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Greening unequal? Conceptualising the impacts of the green transition from a global gendered lens

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Abstract

This paper presents a conceptual framework for an integrated global, sectoral and gendered analysis of the macroeconomic and social dimensions of the green transition with a focus on three critical aspects. The first concerns the uneven global effects of the green transition. Due to differentiated sectoral structures and positions in the global financial architecture, the transition has highly uneven effects across countries: interconnected global production and financial networks can result in the green transition in the Global North having important adverse macrofinancial effects on Global South countries, particularly those reliant on fossil fuel exports, raising climate justice concerns. The second refers to the environmental footprint of green structural change that extends well beyond direct emissions: resource-intensive green activities, such as electric vehicle production, drive ecological degradation through supply chains in Global South producer countries and reinforce green extractivism, making adaptation and the protection of water, land, and biodiversity central for a just green transition. The third is related to the gendered effects of the transition, which can either intensify or reduce existing inequalities through the impact of the green transition on women's paid and unpaid work. These effects diverge between North and South due to differences in labour informality, exposure to environmental degradation, and the gender composition of 'green', 'fossil', and 'purple' sectors. Drawing on post-Keynesian, ecological, and feminist macroeconomics, as well as the physical and monetary input-output approaches, the paper develops a framework that emphasises international and sectoral spillover effects, macrofinancial channels and the local-specific gendered effects of green policies through paid and unpaid work. Based on this framework, the paper outlines how the combined use of green and purple policies can reduce global, sectoral and gender inequalities.

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1. Introduction

There is an urgent need for transformative green and social policies to confront today's intertwined social and environmental crises. Despite the recent backlash against such policies, several countries across the world continue to design and implement policies conducive to the transition to a green economy. Green policies focus on supporting 'green' activities (e.g. production of electricity by renewables, insulation, grid upgrade, industrial energy efficiency and low-carbon public transport) and downscaling 'fossil-based' activities (e.g. production of electricity by fossil fuels, air transport) simultaneously. They are also increasingly supporting climate adaptation and try to address other non-climate environmental challenges, such as water stress, deforestation and biodiversity loss (see e.g. IPCC, 2023; NGFS, 2024). It is now widely accepted that all green policies have global, sectoral, regional, and gendered distributional effects. Although these effects have been explored in recent years (see e.g. Nikolaidi, 2022; Onaran and Oyvat, 2023b; Alexander et al., 2024; OECD, 2025), three issues have received limited consideration from an integrated global gendered lens.

First, differentiated sectoral structures and positions in the global financial architecture suggest that the green transition can have very different effects across countries. The restructuring of energy systems and supply chains in the North can, in some cases, reduce trade imbalances due to the increasing demand for critical minerals that exist in the South. However, in other cases, the green transition in the North can intensify existing trade imbalances by reducing exports from fossil-fuel-dependent Global South countries. This can in turn widen trade deficits, raise public and private indebtedness and disproportionately harm countries with a weak position in the global financial architecture. Countries in the Global South with a weak macrofinancial position also face significant fiscal and balance-of-payments constraints in terms of the financing of their own green spending. This raises significant climate justice issues, since Global South countries have a lower responsibility for the climate crisis (see Hickel, 2020).

Second, the green transition involves several indirect environmental impacts through supply chains, has many non-climate aspects and needs to have adaptation at its core. Several green activities in the Global North have substantial environmental resource demands: electric vehicle production, for instance, relies on resource-intensive processes requiring high quantities of lithium, cobalt, or nickel, which can cause severe ecological degradation from a water, land and biodiversity perspective in producer countries, many of which are in the Global South. This can enhance green extractivism (see Dafermos, 2026). At the same time, climate adaptation policies and measures that prevent water depletion, reduce land conversion, and protect biodiversity are particularly important in the Global South.

Third, the green transition can intensify or reduce existing gender inequalities through its effects on women's paid work in the formal and the informal economy as well as on their unpaid work. Crucially, these gendered effects can differ substantially between the Global North and the Global South. The reason is at least three-fold: (i) the fundamental role of labour informality in the Global South means that the gendered effects of green policies depend significantly on how green and carbon-intensive activities are distributed between formal and informal sectors; (ii) green extractivism and the downscaling of fossil activities can weigh much more heavily on women's unpaid work in Global South contexts, where daily life depends more directly on water availability, agricultural productivity, and access to energy; and (iii) the gender composition of employment in 'green', 'fossil' and 'purple' (education, childcare, health and social care) sectors differ between the Global North and the Global South.

Drawing on post-Keynesian, ecological, and feminist macroeconomics, as well as the physical and monetary input-output literature (see Marques et al., 2024; Fevereiro and Lowe, 2025), we develop a comprehensive conceptual framework for analysing the global, sectoral and gendered distributional effects of green policies, with particular emphasis on sectoral spillover effects, macrofinancial channels and the local-specific gendered effects of the environmental crisis through paid and unpaid work. Our framework distinguishes between three types of transmission channels from green policies to global, sectoral, and gender inequalities: (1) sectoral (national and international) reallocation channels, (2) macrofinancial channels, and (3) environmental channels.

We discuss how this framework can inform the design of policy packages that offset some of the adverse effects of the green transition on gender, sectoral inequalities and the Global South. Such packages would combine suitable green and purple policies with reparations, debt cancellation, and financial and technology transfers from the North to the South. Our global, gendered, integrated analytical framework implies that such packages must accompany green, fiscal and industrial policies if the transition to a green and caring economy is to be consistent with global justice. Without such policy interventions, the socio-economic costs of the climate crisis are bound to deepen, while building coalitions for climate action at both national and international levels will become politically harder, as seen by the recent political backlashes against green policies.

