The ecological transition in a monetary production economy: the role of public banks♠

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Abstract

Public banks are central to the ecological transition when it is understood as a politically driven process of structural transformation in a monetary production economy. Rather than emerging spontaneously from market forces, this transition unfolds under conditions of radical uncertainty, technological incompleteness, and strong coordination requirements. Drawing on Schumpeterian and post-Keynesian insights, this chapter argues that finance is constitutive of the pace, direction, and viability of structural change. It also shows that the persistence of the prevailing carbon-intensive paradigm and the weight of economic and political path dependencies inhibit the large-scale reallocation of investment. In this context, public banks can provide patient capital, absorb initial risks, coordinate heterogeneous investments, and help shape new markets. Finally, the chapter argues that their effectiveness depends on a broader macro-financial and institutional architecture capable of aligning finance with long-term developmental and ecological objectives.

1. Introduction

The urgency of the ecological transition brings to light the need to accelerate the transformation of the productive structure with a view to reducing carbon emissions and pollutants in general. It also becomes clear that the transition extends beyond strictly green investments, encompassing basic infrastructure, adaptation, the scaling-up of mature technologies, conventional support for productive reorganization, and genuine transformational investments. This heterogeneity makes any single financing approach inadequate. Prospects for worsening global warming and the damage already established in the climatic balance require major investments to mitigate the forces that contribute to the continuation of warming and to increase resilience in the face of extreme events that are likely to recur. What is at stake, therefore, is a change in the techno-economic paradigm, involving the accelerated adoption of green technological innovations through the massive reorientation of investment and consumption patterns.

From this perspective, the financing problem becomes central not only because of the volume of investments, but also because of the types of investment. In market economies, the decisive investments are not those that merely follow already consolidated trends, but precisely those that anticipate still-uncertain trajectories, organize future complementarities, and sustain prolonged periods of maturation.

The greater the distance between the existing structure and the desired structure, the greater the need for mechanisms capable of sustaining long-term commitments in the face of expectations of returns that have not yet stabilized (STUDART & ALVES JR., 2019). This problem, which is typical of the development process, i.e., the promotion of large volumes of investment for productive transformation, exacerbated by the demands of the necessary ecological transition. Against the backdrop of the growing risks arising from the environmental crisis, there is also an urgent need to demobilize a large volume of assets linked to a techno-economic paradigm that dominates the world productive structure, hierarchizes countries and firms, and reveals profitable investment opportunities, in favor of the massive financing of activities and technologies whose pattern of economic viability is still in formation.

Within this framework of uncertainty, private financial institutions may fail the test of functionality (STUDART, 1995; STUDART & ALVES JR., 2019) because their stronger preference for liquidity may discourage the large-scale financing of new investments and new forms of consumption, thereby delaying the transformations that need to be accelerated.

For these reasons, the ecological transition, at the desired speed, does not emerge as a market process, but as a politically induced process aimed at overcoming the obstacles to private decision-making posed by radical uncertainty and strong intertemporal coordination requirements. Within this effort, public banks are key components of the necessary state intervention.

2. Development, structural change, and finance

The Schumpeterian tradition associates development with innovation, that is, with the introduction of new productive combinations capable of displacing previously dominant techniques, firms, and sectors. Innovation does not emerge merely as continuous improvement, but also as a disruptive force that reorganizes the economic structure and redistributes opportunities for profit, triggering the famous process of creative destruction.

The major economic transformations associated with innovation presuppose large investments in recent technologies. For them to materialize, therefore, it is necessary to confront a kind of aggravated version of the uncertainty problem surrounding the decision to invest and to finance such investments.

