

Ad Hoc Expert Group Meeting on
**Implementing The Paris Agreement:
Response Measures,
Economic Diversification and Trade**

3 October 2017
Salle XXVII, Geneva

**Climate policies,
economic diversification and
trade**

Paper prepared for the
UNCTAD Ad Hoc Expert Group Meeting by

Aaron Cosbey

Contents

1. The context: The impact of the implementation of response measures	1
2. Global Value Chains	2
2.1 Challenges to GVCs as vehicles for economic diversification	4
2.2 Policies to foster economic diversity through GVC participation	5
3. Green Industrial Policy	6
3.1 Principles for successful industrial policy.....	7
3.2 Is green industrial policy different from industrial policy?	9
3.3 Disruptive Green Industrial Policy.....	10
4. Conclusions	10
References	12

1. Context: The impact of the implementation of response measures

The UNFCCC's Paris Agreement calls on Parties to strengthen the global response to the threat of climate change by, among other things, holding the increase in global average temperature to well below 2° below pre-industrial levels.¹ This will require parties to reach global peaking of greenhouse gas emissions “as soon as possible,” and to reduce emissions rapidly thereafter.²

This necessary level of ambition will entail an unprecedented social and economic transition in a relatively short period of time. The measures used to bring about that transition will have significant economic impacts, as parties seek to restructure toward “greener” systems of production and consumption. Some of those impacts will be felt internationally, as national measures affect demand and supply of traded goods, affecting markets for exporters and importers in other countries. In the long-standing UNFCCC discussions on these matters, these have been called the impacts of the implementation of response measures.³ One of the key objectives in all those discussions has been to reduce any negative impacts to the extent possible, in line with various treaty obligations.

Since the earliest of those discussions it has been evident that economic diversification was one of the key avenues for reducing those impacts (Zhang 2003). The central problem is explored in depth in UNFCCC (2016:8); the most vulnerable states are those for which:

- “A significant percentage of their total exports is concentrated on only a few products or services;
- Demand for those few products or services is likely to drop as a result of climate change mitigation measures in other countries.”

Economic diversification, then, acts to reduce that vulnerability by broadening the export basket of goods and services beyond those at risk from climate change measures. UNFCCC (2016:22) considers the most probable types of policy measures that could be imposed, asking in each case what sectors they would affect, and from those sectors narrows the focus to those few in which a number of states, primarily in developing countries, are over-dependent:

- Conventional oil, gas and coal fuels;
- Energy-intensive trade-exposed goods (e.g., aluminium, iron and steel, cement, chemicals, and pulp and paper);
- Tourism; and
- Agriculture.

While economic diversification is not the only means by which countries can reduce vulnerability to the impacts of response measures, it is hard to imagine effective action that does not involve some measure of economic restructuring away from these types of over-dependence. It then becomes critically important to understand what sorts of policy tools can be employed to foster economic diversification.

Rudiger (2006, cited in UNFCCC, 2016:21) warns that there are no easy answers:

“It must be clear that there is no miracle recipe for achieving diversification overnight. Fostering diversification will be a long, drawn-out process and should hence be seen as a long-term goal. Second, there is no shortage of examples of failed diversification policies and economists know fairly well on the basis of international experience what does not work. Fiscal irresponsibility as well as large-scale state investment in pet industrial projects ranks at the top of the list of what should be avoided. Unfortunately, there is less agreement among economists about what does work, as policies that work well in one place often fail dramatically elsewhere. Indeed, failures have been so

¹ Paris Agreement, Article 2.

² *Ibid.*, Article 4.

³ For a chronological account of those discussions, see http://unfccc.int/cooperation_support/response_measures/items/4295.php.

common (and sometimes so spectacular) that, in recent years, economists have often preferred not to give any advice at all with respect to diversification policies.”

This paper explores two broad areas of policy that may hold some promise. Both are trade-related. Section 2 asks whether the rise of global value chains as a mode of production offers any opportunities to foster economic diversity that leads to reduced response measure vulnerability. Section 3 then asks whether green industrial policy might similarly bring new light to the discussion.

In exploring these two policy areas we are consciously bridging the policy spheres of trade policy and climate policy. While that nexus is not novel (see Tamiotti *et al.*, 2009; Cosbey, 2007), there has been very little in the way of assessing the connections between trade-related policies and the impacts of the implementation of response measures. The hope is that this analysis provides concrete examples of the ways in which trade policy might help to address this aspect of the climate change challenge, in the process playing its part in the implementation of the Paris Agreement.

2. Global Value Chains

Global value chains (GVCs) may be “the defining feature of 21st century trade” (OECD, 2015:11). While production has been segmented into specialized stages since the days of Adam Smith’s iconic pin factory, modern production processes involve dispersing tasks in the chain of production around the globe in the lowest cost locations to a degree that essentially transforms the nature of production and trade (WTO, 2013).

This trend is reflected in the increasing portion of world trade that is taken up by intermediate goods– inputs to production processes that create final goods. UNCTAD (2013a) calculates that about 60 percent of global trade by value is intermediate goods and services.

The momentum toward increased debundling of the production process has slackened in recent years (Hoekman, 2015), with the share of intermediate goods in non-fuel exports plateauing at around 50%. This may simply be the reaching of a new equilibrium state, where the easy potential for increasing efficiency via debundling has been exploited. It is certainly driven in part by an increasing focus on production for domestic markets in China and other East Asian economies (UNCTAD, 2016). In any case, however, the plateau now reached represents a very different state than that which prevailed in the early nineties.

