

UC Berkeley

UC Berkeley Previously Published Works

Title

The Political Economy of Industrial Policies in Natural Resources

Permalink

<https://escholarship.org/uc/item/1mx3349p>

Authors

Rausser, Gordon C.

Foster, William

Choi, Elliot

Publication Date

2025-10-01

Peer reviewed

The Political Economy of Industrial Policies in Natural Resources

Gordon Rausser¹, William Foster², Elliot Choi³

Abstract: The debate on industrial policies has long been polarized between proponents of government intervention and free-market advocates. Proponents argue for market failure correction and industry nurturing, while opponents warn of the inability of the government to “pick winners” and vulnerability to rent-seeking interests. What the current literature overlooks is that effective industrial policies must simultaneously design pie-expanding "public good" policies with appropriate redistribution policies to facilitate their political acceptance. Using this notion, this paper proposes a new approach by extending the PEST-PERT portfolio framework to examine the efficacy of industrial policies in the agricultural, natural resource, and environmental sectors. A number of empirical examples are presented, including payment for ecosystem services, conservation programs, agricultural policy reform, development subsidies to increase maize productivity, infrastructure development, and transportation investments. These industrial policy portfolios are dissected for two policy types: (1) pie-expanding policies that promote public goods, reduce transaction costs, and resolve coordination failures; and (2) redistributive policies often needed to overcome opposition from blocking coalitions. In each empirical study, the policy portfolio is specified, distinguishing these two types of policies.

1. Introduction

The strategic role of government in managing agriculture, environmental goods, and natural resources remains an open, central question for academic and applied economics (Juhász et al. 2023). Can policymakers, through active industrial policies for activities related to natural resources, using tax incentives, subsidies, or direct investments, propel long-term economic development in standard material terms? Can they also integrate other possible social imperatives, such as ecological sustainability, resource conservation, and a more uniform distribution of benefits? And if not, why not? These questions remain open and polemical within the profession (Ilyina et al. 2024, Evenett, et al. 2024), suggesting not merely competing ideological undercurrents but fundamental limitations to the basic diagnostic structure widely employed in agricultural and natural resource economics to analyze government interventions.

We argue that addressing these contentious issues surrounding industrial policies in natural resources from a detached, scholarly perspective requires an analytical context that, echoing David Hume (1739)'s "is-ought problem," emphasizes less on what a government ought to do and focuses more on what a government really is and what it might be able to do within its

¹ Robert Gordon Sproul Distinguished Professor Emeritus, Dean Emeritus, Rausser College of Natural Resources, Professor of the Graduate School, University of California, Berkeley, Department of Agricultural and Resource Economics

² Professor of Agricultural and Resource Economics, Pontificia Universidad Católica de Chile.

³ Researcher, University of California, Berkeley, Department of Agricultural and Resource Economics

capabilities as a political organization. What the government is and how it works depends critically on the contours of the current political-economic landscape. Theory sets the lens through which we interpret empirical evidence regarding policy effects and assess the possible advisability of future policy changes. A theoretical stance assuming the government's function is to correct the poor collective performance of private actors would filter evidence much differently than one assuming the government exhibits its own failures, such as legislative and regulatory capture by special interests. Our fundamental question: What is the most appropriate and useful methodological framework for political-economic analysis of industrial policy in natural resources economics?

We maintain that proponents and opponents of industrial policy have justifiable foundations for their viewpoints but largely argue past one another because they begin with different focal points regarding the government's role and adopt an unrealistic view of what the government can, cannot, and is inclined to do. Proponents stress industrial policy's potential to overcome coordination failures and expand the economic pie, while opponents stress its potential to be merely rent-seeking and redistribution, shrinking the pie. Yet in both models of government action, *ought* tends to trump the *is*, and evaluation of growth-enhancing policies is treated separately from redistributive policies, neglecting the dynamic, complementary integration of these two fundamental goals of real-world political processes. We contribute to analyzing industrial policy related to natural resources by presenting an improved framework to assist in evaluating potentially beneficial policy based on a clear-eyed appreciation of the reality of the political-economic landscape in which concrete policies are made. Note that such policies involve far more than governments supporting infant industries or investing in new factories, but include a host of policies targeting the development of new institutions and markets, whose potential emergence from the private sector alone faces serious coordination obstacles.

An analytical structure accounting for the dual character of observed policy combinations can help advance operational guidelines consistent with real-world politics yet conducive to enhancing social welfare as economists measure it. We argue that governmental performance can improve if economists and policymakers begin with the perspective that combinations of public good and complementary redistributive policies should be designed and implemented simultaneously instead of emerging organically from more chaotic political conflicts (Rausser and Foster 1990). Our core argument is that government policymakers, with resource economists' help, can be "smarter," balancing various interest groups' demands while implementing more efficient policies to grow the economic pie. In short, political economy studies can offer socially beneficial and politically feasible recommendations based on an analytical understanding of how governments work and what industrial policies in natural resources might practically achieve.

In this article, Section 2 reviews relevant literature, elaborating on the pros and cons of industrial policy applied to natural resources, noting analytical limitations of the current model offered by proponents. Section 3 presents the "PEST-PERT portfolio framework," extending the work of Rausser (1982, 1992) and Foster and Rausser (1994), bridging the gap between two opposing perspectives usually found in the economics literature. Section 4 applies this framework to some historical cases of industrial policies related to the environment, natural resources, and

agriculture; all subject to criticism from industrial policy opponents. Section 5 presents concluding remarks and avenues for future research.

2. Industrial policies in natural resources

The concept of industrial policy encompasses government interventions to promote the development of targeted economic activities. This is in contrast to fiscal and monetary policies and overarching property rights, regulatory and other policies that influence broad economic performance and material wellbeing more generally (Rodrik 2004). The *politicians'* case for industrial policy historically has been based on strategic considerations and claims of economic growth and diversification, emphasizing both potential employment, national security, and national income growth deriving from currently non-existent, stunted, or unsuccessful sectors (Warwick 2013). Traditionally, governments have stressed the importance of promoting value-added activities to reduce national reliance on natural resources and the vulnerability to volatile international commodity markets (Hausmann et al. 2008; Kaplinsky 2011). In more recent decades, the sustainability of economic development and the longer-term environmental consequences of natural resource use have taken on greater importance in defining what politicians consider strategic resource management, creating political tensions linked to the balance between the imperfectly aligned objectives of industrial and employment growth, as well as biodiversity and ecological conservation (Rodrik 2014; Altenburg and Assmann 2017). Additional, geopolitical factors enter the discussion of industrial policies, often with a mercantilist flavor, with one argument being that, by supporting specific activities, the government can capture a share of the value-added associated with processing natural resources within the country, rather than being captured by foreign firms and governments (Amsden 2001; Wade 2012). Further, in some contexts, a government might strive to advance its clout in international markets by reaching a dominant or countervailing scale in the supply of "strategic" resource commodities, such as petroleum or the so-called "rare earth" elements (Humphreys et al. 2007).

Historically, U.S. agricultural policy displays the characteristics of industrial policy, such as beneficial market regulations and direct taxpayer support, plus subsidized research and infrastructure investments. The ostensible aims of such policies are to stabilize agricultural markets, to support family farm incomes, and to promote the international competitiveness of the farm sector. Especially in relation to the food system and other natural resources, U.S. government policy has conspicuously emphasized providing incentives for research and development, especially within Land Grant universities (Huffman and Evenson 2006, Fuglie and Heisey 2007). Taxpayer and commodity producer funds allocated to land-grant universities have led to impressive scientific and technological advances which have fueled total factor productivity gains, affordable food supplies, the mitigation of environmental impacts, and the development of new products and product uses (Alston et al. 2011, Wang et al. 2015). State and federal governments also invest in the development and maintenance of basic infrastructure in rural areas in the form of transportation, energy and communication systems, which serve not merely to improve the productivity of resource-based activities but also to enhance the welfare of rural

communities and effectively to reduce the cost of attracting and retaining labor and human capital (Kilkenny 2010). Shifting taxpayer resources from commercial and population centers to investments to improve living standards in remote and less-densely populated but resource-endowed areas is often a long-term strategic decision for governments rather than a charitable concern for small, local populations (Freshwater 2000, Bryden and Warner 2012). The promotion of so-called green technologies can have similar long-term political aims to alter the local environmental consequences of overly aggressive resource extraction and the possible geographically widespread and perhaps global effects of air and water pollution and the production of greenhouse gases (Jaffe et al. 2005, Barbier 2010).