For Keynes and the post-Keynesians, in monetary production economies, as defined by Carvalho (1992) and Davidson (1978), uncertainty is an unavoidable condition to invest and to finance investment decisions, even when economic development follows more clearly defined technological lines. This means that the calculation of project rates of return, or the marginal efficiency of capital in Keynes's (1936/2007) terms, as well as the assessment of the viability of financing (MINSKY, 1986),

carried out respectively by entrepreneurs and bankers, draw on past information about agents' behavior and their patterns of response to macroeconomic data, but not on that alone, since such information is insufficient to estimate the future behavior of variables such as interest rates and demand. Unfortunately, the objective calculation of these central variables presupposes, in macroeconomic terms, knowledge of the future flow of investment and of liquidity preference, in addition to economic policies, among other factors, which simply do not exist at the moment of decision. Thus, the decision to invest depends on realized data, on entrepreneurial hypotheses, or on entrepreneurial "figments of imagination," in Shakle´s terms (SHAKLE, 1961), to fill the informational gaps regarding future variables, as well as on the degree of confidence entrepreneurs place in their hypotheses, which opens the door to the influence of subjective factors in the decision to invest.

For this reason, even in periods of relative technological stability, uncertainty is present and may at times hold back the investments that would lead the economy to full employment. The problem changes in periods of transition, innovations and changes in production technologies and consumption patterns characterize the economic environment. In that case, accumulated experience becomes even less relevant, and scenario-building becomes even more precarious. The decision to invest becomes even more affected by uncertainty and even more dependent on imagination. Under these circumstances, the Keynesian uncertainty about the future merges with Schumpeter's technological uncertainty (SCHUMPETER, 1934/2011) and the innovator relies on intuition to escape the routine of the circular flow to obtain extraordinary gains.

The second part of the problem is that, beyond overcoming the uncertainty that affects entrepreneurs, for investment decisions to materialize financial agents must also be convinced of the viability of the projects they finance. In a widely cited passage, "in general, the banks hold the key position in the transition from a lower to a higher scale of activity," Keynes (1937, p. 688) highlights the relevance of the banking system in determining the pace of activity because of its ability to expand deposits (create money) and increase credit, thus moving beyond the Wicksellian perspective of a savings constraint. Investors do not require prior savings, whether their own or intermediated by the financial sector, but rather liquidity, which commercial banks in modern monetary production economies can be created *ex nihilo*, Carvalho (2016) points out.

Banks, like any company in a monetary production economy, are also subject to uncertainty and manage assets and liabilities based on their preference for liquidity (Paula and Alves Jr, 2020). They will expand the supply of credit only if they consider it a profitable and safe alternative. Thus, in periods of lower uncertainty and, therefore, lower liquidity preference, banks can expand credit on better terms (collateral requirements, maturities, and spreads). In this environment favorable to

production and investment, other financial institutions, which do not create deposits, and the public at large are more willing to acquire longer-term securities at lower interest rates, helping to consolidate bank debts.

Alternatively, in moments of greater uncertainty, liquidity preference increases. Not only do entrepreneurs tend to become more cautious in making the decision to invest, but financial agents, especially banks that create money, also tend to restrain credit through rationing and by worsening financing conditions. Other institutions and the public at large prefer liquid assets in their portfolios, avoiding the purchase of long-term securities that give them claims on new long-term assets, which makes the activity of investing riskier.

The post-Keynesian tradition and the finance–funding literature (see, for example, Davidson, 1978; Minsky, 1986; Studart, 1985) emphasize precisely that sustained financial growth oriented toward development depends on the functionality of financial frameworks. Functionality has both a macroeconomic and a microeconomic dimension. The macroeconomic dimension concerns the ability of financial institutions to provide financing in sufficient volumes to keep the economy operating at full employment and in a sustainable manner. Therefore, if financing becomes costly and short term, the expansion process may be interrupted, rendering investment unviable; but if it expands too rapidly, with mismatches between assets and liabilities, financial fragility tends to increase and to turn expansion itself into crisis.

The microeconomic dimension concerns how financial institutions favor or penalize distinct types of investment by setting credit conditions such as maturity, cost, and risk profile. By this criterion, the more the financial system grants favorable conditions to the types of productive investment desired by society, and penalizes investments linked to activities that run counter to the desired pattern of development, the more functional it becomes.