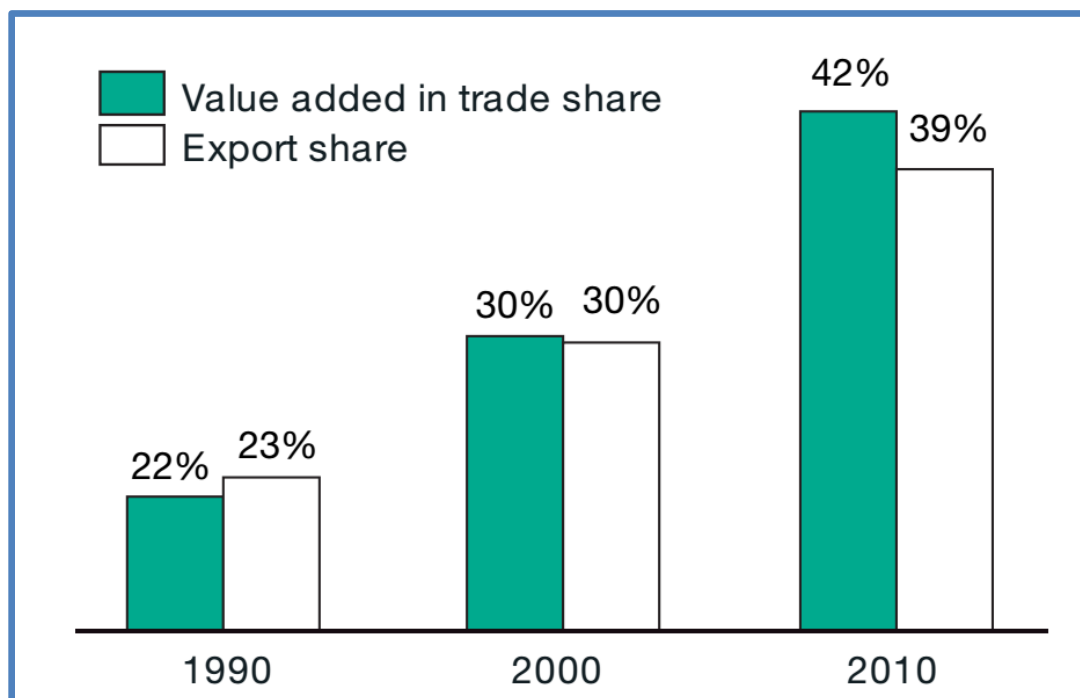
In part, the increased prevalence of GVCs owes much to decades of trade and investment liberalization, making it easier and cheaper for intermediate goods to flow across borders and for foreign direct investment to flow to low-cost production centres in multiple locations. As well, the complex task of coordinating and assuring quality along a disaggregated supply chain has been facilitated by new information and communications technologies. Another key driver is historically low transport costs, the result of innovations such as container shipping (Bernhofen, El-Sahdi and Kneller, 2016), relatively low fuel prices, and more efficient maritime and aviation shipping technologies. All that said, the majority of international value chains are still highly regional in nature, and globally are mostly clustered in nodes that Baldwin and Lopez-Gonzalez (2013) call factory Asia (centred mostly in Japan), factory North America (centred mostly in USA) and factory Europe (centred mostly in Germany).

The transformation of international trade has had important implications for developing country producers. The most critical is the ability for exporters to integrate into the world trading system without having to build complete production ecosystems (Baldwin 2012; OECD 2013). Such efforts have historically been daunting for prospective developing country exporters, especially toward the front and back ends of the value chain which may demand such things as in-depth knowledge of consumer tastes and trends, a network of international buyers or retail distributors, knowledge and implementation of quality and other standards, and capacity for product design and process innovation. The emergence of GVCs has meant that exporters can focus on discrete stages of the value chain – an easier proposition.

There is some evidence that this has in fact taken place – that developing country producers have increasingly become involved in GVCs. Newfarmer and Nouar (2013) use three different possible measures of LDC participation in GVCs and by each measure find that LDCs participation in GVCs is substantial and increasing.

Figure 1 shows that in the 20 years between 1990 and 2010, developing countries gained significantly in their share of global value-added trade (as well as in gross exports).

Figure 1: Share of developing countries in global value-added trade and gross exports



Source: UNCTAD (2013b), based on the UNCTAD-Eora GVC Database.

As well as allowing producers access to world markets, participation in GVCs can also generate knowledge spillovers, helping developing country exporters acquire the know-how that comes from being managed by globally competitive lead firms that have a keen interest in ensuring the quality and efficiency of the elements of their value chain (Piermartini and Rubínová, 2014). The promise of GVC participation for exporters is the possibility that interaction with the GVC and the attendant exposure to global markets and best practices will allow them to upgrade in one or more of several ways (Humphrey and Schmitz, 2002):

- *Product upgrading*: producing existing products more efficiently
- *Process upgrading*: moving to produce different types of products
- *Functional upgrading*: taking on different functions within the value chain
- *Chain upgrading*: moving into different value chains

These possibilities are key to the thesis of this section of the paper: that participation in GVCs provides one means by which firms might contribute to greater national-level economic diversity, and thereby to resilience against the impacts of the implementation of response measures. This can happen by one of several channels:

- Firms “break in” to GVCs, in sectors new to the national economy;
- Firms in existing GVCs engage in process upgrading, producing different types of products in an existing sector;
- Firms engage in functional upgrading in sectors new to the national economy, growing the proportion of GDP not devoted to vulnerable sectors;
- Firms engage in chain upgrading, taking their existing skills and applying them to new (non-vulnerable) sectors.