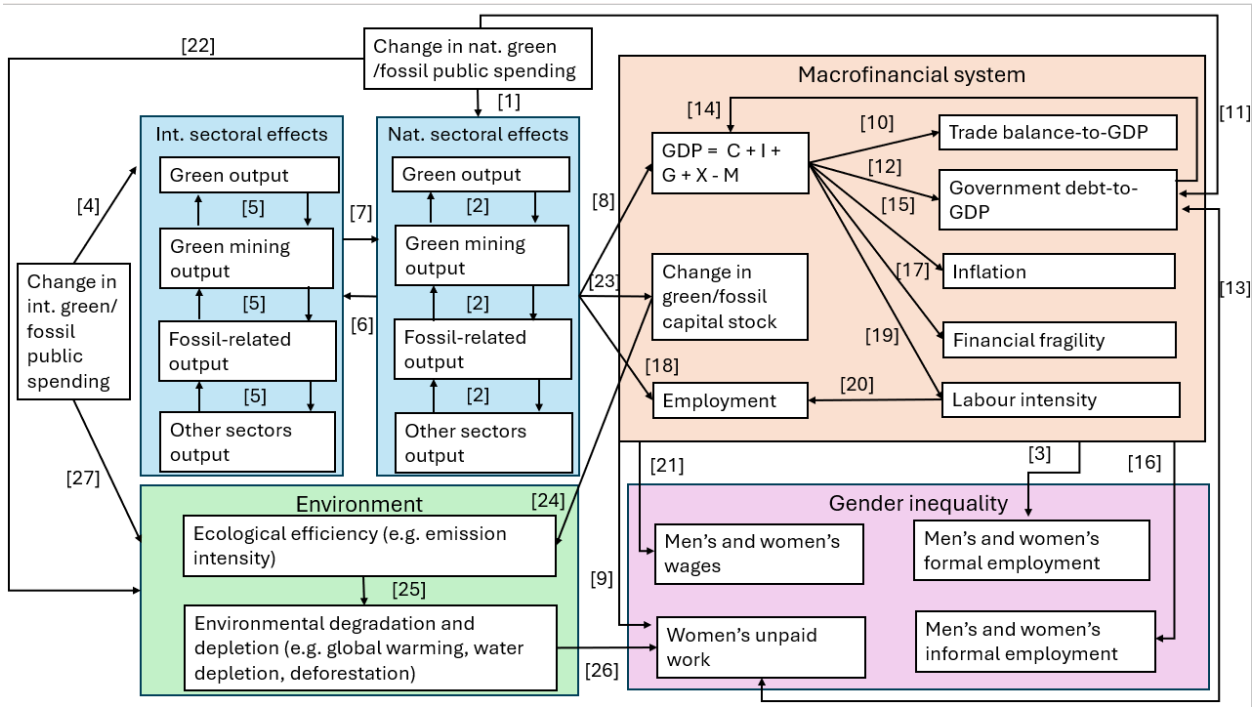
The paper is structured as follows. Section 2 introduces our conceptual framework. Sections 3 to 5 explain how green policies via sectoral, macrofinancial and environmental channels affect global, sectoral and gender inequalities. Section 6 concludes and outlines key policy implications.

2. A global integrated gendered analytical framework

There is a wide range of green policies, including carbon taxes, green subsidies, green public investment, green regulation and green credit guidance. Our analysis focuses specifically on public spending (investment and subsidies), considering the cases of both an increase in green public spending and a reduction in fossil-related public spending.[1] Our conceptual framework is summarised in Figure 1. The framework covers how green policies implemented at the national level affect domestic economies in either the Global North or the Global South (see *change in national green/fossil public spending* in Figure 1). At the same time, domestic green policies may generate cross-border spillovers. For example, an expansion of green public spending in a Global North country can influence economic and environmental conditions in Global South countries through production, trade and financial linkages. The framework explicitly captures these cross-border effects (see c*hange in international green/fossil public spending* in Figure 1).

[1] There are various ways to define green and fossil-related spending. See Batini et al. (2022), Pollin et al. (2022), Onaran and Oyvat (2023b) and Pollin (2026) for definitions of green spending and Pollin et al. (2015) and Battiston et al. (2017) for definitions of fossil-related spending.

Figure 1: Domestic gendered effects of national and international green/fossil public spending: transmission channels



Source: Authors' construction

Note: [1]: Domestic direct sectoral channel; [2]: Domestic indirect sectoral channel; [3]: Gendered formal employment channel; [4]: International direct sectoral channel; [5]: International indirect sectoral channel; [6]: Import spillover channel; [7]: Export spillover channel; [8]: Growth channel; [9]: Unpaid work channel; [10]: Trade balance channel; [11]: Public debt channel; [12]: Growth-debt channel; [13]: Austerity channel; [14]: Interest rate channel; [15]: Inflation channel; [16]: Gendered informal employment channel; [17] Financial fragility channel; [18] Employment channel; [19]: Labour intensity channel; [20]: Intensity-employment channel; [21]: Wage channel; [22]: Green investment channel; [23]: Capital reallocation channel; [24]: Ecological efficiency channel; [25]: Environmental degradation/depletion channel; [26]: Environmental inequality channel; [27]: Global environmental channel

We specify three types of transmission channels through which changes in public spending in the context of the green transition affect global, sectoral and gender inequalities. The first are the national/international sectoral channels. These refer to the fact that green policies may (i) expand green activities and increase green mining that provides essential inputs for these activities, and (ii) contract fossil-dependent sectors (see *national sectoral effects* and *international sectoral effects* in Figure 1). Second, we consider the macrofinancial channels linked to the impact that green fiscal policy has on macroeconomic and financial factors, such as growth, trade balance, government debt, inflation, the private-sector financial fragility and employment (see *macrofinancial system* in Figure 1). Third, we incorporate environmental channels that capture how green policies affect environmental mitigation and adaptation (see *environment* in Figure 1). Through these channels, green policies might affect men's and women's wages or

unpaid work, either by reinforcing existing gender inequalities or by helping to reduce them (see *gender inequality* box in Figure 1).[2]

We build on the multi-regional input-output (MRIO) framework to capture the effects of green policies on sectors, the macroeconomy and the environment and thereby on global, sectoral and gender inequalities in an integrated framework.[3] We distinguish between two economies -the domestic economy (*D*) and the rest of the world (*ROW*)- and use four sectors for illustrative purposes:[4] 1) green sectors (excluding green mining)[5], 2) the green mining sector[6], 3) the fossil-related sectors and 4) other sectors, including the purple care economy[7].

