
WORKING PAPER

Distributional Dynamics in a Post-Growth Economy : A Hybrid ABM-SFC Model

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· Ecological macroeconomics

Résumé

This paper examines the evolution of income inequalities within a post-growth framework, through a hybrid model combining ABM¹ and SFC². The model is calibrated to capture income dynamics across three household classes in a zero-growth context, a new approach in the field of income inequality research. Preliminary results are promising. Future scenarios will explore two main channels : an increase in the wage share and a constraint on GHG³ emissions.

1 Introduction

Since the foundational work of the Club of Rome [Meadows et al. \(1972\)](#), the question of the ecological limits of economic growth has occupied an increasingly central place in both academic and political debate. Economic models premised on the continuous accumulation of capital face structural constraints that are at once environmental and social : resource depletion, transgression of planetary boundaries, and the widening of income and wealth inequalities. In response to these findings, several alternative paradigms have emerged (techno-solutionism, green growth, degrowth) none of which commands consensus, but all of which testify to a profound questioning of the dominant paradigm [Jacobs \(2014\)](#); [Sætra and Selinger \(2024\)](#); [Cahen-Fourot and Monserand \(2023\)](#); [Jackson \(2017\)](#); [Fontana and Sawyer \(2024\)](#).

It is within this context that the present paper is situated. Among the responses proposed, we have chosen to inscribe ourselves within the post-growth framework, which offers one of the most coherent perspectives for simultaneously addressing the social, financial,

and ecological challenges of our time [Jackson \(2016\)](#); [Victor and Rosenbluth \(2007\)](#); [Cahen-Fourot and Monserand \(2023\)](#). Without claiming to encompass the entire body of internal debates that traverse this current of thought, we develop an ecological, economic, and social approach to post-growth, founded on a displacement of conventional economic indicators. The aim is to substitute the primacy of yield and GDP with an economy centred on social well-being, while rethinking our relationship to work and consumption with a view to keeping global warming below the 2 °C threshold.

This orientation is far from marginal : it rests on a rapidly expanding academic corpus, as illustrated by Figure 1. The volume of publications devoted to ecological economics broadly conceived (including post-growth, planetary boundaries, post-Keynesian economics, and energy transition) has grown quasi-exponentially since the 1970s, rising from roughly one hundred annual publications to more than 10 000 in 2023, according to data collected via the OpenAlex API in the Economics & Business domain [Priem et al. \(2022\)](#). This dynamic is structured around key editorial milestones, each of which accompanied

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1. Agent based model
 2. Stock-flow consistency
 3. Greenhouse gases

a visible acceleration in the pace of publication. Within this broader corpus, the specific subfield of degrowth remains more circumscribed : Weiss and Cattaneo (2017) identified 91 articles explicitly addressing degrowth in their title as of end-2015, authored by 108 scholars across 23 journals, with a predominantly Euro-

pean and Iberian character. It is precisely this asymmetry that justifies the modelling effort undertaken in this paper : the theoretical and empirical tools required to rigorously analyse distributive dynamics under a degrowth regime remain largely to be constructed.

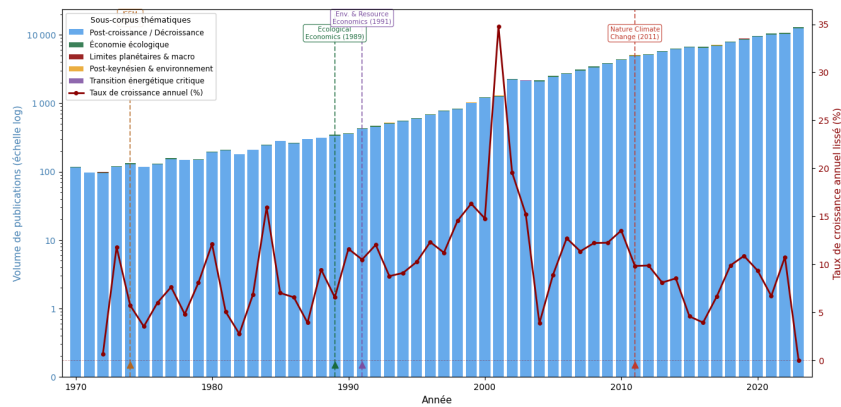


FIGURE 1 – Evolution of the academic corpus on ecological economics (1970–2023)
Source : Own elaboration via OpenAlex API

Alongside this growing literature on ecological sustainability, the question of inequalities has followed a parallel trajectory in academic and institutional debate, as illustrated by Figure 2. The work of Piketty (2013) demonstrated that capital dynamics tend structurally to reconstitute high levels of inequality whenever the rate of return on capital exceeds the rate of economic growth. This dual tendency is clearly visible in advanced economies since the 1980s : while the annual growth rate of GDP per capita has followed a structurally declining trajectory since the post-war boom, the share of national income captured by the top

10 % and the capital-to-income ratio β have both resumed a marked upward trend, approaching levels last seen at the beginning of the twentieth century Bengtsson and Waldenström (2018). This divergence invalidates the hypothesis that economic growth constitutes a sufficient mechanism for reducing inequalities. Without growth as an adjustment mechanism, the conflict over the distribution of value added becomes central Jackson (2016). The reduction of inequalities now constitutes a priority objective within international institutions OECD (2024), reflecting a growing recognition that growth and equity are not mechanically linked.

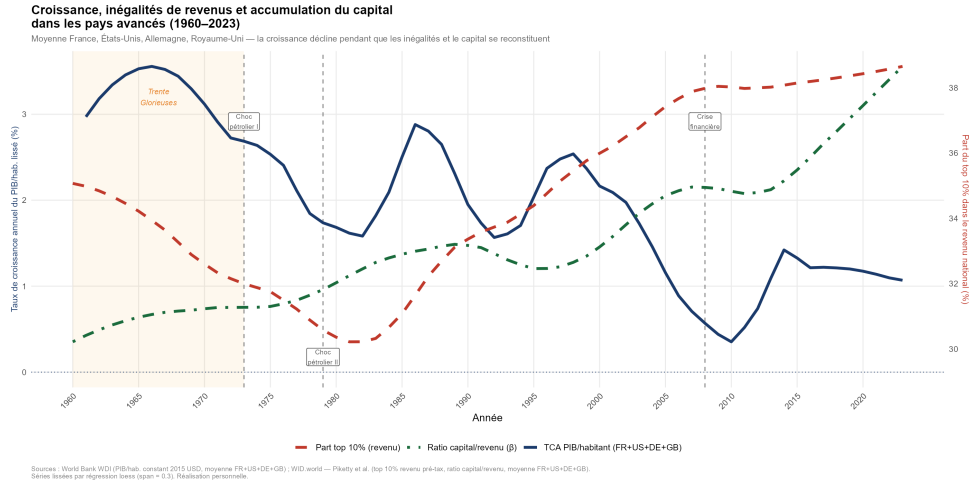


FIGURE 2 – Evolution of GDP as a function of capital
Source : Own elaboration

It is at the intersection of these two fields that the present paper is situated. The dominant economic paradigm today struggles to respond simultaneously to the imperatives of ecological sustainability and social justice. Our objective is to analyse how income inequalities evolve under a post-growth regime, by mobilising a hybrid modelling framework combining SFC and ABM. In doing so, we seek to identify the conditions of a transition that is viable for the greatest number, maintaining global warming below the 2 °C threshold while preserving social cohesion.