In processes of structural transformation, this issue acquires additional density and a more qualitative focus. Innovative projects, emerging sectors, and large-scale technological reconfigurations involve more uncertain returns, greater coordination needs, and longer time horizons than those observed in routine investments. It is not enough, therefore, for financial resources to exist in the aggregate sense—which is already not guaranteed in monetary economies, given the uncertainty typical of monetary production economies, which may eventually increase banks' liquidity preference; it is necessary for the mass of resources required for the transition to be mobilized in a patient, selective, and coherent manner in relation to the direction of change.

3. The specificity of the ecological transition

The ecological transition shares with other major historical changes the character of a profound restructuring of the productive system, but it has specific features that distinguish it. First, it is increasingly driven by political decisions in the face of a growing consensus around the pursuit of sustainability (Lema and Perez, 2024). It does not emerge from the spontaneous diffusion of a set of innovations already demonstrably superior according to the private criterion of profitability. On the contrary, a political and civilizational imperative drives the ecological transition to reduce emissions, contain environmental degradation, and reorganize the productive structure and consumption patterns before ecological and social costs become irreversible and unbearable.

Second, the green transition is simultaneously destructive and incomplete. It is destructive because it seeks the accelerated replacement of assets, infrastructures, productive chains, and consumption patterns associated with carbon and environmental degradation in general. Nevertheless, at its current stage, it remains incomplete because this demand for substitution arises before a stable consensus has emerged regarding the material bases, business models, and institutional arrangements that will organize the new regime of accumulation. This is the case with the lack of definition regarding dominant technological routes in battery production and charging, long-term energy vectors, technologies and business models involving autonomous vehicles, risk-pricing mechanisms, the most efficient regulatory devices for inducing the ecological transition, and the combinations of public action and private initiative that will shape the new pattern of growth.

This does not mean that it is impossible to envisage certain developments. Some sustainable technologies have been around for years and are now part of industry, established due to productive efficiency, national strategic interests like self-sufficiency and regional policies, and pro-sustainability efforts such as subsidies and favorable financing.

Therefore, there are development paths that are already at an advanced stage and receiving substantial investment, thereby mitigating the uncertainties that still surround the ecological paradigm, as in the case of electric and hybrid cars, the various types of renewable energy regularly traded on the market, and less-polluting agricultural techniques such as no-till farming and biofertilizers. Moreover, as Lema and Perez (2024) emphasize, the advance of information and communication technologies (ICT), which dominate the current paradigm and are becoming increasingly diffused across all sectors, also benefits the technologies that accelerate the transition, demonstrating the economic possibilities of new productive combinations, apparently with a broad horizon yet to be explored.

Third, the current paradigm resists. On the one hand, the production and consumption system, intensive in carbon and other pollutants, remains anchored in operational capital stocks, consolidated

business models, a web of long-term contracts linking productive chains, established consumption habits, and dense business and financial networks. The enduring horizon of these activities is evident in the IEA (2025) scenarios for oil and gas dependence, which suggest that, even in the best-case scenario, dependence on oil will persist for another 30 to 50 years.

Moreover, if ICT may broaden the development horizon of ecological technologies, they also increase the competitiveness of the activities associated with the current paradigm, expanding its technological horizon. Thus, it is premature to say that unsustainable technologies show unequivocal signs of techno-economic exhaustion. Indeed, part of the activities linked to ICT are themselves polluting and intensive in scarce natural resources. This is the case of the energy demand generated by data centers and by the processing effort associated with artificial intelligence. Along the same lines, there is pollution potential associated with the mining and processing of critical minerals, and conflicts over land and water ownership and use emerge around them, as Mansur, Wanderlei, and Fraga (2024) conclude in a study on Brazil. This demonstrates the technical difficulties involved in overcoming the current paradigm.

On the other hand, while the defense of the ecological paradigm originates in a just social demand, anchored in scientific principles that announce environmental exhaustion and its drastic consequences for life on Earth, the interests surrounding the existing paradigm are translated into political representation that directly interferes in the forms of state action and in institutional development. Legitimate blocks of interest argue that institutional changes in favor of sustainability should not harm activities on which many firms, regions, and workers depend before viable and superior alternatives present themselves. These legitimate interests even include considerations about national competitiveness and geopolitical concerns.

