

Porcile, Gabriel; Alatorre, José Eduardo; Cherkasky, Martín; Gramkow, Camila; Romero, João

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Invited Article

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New directions in Latin American Structuralism: a three-gap model of sustainable development

Gabriel Porcile,* José Eduardo Alatorre, Martín Cherkasky and Camila Gramkow
The United Nations Economic Commission for Latin America and the Caribbean (ECLAC), Santiago, Chile

João Romero
CEDEPLAR, Federal University of Minas Gerais, Brazil

Sustainable development implies reducing the gap in GDP per capita between center and periphery, increasing equality and protecting the environment. In this paper, we present a simple model within the Structuralist tradition that combines these three dimensions of sustainable development. We define three rates of growth: the minimum required to reduce inequality and eradicate poverty (y^S); the maximum compatible with external equilibrium (y^T); and the maximum compatible with a global carbon budget (y^L). Estimations of these rates of growth for Latin America suggest that $y^S > y^T > y^L$. We argue that a combination of industrial and technological policies, along with a major effort at income redistribution, is necessary for having $y^S = y^T = y^L$, which defines a sustainable development path.

Keywords: *sustainable development, Latin American Structuralism, growth and distribution*

JEL codes: *F63, O14, O44*

1 INTRODUCTION

Latin American Structuralism (LAS) is part of the core of heterodox thinking on economic development. In this paper we focus on the advances of LAS in the field of sustainable development and discuss some of its implications for economic policy and the political economy of development. The concept of sustainable development implies not only reducing the gap in GDP per capita between center and periphery, but also that this should be attained with growing equality and respecting the environmental boundaries of the planet. We present a simple model within the LAS tradition that combines the three dimensions of sustainable development, namely the economic, social and environmental dimensions.

The backbone of LAS is the center–periphery theory, namely the idea that the international system is fundamentally asymmetric and that asymmetries tend to reproduce over time. First, it is asymmetric in technological and productive capabilities (Bértola/Ocampo 2012) due to what Prebisch (1950) called the ‘slow and unequal diffusion of technology’ at a global level. Second, it is asymmetric in the financial sphere as the periphery occupies a subordinated position in the hierarchy of currencies (Fritz et al. 2022). Last but not least, it is asymmetric from the point of view of power relations in the international system,

* *Corresponding author.* Email: jose.porcile@cepal.org.

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as the periphery has very little sway in the definition of the rules of the game governing the system (Rivarola Puntigliano 2017).

The contribution of this paper to the existing literature is to integrate within a simple analytical framework the different dimensions of sustainable development; provide broad quantitative estimations of the changes required in trade patterns, emissions and income redistribution in Latin America; and address industrial, environmental and social policies as interactive and self-reinforcing rather than in isolation.

The paper is organized into five sections, besides the introduction and the concluding remarks. Section 2 discusses convergence and divergence based on a Balance-of-Payments (BOP)-constrained growth model; Section 3 extends the model to include the concepts of social and environmental equilibria, along with external equilibrium; Section 4 articulates the three dimensions of sustainable development in the form of three rates of economic growth and the gaps between them; and Section 5 presents some empirical evidence for Latin America of the magnitude of those gaps. It is argued that closing the gaps requires a combination of large-scale income redistribution, along with industrial and technological policies with a focus on green technologies.

2 THE ORIGINAL LAS MODEL AND THE CRUCIAL ROLE OF STRUCTURAL CHANGE

LAS combines insights from the Schumpeterian tradition in the fields of technological innovation and diffusion with the demand-led growth models of the Keynesian tradition. One way of looking at LAS is as a theory of divergence between two regions based on the persistence of the technology gap and the inertia of specialization patterns in the absence of industrial policy.

We start with the canonical BOP-constrained growth equation which is part of both LAS and Keynesian growth models (see Thirlwall 2011):

$$y^T = \frac{\varepsilon}{m} y^W, \quad (1)$$

where y^T is the rate of economic growth that keeps the current account in equilibrium; ε is the income elasticity of exports; m the income elasticity of imports; and y^W is the rate of growth of the rest of the world. It is assumed that the real exchange rate is stable in the long run and does not affect the equilibrium rate of growth. For a thorough review of this model see Blecker/Setterfield (2019: ch. 9) and Blecker (2022).

The rate of growth of exports of goods and services should equal the rate of growth of imports, $\varepsilon y^W = m y^T$. If elasticities are given and growth in the rest of the world is exogenous (which is a reasonable assumption if the periphery is a small open economy), then the rate of growth of the periphery must adjust to satisfy equation (1) to prevent an explosive trajectory of the external debt. Short-term fluctuations and cycles may occur around the trend, particularly as a result of cycles of international liquidity in a financialized global economy (see Spinola 2020; Botta 2021; Hein/Van Treeck, 2010). These fluctuations could, in some cases, give rise to hysteresis effects. Moreover, y^T is the maximum rate, which in some cases might not be attained, which happens when the economy accumulates reserves. However, we will ignore these complications and focus on equation (1) as a good predictor of the long-run rate of economic growth.