This paper thus attempts to provide an answer to a question still largely unexplored in the literature : how do income distributions evolve within the framework of an economic post-growth regime ?

To answer this question, we proceed in four stages. Section 2 presents a literature review articulated around three axes : the theoretical foundations of post-growth and ecological economics, the analysis of income inequalities in contemporary economic systems,

and the methodological contributions of ABM-SFC models for the study of distributive dynamics. Section 3 details the architecture of our model, its structuring hypotheses, and the calibration choices retained to represent an economy in transition towards post-growth. Section 4 presents and discusses the results of our simulations, analysing the evolution of income distributions and identifying the mechanisms underlying these dynamics. Finally, Section 5 synthesises our main results and draws their theoretical and policy implications, while highlighting the limitations of our approach and avenues for future research.

2 Literature Review

This section establishes the theoretical and methodological foundations of our analysis along three complementary axes. We first situate our work within the landscape of alternative economic paradigms, justifying our inscription within the post-growth framework. We then examine the structural dynamics of in-

come inequality, which constitutes the core of our research question. Finally, we set out the rationale for our methodological choice of a hybrid SFC-ABM modelling framework.

2.1 Ecological Post-Growth

No single alternative to contemporary capitalism commands consensus. Table 1 offers a comparative overview of the three main paradigms currently debated in the literature.

	Techno-solutionism	Post-growth	Green Growth
Arguments in favour	- Provides concrete solutions to societal problems - Frames social challenges through a technical lens - Develops a common language for inter-disciplinary dialogue	- Only framework to rethink the economic system within planetary boundaries - Federates alternative currents such as eco-feminism, eco-Marxism and de-growth	- Requires no fundamental economic or social restructuring - Compatible with dominant policies currently in force in most countries
Limitations	- Limited public understanding - Disconnected from social justice concerns - Requires precise definition of social conflicts and needs	- Internal disagreements on terminology and scope - Implies deep societal transformations - Paradigm still under construction	- Places growth at the heart of its ideology - Largely ignores recent work on the limits of decoupling - Frequently instrumentalised for green-washing
Key references	Sætra and Selinger (2024)	Cahen-Fourot and Monserand (2023) Jackson (2019) Jackson (2017) Victor and Rosenbluth (2007)	Jacobs (2014)

TABLE 1 – Comparative overview of alternative economic frameworks

Source : Own elaboration

As Table 1 makes clear, none of these approaches is free from theoretical tensions, practical limitations, or internal controversies. This pluralism underscores the need to think the transition beyond monolithic solutions. Our choice of the post-growth framework rests on the observation that it constitutes a theoretical project capable of federating heterogeneous positions, while offering a sufficiently structured analytical space to interrogate the macroeconomic transformations ahead. Post-growth thus appears as a relevant framework for analysing distributive dynamics in a post-capitalist transition context, understood here as a socio-economic configuration that moves beyond the contemporary forms of capitalism as we know them.

Post-growth finds its origins in the de-growth theorised by [Latouche \(1986\)](#), which initially advocated a reduction in GDP and a redesign of social well-being indicators. Subsequent theoretical advances gave rise to a less radical framework, centred not on mere GDP contraction but on a profound transformation of societal objectives (substituting conventional indicators with new measures of well-being, reducing wage and wealth inequalities, and realising the ambitions formulated by [Keynes \(1936\)](#)). A central finding of this literature is that the current economic system fails to reduce inequalities ([Piketty, 2013](#)), though [Jackson and Victor \(2018\)](#) shows that a redistribution of surplus value in favour of workers would suffice to produce significant distribu-

tional gains even in the absence of growth.

Our analysis focuses specifically on income inequalities. Several contributions show that without growth, financial assets risk suffering sharp devaluations (Funalot and Clévenot, 2024; Cahen-Fourot, 2024), whilst others demonstrate that a different organisation of work would bring labour income dynamics to the fore in the inequality debate (Victor and Rosenbluth, 2007; Cahen-Fourot and Monserand, 2023).

2.2 Structural Inequalities and Redistribution

Our questioning of post-growth highlights that inequalities constitute one of the cornerstones of a growth-limited economy. Moreover, Angel et al. (2024) shows that pre-distribution negatively affects GHG emissions, reinforcing the relevance of our focus on income inequalities (REY, 2025). Following Atkinson (2016), we organise our analysis around two central questions : “Who are the agents concerned by these inequalities?” and “Do inequalities go from whom to whom?”

Evidence from Aghion et al. (2023), Piketty (2003), Chancel et al. (2025) and Bozio et al. (2023) shows that wealth accumulation has never been so concentrated, both in France and globally, and that since the 1990s the income gains of the top percentile reflect fiscal optimisation rather than equity. The work of Bengtsson and Waldenström (2018) further demonstrates that the functional distribution of income is a major determinant of personal income inequality across historical configurations. If, as these authors show, rising contem-

porary inequalities are partly driven by the growing capital share, then a post-growth regime would mechanically shift the distributive stakes towards wage distribution (precisely what our model seeks to capture).

On social mobility, Aghion et al. (2023) documents a strong persistence of income positions in France : approximately 70 % of individuals remain within ± 10 % of their initial percentile over five years, with 76 % of top-decile individuals remaining there after five years and 54 % of bottom-decile individuals unable to escape it. This persistence provides strong empirical justification for our tripartite household segmentation.

Drawing on INSEE (2024), we define three classes : workers (below the median income of 2,190 per person per month), representing 50 % of the active population), rentiers (above 4,334 per person per month, representing 10 %), and a middle class covering the interval between these thresholds (40 % of the population).