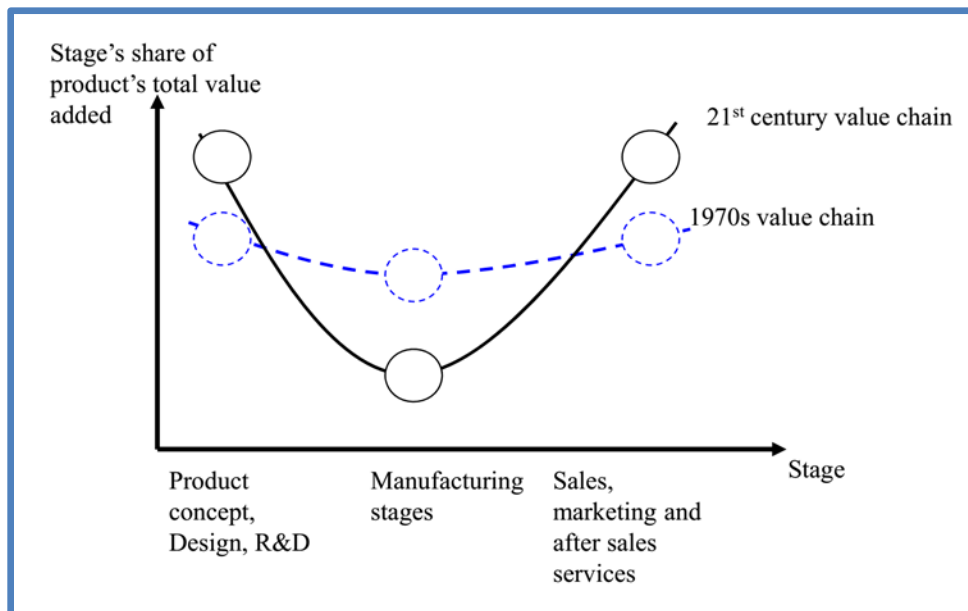
2.1 Challenges to GVCs as vehicles for economic diversification

While GVCs have meant increased opportunities for developing country participation in the global trading system, that participation—and the attendant benefits in terms of growth, poverty reduction and economic diversification—is not automatic. There are some challenges and caveats to bear in mind.

First, while overall growth in GVC participation has been impressive, it has also been uneven. While there is a factory Asia, factory North America and a factory Europe, there are no equivalent regional dynamics for Latin America or Africa. Estevadeordal, Blyde and Suominen (2013) suggest that this is because transport costs increase as production gets further from the value chain's hub, and because of the prevalence of preferential trade agreements among the existing hubs – agreements that lower tariffs among the regional partners and that impose rules-of-origin thresholds for tariff preferences. This presents a challenge for firms outside of those areas, for whom it is still possible to join GVCs, but only if they can overcome those offsetting considerations.

Second, participation in GVCs can have very different development implications depending on the nature of the terms of engagement. Many developing countries participate in GVCs at the manufacturing or fabrication stages of production. These are the bottom of the so-called smiling curve (see Figure 2), a position that indicates the least value-added capture relative to other stages of the chain. WTO (2014) suggests that this curve has deepened since the 1970s, with even less value-added accruing to those stages; Figure 2 shows this dynamic. Where developing countries participate in the upstream sections of the value chain, it is often as providers of raw materials destined for further processing after export (Foster-McGregor, Stallich and Stehrer, 2015). Again, this yields a smaller share of value added than would participation in other stages of the value chain. OECD (2015) argues that in fact the volume of activity matters just as much as the domestic share of the value of the product, and points to the success enjoyed by some East Asian economies that focused on high-volume assembly economies. While this is true, the critical question is whether a position at the bottom of the curve, or a position as raw material exporter, where opportunities for learning and upgrading may be more limited, makes it more challenging to increase either the volume of activity or the share of domestic value added.

Figure 2: The Smiley Curve



Source: Baldwin (2012).

In a similar vein, Humphreys and Schmitz (2002) point out that most developing country participants in GVCs are positioned in what they call quasi-hierarchical value chains, with a lead firm exercising a great deal of control over other firms in the chain, and over product specifications, processes and control mechanisms. In such settings, they argue, product upgrading will result, but other types of upgrading – those with most

potential to contribute to economic diversification – are difficult. That is, the strong hand of the lead firm will have kept the other firms in the value chain weak in the areas that it controls, such as product design, supply chain management, marketing – many of which need to be mastered if firms are to contribute to economic diversity.

Third, the ability of domestic firms to upgrade, or to benefit from knowledge spillovers, cannot be taken for granted. The firms involved need to invest resources into a dedicated effort that may involve purchase of new equipment, reorganization of productive and administrative processes, hiring and/or re-training staff. It may involve the delicate process of entering into competition with the lead firm or other firms in some stages of existing value chains. Success will depend on the firm's capacity to absorb and use new practices and technologies, and to grow beyond established operations.

2.2 Policies to foster economic diversity through GVC participation

The benefits of participating in GVCs are not automatic (UNCTAD 2013a; McDermott and Pietrobelli, 2015). For the purposes of this paper that also means that participation in GVCs is not a magic bullet for fostering economic diversity, and reducing vulnerability to the impacts of response measures. There are a number of policies and measures that can be employed to increase the chances that this outcome will prevail. As Pietrobelli and Staritz (2013) note, value chain interventions can be of two basic types:

- Targeting access and integration into GVCs
- Targeting value capture within GVCs

These are not mutually exclusive, but the first type of intervention is suited to less developed countries with weak participation in GVCs, while the second is more suited to emerging countries looking to wrest more substantial benefits from existing GVC participation.

In the first category are horizontal measures to increase the competitiveness of potential GVC partners. Describing one example of this sort of intervention, Newfarmer and Nouar (2013) suggest that aid for trade and trade facilitation have played a significant role in allowing LDC producers to engage in GVCs. They highlight in particular transportation infrastructure and reforms that lower the time and costs for goods crossing borders. For these same reasons Estevadeordal, Blyde and Suominen, (2013) recommend continuing the successful efforts of the collaborative aid for trade initiative,⁴ and agreeing within the WTO to implement the Trade Facilitation Agreement.