Convergence in GDP per capita gap between center and periphery (abstracting from differences in population growth in the two poles of the system) entails:

$$\frac{y^T}{y^W} > 1 \Leftrightarrow \left(\frac{\varepsilon}{m}\right) > 1. \quad (2)$$

Technological and productive asymmetries are reflected in the pattern of specialization and shape the elasticity ratio ε/m . These asymmetries explain why the periphery specializes in exports from low-tech sectors whose demand is relatively weak in the international economy, while at the same time is highly dependent on high-tech imports whose demand grows at a very fast rate with the rise of domestic income (Romero/McCombie 2018). Structural change (transforming the pattern of specialization and hence the income elasticity ratio) is key for redefining the position of the periphery in the international system.

Two important points should be stressed. The first is that the income elasticity ratio can vary with the adoption of industrial and technological policies in favor of sectors with higher technological intensity and higher income elasticity of the demand for exports. The supply-side story of LAS finds a perfect match in the evolutionary theory of technical change (Cimoli/Katz 2003; Dosi et al. 2022; Porcile 2019). This theory explains why technological backwardness can persist over time due to increasing returns, path dependence, and lock-in phenomena in learning, which impress a strong inertia on the pattern of specialization. Industrial policy is crucial to escape from this trap – which is why the supply-side story of LAS is necessarily an evolutionary story, not a neoclassical one.

A second key point is that having a supply-side story does not mean that Thirlwall's law no longer holds. Technical change, structural change and productivity growth can only affect the long-run equilibrium rate of growth by changing two demand-side parameters, namely the income elasticity of exports, and the income elasticity of imports. In a more straightforward way: no supply-side change can affect economic growth directly but only through changes in effective demand. In the periphery, these changes are driven by the demand for exports and imports.

In sum, convergence with advanced economies requires reshaping the pattern of specialization of the periphery to ease the external constraint on growth. However, convergence is just part of the challenge of sustainable development, which should also comply with the objectives of social inclusion and protecting the environment. These are the topics addressed in the next sections.

3 SOCIAL AND ENVIRONMENTAL SUSTAINABILITY

There are endogenous forces in the market system (within the current rules of the game in the international economy) that make the BOP the binding constraint on economic growth in the periphery – and hence make y^T the equilibrium solution in the market. Economic agents cannot ignore this constraint, which is incorporated in expectations and decisions regarding new investments and production in the face of trade imbalances.

But there are other constraints that represent externalities that uncoordinated private decisions cannot address. Inequality creates a political economy that threatens political stability and the ability of private and public agents to uphold institutions conducive for growth and innovation (ECLAC 2020). In the same vein, environmental destruction is a canonical example of externalities not internalized in private decisions with significant impacts on future growth and welfare (Stern 2022). In both cases, there are no market forces working to correct the grave effects that either the escalation of political conflict, or environmental destruction produces on welfare and the prospects of peaceful development. As argued by Huwe/Rehm (2022: 398), the 'ecological crisis can be characterized by three interlinked dimensions of ecology, inequality and the economic system'. How can these three dimensions be put together in an analytical framework that allows for discussing their interactions in a more rigorous way? We define three rates of growth: the one

with external equilibrium (y^T), which represents economic sustainability for the periphery; the rate of growth required for social sustainability (y^S), which is the one compatible with growing equality in the economy; and the rate of growth that respects the ecological limits of the planet (y^L). The determinants of y^T have already been discussed, so we focus on y^S and y^L .

3.1 Social sustainability

Patterns of specialization entail distributional implications. LAS has argued that peripheral economies are characterized by ‘structural heterogeneity’, meaning that differences in labor productivity across the production structure of the periphery are very high. A simple way of approaching this is to see the periphery labor market as dual, with a large informal sector of workers allocated in activities of very low productivity.

Figure 1 offers a graphical representation of structural heterogeneity and how it is related to the pattern of specialization.¹ The figure contains three panels. Panel NW keeps the current account in equilibrium (points on the curve $y^T = \frac{\varepsilon}{m} y^W$). The vertical line y^W gives the exogenous rate of growth of the center (a given for the periphery, which is assumed to be a small country). Panel NE translates the production structure into a certain employment structure in the periphery, in particular, the share of formal employment in total employment, represented by the letter N . The distance AC ($1 - N$) is a measure of structural heterogeneity (share of underemployed workers in total employment) in the periphery. For simplicity, we use the terms ‘underemployment’ and ‘informal jobs’ as equivalent. Panel SE can be seen as an expression of the ‘wage curve’ in the periphery, where the wage share depends positively on the share of formal employment N .

We start with structural change in the periphery in panel NW, which increases $\frac{\varepsilon}{m}$ and shifts the TB curve from TB1 to TB2. Workers move from underemployment to the higher-productivity formal jobs created by the diversification of the economy. Structural change is the engine that absorbs the labor surplus in decent jobs.

The new higher rate of growth raises formal employment in panel NE, from N_1 to N_S . Shrinking underemployment, the rise of real wages, more sophisticated skills, and the higher quality of employment favor income redistribution towards labor (Oreiro et al. 2022). More workers enjoy labor rights and social benefits, with a positive effect on unionization and bargaining power. This redistribution of income and power is captured in panel SE, where the wage share w responds positively to higher levels of employment, $w = w(N)$, $w_N > 0$. Positive feedbacks may exist between wage share and productivity growth (not included in Figure 1).