The choice of inequality indicator is not neutral. As Cowell (2011) notes, no single measure simultaneously satisfies all desirable properties. We retain the Gini coefficient as our primary synthetic indicator for three reasons : its familiarity and boundedness between 0 and 1 facilitate comparison with the existing post-growth literature ; the Theil index is better suited to sectoral or geographical decompositions absent from our framework ; and the Atkinson index requires calibrating a normative inequality aversion parameter difficult to justify in an aggregate model. We nonetheless acknowledge the limitation identified by

Cowell and Flachaire (2024) : the Gini can counter-intuitively decline when top incomes rise above the mean, tending to underestimate rising inequality, notably in the United States since the 1990s. We therefore complement it with the Lorenz curve and the $P90/P10$ and $P40$ interdecile ratios as methodological safeguards.

Finally, we draw on the Marxian theoretical framework (particularly the conception of labour and the reification of wages developed by Marx (1867) and deepened by Lukács (1960)) to grasp the structural and reproductive dimension of inequalities that a purely quantitative reading would miss.

2.3 Why an ABM-SFC Model?

In the 2000s, post-Keynesian modelling experienced a major renewal with the emergence of PK-SFC models, driven notably

by the collaboration between Godley (1999), Zezza (2008) and Dos Santos (2003) within the Levy Economics Institute⁴. These models emerged as a robust alternative to dominant neoclassical frameworks (in particular DSGE models, which proved unable to anticipate or adequately address the 2008 financial crisis). As Godley and Lavoie (2006) establish, the SFC framework rests on three pillars : the endogeneity of money, adjustment by quantities rather than prices, and a strict stock-flow coherence eliminating any ex post accounting disequilibrium (Clévenot and Héron, 2014; LeHeron, 2018). Souffron and Jacques (2023) further notes that SFC models are now widely mobilised to analyse ecological transition from a macroeconomic angle.

Table 2 summarises the respective strengths and limitations of the two frameworks.

	ABM	SFC
Advantages	• Agent heterogeneity in behaviours, preferences and information • Adaptive agents capable of learning and revising decision rules • Bottom-up modelling enabling emergent macroeconomic dynamics • Capacity to generate unpredictable events and endogenous crises	• Rigorous accounting coherence : no black hole • Endogeneity of money and integration of real and financial spheres • Historical time and path dependence, without intertemporal optimisation • Capacity to model diverse economic regimes and class structures
Limitations	• Absence of global accounting coherence • Difficult calibration and empirical validation • Risk of excessive complexity reducing model readability • Results highly sensitive to behavioural rules retained	• Absence of endogenous crises in the canonical framework • Difficult parameter calibration for non-linear models • Stability dependent on the choice of behavioural equations • Under-representation of microeconomic behaviours in simple versions

TABLE 2 – Comparative overview of ABM and SFC modelling

Source : Own elaboration

4. LeHeron (2018), p. 4

As Table 2 makes clear, the respective limitations of the two frameworks are mutually corrective, which justifies our hybrid ABM-SFC approach. On one side, ABM models (Dai et al., 2020; De Marchi and Page, 2014) allow us to represent social mobility and inter-class inequalities through strong agent heterogeneity, generating emergent macroeconomic dynamics from individual interactions (a decisive advantage in a post-growth context where structural transformations may produce unpredictable bifurcations). On the other side, the SFC framework (Clévenot and Héron, 2014; LeHeron, 2018; Berr, 2019) supplies the macroeconomic rigour that ABM alone cannot ensure : strict accounting coherence, monetary endogeneity, and path-dependent historical time without intertemporal optimisation assumptions.

The literature mobilising ABM for income inequality analysis is now well established. Dosi et al. (2013) were among the first to deploy a post-Keynesian ABM to study the distributional effects of fiscal policies, showing that more progressive redistributive policies tend to sustain aggregate demand. Building on this, Caiani et al. (2016) laid the foundations of a reference ABM-SFC hybrid framework, subsequently exploited by Caiani et al. (2019) to analyse the link between inequality and innovation dynamics across four household classes with heterogeneous propensities to consume. On the post-growth side, Jackson and Victor

(2016) and Jackson and Victor (2018) showed through the SIGMA model that inequalities need not rise as growth slows, under certain institutional conditions (though their framework relies on a representative-agent SFC model without microeconomic heterogeneity).

It is precisely at the intersection of these two bodies of work that our contribution is situated. To our knowledge, no existing work simultaneously combines a hybrid ABM-SFC modelling framework, an analysis of income inequalities by social class, and a post-growth macroeconomic regime. This paper seeks to fill that gap.

3 Model Architecture and Formalisation of Income Inequalities

3.1 General Presentation

This methodological hybridisation requires a rigorous formalisation of the model's architecture. Figure 3 presents the overall structure of the model, articulated around five sectors connected by four types of flows : real, financial, fiscal, and ecological. This representation allows us to identify from the outset the transmission channels between distributive dynamics and ecological constraints that are at the heart of our analysis.

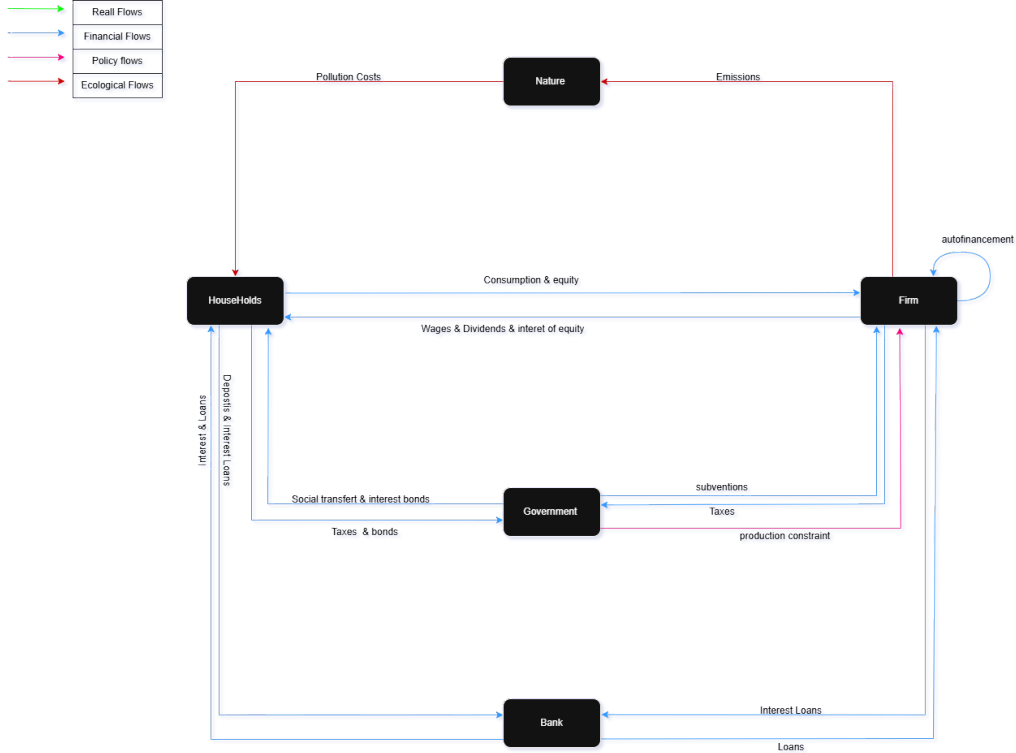


FIGURE 3 – Architecture of the ABM-SFC Model
Source : Own elaboration

From this architecture, we present the two fundamental matrices that structure the SFC component of the model : the balance sheet matrix, which describes the patrimonial position of each sector at a given point in time, and the transaction flow matrix, which traces the entirety of monetary exchanges between

agents over a given period. These two matrices constitute the structural foundation from which the behavioural equations and accounting identities will subsequently be developed, whilst the ABM dimension specifies the heterogeneity of behaviours within each sector.