The strictly economic case for industrial policies of its proponents rests on the contention that unfettered markets are sometimes prone to coordination failures associated either with imperfectly defined or enforced property rights (externalities and the so-called tragedy of the commons), asymmetric information, scale economies, or with inadequate public goods. Harrison and Rodriguez-Clare (2009) identify how industrial policies could mitigate coordination failures and foster Marshallian externalities within nascent industries, subsequently eliciting sustainable private-sector investments. The presence of learning externalities, such as those from R&D and on-the-job skill acquisition, can justify intervention because these spillovers often go uncompensated. Cost-discovery externalities, where the initial forays into a new market reveal the broader potential for the industry and reduce risk for subsequent entrants, are also potentially significant (Hausmann and Rodrik 2003). Furthermore, governments might play a pivotal role in mitigating coordination or agglomeration failures, which are particularly relevant in industries that benefit from scale economies and where the actions of one firm can significantly impact the outcomes of others. By facilitating simultaneous investment commitments or offering public guarantees, governments might ensure a more efficient industrial expansion (Krugman 1991).⁴

Anticipating the critiques from opponents of industrial policy regarding government inefficiency, more recent proponents of the optimistic view, such as Rodrik (2004, 2008), have argued that these policies could be cost-effective, if they were to correct for historically observed limitations inherent in governmental interventions. In particular, industrial policy might be rationalized if it would possess three key design attributes: "embeddedness" within industries to ensure policies are well-informed; "carrots and sticks" to balance incentives and disincentives; and "accountability" to keep track of outcomes and adjust policies accordingly. Hausmann et al. (2005) present those "design features" for industrial policy, including a sunset provision, limiting "new" activities by industry agents, clear performance-based benchmarks, interdependence with other agencies, and a degree of autonomy from political forces. Despite these proposed safeguards, however, the implementation of such policies remains contentious.

⁴ Economists also recognize that the creation of middle-class jobs through industrial policy contributes to longer-term societal benefits linked to social cohesion and a shared sense of communal progress, such as the reduction of crime and substance abuse, the avoidance of youth emigration, and maintenance of a local tax base (Rodrik and Sabel, 2022, Chetty et al. 2014, Case and Deaton 2020). Pigouvian subsidies, which aim to encourage firms to internalize the value of these sociological spillovers, stand as a potential remedy to ensure these externalities are adequately factored into private-sector economic decision-making (Greenstone et al. 2010; Kline and Moretti 2014).

Critics argue that the pursuit of industrialization policies by governments has a checkered history, with persistent doubts about the government's ability to discern and nurture infant industries into market leaders. Opponents of industrial policy contend that the *political* economy often overshadows the objectives of industrial policy, incentivizing certain industries that stand to benefit from state subsidies to exert political influence and, in some instances, "capture" the government decision-making process (Stigler 1971). Notions of protecting infant industries, poised to develop latent comparative advantages, have often resulted in these sectors perpetually relying on state aid. A significant body of research, including the six case studies in "The Technology Pork Barrel," highlights a range of issues – from misplaced technological optimism to narrowly focused political agendas and pervasive bureaucratic inefficiencies such as cost overruns and favoritism – leading to suboptimal outcomes (Cohen and Noll 1991). This lens characterizes a vicious cycle in which such industries become dependent on government subsidies and concentrate on siphoning more subsidies rather than investing in innovation, efficiency, and meaningful development. Many countries have witnessed the pitfalls of this approach when the selection of 'winners' was less about economic potential and more about political expediency. Such examples include the United States' subsidization of Solyndra, South Korea's shipbuilding and heavy industries subsidization of Hyundai, and Tunisia's telecommunications and banking subsidization of "Ben Ali" firms (Sobel and Graefe-Anderson 2018; Choi and Levchenko 2021; Rijkers et al. 2016).

The risk of political capture is non-trivial, where industrial policies are vulnerable to lobbying and political influences that divert resources towards serving private self-interests, overshadowing the larger public interest. This concern extends across various sectors, including agriculture, environmental management, and natural resources (e.g. Krueger 1990; Anderson et al. 2013). While proponents of industrial policy argue that East Asian industrial successes underscore the merits of such strategies, contrasting outcomes in Latin America and Africa point to a nuanced understanding of industrial policy implementation, with some suggesting that initial import-substitution strategies, while successful in spurts in economies like Mexico and Brazil, generally yield disastrous results in the long run (Noland and Pack 2003; Easterly 2001). Opponents counter that the seemingly successful East Asian industrial policies could be exceptions attributed to uniquely competent bureaucracies capable of effectively disciplining the private sector rather than the industrial policies themselves. They posit that these nations might have prospered even more without such policies and that such successes are not broadly generalizable (Lincicome 2021). This harmful symbiosis between the government and the industries successful in capturing the political economy processes strengthens the assertion that governments cannot pick "winners," a claim that is advanced by public policy think tanks across the political spectrum, including the Brookings Institution, the Cato Institute, and the Hoover Institution (Devarajan 2016, Lincicome 2021, Henderson 2023).

The critique of industrial policy extends beyond its practical implementation to its theoretical foundations. Even the classic justifications for industrial policy, such as the infant industry argument, have been long challenged on theoretical grounds (Baldwin 1969). Moreover, the potential for industrial policies to distort international trade and create inefficiencies in resource allocation has been a persistent concern among free-market advocates (e.g., Bhagwati 1988; Lal 1983). In the agricultural sector, government interventions such as subsidies and price

support have been shown to create market inefficiencies and often fail to achieve their intended goals. These policies frequently benefit large agribusinesses more than small family farms and are increasingly viewed as outdated in modern agricultural markets (Gardner 1992). Similarly, in the environmental and energy sectors, industrial policies aimed at promoting sustainability and reducing pollution have been criticized for their potential inefficiencies and vulnerability to capture by special interests (Bovenberg and Goulder 2002; Helm 2010). Within the energy sector, particularly policies promoting renewable energy have faced scrutiny for potentially leading to higher costs for consumers without commensurate environmental benefits (Michaels 2008; Joskow 2011).

The historical shift away from state-directed economies provides further ammunition for critics of industrial policy (Yergin and Stanislaw 1998). They argue that the global trend towards market liberalization reflects the recognition of the limitations and potential pitfalls of extensive government intervention in the economy. Instead, critics advocate for a more limited role for government, focusing on creating a favorable business environment through stable macroeconomic policies, strong institutions, and investments in education and infrastructure, rather than attempting to direct industrial development through targeted interventions (Schultze 1983; Wolf 1979).

In short, in certain activities one could imagine that a costless government run by self-policing angels might deal with “market failures” via tax and subsidies and direct interventions to guide resources from overfunded to underfunded activities. A benignly motivated government could take the longer-term, risk-neutral perspective and ensure credible commitments conducive to large-scale industrial projects that private actors acting only through voluntary exchange and contracts would be unable to sustain. In contrast, opponents of industrial policy argue that governments and their associated politicians are neither angels nor even entirely civic-minded and would insist that interventions are never costless. Based on empirical evidence, both of these counterarguments cannot be denied (Lerner 2009).

3. A more realistic approach to the analysis of industrial policies

The debate on industrial policy often assumes government as a unitary, benevolent actor seeking optimal social outcomes. Proponents argue that such policies can correct market failures and foster growth in nascent industries (Stiglitz and Lin 2013; Mazzucato 2013). They posit that a wise government should intervene to address free market shortcomings. Conversely, opponents contend that governments lack the capacity to effectively identify and nurture infant industries. They warn of the inherent vulnerability to manipulation by rent-seeking interests, potentially diverting resources from economic growth to costly redistribution (Krueger 1974). These critics advise limiting the government to providing public goods and maintaining free market conditions. While proponents often win the initial argument, resulting in policy implementation, opponents frequently prevail in subsequent evaluations, citing unfavorable cost-benefit outcomes.

A more useful approach, in both *ex-ante* and *ex-post* analysis of industrial policies, is to recognize that governments are political systems without unitary personalities, and there are never pure public good policies benefiting all society members. All pie-expanding

government actions have distributional consequences, always with winners and losers. In the final analysis, real politics is always about balancing these winners and losers (Rausser et al. 2011). For economists to go beyond general and often unrealistic conclusions to practical advice for policymakers requires advancing toward a more realistic examination of the underlying political-economic processes.