In short, path dependencies linked to the prevailing paradigm constrained the development of the ecological one (Lema and Perez, 2024). This set of characteristics significantly heightens the uncertainties surrounding the configuration of the new techno-economic paradigm, thereby influencing the definition of competitive strategies and, consequently, private investment. When paradigms are consolidated, private agents operate with stable references for prices, demand, technology, and finance, although they must still contend with the uncertainty typical of monetary economies. During transitional phases, however, these references themselves become objects of dispute, including political dispute, depending both on the correlation of political forces governing the state and on their institutional configuration. As long as these definitions remain unsettled, project evaluation and investment decisions come to depend on very long time horizons, future regulatory changes, complementarities not yet in place, and unstable collective expectations.

4. The state, missions, strategic coordination, and public banks

The ecological transition, which demands urgent action, cannot follow market logic alone. For this reason, the state cannot limit its role to correcting market failures or subsidizing isolated activities. At this moment, we must recognize that political powers induce the direction of structural change, as is the case of ecological transition. Therefore, the state, more than ever, must provide direction, set the pace, and ensure the coherence of the transformation. The state must do more than remedy insufficiencies: it must define missions, establish priorities, articulate complementary investments, and sustain temporal commitments that the private sector tends to avoid (MAZZUCATO & PENA, 2016).

We can conceive this role on two articulated levels. The first is the macro-financial level, which shapes the general conditions for investment, including the cost of capital, the availability of long-term funding, fiscal constraints, the state's ability to act countercyclically, and mechanisms for mitigating systemic risk. Unless policymakers take the macro-financial level into account (as discussed below), even well-designed sectoral strategies become unviable, because the economy may generate financial incentives incompatible with the scale of long-maturity projects required for the transition. The second level is the strategic-operational plane, which includes industrial policies, public procurement, directed subsidies, guarantees, investment platforms, sustainable taxonomies, state-owned enterprises, and the action of public banks.

The mission-oriented logic synthesizes this dual requirement. One cannot limit a mission to stating abstract priorities; it must transform political objectives into concrete trajectories of investment, learning, and technological diffusion. This requires aligning diverse instruments around the same vector of change, a condition for the reorganization of private expectations. A mission-oriented policy is successful when it manages to reduce the distance between the long-term public interest and short-term private rationality, modifying the structure of incentives and making the direction of transformation credible.

From this perspective, the ecological transition requires a state capable of acting as a coordinator of first and last resort, that is, one that acts both as planner and as coordinator properly. The exercise of planning and coordination derives from the need to make the direction of development clear from the complementarity among investments, from the indivisibility of certain infrastructures, from technological uncertainty, and from the asymmetry between private returns and public benefits. Without planning and coordination, decisions tend to remain fragmented: firms wait for infrastructure; financiers wait for mature projects; governments wait for private responses; and everyone waits for clearer signs of profitability. The result is the postponement of change.

Public banks occupy a singular position in this arrangement because they combine attributes rarely found together in other institutions. First, they can operate as instruments of state policy, articulating themselves with sectoral strategies and long-term public goals. Second, they possess the capacity to engage with private financiers, institutional investors, and multilateral organizations, functioning as translators between public and financial logic. Third, they tend to develop the competence to evaluate non-conventional projects, structure hybrid solutions, and absorb initial risks that the private system avoids. Fourth, they can provide financing in domestic currency with a longer time horizon and less sensitivity to the almost immediate liquidity preference displayed by the private sector.

5. Public patient capital and public banks

To accelerate the transition, the notion of patient capital becomes central. Patient capital is not merely long-term capital in a chronological sense. It is capital willing to support trajectories involving prolonged learning, deferred returns, substantial experimentation, and a risk of failure. In processes of productive transformation, this type of financing is a condition for projects that have not yet stabilized to cross the interval between the formulation of the mission and the maturation of markets, technologies, and business models.

