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Tax Credits Are Industrial Policy: Answering the Derisking Critique on Discipline and Investment

by

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ABSTRACT

The Inflation Reduction Act (IRA) is criticized for "derisking" private investment by increasing the gains to private firms. The derisking critique argues that the IRA insufficiently disciplines private firms; it does not utilize legal or financial penalties which would force firms to undertake green investment and bar emissions-intensive investment. This paper answers that critique by providing a Post-Keynesian theory of capital expenditure. It argues all industrial policies promote investment by removing or mitigating risks in an environment of fundamental uncertainty. Industrial policies tackle different risks and can be assessed or compared on their effectiveness in doing so. An insufficient investment growth rate need not be an indication of their failure, but that complementary policies are required to mitigate risks or make risks calculable. For instance, the IRA's uncapped Investment Tax Credit (ITC) increases clean energy investment by reducing project reliance on expensive debt financing. The ITC does not address other barriers to clean energy investment: transmission and distribution, permitting, or the need for clean firm resources. This is not a failure of discipline, but rather an indication that more state intervention must facilitate rapid decarbonization. The derisking critique's emphasis on disciplining private firms into investment reallocation underestimates real obstacles to investment, particularly how those obstacles shape choices faced by firms. It also affects the character of investment itself, making it inaccurate to describe investment as the allocation of fixed financial resources. The derisking critique lacks a mechanism connecting financial or legal disciplinary measures on firms to an increase in green capital expenditure. This causes the derisking critique to miss a more productive avenue for investigating industrial policy conditionalities: linking them to a broader state-led coordination of varying industrial policy priorities, the timing of capital expenditure to meet them, and seizing of opportunities presented by their success.

KEY WORDS: Tax Credits, IRA, Inflation Reduction Act, Clean Energy, Industrial Policy, Investment Theory, Capital Theory, Risk, Uncertainty

Introduction[1]

Industrial policy was long thought dead prior to 2020—a casualty of the neoliberal turn away from conscious or active state-led economic coordination of the American economy. But three pieces of post-Covid fiscal legislation have brought it back to the forefront of economic policymaking: the Infrastructure Investment and Jobs Act (IIJA), the Chips and Science Act (CHIPS), and the Inflation Reduction Act (IRA). All three were meant to shape critical aspects of the post-Covid economic recovery and to tackle challenges faced by the near-simultaneous rebound of consumption, incomes, and employment during a period of supply shortages, geopolitical risks from globalized supply chains, and energy price volatility due to war and climate change. They sparked fierce debates across the political spectrum and within economics. To what extent did they constitute industrial policy as opposed to "just" subsidization of private capital?[2] Was that even the proper juxtaposition? Did the bills necessarily herald a return to American economic nationalism? Or, more simply, are they indicative of an American state once again interested in proactively shaping economic outcomes in its chosen direction? Most curiously, these debates raged fiercely among the American and European progressives, who are thought to be neoliberalism's skeptics, dirigiste planners, and champions of public investment. Some progressives offer a "derisking critique" of the IRA tax credits' financial incentivization of investment, arguing it fails to discipline private capital by forcing it to pursue clean investments and avoid dirty investments. The derisking critique argues that the credits are a poor substitute for a robust "big green state:" which would combine public ownership, legal and financial discipline of private firms and financiers, and tools of planning or coordination of disparate actors.

This paper aims to counter those criticisms. First, by asserting that the basic task of industrial policy is to promote private or public investment[3] in strategic sectors or activities. IRA credits have a clear framework for increasing private and public capital expenditure in the energy sector. They reduce project costs of capital projects, crowd-out more expensive forms of debt from project capital stacks, and thereby slacken the financial risks of project investment. This is what earns tax credits the derisking moniker. And yet, financial risks are not the only hurdle to expanding investments in clean generation or storage. Others include transmission and distribution, clean firm power sources, siting and permitting of energy projects, public capacity to take on project investments, and more. While examining those additional interventions in detail is beyond the scope of this paper, it is worth noting that an industrial policy built around a big green state would face them too. A big green state policy also has to justify that its tools are

[1] **Acknowledgements**: I thank Advait Arun and Yakov Feygin for their feedback. They reviewed numerous drafts and this working paper is stronger because of them. This paper's faults are solely my responsibility.

[2] Capital can refer to a factor of production or certain types of physical equipment, the balance sheet space allowing for asset acquisition or investment, or function as a term for private firms or their investors. This essay will respectively strive to distinguish between capital assets or capital equipment, the various types of financial resources utilized for investment, and private capital or private firms respectively.

[3] Investment in this paper refers to capital expenditure, or expenditure towards the procurement, installation, manufacturing, or utilization of fixed or physical capital structures. This paper will interchangeably use the terms investment, capital investment, capital expenditure (capex).

conceptually different from tax credits, that they are more efficacious, or that they present a more realistic political economy. I argue none of these criteria have been met by the derisking critique.

Section I of this paper describes the Clean Electricity Investment Tax Credit (ITC) and explains how the ITC aims to support capital expenditure in energy generation. Section II describes the derisking critique of the tax credits and argues its emphasis on discipline wrongly emphasizes forced reallocation of expenditure between sectors; it should instead be focusing on the impact of conditionalities and sticks upon investment decision making. Section III presents a theory of capital investment and examines a typical pathway for a private or public renewable energy project from its initial development stages through to operation. It identifies "investment barriers" that can prevent investment from progressing due to fundamental uncertainty and argues industrial policy is about addressing barriers to desired investment. Section III also comments on the path-dependent and dynamic nature of investment across time—and the importance of sequencing and prioritization to industrial policy. Finally, Section IV argues the ITC does provide specific and identifiable pathways for the state to shape the character of public and private investment; the fact that tax credits are structured as contracts with conditionalities means they have built-in checks on abuse. The paper concludes by arguing that the derisking critique's emphasis on state discipline of capital for reallocation can cause it to misidentify key policy features like credit structure and to understate the obstacles to investment by both public and private entities. In doing so, the critique also understates the role of the state in alleviating those obstacles through industrial policy and coordination.

Section I

The tax credits comprise the largest spending component of the IRA and the fastest growing component in total IRA spending projections. Initial estimates of the IRA suggested that total climate spending by the bill would be $369 billion over ten years,[4] but estimates since then have seen that figure increase to near or well over $1 trillion.[5] Once the IRA passed, increasing private developer and utility interest in developing clean energy generation projects, electric vehicle purchases, and manufacturing of new technologies, the number of prospective tax credit claimants grew as did projected spending. Furthermore, unlike grant programs, numerous IRA tax credits are uncapped, meaning that projects do not compete with one another to receive funding. All projects that meet credit eligibility criteria can claim credits. In other words, the maximum spending disbursed via these tax credit provisions is theoretically unlimited during the time the credits are active. The credits can be thought of as a "fiscal window"[6]—an

[4] JCT. 2022. *Summary: The Inflation Reduction Act of 2022.* Available at: https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_one_page_summary.pdf.

[5] 1) Jiang et al. 2022. US Inflation Reduction Act: A Tipping Point in Climate Action.Credit Suisse. p. 19. 2) Bistiline et al. 2023. Economic Implications of the Climate Provisions of the Inflation Reduction Act. Brookings Papers on Economic Activity. Available at: https://www.brookings.edu/wp-content/uploads/2023/03/BPEA_Spring2023_Bistline-et-al_unembargoedUpdated.pdf.

[6] While the precise origin of the term "fiscal window" is unknown, Nathan Tankus alluded to the concept in 2020 when proposing "uncapped, mandatorily funded programs which establish an absolute legal right to access the

appropriations device in which total program spending is endogenous to the eligibility of claimants to access it automatically according to a statutory formula.[7]

One tax credit in particular acts as an exemplary fiscal window for energy project investment: the ITC. Along with its counterpart and alternative credit, the Clean Electricity Production Tax Credit (PTC), the ITC is meant to encourage investment in the installation of energy projects by compensating public, private, or nonprofit[8] developers for a portion of their capital expenditure.[9] The ITC has a base compensation rate of 30 percent of eligible project costs, presuming a developer meets prevailing wage and apprenticeship requirements.[10] The credits also contain sizable bonuses for projects that meet additional qualifications:[11]

- A project located in an energy community will receive a 10 percentage point bonus on its base ITC compensation ratio;
- A project meeting domestic content requirements for XXX products will receive a 10 percentage point bonus on its base ITC compensation ratio;
- A project smaller than 5 MW and that is located in a low income community or a tribal community will receive a 10 percentage point bonus on its base ITC compensation ratio;
- A project smaller than 5 MW and that is classified as a qualified low income residential building project or a qualified low income economic benefit project will receive a 10 percentage point bonus on its base ITC compensation ratio.[12]

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program as long as the [applicant] qualifies" for the purpose of pandemic relief. These fiscal windows would be undertaken through Congress' mandatory appropriations and he did not specify whether the programs would have an end date. However, the concept of a program that disburses funds as eligible entities claim them remains with the tax credits. Source: Tankus, N. 2020. *The Coronavirus Depression Requires A New Approach to Budgeting*. Notes on the Crisis. Available at: https://nathantankus.substack.com/p/the-coronavirus-depression-requires.

[7] Fiscal windows need not be uncapped or permanent so long as the spending itself is disbursed per some formula *until* it hits the cap or runs out. In the case of IRA, many of the credits are uncapped, but not permanent. They expire at the end of 2032. The EJ bonus credits are examples of project credits that are capped based on the size of projects that take them up rather than by the amount disbursed.

[8] The elective pay provisions of the tax credit allow tax exempt entities such as nonprofits or state instrumentalities to claim the tax credits if they meet the credits' project eligibility criteria. Source: Lala, C. 2023. *Direct pay: an uncapped promise of the Inflation Reduction Act.* Center for Public Enterprise. Available at: https://www.publicenterprise.org/reports/direct-pay-uncapped-ira.