In the context of successful pie-expanding industrial policies, implementing compensation is crucial to counter-blocking coalitions or to satisfy powerful interest groups supporting the status quo. An effective political-economic framework to overcome obstacles to improved economic well-being must identify methods to dissolve or break blocking coalitions, potentially requiring compensation to affect defections.⁵ Redistributions or compensations to break these coalitions may yield net social benefits compared to failing to implement pie-expanding policies.⁶ Accordingly, it is important explicitly to model the simultaneous use of two types of policies (following Rausser 1982, 1992): those which expand the economic pie (PERTs – political-economic resource transaction policies) and those which are redistributive in nature (PESTs – political-economic seeking transfer policies) PERTs use resources to reduce transactions costs (capture Marshallian externalities or correct various coordination failures), or to resolve the consequences of poorly assigned property rights, or to invest in public goods. PESTs move resources between interest groups, e.g. via subsidies, new employment opportunities, taxes or protectionist policies. Note that the concept of PERTs goes beyond the set of textbook public goods to comprise any type of policy that increases the total size of the economic pie starting from an initial state conditioned on all previous government actions and institutions. PERTs are policies that can be structured to reduce or resolve coordination failures, including distortions and obstructions already in place due to existing institutions and government actions in the past.

The PERT/PEST portfolio approach should be thought of in terms of remedying the practical, normative shortcomings of an array of political-economic models available in the literature. This is because the portfolio of simultaneously implemented policies recognizes that there are more degrees of freedom available in real policymaking processes. In terms of positive, descriptive economics, practical political decision-makers do act with a greater degree of flexibility in combining policies, which, in terms of normative, advice-oriented economics, widens the possible range of possible future action and gives analysts some framework for making social-welfare-improving recommendations. From the perspective of working within the political system as it is, the standard literature is overly focused on distortionary PESTs alone and on the game-theoretic mechanics of characterizing a political-economic equilibrium that produces inefficient government interventions (Rausser et al. 2011). By contrast, a better model would admit that there are various margins along which politicians make improvements that result in overall gains to society. Politicians, acting as political entrepreneurs, are already employing combinations of PERTs and PESTs to some degree, which should come as no surprise.

⁵ It is a more challenging problem, of course, to correct a maldistribution of deeper political power or a misalignment of influential groups' interests with the public interest, but the principal of pie-expansion with some level of compensation remains the same.

⁶ And in some circumstances, even if unintentionally, seemingly inefficient subsidies are useful for targeting members of a blocking coalition so that they gain a net benefit from the introduction of public goods that would otherwise be harmful to their self-interest (e.g., Foster and Rausser 1994; de Gorter, Neilson and Rausser 1992).

To develop the intuition underlying the portfolio approach to the simultaneous determination of PESTs and PERTs in the modeling of the political-economic process, we make use of the welfare transformation framework (see, e.g., Rausser et al. 2011). Our purpose in presenting the basic model is to demonstrate in a simplified setting the critical conceptual role of political complementarities as well as the notion of the simultaneous introduction of a portfolio of pie-expanding and compensatory-redistributive policies. The welfare transformation framework specifies the constraints faced by governments and other players in the political game that lead to limits on interest group welfare and to the trade-offs between welfare levels of different groups. In fact, much of the economics literature on policy formation can be interpreted in terms of how policy choices eventually come to balance the potential welfare levels of different groups as they are constrained by a transformation frontier (Rausser et al. 2011). We focus on the trade-off between the welfare levels of two groups to streamline the intuition: a single organized interest group, represented by the letter A , and the rest of society, R , which could be organized or not (in the sense that its members are coordinated and act collectively to expend effort and other resources to influence policy). The welfare of each group, without accounting for the expenditure of efforts in influence and measured in some comparable metric, say dollars, depends on a policy choice, p . We represent the gross welfare level of the two groups by $u_A(p)$ and $u_R(p)$.⁷ Net welfare is found by subtracting some measure of the cost of effort or “contribution” to actors in the political process, which could be null for some interest groups.

The welfare transformation frontier is a graphical representation of the maximum possible welfare (not yet accounting for cost of lobbying efforts) that can be attained by one group given a certain welfare value of the other group. Figure 1 shows the frontier in terms of the maximum value of group R 's welfare that can be had given group A 's welfare. Pairs of values for the two groups that fall strictly within the frontier are feasible although not “efficient” in Pareto's sense that it is possible to improve the welfare of one group without reducing the welfare of the other. There is a trade-off along the frontier between these welfare measures as the policy variable, p , is changed from levels more favorable to group A to those more favorable to everyone else. Given scarcity and the declining marginal productivity of resources, along with the declining marginal utility of income, the welfare transformation curve is concave, implying that to increase the welfare of group A by an additional unit requires an ever-greater sacrifice of the welfare of group R . The curvature of the transformation frontier reflects the efficiency with which a policy could transfer welfare from one group to another. The sharper the curvature, the less efficient is any potential set of transfer mechanisms.

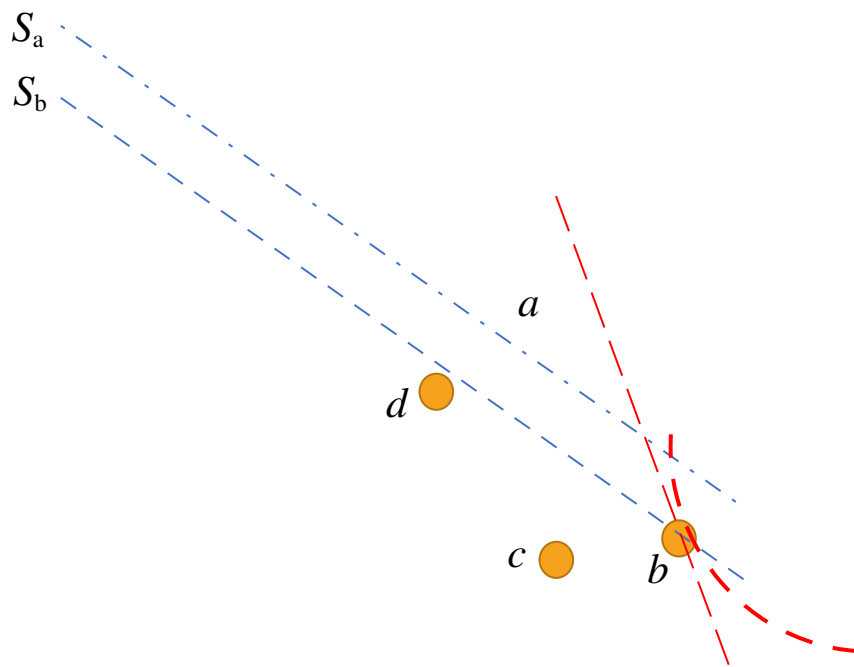
Suppose the policy that maximizes the sum of the two welfare levels is p_a in Figure 1, which one might think of as the socially-optimal policy given initial conditions and without lobbying or influence peddling. In an ideal world where no one seeks political advantage, no effort would be expended by any interest group, which would produce no government intervention beyond that perhaps of the unanimously accepted minimalist state, with no

⁷ The welfare of the “rest of society” can be thought of as some aggregate measure of the welfare of all other interest groups, organized or not.

redistributive policies.⁸ The maximum social welfare is where, at the margin, the trade-off between the welfare of the two groups is one-to-one for small changes in the policy p . This social optimum is represented as point a in Figure 1, where the line tangent to the transformation frontier is minus one (-1) and its intersection with the vertical axis measures the sum of the groups' welfare levels. Call this optimal social welfare level S_a . The level S_a on the vertical axis would be the welfare of group R if it were possible to first attain the combination of welfare levels at point a and then *costlessly* transfer all group A 's welfare to group R . If the government's policy positions the pair of welfare values at some other point to the right of a , say b , the slope of the transformation frontier is steeper and represents a greater weight placed on group A relative to group R . As the government deviates from the social optimum pair at a by increasing the welfare of one group or the other, total social welfare declines as can be seen by passing a 45° degree line (of slope -1) through the point b and noting that its intersection with the vertical axis, S_b , falls below the optimal level S_a .

