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Policy action for greening industrial development: coordinating low carbon consumption, production & innovation

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Abstract

Climate change raises important questions for the sustainability of industrialization as a development model, a model that has allowed countries to prosper over the past two centuries. Industrial policy remains as relevant as ever; it is increasingly being recognized as a key ingredient of the transition to a low carbon future. The global discourse around climate change mitigation often focuses on what we as individuals can do to reduce consumption. **Greener consumption is crucial if we are to achieve the sustainability goals, but we will not reach them without simultaneously implementing a shift towards green manufacturing and low carbon innovation.** **The most effective green industrial policies coherently cut across three distinct dimensions: (i) the consumption-centred dimension; (ii) the firm-level sustainability dimension, and (iii) the productionist innovation-driven dimension.** A holistic and complementary approach across these three dimensions is necessary to ensure a coherent transition towards a low carbon economy which also delivers benefits at the local level, such as job creation.

Key Messages

- 1.** The challenge is not to reduce our consumption but to green it by bolstering low-carbon manufacturing and innovation.
- 2.** Green industrial policy is a linchpin for a low carbon future, but its success requires careful coordination across consumption, production and innovation dimensions.
- 3.** For maximum impact, green industrial policies must be adapted to each country's unique economic and social context and its pre-existing capabilities.

Introduction

Climate change is increasingly occupying more space in the development agenda. Whether the majority of countries can effectively address the challenge of mitigating climate change while simultaneously ensuring growth and poverty reduction remains debatable. As the pressure to meet the sustainability goals continues to grow, industrialization as a development model is facing rising scrutiny. Industry is closely connected to climate change: energy use in industry accounts for 24.2 per cent of global greenhouse gas (GHG) emissions, while the share of GHG emissions from direct industrial processes is 5.2 per cent. In the context of a low carbon future, a fundamental shift towards industrial greening is therefore indispensable.

There is increasing recognition that green industrial policy is key in driving structural transformation towards a more sustainable and greener economic system, especially in light of the long-term investments associated with green activities. While the term 'green industrial policy' has gained in popularity in recent years, it is interpreted in different ways. We have developed a new framework that identifies the different dimensions of green policy action. The global discourse around climate change must shift from a purely consumption-focused perspective to a more holistic approach that takes production and innovation dynamics into account.

Industrial greening: different dimensions for coordinating consumption and production

While the general discourse has focused on the urgency of shifting consumption towards "greener" products and cleaner energy sources, surprisingly little attention has been paid to what such a shift to greener consumption entails, namely a transformation of our productive structures. Hence, the challenge of climate change mitigation goes beyond "consuming less", because it also involves changing the way we produce to sustain low carbon consumption patterns. Manufacturing continues