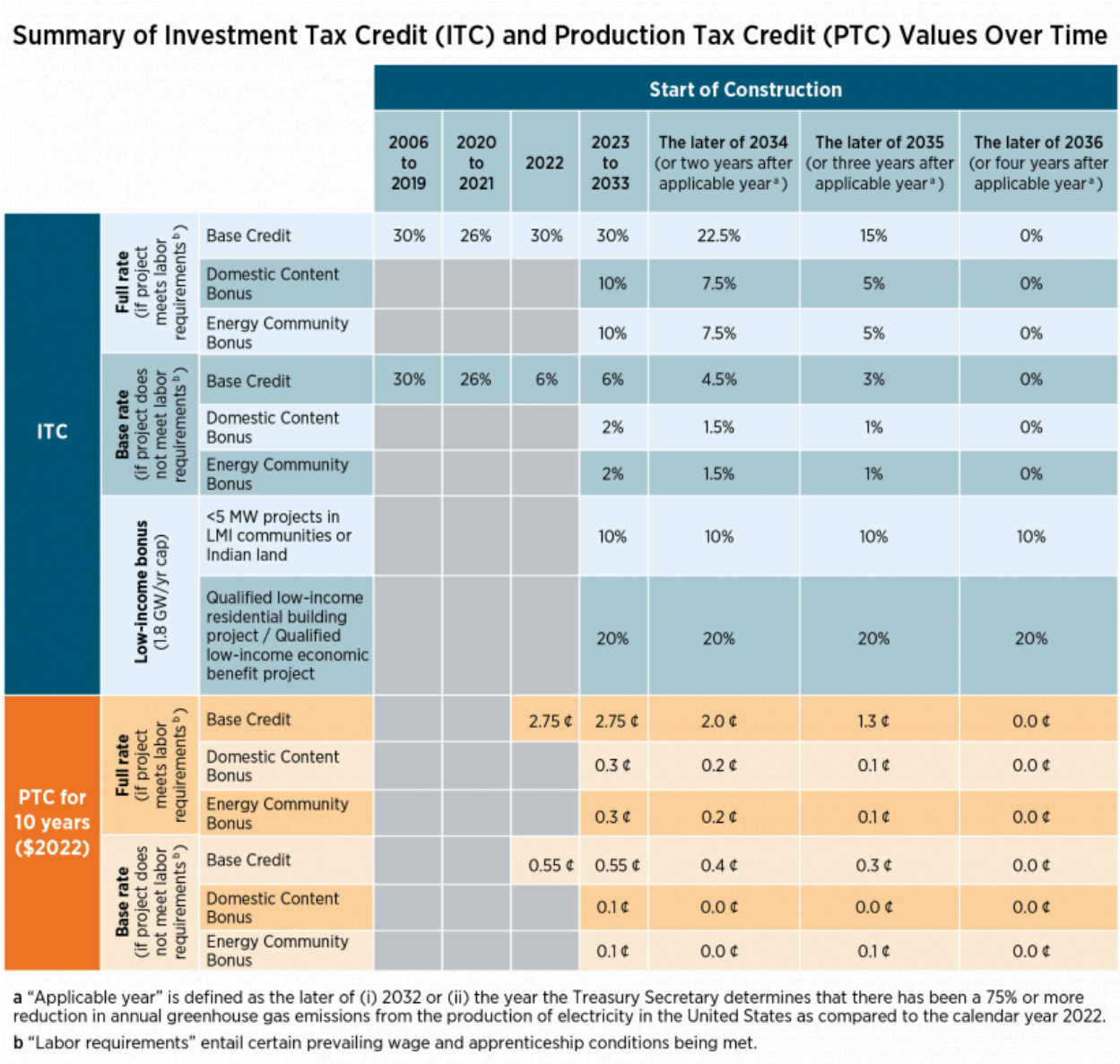
[9] The PTC disburses compensation based on energy output (kWhs) generated by the qualifying project in its first ten years. Eligible entities can only claim either the ITC or PTC. Ergo, projects can choose the form of financial reimbursement that eases technology-specific risks (i.e. is capital expenditure higher relative to the output of a project) or most immediately addresses the kind of cash flow needs the developer will face following installation (will they need assistance with medium-term cash commitments or do they wish to immediately utilize a lump-sum payment?). Source: DOE. 2023. Federal Solar Tax Credits for Businesses. Available at: https://www.energy.gov/eere/solar/federal-solar-tax-credits-businesses.

[10] If a developer does not meet the prevailing wage and apprenticeship requirements, the base ITC compensation ratio will be reduced to 6 percent. Certain bonus credits are also reduced by the failure to meet prevailing wage and apprenticeship requirements. Source: DOE. 2023. Federal Solar Tax Credits for Businesses. Available at: https://www.energy.gov/eere/solar/federal-solar-tax-credits-businesses.

[11] Source: DOE. 2023. Federal Solar Tax Credits for Businesses. Available at: https://www.energy.gov/eere/solar/federal-solar-tax-credits-businesses.

[12] The bonuses for projects in low income and tribal communities and projects qualifying as low income residential building or low income economic benefit projects cannot go out to more than 1.8 GW worth of projects per year. In other words, the bonuses are capped on an annual basis. Source: DOE. 2023. Federal Solar Tax Credits for Businesses. Available at: https://www.energy.gov/eere/solar/federal-solar-tax-credits-businesses.

Figure 1. DOE Schematic on tax credits and bonus credits



Summary of Investment Tax Credit (ITC) and Production Tax Credit (PTC) Values Over Time

			Start of Construction						
			2006 to 2019	2020 to 2021	2022	2023 to 2033	The later of 2034 (or two years after applicable year[a])	The later of 2035 (or three years after applicable year[a])	The later of 2036 (or four years after applicable year[a])
ITC	Full rate (if project meets labor requirements[b])	Base Credit	30%	26%	30%	30%	22.5%	15%	0%
		Domestic Content Bonus				10%	7.5%	5%	0%
		Energy Community Bonus				10%	7.5%	5%	0%
	Base rate (if project does not meet labor requirements[b])	Base Credit	30%	26%	6%	6%	4.5%	3%	0%
		Domestic Content Bonus				2%	1.5%	1%	0%
		Energy Community Bonus				2%	1.5%	1%	0%
	Low-income bonus (1.8 GW/yr cap)	<5 MW projects in LMI communities or Indian land				10%	10%	10%	10%
		Qualified low-income residential building project / Qualified low-income economic benefit project				20%	20%	20%	20%
PTC for 10 years ($2022)	Full rate (if project meets labor requirements[b])	Base Credit			2.75 ¢	2.75 ¢	2.0 ¢	1.3 ¢	0.0 ¢
		Domestic Content Bonus				0.3 ¢	0.2 ¢	0.1 ¢	0.0 ¢
		Energy Community Bonus				0.3 ¢	0.2 ¢	0.1 ¢	0.0 ¢
	Base rate (if project does not meet labor requirements[b])	Base Credit			0.55 ¢	0.55 ¢	0.4 ¢	0.3 ¢	0.0 ¢
		Domestic Content Bonus				0.1 ¢	0.0 ¢	0.0 ¢	0.0 ¢
		Energy Community Bonus				0.1 ¢	0.0 ¢	0.1 ¢	0.0 ¢

a "Applicable year" is defined as the later of (i) 2032 or (ii) the year the Treasury Secretary determines that there has been a 75% or more reduction in annual greenhouse gas emissions from the production of electricity in the United States as compared to the calendar year 2022.

b "Labor requirements" entail certain prevailing wage and apprenticeship conditions being met.

Reproduced from: DOE. 2023. Federal Solar Tax Credits for Businesses. Available at: https://www.energy.gov/eere/solar/federal-solar-tax-credits-businesses.

The credits do have limits. The ITC can only be disbursed after a project enters operation. To monetize credits sooner than installation, a developer must pay for the privilege on tax equity markets. Credits are not given to different entities on the same terms either. Nonprofits and state instrumentalities must meet domestic content requirements to monetize the credits and are penalized if a portion of their capital stack utilizes tax-exempt debt (tax-liable entities need not meet domestic content requirements, but do receive a bonus if they do).[13] Nonprofits and state

[13] Note that it is my present understanding that entities utilizing elective pay still get a "bonus payment" for meeting domestic content, even if meeting domestic content is also a requirement to receive base elective pay after January 1, 2025.

instrumentalities cannot claim accelerated depreciation for their projects. On the other hand, private or tax-liable entities cannot access credits directly from the government like their government or nonprofit counterparts. Their access to credits is limited by the size of their tax liabilities (the credits to private entities are not fully refundable). Tax liable developers must promise to provide the full value of the credit upon receipt to a tax equity investor (typically a large financial institution) in exchange for receiving their eligible credit amount upfront with a discount. These credit characteristics limit disbursement by closing off edge cases in which particular projects would qualify. The role of tax equity markets can also broadly limit credit disbursement because tax equity investors can only monetize credits so long as they have sufficiently large tax liabilities to claim the credit money. This is mitigated by the IRA's transferability provision[14] but it still forces projects to take a discount on their tax credit monetization to receive the money sooner.

Despite these limitations, the financial incentives do appear to be working. A joint report in February 2024 by the Rhodium Group and MIT-CEEPR estimates total federal investments in clean energy were $34 billion in FY2023 and private investments totalled $220 billion, an aggregate leverage ratio of 5-6.[15] Total investment in 2024 Q4 was $67 billion, a 40 percent increase from the same period in 2022.[16] Analyses from the Rhodium Group, Energy Innovation, and the REPEAT Project —whose scenarios were accounted for in the 2024 Rhodium and MIT-CEEPR report —show US net-emissions falling between 37 and 42 percent.[17] Analysis published in March 2024 in *Energy Research and Social Science* argues IRA financial incentives play a crucial role in increasing the pace of emissions reduction.[18]

The ITC represents one of multiple financial incentivization approaches dubbed "derisking." In the context of electricity markets, Boyd characterizes derisking as a reduction in the cost of capital of an energy project.[19] Gross et al. argued in 2010 that policymakers could "reduce, or remove, price risks through the design of incentive schemes."[20] The credits incentivize investment by reducing the vulnerability of a project's finances to more expensive forms of

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[14] The transferability provision allows qualifying entities ineligible for elective pay to transfer some or all of their tax credit amount to a third party for payment in cash. Source: IRS. "Elective pay and transferability." Available at: https://www.irs.gov/credits-deductions/elective-pay-and-transferability.