⁸ The classic, go-to textbook example of such a policy p_a is a set of prices that consumers and producers would face in free trade, where the price of tradable goods is determined by world prices.

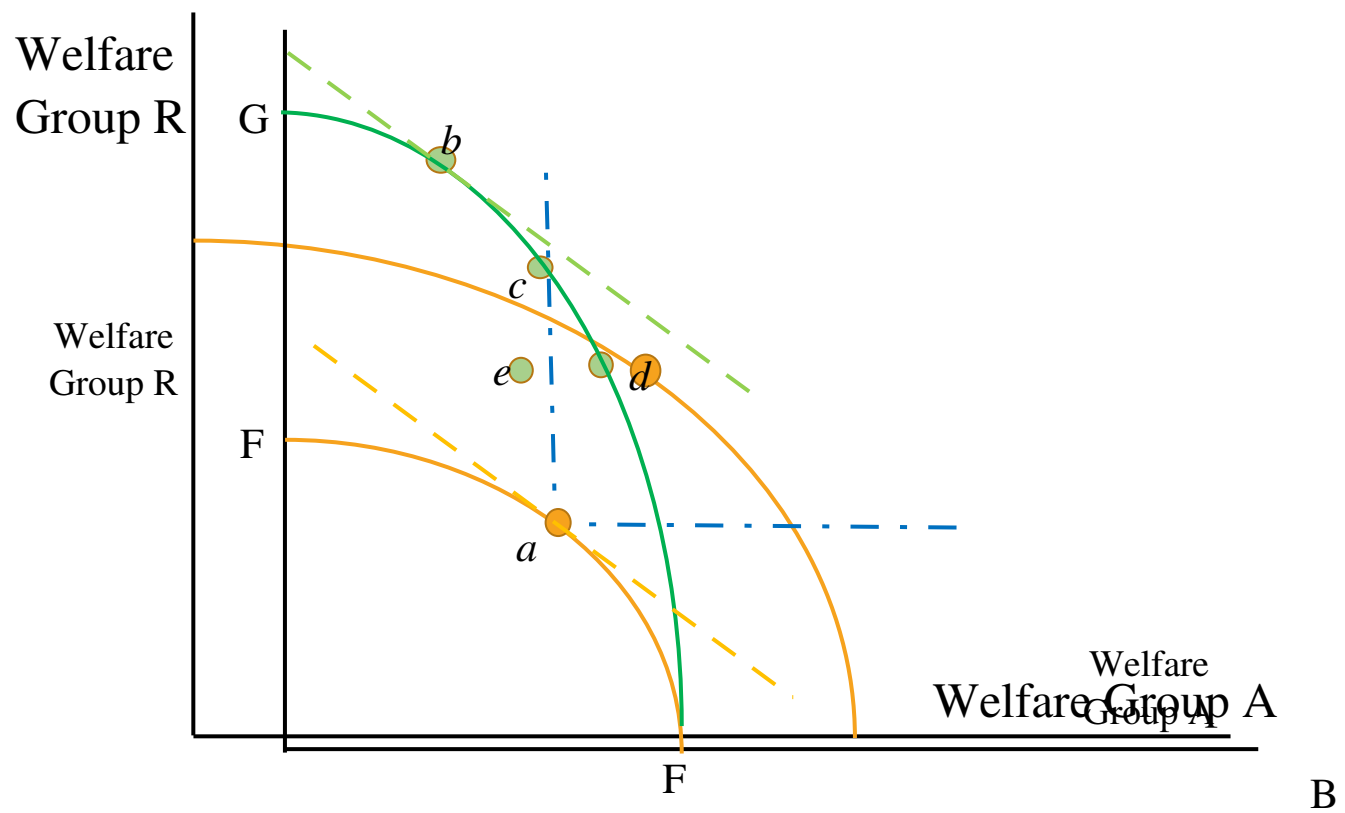
Figure 1. The welfare transformation frontier and political economic equilibrium



The result of a real-world political-economic process is some pair of (gross) welfare levels falling along the transformation frontier. Suppose that after playing the influence game, which establishes the preferences of the government, one observes a policy that results in a welfare pair at point b on the transformation frontier in Figure 1. The dashed red curve represents a policy indifference curve of the government, tracing pairs of group welfare that would leave the government indifferent in terms of its own collective welfare or political support. Where along the frontier this indifference curve is positioned, and its curvature, is the graphical representation of the "governance structure" (Rausser et al. 2011). The point b is where the marginal rate of welfare transformation along the utility possibility frontier equals the marginal rate of substitution between group welfare in the government preference ordering. But to arrive at b , at least winning group A had to expend resources to pull government actors to that point. Losing group R would likely also have expended resources to influence the government from deviating further from optimal point a . The pair of net welfare values received by both groups would fall within the transformation frontier, say point c , due to these resource expenditures. The slope of the transformation frontier at b represents the effective weight in the governance function placed on group A relative to R.

We can use the welfare transformation frontier to illustrate the importance of a portfolio of pie-expanding policies (PERTs) and redistributive policies (PESTs). Figure 2 shows two welfare frontiers: the maximum value of group R's welfare given group A's welfare. Curve FF shows the ex-ante transformation for a given political-economic outcome. The maximum potential welfare to group A under the initial equilibrium is at point F on the horizontal axis and the maximum potential welfare to group R is at point F on the vertical axis. To simplify, we assume the initial equilibrium delivers the largest economic pie possible; there are no redistributionist policies, and the system produces welfare combination a . Suppose a PERT policy becomes available that expands the potential welfare transformation curve to GF. For example, the government can invest in research that leads to productivity gains and lower consumer costs or reduces trade transaction costs. This pie-expansion is not neutral. Some industries expand more than others, and some may contract as resources move from disadvantaged to benefiting sectors. Owners of resources in disadvantaged sectors (group A) are harmed to the extent their resources are immobile. Those with resources in advantaged sectors and mobile assets (group R) are beneficiaries. The potential welfare attainable by group R can expand much more than that of group A. Under the initial conditions with the PERT, a non-redistributionist outcome produces welfare combination b , where the economic pie is largest. Group R gains absolutely and group A loses absolutely, even as the total pie has expanded.

Figure 2. Political Complementarity



In terms of the Kaldor-Hicks criterion for policy making, a pie-expanding policy should be adopted if the benefiting group could *hypothetically*, in principle, compensate the losing group (Kaldor 1939). If one could costlessly transform, one-to-one, the welfare of group R into the welfare of group A, a Pareto improvement could be had. In Figure 2, if such an ideal, costless transfer mechanism were available, all groups would agree, and the government would adopt the PERT. There are, however, costs to redistribution reflected in the curvature of the welfare transformation frontier. To be sure, a politician citing the Kaldor-Hicks criterion alone to justify a stand-alone PERT would offer little consolation to losers. Group A would seek to block the PERT without compensation that would, at a minimum, return them to their initial welfare level. The combinations of welfare levels acceptable to both groups are given by the area northeast of point *a*. For group A, point *c* represents the minimum welfare they would accept without attempting to thwart the PERT. Policy decisions arriving at point *c* would produce a combination of pie-expansion and redistribution. The PERT would deliver the new welfare transformation curve GF and the PEST would achieve a sharing of the total benefits, albeit with a welfare cost or inefficiency compared to point *b*. Note that, if these were the only practical choices, point *c* is a Pareto improvement over point *a*. The PEST redistribution would serve as a key, politically complementary policy to the PERT. Any combination of welfare levels to the northeast of point A would represent a gain for all members of society. Given the greater incentives for a small losing group to organize and the diffusion of benefits across a large winning group, the likelihood is to arrive at point *d* along the surplus transformation curve, leading to a net welfare level for group A at point *e*. Although point *e* represents a loss to group A relative to point *a*, the group would be better off than at point *b*. If group A had veto power over the PERT, their welfare level with the combination of PERT and PEST would not fall below that given by point *a*.