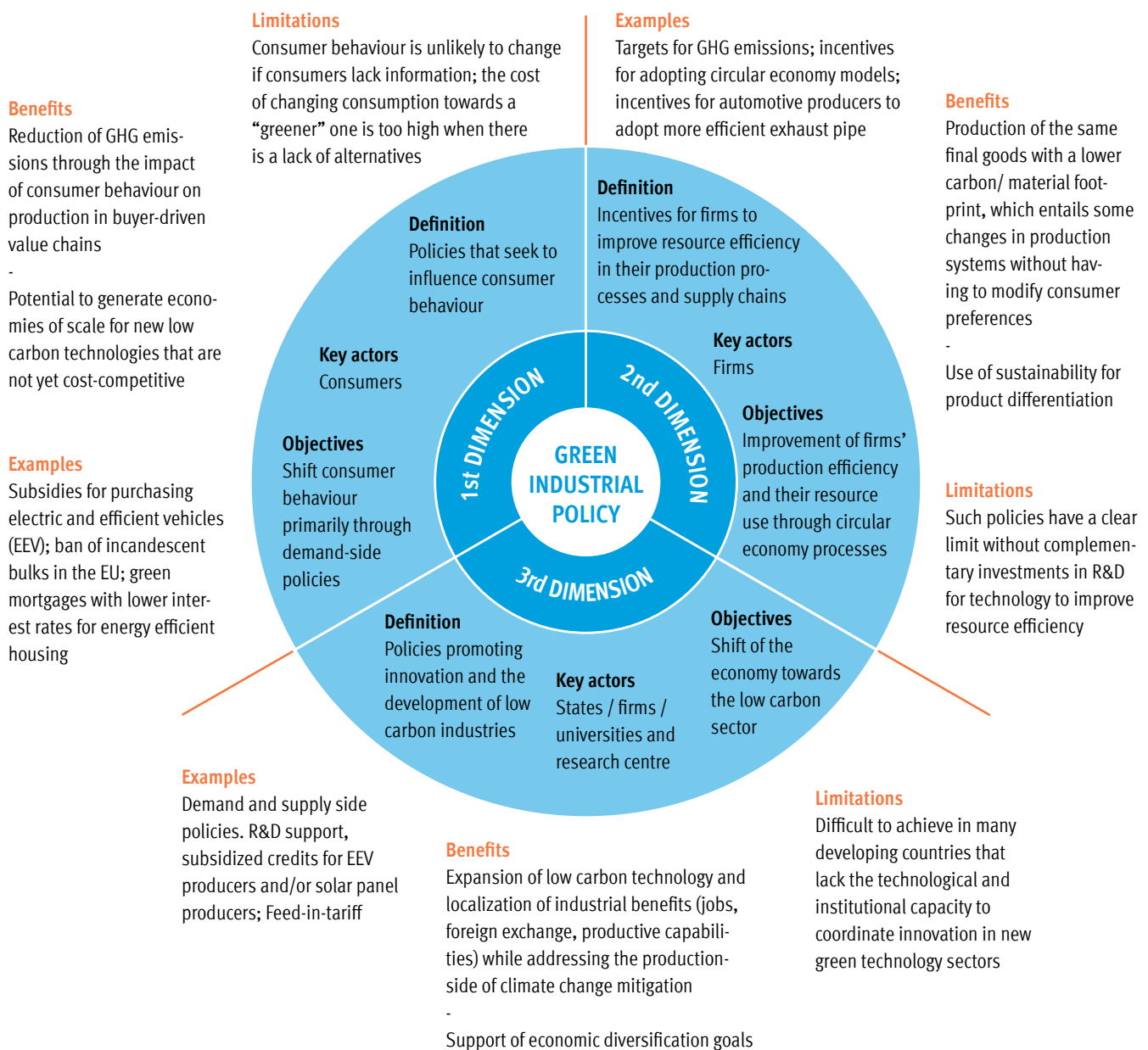
to be the main driver of development due to its unique properties such as employment creation, vertical and horizontal spillovers to other sectors, and serving as the bedrock of technological innovations.

We have developed a new framework to help compartmentalize the wide range of "green" policy instruments, their objectives, time horizons, strengths and limitations. Our framework and matrix (summarized in Figure 1) shows that green policy actions (including

both market-based mechanisms and more interventionist approaches) cut across three different dimensions, which can be used to achieve different policy goals, but which also need to be carefully coordinated to ensure their sustainability and to maximize the industrial benefits associated with a low carbon transition. These three dimensions are:

1. The consumption-centred dimension
2. The firm-level sustainability dimension
3. The productionist innovation-driven dimension.

FIGURE 1: THE THREE DIMENSIONS OF GREEN INDUSTRIAL POLICIES



Source: Authors’ elaboration based on Anzolin, G. and Lebdioui, A., (2021). “Three dimensions of green industrial policy in the context of climate change and sustainable development”.

The first policy dimension promotes “green consumption” and includes policies that aim to influence consumer behaviour. These may involve both market-based mechanisms (e.g. fees and taxes that increase the cost of carbon-intensive goods and activities) and regulations (such as product bans). The main purpose of these policies is “how to make people buy greener”. Policies that aim to change consumer behaviour are necessary but often fail to deliver results (especially in terms of local industrial benefits) if there is no proper coordination with domestic production processes. Consumer behaviour is also unlikely to change if it is more costly for them to reduce carbon emissions than to buy the right to pollute by paying for carbon permits or if carbon taxes are too low. The success of such policies is also highly dependent on the pre-existence of quality alternatives that consumers can fall back on. Bans might be met with resistance if individuals feel that such policies infringe on their individual freedoms, which is more likely to be the case when the quality of green consumption alternatives is lower than the standards consumers are used to.

The second policy dimension addresses the challenge of producing the same goods with fewer resources and lower GHG emissions, namely by improving the environmental sustainability of existing productive activities and value chains. It includes policies that aim to influence firms’ behaviour in terms of changing their business and manufacturing practices. This dimension is particularly relevant considering that 90 firms worldwide are responsible for two-thirds of GHGs.

Policies that fall within this second dimension could have different impacts across sectors because not all industries have the same possibility to retrofit or reduce waste/pollution with their existing technologies. **Greening our economies may therefore not only require a shift in the way we produce goods but also in the way we consume them.** Incentives at the firm level (the 2nd dimension of GLPs in Table 1) therefore complement both consumer incentives (1st dimension) and innovation policies (3rd dimension) because their success heavily depends on the strength of low carbon innovation ecosystems that can reduce costs and provide low emission solutions for firms’ production processes.