[15] Bermal, L. et al. 2024. *Clean Investment Monitor: Q4 2023 Update*. Rhodium Group and MIT-CEEPR. Available at: https://assets-global.website-files.com/64e31ae6c5fd44b10ff405a7/65dfcaebd76fc56445fd7375_Clean%20Investment%20Monitor%20-%20Q4%202023%20Update.pdf. p. 11.

[16] Rhodium Group and MIT-CEEPR. "The Clean Investment Monitor." Available at: https://www.cleaninvestmentmonitor.org/.

[17] Bermal, L. et al. 2024. *Clean Investment Monitor: Q4 2023 Update*. Rhodium Group and MIT-CEEPR. Available at: https://assets-global.website-files.com/64e31ae6c5fd44b10ff405a7/65dfcaebd76fc56445fd7375_Clean%20Investment%20Monitor%20-%20Q4%202023%20Update.pdf. p. 2.

[18] Leffel, B., T. P. Lyon, J. P. Newell. 2024. "Filling the climate governance gap: Do corporate decarbonization initiatives matter as much as state and local government policy?." *Energy Research & Social Science.* Vol 109. Available at: https://www.sciencedirect.com/science/article/abs/pii/S221462962300436X.

[19] Boyd, W. 2014. "Public Utility and the Low Carbon Future." UCLA Law Review. Vol. 61. p. 1692.

[20] Gross, R., W. Blyth, P. Heptonstall. 2010. "Risks, revenues and investment in electricity generation: Why policy needs to look beyond costs." *Energy economics.* Vol. 32. p. 803.

subordinated debt products. If a project sees 30 percent of its capital expenditure reimbursed after installation, it can use the cash flow from reimbursement to pay off more expensive project debt, seed future projects, or otherwise free up cash flow for other purposes. In other words, the credits constitute an open and conditional offer from the state to energy project developers: agree to shepherd a project from development to installation and operation, and the state will shoulder a significant portion of the costs. Jeff Gordon argues these conditionalities make the IRA tax credits akin to statutory contracts, which provide voluntary opportunities to alter key firm behaviors in exchange for unpredictable takeup and spending potential.[21]

However, there are different theories as to why the IRA would entice more investment in the energy sector. One answer is it would render renewable investments cheaper than fossil fuel investments due to the reduction in costs borne by developers. Another answer (favored by this author) is that the reduction in the cost of capital engendered by the ITC creates additional profitable opportunities for a variety of actors to undertake investment regardless of the investment atmosphere faced by fossil fuels. These answers might seem similar, but they imply divergent investment theories. The former describes a world in which investment is a question of capital allocation within or between sectors, and/or a world in which firms undertaking investment can choose to ignore incentives like the tax credits even if profit beckons because they were not forced to take them. In other words, barriers to investment are secondary to firm bargaining power. The latter is a world in which investment is a gain-driven enterprise under fundamental uncertainty, wherein the developer must decide whether a gain is plausible and worth pursuing. By refusing to take credits, they run the risk of being wrong and losing out to those who disagree. By agreeing, they run the risk that other factors may block profitability and penalize their risk taking. Put another way, investment barriers create the circumstances in which profit is assessed.

I favor the latter theory; the derisking critique favors the former. In the next section, I describe the derisking critique of the IRA in detail. In particular, I focus on how it defines and justifies the role of discipline in industrial policy. I note the derisking critiue's citation of the developmental literature; its neoclassical emphasis on investment reallocation, fixed demand, and relative costs of capital; and its assumption that the decision to invest is ultimately within the control of private firms.

Section II

The operational description of derisking is not widely contested. Most would share Tim Barker's description of derisking investment as insuring private companies against various forms of loss if they undertake investment—a definition Barker draws from David Friday's *Profits, Wages, and*

[21] Statutory contracts are money-mandating obligations that require the federal government to make payments once private entities meet conditions. This is similar to the concept of a fiscal window. Source: Gordon, J. 2025 (forthcoming). "Statutory Contracts." *Yale J. on Reg.* Vol 42. p. 2; 48.

Prices.[22] Friday notes that guaranteeing firms operating losses, including depreciation, would minimize the risk of losses and surely stimulate production.[23] The IRA does not go nearly that far; the ITC only promises a percentage of capital expenditure be reimbursed following the installation of a project. That said, there is no upper limit on how much the government can reimburse during the IRA's period of operation. If conditions are right, the government could spend far more reimbursing more capital projects than currently predicted. Not without admiration, Tim Sahay has dubbed this a policy of "bottomless mimosas" for investors in clean technologies.[24] Similar to Gordon's view, derisking is seen as a trade, or perhaps a bribe.[25] Firms and their investors get safer returns. The country gets new capital equipment. On a basic level, there are basic problems with this approach. The deal might not be worth the capital equipment. If structured poorly, firms could pocket the gains without supplying the capital equipment.

But these basic criticisms do not apply to the ITC. The ITC concerns clean electricity, something derisking's critics and supporters alike agree we need more of. The ITC also requires that projects be installed before capital expenditure is reimbursed, a stern conditionality. The derisking critique posits three deeper problems. The first is that private firms could demand more before undertaking clean investment or part way through the investment process by refusing to go further unless prices rise or the subsidy increases. The second is that firms might continue with undesirable investments even while installing clean projects, slowing emissions reductions. The third is that private entities retain primary say over what is invested in. This section tackles a common thread in all three criticisms: that the IRA insufficiently disciplines private capital and therefore fails to prevent these possibilities. In other words, the derisking critique allots firms the power to decide whether an investment subsidy is enough by assuming that there are no countervailing forces that inform its decisions: no investment barriers, no competitors undertaking investment, no additional demand or market share opportunities.

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[22] 1) Barker, T. "The Longer History of "Derisking." Origins of Our Time. Available at: https://ourtime.substack.com/p/the-longer-history-of-derisking. 2) Friday, D. 1920. *Profits, Wages, and Prices.* Harcourt. New York, NY. Available at: https://archive.org/details/profitswagesand00fridgoog.

[23] Friday, D. 1920. *Profits, Wages, and Prices.* Harcourt. New York, NY. Available at: https://archive.org/details/profitswagesand00fridgoog.

[24] The Rhodes Center Podcast. "What Mark Blyth Got Wrong About Bidenomics and Climate Change." Available at: https://rhodes-center-podcast.captivate.fm/episode/what-mark-blyth-got-wrong-about-bidenomics-and-climate-change.

[25] The description of derisking as a "bribe to capital" comes from Paul Samuelson's description of the Kennedy Administration's tax cuts. The 1962 Investment Tax Credit allowed a business to subtract 8 percent of the cost of investment in tangible business assets (not buildings) from its tax liability. This is analogous to the structure of the contemporary ITC.Source: 1) U.S. House Committee on Ways and Means. 1962. *Brief Summary of Provisions in H.R. 10650 The Revenue Act of 1962.* Printed for use of the Committee of Finance. Available at: https://www.finance.senate.gov/imo/media/doc/87PrtRevwm.pdf. p. 1. 2) Brusseler, M. 2023. "Transitioning Systems: on coordinating green investment." Commonwealth. Available at: https://www.common-wealth.org/perspectives/transitioning-systems-coordinating-the-green-transition. 3) Amarnath, S., M. Brusseler, D. Gabor, C. Lala. 2023. "Varieties of derisking." *The Polycrisis.* Phenomenal World. Available at: https://www.phenomenalworld.org/interviews/derisking/.

Perhaps the foremost critic of the IRA's derisking policy is Daniela Gabor. In a paper with Benjamin Braun, Gabor argued that the IRA represents a "robust derisking regime,"[26] characterized by: a policy of targeting capital assets, partnership with industrial capital, tax credits or preferential credit rates, and a non-financial regulatory apparatus focused on assessing the conditions under which subsidies are disbursed.[27] Gabor and Braun argue that the IRA's robust derisking regime lacks the capacity to avoid "disorderly expansions fuelled by subsidies."[28] In particular, Gabor and Braun argue that the IRA lacks the capacity to discipline capital, which in the decarbonization context they define as "penalties for for dirty capital" and argue is necessary to "a radical reorganization of production, consumption, and infrastructure."[29] Specifically referencing the ITC's system of base compensation and bonuses, they argue the volume of public spending and the distribution of carrots are left to private capital.[30] Furthermore, they argue its economic coordination mechanism is that of tweaking market prices, which allows for disorderly expansions of capital that see expansions of both renewables and fossil fuels—rather than pairing green expansion with fossil contraction.[31] Note that Gabor and Braun do not define or clarify the desirable timing or sequencing of fossil shrinkage relative to renewable expansion.[32]

Discipline could encompass a range of policy tools that use compulsion on private firms to prevent undesirable outcomes as a result of the subsidies. The policies of a big green state include state-led planning, state ownership, the use of "sticks and carrots" on private capital, a coalition of green planners, and finance that is captive to the state.[33] Other policies include state ownership of low carbon infrastructure, independent and accountable public agencies setting the pace of decarbonization (not private capital), fiscal and monetary coordination, and capital

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[26] Gabor, D., B. Braun. October 21, 2023. *Green macrofinancial regimes.* Available at: https://ideas.repec.org/p/osf/socarx/4pkv8.html. p. 10; 19-22.