3.1.1 Households : Behaviour, Income and Consumption

Following [Dafermos and Papatheodorou \(2015\)](#), we distinguish three household groups : workers, the middle class, and rentiers. This tripartite segmentation integrates social mobility mechanisms and fully deploys the analytical potentialities of the ABM framework. Although a finer typology could track

income strata more granularly, this intermediate configuration preserves model tractability whilst capturing the essential distributive dynamics.

Equations (1), (2) and (3) formalise household income, the central variable of our analy-

Transactions	Households			Firms		Banks	Government	Total
	Worker	Mid class	Rentier	Current	Capital			
<i>Current transactions</i>								
Consumption	$-C_w$	$-C_m$	$-C_r$	$+\sum C$	0	0	0	0
Investment	0	0	0	$+I$	$-I$	0	0	0
Government spending	0	0	0	$+G$	0	0	$-G$	0
Wages	$+W_w$	$+W_m$	$+W_r$	0	0	0	0	0
Household taxes	$-Imp_{h1}$	$-Imp_{h2}$	$-Imp_{h3}$	0	0	0	$+Imp_h$	0
Household transfers	$+Gov_{h1}$	$+Gov_{h2}$	0	0	0	0	$-Gov_h$	0
Corporate taxes	0	0	0	$-Imp_f$	0	0	$+Imp_f$	0
Corporate transfers	0	0	0	$+Gov_f$	0	0	$-Gov_f$	0
Deposit interest	$+r_m M_{d,1}(-1)$	$+r_m M_{d,2}(-1)$	$+r_m M_{d,3}(-1)$	0	0	$-r_m M_d(-1)$	0	0
Bond interest	$+r_b B_{hw}(-1)$	$+r_b B_{hm}(-1)$	$+r_b B_{hr}(-1)$	0	0	0	$-r_b B(-1)$	0
Loan interest	$-r_l L(-1)$	$-r_l L(-1)$	0	$-r_l L(-1)$	0	$+r_l L(-1)$	0	0
Dividends	$+F_{dw}$	$+F_{dm}$	$+F_{dr}$	$-F_d$	0	0	0	0
Retained earnings	0	0	0	$-F_u$	$+F_u$	0	0	0
<i>Capital transactions</i>								
Change in deposits	$-\Delta M_{d,1}$	$-\Delta M_{d,2}$	$-\Delta M_{d,3}$	0	0	$+\Delta M_d$	0	0
Change in bonds	$-\Delta B_{hw}$	$-\Delta B_{hm}$	$-\Delta B_{hr}$	0	0	0	$+\Delta B$	0
Change in loans	$+\Delta L$	$+\Delta L$	$+\Delta L$	0	$+\Delta L$	$-\Delta L$	0	0
Equity issuance	$-p_e \Delta ed_1$	$-p_e \Delta ed_2$	$-p_e \Delta ed_3$	0	$+p_e \Delta es$	0	0	0

TABLE 3 – Flow matrix
Source : Own elaboration

Stocks	Households			Firms		Banks	Government	Total
	Worker	Mid class	Rentier	Current	Capital			
Bank deposits	$+M_{d,1}$	$+M_{d,2}$	$+M_{d,3}$	0	0	$-M_d$	0	0
Government bonds	$+B_{h1}$	$+B_{h2}$	$+B_{h3}$	0	0	0	$-B_h$	0
Bank loans	$-L_h$	$-L_m$	0	$-L$	0	$+L$	0	0
Equities	$+e_{d,1} p_e$	$+e_{d,2} p_e$	$+e_{d,3} p_e$	$-e_s \cdot p_e$	0	0	0	0
Fixed capital	0	0	0	$+K$	0	0	0	$+K$
Net worth	V_w	V_m	V_r	V_e	0	0	V_g	V

TABLE 4 – Stock matrix
Source : Own elaboration

sis :

$$Yh_w = W + F_d + r_m \cdot M_{\text{dep},-1} + \text{Int}_b - \text{Imp}_h + \text{Gov}_h$$

$$Yh_m = W + F_d + r_m \cdot M_{\text{dep},-1} + \text{Int}_b - \text{Imp}_h + \text{Gov}_h$$

$$Yh_r = W + F_d + r_m \cdot M_{\text{dep},-1} + \text{Int}_b - \text{Imp}_h + \text{Gov}_h$$

All three household categories share the same income structure, insofar as all agents may,

depending on their consumption level, generate savings and undertake portfolio arbitrage. However, dividends received (F_d) and bond interest (Int_b) vary across households in proportion to their respective asset holdings. The term Gov_h encompasses all public transfers : housing assistance, student grants, and training subsidies for workers and the middle class, and fiscal advantages (tax exemptions and niches) modelled as equivalent transfers for rentier households (an accounting conven-

tion that preserves SFC coherence whilst capturing the redistributive effect of these mechanisms. Incomes are reduced by income tax (Imp_h), whose computation is detailed in Section 3.1.3.

Household net wealth evolves according to :

$$V_w^* = V_{w,-1} + Yh_w^* - C_w \quad (4)$$

$$V_m^* = V_{m,-1} + Yh_m^* + CG - C_m \quad (5)$$

$$V_r^* = V_{r,-1} + Yh_r^* + CG - C_r \quad (6)$$

Capital gains (CG) are integrated for all households but are recorded only upon effective disposal of equities (equation 12). Their exclusion from workers' wealth dynamics in earlier versions reflected a uniform distribution hypothesis (Bovari et al., 2018) that is difficult to reconcile with an analysis centred on income inequality dynamics.