Especially in moments of heightened uncertainty—which may constitute a significant obstacle to accelerating the ecological transition, still in its infancy—public banks are well positioned to become providers of patient capital aligned with the objectives of ecological transition and economic growth. By virtue of their capacities for coordination, credit expansion, and financial innovation, they can sustain investment trajectories that private financial institutions, constrained by stronger liquidity preference and shorter time horizons, are often unwilling to support.

Public banks can provide financing in domestic currency with a longer time horizon and less sensitivity to the almost immediate liquidity preference displayed by the private sector. Especially in moments of heightened uncertainty—which may constitute a relevant obstacle to accelerating the ecological transition, still in its infancy—public banks, by virtue of their capacities for coordination, credit expansion, and financial innovation, which are in principle not limited by market forces, are capable of becoming providers of patient capital aligned with the objectives of accelerating the ecological transition and economic growth.

If public banks are to perform coordinating functions and supply patient capital, analysts must not assess them in monetary production economies solely by microeconomic criteria such as profitability, operational efficiency, or static comparison with private banks. The central issue is to evaluate their contribution to the macroeconomic functionality of the financial system, measured by their capacity to

provide liquidity on a scale and with maturities compatible with the investment required to maintain full employment and promote productive transformation, reduce the effects of uncertainty on intertemporal decisions, and contain the tendency toward financial instability. From this standpoint, a system may be sophisticated and efficient from a microeconomic perspective and yet reveal itself to be dysfunctional for development if it does not finance structural transformation, innovation, and infrastructure under the required conditions and/or offers favorable conditions to investments that run counter to the direction of development (Studart, 1995; Studart and Alves Jr., 2019).

This point becomes even clearer when one considers the Keynesian distinction between finance and funding. Banks play a decisive role because they provide the initial liquidity that transforms projects into effective expenditure, but private preference for liquidity and the short maturity structure of bank liabilities often restrict the credit horizon. Therefore, the problem of development does not consist merely in increasing the volume of available resources, but in building institutional mechanisms that lengthen maturity, stabilize expectations, and provide support for investment funding. Historically, this has been solved through diverse arrangements, including strongly bank-based structures shaped by regulation, public policy, and state coordination, which reinforces the idea that there is no single "natural" model of a financial system functional to development (Keynes, 1937; Studart and Alves Jr., 2019; Zysman, 1983).

From this follows an important implication for the theory of public banks. When markets exist and relevant information is sufficiently standardized, private intermediation may meet a significant share of financing demand. But as information asymmetries, market incompleteness, and uncertainty irreducible to risk increase, public intervention ceases to be residual and becomes constitutive of the financing process itself. In such cases, public banks operate through selective credit, guarantees, risk sharing, participation in hybrid structures, and support for the construction of new markets (Mazzucato and Pena, 2016; Studart, 2003; Studart and Alves Jr., 2019). Their function is not merely to replace the private sector when it retreats, but to create the conditions under which new investment and financing horizons may emerge.

This role helps explain why public banks and state-owned financial institutions have occupied central positions in historical experiences of late industrialization, reconstruction, and the financing of major transformations. The more accelerated and demanding the process of structural change, the greater the need for institutions capable of coordinating agents, absorbing initial risks, and inducing private participation. In the case of the ecological transition, given the various uncertainties and the need for planning and coordination to accelerate it, there is no reason to fear that the action of public banks will produce a crowding-out effect in the financial system. On the contrary, by reducing

uncertainties, structuring projects, and signaling a long-term state commitment, the action of public banks tends to increase the subsequent participation of productive and financial private capital in new markets. Griffith-Jones and Ocampo (2018), for example, explore the bridges between public banks and institutional investors in the development of financial and capital markets.

More than correcting market failures, public banks can participate in the creation and reorganization of markets. In the current context, in which the aim is to affirm the ecological techno-economic paradigm to the detriment of polluting and carbon-emitting activities, they do not act merely as suppliers of credit. They are also organizers of portfolios, builders of new financial instruments, inducers of financing patterns, and coordinators of other financial agents, firms, and government bodies. Their role becomes even more important when the transition simultaneously requires the expansion of new activities and the demobilization of old segments, that is, when financial policy must operate both in favor of the creation of new markets and in the inhibition of the functioning of polluting activities.