[27] Gabor and Braun distinguish between a weak and robust derisking regime. The former is not germane to this paper, but targets financial asset acquisition and returns (as opposed to capital assets), a partnership with financial firms (as opposed to developers or utilities), and regulates finance through disclosure and stress testing. Weak derisking regimes also utilize public-private partnerships and power purchase agreements over tax credits while focusing on underwriting demand. One might describe it as derisking financial assets (which I argue in this paper face an investment-like process during asset origination or acquisition). An obvious pitfall of such an approach is that it may have little or no relation to capital expenditure and could simply guarantee cash flows with insufficient conditionalities enabling actual results in turn. Gabor and Braun argue that both weak and robust derisking leave capital (financial or industrial respectively) the power to veto decisions, and both involve coalitions with geopolitical hawks (with financial hawks or green planners respectively). Finally, both weak and robust derisking see private finance constrain the regimes actions, presumably on investment. Source: Gabor, D., B. Braun. October 21, 2023. *Green macrofinancial regimes.* Available at: https://ideas.repec.org/p/osf/socarx/4pkv8.html. p. 10; 19.

[28] Ibid, p. 22.

[29] Ibid, p. 3-4; 6-7.

[30] Ibid, p. 21.

[31] Ibid, p. 21-22; 27.

[32] Gabor and Braun cite Durand et al 2023, who also fail to identify a desirable timeline for shrinking the fossil fuel sector and who emphasize the role of policies facilitating shrinkage in a degrowth framework. Source: 1) Gabor, D., B. Braun. October 21, 2023. *Green macrofinancial regimes.* Available at: https://ideas.repec.org/p/osf/socarx/4pkv8.html. p. 27; 2) Durand et al. 2023. "Planning beyond growth: The case for economic democracy within ecological limits." *Journal of Cleaner Production.* Vol. 437.

[33] Gabor, D., B. Braun. October 21, 2023. *Green macrofinancial regimes.* Available at: https://ideas.repec.org/p/osf/socarx/4pkv8.html. p. 10.

controls.[34] Disciplinary features of a big green state include a series of direct credit allocation policies which set the price or quantity of credit on particular sectors as determined by the central bank or some other state institution.[35] These policies can also require firms to undertake certain activities before qualifying for certain kinds of financial support; Kedward et al cite the Chinese state's use of green targeted refinancing by which banks must lend to green activities at close to benchmark rates before qualifying for discounted funding.[36] Gabor also lists penalties on carbon credit, captive finance, and limits on early exit [presumably from green investments] as disciplinary features of the big green state.[37]

Gabor treats the sources of discipline as a crucial basis for comparing industrial policy schemes[38] and notes its close connection to the development literature.[39] In particular, Gabor repeatedly cites Öniş' argument[40] that successful developmental states secured cooperation with private capital and prevented rent seeking through the creation of special institutions relying on a significant element of compulsion.[41] To not do so risked turning subsidies into an avenue for rent-seeking.[42] While Öniş explicitly cites the twin-pairing of performance standards and industrial subsidies as a successful development formula, Gabor and Sylla argue examples of these special institutions include: "state-controlled finance, capital controls, competition authorities checking monopoly power via stringent price controls, institutions enforcing compliance with performance conditions, etc."[43] Notice that Öniş does not cast discipline as a mechanism for sustaining or increasing investment per say, but as a guardrail against investments becoming a fount for rent-seeking. Discipline here is political, a kind of insurance against losing

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[34] Gabor, D. 2023. *The (European) de-risking state.* Available at: https://ideas.repec.org/p/osf/socarx/hpbj2.html. p. 19.
[35] Kedward, K., D. Gabor, J. Ryan-Collins. 2022. *A modern credit guidance regime for the green transition.* SUERF: The European Money and Finance Forum. Available at: https://www.suerf.org/publications/suerf-policy-notes-and-briefs/a-modern-credit-guidance-regime-for-the-green-transition/. p. 6.
[36] Ibid, p. 6.
[37] Gabor, D. 2023. *The (European) de-risking state.* Available at: https://ideas.repec.org/p/osf/socarx/hpbj2.html. p. 19.
[38] Gabor, D. 2023. *The (European) de-risking state.* Available at: https://ideas.repec.org/p/osf/socarx/hpbj2.html. p. 19.
[39] 1) Gabor, D. 2023. *The (European) de-risking state.* Available at: https://ideas.repec.org/p/osf/socarx/hpbj2.html. p. 4-5; 2) Amarnath, S., M. Brusseler, D. Gabor, C. Lala. 2023. "Varieties of derisking." *The Polycrisis.* Phenomenal World. Available at: https://www.phenomenalworld.org/interviews/derisking/.
[40] Öniş was reviewing four classics of developmental literature: 1) Amsden, A. 1989 *Asia's Next Giant: South Korea and Late Industrialization.* New York: Oxford University Press. 2) Deyo, F. C. 1987. *The Political Economy of the New Asian Industrialism.* Ithaca: Cornell University Press. 3) Johnson, C. 1982. *MITI and the Japanese Miracle.* Stanford: Stanford University Press. 4) Wade, R. *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization.* Princeton: Princeton University Press.
[41] 1) Öniş, Z. 1991 "The Logic of the Developmental State." *Comparative Politics.* Vol. 24(1): 109–26. Available at: https://www.jstor.org/stable/422204. p. 116.
[42] Öniş, Z. 1991 "The Logic of the Developmental State." *Comparative Politics.* Vol. 24(1): 109–26. Available at: https://www.jstor.org/stable/422204. p. 113.
[43] 1) Öniş, Z. 1991 "The Logic of the Developmental State." *Comparative Politics.* Vol. 24(1): 109–26. Available at: https://www.jstor.org/stable/422204. p. 116. 2) Gabor, D., N.S. Sylla. 2023. "Derisking Developmentalism: A Tale of Green Hydrogen." *Development and Change.* Vol. 54 (5). Available at: https://onlinelibrary.wiley.com/doi/full/10.1111/dech.12779#dech12779-bib-0058.

influence over investor groups rather than an economic mechanism for facilitating investment itself.

Yet this is not why Gabor and Braun argue discipline is a critical feature of a big green state.[44] To them, discipline steers investment away from bad capital goods to good capitals.[45] Notably, discipline in the derisking critique represents the power to use derisking in reverse: to raise the costs and penalties on bad investments or on the abstention from investment, ultimately altering the expectations of financial actors on where the uncertainties and profits truly lie.[46] Discipline as conceived here is not the discipline of markets, but rather the use of state power to force private capital to shape the investment process before its outcomes or processes occur: it is an a priori imposition of state power that presumes firms choose among vastly different investment sets (green or brown), reallocate fixed loanable balances for investment between those sets through the financial system, and therefore force firms to allocate capital differently.[47]

This is not how the development or the industrial policy literatures conceive of discipline. For the development literature, discipline is a political coalition-building (or coalition-preserving) device, not the mechanism by which investment operates. Discipline can prevent private capital's opposition to industrial policies, set higher quantity and quality targets for private capital's investment efforts, or provide a benchmark against which to measure outcomes and adjust subsidy allocation. It can allow for both market- and state-driven measures. Alice Amsden spoke specifically of rewarding only good performers and penalizing poor performers—an ex post statement on the effectiveness of choosing the right firms for subsidies, not a statement that such discipline was necessary to allocating capital expenditure to the right sectors.[48] Amsden also highlighted the role of preserving market competition and preventing firms from getting too big.[49] In other words, discipline is a description of policies preventing corruption and creating an ineffective trough for firms. In a similar argument, Vivek Chibber argues export-led industrialization made it rational for South Korean firms to accept discipline from state institutions (that is to cooperate in the state's desire to see investment support utilized wisely), as

[44] In pre-2023 iterations of their macrofinancial regime typology, Braun and Gabor distinguished between a big green state and a "green planning state." The latter saw: state planning (as opposed to indicative planning); financial repression (instead of mandatory balance sheet decarbonization and ESG taxonomies); fiscal dominance and open monetary financing with taxation and distribution (instead of green public investment or quantitative credit allocation); and nationalization of some of the non-financial sector as well as the financial sector. Source: Cambridge Society for Economic Pluralism. "Benjamin Braun and Daniela Gabor: In Search of a Green Macro-Financial Regime." Available at: https://www.youtube.com/watch?v=5tSqwJTyfFA.
[45] Ibid, p. 27.
[46] Eich, S. 2023. *Derisking as Worldmaking: Keynes and the Politics of Climate Uncertainty.* p. 27.
[47] I use the term "a priori" compulsion or discipline to note that, throughout the literature, discipline on capital is cast as something that is done prior to the capital investment or as a part of the industrial policy mechanisms promoting it, thereby causally generating pressure on private firms to act a certain way. This can be distinguished from "ex post" compulsion or discipline in which capital's pursuit of an outcome and avoidance of a different outcome might be seen as the outcome of the policy or the investment itself.
[48] Amsden, A. 1990. "East Asia's Challenge—to Standard Economics." *The American Prospect*. Available at: https://prospect.org/features/east-asia-s-challenge/.
[49] Ibid.

compared to Indian import-led industrialization's failure to do the same with Indian firms.[50] Like Öniş, Chibber is describing political mechanisms to keep capital bound to the pro-industrial policy political leadership. Chibber is *not* describing a mechanism to make investment happen nor is Chibber presuming that the firm's decision to undertake investment is itself contingent on whether the state disciplined the firm; those mechanisms presumably depended on other institutions. The discipline was between the state as an actor and firms as actors, not between the state and firm investment functions. The developmental literature leaves room for both additional obstacles to undertaking capital expenditure and for state policies to expand investment by addressing those obstacles: industrial policy and more particularly subsidies. Its presupposition was that capital expenditure projects among large conglomerates could go wrong and fail to achieve particular results—hence the need for some set of incentive mechanisms to prevent business malfeasance and failed projects.