Consumption functions follow a class-specific propensity schedule calibrated on empirical data from INSEE (2024), drawing on the values proposed by Bovari et al. (2018); Russo et al. (2016); Detzer (2018) :

$$Cons_{\text{desired}} = c(w, \text{class}) \times w \quad (7)$$

$$c(w, \text{worker}) = \begin{cases} a_0 & \text{if } w \leq 2000 \\ a_1 & \text{if } w > 2000 \end{cases} \quad (8)$$

$$c(w, \text{middle}) = \begin{cases} a_2 & \text{if } w < 2190 \\ a_3 & \text{if } 2190 \leq w < 2442 \\ a_4 & \text{if } 2442 \leq w < 2785 \\ a_5 & \text{if } 2785 \leq w < 3305 \\ a_6 & \text{if } w \geq 3305 \end{cases} \quad (9)$$

$$c(w, \text{rentier}) = \begin{cases} a_7 & \text{if } w < 4334 \\ a_8 & \text{if } 4334 \leq w < 5593 \\ a_{10} & \text{if } w \geq 5593 \end{cases} \quad (10)$$

This distinction between household types has been proposed in Detzer (2018). Each category is assigned consumption propensities specific to its income decile, allowing consumption to adjust as incomes evolve. These decisions, endogenous in the model, exert a significant impact on the allocation of

household wealth across equities, bonds, and monetary deposits, thereby determining the trajectory of GDP through the aggregate demand channel (Godley and Lavoie, 2006). The remaining elements of equations (1)–(3)

are :

Detzer (2016) :

$$W = (r_o \cdot \text{GDP}) \cdot \left[1 + g_y + \left(\frac{N_t}{N_{t-1}} - 1 \right) \right] \quad F_t = \frac{(\text{price} \cdot \text{GDP}) - W}{\text{price} \cdot \text{GDP}} \quad (17)$$

$$(11) \quad F_u = F_t - F_d - r_l \cdot L_{-1} - (\text{Imp}_f - \text{Gov}_f) \quad (18)$$

$$CG = \Delta p_e \cdot e_{d,-1} \quad (12) \quad (18)$$

$$\text{total}_{\text{demand}} = C_{\text{des},r} + C_{\text{des},m} + C_{\text{des},w} + \text{Gov} \quad F_d = (1 - s_f) \cdot (F_t - r_l \cdot L_{-1}) \quad (19)$$

$$(13)$$

Equation (11) links the wage bill to GDP through the wage-share parameter r_o , adjusted for productivity growth g_y and employment dynamics. Equation (13), which aggregates desired household consumption and public spending, serves as the ex ante aggregate demand anchor for evaluating the GDP trajectory.

Bank deposits are modelled as residual balances resulting from consumption and portfolio decisions, in the spirit of Keynes (1936), with θ capturing risk aversion across household groups :

$$d(M_{\text{dep},r}) = \theta_1 \cdot S \quad (14)$$

$$d(M_{\text{dep},m}) = \theta_2 \cdot S \quad (15)$$

$$d(M_{\text{dep},w}) = \theta_3 \cdot S \quad (16)$$

Total profits (F_t) measure the surplus generated by firms, expressed as the share of aggregate output not going to workers. They are sensitive to fiscal constraints linked to GHG emissions, detailed in the scenario analysis. Retained earnings (F_u) are determined residually after deducting dividends, loan interest, and net taxes. Distributed profits (F_d) directly condition the income of all household classes in proportion to their equity holdings, linking productive sector performance to patrimonial inequality dynamics.

Supply and price formation follow Dafermos and Papatheodorou (2015); Botta et al. (2024).

The price is determined as the markup over unit labour costs :

$$\text{GDP}_s = \text{prod} \cdot K \quad (20)$$

$$\text{price} = (1 + \bar{\mu}) \cdot \frac{W + r_l \cdot L}{Y} \quad (21)$$

3.1.2 Firms : Production, Investment and Employment

This sector governs the construction of means of production, profit formation, productivity, and price determination. Profit distribution follows Clévenot (2006), also adopted by

The ABM dimension introduces a detailed production block that distinguishes our approach from models applying a damage function directly to output. Desired supply adjusts

toward demand with a trend component :

$$Y_{S,t}^* = [Y_{S,t-1}^* + v_1(Y_{D,t-1}^* - Y_{S,t-1}^*)](1 + v_2) \quad (22)$$

$$Y_{K,t}^{\max} = K_{t-1} \cdot X_K \quad (23)$$

$$Y_{L,t}^{\max} = N_t \cdot X_{L,t} \quad (24)$$

$$Y_t^{\max} = \min(Y_{K,t}^{\max}, Y_{L,t}^{\max}) \quad (25)$$

Actual supply is capacity-constrained :

$$Y_{S,t} = \min(Y_{S,t}^*, Y_t^{\max}) \quad (26)$$

Aggregate demand and labour productivity evolve as :

$$Y_{D,t} = \sum W \cdot a + ((\sum \Pi + \sum CG + \sum \text{Int}_b) \cdot \frac{0.03}{12}) \quad (27)$$

$$X_{L,t} = X_{L,t-1} \cdot \left[\chi_{L1} + \chi_{L2} \cdot \left(\frac{Y_{D,t}^*}{Y_{D,t-1}^*} - 1 \right) \right] \quad (28)$$

$$N_t = \frac{Y_{S,t}}{X_{L,t}} \quad (29)$$

Firm financing is residual : bank credit fills the gap between investment and internal resources net of equity issuance :

$$d(L) = I - F_u - d(e_s) \cdot p_e \quad (30)$$

3.1.3 The State : Taxation, Public Spending and Regulation

We model a basic fiscal system using an aggregate class-based approach. Household income tax is progressive across the three

classes, with a flat levy on financial income :

$$T_{\text{net}} = \begin{cases} \tau_w & \text{if } W < W_{D5} \\ \tau_m & \text{if } W_{D5} \leq W < W_{D9} \\ \tau_r & \text{if } W \geq W_{D9} \end{cases} \quad (31)$$

$$T_f = \tau_f \cdot Y \quad (32)$$

$$\text{Imp} = \sum T_{\text{net}} + T_{\text{wealth}} + T_f \quad (33)$$

$$T_{\text{wealth}} = \frac{0.3}{12} \cdot (\sum F_d + CG + r_i \cdot \sum \text{Int}_b + r_m \cdot \sum M_{\text{dep}}) \quad (34)$$

Income tax thresholds evolve with the growth rate g_y . T_{wealth} applies a flat rate close to the French *prélèvement forfaitaire unique* to financial income. Corporate tax (T_f) is levied at 30 % of annual output. Equation (33) aggregates all tax revenues for public accounting.