Eq. (1) shows that gross output ($\mathbf{x}$) is determined based on the transactions matrix ($\mathbf{Z}$) of interindustry (or intermediate) sales, postmultiplied by the summation vector $\mathbf{i}$, and the final demand vector ($\mathbf{f}$).

$$\mathbf{x} = \mathbf{Z}\mathbf{i} + \mathbf{f} \tag{1}$$

where

$$\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \\ x_8 \end{bmatrix}, \ \mathbf{Z} = \begin{bmatrix} z_{11} & \cdots & z_{14} & z_{15} & \cdots & z_{18} \\ \vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\ z_{41} & \cdots & z_{44} & z_{45} & \cdots & z_{48} \\ z_{51} & \cdots & z_{54} & z_{55} & \cdots & z_{58} \\ \vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\ z_{81} & \cdots & z_{84} & z_{85} & \cdots & z_{88} \end{bmatrix} \text{ and } \mathbf{f} = \begin{bmatrix} f_1 \\ f_2 \\ f_3 \\ f_4 \\ f_5 \\ f_6 \\ f_7 \\ f_8 \end{bmatrix}$$

[2] See e.g. Nikolaidi (2022) for an overview of the gendered effects of a wide range of green fiscal, monetary and financial policies.

[3] See Miller and Blair (2022) for an introduction to input-output analysis and for applications of MRIO, see e.g. ILO (2018) and Magacho et al. (2023).

[4] The aggregation to four industries is for simplicity and illustration purposes. Empirical analysis needs to use the sectors in input-output tables in a highly disaggregated way and clearly define green and carbon-intensive activities at the granular level.

[5] Green sectors include, for example, those associated with green renewable energy, energy efficiency activities (insulation, industrial energy efficiency, grid upgrade) and low-carbon public transport. Investments in these sectors require inputs from manufacturing industries, such as plastic products, glass products, cement and plaster and concrete products, non-ferrous metals, fabricated metal products, general purpose machinery, special purpose machinery, domestic appliances, electrical machinery and apparatus, electronic valves, tubes, etc., locomotives and rolling stock, other transport equipment, transport services (excluding air transport), and construction. Green sectors can also include those that engage in circular economy activities (recycling for plastics, glass, pulp, metals and minerals; replacing the direct extraction of the primary resources for these products; growth in rental and repair services, reducing the ownership and replacement of goods), as well as those that are related to sustainable agriculture, fishery and forestry as well as the protection of wildlife, biodiversity, and ecosystems (Onaran and Oyvat, 2023b).

[6] Green mining is analysed separately due to its relevance for some Global South economies.

[7] Empirical input-output analysis can capture the sectors of the purple care economy separately from other sectors. Here they are grouped with the other sectors for simplicity.

$\mathbf{x}$ is a column vector with 8 rows showing the gross output in each sector and in each economy, $\mathbf{Z}$ is a square matrix (8 x 8) with the interindustry transactions between sectors and economies and $\mathbf{f}$ is a column vector with 8 rows representing the final demand in each sector and in each economy. x_j are the elements of the column $\mathbf{x}$, z_{ij} are the elements of matrix $\mathbf{Z}$ and f_j are the elements of the column $\mathbf{f}$, *j* and *i* can take values between 1 and 8 (i.e. *j=1,…8* and *i=1,….,8*).

The elements of matrix $\mathbf{Z}$ are a fixed proportion (a_{ij}) of gross output:

$$z_{ij} = a_{ij}x_j \tag{2}$$

Based on Eqs. (1) and (2), gross output is given by:

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{f} \tag{3}$$

where $\mathbf{A}$ is the square matrix (8 x 8) of technical coefficients that are fixed ratios of inputs to total output for each sector. From Eq. (3), we get:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{f} \tag{4}$$

where $\mathbf{I}$ is an identity matrix (*8* x *8*).

Exports and imports of the domestic economy can be calculated using Eqs. (5) and (6).[8] Eq. (5) shows that exports from the domestic economy are given by the sum of intermediate exports (the area highlighted in grey in the $\mathbf{Z}$ matrix) and the domestic goods consumed in the rest of the world (part of the $\mathbf{f}$ vector). Eq. (6) shows that the imports in the domestic economy are equal to the sum of intermediate imports (the area highlighted in green in the $\mathbf{Z}$ matrix) plus the rest of the world goods consumed domestically (part of the $\mathbf{f}$ vector).

$$Exports_D = \sum_{D \neq ROW} Z_{DROW} + \sum_{D \neq ROW} Y_{DROW} \tag{5}$$

$$Imports_D = \sum_{D \neq ROW} Z_{ROWD} + \sum_{D \neq ROW} Y_{ROWD} \tag{6}$$

To transform gross output effects into employment effects, we can use a matrix of employment-to-output ratios ($\mathbf{e}$). To obtain the employment-to-output matrix, we first calculate the employment-to-output ratios of all sectors and countries. In particular, the employment of a sector in a country *j* (e_j) is divided by its gross output (x_j) for all sectors and countries. Then we calculate a diagonal matrix (8 x 8) with the above-mentioned employment-to-output ratios of the different sectors as diagonal elements. Eq. (7) gives the level of employment ($\mathbf{E}$):

$$\mathbf{E} = \mathbf{e}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{f} \tag{7}$$

[8] See e.g. Fevereiro and Lowe (2025).

where $\mathbf{e} = \begin{bmatrix} e_1/\,x_1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & e_8/\,x_8 \end{bmatrix}$ is the matrix of employment-to-output ratios and *j* takes values from 1 to 8.

The same steps are taken to obtain results for employment by gender (by using the women's or men's employment-to-output ratio) and for emissions (by using emissions intensities for each sector).[9]

For example, emission intensities (emissions-to-output ratios) are obtained by dividing the aggregated emissions of each sector by the sector's gross output. As above, to obtain the matrix of emission intensities (**emis**), we first take the ratios of total emissions ($emis_j$) to gross output (x_j) in each sector and country *j*. Then we calculate a diagonal matrix (8 x 8) with the above-mentioned emission-to-output ratios of the different sectors as diagonal elements. Eq. (8) shows the level of emissions (**EMIS**):

$$\mathbf{EMIS} = \mathbf{emis}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{f} \qquad (8)$$

where $\mathbf{emis} = \begin{bmatrix} emis_1/\,x_1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & emis_8/\,x_8 \end{bmatrix}$ is the matrix of emission-to-output ratios and *j* takes values from 1 to 8.

Suppose that there is a decline in spending in the fossil-related sector in the domestic economy because of a national green policy. This is reflected in a decline in f_3. Such a decline in fossil-related spending can have adverse domestic effects. Using Eq. (4), we can see that the reduction in fossil-related spending decreases the gross output of the same sector (x_3), but it can also reduce the gross output of other sectors in the same country (e.g. x_4). The larger the value of a_{33}, the greater the reduction in the gross output of the fossil-related sector domestically (x_3). Similarly, the larger the value of a_{43}, the greater the reduction in the gross output of other domestic sectors (x_4).