It is worth noting that the derisking critique does not necessarily oppose the tax credits themselves, but rather to what they see as missing from the IRA. On the one hand, this takes some onus off the tax credit mechanism because one could imagine similar grants or uncapped tax credits in a big green state framework alongside other policies which may provide conditions for their disbursement. Mazucatto and Rodrik provide examples of precisely this when they discuss the conditionalities of industrial policy, which they frame as the benefit to the state in exchange for providing a subsidy, grant, or R&D.[51] Note that Mazucatto and Rodrik acknowledge that simply undertaking capital expenditure is a crucial conditionality, but they also envision other conditionalities to benefit society from the activity sparked by the carrots of industrial policy.[52] One could just as easily argue that certain conditionalities could be made part of Gordon's statutory contracts and that the debate over conditionalities concerns the terms of those contracts, not the mechanisms of investment. Indeed, the ITC incorporates conditionalities on the main credit (takers must undertake investment), the domestic content bonus credit (takers must utilize a certain amount of domestically produced steel or iron), and the energy community bonus (takers must locate a project in places with particular need for the credits' developmental impacts).

But acknowledging the possibility of pairing derisking measures with conditionalities also weakens the derisking critiques' unique point of focus: that it is the lack of a priori discipline that is slowing emissions reduction via the installation of cleaner capital equipment. Discipline is vital to the critics' theory of why or how investment occurs. Without discipline, private capital is seen to control the sequencing and timing of decarbonization because it may still undertake fossil fuel investments, or it may stall investments to demand additional subsidies on top of what the

[50] Chibber, V. 2003. *Locked in Place: State-Building and Late Industrialization in India.* Princeton University Press. p. 10.
[51] Mazucatto, M., D. Rodrik. 2023. *Industrial Policy with Conditionalities: A Taxonomy and Sample Cases.* UCL Institute for Innovation and Public Purpose. Available at: https://www.ucl.ac.uk/bartlett/public-purpose/publications/2023/oct/industrial-policy-conditionalities-taxonomy-and-sample-cases.
[52] Ibid, p. 4.

IRA already provides.[53] Controlling opportunities for fossil investment is seen as a prerequisite for additional clean investment—either because fossil investment is more profitable or because of an implicit assumption that capital expenditure can be 'reallocated' from brown to green projects. To argue this requires that derisking must affect relative costs of capital between clean and dirty fuels in a way that makes "investors" choose to invest more in one rather than the other—or redirect supposedly preexisting investable "capital" from one to the other. See Daniela Gabor's statement pointing favorably to prior European efforts to create a monitoring regime on firms: "You can change the cost of capital and stimulate fixed investment not just by increasing returns, but by making it far more expensive or to invest in dirty assets."[54] Arguing that new capital expenditure is strongly constrained by reductions other types of capital expenditure unintentionally presumes that demand for new capital equipment's output is fixed or otherwise locked into a slow rate of growth. It assumes that stocks of pre-existing financial balances constrain financial asset acquisition decisions. Furthermore, it assumes that demand cannot be altered by state policy or will not be altered by plausible developments in the target sector. For electricity production, these assumptions do not hold. Load forecasts for the United States are being rapidly revised upwards as electrification, data centers, and new manufacturing are forcing utilities to consider new resources.[55] In this circumstance, the relationship between new renewable energy capacity, storage capacity, prospective new nuclear capacity, and either existing or new gas capacity becomes positive-sum as firms become willing to accept higher energy prices so long as they can procure the electricity they need to continue their operations.[56]

Whether the derisking critique and its favored policies have merit depends entirely on how one understands industrial policy and investment: what it is, how it is scaled, the role of the state in its management, the impacts on markets of increasing capacity, and particularly the obstacles inhibiting capital expenditure from growing "absent" discipline. As noted above, the derisking critique's focus on discipline either does not elucidate such a theory. The critique relies on neoclassical conceptions of investment through its emphasis on relative pricing of the cost of capital and on the reallocation of capital expenditures or loanable funds from one sector to another, as if there was either fixed demand or a timeless conditionality on further clean investment. In particular, the derisking critique argues discipline is common to a successful structural transformation (like decarbonization), and that the preference must be for state-led, not

[53] This has been dubbed as a green capital strike. Source: Brusseler, M., C. Hayes. 2023. "Green capital strike." Commonwealth. Available at: https://www.common-wealth.org/perspectives/green-capital-strike-the-failed-cfd-auction-and-the-case-for-public-power.
[54] Amarnath, S., M. Brusseler, D. Gabor, C. Lala. 2023. "Varieties of derisking." *The Polycrisis.* Phenomenal World. Available at: https://www.phenomenalworld.org/interviews/derisking/.
[55] Wilson, J., Z. Zimmerman. 2023. *The Era of Flat Power Demand Is Over.* Grid Strategies. Available at: https://gridstrategiesllc.com/wp-content/uploads/2023/12/National-Load-Growth-Report-2023.pdf.
[56] Volts. 2024. "Nuclear? Perhaps!: A conversation with Jigar Shah, head of DOE's Loan Programs Office." Available at: https://www.volts.wtf/p/nuclear-perhaps.

market-led discipline.[57] This distinction of state- and market- led discipline of firms further muddles the definition of discipline by 1) narrowly emphasizing a priori circumstances in which states compel private firms to undertake actions presumed to be opposed by those firms while 2) assuming away the possibility that conditionalities and performance incentives can either be built into derisking policies and or come from the outcomes of new investment and the impacts of operating new capital equipment.

This central focus on discipline as a priori reallocation alteration of investment functions in the derisking critique obscures the workings of industrial policy. In particular, it distracts from the examination of conditionalities, negative price incentives, or other prohibitions or regulations or standards upon unwanted emissions-intensive technology. Such an examination might allow us to determine how to structure industrial policy conditionalities in such a way that the decommissioning of fossil fuel infrastructure or the curtailment of further investment can be timed adequately to the increase in zero-emissions generation capacity without harming other goals such as resiliency, a just transition, or the loss of workers' skills and jobs. Instead, the derisking critique inadvertently fixes the presumed sequencing and prioritization of these considerations by linking discipline not to the industrial policy "offer," but to the mechanism of investment growth.

If one is to claim that a certain application of discipline is required to undertake capital expenditure, one must be able to say how that force acts upon investment formation. This paper provides that theory and finds that while criticisms of deriskings' incompleteness for the purposes of scaling clean electricity are valid and conditionalities are indeed complements to industrial policy, the necessity of discipline as defined in the derisking critique specifically has not been sufficiently justified either for quantitative or qualitative changes to investment functions nor as a description of how conditionalities (sticks) work alongside derisking (carrots). This paper seeks to remedy that shortcoming.

Section III provides an investment theory emphasizing investment as a social process for addressing fundamental uncertainty using the example of energy generation in the United States. In doing so, I provide a basis to examine the shortcomings and successes of tax credits relative to other industrial policy tools. The investment theory argues that industrial policy exists precisely because there are risks and uncertainties private entities cannot bear without assistance from the state. As such, the state must tackle those obstacles and decide how best to do so, creating a basis for both industrial policy and coordination. In doing so, the state not only directly changes capital's behavior by creating pathways for it to follow, it then changes the environment faced by

[57] Echoes of these positions can be found in neoclassical literature on industrial policy, in the advocacy of carbon taxes, or in criticism of industrial subsidies. Lincicome and Zhu argue that a lack of discipline is a problem in industrial policy, but that discipline is required on the state and its expenditures. In describing their "carbon shock therapy" regime, Gabor and Braun note that high carbon prices can force private capital out of dirty technologies and to invest in cleaner ones, the distributional impacts, employment impacts, and growth impacts of which are uncontrolled without additional policies. Not only do they view carbon prices as a form of "market discipline," but they argue it would trigger structural transformation. Source: 1) Gabor, D., B. Braun. October 21, 2023. *Green macrofinancial regimes.* Available at: https://ideas.repec.org/p/osf/socarx/4pkv8.html. p. 2; 23-24. 2) Lincicome, S., H. Zhu. 2021. "Questioning Industrial Policy: Why Government Manufacturing Plans Are Ineffective and Unnecessary." Cato Institute. Available at: https://www.cato.org/white-paper/questioning-industrial-policy.

both private capital and industrial policy through the creation of new capital equipment. In this framework, conditionalities become industrial policy considerations themselves for the state must ask itself whether it is doing sufficient work to help firms meet them, not whether it must discipline the firms into doing so.

Section III

Economics has long distinguished between two types of expenditures among economic actors: consumption and investment. The relationship between these two expenditures defines theoretical debates between the major schools. This paper takes a Keynesian approach.[58] That is, investment is understood as expenditure for the acquisition, installation, and/or production of capital goods—which facilitate the production of other goods and services. This definition of investment is different from that used by those prioritizing specific activities—including certain derisking critics, some of whom argue that more robust industrial policy regimes prioritize manufacturing over other activities like installation or infrastructure.[59] Instead, this definition requires that the entity procuring the capital good's use value must consider whether it will be able to make sufficient use of that capital good relative to the risks or cash commitments it takes on during acquisition or prior to undertaking capital expenditure.[60]

Why focus so much on capital goods? As noted above, capital goods allow for the production of use values vital to economies and society. Those use values include not just the increase of basic consumption, but also additional investment that may require a series of capital goods to be available in sufficient supply at particular times. Crucially, the relative shortages or surpluses of vital capital goods relative to demand impart markets with particular dynamics. Shortages create the possibility of supplier markups and inflationary spirals.[61] Inflation in the supply of a particular good can feed into the economy through input-output channels, jeopardizing both consumption and investment in other sectors.[62] By contrast, surpluses of particular capacity can enable the state to increase demand or pursue new investment-drives by utilizing the surplus.