The graphical treatment in Figures 1 and 2 simplifies the details of policies that might be implemented to reach a political-economic equilibrium. While various politically complementary redistribution schemes can achieve an overall gain in total welfare when it is possible to implement the PERT, some PEST redistributive policies would be less inefficient and even economically complementary to the pie-expanding policy. An economically complementary PEST would use transfer instruments to induce behaviors that enhance the PERT's impact over time and inoculate against future resistance to unbalanced growth. Ideally, the smartest PEST would generate incentives for a future change in the losing group's portfolio of income-generating assets and employment opportunities. Under such circumstances, compensated group members would be able to take advantage of new economic conditions accompanying current and future PERTs, reducing their incentives to resist future economic pie expansions. The interplay between PERTs and PESTs requires PESTs to be carefully structured to support PERTs' goals, ensuring they complement redistribution efforts and encourage sustainable economic growth. Rausser and Foster (2025) provide a framework to identify three key attributes of such PESTs, dubbed "smart PESTs." First, smart PESTs should have a natural and credible phase-out or sunset as their purpose wanes as a complementary counterpart to the PERT. Smart PESTs are both politically and economically complementary to PERTs, having a potential positive dynamic effect of growing the economic pie in the future. Third, they must have lower incentives for

the formation of political organizations around the subsidy that could serve to sustain and extend their rents.

4. Illustrative Industrial policy examples of the PEST-PERT portfolio framework

In this section, we apply the political-economic model sketched out in the previous section and present several examples in the fields of agricultural, environmental, and natural resource economics, where we contend that the PEST-PERT portfolio framework has played a crucial role. For each example, we identify the PERT policy that has the potential to enlarge the economic pie. Next, we present the PEST policies that were implemented to overcome politically distributional challenges of any implemented PERTs. We also determine whether the PEST is a “smart” PEST using the three attributes briefly specified in section 3.

Payments for Environmental Services (PES) in Costa Rica

PERT: solving the coordination failure of the environmental services market

PEST: direct cash transfers to landowners

Costa Rica initiated a PEST subsidy program to jumpstart a market for ecosystem services, known locally as *Pagos por Servicios Ambientales*, in the mid-1990s, in response to the alarming rates of deforestation that threatened its rich biodiversity (FONAFIFO 2005, Castro et al. 1997). The country recognized the critical need to conserve its natural resources, not just for their inherent ecological value but also for their capacity to provide quantifiable ecosystem services and economic benefits (Daily et al., 2000). These benefits include soil retention, water quality improvement, wildlife habitat preservation, and carbon sequestration, all of which have tangible economic impacts on agricultural productivity, public health, and climate change mitigation efforts (Ribaudó et al., 2001). The subsidy program was designed to address this by compensating landowners (potential losers) for the preservation and sustainable management of their forests, thus directly targeting coordination failures within the ecosystem services market. The program focuses on four main conservation objectives: biodiversity protection, carbon sequestration, hydrological services, and scenic beauty—each contributing to the country's environmental sustainability and economic welfare.

The rationale behind the implementation of the subsidy program in Costa Rica was multifaceted, with the overarching goal of solving the coordination failures between the buyers and sellers of ecosystem services, which can be classified as a PERT policy (Pagiola 2008). First, it addressed the issue of positive externalities by ensuring that landowners, who might otherwise receive no direct financial benefit from their land's ecological services, were compensated for actions that benefit society at large, such as carbon storage or water purification (Sánchez-Azofeifa et al. 2007). Second, the program tackled information

asymmetries by providing both landowners and potential buyers with better information regarding the value of ecosystem services and the importance of their conservation (Porras et al. 2013). This transparency helped bridge the gap between the environmental costs borne by landowners and the societal benefits of ecological preservation. Last, the subsidy program significantly reduced transaction costs associated with negotiating and enforcing contracts for ecosystem services (Wunder et al. 2008). By establishing a standardized system for payments, Costa Rica streamlined the process, making it easier for landowners to participate and for services to be effectively traded.

The direct cash transfer to landowners in Costa Rica's subsidy program aligns with the defining characteristics of a smart PEST. First, the presence of a sunseting mechanism, or a credible commitment to conclude the policy after achieving its objectives, is crucial for ensuring that the PEST does not become a perpetual entitlement. In the context of Costa Rica's subsidy program, contracts with landowners typically span five years, with the possibility of renewal contingent on continued compliance with conservation goals. This finite duration embodies a form of sunseting mechanism, encouraging landowners to plan for a future where direct payments might not be available, thus promoting the sustainability of conservation efforts beyond the program's initial financial incentives.

Second, the economic complementarity of the PEST policy with the overarching PERT goals is evident in its ability to enhance the benefits of ecosystem services conservation. By providing direct financial incentives to landowners, the subsidy program not only compensates for the opportunity costs of not converting forests to agricultural or development uses but also potentially stimulates local economies. These payments can enable landowners to invest in sustainable practices or other economic activities that further the conservation objectives of the PERT, creating a virtuous cycle of environmental stewardship and economic development.

Lastly, the PEST's impact on reducing incentives for future rent-seeking by promoting asset mobility and diversification is perhaps its most forward-looking attribute. By receiving payments for ecosystem services, landowners are encouraged to diversify their income sources, invest in other sustainable ventures, or improve their land's natural capital. This diversification can reduce dependency on government transfers, diminishing the likelihood of opposition to future conservation policies (PERTs). Moreover, by fostering a culture of sustainable land management and financial independence, the subsidy program mitigates the risk of entrenched rent-seeking behaviors, making it less likely that future generations will demand similar compensations.

Conservation Reserve Program

PERT: environmental conservation

PEST: direct compensation to landowners

The Conservation Reserve Program (CRP) was established in 1985 as a response to the pressing land environmental and economic challenges of the time (Reichelderfer and Boggess 1988). Driven by concerns over environmental degradation, particularly soil

erosion and deteriorating water quality, and economic difficulties marked by overproduction and low commodity prices, the CRP was designed to enhance both environmental sustainability and economic stability in agriculture (Wu and Weber 2012). By providing financial incentives for farmers to retire environmentally sensitive land from agricultural production, the program sought to balance the need for agricultural production with the imperative of conserving natural resources.

The Conservation Reserve Program embodies a PERT policy by delivering comprehensive environmental conservation benefits, including improved air and water quality, enriched biodiversity, and increased carbon sequestration (Feather et al. 1999). Such outcomes are essential for ecological sustainability and climate change mitigation. The program's approach links individual economic decisions to broader environmental goals, enabling landowners to synchronize their land-use practices with conservation aims (Wu et al. 2001). The CRP was crucial in creating environmental corridors, which are key to allowing wildlife to move across fragmented landscapes, maintain genetic diversity, and thrive (Herkert 2009). Implementing the CRP addresses not only soil and water conservation but also acts in anticipation to support biodiversity and strengthen climate resilience, representing a comprehensive strategy for tackling ecological and agricultural challenges (Hansen 2007).

The compensation to landowners for setting aside land for environmental compensation can be considered a smart PEST. First, the CRP is designed with contract durations ranging from 10 to 15 years, which inherently includes a sunset feature. This temporal limitation ensures that the program does not become a perpetual entitlement but rather a temporary incentive for environmental stewardship. The repeated opportunity for contract renewals, however, may somewhat undermine the credibility of this sunset mechanism, potentially encouraging long-term dependency rather than fostering sustainable land management practices that outlive the program's financial incentives.

Second, the CRP's compensation to landowners serves not only a political purpose by garnering support for environmental conservation efforts but also bolsters the economic rationale behind the PERT by providing immediate financial benefits to participants. These payments help to mitigate the opportunity cost of removing land from agricultural production, making the program economically attractive to landowners. This complementarity ensures that the CRP's environmental objectives are met while also supporting the economic well-being of rural communities, thus reinforcing the program's overall goals.

Third, by offering financial compensation for conservation practices, the CRP encourages landowners to explore alternative income streams beyond traditional agriculture, such as recreational uses or carbon credits. This diversification can increase households' resilience to economic fluctuations and reduce their dependence on government subsidies, thus lowering the incentive for future rent-seeking. The success of this aspect, however, largely depends on the extent to which participants leverage CRP payments to expand their human capital mobility as well as their asset diversification.

U.S. Agricultural Policy Reform

PERT: Reduction of trade distortions

PEST: compensation for the elimination of coupled subsidies

Governments often adopt trade protectionist policies, neglecting the economic growth potential of trade liberalization and globalization. Despite successful advances in trade openness and the integration of world economies, politicians continue to respond to demands of domestic interest groups to protect them from foreign competition, proving to be a perennial obstacle to growing the world's total economic pie. Trade liberalization expands the economic pie as resources are shifted towards a country's comparative advantages, leading to higher productivity and lower consumer prices. The distributional problem arises because opening trade means competition with foreign producers and lower prices for consumers. With imperfect mobility and asset diversification, workers and asset holders in harmed industries object. These costs are concentrated in specific industries that were once protected, while the benefits are diffused over many consumers. Protectionist demands persist because, while the total pie might grow with trade openness, there is often real pain experienced by groups that cannot share in that growth.