This decline in fossil-related spending can also affect other countries, depending on the interindustry linkages between countries and sectors. For example, the decline in fossil spending might affect the rest of the world (e.g. x_8, the gross output of other sectors in the rest of the world countries), depending on the value of a_{83}. The larger the value of a_{83}, the greater the decline in economic activity in the rest of the world.

[9] Other environmental variables, such as water, materials, or land use, can be calculated in a similar way.

The decline in fossil-related spending because of a national green policy also affects imports. Based on Eqs. (2) and (5), a reduction in x_8 (the gross output of other sectors in the rest of the world countries) decreases the intermediate inputs that the domestic economy demands from the rest of the world, resulting in lower imports.

The decline in fossil spending can also affect employment in the rest of the world. By combining Eqs. (4) and (7), and considering that employment-to-output ratios are constant, we can see that a reduction in fossil spending can adversely affect employment in other sectors of the domestic economy or in the rest of the world. For example, if the decline in x_8 (the gross output of other sectors in the rest of the world countries) is large and the employment-to-output ratio for this sector $\left(e_8/\ x_8\ \right)$ is high, then the reduction in employment in this sector is also expected to be large.

By combining Eqs. (4) and (8), we can also see the effect on emissions. A reduction in gross output leads to a decline in emissions in the same sector, and this decline is larger when the emissions-to-output ratio is high. For example, a reduction in x_8 contributes to lower emissions from this sector, and this reduction is higher the higher the emissions-to-output ratio for this sector ($emis_8/\ x_8$).

If the employment-to-output ratio or the emissions-to-output ratio change in an endogenous dynamic way, the results above might be reinforced. For example, if public spending in the green sector reduces the emissions-to-output ratio then the reduction in emissions will be higher.

3. National and international sectoral reallocation channels

Due to the differentiated sectoral structure of economies across the world, green structural change has very different effects in different countries. At the same time, the different composition of 'green' and 'fossil' sectors in terms of women's and men's employment suggests that national or international policies that lead to green structural change inevitably have gendered effects.

3.1 National sectoral channels

A change in national green or fossil-related public spending leads to changes in the sectoral input-output structure of the economy (see *domestic direct sectoral channel* [1] in Figure 1). Green sectors, such as the renewable electricity sector, expand, while fossil-related sectors, such as the fossil-based mining sector, shrink their production, as there is a change in demand for the

products these sectors produce. Moreover, changes in public spending indirectly affect other sectors in the economy because of the interconnectedness through supply chains. Sectors that provide inputs to green sectors (such as green mining) expand, while sectors that indirectly support the production of fossil-fuel sectors contract. These inputs can be provided domestically (see *domestic indirect sectoral channel* [2] in Figure 1) or internationally (as we discuss below).

What are the direct national effects of green/fossil spending in the domestic economy (in line with the *domestic direct sectoral channel* [1] in Figure 1)? This depends on the productive structure of countries. The green sector is relatively large in parts of the Global North. Jobs in the renewable sector in the US and Europe make up 6.8% and 10.8% of total renewable employment, respectively (IRENA and ILO, 2026). Several Global South countries, such as Brazil and India, also have a relatively large renewable sector that has a high presentation in global employment, with China dominating in this area (43.9% of those who work in the renewable sector are in China). For these economies, an increase in global green spending would be beneficial.

By contrast, fossil fuel sectors play a central role in many Global South economies.[10] Andres et al. (2023) report that fossil fuels account for 90.75%, 88.99% and 87.69% of total exports in Algeria, Angola and Nigeria, respectively. Some countries have subordinate positions at the bottom of global value chains, exporting low value-added highly polluting manufacturing goods.[11] Cuts to fossil-related spending could therefore shrink these economies considerably, amplifying existing macroeconomic imbalances. Some Global North fossil producers, such as Australia, Canada and Norway, would also be adversely affected (see Andres et al., 2023).

Green fiscal policies create jobs in some sectors while reducing them in others (see e.g. ILO, 2018; Pollin et al., 2014, 2015, 2022; Pollin, 2026), with consequences for both men's and women's formal employment (see [3] in Figure 1). Two points are worth highlighting. First, the gender impact depends on which sectors expand and which contract. If new jobs are mostly created in male-dominated sectors, while losses take place in female-dominated ones, women's formal employment is disproportionately affected. Second, the gender composition of the renewable sector itself varies across regions. IRENA (2025) reports that women hold 33% of renewable energy jobs in Asia-Pacific and Africa and 31% in Latin America and the Caribbean, compared with 27% in Europe and North America. Because women make up a relatively larger share of the renewable workforce in the Global South, expanding renewable energy spending

[10] Woolfenden (2023) outlines how the fossil fuel reliance of Global South countries is rooted in colonialism and perpetuated by current debt and financial systems.

[11] Some Global South countries have escaped this trap. A few Global North countries (e.g. Australia and Canada) also rely on primary exports but are less vulnerable, given their capacity to produce high value-added products.

could generate proportionally greater employment opportunities for women in the Global South than in the Global North.

What are the indirect national effects of green/fossil-related spending in the Global North and Global South? An increase in green spending generates strong domestic feedback effects in countries with a large green mining sector (see *domestic indirect sectoral channel* [2] in Figure 1). China is an example: alongside its overall large green sector, it has a substantial green mining sector (e.g. cobalt and graphite, see IEA, 2025). Higher green spending would therefore benefit China disproportionately, since gains in renewable energy are amplified by expansion in green mining. The gendered effects, however, are more ambiguous. Mining is heavily male-dominated: ILO (2024) reports that women make up just 14.4% of the global mining sector workforce, falling to 12.4% in Asia and the Pacific (see Table 1). Therefore, while countries with large green mining sectors can benefit in terms of aggregate output and employment, a smaller share of those employment gains will accrue to women.

Table 1: Employment of women as a percent (%) of total employment in mining, oil and gas and the total economy, 2023, various regions

	Africa	**Americas**	**Arab States**	**Asia and the Pacific**	**Europe and Central Asia**	**World**
Employment of women in mining	18.8	16.2	5.3	12.4	14.9	14.4
Employment of women in oil and gas	14.3	18.9	8.0	14.5	16.2	14.9
Employment of women in the economy	42.9	43.1	15.8	38.0	45.4	40.0

Source: ILO (2024)

A decline in fossil-related spending in the Global North countries can indirectly affect the rest of the domestic sectors, such as the construction sector (in line with the *domestic indirect sectoral channel* [2] in Figure 1). This might be substantial depending on the interlinkages between the fossil-related sectors and the rest of the sectors in the domestic economy.