In a similar vein, OECD (2015) argues that lowering tariff and non-tariff barriers to trade and investment flows will similarly make it more feasible for domestic firms to participate in GVCs. Of particular interest are barriers to intermediate goods, given their importance to actors in GVCs. Barriers to trade in services are also important to address; services in GVCs act both as facilitators of supply chain management and as elements of the supply chain in their own right (Jenks and Persson, 2013).

The second category of intervention aims to help firms upgrade within value chains. Humphrey and Schmitz (2002) note that financing is critically important for firms that aspire to upgrade. Any sort of upgrading will demand capital and other expenditures, and financing is a key obstacle for small and medium-sized enterprises in developing countries. Development bank and ODA financing to enable entry into GVCs and upgrading could help address this obstacle.

Morrison, Pietrobelli and Rabellotti (2008) highlight the importance of, among other things, local innovation systems. Innovation systems are the network of institutions and relationships that bind firms, research and training institutions, policy makers and others in search of heightened firm capacity to learn and innovate, and increasing absorptive capacity for new technologies and processes. Governments can lead in creating innovation systems by establishing training centres, investing in basic and dedicated education, fostering linkages among educational institutions and firms, and reforming intellectual property laws and patent processes.

⁴ See https://www.wto.org/english/tratop_e/devel_e/a4t_e/a4t_factsheet_e.htm.

Pietrobelli and Staritz (2013) stress that any value chain interventions must be tailor-made and context-specific, adapted to the specific realities of the firms and value chains involved, the particular strengths and weaknesses of the existing regime of support, and the key obstacles involved.

It is also worth noting that any efforts to enable GVC participation should be situated within the context of a broader national development strategy (UNCTAD 2013a). Policies such as lowering import tariffs or liberalizing trade in services may have advantages as broad-brush efforts, but should be used in a targeted fashion that accounts for their impacts beyond fostering GVC participation. Lowering tariffs across the board, for example, is a blunt instrument for increasing GVC participation; that would be more directly accomplished by a focus on intermediate goods. Financing should target the specific barriers faced by the firms the government has decided to support in their efforts to upgrade. The nature of these challenges takes us into the realm of industrial policy, which is examined in greater depth below.

3. Green Industrial Policy

As noted in Section 1, economic diversification is an important path to increase resilience to the impacts of the implementation of response measures. Essentially this avenue involves structural economic change, moving the economy away from an over-dependence on the export of goods that, in their production and/or end use, have negative climate change impacts and are therefore vulnerable to reductions in demand as governments and consumers act to address climate change.

Beneficial economic restructuring is routinely practiced by almost all governments, by a variety of means. But restructuring specifically in the direction of low-carbon and climate-adapting goods and technologies is the territory of what has come to be called “green industrial policy”. Altenburg and Rodrik (*forthcoming*) define green industrial policy as:

“... any tool at the disposal of a government that ensures the adherence of an industrial sector to nationally endorsed environmental rules and social standards or supports the emergence of a new sector that has the potential to advance structural change and competitiveness on the basis of low-carbon, resource efficient technologies.”

Green industrial policy, of course, covers more than climate-friendly activities; it can also be used to direct the economy toward goods and activities that achieve other environmental goals. But climate change is arguably the primary environmental challenge of our times, and is thus a key goal. Consequently, it is also one of the strongest drivers of new market opportunities; trade in climate-friendly goods now tops USD 250 billion per year, almost a four-fold increase from 2002 levels (Adès and Palladini, 2017). The size and growth of that market make climate friendly sectors a desirable target for industrial policies.

Green industrial policy can increase resilience to the impacts of response measures by any of four basic types of forms, through measures to encourage:

1. Cleaner production in the vulnerable sectors (e.g., promoting renewable energy as an input to the production of traded steel);
2. Re-designing existing export goods such that they have less climate impact in their end use (e.g., promoting a shift from internal combustion engine vehicles to electric vehicle production; promoting production of higher-efficiency white goods);
3. Phase out of significant climate-damaging sectors (e.g., removal of subsidies to entrenched vulnerable sectors), in the expectation that other greener sectors will take their place.
4. The emergence of entirely new low-carbon and climate-adapting sectors of activity (e.g., promoting the development of new water-saving technologies);

The objective of such measures is ultimately two-fold. First, they aim to reduce the vulnerability to shocks from reduced exports of climate-damaging goods. They do this by reducing the importance of those goods in the basket of national exports, diversifying away from such goods by greening existing production, encouraging new green products and technologies, and discouraging or removing incentives for existing “brown” sectors. Second, they aim to ensure that the sectors into which the economy diversifies have a beneficial climate profile and better long-term market prospects. Of course, even without this last element,

any policy that decreased the relative share of climate-harming goods in the national export stream—for example by diversifying away from carbon-intensive into climate-neutral goods—could probably be counted as green industrial policy, and would have the benefit of reducing vulnerability to the impacts of response measures.

There are four key determinants of that sort of vulnerability:

- **An over-dependence on the export of relatively few goods.** As of 2015 sixteen states counted on fuel exports for more than 60% of total merchandise exports and nine states counted tourism receipts for over 60% of total exports.⁵ As of 2013, ten states counted on mining for more than 60% of merchandise exports, and twenty-five states counted on commodity exports for more than 60% of merchandise exports.⁶
- **An export focus on countries likely to implement response measures.** The principle of common but differentiated responsibilities dictates that some countries have a heavier burden of responsibility for addressing climate change. An over-dependence on the markets in those particular countries will exacerbate vulnerability.
- **Carbon-intensity of the exported goods.** This could be carbon-intensity in extraction, processing, transport or end use; different types of response measures will target different stages of the life cycle.
- **Capacity to adapt.** Vulnerability is reduced by policy frameworks and institutions that are able to adapt to shocks. (Adler and Sosa, 2011). It is worth noting that much of the over-dependence described above is in developing countries, many with under-developed institutions for managing social and economic transitions.