Social transfers are differentiated by class through parameter ϕ (see Table 6), modelling housing assistance and fiscal niches. Equity price formation links all household classes to market valuation :

$$p_e = \left(\frac{V_r^* + V_m^* + V_w^*}{e_d} \right) \cdot \sigma \quad (35)$$

$$r_e = \frac{F_d + CG}{p_{e,-1} \cdot e_{d,-1}} \quad (36)$$

$$e_d = e_s \quad (37)$$

The equity return (r_e) is the sum of distributed profits and capital gains divided by the lagged equity value. Unlike [Jackson and Victor \(2016\)](#), we do not distinguish between current and capital accounts, whilst maintaining equivalent modelling depth. The market-clearing condition (37) ensures accounting coherence

indispensable to any SFC framework.

Bond management rests on three equations. Equation (40) determines bond issuance as the residual of public expenditures over tax revenues. The bond rate equals the deposit rate (41), following [Detzer \(2018\)](#); [Bovari et al. \(2018\)](#); [Giraud and Grasselli \(2021\)](#) :

$$\text{GDP} = (\text{Cons} + I + \text{Gov})/\text{price} \quad (38)$$

$$g_{\text{GDP}} = \frac{\text{GDP}_t - \text{GDP}_{t-1}}{\text{GDP}_{t-1}} \cdot 100 \quad (39)$$

$$\text{Bonds} = \text{Gov_expenses} - \text{Imp} \quad (40)$$

$$r_{\text{bonds}} = r_m \quad (41)$$

$$\text{Int}_{\text{bonds}} = r_{\text{bonds}} \cdot \text{Bonds}_{-1} \quad (42)$$

Compared to [Dafermos and Papatheodorou \(2015\)](#), our model explicitly integrates the government as a macroeconomic actor, capturing redistributive and fiscal dynamics in a more complete manner. Relative to [Bovari et al. \(2018\)](#), we propose an alternative trajectory in which moderate post-growth (approximately -2% annual GDP growth) can be situated within a stabilised macroeconomic configuration without generating cumulative disequilibria.

3.1.4 Ecological Module

We construct a synthetic ecological block capable of exerting a strong influence on model results, building on [Funalot \(2024\)](#) and [Bovari et al. \(2018\)](#) :

$$\text{GHG} = \text{int_GHG} \cdot \text{GDP} \quad (43)$$

$$\text{int_GHG} = \text{int_GHG}_{-1} \cdot (1 - \Psi) \quad (44)$$

$$\text{GHG}_{\text{acc}} = \text{GHG}_{\text{acc},-1} \cdot \beta + \text{GHG} \quad (45)$$

Equation (43) calculates annual GHG

emissions by multiplying the carbon intensity of production by GDP. Equation (44) reduces this intensity period by period through an empirically calibrated parameter Ψ , reflecting progressive decarbonisation efforts. Equation (45) models atmospheric accumulation as a stock inherited from the previous period, reduced by natural degradation factor β , to which current emissions are added (a dynamic central to our model since it indirectly influences potential output via productivity.

Unlike Goodwin-Keen-inspired models that resort to explicit damage functions ([Jackson and Victor, 2020](#); [Giraud and Grasselli, 2021](#)), we adopt a structural approach centred on the physical evolution of GHG emissions rather than their immediate functional feedback. More developed climate architectures exist ([Dafermos et al., 2017, 2018](#)) and constitute an avenue for future extensions.

3.1.5 Inequality Module

We retain the Gini coefficient as our primary synthetic indicator, for reasons detailed in Section 2. The standard formulation for a population of size N with individual incomes YH_i and mean income μ is :

$$\text{GINI} = \frac{1}{2 \cdot N^2 \cdot \mu} \sum_{j=1}^N \sum_{i=1}^N |YH_i - YH_j| \cdot N_i \cdot N_j \quad (46)$$

In our three-class discrete model, we adapt this formulation using consumption as a proxy for living standards, following the post-

Keynesian literature (Detzer, 2018) :

$$\text{Gini} = \frac{1}{2\mu} \sum_{i=1}^3 \sum_{j=1}^3 p_i p_j |C_i - C_j| \quad (47)$$

where $\mu = \text{scalarp}_w \cdot C_w + \text{scalarp}_m \cdot C_m + \text{scalarp}_r \cdot C_r$ is the weighted mean consumption, p_i denotes the population share of each class, and C_i its consumption. This formulation preserves the fundamental properties of the Gini coefficient : boundedness between 0 and 1, scale independence, and the Pigou-Dalton transfer principle. As noted in Section 2, this indicator will be complemented by the Lorenz curve and the $P90/P10$ and $P40$ ratios to guard against its known limitations at the top of the distribution (Cowell and Flachaire, 2024).

4 Results

Before presenting the results, it is necessary to set out the different scenarios we have chosen to implement. In keeping with the various aspects developed in the preceding sections, we made the arbitrary choice to highlight changes from an ecological perspective by applying three different values to β . In a second set of scenarios, we focus on the share of value added (r_0) attributed to workers. Two parameters are held constant across all scenarios : the growth rate is set to zero, and financial assets (excluding deposits) no longer generate either dividends or capital gains. For ease of reading, the scenarios are summarised in Table 5.

Scenario	r_0	β	Description
1	0.6	0.9751	<i>Low distribution, optimistic ecological trajectory</i>
2	0.6	1	<i>Low distribution, neutral ecological trajectory</i>
3	0.6	1.05	<i>Low distribution, degraded ecological trajectory</i>
4	0.7	0.9751	<i>Moderate redistribution, baseline</i>
5	0.7	1	<i>Moderate redistribution, neutral ecological trajectory</i>
6	0.7	1.05	<i>Moderate redistribution, degraded ecological trajectory</i>
7	0.8	0.9751	<i>Strong redistribution, optimistic trajectory</i>
8	0.8	1	<i>Strong redistribution, neutral trajectory</i>
9	0.8	1.05	<i>Strong redistribution, degraded trajectory</i>

TABLE 5 – Scenario table

Source : Author's own elaboration

Dans un premier temps pour venir expliquer les différents scénario et les résultats préliminaires que nous venons d'obtenir, nous

avons souhaité discuter du montant du PIB en euros du BAU mais aussi des autres scénarios.