There is no clear-cut definition for y^S , except that it should allow for growing equality and the incorporation of the underemployed to formal labor markets at a rate that ensures political and social stability in the context of political democracy.² For simplicity, the graph assumes that y^S represents zero underemployment in the periphery (which is the same as assuming that there is full employment in the formal sector). $N_S = 1$ should

1. If aggregate demand increases, but neither the TB curve nor growth in the center change, then in point B a trade deficit will emerge.
2. The higher the share of underemployment in total employment and the weaker the institutions for income distribution and social protection, the higher will be y^S , the rate of growth required for inclusion and social and political stability in democracy.

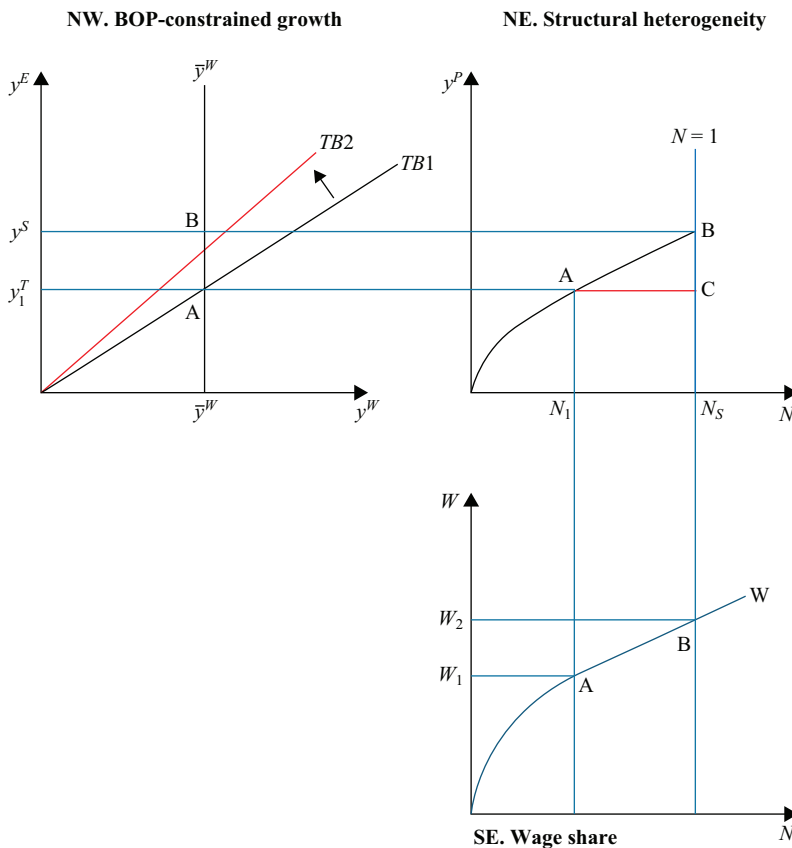


Figure 1 Structural change, employment and real wages

not be interpreted literally, but as a useful simplification that captures the idea that employment and inclusion are central to sustainable development.

In sum, the gap between N_1 and N_S is a measure of structural heterogeneity (the share of workers in low-productivity jobs); closing this gap demands a rate of growth y^S , which in turn can only be sustained over time if there is a transformation of the pattern of specialization that makes y^T converge to y^S .

3.2 Environmental sustainability

Current patterns of growth and consumption compromise the capacity of the planet to sustain life. The loss of biodiversity, the amount of hazardous chemicals and toxic waste released in the air, seas and soil and greenhouse gas (GHG) emissions leading to climate change are examples of the destructive impact of human action on nature. We will use GHG emissions as a proxy for these various forms of environmental destruction, while keeping in mind that it is a very partial indicator.

The rate of GHG emissions depends, on the one hand, on the rate of economic growth, since growth demands energy, part of which is supplied by fossil fuels.³ On the other hand, it depends on technological efforts directed at increasing the efficiency of energy consumption and at changing the energy matrix towards renewables. Consequently, GHG emissions are directly related to the economic structure of each country (Romero/Gramkow 2021).

The environmental constraint on growth can be represented by a carbon budget given by the maximum level of GHG compatible with preventing the temperature of the earth from rising above 1.5°C (the critical level identified by the science of climate change). From a center–periphery standpoint, the problem is thus how to allocate the carbon budget: the higher the rate of growth of the center, the lower the amount of the carbon budget left for the periphery, and the lower the rate of growth of the periphery compatible with environmental sustainability. Inversely, structural and technical changes that reduce GHG emissions per unit of GDP expands the carbon budget, and hence the potential rate of growth with environmental sustainability that can be attained by the periphery given the rate of growth of the center.