3.1 Principles for successful industrial policy

Until recently, the accepted wisdom of most economists was that industrial policy was an ill-advised prospect for governments, who were terrible at picking winners and losers. This thinking has changed, however, in part as a result of the success of a number of emerging economies that extensively employed industrial policies (World Bank, 1993), and in part as a result of the wave of stimulus spending on the part of most major economies following the 2008 financial crisis. The current literature features less preoccupation with the question whether industrial policy is advisable, and more preoccupation with learning from the successes and (many) failures of the past, and getting it right (Rodrik, 2004; Suzigan and Furtado, 2006; Rodrik 2008; World Bank 2012; Hallegatte, Fay and Vogt-Schilb, 2013; Lall, 2013; Dietsche, 2017).

It is particularly important to note that there is no single policy prescription that will work in all cases. There are, however, some elements of policy, some principles, on which most economists agree. As a starting point most agree on the desirability of “soft” (or “horizontal”) industrial policy – measures that will improve investment conditions for a range of sectors and actors, without targeting specific sectors or firms (Harrison and Clare-Rodríguez, 2010). These sorts of measures are aimed at improving the investment and innovation climate, often with a focus on exports:

- Creating special economic zones with lower infrastructure costs;
- Investing in transportation-related infrastructure designed to increase trade;
- Promoting export clusters (without sectoral discrimination).
- Promulgating science and innovation policies;
- Streamlining bureaucracy for business licencing and support
- Investing in energy, transportation and communications infrastructure
- Providing non-sector-specific financing for start-ups, commercialization, export finance, etc.

The advisability of so-called “hard” (or “vertical”) industrial policy, however, is more contested (Pack and Saggi, 2006). This is government intervention designed to foster competitiveness in a particular sector. These might include such measures as:

⁵ *World Development Indicators* database.

⁶ UNCTAD, 2014a.

- Protective import tariffs on final goods;
- Lower tariffs on specific inputs;
- Subsidies to specific sectors: outright grants, land grants, low-interest loans, R&D support, tax holidays, etc.;
- Domestic-content requirements; and
- Joint venture or technology requirements as a condition of foreign direct investment.

Arguing in favour of some elements of hard industrial policy on the basis of a number of case studies, Moran (2015:3) notes:

“The evidence presented here shows clearly that developing countries that want to use FDI to diversify and upgrade the production and export base of the host economy cannot simply sit back and wait to see what international market forces bring to them. They need interventionist policies to overcome imperfections in information markets, assure potential investors that they will be able to integrate plants in untried sectors smoothly into their worldwide production networks, and overcome coordination externalities to make such assurances credible.”

The arguments against hard industrial policy centre on the risk that the supported infant industries will never reach the point of global competitiveness, and that the vested interests created by that support will create roadblocks to withdrawing support even where the need for withdrawal is clear.

In the end, it is difficult to generalize about the effectiveness of hard industrial policy. What evidence there is seems to indicate that import tariffs and joint venture requirements struggle to succeed (Pack and Saggi, 2006; Moran, 2002). And it seems clear that measures designed to foster upstream linkages will only succeed in concert with active policies to build capacity in indigenous firms (Moran, 2015). UNCTAD (2007, 2014b) argues strongly that local content policies can only succeed if they are part of a broader package of policies and measures aimed at building capacity for increased domestic value-added. But the success of most policy tools is heavily context-dependent (Grossman, 1990). It is a matter of discovering case by case what works in each country's, and often each firm's, particular circumstances, taking into account exogenous variables such as geography, resource endowments and history, as well as myriad endogenous variables, such as the capacity of the targeted domestic sectors, capacity of supporting sectors such as finance, communications and transport, the specifics of the policies employed and the bureaucracy mandated to implement, associated policies such as science and technology policies, education policies, intellectual property law, government procurement policies, and others.

That said, there are a number of design considerations that hold generally true. Newfarmer (2011) proposes a set of 10 guiding precepts for successful industrial policy, drawn from the experience to date:

1. As a first step, remove policy, institutional, and cost elements in the value chain that limit production and exports, such as perverse subsidies;
2. Transparency: Quantify amounts in budget to parliament; begin by quantifying the industrial policy you have;
3. Incentives/subsidies: Should be provided only to “new” activities, which are the real target for support;
4. Objectives should be clear, with established benchmarks/criteria for success and failure;
5. Sunset clause: phase out subsidies and other support automatically;
6. Projects should entail *private risk* commensurate with *public risks*; private actors without risks have the wrong kind of incentives;
7. Competition: Avoid raising barriers to entry and import competition;
8. The agency administering intellectual property rights must have demonstrated competence – with clear political oversight and accountability;
9. The coordinating Ministry should maintain channels of communication with the private sector; and
10. Evaluations: The portfolio of support recipients should be subject to regular *ex post* external evaluation.

One of the most difficult questions in the exercise of industrial policy is exactly which sectors to support. It is noted above that some types of industrial policies forgo that choice, employing horizontal measures that

improve the investment climate for a broad number of sectors. But where hard industrial policy is practiced, there are tools that are helpful in directing policy makers toward sectors of promise in the domestic economy. One such is the concept of “product space” (Hidalgo and Hausmann, 2009), which argues that countries are likely to find latent comparative advantage in product lines that are not too “distant” from existing successful exporting sectors. Distance in this case can be a function of many factors, including natural resource input needs, need for certain types of skilled employees, infrastructure, technical expertise, etc.⁷ If, for example, a country has a thriving mining products export sector, the geothermal sector might have latent comparative advantage; it relies on many of the same skilled workers, capital goods and know-how. On the other hand, the further away a product is in product space from a country’s existing successful exports, the more unlikely that it is a potentially viable candidate for industrial policy support.