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[58] Williams, A. 2021. "The Post-Keynesian Worldview in Five Principles." Continuous Variation. Available at: https://www.continuousvariation.com/p/the-post-keynesian-worldview-in-five.

[59] Daniela Gabor argued for a distinction between manufacturing and installation when critiquing this authors' investment theory, arguing that industrial policy requires a focus on manufacturing rather than equipment installation. Furthermore, Gabor and Braun note a difference in focus between manufacturing and a focus on infrastructure. Source: 1) Gabor, D., T. Akram, C. Lala. 2023. *New Directions in Money, Finance, and Public Policy: Panel 3–Macroeconomic Management Around the World.* Panel hosted by the OSUN Economic Democracy Initiative. Available at: https://www.youtube.com/watch?v=-WtedBbYFUM. 2) Gabor, D., B. Braun. October 21, 2023. *Green macrofinancial regimes.* Available at: https://ideas.repec.org/p/osf/socarx/4pkv8.html. p. 7.

[60] This happens when the use value of capital expenditure cannot be utilized all at once and when the expenditure feeds or facilitates subsequent consumption.

[61] Weber, I., E. Wasner. 2023. "Sellers' Inflation, Profits and Conflict: Why can Large Firms Hike Prices in an Emergency?" UMass Amherst Economics Department Working Paper Series. UMass Amherst. 2023-2. Available at: https://scholarworks.umass.edu/econ_workingpaper/343/.

[62] Weber I. M., J. L. Jauregui, L. Teixeira, L. N. Pires. 2024. "Inflation in times of overlapping emergencies: Systemically significant prices from an input–output perspective." *Industrial and Corporate Change*. Vol. 33 (2): 297–341. Available at: https://academic.oup.com/icc/article/33/2/297/7603347?login=true#439198806.

That then begs the question, how do we increase the supply of desirable capital goods. That is the purpose of investment.

Investment has discrete and stylized characteristics relative to consumption expenditures. First, investment expenditures occur in large, discrete, and staged processes. Capital goods have operating and depreciating schedules and hence do not require constant installation or reinstallation.[63] The installation of capital goods also requires technical expertise, access to materials, and permissions to ensure its smooth operation. Investment undergoes various steps from development and conceptualization to operation (production). These stages and processes may feed into or be fed by other investment processes due to capital goods being assemblages of other capital goods. One of these processes can include the financing of capital expenditure (see more below).

Second, investment expenditures are made with some expectation of future gains. No entity will undertake the acquisition of a capital good without some internally set criteria for judging a successful or useful acquisition—often a measure of financial gain relative to some quantitative or qualitative benchmark: a hurdle rate.[64] If there are gains to be made from investment and those gains are judged sufficient against the hurdle rate benchmark, investment can proceed.[65]

Third, investment is undertaken in an environment of fundamental uncertainty.[66] This uncertainty applies both to whether the investment will produce sufficient gains and to the success or plausible operation of the process and supply chains needed to move the project from planning to operation. It therefore requires firms to balance their desire for gains and their desire for safety.[67]

Fourth, consumption of the investment's output is the ultimate validator of investment. The capital good is acquired to produce something; as such, investment requires some sufficient and stable or predictable demand for what the target capital good is intended to produce.

Fifth, the existence of alternative or competing capital goods does not in and of itself indicate a tradeoff between investment in one good or another. The existence of an alternative capital good A supplying existing demand can make it difficult for output from its substitute capital good B to acquire market share. Constrained demand either today or in the future for B's output thereby limits future investment in B. But new capital expenditure on A will not itself limit capital

[63] Capital goods do require operation, maintenance, and repair. But these are not investment processes nor are they treated as such by most theorists or practitioners.
[64] Example benchmarks can include debt service coverage ratios, earnings per share, or dividends normalized by returns on equity. Alternatively, the benchmark could be profits or revenues per unit of output. Preferred values can be informed by investors' preferences, but are still ultimately decided by the firm. Firms will not typically utilize just one benchmark and their hurdle will always contain an irreducible subjective or heuristic component.
[65] Sufficient here can mean different things. They have to be high enough, stable enough, of sufficient duration, and/or sufficiently protected against plausible shocks. Different entities will assign these and other criteria different weights and will have different hurdle rates.
[66] Fundamental uncertainty is the idea that there are always certain matters upon which there is no basis to determine a reliable predictive probability. And yet firms must act anyway. Keynes, J. M. 1937. "The General Theory of Employment." *The Quarterly Journal of Economics.* p. 214.
[67] Crotty, J. 1992. "Neoclassical and Keynesian Approaches to the Theory of Investment" *Journal of Post-Keynesian Economics.* vol. 14 (4). p. 492.

expenditure on B if investors do not revise downward their assessments of possible demand for B's output.

Finally, the private financing of investment is constrained by the financial system's own assessment of the viability of returns on the assets that they acquire and the risks to their own balance sheet's from those asset acquisitions. Investment is not constrained by pre-existing deposits, reserves, or other financial balances on a bank's balance sheet. Financial assessments of a project can have a relationship to industry conditions, but they are also influenced by conditions in the financial sector: the presence of a dealer of last resort, standardization or lack thereof with respect to asset origination, underwriting capacity, and more. This means projects can encounter "cost of capital" constraints in which lending at particular rates, durations, and volumes may not be occurring. But solving those constraints is not a matter of halting certain activities and reorienting the balance sheet spaces of asset holders from one financial asset to another (reallocating capital), but rather of altering financial market structure, using public finance, or otherwise altering associated real-side constraints for projects seeking financing. These combined measures make particular forms of lending more possible, without necessarily changing the existence of other lending activities.[68]

A lesson of these stylized characteristics is that investment across different industries can be distinguished by the processes particular capital goods undergo from a planning stage to operation—and particularly by the barriers those capital goods encounter in traversing that process, acquiring financing, finding and meeting demand, and justifying the risks to firms of traversing the process. Investment in a new frontier industry may encounter difficulties due to the lack of established consumption markets or a workforce with adequate skill sets. An established industry may suffer from shortages of inputs or threats to its existing capital goods (say, from climate change). Industries that have long-established markets may have difficulty scaling if their expansion requires a parallel scaling of infrastructure or production of primary or intermediate goods.

Energy generation projects in the United States are built using one of two processes. The first is a formal rate case in which a rate-regulated utility proposes an investment to a public service commission or similar body (that it has most likely already decided to undertake beforehand).[69] The commission's role is to approve the rate increases which provide the utility revenue out of which it will pay project costs and various financial obligations while receiving a regulated rate of return. The second major method is when a developer undertakes energy investment outside of a rate-regulated process; these merchant developers build and operate the project independent of

[68] If anything, enabling cheaper financial asset origination and acquisition investors in clean capital assets doesn't crowd out investment in substitute capital goods. If anything, it crowds out lower-quality financial products for those same clean capital assets. And that crowding out effect is not due to a redirection of preexisting loanable funds, but more that investors no longer have any reason to acquire or originate lower quality financial assets. One can make an analogy to capital assets. A more productive factory does not mean an older factory could not still be profitable. Instead, the productive factory steals market share when demand is fixed or growing slowly. If demand is growing rapidly, both the new and old factory might continue operating together.

[69] There may be circumstances where the utility presents options to a public service commission it does not want to undertake. Those are not considered here.

ratemaking or public service commissions, earning revenues through a power purchase agreement with a utility company, by selling energy on regulated wholesale markets, or by some combination of the two. End-use customers can also acquire their own distributed generation or storage assets. In either case, developers or distributed customers proceed with investment hoping to secure some self-set stable and sufficient return: i.e. one that meets their financing commitments and a self-set safety buffer.[70] The discussion on energy investment below will begin by abstracting from the differences between ratemaking or merchant generation to identify the various considerations on "whether to invest." It will illustrate how the decision to invest in energy is taken and the barriers it can encounter. The two major routes to energy investment can facilitate or impede that decision in different ways, but ultimately the decisions to invest in either process are fundamentally comparable.

Energy development proceeds in stages.

1. A project must be planned.
2. A project must secure the necessary partnerships and counterparty relationships (supplier, co-investor, contractors etc.).
3. A project must secure financing, the capital stack for which can vary depending on whether the financing is for the construction or operation period.
4. The project must secure regulatory or legal permissions (e.g. on land use or legally required input or sign off from stakeholders).
5. The project must sign a PPA if it is a merchant-developed project?
6. The project must undergo construction.
7. The project must interconnect to the grid.
8. The project must operate and provide power in sufficient accordance with its promised or planned delivery.
9. The project must bring in sufficient revenue to meet its debt service commitments as well as the developers' predetermined desired rate of return.

It is not an accident that the description of energy development is written as a series of viability assessments—both beforehand and after-the-fact. [71] Beforehand, in an environment of fundamental uncertainty, developers must judge whether a project can pass through the entire investment process, with all the conditionalities and risks that such a decision entails, *and* ultimately meet a desired rate of return (however that is measured or proxied). To make this decision, developers rely on a set of expectations formed through experience and heuristics.[72] These expectations can swing wildly over time from optimism to pessimism and back again

[70] Public development can also include a requirement for some stable or sufficient return—even by entities who do not formally have a return requirement. In any case, the public entity will still make assessments described in Section II for they still want the investment to succeed, even if it is not for reasons of profitability.
[71] That is not to say the developers' assessment of success cannot be influenced by external factors. For example, the prospects of securing future financing may drive the developer to set a higher return target for a project. But ultimately, the decision to aim for a higher return is the developers'.
[72] See Jim Crotty on conventional expectations. Source: 1) Crotty, J. 1992. "Neoclassical and Keynesian Approaches to the Theory of Investment" *Journal of Post-Keynesian Economics.* vol. 14 (4). p. 492. 2) Crotty, J. 1994. *Are Keynesian Uncertainty and Macrotheory Compatible? Conventional Decision Making, Institutional Structures, and Conditional Stability in Keynesian Macromodels.*

based on developers' experiences of prior investments or changes in their expectations of the future. The expectations are also contingent upon developers' understanding of the barriers to investment they face at the various stages of project development. These barriers represent either problems that have risks the developer can calculate using heuristics and/or hedge against, or problems whose probability distributions are incalculable or unassignable.[73] In the former case, mitigating the risks or their potential impacts can impact expectations formation and investment. In the latter case, expectation formation will be difficult no matter the optimism or pessimism about the future, and the obstacle will have to be altered or removed before investment can proceed. These barriers—whether providing uncertainty or risks on projects—allow investment across and within different sectors to be compared.