6. A typology of investments in the ecological transition

The theory of financing for the ecological transition must distinguish, even if only analytically, diverse types of investment. The usefulness of this typology does not lie in establishing watertight compartments, but in highlighting that the transition combines heterogeneous needs in terms of risk, maturation, public additionality, and form of financing. Without such differentiation, the debate tends to collapse into a generic category of "green investments," which does little to guide concrete instruments. What follows is an outline of a classification of investments related to the microeconomic functionality of the financial system in general, and of public banks in particular, seeking logic for hierarchizing their financial operations in favor of the ecological transition.

The first type consists of structuring investments, that is, investments whose absence compromises the basic functioning of the economy and social life. This category includes economic and social infrastructure indispensable to development: sanitation, adequate housing, mobility, energy networks, logistics, and other material bases without which no consistent sustainable transformation can occur. Deficiencies in this stock of capital, which are particularly significant in developing countries, require investment to be overcome, even though such capital is not always classified as green in the strict sense. It constitutes a "condition of possibility" for both development and decarbonization, since these investments raise productivity, reduce vulnerabilities, and expand the capacity to absorb modern technologies.

The second type corresponds to investments in climate resilience and adaptation. Their objective is not merely to expand installed capacity, but to reduce the vulnerabilities of people, territories, public services, and productive activities in the face of extreme events and persistent environmental changes. Here, the asymmetry between public benefits and private returns is high, even if it is not easy to measure, because much of the value generated takes the form of avoided losses, operational redundancies, and shock-response capacity. For this reason, such investments are unlikely to emerge on an adequate scale without strong public protagonism.

The third type comprises scale investments in mature clean technologies. In this case, the main challenge is not innovation as such, but the diffusion of innovative technology, the articulation of productive chains, the coordination of demands, and the provision of financing compatible with its expansion. Consolidated renewable energy, fleet electrification, energy retrofit, and clean inputs often fall into this category. Here, credit instruments, guarantees, contractual standardization, and the reduction of transaction costs may be decisive in converting isolated experiences into broad productive systems.

The fourth type consists of conventional investments that support the transition. Not every expenditure required for structural change directly reduces emissions. Ports, railways, digital networks, industrial equipment, and logistics infrastructure may not be green in themselves, but they may be indispensable to sustaining new low-carbon sectors. Ignoring this block is equivalent to assuming that the transition can occur without material support, which frequently leads to the emergence of physical bottlenecks that render the expansion of transformational investments unviable.

Finally, there are green transformational investments in the strict sense. They seek to constitute a new pattern of development, creating sectors, value chains, technological bases, and dynamic comparative advantages. These are investments in which technological, regulatory, and market uncertainty is higher, and in which dependence on public coordination is more intense. Their financing requires more sophisticated instruments, greater tolerance for risk, the capacity to sequence complementary investments, and a willingness to sustain trajectories that are still being formed.

The typology matters because it indicates that the transition does not replace a prior development agenda; it requalifies and broadens it. In countries marked by historical infrastructure deficits, low productive complexity, and high structural heterogeneity, the frontier between development investment and decarbonization investment is porous. Ecological transition must recognize the diversity of the investments involved and refuse financial logic as the only one criterion to define the bulk of investments to function as an axis of development.

7. Taxonomies, metrics, and informational coordination

In processes of structural change, taxonomies are not merely classificatory devices; they can be mechanisms of coordination. By defining transparently which activities, projects, and trajectories are compatible with environmental and climate goals, a common taxonomy reduces ambiguities, organizes priorities, and creates a shared language among government, public banks, regulators, and the private sector. Its main usefulness does not lie in replacing economic policy, but in increasing coherence among mission, instruments, and monitoring.

To play this role, however, government should connect taxonomy to a substantive investment strategy. When eligibility criteria do not dialogue with the typology of the investments required, the instrument tends to degenerate into a regulatory checklist or a reputational label. The ecological transition demands more than a distinction between green and non-green assets; it demands a device that relates environmental priorities, development needs, scales of financing, degrees of risk, and modalities of public support.