Politically, there is a widespread perception that current globalists, multinational corporate interests, and foreign workers enjoy the bulk of the benefits of trade expansion, while domestic workers, smaller-scale firms, and some backward regions become worse off. Some politicians naturally capture intense political support by giving a strong voice to those who have suffered from trade liberalization. The economics profession emphasizes that the absolute gains from trade liberalization dominate the losses of those parties that suffer from liberalization (e.g., Fernandez and Rodrick, 1991; Irwin, 2017). By contrast, it is not well known why governments do not generally implement "smart" PESTs to upgrade the human capital skills of those displaced by trade liberalization to enhance their mobility in adjusting and taking advantage of sectors and economic activities that benefit from globalization. Various studies have emphasized the importance of compensation as an essential element of a larger mix of policy changes aimed at trade and other reforms (Just and Rausser, 1992; Just, Rausser, and Zilberman, 1995). As Foster, Gray, and Rausser (1995) highlight, resource ownership diversification and/or resource mobility decrease the possible compensation requirements of trade reforms.

After seven post-WWII GATT Negotiations rounds, the US government, in 1986, put agricultural policy on the trade negotiating table for the first time. Major OECD country governments had been unwilling or incapable, given their domestic governance structures, of supporting phased reductions of agricultural protectionist policies, including tariffs, quotas, and various coupled subsidies. The dominant weight assigned to protected producer interest groups in domestic governance structures led to the continued evolution of shortsighted, distortionary policies.⁹ The detrimental market consequences prepared

⁹ The dynamic consequences of such policies particularly in the EU and US led to huge commodity surpluses. This, in turn, led to other imprudent policies such as the export enhancement program that involved subsidizing the exports of such surpluses, dumping large volumes of commodities on less-developed countries.

countries to revisit the US-led inclusion of agriculture in the eighth GATT Negotiations round, the "Uruguay Round."

Embedding constraints to individual government policy choices via international treaty obligations, the Uruguay Round promised a material modification in domestic governance structures. The political landscape would change with the enhanced importance of potential gains from overall global liberalization to interest groups beyond the farm and food sectors. Years of negotiation resulted in a transition towards decoupled policies with compensation for the losses to producers of specific commodities (smarter PESTs), the core political-economic narrative rationalizing the entire process (Just and Rausser 1992; Gardner 1992). This shift culminated in the Federal Agriculture Improvement and Reform (FAIR) Act of 1996 (Young & Westcott 1996). The Act introduced "production flexibility contract payments" for major program crops such as wheat and corn, compensating farmers for the elimination of coupled subsidies (Orden et al. 1999). This policy change was driven by the "crisis" of large surpluses and low international commodity prices, which were directly the result of the prior coupled subsidy policies, ultimately producing a pie-expanding change in the policy environment. The FAIR Act represented a significant departure from previous agricultural policies, aiming to reduce government intervention in agricultural markets while still providing support to farmers (Tweeten & Thompson, 2002).

Mozambique and Maize

PERT: superior maize seeds & fertilizer reformulation

PEST: Smart input subsidies to adopt seeds and fertilizer

Mozambique increased maize output after the implementation of smart input subsidy programs, or smart PESTs, to incentivize widespread adoption of improved maize seeds and NPK fertilizer. The Mozambique government implemented temporary input subsidies (smart PESTs) in the form of vouchers, allowing farmers to purchase 100kg of NPK fertilizer and 12.5kg of improved maize seeds at a 73% discount. Such subsidies took place over the 2009-10 and 2010-11 crop year. In addition to the subsidy program, farmers were provided education sessions jointly taught by Jameel Poverty Action Lab (J-PAL) researchers and the Banco Oportunidade de Moçambique (BOM) regarding the benefits of using fertilizer and improved seeds, basic financial literacy and planning, utilization of savings accounts for agricultural investments and insurance (Carter et al. 2021). Similar to the experience of India's IR-8 rice (Dalrymple 1986; Evenson and Gollin 2003), the distribution effects on the producer side relies on rapid adoption of improved maize seeds and NPK fertilizer. Here again, consumers benefitted from lower prices on maize goods.

These programs of both the EU and US encouraged large commodity trading firms (e.g., Cargill) to purchase domestic surpluses at artificially-elevated prices and to dump such surpluses at artificially-deflated prices (both the EU and US were insensitive to the prices at which the surpluses were sold). The difference in prices was captured as a subsidy by the intermediary trading firms. The resulting create-and-dump surplus gain led to a prisoner's dilemma between the US and the EU (Rausser 1987). The steadily declining prices for food-related exports led to embarrassingly large costs to the EU and US and serious diplomatic complaints from other major exporting countries, including Australia, New Zealand, Brazil and Argentina.

Farmers during the subsidized year had increased yearly maize yield of 22% on average (177 kg), with gains persisting two years after the subsidy ended (Carter et al. 2021), signaling success after phasing out the “smart PEST.” Farmers who attended educational sessions had their formal savings balances increase almost threefold. The greatest gains were due to spillover effects, in which socially connected farmers learned about the benefits of fertilizers and improved seeds; farmers subject to the positive externalities from the subsidized farmers used 78% more fertilizer and had 85% larger maize yields after subsidies ended. This satisfies the second attribute of smart PESTs, in which the political and economic complementarities developed a substantial growth in the “economic pie” that returns from the initial capital expenditures in the form of input subsidies. Thirdly, there is no evidence that interest groups actively attempted to seek political rents, satisfying the third attribute of smart PESTs.

Infrastructure Investment and Jobs Act

PERT: Lowered transaction costs and eliminated coordination failures

PEST: renewable energy subsidization.

In efforts to satisfy emission-reducing and sustainability guidelines proposed in global agreements (i.e., the Paris Agreement) and national standard targets (i.e., 2030 Greenhouse Gas Pollution Reduction), the Infrastructure Investment and Jobs Act of 2021 allocated \$1.2 trillion towards enhancing physical infrastructure in attempts to reduce transaction costs and eliminate coordination failures. Billions were also allocated for research and development (R&D) investments on renewable energy technologies. Specifically, \$10 billion was allocated to the Department of Energy to fund research for carbon sequestration, utilization, and storage technologies. An additional \$11 billion is apportioned to revamping the electrical grid system to mitigate power outages, reducing inefficiencies from grid energy losses. Billions were earmarked to fund research in key renewable energy technologies, including hydrogen, nuclear, and lithium-ion batteries.

This governmental program has embedded PESTs to potential losers in the form of subsidies for at least a subset of automobile drivers – those who switch to electric vehicles (EVs) – which, indirectly, support demand facing EV manufacturers. An earmark of \$7.5 billion in EV charging stations is expected to bolster the political and economic strength of “green” companies to scale green technologies. This PEST is not only politically complementary to the underlying PERT, but its design is economically complementarity. In addition, subsidization from this infrastructure act should cease when the allocated money is exhausted, which is a natural sunset provision that satisfies the first attribute of smart PESTs. Nevertheless, the question remains whether a credible commitment has been made to halt subsidies after the initial appropriation. To be sure, there will be incentives for lobbyists and campaigns by automobile companies to prolong such subsidies to underwrite the expansion of charging stations.

Transcontinental rail investments

PERT: Lowering logistical & transaction costs & coordination failures.

PEST: Land grants subsidized by land ownership.