Following Althouse et al. (2020) and ECLAC (2020), assume that $-x$ is the rate of reduction of GHG emissions that must be attained at a global level to keep the earth temperature below 1.5°C. We define the center–periphery environmental frontier (CPEF) as the combinations of the rates of growth in the center (y^W) and periphery (y^L) that allows for a reduction of emissions equal to x . Formally:

$$y^L = \frac{1}{a} \left[\underbrace{\left(z^C - x \right)}_A + a \left(\underbrace{z^P - z^C}_B \right) - \underbrace{(1 - a)y^W}_C \right] \quad \text{with } 0 < a < 1. \quad (3)$$

In equation (3), y^L is the rate of growth of the periphery compatible with environmental sustainability – the higher the rate of growth in the center, the lower the y^L . The intercept of the curve depends on the rate of growth of GHG efficiency due to green technical change in the center (z^C) and the periphery (z^P), weighted by the share of the periphery in global GHG (a). The impact of green innovations in the center is captured by the term $(z^C - x)$, which is growth of GHG efficiency in the center as compared with the target (the ceiling of 1.5°C), and the term $(z^P - z^C)$. The latter is the velocity with which the periphery catches up with green technological change in the center (the change in the technology gap of the periphery with respect to the environmental technological frontier). Assuming that the center is the technological leader, if $z^P > z^C$, then technical change is faster in the periphery (catching up in green technologies); if $z^P < z^C$, there is technological divergence in favor of the center, as the periphery lags behind the green technological frontier.

In sum, there is a maximum rate of growth the periphery can attain (given the existing technology and the rate of growth of the center) to keep emissions below the critical level identified by climate change science. This rate of growth is expressed in the y^L, y^W plane as the center–periphery environmental frontier (CPEF). Growth in the periphery depends negatively on growth in the center; the CPEF may shift towards the right due to innovation and catching up in green technologies, as discussed in the next section.

3. The association between economic growth and GHG emissions is not a necessary one. New propositions for reshaping the patterns of growth, such as the Green New Deal, point out that the right mix of climate policies can allow for decoupling growth and emissions (see Barbier 2019).

4 THE THREE GAPS OF SUSTAINABLE DEVELOPMENT: A SIMPLE MODEL

4.1 The three gaps

The rate of growth necessary for social equilibrium in the periphery is higher than the rate of growth consistent with external equilibrium, while the latter is higher than the one compatible with environmental sustainability, i.e. $y^S > y^T > y^L$.⁴ These inequalities yield three gaps: the social gap ($y^S - y^T$), which is the difference between the required rate of growth for social equilibrium and that compatible with external equilibrium; the environmental gap ($y^T - y^L$), which is the difference between the BOP-constrained rate of growth and the one that respects the environmental limits of the planet; and the sustainable development gap, which is the sum of both gaps, ($y^S - y^L$). *An economy can be considered to be moving along a sustainable development path if and only if it is true that the equality $y^S = y^T = y^L$ is satisfied in the long run.*

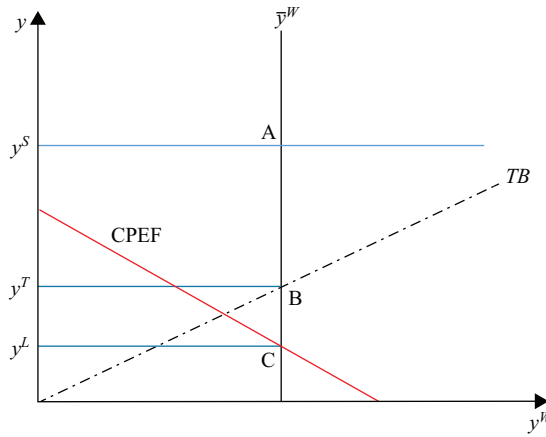
In the periphery, the highest of the three rates of growth is the one required for social equilibrium, y^S . This results from high initial levels of inequality, high levels of poverty and the large share of underemployed workers in the labor market. The pattern of specialization of the periphery, heavily concentrated in low-tech sectors, makes y^T systematically below y^S . Nevertheless, in spite of y^T being lower than what is needed to curb underemployment, patterns of growth and consumption are unsustainable from an environmental point of view. Even the relatively low levels of growth in equilibrium associated with a low income elasticity ratio ($\frac{g}{m}$) are higher than y^L if there is no significant decoupling between GHG emissions and GDP growth. In short, $y^S > y^T > y^L$. For attaining sustainable development (the equality of the three rates of growth), y^T and y^L should converge to y^S .

As mentioned, of the three rates of growth only y^T emerges from market forces in trade and financing. There are no market forces working in favor of social or environmental equilibrium. Therefore, the equality between the three rates of growth should be attained through public policies that modify the intensity and direction of structural and technical change towards environmental protection, along with measures to redistribute income in favor of labor.

Figure 2 presents the ‘business as usual’ scenario, which reinforces international asymmetries. The curve TB is the same as in Figure 1; the curve CPEF is the center–periphery environmental frontier, that gives the rate of growth of the periphery required for reducing GHG emissions at the rate x for each rate of growth in the center; and the horizontal line gives the rate of growth for social equilibrium. The center grows at an exogenous rate y^W . The distance between points A and B is the social gap, while the distance between B and C is the environmental gap. The AC segment gives the total gap of sustainable development.