The product space concept has been adapted to help identify viable avenues for countries trying to move toward a greener economy – in effect helping to formulate green industrial policies (Hamwey, Pacini and Assunção, 2013).

3.2 Is green industrial policy different from industrial policy?

The most important distinction between green and traditional industrial policy, for the purposes of this paper, is that the former is a more targeted tool for reducing vulnerability to the impacts of the implementation of response measures. Traditional industrial policy might by chance guide an economy in directions that reduce those vulnerabilities, but green industrial policy does so intentionally.

More substantially, while green industrial policy is underpinned by the same rationales that argue for the use of traditional industrial policy – largely focused on various types of market failures⁸ – its use as a tool to address climate change and vulnerability to response measures brings in new and stronger arguments.

The most obvious is that green industrial policy addresses an additional type of market failure – the failure to adequately price environmental externalities, both positive and negative. That is, both the costs of carbon and the benefits of low-carbon investments are typically not fully costed. Where the global benefits of industrial policy include the avoidance of climate change—arguably our greatest environmental crisis, with wide-ranging global costs if left unaddressed—these external benefits will be substantial. Government interventions such as subsidies, feed-in tariffs and renewable purchase obligations are designed to address this sort of market failure.

But full cost pricing may not be enough. Lutkenhorst *et al.* (2014) argue that costing environmental externalities may not lead to actions on an appropriate timescale, given the challenges of path dependency and the need to change entrenched social behaviours. Other market failures such as principal-agent problems, uncertainty about the durability of policy reform, and low price elasticity (for example caused by the unavailability of substitutes for taxed goods), may also mean that pricing does not have the desired effects.⁹ They argue that while it is important to use markets to their full potential, the urgency of the climate change dilemma argues for more interventionist policies. In a sense, full-cost pricing is akin to soft industrial policy; it sets up a necessary foundation, but according to some may not be sufficient in and of itself.

In the final event, there are two standard tests that green industrial policy, like traditional industrial policy, must meet if it is to be justified: the Mill test and the Bastable test (Kemp, 1960). The Mill test (as interpreted by Kemp) demands that the supported sector can eventually survive unsupported to compete globally. The Bastable test (again as interpreted by Kemp) demands that the total costs of support be outweighed by the present discounted value of the benefits involved. Costs in this case would depend on the policy tools used: higher consumer prices if tariff protection is used; opportunity costs if subsidies are used, etc.

⁷ Note that the methodology does not actually look for these sorts of underlying linkages – it simply identifies correlations between observed export patterns, leaving it to us to posit that the related products must share some of those factors.

⁸ For a summary of those rationales, see Cosbey (2013).

⁹ They also argue the inevitable difficulty of properly pricing environmental externalities such as damage from carbon emissions.

In the case of green industrial policy, however, we can conceive of an *environmental* Bastable test that has a different calculus. The modified test would count as costs the lost environmental benefits from slower deployment of the protected technologies. Against this, it would balance off the future environmental benefits of the policy. These might include, if the industrial policy is successful, the environmental impacts resulting from the creation of new innovators and competitors in the environmental technology space. Note that while the benefits of traditional industrial policy are mostly national, the benefits of green industrial policy would be both national and international; innovation and increased competition in production of green goods would have substantial global spillover benefits. The Chinese drive to enter the markets for solar PV technology, for example, has been one of the main drivers in a drop in installed costs of 61 – 80% since 2010,¹⁰ with benefits felt by every country that imports those technologies, and every country where climate-related costs have been avoided via avoided emissions from the more widespread use of those technologies.

3.3 Disruptive Green Industrial Policy

For many of the same reasons that full-cost pricing may be inadequate to bring about green economic diversification, it may be necessary to complement the promotion of new or greener sectors and goods with measures to discourage those sectors that are most vulnerable to the impacts of the implementation of response measures (Cosbey, *forthcoming*). Altenburg and Pegels (2012) discuss this sort of GIP strategy as “pathway disruption”: the discouraging of key brown sectors of the economy to allow the growth of greener alternatives. They argue that the sectors most in need of active disruption are locked in, and have the financial power and political clout to frustrate needed restructuring. As well, these sectors merit attention because they tend to be deeply embedded in our social and economic fabric, and their decline will imply significant transition costs which should be anticipated and appropriately managed.

There is a rich variety of tools that might be used in the practice of disruptive GIP, to help phase out the targeted sectors:

- **Environmental taxes, charges, levies, fees:** Any sort of financial burden placed on firms and sectors will decrease their competitiveness relative to other actors in the economy.
- **Elimination of incentives:** Another set of tools removes incentives granted to sectors targeted for phase out. These might be financial incentives, subsidies, or regulatory incentives as when specific firms are granted exclusive marketing rights, or concessions. Again, this may act to increase the relative competitiveness of other economic sectors.
- **Mandated phase out:** The most powerful set of tools impel a mandated phase out of the targeted sector or firms. Where the sector is operated by private interests, a phase out will involve regulatory and legal bans or restrictions on sales or operation, as in the phase out of lead as a paint additive in most OECD countries.

It is critical that the measures taken do not simply add to the social and economic burden of disrupting sectors that are major elements of GDP in many countries. The challenge is to find ways to simultaneously develop other elements of the economy such that overall growth is actually augmented.