Moreover, taxonomies in isolation do not by themselves mobilize relevant volumes of financing. They may reduce information asymmetries, facilitate product design, and discipline narratives, but they do not replace long-term credit, guarantees, sectoral planning, mechanisms for risk sharing, and a compatible macroeconomic environment. Their strength lies in ordering public action and monitoring coherence between discourse and the effective allocation of resources.

In an architecture oriented toward the transition, the taxonomy should perform at least three functions. First: to align institutions and instruments around common priorities. Second: to allow the monitoring of the environmental and economic additionality of operations. Third: to reduce fragmentation among sectoral classifications, risk standards, and eligibility criteria adopted by different actors. Without these mediations, taxonomy may inform, but it will hardly coordinate.

8. Origination, pipeline, and the scale of transformational projects

The discussion of financing for the transition usually concentrates on the supply of resources. In economies with low coordination capacity, however, an equally decisive bottleneck lies in project origination and structuring. The green transition requires not only available money, but also identifiable projects, technically prepared, articulated with public policies, capable of absorbing capital on a large scale and of ordering complementary investments. When these capacities are lacking, even well-designed financial instruments tend to operate below ecological transition requirements.

Transformational projects differ from isolated investments because they depend on systemic complementarities. Electric mobility requires energy, charging infrastructure, urban organization, and

regulatory coordination; new energy vectors depend on infrastructure, contracts, technical standards, and buyer markets; nature-based solutions require land coordination, technical assistance, monitoring, and adequate forms of remuneration. In such cases, the problem is not merely financing an asset but building investment ecosystems.

The fragility of origination processes usually stems from accumulated factors: the loss of planning capacities, the weakening of firms and public bodies, institutional discontinuity, the excessive cost of capital, and generalized risk aversion. The more expensive the error, the lower the willingness to experiment; the weaker the state's capacity to coordinate and prepare projects, the greater the probability of fragmentation; and the more fragmented the process, the more difficult it becomes to mobilize long-term private resources.

Hence the theoretical relevance of investment platforms, blended finance structures, and coordination arrangements dedicated to pipeline formation. Their role is not merely to raise resources, but to reduce information costs, aggregate projects, make priorities explicit, reveal bottlenecks, and connect different layers of financing. In conceptual terms, such mechanisms occupy the intermediate space between the strategic mission and financial operation, converting political direction into a concrete investment portfolio.

9. Macro-financial constraints and institutional impediments

Over the past forty years, the liberal orientation of economic policies has become sedimented, both from the standpoint of rationality and in the institutional configuration of relevant economies. Considering this, in advanced economies the dominant approach to accelerating the ecological transition is, in the terms of Gabor & Braun (2025), derisking, which consists of developing policies to stimulate private-sector investment and finance. Therefore, even when the sense of urgency of the climate crisis is common sense, there is clarity regarding strategies, and there are even well-equipped institutions to carry forward investment in the transition, such as public banks, the macro-financial environment may still be completely hostile. Persistently high interest rates, short financing horizons, prolonged fiscal austerity, and the retrenchment of public investment compress the capacity to sustain capital-intensive projects with long maturities. In such a context, the cost of capital discourages private investors, raises the carrying cost of projects, shortens decision horizons, and reduces the state's room to provide infrastructure, guarantees, subsidies, and patient funding.

The consequence is a cumulative trap with grave consequences for the desired ecological transition. Insufficient public investment increases structural bottlenecks, thereby heightening private uncertainty not only regarding demand, but also regarding supply conditions. In turn, private

uncertainty leads to caution with respect to productive investment, reinforcing the preference for short-term assets. The low investment rate weakens growth and feeds back into the fiscal and financial constraint itself. When this mechanism combines with the postponement of investments in climate mitigation and adaptation, the cost of inaction rises more rapidly than the capacity to finance the transition, producing a vicious circle among ecological vulnerability, low investment, and macro-financial constraint.