During the greatest political schism in American history, political power factions in northern and southern states were deadlocked over economic development in western territories, especially the expansion of slavery. Southern interests wanted Western expansion amenable to their slave-based agricultural economies, while Northern economic interests and abolitionist sentiments opposed such an implementation. Despite the conflict, westward expansion was inevitable. For economic and geo-strategic reasons, all mid-19th-century political parties saw advantages in an efficient long-distance transportation system for goods and people (Fishlow 1965). While private investments for smaller-scale projects had been forthcoming in some eastern areas, no private railroad companies would make the massive investments for a transcontinental system. The federal government stepped in to eliminate this coordination problem.¹⁰

Initially, the federal government used government bonds and large-scale land grants under the Pacific Railroad Acts of 1862 to encourage the expansion of a transcontinental railroad system (Mercer 1982). The obvious PERT was the transcontinental rail network, which greatly expanded the U.S. economic pie by reducing transportation costs and time, integrating interstate markets, and by facilitating rapid settlement and development of western territories, subsequently expanding the nation's effective agricultural and mineral resource base (Donaldson and Hornbeck 2016). The railroad system reduced coordination obstacles for private actors interested in building railroads and increased incentives to take on the risks of a continental project while assuring political support from a broad base of interest groups.

Two PEST policies were implemented to foster railroad expansion: first, for every mile of rail tracks, railway companies (the Union Pacific and the Central Pacific) were granted the equivalent of 6,400 acres of land in an alternating checkerboard fashion alongside the tract construction (Walton and Rockoff 2005). Over ten years, the railways accumulated federal land grants of over 175 million acres.¹¹ Another PEST was that rail lines were to use American steel, assisting other economic interests but adding

¹⁰ Although constructed and managed by the Central Pacific and Union Pacific companies, the federal government was the catalyst for the Pacific Railroad connecting Council Bluffs, Iowa, with Alameda, California. The U.S. government resolved problems of a contiguous right-of-way, reducing investor risk through federal funding support and land grants and managing the support of other industrial interests (Fogel 1964). Despite doubts regarding the ultimate morality, goals, benefits, and costs of details of the project, the portfolio of policies was successful on its own terms. The first transcontinental railroad was completed in 1869, allowing travel time of under a week between New York and San Francisco. Over the following three decades, various other transcontinental railroads were built through northern and southern routes. Costs of transport fell, and the United States enjoyed many decades of continuous growth in population and economic activity (Grant 2012).

¹¹ As with the case of land granted by the federal government in the establishment of land-grant universities throughout the country, there is increasing concern regarding the economic losses to Native Americans, who had little or no political power.

to the costs and supply logistics of railroad construction, specified in Section 3 of the Act (especially for the western-originating Central Pacific).

The federal government fostered rapid development of the West, railroad companies were well-compensated with little measurable direct costs to taxpayers, and over decades the country benefitted from reduced transportation costs and economic complementarities evidenced by the positive externalities generated by millions of smaller-scaled private investments, thus satisfying the second attribute of smart PESTs. The conclusion of land grants after the completion of western railroads led to the sunseting aspect of the PEST.

Concluding Remarks

Looking forward to other possible simultaneous implementations of PERTs and PESTs to address future coordination failures, why not consider the existential risk of climate change? Economists and other analysts have long emphasized that the "best" PERT response to the risks posed by climate change is carbon taxes on fossil fuels to internalize the true marginal social costs of carbon emissions, which would have the intended outcomes of reducing carbon output, generating public revenue, and incentivizing green technological innovations. Such taxes, however, have significant distributional implications, with some groups adapting easily while others facing much higher costs. This leads to political resistance from various stakeholders, including unorganized consumers, the organized fossil fuel industry, energy-intensive firms, as well as developing countries reliant on traditional energy sources for economic growth. One bold PERT strategy could involve establishing an international agency for investments in climate change mitigation research and development, with a potential financing structure that acknowledges the disparity between developing and developed countries in burden-sharing capabilities (Rausser 2022).

From the perspective advanced here, to facilitate the political acceptance of any effective policy, a compensating PEST should be evaluated. One possibility is to allocate proceeds from a carbon tax to partially cover the impact on interest groups who suffer losses from the tax. A still more sophisticated PEST policy would utilize carbon tax revenues to fund the development of CCUS (carbon capture, utilization, and sequestration) technologies while strategically compensating major sectors that are economically harmed. This PEST policy incorporates a natural sunseting mechanism, and as such technologies become viable, the need for subsidized research naturally diminishes. It also demonstrates economic complementarity with PERT goals by stimulating innovation, creating new opportunities for affected industries, and fostering a virtuous cycle of environmental stewardship and economic growth. To be sure, further research is required on reducing incentives for future rent-seeking as well as refining implementation strategies.

Reference List

Alston, J.M., Anderson, M.A., James, J.S. and Pardey, P.G. (2011) 'The Economic Returns to U.S. Public Agricultural Research', *American Journal of Agricultural Economics*, 93(5), pp. 1257-1277.

Altenburg, T. and Assmann, C. (eds.) (2017) *Green Industrial Policy: Concept, Policies, Country Experiences*. UN Environment; German Development Institute.

Amsden, A.H. (2001) *The Rise of "The Rest": Challenges to the West from Late-Industrializing Economies*. Oxford University Press.

Anderson, K., Rausser, G. and Swinnen, J. (2013) 'Political Economy of Public Policies: Insights from Distortions to Agricultural and Food Markets', *Journal of Economic Literature*, 51(2), pp. 423-477.

Baldwin, R.E. (1969) 'The Case against Infant-Industry Tariff Protection', *Journal of Political Economy*, 77(3), pp. 295-305.

Barbier, E.B. (2010) *A Global Green New Deal: Rethinking the Economic Recovery*. Cambridge University Press.

Bhagwati, J.N. (1988) *Protectionism*. MIT Press.

Bovenberg, A.L. and Goulder, L.H. (2002) 'Environmental Taxation and Regulation', *Handbook of Public Economics*, 3, pp. 1471-1545.

Brown, D.L. and Schafft, K.A. (2011) *Rural People and Communities in the 21st Century: Resilience and Transformation*. Polity Press.

Bryden, J. and Warner, M.E. (2012) 'Policy Affecting Rural People, Economies and Communities', in *Rural Transformations and Rural Policies in the US and UK*. Routledge, pp. 179-195.

Carter, M., Laajaj, R. and Yang, D. (2021) 'Subsidies and the African Green Revolution: Direct Effects and Social Network Spillovers of Randomized Input Subsidies in Mozambique', *American Economic Journal: Applied Economics*, 13(2), pp. 206-229.

Case, A. and Deaton, A. (2020) *Deaths of Despair and the Future of Capitalism*. Princeton University Press.

Castro, R. and Tattenbach, F., with Olson, N. and Gamez, L. (1997) *The Costa Rican experience with market instruments to mitigate climate change and conserve biodiversity*. Paper presented at the Global Conference on Knowledge for Development in the Information Age, Toronto, Canada, 24 June 1997.

Chang, H.J. (2010) 'Industrial Policy: Can We Go Beyond an Unproductive Confrontation?' Annual World Bank Conference on Development Economics.

Chetty, R., Hendren, N., Kline, P. and Saez, E., 2014. Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States. *The Quarterly Journal of Economics*, 129(4), pp.1553-1623.

Choi, J. and Levchenko, A.A., 2021. The Long-Term Effects of Industrial Policy. CEPR Discussion Paper No. DP16534. Available at SSRN: <https://ssrn.com/abstract=3928845>

Cohen, L. and Noll, R.G., 1991. *The Technology Pork Barrel*. Washington, D.C.: Brookings Institution.

Daily, G.C., Söderqvist, T., Aniyar, S., Arrow, K., Dasgupta, P., Ehrlich, P.R., ... and Walker, B., 2000. The value of nature and the nature of value. *Science*, 289(5478), pp.395-396.

Dalrymple, D.G., 1986. Development and spread of high-yielding rice varieties in developing countries. Washington, D.C.: Bureau for Science and Technology, Agency for International Development.

de Gorter, H., Nielson, D.J. and Rausser, G.C., 1992. Productive and Predatory Public Policies: Research Expenditures and Producer Subsidies in Agriculture. *American Journal of Agricultural Economics*, 74(1), pp.27-37.

Devarajan, S., 2016. Three Reasons for Universal Basic Income. Future Development blog, Brookings Institution.

Donaldson, D. and Hornbeck, R., 2016. Railroads and American Economic Growth: A "Market Access" Approach. *The Quarterly Journal of Economics*, 131(2), pp.799-858.

Easterly, W., 2001. *The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics*. Cambridge: MIT Press.

Evenett, S.J. et al., 2024. The return of industrial policy: A global survey and implications for the multilateral trading system. IMF Working Paper.

Evenson, R.E. and Gollin, D., 2003. Assessing the impact of the Green Revolution, 1960 to 2000. *Science*, 300(5620), pp.758-762.