4. Conclusions

This paper has surveyed two areas of trade-related policy to assess their potential for reducing the impacts of the implementation of response measures via economic diversification. In the area of global value chains, it found that there is significant potential for firms entering GVCs and upgrading within existing GVCs to contribute to economic diversification in ways that would be far more difficult were they required to build up capabilities along the entire value chain in-house. It surveyed a number of policy interventions that would increase the ability of firms to do so, including lowering tariff and non-tariff barriers to trade in intermediate goods and services, targeted liberalization of investment flows, making financing available, and building national systems of innovation. Based on the experience to date, it also warned that such interventions will be key to success – there is nothing automatic about the benefits to be gained from the existence of the GVC

¹⁰ Fu *et al.*, 2017, Figure ES-1, using current costs as of Q1 2017. The range of figures is for different types of applications: residential, commercial, utility-scale (fixed) and utility scale (tracking).

model of production – and that any such efforts must be tailor-made to the unique circumstances of the implementing country.

The paper also explored the idea of green industrial policy, finding that it coincides well with the aims of reducing vulnerability to the impacts of response measures. While there is broad agreement on the value of horizontal measures designed to improve the overall investment environment, there is more controversy on the advisability of hard industrial policy measures that seek to promote particular sectors. While there are risks to such policies—including the risk of policy failure and rent-seeking—climate change may be an urgent enough problem to impel action even so, building on the successes and (many) failures of such policies in the past. As with GVCs, such policies are extremely context specific, and there is no one-size-fits-all solution to the challenges of such “economic engineering.”

Ultimately, the paper found a number of ways in which trade policy and trade-related policies could further the goal of economic diversification, helping to reduce response measure vulnerability, and in the process helping to implement the goals of the Paris Agreements. Given the need for all policy areas to consider how they can contribute to meeting those goals, this is a welcome result.

References

- Adès, Julie and Jacqueline Palladini. 2017. "Clean Trade: Canada's Global Opportunities in Climate-Friendly Technologies." Conference Board of Canada Briefing Paper.
- Altenburg, Tilman and Dani Rodrik. *forthcoming*. "Green Industrial Policy: Accelerating structural change toward green economies," in Tilman Altenburg and Claudia Assmann (eds.), *Green Industrial Policy*. UN Environment/German Development Institute (DIE).
- Altenburg, Tilman and Anna Pegels. 2012. "Sustainability-oriented innovation systems – managing the green transformation," *Innovation and Development* 2(1): 5–22.
- Baldwin, Richard. 2012. "Trade and Industrialisation after Globalisation's Second Unbundling: How Building and Joining a Supply Chain are Different and Why It Matters," in *Globalization in an Age of Crisis: Multilateral Economic Cooperation in the Twenty-First Century*, R. Feenstra and A. Taylor (eds.), University of Chicago Press.
- Baldwin, Richard and Lopez-Gonzalez, Javier. 2013. "Supply-Chain Trade: A Portrait of Global Patterns and Several Testable Hypothesis", *CEPR Discussion Paper No. 9421*, London: Centre for Economic Policy Research.
- Bernhofen, Daniel M., Zouheir El-Sahli and Richard Kneller. 2016. "Estimating the effects of the container revolution on world trade." *Journal of International Economics*, Vol. 98: 36-50.
- Cosbey, Aaron. *forthcoming*. "In with the Good, Out with the Bad: Phasing Out Brown Sectors as Green Industrial Policy," in Tilmann Altenburg and Claudia Assmann (eds.) *Green Industrial Policy*. UN Environment/German Development Institute (DIE).
- Cosbey, Aaron. 2013. "Green Industrial Policy and the World Trading System," ENTWINED Issue brief No. 17. Stockholm: ENWINED Network, 2013.
- Cosbey, Aaron. 2007. "Trade and Climate Change Linkages," Scoping paper produced for the *Trade Ministers' Dialogue on Climate Change Issues*, held in conjunction with UNFCCC COP 13, Kyoto Protocol MOP 3 Bali, Indonesia, December 8-9, 2007.
- Dietsche, Evelyn. 2017. "New Industrial Policy and the Extractive Industries." *WIDER Working Paper 2017/161*. UNU World Institute for Development and Economics Research.
- Estevadeordal, Antoni, Juan Blyde, and Kati Suominen. 2014. "Are Global Value Chains Really Global? Policies to Accelerate Countries' Access to International Production Networks." *E15 Initiative Think Piece*. Geneva: International Centre for Trade and Sustainable Development and World Economic Forum.
- Foster-McGregor, Neil, Florian Kaulich and Robert Stehrer. 2015. "Global Value Chains in Africa." UNIDO/UNU-MERIT background papers for the UNIDO, Industrial Development Report 2016, No. 2015-02.
- Fu, Ran, David Feldman, Robert Margolis, Mike Woodhouse, and Kristen Ardani. 2017. "U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017" National Renewable Energy Laboratory Technical Report NREL/TP-6A20-68925. Golden, CO, USA: NREL.
- Grossman, Gene M., 1990. "Promoting New Industrial Activities: A survey of recent arguments and evidence." *OECD Economic Studies* 14: 87-125.
- Hamwey, Robert, Henrique Pacini, and Lucas Assunção. 2013. "Mapping Green Product Spaces of Nations." *Journal of Environment and Development*, Vol. 22(2): 155-168.