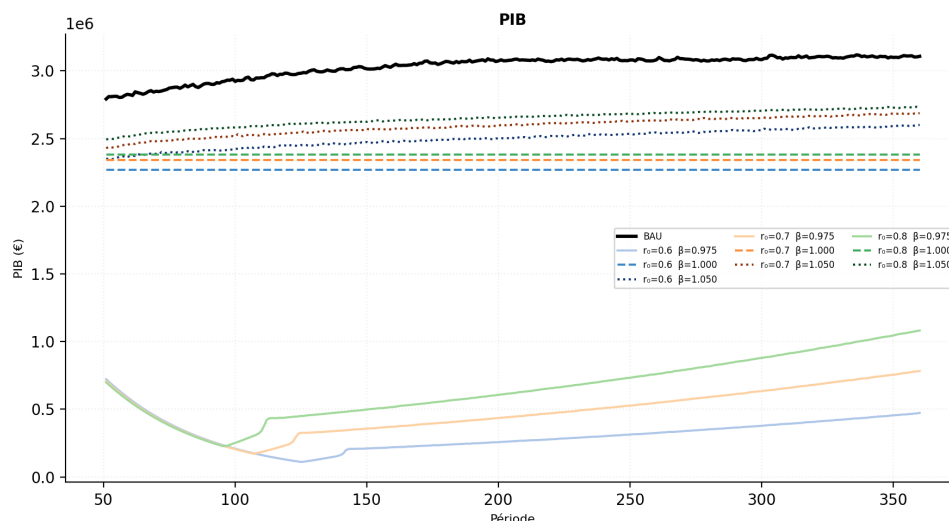


FIGURE 4 – Evolution of GDP in euros
Source : Own elaboration

A first clear separation can be observed between scenarios in which β is equal to or greater than 1 and those in which we introduce a damage function that reduces production by 2.5% per year, which has the effect of drastically reducing , even though a recovery in values can be observed over the very long run in these last three scenarios. This suggests that the reduction of emissions would have a strong short-term impact on the economy, but that over a period of 30 years or more, these scenarios tend to converge towards the results obtained with no reduction. It should nonetheless be noted that the business-as-usual trajectory remains well above the values of the other

scenarios. An interesting point to highlight, however, is that despite the inability of growth to increase normally, investment remains relatively strong in the scenarios where the share of value added is most redistributive.

This can be attributed with certainty to what our data clearly shows : consumption is only marginally affected across our different scenarios. With the exception of cases where β is below 1, in which we observe a drastic fall in the share of consumption in , reaching values close to 1%, consumption remains broadly stable.

Two results stand out as particularly concerning : public spending and employment.

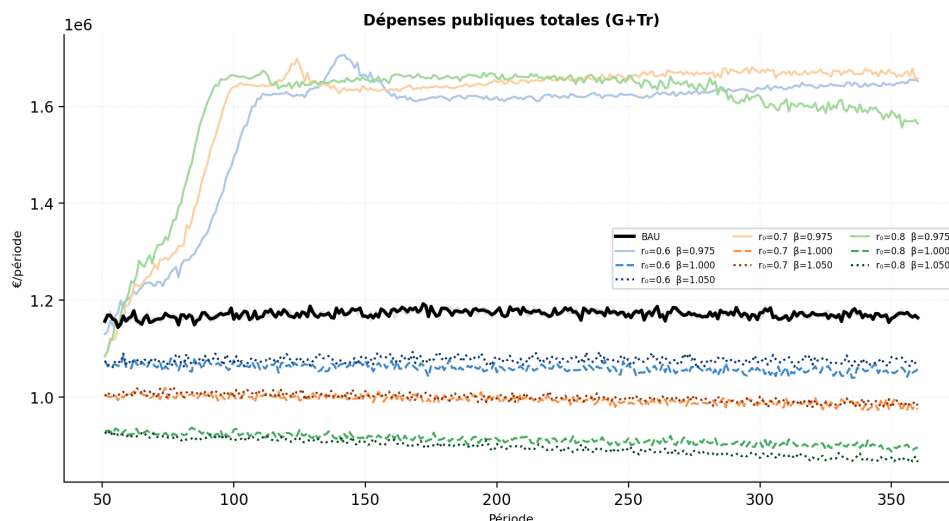


FIGURE 5 – Evolution of public expenses in euros
Source : Own elaboration

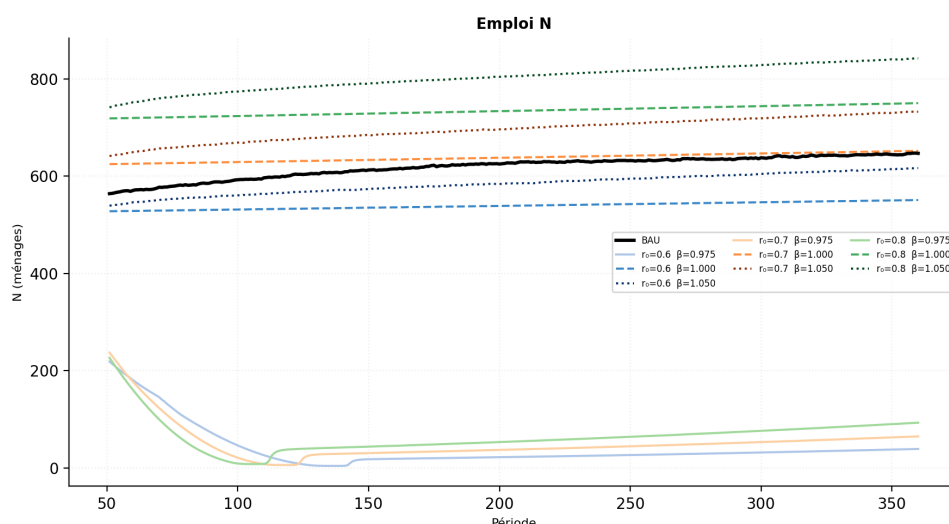


FIGURE 6 – Evolution of employment
Source : Own elaboration

In the first graph 5, we observe an explosion of values in cases where β equals 0.975, which corroborates the results of Bovari et al. (2018), who showed a collapse of the system in the event of a reduction in emissions. It is nonetheless equally important to note a marked reduction in public spending in the other scenarios : since our social transfer values re-

present the provision of free education and the French healthcare system, this reduction implies a fall in the deficit, which could translate into greater employment in public institutions, civil service, and hospital services. We will return to this point in the conclusion, but a recovery in value added could be coupled with a reassertion of control over employment and

therefore over the direction of public spending.

We now turn to the analysis of the different inequality indicators. We first focus on the Gini coefficient 8, which shows a non-negligible reduction across all scenarios. We do not yet have a satisfactory explanation for the upturn observed in the most radical scenarios. This pattern is found in similar proportions in the analysis of the Theil coefficient 7, and the MLD coefficient 9 also fails to adequately capture these dynamics. Focusing on the remaining results as a whole, we can nonetheless assert that a significant reduction in inequalities is observable.

5 Conclusion

All of the results discussed above are directly grounded in the work of [Jackson \(2017\)](#);

[Monserand \(2022\)](#); [Victor and Rosenbluth \(2007\)](#); [Kallis \(2019\)](#), which show that an alternative way of thinking about the economy, and in particular through the lens of post-growth, is entirely conceivable. We must nonetheless reiterate that the results presented here are preliminary and calibration-dependent : a complete reduction of growth and financial assets is no straightforward exercise. Our results are nonetheless more than encouraging, showing a marked improvement in numerous ratios and variables under a post-growth regime. They further suggest that a rebalancing of power in favour of value-added producers contributes to greater long-term system stability. We hope to be able, in future work, to address the remaining limitations of this model.