In an interesting approach to this constraint, Guter-Sandu and Murau (2022) and Guter-Sandu, Haas & Murau (2024) observed that, in Europe, the way governments found to overcome fiscal and monetary constraints was to explore the possibilities of off-balance-sheet fiscal agencies, among which banks can be found. They argue that, over time, a parallel institutional framework has been emerging to mitigate fiscal discipline and that this framework may be employed to finance the transition effort. In other countries, such as Brazil, government uses public banks to expand financing capacity by circumventing fiscal constraints. In Brazil, however, controls over public banks have increased, making it more difficult to resort to this instrument as a vehicle for financing the green transition.

Fiscal and monetary pressures may, in fact, become highly restrictive if public policy is excessively committed to fiscal and monetary rigidity. For example, the controlling state often imposes dividend-distribution requirements on public banks to strengthen government cash flow and comply with fiscal targets. In the same vein, high interest rates make it more difficult for public banks to raise resources in the market, and, worse still, fiscal pressures may lead the controlling state to withdraw funds it had previously injected into the bank. The inhibition of public banks will lead them to charge higher interest rates, shorten maturities, and require greater financial counterpart funding from financed firms.

In addition to direct macro-financial restrictions, specific institutional limitations on the functioning of public banks often combine with a conception—very much in vogue over the past forty years—that policymakers should treat them as private banks. For example, policymakers have applied prudential rules originally designed to prevent bank runs and the excesses typical of private banks to ensure systemic stability, even in development banks that do not issue deposits and therefore do not face bank runs. Most notably, this set of measures restricts the capacity of public banks to conduct operations more closely aligned with development objectives, especially those involving longer maturities, greater uncertainty, and heavier reliance on qualitative assessment.

The insistence on regulating public banks as though they were private ones, combined with macro-financial restrictions, prunes the capacity of public banks to act more functionally for the ecological transition. Conventional profitability targets and governance standards excessively oriented toward

short-term financial criteria restrict these institutions' ability to expand their portfolios, whether by providing patient capital or even by operating rapidly in a countercyclical manner whenever necessary. And the counterpart of inhibiting public banks may jeopardize the ecological transition, since historical evidence and the operation of the monetary production economy suggest that private banks will not expand their portfolios to the extent necessary to ensure credit volumes under conditions compatible with the investments required.

This does not mean defending the absence of financial discipline. The issue is to distinguish the role played by macro-financial constraints and prudential rules in achieving financial stability from those that neutralize the public mandate. Development banks are not functionally equivalent to private banks and therefore cannot be evaluated solely by the same metrics and incentives. Regulation must recognize that such institutions exist precisely to operate where private profitability is insufficient, risk is high, and social relevance is great. When their institutional frameworks ignore this specificity, financial policy becomes incoherent with the objectives of the ecological transition.

10. Concluding remarks

Society and government must understand ecological transition as a politically induced process of structural change, and not as a simple automatic market response to price incentives. Its financing requires more than the aggregate availability of resources: it requires an institutional architecture capable of providing patient capital, coordinating temporalities, managing risks, and articulating complementary investments. For this reason, the debate on public banks cannot remain restricted to the quantitative expansion of credit, even though this is essential. It must encompass the macro-financial, regulatory, and organizational design that enables these institutions to exercise their transformative mandate.

It also becomes clear that the transition extends beyond strictly green investments. It also requires basic infrastructure, adaptation, the scaling-up of mature technologies, conventional support for productive reorganization, and genuinely transformational investments. This heterogeneity makes any single financing approach inadequate. Several types of investment require different combinations of credit, guarantees, subsidies, planning, taxonomies, and state coordination capacities.

Finally, a coherent theory of financing for sustainable productive transformation in a monetary production economy needs to place the state back at the center of the analysis, not as an absolute substitute for the private sector, but as the organizer of the conditions under which private initiative can be reoriented. In market economies, the green transition becomes viable only when the state manages to reduce the distance between the collective urgency of change and private prudence in the face of

uncertainty. It is precisely in this space that public patient capital, public banks, and the instruments of coordination capable of transforming a political mission into an effective trajectory of development are situated.

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Notes:

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