- Hallegatte, Stephane, Marianne Fay, and Adrien Vogt-Schilb. 2013. "Green Industrial Policies: When and How." *Policy Research Working Paper 6677*, Washington DC, USA: World Bank.
- Harrison, Ann and Andrés Clare-Rodríguez. 2010. "Trade, Foreign Investment and Industrial Policy for Developing Countries." In Dani Rodrik and Mark Rosenzweig (eds.), *Handbook of Development Economics* (vol. 5). The Netherlands: North-Holland, pp. 4039-4214.
- Hidalgo, Cesar and Ricardo Hausmann. 2009. "The building blocks of economic complexity." *Proceedings of the National Academy of Science*, 106(26): 10570-10575.
- Hoekman, Bernard. 2015. *The Global Trade Slowdown: A New Normal*. VoxEu.org e-Book. London: CPER Press.
- Humphrey, John and Hubert Schmitz. 2002. "How does insertion in global value chains affect upgrading in industrial clusters?" *Regional Studies*, Vol. 36(9): 1017-1027.
- Jenks, Andrew and Sofia Persson. 2013. "Global Value Chains and Services." Stockholm: Kommerskollegium (Swedish National Board of Trade).
- Kemp, Murray C., 1960. "The Mill-Bastable Infant-Industry Dogma," *Journal of Political Economy*, 68(1): 65-67.
- Lall, Sanjaya. 2013. "Reinventing Industrial Strategy: The Role Of Government Policy In Building Industrial Competitiveness," *Annals of Economics and Finance*, Society for AEF, Vol. 14(2): 785-829.
- Lütkenhorst, Wilfried, Tilman Altenburg, Anna Pegels, and Georgeta Vidican. (2014). *Green Industrial Policy: Managing Transformation under Uncertainty*. *German Development Institute Discussion Paper No. 28/2014*. Bonn: German Development Institute (DIE).
- McDermott, Gerald A. and Carlo Pietrobelli. 2015. "SMES, Trade and Development in Latin America: Toward a New Approach on Global Value Chain Integration and Capabilities Upgrading." ITC Working Paper No. WP-02-2015.E. Geneva: International Trade Centre.
- Moran, Theodore H. 2015. "Industrial Policy as a Tool of Development Strategy: Using FDI to Upgrade and Diversify the Production and Export Base of Host Economies in the Developing World." *E15 Initiative Think Piece*. Geneva: International Centre for Trade and Sustainable Development and World Economic Forum.
- Moran, Theodore. 2002. *The relationship between trade, foreign direct investment, and development: new evidence, strategy, and tactics under the Doha Development Agenda negotiations* (Paper prepared for ADB's Study on Regional Integration and Trade: emerging policy issues for selected developing member countries).
- Morrison Andrea, Carlo Pietrobelli and Roberta Rabelotti. 2008. "Global value chains and technological capabilities: a framework to study learning and innovation in developing countries." *Oxford Development Studies*, 36(1):39-58.
- Newfarmer, Richard. 2011. "What is 'smart' industrial policy?" Presentation given at IISD conference *Trade, investment and climate change: Search for progress on key issues*, October 13, Geneva.
- Newfarmer, Richard and Mariem Nouar. 2013. "LDCs and Global Value Chains: Using Aid for Trade to Seize New Opportunities." Geneva: International Trade Centre.
- Pack, Howard and Kamal Saggi. 2006. "The Case for Industrial Policy: A Critical Survey." *Policy Research Working Paper 3839*. Washington DC: World Bank.

- Pietrobelli, Carlo and Cornelia Staritz. 2013. "Challenges for Global Value Chain Interventions in Latin America", IADB, Technical Note No. IDB-TN-548.
- Rodrik, Dani, 2004. "Industrial Policies for the Twenty-First Century," John F. Kennedy School of Government, Harvard University.
- Rodrik, Dani. 2008. *Normalizing Industrial Policy*. Washington, DC: World Bank (on behalf of the Commission on Growth and Development).
- Suzigan, Wilson and João Furtado. 2006. "Industrial Policy and Development," in *CEPAL Review* 89 (pp. 69-84). Santiago: UN Economic Commission for Latin American and the Caribbean.
- Tamiotti, Ludivine, Anne Olhoff, Robert Teh, Benjamin Simmons, Vesile Kulaçoğlu and Hussein Abazza. 2009. *Trade and Climate Change: A report by the United Nations Environment Programme and the World Trade Organization*. Geneva: World Trade Organization.
- UNCTAD. 2007. *Elimination of TRIMs: The Experience of Selected Developing Countries*. Geneva: United Nations Conference on Trade and Development.
- UNCTAD. 2013a. *World Investment Report 2013: Global Value Chains: Investment and Trade for Development*. Geneva: United Nations Conference on Trade and Development.
- UNCTAD. 2013b. *Global Value Chains and Development: Investment and Value Added Trade in the Global Economy*. Geneva: United Nations Conference on Trade and Development.
- UNCTAD. 2014a. *State of Commodity Dependence 2014*. Geneva: United Nations Conference on Trade and Development.
- UNCTAD. 2014b. *Local Content Requirements and the Green Economy*. Geneva: United Nations Conference on Trade and Development.
- UNCTAD. 2016. *Key Statistics and Trend in International Trade 2016*. Geneva: United Nations Conference on Trade and Development.
- UNFCCC. 2016. "The concept of economic diversification in the context of response measures." Technical paper by the secretariat (FCCC/TP/2016/3).
- World Bank. 1993. *The East Asian Miracle*. New York: Oxford University Press.
- World Bank. 2012. *Inclusive Green Growth: The pathway to sustainable development*. Washington, D.C.: World Bank.
- WTO. 2013. *World Trade Report 2013: Factors Shaping the Future of World Trade*. Geneva: World Trade Organization.
- WTO. 2014. *World Trade Report 2014: Trade and development: Recent trends and the role of the WTO*. Geneva: World Trade Organization.
- Zhang, Le-Yen. 2003. "Economic Diversification in the Context of Climate Change." Background paper to the UNFCCC Workshop on Economic Diversification Teheran, Islamic Republic of Iran, 18-19 October 2003.