3.2 International sectoral effects

Inequalities within and across countries are shaped not only by domestic green policies, but also by those abroad.[12] A change in green or fossil-related spending in the rest of the world can spill over to the domestic economy (see *international sectoral effects channel* in Figure 1).[13] For example, higher green public spending in the Global North can benefit producers of critical green minerals through the *international direct sectoral channel* ([4] in Figure 1). This includes the 'lithium triangle' (Argentina, Bolivia and Chile), nickel producers like Indonesia and cobalt producers like the Democratic Republic of the Congo (IEA, 2025). Some Global North countries can benefit as well, such as Australia with its lithium reserves (IEA, 2025). The resulting expansion in green mining can boost employment, though, as noted above, women capture only a small share of these employment gains: Fundar (2023) reports women's employment shares of 12.6% in Argentina's metal and lithium sectors, 17% in Chile, and 18% in Australia.

Higher green spending can also generate beneficial indirect effects on sectors abroad through supply chain linkages (in line with the *international indirect sectoral reallocation channel* [5] in Figure 1). For example, an increase in green spending in the Global North expands its renewable energy and manufacturing sectors, raising demand for intermediate inputs such as steel, copper cables and processed minerals, some of which are imported from the Global South. This stronger demand indirectly boosts production and employment in supplier countries. At the same time, the domestic economy can experience an increase in imports of the intermediate goods required for the green expansion (in line with the *import spillover channel* [6] in Figure 1).

The expansion of the green sector in the rest of the world can have additional spillover effects. For example, the domestic economy might be able to export more intermediate goods due to the increase in gross output in the rest of the world. This can further reinforce the increase in economic activity in the domestic economy (in line with the *export spillover channel* [7] in Figure 1).

Finally, phasing out fossil fuels in the North can have disproportionately negative effects on fossil producing and exporting countries in the South (in line with the *international direct sectoral channel* [4] in Figure 1). Falling export demand would shrink the fossil fuel sector in countries such as Iraq, South Sudan and Libya (Andres et al., 2023), with spillover effects on other sectors through supply chain linkages (see *international indirect sectoral channel* [5] in Figure 1). The gender implications are distinctive. Oil and gas employment in regions like Asia and the Pacific is

[12] Several macroeconomic models with input-output structures analyse the spillover effects of green policies (e.g. Gourdel et al., 2025; Espagne et al., 2023; Leoni et al., 2023); see also Marques et al. (2024) and Fevereiro and Lowe (2025) for static input-output models.

[13] The importance of the international sectoral effects depends on the strength of the grey and green elements in the Z matrix. Larger values in the grey area show higher exports from the domestic economy, while larger values in the green area show greater imports by the domestic economy.

amongst the most male-dominated (see Table 1). Therefore, the direct job losses would fall disproportionately on men. However, as formal employment contracts, both men and women may be pushed into the informal sector.

In Global South countries, this decline in aggregate output might also reduce imported intermediate goods (in line with the *import spillover channel* [6] in Figure 1), and thereby the trade balance for the Global South economy might improve. Therefore, the net effect on the trade balance is ambiguous.

4. Macrofinancial channels

4.1 Growth channel

Governments can play a key role in the green transition by investing in environmentally sustainable projects, such as renewable power, low-carbon transport and energy-efficient buildings. If green public investment is expansionary (i.e. it takes place on top of existing investment commitments), it can stimulate economic activity through the *growth channel* (see [8] in Figure 1). This stimulus can be substantial.[14] For instance, Batini et al. (2022) and Shah and Wu (2025) find that investment multipliers for renewable energy exceed those for fossil fuels. Beyond its direct effects, public investment in green sectors can also crowd in private capital by encouraging additional private investment in green sectors.[15] However, crowding in might not be so strong in Global South countries due to financial subordination.[16] Reductions in fossil-related fiscal spending have recessionary effects, but these tend to be modest.[17]

Beyond these aggregate effects, the composition of green spending also matters for gender outcomes. Specific types of green public investment (e.g. public transport or dedicated cycling lanes) benefit women more than men. Greater spending in these specific types of public investment can reduce the time women devote to caring and other unpaid responsibilities and potentially allow them to earn income with beneficial effects on growth (see *unpaid work channel* [9] in Figure 1). Moreover, when green spending includes spending in social infrastructure, such

[14] For example, Bordenave and Ciaffi (2025) focus on European countries and find that green public spending has a significant impact on the macroeconomy. Dafermos and Nikolaidi (2022) analyse the effects of green public spending at the global level using an ecological stock-flow consistent model.

[15] For empirical evidence, see Azhgaliyeva et al. (2023) for the effects of public spending in R&D and Onaran and Oyvat (2023a; 2026; 2027) for a macroeconomic model.

[16] For example, Althouse and Svartzman (2022) explain that currency subordination prevents Global South countries from getting access to funding necessary for investing in green projects.

[17] Some ecological macroeconomic models investigate the effects of decline in economic growth (see e.g. Dafermos et al., 2022; Cieplinski et al., 2023).

as schools and public transport, it can reallocate consumption by reducing the need for private expenditures.

4.2 Trade balance channel

In the case of higher green spending, higher levels of economic activity can increase final good imports for the domestic economy, thereby worsening the trade balance and potentially leading to a lower trade balance-to-GDP ratio (see *trade balance channel* [10] in Figure 1).[18] On the contrary, in the case of lower fossil-related spending, lower GDP reduces imports, which can potentially improve the trade balance-to-GDP ratio.

The effects of green policies on the trade balance depend on a country's resource profile, specifically whether it is rich in green materials but poor in (importer of) fossil fuels or whether it possesses large fossil fuel reserves and exports oil or petroleum.[19] Two contrasting cases illustrate this. First, when a country with a sizeable green sector raises green spending domestically, its trade balance-to-GDP ratio is likely to improve, since much of the green value added is produced domestically. The substitution of imported fossil fuels with domestically generated renewable energy can reinforce this effect. Second, when a fossil-fuel-rich country cuts fossil spending, the opposite occurs: the trade balance-to-GDP ratio tends to deteriorate.