In one scenario (which reflects the prevailing trends in the international political economy), the center heightens its efforts at green innovation but there is no international cooperation for the diffusion of technology or green industrial policy in the periphery. Green innovation in the center shifts the CPEF to the right, but the shift is small because the periphery fails to absorb these new technologies, leading to a higher environmental gap. If the periphery loses international competitiveness as a result of

4. Please see Section 5 for the empirical estimates.



Notes:

y^T : rate of growth with external equilibrium

y^L : maximum rate of growth compatible with environmental sustainability

y^S : minimum rate of growth required for social equilibrium

AB social gap; BC environmental gap; AC gap of sustainable development

Figure 2 The three gaps of sustainable development

being left behind in technical change, y^T falls and the social gap increases. The most likely result is therefore an increase in the three gaps of sustainable development.

Taking stock: the combination of poverty and underemployment, low levels of diversification and technological capabilities, and the prevailing patterns of production and consumption, gives rise to a scenario in which $y^S > y^T > y^L$. To make all the rates of growth converge to y^S needs changes in both the intensity and the direction of technical change, as discussed below.

4.2 The model

To keep the model simple, we assume that the total labor force in the periphery is constant and equal to 1. Increases in formal employment N therefore represent a fall in the share of underemployed labor. The economy has a very large reservoir of labor in the informal sector and hence $0 < N \ll 1$. The rate of growth of formal employment (\hat{N}) equals the BOP-constrained rate of growth (y^T) minus the rate of growth of labor productivity (a) in the long run:

$$\hat{N} = y^T - a. \tag{4}$$

Technological change plays two roles. One is to increase labor productivity; the other is to reduce GHG emissions through new processes and products and the deployment of new technologies for energy production based on renewable sources. The relative importance of the two avenues of technological change depends on the direction of investments in R&D. We assume it can be changed by policy decisions, which are exogenous to the model.

4.2.1 Technical change and labor productivity: the modified Kaldorian regime

Let us look first at the impact of technical change on labor productivity. We assume a modified Kaldorian function of technical change based on dynamic increasing returns. For simplicity, we specify the technical change function as linear in N and y^T .

$$a = g_0 + g_1 y^T + g_2 N. \quad (5)$$

The productivity regime is Kaldorian because labor productivity increases with the rate of growth of the economy y^T (learning by doing), $g_1 > 0$; but it is a ‘modified Kaldorian’ regime because there is an additional variable in the argument of the technical change function, namely employment in the formal sector, N . As the economy becomes more diversified and sophisticated, N increases and fewer workers are underemployed. Positive externalities arise from advanced skills and capabilities, which accelerate productivity growth, $g_2 > 0$. Another reason for having $g_2 > 0$ is that a higher N implies rising real wages and hence more incentives for labor-saving induced technical change (the Sylos–Labini equation; see Fontanari/Palumbo 2022; Storm/Naastepad 2012).

Combining equations (2), (4) and (5) gives:

$$\hat{N} = \frac{\varepsilon}{m} y^W (1 - g_1) - g_0 - g_2 N. \quad (6)$$

And in equilibrium formal employment (N^*) is:

$$N^* = \frac{\left[\frac{\varepsilon}{m} y^W (1 - g_1) - g_0 \right]}{g_2}. \quad (7)$$

A higher N^* also means a higher wage share equilibrium $w^* = w(N^*)$. The critical role of effective demand in increasing formal employment comes directly from equation (7). N^* responds positively to growth in the center and the income elasticity ratio and negatively to the learning parameters of the economy related to labor productivity (g_0, g_1, g_2). Two additional assumptions are key for this result. First, real wages increase *pari passu* with productivity growth and hence price competitiveness does not change out of labor-saving technical change. Second, there is no technological spillovers from labor-saving technical change to green technical change, as discussed below.

4.2.2 Green technical change: the green technology gap

The second role of technical change is to reduce GHG emissions per unit of output. Define $Z^i = Y^i / (GHG)^i$, units of GDP per unit of GHG emissions as the GHG efficiency with $i = C, P$. In the tradition of the center–periphery models, the potential for the diffusion of green technologies from center to periphery is assumed to be a positive function of the stock of green technologies available in the center as compared to that in the periphery (see Fagerberg/Verspagen 2002). The potential diffusion of technology to the periphery increases with the green technology gap, proxied by the gap in the GHG efficiency, $Z = Z^C / Z^P$. Taking logs and differentiating with respect to time, it is straightforward that $z = z^C - z^P$, where small letters are proportional rates of growth (i.e. the rate of change of the gap in GHG productivity is $z \equiv Z^C / Z^P = z^C - z^P$). We will use ‘green technology gap’ and ‘GHG productivity gap’ as synonymous.

Formally, the center–periphery green technology gap evolves as follows:

$$z = f(Z), f_Z < 0. \quad (8)$$

The function $f(Z)$ falls monotonically with the size of the green technology gap. Economies that are far apart from the green technological frontier learn faster than those closer to it because they have a larger backlog of innovations to imitate. Still, the potential for imitative learning only becomes effective when there are domestic efforts and institutions devoted to capacity-building in these technologies. Better institutions for learning in the periphery (what Freeman (2004) called ‘technological infrastructure’) implies a lower value of Z in equilibrium (a fall in the green technology gap).