Examples of these barriers for energy projects can include lengthy delays or repeated studies in the interconnection process, difficulties securing land use permissions, the skittishness of a particular source of financing, construction delays, input shortages, the threat of curtailment following operation, or the risk of future profitability due to from changes in regulation or policy incentives. Overtime, many investment barriers come about because of the success or failure of previous or concurrent investment processes—either of the same product or in key inputs or infrastructure associated with energy generation. For instance, the rising prevalence of solar on grids results in a large "duck curve" in which net generation (generation sans renewables) collapses rapidly in the morning and afternoon as solar energy floods the grid and rises rapidly in the evenings as the sun sets. This limits the deployment of further renewables until grid-wide resources—storage capacity, transmission capacity, or alternative forms of clean "firm" resources—can be found to ensure the grid can continue to provide power on a consistent basis. These barriers must be removed or dealt with. Their effect on investment depends on their interaction with other types of investment barriers. Some barriers slow investment growth, while others outright stop it. The removal of a particular barrier may have a negligible, slow, or outsized effect on increased investment.[74]

Thus far, I have examined investment at the level of a singular project without noting its dynamic characteristics. First off, both a priori (will the proposed investment work?) and ex post assessments (did previous attempts at such investment work?) of investment barriers proceed simultaneously across and within firms. These assessments might also happen in tandem on the same project or involve the developer making assessments about investment processes that feed its own (i.e. will suppliers be able to provision sufficient parts). Just as a firm thinks it might have solved particular input shortages, an interconnection or financing problem may emerge.

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[73] 1) Knight, F. 1921. *Risk, Uncertainty, and Profit.* 2) Dimand, R. 2021. "Keynes, Knight, and Fundamental Uncertainty: A Double Centenary 1921-2021." *Review of Political Economy.* p. 1.

[74] Some of these barriers can be compensated for by insurance (which, although it raises the upfront costs of undertaking a project, can sufficiently mitigate future costs to make the project "pencil"). But others cannot. Barriers like interconnection delays, may be impossible to reliably predict in advance because interconnection processes may turn out entirely differently for similar projects with different positions in the interconnection queue. Source: Lala, C., J. Burt, S. Peddada. 2023. *The Interconnection Bottleneck: Why Most Energy Storage Projects Never Get Built.* Applied Economics Clinic. Available at: https://aeclinic.org/publicationpages/2023/5/17/the-interconnection-bottleneck-why-most-energy-storage-projects-never-get-built-48nct.

Firms undertaking investment in particular areas learn how to deal with certain barriers overtime—or they learn that certain barriers cannot be dealt with and simply accept their implications for capital investment. That need not result in investment failing. But it does often mean that investment happens in reduced quantities and/or may come with additional costs or threats to profits that a developer *must* be willing to tolerate if an investment is to proceed. In aggregate, these barriers can slow the pace of investment growth, standardization, learning-by-doing, and productivity growth. If the barriers create bottlenecks or shortages in critical resources or infrastructure, then that can start an inflationary spiral in associated prices if shocks or persistently high demand keep calling on the capital good's output.[75]

If the investment required to meet a particular target must rapidly span the entire economy or multiple sectors, the interaction of various barriers can multiply both the quantity and qualitative nature of project uncertainties.[76] As investment priorities pile up, the potential for contradictions among them grows non-linearly. Priorities within or across sectors may conflict or reduce the urgency of other investments that occur. A buildout of certain capital goods may require other capital goods be built at sufficient scale first in order to prevent socially suboptimal outcomes. Buildouts may also face shortages of skilled workers, who themselves cannot move easily between industries or specialties due to the time it may take to learn specific operations. A rapid buildout of certain capital goods may require aligning different producers to feed various investment processes in such a way that renders other investment priorities and their firms less necessary.

These examples are not meant to illustrate any fundamental scarcity or opportunity cost in the economy. Rather, they are shown to demonstrate the increasing difficulty for all economic actors facing such a situation. For private firms in a particular industry, assessing a potential investment in decarbonized capital equipment becomes impossible without knowing whether that equipment can even be made to exist in saleable form in time to meet consumption demand, which may not even want that capital goods' output. Technologies may need years of patient testing and repeated experimental failure before they are ready to even demonstrate, let alone sell across the economy. New technologies will require additional infrastructure and supply chains. All the while, firms will remain exposed to basic balance sheet constraints in an environment where potential profitability cannot be assessed because the predictability of the past is useless in a world where everything is changing. In such an environment, the firms' internal threshold for a safe and stable return will sharply increase to hedge against the many pitfalls it may encounter. In other words, private actors will find it difficult to understand, let alone quantify the nature of risks they face. Only fundamental uncertainty will remain. As will the investment barriers.

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[75] Weber, I., E. Wasner. 2023. "Sellers' Inflation, Profits and Conflict: Why can Large Firms Hike Prices in an Emergency?" UMass Amherst Economics Department Working Paper Series. UMass Amherst. 2023-2. Available at: https://scholarworks.umass.edu/econ_workingpaper/343/.

[76] Hicks described a movement between dramatically different structural conditions as a "traverse." The previous capital stock proves unequal to the task because it was not built with the needs of the new capital stock (or its outputs) in mind. Source: 1) Hicks, J. 1965. *Capital and Growth.* Oxford. Clarendon Press; 2) Gehrke, C., H. Hagemann. 1996. "Efficient Traverses and Bottlenecks: A Structural Approach." Chapter in *Production and Economic Dynamics*. Edited by Michael A. Landesmann and Roberto Scazzieri. Cambridge. Cambridge University Press. Chapter 4. p. 140-141.

The state is necessary. Its policies can remove, mitigate, alter, or supersede investment barriers for private actors, as well as public actors.[77] But even more importantly, the state can make choices about the prioritization, sequencing, and goals of the investment barriers it tackles. The former set of policies are industrial policies. The latter set of policies fall under the broad umbrella of coordination.[78] The state will have to adjudicate how it utilizes its industrial policies if it is pursuing strategic investment priorities of sufficient scale, diversity, rapidity, or some combination thereof. It may require the state to choose or facilitate the selection of which barriers are addressed first and in what order. To do that will require expertise. In the case of energy generation, Mitch Green argues it will require setting investment decisions for particular generation resources (solar, wind, storage, etc.) while accounting for how their installation will affect grid-wide dynamics, particularly the need for resources to ensure the reliability of electric power.[79] As different grid mixtures will require different management and resourcing decisions, policies removing barriers to investment in particular types of generation at the project level should be mindful of what the installation of those resources could result in: future investment needs in infrastructure or storage, management systems, resource tradeoffs, and risks to the grid infrastructure or reliability.[80] This kind of assessment is both technical and political in nature. The state itself must make choices in those moments, choices that carry their own irreducible and often unknowable risk that future choices of the state may be more difficult than the ones today.

Rapid and transformational investment drives (either in frontier areas or long-standing lines of activity) happen because barriers to investment were either addressed, mitigated, or rendered irrelevant and firms were able to develop stable business models that navigated the barriers that remained. Industrial policies in turn are undertaken to fix barriers precisely because increasing the quantity and quality of key capital goods is seen as a critical policy target. In the case of energy, the justification is to rapidly reduce greenhouse gas emissions by replacing all emitting generation with zero emissions generation and only installing zero emissions generation (and the accompanying infrastructure and storage assets) such that future load growth is met without producing emissions. Industrial policies to that end can be evaluated within and across sectors on their ability to address barriers that inhibit the speed of that process. They can also be evaluated on the order and sequencing in which barriers are addressed, the technologies and infrastructure that are targeted, and how such decisions were weighed against alternative industrial policy and coordination choices.

The above is a theory of investment and industrial policy. But it is also the basis for political economy. It is one thing to stay states acting upon a particular barrier will result in investment increasing. It is quite another to incorporate assessments of why states can act on certain investment barriers and not others. Political obstacles to undertaking industrial policy are too numerous to recount here, but one significant obstacle is that some policymakers and analysts

[77] This is not to imply that the state is strictly necessary for the removal of all investment barriers.
[78] Brusseler, M. 2023. "Transitioning Systems? On coordinating the green transition." Commonwealth. Available at: https://www.common-wealth.org/perspectives/transitioning-systems-coordinating-the-green-transition.
[79] Green, M. 2023. "The Case for Grid Thought." Center for Public Enterprise. Available at: https://www.publicenterprise.org/blog/case-for-grid-thought.
[80] Ibid.

believe undertaking specific industrial policy or coordination actions may fail. They may fail because the state may bet on the wrong targets or use the wrong tools. They may fail because political opposition may curtail or warp the industrial policy before the desirable change may be affected. They may fail because the state misunderstands the nature of the investment barriers it is assessing or makes an ultimately poor prediction about the interaction of its investments with the existing or future capital structure. Because the available capital equipment in one period impacts the investment choices in that period (including the barriers faced by projects), industrial policy and coordination can affect their own politics in subsequent periods as a result of investment that is (or isn't) successfully affected. The choices faced by society can thus be made different in subsequent periods, creating open spaces for political contestation over the nature of those choices, their beneficiaries, their effects on society, and their normative implications.