A deteriorating trade balance-to-GDP ratio can generate pressure from the financial markets, contributing to capital outflows, exchange rate depreciation and pass-through inflation as imported input costs rise. Global South countries are particularly vulnerable to volatile short-term international capital flows (see Ocampo, 2017; Bonizzi et al., 2019). Because of this reliance on capital inflows and their broader financial subordination, expansionary green fiscal policies in these economies can trigger balance-of-payments pressures and exchange-rate depreciation, while dependence on costly imported green inputs can add further inflationary pressures.

For countries facing balance-of-payments constraints, green public investment therefore needs to be accompanied by green industrial policies aimed at reducing reliance on imported green inputs and technologies, thereby limiting adverse effects on the trade balance. This hints at the importance of developing policies in the transition phase to address the impact of green capital accumulation on imports in the Global South.

4.3 Public debt channel

[18] For example, several countries in the Global South might end up importing final consumption goods from Global North countries.
[19] See e.g. Leoni et al. (2023) for an open economy ecological macroeconomic model.

The impact of green public spending on public debt can be either positive or negative, depending on the strength of the expansionary effects of government expenditure. Specifically, the government debt-to-GDP ratio might be negatively affected by the initial rise in green public expenditure, which can increase the absolute level of government borrowing if not accompanied by increasing tax rates (see *public debt channel* [11] in Figure 1). Alternatively, the government debt-to-GDP ratio might decrease due to higher output and higher tax revenues even with constant tax rates (see *growth-debt channel* [12] in Figure 1). Consequently, the overall effect of government spending on the debt-to-GDP ratio is theoretically ambiguous. When fiscal multipliers are sufficiently large, the boost in economic activity can outweigh the increase in borrowing, leading to a reduction in the debt-to-GDP ratio.[20] Conversely, the debt-to-GDP ratio may increase if higher green government spending does not produce a significant rise in output and domestic tax revenues.

An increase in the government debt-to-GDP ratio can have important policy implications, depending on the country that increases green spending. In Global South countries, higher public indebtedness may trigger the adoption of austerity measures. Such austerity policies can have adverse gendered effects (see Hawkins and Zucker-Marques, 2024), particularly when fiscal consolidation leads to cuts in care-related public spending and/or triggers capital outflows discussed above as part of the trade channel. Reduced public provision of care services can increase the burden of unpaid care work, which is disproportionately borne by women in both the Global South and North countries (see *austerity channel* [13] in Figure 1)[21]. A higher public debt as a ratio to GDP might also increase interest rates and crowd out private investment, if the latter is sensitive to interest rates (see *interest rate channel* [14] in Figure 1), adversely feeding into the *growth channel*.[22]

Reductions in fossil-related public spending can likewise have either positive or negative effects on the government debt-to-GDP ratio, depending on the extent of the resulting decline in economic output. As discussed above, in Global South countries, the government debt-to-GDP ratio may increase, particularly where carbon-intensive activities account for a large share of production. In these Global South countries, cuts to fossil-related spending can lead to significant output and revenue losses, outweighing direct fiscal savings and worsening public indebtedness. As highlighted before, this might have substantial gendered effects.

[20] See Dafermos and Nikolaidi (2022) for a global ecological macroeconomic model. Onaran et al. (2023) and Onaran and Oyvat (2026, 2027) present empirical estimations indicating that the self-financing potential of public spending is higher in the UK and South Korea compared to seven other emerging economies.
[21] See Zanon Brenck and Pereira Serra (2026) for a model which includes womens' time allocation between labour in the market economy and on unpaid care, as well as the resulting impacts on their time poverty.
[22] Onaran et al. (2022a, 2022b, 2023) models the effect of public spending on private investment demand.

4.4 Inflation channel

Higher green spending can push up inflation for a given level of supply (see *inflation channel* [15] in Figure 1). Part of this stems from the so-called greenflation, as the transition raises demand for minerals such as lithium, cobalt, and copper. Greenflation, and inflation more broadly, can adversely affect household real incomes. That said, most green spending builds new productive capacity (like electricity grids, solar panels, and low-carbon transport) and reduces dependence on fossil fuels. So, while higher green public investment may initially raise demand for goods and services, the additional supply it creates can reduce inflationary pressures in the medium run.

When inflationary pressures do persist and lead to a reduction in the real income of households, gender norms mean that women are often forced to increase unpaid work to substitute for purchased goods and services (see e.g. Elson, 2010; Seguino, 2020). This is captured by the *unpaid work channel* in Figure 1.

Inflationary pressures might also induce women to increase their labour supply and find jobs in the informal market (especially in the Global South) to counterbalance the negative effect on household income (see *gendered informal employment channel* [16] in Figure 1). Jobs in the informal labour market are mostly low-paid and precarious. Women are over-represented in the informal labour market, especially in the Global South (see e.g. WIEGO, 2024).

A parallel dynamic operates on the fossil side. Contraction of fossil-related sectors can increase the cost of fossil energy, pushing up energy prices and the prices of products that rely on fossil fuels. This fossil-induced inflation directly erodes household real incomes, with disproportionate effects on women's living standards and unpaid work (Allwood, 2023; European Parliament, 2024). To protect household finances, women may cut back on energy use in caring, cleaning and cooking, for example, running washing machines or dishwashers less often, or they might switch to cheaper but more time-consuming forms of transport. Such adjustments increase women's unpaid work (see *unpaid work channel* [9] in Figure 1). As with greenflation, women may also be pushed to increase their labour supply in the formal or informal sector to offset the loss in household real income (see *gendered formal employment channel* [3] and *gendered informal employment channel* [16] in Figure 1).

4.5 Financial fragility channel

Green public investment is more likely to increase firms' profitability and households' incomes (Dafermos and Nikolaidi, 2022). This implies that green public investment can reduce the financial fragility of indebted firms and households (see *financial fragility channel* [17] in Figure 1). Higher household incomes—particularly among women—may also translate into increased consumption of green goods and services, thereby reinforcing demand-side effects (e.g. OECD, 2025). At the same time, stronger demand for green products may encourage firms to expand capacity by taking on additional debt, potentially increasing the financial fragility of non-financial corporations. As a result, the net effect of green public investment on firms' financial stability is theoretically ambiguous and depends on the relative strength of income and leverage dynamics.

A decline in fossil-related spending is more likely to increase the financial fragility of fossil fuel sectors since their sales might be adversely affected. This decline in fossil-related spending might increase the share of green sectors and potentially support their profitability. In this case, there is likely a decline in the financial fragility of green sectors.

