, such as border tax adjustments. In case these measures were generalised, this could induce exporting developing countries to adopt similar environmental standards to avoid sanctions. However, imposing these kinds of sanctions on developing countries is hardly justifiable on ethical grounds if there are not compensatory—or environmentally motivated—transfers from developed countries to developing ones.

As more stringent environmental policies, green industrial processes and market preferences for green production and products become widespread in industrialised economies, sticking to polluting economies may reduce opportunities for that developing country to export to a developed country market. If more strict environmental standards are adopted in developed nations, these are likely to be imposed on imported products as well, with the same effect on exporting opportunities of developing countries that do not make adequate efforts to green their industries.

In the specific case of international climate agreements, countries have incentives to free ride, as climate policies can be considered a public good. That is, free riders will benefit from the reduced impacts of climate change, while not making any effort to reduce their own emissions. To solve this problem, an increasingly popular idea is that there should be mechanisms to avoid the free riding
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Various studies analyse the design of carbon-motivated border tax adjustments and how they could be made consistent with WTO rules (Cottier et al. 2009; Mattoo et al. 2009; Jakob et al. 2014; Rocchi et al. 2015). These measures could be made consistent with WTO rules and help avoid negative competitive effects of carbon pricing in energy and emission-intensive industries. These measures therefore help to level the playing field for green and low GHG products and provide an incentive for countries to invest in their green industrial capacity as part of global value chains.

In this context, not participating in those agreements and following a high-carbon development path could undermine the long-term potential for exports and industrial development of developing countries. Early adoption of green industrial policies in developing countries’ economies and an early green transformation could provide countries with an early mover advantage as regards low-carbon industrial capacity and the production of environmental goods and services. It can also reduce costs of transition at a later point and avoid costs associated with trade-related policy measures of importing countries, such as carbon tax equalisation or similar measures.

3.12. INTERNATIONAL ENVIRONMENTAL AGREEMENTS CAN ALSO INVOLVE FINANCING OPPORTUNITIES AND TECHNOLOGY TRANSFERS FOR DEVELOPING COUNTRIES

Developing countries have significant opportunities for low cost reductions of greenhouse gas emissions, particularly from agricultural and deforestation activities and other land use change (Bowen and Fankhauser 2011). Efficiencies alone could encourage developing countries to minimise the global costs of mitigation. Flexible mechanisms, such as the clean development mechanism, allow developing countries to obtain funds from richer countries for projects that reduce emissions, mainly in the energy and manufacturing sectors, or as payments for reduced emissions from deforestation and forest degradation. These schemes help achieve global reductions at lower costs, because they are implemented in developing countries, and thus make sense for countries with binding obligations. They also involve additional financial, technological transfer and capacity development support required for successful implementation that can also facilitate the transformation of the energy and manufacturing sectors of the host developing countries. These mechanisms can provide incentives for developing countries to participate in climate agreements, and motivate developing countries to expedite the green transformation of their industries. International carbon trading could initiate countries to follow a low-carbon development path and provide gains to those performing well (Bowen and Fankhauser 2011). Global climate agreements must also include climate-finance for developing countries to help their mitigation and adaptation efforts and to build their resilience to climate change. The Paris Agreement indicated the non-binding plan will provide US$ 100 billion per year for the period 2020 to 2025 to developing countries for decarbonisation, including technology transfers, and for adaptation measures. This amount will be increased after this period. The fund, and its eventual increase, argues in favour of decarbonisation measures and in environmentally sound adaptation and capacity building in developing countries.

A successful example of the implementation of a global agreement for another global environmental problem is the Montreal Protocol on Substances that Deplete the Ozone Layer. This protocol was signed in 1987 and ratified by 197 countries, most of them developing countries. Together with the original Vienna Convention for the Protection of the Ozone Layer, they became the first UN treaties to achieve universal ratification (UNEP 2014; 2015). The success of the Montreal Protocol, which induced a transformation in the manufacturing processes of the involved industries, has much to do with the special treatment that it gives to developing countries. They were given longer periods for meeting reduction targets and provided with means to do so, with
the establishment of the Multilateral Fund for the Implementation of the Montreal Protocol in 1991 (Brander 2013). This fund provided financial assistance to developing countries for meeting their mitigation targets through projects oriented to replace polluting technologies. The Multilateral Fund provided a strong incentive for developing countries to join the Protocol and implement measures that reduced the use of ozone-depleting substances. Other factors contributed to successful implementation of the Montreal Protocol, including the availability of affordable alternatives and the existence of trade sanctions that made possible punishments for non-adherence credible.