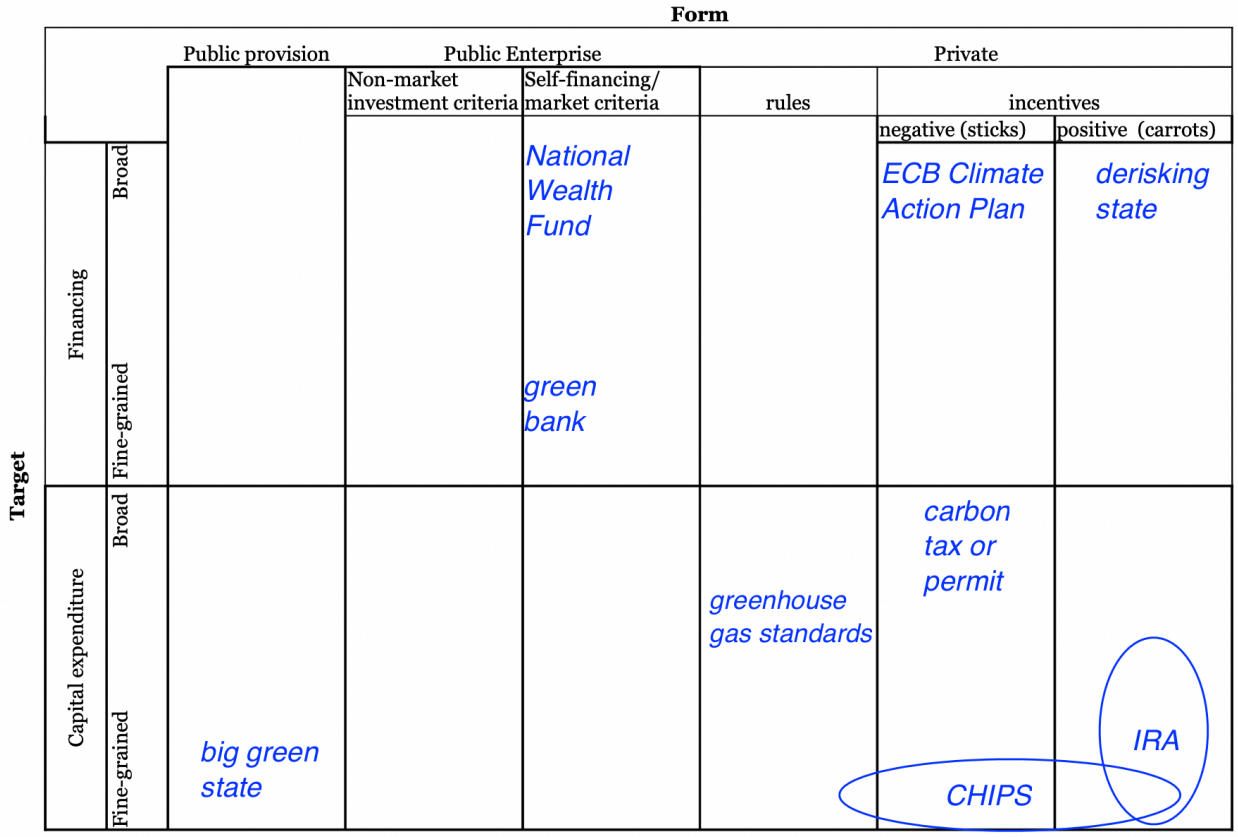
So where does this leave this papers' discussion of discipline and industrial policy tools? For one thing, it imparts the pairings and plausible outcomes of industrial policy tools with far more flexibility precisely because the capital structure of different economies can be as diverse as the histories of how those capital structures came to be. Investments temporal and path-dependent character means one can find numerous examples of shortages or surpluses without having to attribute them to the nature of a given technology, relationships between that technology and politics, nor to to any steady-state growth path. Rather, capital structures change because of decisions made by entities and institutions across the economy. It is these *contested* decisions that must be analyzed, particularly to how they chose to address certain uncertainties and risks. The next section illustrates the implications of this finding for industrial policy conditionalities, arguing that we can form and structure such conditionalities if we see them as additional vectors for investment, not as vectors for discipline. The former view will increase the clarity of choices faced by democratic states. The latter will only frustrate the rapid and urgent tasks of society.

Section IV

Industrial policy tools are numerous in character and scope. It is a mainstay of the industrial policy, economic history, and developmentalist literatures to compare them along numerous dimensions. One particularly informative comparison is offered by Josh Mason (see Figure 2 below).[81] Mason compares industrial policy tools on two axes: their form (a basic descriptive characterization of how they operate) and their target. The latter criterion distinguishes between fine-grained and broader targets of either capital expenditure or financing.

[81] Mason, J.W. 2023. "Varieties of Industrial Policy." Slackwire. Available at: https://jwmason.org/slackwire/varieties-of-industrial-policy/.

Figure 2. Forms and targets of industrial policy



Reproduced from: Mason, J.W. 2023. "Varieties of Industrial Policy." Slackwire. Available at: https://jwmason.org/slackwire/varieties-of-industrial-policy/.

Mason highlights two implications, both of which I agree with. The first is that these policy comparisons of ideal types.[82] Industrial policy in practice draws on a mixture of policies. Public ownership can be paired with carbon taxes. Mandates or prohibitions on particular actions by private firms can be paired with strong incentives to invest in better things. Green banks and greenhouse gas reduction targets are not contradictory efforts. The second is that the combination of policies does matter because different combinations of policies can have stronger or weaker impacts upon investment—the critical variable under management.[83] So far, proponents of IRA's tax credits, (robust) derisking's advocates, nor the derisking critique would disagree. Where they part ways is that the derisking critique has assigned a special comparative value on the role of "discipline" or a priori legal or financial penalties in securing additional investment. But as Mason notes, this focus on form can obscure how policies operate. Policies that seek to raise the cost of carbon-linked financial assets are implying there is a link between those costs and the capital expenditure that ultimately occurs.[84] As Mason notes, there is little evidence of such a link. This is because discipline-driven arguments have not done the work to identify what barriers to investment such policies actually raise, particularly if fossil assets are still deemed profitable and other forms of subsidization still persist. Barriers to investment are a secondary concern of the derisking critique.

[82] Ibid.
[83] Ibid.
[84] Ibid.

And yet it is far more likely that private firms are out of their depths in their capacity to affect system-wide change than it is that discipline on otherwise capable actors will give them the ability (strength? will? way?) to bypass obstacles to investment. This is not to say that "sticks" do not have a role in industrial policy. They clearly do, particularly as conditionalities and when instituted in serious consideration of real investment obstacles. But they are far more likely to succeed when states consider how or if they will actually impact the macroeconomic dynamics of investment. As it is, the derisking critique does not give those dynamics sufficient considerations. As a result not only does it oversell the role of discipline, it undersells the obligations it creates for the state to potentially derisk additional investment.

Imagine conditionalities that require firms to invest in local communities or procure certain materials domestically. We can use the domestic content bonus as an example of the latter. If firms do not make sufficient use of the bonus, the derisking critique might suggest firms must be compelled to do so with additional sticks. And yet the reason the firms may not make use of the bonus can be because domestically produced inputs are not sufficiently available (anticipating this, the Treasury Department offers conditional safe harbors for domestic content requirements—not just those in the IRA[85]). That is, there could be a shortage of capital goods producing or extracting such inputs. If that is so, no performance targets, cost of capital penalties, or mandatory purchases will produce sufficient increases in takeup of the domestic content bonus. Successfully increasing domestic content takeup will instead require additional investment, which the government in turn might have to create its own pairings of carrots and sticks for. When undertaken across numerous policy areas, the potential increases for different conditionalities to contradict one another or encounter edge case bottlenecks that slow the progression of overall investment. Fundamentally, the issue is not one of whether industrial policy conditionalities exist or represent discipline or sticks, but whether the state is accounting for all of the investments required to meet its various objectives and has assessed the impact of its industrial policies on the uncertainties holding investment back.

This framing has several advantages. First, it allows us to link together sector-specific details on the manifestation of investment barriers to a macroeconomic investment theory whose basic precepts can apply across sectors. I could apply this investment theory on an examination of semiconductor production, transmission and distribution lines, or the establishment of childcare facilities and it would provide the framework to examine those sectors, incorporating firm and worker knowledge, and identifying obstacles to desired results. The theory in Section III is a basis to both gather knowledge and identify what knowledge is necessary. Second, this paper's theory allows more flexibility on the pairing of particular industrial policy forms with successes and failures on achieving clean investment or reducing emissions. In other words, it provides a check against weak causal claims or assertions about either industrial policy's form or the political coalitions who back it. Third, it abstracts away from the derisking critique's isolation of a priori or ex post discipline on capital. If capital is made to do something it was not otherwise doing, does it matter so much that the policy that made it did so by incenting it or by forcing it? Likely not. What matters should be comparative effectiveness and the end-result's desirability of the policy approaches used. The derisking critique may argue that political effectiveness matters in that certain policies can open up new coalitional possibilities for development or decarbonization. This may be. But the derisking critique has not sufficiently justified the

[85] 49 CFR § 661.7; 2) Cornell Legal Information Institute. *26 U.S. Code § 45 - Electricity produced from certain renewable resources, etc*. Available at: https://www.law.cornell.edu/uscode/text/26/45.

relationship between its proposed disciplinary measures and the supposed implications for the state, firms, and other stakeholders of industrial policy. They do not define discipline in a manner analogous to the development literature. We must also be careful not to discard key observations from this paper: fundamental uncertainty pervades economic decision-making; capital equipment impacts political choices and economic options simply by existing and operating; and forms of industrial policy can have varying relationships with effectiveness because of the investment barriers created by the interaction of the changing capital structure and decision making under uncertainty. This necessitates pushing back on simplistic political economy tradeoffs that cannot be related to sectoral conditions and existing institutional capacities. It requires rooting arguments for policy in its relationship to investment mechanics and system-conscious assessments of investment's implications.