4.6 Employment channel

Governments can directly create jobs in sectors that are strategically important for decarbonisation (see *employment channel* [18] in Figure 1). This can be done through subsidies to private green sectors, direct public employment in state-owned green sectors, or a green employer of last resort programme that guarantees work to those unable to find it in the private sector. The composition of green investment also matters: some green sectors are more labour-intensive than others. Renewable energy, for example, generates more jobs per unit of investment than the fossil fuel sector (see e.g. Pollin et al., 2014; ILO, 2018), so directing spending towards renewables can yield substantial employment benefits.

The *employment channel* generates stronger gains for women when the expanding sectors are female-dominated. As mentioned earlier, some green sectors have a relatively large proportion of women compared to other manufacturing or construction sectors, but most remain male-dominated overall. As a result, green expansion will create many new jobs, but many of them might be for men (see *gendered formal employment channel* [3] in Figure 1). If green employment is accompanied by public investment in the care economy, which includes many low-carbon sectors (like health, social care, and education), this can increase women's share in employment as these sectors are dominated by women, given the current gendered occupational segregation patterns.

Higher green employment and green spending support wages, and thus the income of both men and women. With this additional income, women can reduce their own unpaid workload, by paying others to take on some tasks or by investing in equipment such as energy-efficient cooking stoves, rainwater harvesting tanks or dishwashers, to help them reduce the time that they spend on unpaid work (see *gendered formal employment* [3] in Figure 1). Higher incomes can also be channelled into goods and services that improve the nutrition, health, and education of children and other household members.

The reduction in fossil-related spending by the government can directly lead to job losses. From a global distribution point of view, Global South countries that have relatively large fossil sectors (see e.g. Andres et al., 2023) will also be affected more adversely. The reduction in fossil-related spending's effect on carbon-intensive sectors can have a particularly adverse impact on men's employment since men are over-represented in these sectors. Women might need to increase their unpaid work and their labour supply in the paid labour market, and if the labour demand in the formal sector is limited, they may be drawn to the informal sector (*gendered formal employment channel* [3] and *gendered informal employment channel* [16] in Figure 1).

Moreover, a reduction in fossil-related spending can contribute to the fossil-induced inflation described earlier if firms pass the higher costs through to prices. This is more likely in oligopolistic markets, where firms can raise prices without experiencing significant losses in sales. Alternatively, firms may absorb the additional cost themselves, weakening their financial position. This can lead them to cut jobs. In this case, men employed in carbon-intensive companies are more likely to lose their jobs, which, as described above, can in turn affect women's well-being through reduced household income and increased unpaid work.

4.7 Labour intensity channel

Green public investment can stimulate economic activity and enhance labour productivity (see *labour intensity channel* [19] in Figure 1), in line with Kaldor–Verdoorn's law: as output expands, productivity tends to rise through investment and learning by doing.[23] These productivity gains then feed back into the labour market through distinct channels. The first is related to employment (see *labour intensity channel* [19] and *intensity-employment channel* [20] in Figure 1): higher labour productivity means fewer workers are needed per unit of output in green sectors, which can dampen the employment gains from green expansion. The second is linked to wages (see *wage channel* [21] in Figure 1): expansionary green policies reduce unemployment and strengthen workers' bargaining power which, along with improvements in labour

[23] For the incorporation of this effect in an ecological and gender macroeconomic models, see Dafermos and Nikolaidi (2022), and Onaran and Oyvat (2023, 2026, 2027).

productivity, can translate to higher wages. The effect tends to be largest at the bottom of the wage distribution, where women are over-represented, giving greater scope to negotiate wage improvements.[24]

A reduction in fossil-related spending activates the same channels in reverse. The *labour intensity channel* ([19] in Figure 1) can amplify employment losses in carbon-intensive sectors, while weaker economic activity erodes the bargaining power of both men and women. Combined with lower labour productivity, this can translate into lower wages for both (see *wage channel* [21] in Figure 1).

4.8 Green to conventional capital stock channel

Green public spending directly increases the ratio of green capital stock to fossil-fuel-based capital stock. A reduction in fossil-related public spending further reinforces this (see *green investment channel* [22] in Figure 1). Crowding-in effects can amplify the green transition by enhancing private green investment (see *capital reallocation channel* [23] in Figure 1). That said, some public green investment might crowd out private green investment instead. For example, expanded public transport can reduce private investment in electric vehicles.

As will be explained in the next section, the capital stock channel allows governments to improve ecological efficiency (e.g. emission intensity) and reduce environmental degradation and environmental depletion which can be beneficial for reducing women's unpaid work and the challenges they are facing in the informal sector. However, the benefits of building green capital stock—improvements in ecological efficiency, higher exports, and reduced energy import dependency—materialise only gradually. In the meantime, the upfront green spending can widen the trade deficit and push up public debt during the transition phase. This can be a particularly important challenge for Global South countries.

5. Environmental channels

5.1 Change in national green/fossil public spending

As explained earlier, green public spending directly and indirectly expands the green capital stock while reducing fossil-based capital. This reallocation improves ecological efficiency, along several dimensions, including emission, energy and water intensity (see *ecological efficiency*

[24] Onaran and Oyvat (2023) develop a gendered macroeconomic model in which the wages of men and women are affected by the bargaining power of workers and labour productivity.

channel [24] in Figure 1). The resulting reduction in emissions (see *environmental degradation/depletion channel* [25] in Figure 1), can, however, be partially offset by macroeconomic rebound effects, as higher aggregate demand increases economic activity and, therefore, environmental impacts.[25] Cuts to fossil-related public spending, by contrast, do not generate such rebound effects and therefore reinforce the decline in environmental effects via lower economic activity.

Reducing environmental impacts has several implications from a global and gender justice perspective. First, the unpaid work of women is affected much more significantly by the environmental crisis in Global South countries, where women's daily lives depend heavily on water availability, agricultural productivity (see e.g. Fruttero et al., 2024) and access to energy-related resources (see *environmental inequality channel* [26] in Figure 1). Because securing resources for households, for example via fetching water and gathering firewood for cooking, is typically women's responsibility within the current gendered division of labour (see e.g. Hu, 2022), environmental degradation translates directly into a higher unpaid workload: as natural resources become scarcer, women must walk longer distances and spend more time getting them.

Second, the crisis reshapes women's paid work as well (see *gendered formal employment channel* [3] in Figure 1). Women tend to rely more than men on natural resources for income, and this largely takes place in the Global South, where agriculture remains a major source of employment – in some countries more than 50% of their population works in the agricultural sector (see e.g. Hu, 2022).