Another important finance tool that has provided incentives to developing countries to participate in various international environmental agreements is the Global Environment Facility (GEF 2016). The fund is now a partnership of 183 countries, multilateral implementing agencies, organizations and the private sector. The fund was created to promote sustainable development and the protection of the global environment by providing funds for the development of projects with environmental benefits, and has been indispensable to facilitate the participation of developing countries in various international agreements.

Finally, the Green Climate Fund was established in 2010 by 194 countries party to the United Nations Framework Convention on Climate Change (UNFCCC) as a financial mechanism of the UNFCCC supporting the global response to climate change. Its resources are allocated to low-emission and climate-resilient projects and programmes in developing countries. Developed countries formally agreed to jointly mobilise US$ 100 billion per year by 2020 (GCF 2016). To receive any of these funds, and the development opportunities they offer, developing countries must be parties to the relevant multilateral environmental agreements.

4. CONCLUSIONS

A review of the arguments that are usually made against the application of environmental and green industrial policies in developing countries shows that these neglect important information. Neither the belief that economic growth alone will automatically lead to the best possible future nor the differentiated responsibilities between industrialised and developing countries for current environmental pressures offer persuasive arguments for rejecting the adoption of environmental and green industrial policies. In addition, besides the environmental improvement that can be obtained through these policies, there are a series of potential co-benefits for developing countries in terms of welfare enhancement and social and economic gains. Policies should be designed in an integrated manner, taking account of a country’s specific circumstances, to maximise gains and co-benefits and manage potential risks.

If some green policies are win-win options, why are they not developed at a more rapid pace? First, various government policy and market failures require appropriate policy counter measures to neutralize them (World Bank 2012; Lütkenhorst et al. 2014). Second, implementing the appropriate measures is particularly challenging in developing countries. Developing countries face several economic and institutional limitations that can impede success. Some green industrial policies that are specifically designed to support particular industries or technologies require good governance of institutions, with the capacity to avoid rent-seeking and political capture by vested interests. These measures include feed-in tariffs for renewables, tax breaks for innovative firms or green public procurement. Public sector efforts face huge risks of failure from interest group pressure, rent-seeking behaviours or imperfect information, problems that lead to outcomes favouring specific groups rather than society as a whole (Pegels 2014; Rodrik 2014).

Policymakers should also be able to eliminate support programmes once they are no longer justified or accomplishing their objectives (World Bank 2012). Some policies that promote promising green industries and technologies could fail if these problems are not addressed adequately and appropriately. In addition, several green industrial policies require short-term investments that provide benefits only over the long term. The lack of financial institutions able to support such investments hinders their implementation in low-income countries. International finance and institutional support may be required to facilitate the success of green transformation processes in low-income countries.

Each country should assess the opportunities of applying green policies in its particular context, balancing the expected benefits against the potential risks. Moreover, each country should choose its own path of green transformation. This
involves customising choices about sequencing and prioritizing measures that yield the highest short-term benefits, such as energy efficiency improvements or a proper management of natural resources. These customised choices could also lead to fewer or no regrets, such as efficient infrastructure construction that forestalls later replacement costs. Justifications for and potential benefits of the policies should be clearly identified for all stakeholders. Putting a price on pollution helps to reduce environmental problems and pressures, but it is not enough. Each instrument and mechanism should be combined with different measures according to the particular context. The potential costs of promoting innovative but unproven technologies may be great, so green industrial policies are less risky when they focus on technologies that have been tested elsewhere and adapted to the local situation or when they complement untapped comparative advantages that are readily observable. Each developing country should balance the costs of early action against the costs of lock-in and should follow a greening path appropriate to its specific needs.

Finally, the international context can play an important role in the definition of environmental policies and the development paths of developing countries. A context of more stringent environmental policies in developed countries can produce a variety of results for developing countries. For developing countries to succeed in following a clean development path, it is important that developed countries support them by providing the appropriate financial mechanisms. Some mitigation measures will require international finance to facilitate implementation. Help from the international community to facilitate provision of proper financial instruments, institutional support, or technology transfers may be crucial to convert potential gains into actual ones.
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