The 3rd dimension addresses climate change mitigation as something that is based, above all, on the transformation of the economy’s productive structure towards low carbon manufacturing. This is perhaps the most critical policy dimension for seizing the industrial benefits that arise from global decarbonization but is also the most complex one as it requires organizational capabilities at both the institutional and industrial level. Countries that have adopted the 3rd dimension aim to go beyond mere renewable energy adoption and deployment measures, and also support the production of goods and services, which feeds directly into low carbon technology value chains.

Examples are plentiful and include recent policy action by governments in the United States (especially as part of the recent Inflation Reduction Act), China, Brazil, India and the EU. In China, for instance, careful coordination between demand- and supply-side policies has fostered an impressive development of the electric bus industry. China’s policy in the wind sector has enabled the accumulation of technological capabilities, and included the adoption of local content requirements for wind turbines, support for local R&D activities and technological acquisitions, as well as demand- and supply-side policies.

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Policy implications: key considerations for successful green industrial policy

In developing countries, early greening rather than delaying the implementation of measures ('growing now and cleaning up later') can generate a range of co-benefits, while these countries gain a foothold in the markets of the future, avoiding asset stranding, and the risk of locking their economies into energy-intensive pathways as energy systems tend to have high a path dependency. Indeed, the green transformation and the related technical-economic paradigmatic changes across institutional, market and technological domains are opening up so called green windows of opportunity for emerging economies to become leaders in new sustainability-related industries. Seizing such green windows of opportunities is no easy task, however. Major challenges must be overcome, especially in relation to building up basic and intermediate production capabilities, which are often lacking in developing countries. These production capabilities must be reinforced by coordinated green industrial policies that coherently cut across the three dimensions we have identified. The development of production capabilities is crucial as developing countries are in a unique position to embark on a path of industrialization based on specific technologies, such as solar, wind and tidal energy, which will also bolster local development.

Although there clearly is no one size fits all, a holistic approach is needed both in terms of policy instruments and objectives, which, inter alia, will maximize the socio-economic spillovers of green transitions. In addition to increasing access to low carbon solutions, green industries can generate wider socio-economic benefits beyond those in the environmental domain (such as skilled job creation, expansion of productive capabilities, foreign exchange revenues and macroeconomic resilience in the face of transition risks). Although the most effective green industrial policies coherently cut across the three dimensions we have identified, each country's political, social and economic characteristics, such as the starting composition of their productive structures, the size of their domestic market, policy ambitions, development needs, and the strength of domestic social coalitions in support of a green agenda, profoundly influence the way policymakers choose to

address the different dimensions of green industrial policy, as well as more generally the speed and scale of the decarbonization process. Researchers and policymakers can draw valuable lessons from studying the experiences of industrialized economies (such as the EU, Japan, the Republic of Korea, or the United States) and large developing economies (such as Brazil or China). Their experiences may not often be easily replicable, however.

We must also bear in mind that innovation is often path dependent on productive capabilities. Green industrialization requires the existence of a range of (often pre-existing) capabilities at different levels (both individual and collective). China was already industrializing before it emerged as the leading low-cost producer of photovoltaic cells and modules; in Brazil, the success of the wind turbine manufacturing sector relied on its ability to leverage the pre-existing domestic capabilities in aircraft manufacturing. In addition, the Chinese example—as well as the Brazilian one, albeit to a lesser extent—may be unique given their domestic markets' unusually large size and the relatively high capacity of the State to design and implement a coherent set of policies.

For developing countries aiming to embrace a green industrial policy agenda, careful policy planning and an adaptation to the local economic, political and social contexts will be particularly critical if they are to succeed. Some key considerations for effective green industrial policy design and implementation include:

- Fluid dialogue between different stakeholders, such as public agencies, higher education institutions, financial institutions and the private sector;
- Resources for patient capital that can be deployed to finance long-term R&D;
- Stable demand-side policies: effective use of public procurement policies and incentives for consumers and firms to avoid demand volatility for domestically produced local carbon technology;
- Targeted development of skilled human capital to produce and scale up low carbon solutions.

In the context of a century that will be characterized by the global fight against climate change, we should also not forget that the status quo is unlikely to help developing economies leap to the development frontier. Climate change will continue to have an increasingly serious impact on trade and development across the

globe, which seriously jeopardizes human livelihoods, economic productivity and food security, especially in developing countries. It is undeniable that the quest for more sustainable development models requires bolder policy steps towards greener industrial models based on the inclusive expansion of low carbon industries.

Endnotes

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