Third, informal work can be affected as well by the environmental crisis. For example, green policies can result in green extractivism that can lead to the degradation of ecosystems that are important for informal work and can displace rural communities, disproportionately affecting disadvantaged groups and women.

Finally, the reduction in emissions itself can have adverse environmental impacts, including land conversion, material depletion and water stress. For example, the production of electric vehicles relies on resource-intensive processes, often requiring large amounts of lithium, cobalt, or nickel, which can cause severe ecological degradation in producer countries, many of which are in the Global South. Argentina, Bolivia and Chile – as mentioned above – hold a large share of global lithium reserves used in battery production. However, lithium extraction is highly water-

[25] See Dafermos and Nikolaidi (2022) for these effects in an ecological macroeconomic model.

intensive, raising serious concerns about groundwater depletion and the livelihoods of local and Indigenous communities.[26]

A climate justice and gender lens requires moving beyond mitigation policies. Climate adaptation policies and policies that constrain water depletion, reduce land conversion and protect biodiversity have an important impact on reversing the negative effects that the environmental crisis has on disadvantaged groups and the unpaid work of women. Importantly, adaptation policies must be explicitly designed to address the structural and social barriers women face. Failure to do so can undermine their effectiveness. IISD (2025) documents a case in which financial support was provided to seaweed cooperatives in Zanzibar to facilitate climate adaptation. However, the adaptation strategy did not consider that many women were unable to swim, effectively excluding them from deep-water seaweed farming and limiting the benefits of the adaptation policy. This example illustrates the importance of integrating gender-specific aspects into the design of adaptation policies to ensure both equity and effectiveness.

5.2 Change in international green/fossil public spending

Changes in international public spending can affect Global South countries drastically (see *global environmental channel* [27] in Figure 1). Because the majority of the global emissions are produced by large Global North countries such as the US, Europe and China (see e.g. Hickel, 2020), ambitious mitigation policies in these countries would achieve substantial cuts in global emissions – reducing the adaptation spending that is needed in Global South countries. Lower adaptation spending would, in turn, have substantial beneficial effects on the government debt-to-GDP ratios of the Global South countries and would avoid potential austerity measures with adverse gendered effects.

6. Conclusion and policy implications

We have developed a conceptual framework that captures the sectoral, macrofinancial and environmental channels through which green policies shape global, sectoral, and gender inequalities, taking into account both national and interregional effects. Within this framework, changes in green or fossil-related public spending influence distribution through their effects on formal and informal employment, wage bargaining and unpaid work.

[26] See Diaz Paz et al. (2025).

Our analysis has highlighted the following issues: First, global supply chains play a key role in how green policies in the Global North affect the Global South. An increase in green spending in the North can benefit a small group of Global South countries that can supply green inputs. However, the reduction in fossil-related spending can have adverse effects on growth and employment in many Global South countries that rely heavily on fossil fuel exports. Therefore, the green transition in the North is likely to increase inequality across countries, unless it is accompanied by other policies.

Second, the macrofinancial and balance-of-payments constraints that Global South countries face can create negative economic effects when these countries implement green policies (Althouse and Svartzman 2022; Magacho et al., 2023). Given their reliance on capital inflows and their financial subordination, expansionary green fiscal policies can trigger balance-of-payments pressures and exchange-rate depreciation, with the overall impact on trade balance-to-GDP and government debt-to-GDP ratios depending on the size of the growth response to the spending. Where public indebtedness rises, governments may turn to austerity, including cuts in care-related spending, which shifts an even greater unpaid care burden onto women. Inflation introduces an additional burden: both higher green investment and falling fossil-related spending can lead to higher inflation, adversely affecting household real incomes and pressuring women to take on more informal and unpaid work to compensate.

Third, the effects of the green transition on women's employment are mixed. Although in some cases women's employment can increase, the majority of new green jobs will still go to men. Investment in the care economy – a labour-intensive, low-carbon sector with a high share of women's employment – can help correct this imbalance and support a more equitable transition (Onaran and Oyvat, 2026). Moreover, within the current gendered structure of our societies, the implications of job creation and destruction for women and men for women's well-being are more complicated. This is the case since men's employment also affect household incomes and women's unpaid work and bargaining position.

Fourth, green policies interact in important ways with labour informality, particularly in the Global South. As formal employment contracts in fossil sectors, both men and women may be pushed into the informal sector, where work tends to be low-paid and precarious. The gendered effects of green policies, therefore, depend not only on which formal sectors expand and contract, but also on how green and carbon-intensive activities are distributed between the formal and the informal economy. Expanding the care and education sectors will also matter for workers displaced from fossil sectors, who will need reskilling and training. However, redeployment has limits, depending on workers' skills, regions, life stages and ages. So funding for voluntary early

retirement plans will be crucial to enhance broad social support for a green and caring just transition (see Pollin, 2026 for a costing example).

Fifth, green policies in the Global North can have adverse environmental effects in the Global South. While reductions in global environmental degradation (provided rebound effects remain contained) disproportionately benefit women and other disadvantaged groups whose livelihoods depend more on water, agricultural productivity (Fruttero et al. 2024) and access to energy-related resources, these gains can be undermined by green extractivism and land grabbing carried out by Global North countries in the South, which place renewed pressure on natural resources.

The framework developed in this paper can inform policy design by illuminating how packages of measures can mitigate some of the adverse effects of the green transition on Global South countries, women and other disadvantaged groups. At the national level, such packages should combine purple policies of care investment with green policies (see Onaran and Oyvat, 2023), alongside adaptation policies designed with gender and community needs at their core, since these considerations are essential for both equity and effectiveness. At the global level, packages should include climate reparations, financial and technology transfers from North to South, adaptation support and debt cancellation (see e.g. Perry, 2020; Woolfenden, 2023; Zucker-Marques and Volz, 2023; Dafermos, 2026). Such policies are critical for ensuring North-South equity in coordinated climate action.

Calling for changes to policy frameworks may not, however, be sufficient. The green transition intersects with social reproduction systems and colonial legacies that have entrenched informality and inequalities of gender, race and class within the global division of labour. Understanding this intersection requires drawing on feminist political economy perspectives (see e.g. Stevano et al., 2021; Mezzadri et al., 2022; Cantillon et al., 2023) that shed light on the power relations that underpin inequalities – and how these power relations can prevent structural changes that are necessary for a more equal economy.

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