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TABLE 6 – Exogenous Variables

Variable	Description	Value
e_0	Equity issuance parameter	0.008
θ_1	Propensity to hold deposits (rentiers)	0.05%
θ_2	Propensity to hold deposits (workers)	0.3%
s_f	Profit distribution rate	0.3
δ	Capital depreciation rate	0.03
a_0	Marginal propensity to consume	0.4
a_1	Marginal propensity to consume	1.00
a_2	Marginal propensity to consume	0.95
a_3	Marginal propensity to consume	0.90
a_4	Marginal propensity to consume	0.85
a_5	Marginal propensity to consume	0.80
a_6	Marginal propensity to consume	0.75
a_7	Marginal propensity to consume	0.70
a_8	Marginal propensity to consume	0.65
ϕ	Rate of social transfer	0.20
σ	Equity valuation parameter	0.015
r_o	Wage share parameter	0.6
w_0	Base wage	0
ζ	Dividend distribution coefficient	0.2
scalarp_r	Scale factor for rentiers	0.1
scalarp_m	Scale factor for rentiers	0.4
scalarp_w	Scale factor for workers	0.5
μ	markup	0.35

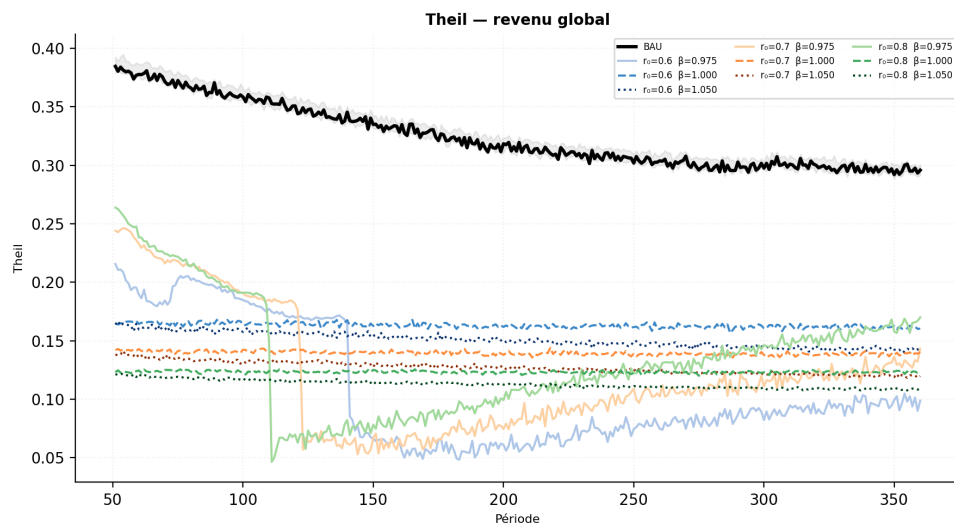


FIGURE 7 – Evolution of Theil coefficient
Source : Own elaboration

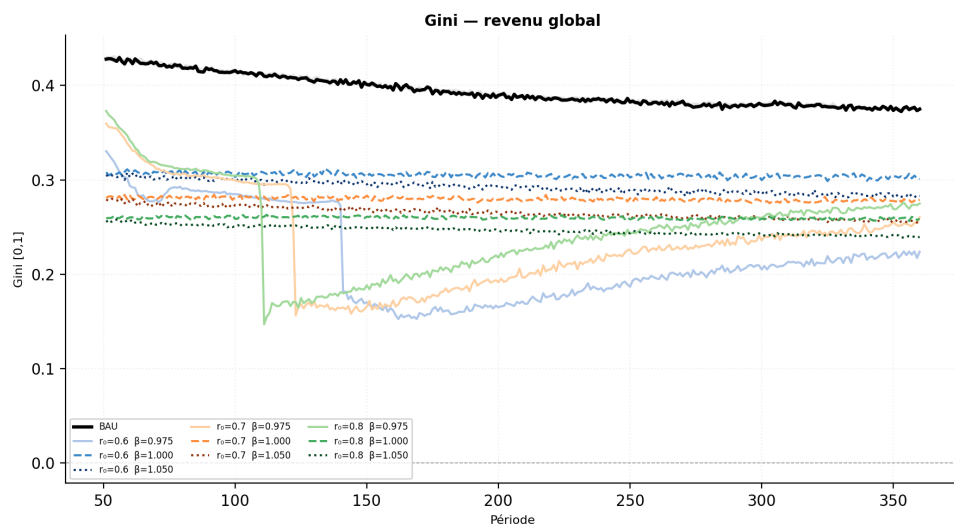


FIGURE 8 – Evolution of GINI
Source : Own elaboration

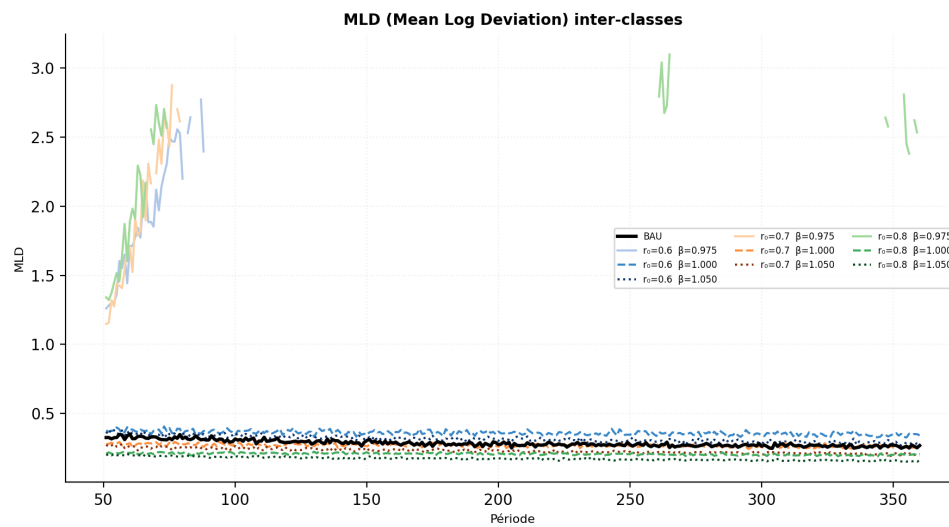


FIGURE 9 – Evolution of MLD coefficient
Source : Own elaboration