The diffusion of green technology does not only affect emissions. It also changes the production structure and the $\left(\frac{\varepsilon}{m}\right)$ ratio. Several factors concur to explain why. First, a green transition requires changing the energy matrix, creating new inputs and redefining the product mix and production processes (Romero/Gramkow 2021). In other words, a green transition entails a profound transformation of the production structure. Second, higher energy productivity may help new sectors of the economy to become competitive and access global markets that are increasingly environmentally strict. Third, patterns of consumption are changing out of a growing awareness of climate change. Consumers are changing their preferences in favor of greener goods and services, while governments impose new regulations in international trade that penalize carbon-intensive goods. As a result, a fall in Z produces a positive effect on structural change and the international competitiveness of the periphery, which begins to export a broader set of goods to the center, or replace brown imports by greener domestic production.

A lower Z means a higher $\varepsilon(Z)/m$ (equation 9, where the income elasticity of exports falls with Z), a higher BOP-constrained growth y^T and a higher rate of employment creation (equation 7’):

Formally:

$$\varepsilon = \varepsilon(Z), \varepsilon_Z < 0. \quad (9)$$

And:

$$\widehat{N} = \left[\frac{\varepsilon(Z)}{m} \right] y^W (1 - g_1) - g_0 - g_2 N. \quad (7')$$

Recall that all parameters in equations (9) and (7’) are positive, while N is the share of formal employment in total labor supply, $0 < N < 1$. The demand of workers in the formal labor market continues to depend on global growth, but now growth depends (negatively) on the green technology gap. Labor-saving technical change reduces the demand of labor under the assumption of no technological spillover between the two types (labor-saving and GHG-saving) of technical change. In this (somewhat extreme) version of the model, only green innovations affect growth. This has to do with the fact that: (i) the model is demand-led and (ii) only green technical change has an impact on the income elasticity of exports (see Gramkow/Anger-Kraavi 2019).

4.2.3 Equilibrium and stability

Equations (7') and (9) form a system of differential equations where the state variables are N and Z . The Jacobian of the system is:

$$J = \begin{vmatrix} -g_2 & \varepsilon_z \left[\frac{y^W}{m} \right] (1 - g_1) \\ 0 & f_Z \end{vmatrix}.$$

The trace is negative (since $g_2 > 0$ and $f_Z < 0$) and the determinant ($-g_2 f_Z$) is positive, hence the equilibrium solution is stable.

We are interested in two changes in the value of the parameters of the dynamic model. The first is a change in policy that accelerates the diffusion of green technologies in the periphery and reduces the green technology gap in equilibrium. This change may come out of a reallocation of resources towards R&D in green technology and / or the adoption of a new regulatory framework in favor of low-carbon production processes and goods. The second change is a policy that accelerates labor-saving productivity and hence changes the level of formal employment in equilibrium at each level of GDP.

The results are very different in terms of growth and formal employment. Green technical change impacts international competitiveness and therefore aggregate effective demand, giving rise to a higher level of formal employment in equilibrium. This in turn reflects a more complex production structure than before the policy change. In the case of labor-saving technical change, as there is no impact of the policy on aggregate demand, there will be a reduction in formal employment, while the green technology gap does not vary.

In sum, a policy that encourages catching up in green technologies may have a positive impact both on competitiveness and employment, while a focus on labor-saving technical change may have a negative impact on employment (and hence on the inclusiveness of the growth path). The model highlights the importance of the *direction* of technical change, alongside its intensity.

5 A SIMULATION FOR LATIN AMERICA

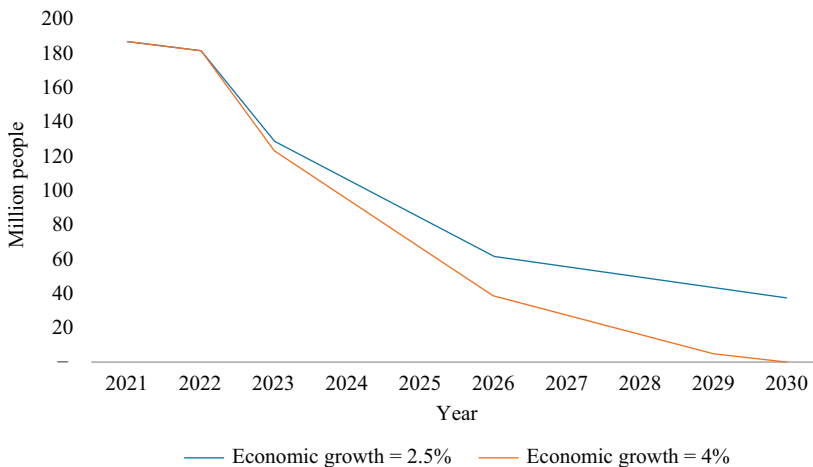
In this section we simulate a growth trajectory for Latin America which combines the three equilibria. First, we present some operative definitions of the three rates of growth that define the sustainable development path. Subsequently, we estimate the size of the existing gaps and provide a rough measure of the effort at income distribution and structural change required to close those gaps. The simulations are updated estimations of those provided by ECLAC (2020) and Samaniego et al. (2022).

We will define y^S as the growth rate necessary to eradicate poverty in an imaginary country, which is the aggregate of the entire Latin America. The percentage of people below the poverty line in the region was about 33 per cent in 2022. To end poverty, measures aimed at 'pure' income redistribution must be combined with measures for the creation of employment. We work with a scenario in which Latin America makes a strong commitment with the redistribution of income, which consists in taxing the rich to transfer an amount equivalent to one monetary poverty line to the poor. The initial tax and transfers equal 1.5 percentage points of the income share in GDP of the richest 10 per cent (who own about 60 per cent of total income in Latin America, according to the

World Inequality Lab) in 2023. The tax and transfers then increase 0.5 percentage points every year until reaching 3 percentage points of the richest 10 per cent in 2026 (i.e. 0.3 percentage points of the GDP is transferred to the poor). Taxes and transfers remain at the same level thereafter. This is a significant effort at redistribution, but not particularly ambitious. First, it just implies monetary transfers corresponding to one poverty line, which is a rather modest goal in terms of improving the welfare of the poor. Second, it implies reducing the Gini index of the whole Latin American region from about 0.46 to 0.4, which is the Gini index of Uruguay. This is hardly a radical advance in equality although, as mentioned, a significant one in the context of the extremely high levels of inequality that characterized Latin America throughout its history.

The reduction of poverty should arise from the redistribution of income, but also from the rise in formal employment, which in turn depends on economic growth per equation (7'). Figure 3 shows the number of people expected to be below the poverty line in 2030 assuming different rates of growth in Latin America between 2022 and 2030 (always under the of the monetary transfers described above). We simulate two scenarios, one in which growth is 2.5 per cent per annum (which assumes the continuation of the trend observed in the 1990–2019 period in Latin America) and the other in which is 4 per cent per annum. The simulations show that only the scenario with 4 per cent growth per annum is consistent with the objective of eradicating poverty in 2030. The actual growth rate in the region in the period 2014–2019 was extremely slow (just 0.3 per cent per year) and the estimates for 2022 suggest an annual growth rate of about 1.8 per cent. As shown in the simulations, this trend is below the rate of growth needed to eradicate poverty.

In addition, growth for social equilibrium is above the BOP-constrained rate of growth (i.e. $y^S > y^T$). The latter rate can be estimated (as argued in the theoretical model) using Thirwall's law, i.e. by estimating the ratio between the income elasticity of exports and the income elasticity of imports, and multiplying this ratio by the expected rate of growth of



Notes: Two scenarios are represented: one in which Latin America grows at a steady rate of 4 per cent between 2021 and 2030; and the other in which Latin America grows at a steady rate of 2.5 per cent, which is the 1990–2019 average.

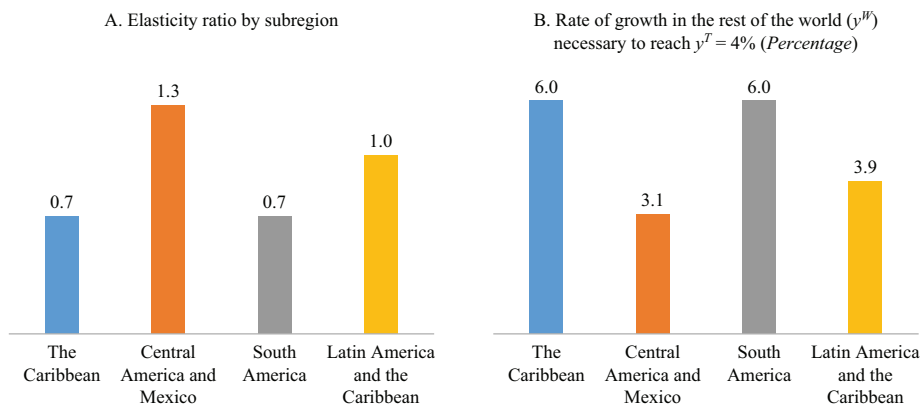
Figure 3 Poverty and growth: estimated number of people in poverty in Latin America in 2030 with income redistribution under two different scenarios of economic growth

the global economy until 2030. This exercise should be taken *cum grano salis* since there is a lot of uncertainty about what will happen with global growth and barriers to trade in the next decade. Still, the estimations provide a broad indication of the difficulties the region faces in the quest for sustainable development.

Figure 4A shows the income elasticity ratio for different subregions of Latin America and the Caribbean. Figure 4B shows the rate of growth of the global economy that would be necessary for attaining the 4 per cent rate of growth in Latin American and the Caribbean *if elasticities do not change*. It can be seen that – perhaps with the exemption of Mexico and Central America – the expected rates of growth of the world economy would not allow these countries to attain the social equilibrium rate of growth while at the same time avoiding external imbalances. For South America and the Caribbean, the required rate of growth of the international economy is about 6 per cent, a rate that is clearly well above of what is expected for the coming years.

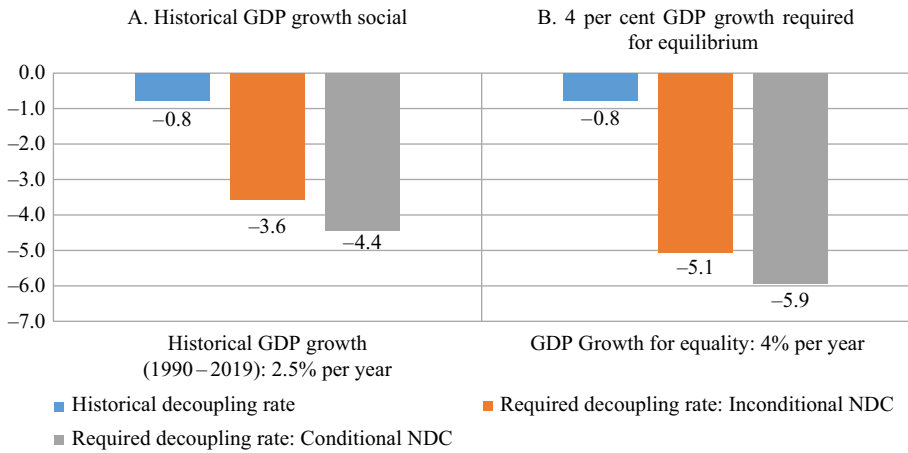
Last but not the least, we look at how to conciliate growth in LA with targets for GHG emissions. While climate change science does provide an indicator of total GHG reductions required to be on the CPEF, it cannot answer how the global carbon budget should be distributed among individual countries and regions. A just transition should allow developing economies to use more of the carbon budget than developed economies. Ultimately, however, international negotiations and political power will determine the exact point on the CPEF that will be chosen.

To overcome the problem of not having a clear target for LAC's GHG emissions, we choose the one that the Latin American countries themselves promised to achieve in their National Determined Contributions (NDCs). This is the target used in Figure 5, which shows the rate of green technical change (decarbonization rates, the negative of z in the model) required to honor the NDCs if the rate of growth continues at its historical pace (Panel A) or if the rates of growth equals the 4 per cent necessary for social equilibrium (Panel B).



Notes: The estimation presented uses information from the Penn World Table (version 10) containing observations for 32 countries in the region for the period 1990–2019. The estimation of the elasticities for Latin America and the Caribbean was done using panel dynamic ordinary least square (DOLS).

Figure 4 Required rate of growth in the rest of the world for stable growth in selected regions in LA, based on elasticity estimates



Note: Two scenarios are represented: one in which Latin America grows at a steady rate of 4 per cent between 2021 and 2030; and the other in which Latin America grows at a steady rate of 2.5 per cent, which is the 1990–2019 average.

Figure 5 Growth and decarbonization rate under two growth scenarios (in percentage)

Figure 5 shows that, even in the case that the region continues to grow at the extremely low levels of the period 1990–2019, a fall of 0.8 per cent in GHG per unit of GDP would not be enough to attain the least ambitious of the NDC (-3.6 per cent). Moreover, if the region succeeded in attaining the goal of growing at a least 4 per cent per year, the effort for decoupling should be more than six times higher than the historical rate of decarbonization.

6 CONCLUDING REMARKS

The challenge of sustainable development is to provide decent jobs and rising living standards in the periphery, while at the same time preventing growth from destroying the environment. We have addressed this problem in a highly simplified way defining three rates of growth: the minimum required to end poverty (y^S); the maximum compatible with external equilibrium (y^T); and the maximum compatible with a global carbon budget (y^L). The estimation of these rates of growth, and the analysis of its determinants, may contribute to devise a coherent development strategy.

We estimated these three rates of growth for Latin America and find that $y^S > y^T > y^L$. This means that the actual growth path does not comply with the objectives of inclusiveness and respect for the environment. Our figures are preliminary, but they do provide a first quantitative estimation of the magnitude of the gaps between the social, economic and environmental objectives of sustainable development – and hence of the magnitude of the policy changes needed to make the three rates converge.

An effective response to the three-gap challenge demands the combination of a broad set of policies and new political coalitions to sustain it. At the international level, the problems of the just transition to a green economy require strengthening multilateral cooperation in technological, financial and trade issues to reduce the technology gap in green technologies (green

catching up). At the domestic level, there are two closely intertwined policies that should be embraced. One is a major effort at eliminating poverty, reducing inequality and extending social protection. The other is to encourage domestic investments and institutions for green technologies that boost decarbonization while easing the external constraint on growth.

The magnitude of the challenge has led ECLAC (2020) to call for a ‘Big Push for Sustainability’, an articulated set of investments aimed at changing the intensity and direction of technical and structural change towards greener technologies and sectors. The investment ‘package’ should be accompanied by institutional changes that reshapes incentives in R&D and encourage new consumption and production patterns. Technological change would certainly not solve all the problems associated with the climate and inequality crises. Radical changes in the tax system, income redistribution and education are needed to halt the quest for growth and capital accumulation as the only means to manage social conflict.

The political economy conditions necessary for the adoption of these policies, however, are conspicuously absent at this moment. War and geopolitical rivalry have, at least temporarily, compromised the attention that inequality and climate change gained in the past two decades. Insecurity in jobs and income led in some cases to the rise of anti-internationalist (and in some cases xenophobic) sentiments. Strengthening multilateralism, open more policy space for catching up in the periphery and more cooperation in trade and technology are still pending tasks for the international community and domestic politics.

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