Feather, P., Hellerstein, D. and Hansen, L., 1999. Economic valuation of environmental benefits and the targeting of conservation programs: The case of the CRP. *Agricultural Economics Reports 34027*, United States Department of Agriculture, Economic Research Service.

Fernandez, R. and Rodrik, D., 1991. Resistance to Reform: Status Quo Bias in the Presence of Individual-Specific Uncertainty. *American Economic Review*, 81(5), pp.1146-1155.

Fishlow, A., 1965. *American Railroads and the Transformation of the Ante-bellum Economy*. Cambridge: Harvard University Press.

Fogel, R.W., 1964. *Railroads and American Economic Growth: Essays in Econometric History*. Baltimore: Johns Hopkins Press.

Fondo Nacional de Financiamiento Forestal (FONAFIFO), 2005. *FONAFIFO: Más de una década de acción*. San José: FONAFIFO. (in Spanish)

Foster, W.E. and Rausser, G.C., 1994. Price-Distorting Compensation Serving the Consumer and Taxpayer Interest. *Public Choice*, 80(1-2), pp.173-189.

Foster, W.E., Gray, R. and Rausser, G.C., 1995. Mobility, Diversification, and Sustainability of Trade Reform. In: G.C. Rausser, ed. *GATT Negotiations and the Political Economy of Policy Reform*. Berlin: Springer, pp.145-173.

Freshwater, D., 2000. The "New" Open Economy: What Has Changed for Rural Areas? In: *European Rural Policy at the Crossroads Conference*. Aberdeen, Scotland.

Fuglie, K.O. and Heisey, P.W., 2007. Economic Returns to Public Agricultural Research. *Economic Brief Number 10*. Washington, D.C.: U.S. Department of Agriculture, Economic Research Service.

Gardner, B.L., 1992. Changing Economic Perspectives on the Farm Problem. *Journal of Economic Literature*, 30(1), pp.62-101.

Greenstone, M., Hornbeck, R. and Moretti, E., 2010. Identifying Agglomeration Spillovers: Evidence from Winners and Losers of Large Plant Openings. *Journal of Political Economy*, 118(3), pp.536-598.

Hansen, L., 2007. Conservation Reserve Program: Environmental benefits update. *Agricultural and Resource Economics Review*, 36(2), pp.267-280.

Harrison, A. and Rodríguez-Clare, A., 2009. Trade, Foreign Investment, and Industrial Policy for Developing Countries. In: *Handbook of Development Economics*. Vol. 5. Amsterdam: Elsevier, pp.4039-4214.

Hausmann, R., Pritchett, L. and Rodrik, D., 2005. Growth Accelerations. *Journal of Economic Growth*, 10(4), pp.303-329.

Hausmann, R. and Rodrik, D., 2003. Economic Development as Self-Discovery. *Journal of Development Economics*, 72(2), pp.603-633.

Hausmann, R., Rodrik, D. and Velasco, A., 2008. Growth Diagnostics. In: The Washington Consensus Reconsidered: Towards a New Global Governance. Oxford: Oxford University Press.

Helm, D., 2010. Government Failure, Rent-Seeking, and Capture: The Design of Climate Change Policy. *Oxford Review of Economic Policy*, 26(2), pp.182-196.

Henderson, D. R. (2023) 'Industrial Policy: Harms and Alternatives', *Defining Ideas*, Hoover Institution.

Herkert, J. R. (2009) 'Response of bird populations to farmland set-aside programs', *Conservation Biology*, 23(4), pp. 1036-1040.

Huffman, W. E. and Evenson, R. E. (2006) *Science for Agriculture: A Long-Term Perspective*. Blackwell Publishing.

Hume, D. (1739-1740) *A Treatise of Human Nature*. London: John Noon.

Humphreys, M., Sachs, J. D. and Stiglitz, J. E. (eds.) (2007) *Escaping the Resource Curse*. Columbia University Press.

Ilyina, A., Pazarbasioglu, C. and Ruta, M. (2024) 'Industrial Policy is Back But the Bar to Get It Right Is High', *International Monetary Fund*. Available at: IMF Website (Accessed: date).

Irwin, D.A. (2017) *Clashing over Commerce: A History of US Trade Policy*. Chicago: University of Chicago Press.

Jaffe, A. B., Newell, R. G. and Stavins, R. N. (2005) 'A Tale of Two Market Failures: Technology and Environmental Policy', *Ecological Economics*, 54(2-3), pp. 164-174.

Joskow, P. L. (2011) 'Comparing the Costs of Intermittent and Dispatchable Electricity Generating Technologies', *The American Economic Review*, 101(3), pp. 238-241.

Just, R.E. and Raussler, G.C. (1992) 'Environmental and Agricultural Policy Linkages and Reforms in the United States Under the GATT', *American Journal of Agricultural Economics*, 74(3), pp. 766-774.

Just, R., Raussler, G.C. and Zilberman, D. (1995) 'Compensation and Political Feasibility: Facilitating Welfare Improving Policies', in G. C. Raussler (ed.) *GATT Negotiations and the Political Economy of Policy Reform*. New York: Springer.

Kaldor, N. (1939) 'Welfare Propositions of Economics and Interpersonal Comparisons of Utility', *Economic Journal*, 49(195), pp. 549-552. DOI: 10.2307/2224835.

- Kaplinsky, R. (2011) *Commodities for Industrial Development: Making Linkages Work*. United Nations Industrial Development Organization.
- Kilkenny, M. (2010) 'Urban/Regional Economics and Rural Development', *Journal of Regional Science*, 50(1), pp. 449-470.
- Kline, P. and Moretti, E. (2014) 'People, Places, and Public Policy: Some Simple Welfare Economics of Local Economic Development Programs', *Annual Review of Economics*, 6(1), pp. 629-662.
- Krueger, A.O., 1974. The political economy of the rent-seeking society. *The American Economic Review*, 64(3), pp.291-303.
- Krueger, A.O., 1990. Government Failures in Development. *Journal of Economic Perspectives*, 4(3), pp.9-23.
- Krugman, P., 1991. Increasing Returns and Economic Geography. *Journal of Political Economy*, 99(3), pp.483-499.
- Lal, D., 1983. *The Poverty of 'Development Economics'*. London: Institute of Economic Affairs.
- Lerner, J., 2009. *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed--and What to Do About It*. Princeton: Princeton University Press.
- Lincicome, S., 2021. *Manufactured Crisis: "Deindustrialization," Free Markets, and National Security*. Cato Institute Policy Analysis No. 907. Washington, D.C.: Cato Institute.
- Mazzucato, M., 2013. *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*. New York: Public Affairs.
- Mercer, L.J., 1982. *Railroads and Land Grant Policy: A Study in Government Intervention*. New York: Academic Press.
- Michaels, R.J., 2008. Electricity Market Reform: An International Perspective. *Regulation*, 31, pp.40-47.
- Noland, M. and Pack, H., 2003. *Industrial Policy in an Era of Globalization: Lessons from Asia*. Washington, D.C.: Peterson Institute for International Economics.
- Orden, D., Paarlberg, R. and Roe, T., 1999. *Policy reform in American agriculture: Analysis and prognosis*. Chicago: University of Chicago Press.

- Pagiola, S., 2008. Payments for environmental services in Costa Rica. *Ecological Economics*, 65(4), pp.712-724.
- Porras, I., Barton, D.N., Miranda, M. and Chacón-Cascante, A., 2013. Learning from 20 years of payments for ecosystem services in Costa Rica. London: International Institute for Environment and Development.
- Rausser, G.C., 1982. Political economic markets: PESTs and PERTs in food and agriculture. *American Journal of Agricultural Economics*, 64(5), pp.821-833.
- Rausser, G., 1987. Towards Agricultural Policy Reform. In: *Economic Report of the President*. Washington D.C.: U.S. Council of Economic Advisers, pp.147-78.
- Rausser, G., 1992. Predatory versus productive government: The case of U.S. agricultural policies. *Journal of Economic Perspectives*, 6(3), pp.133-157.
- Rausser, G. (2022) 'Review of The Spirit of Green: The Economics of Collisions and Contagions in a Crowded World', *Journal of Economic Literature*.
- Rausser, G. and Foster, W. (2025) *The Curation of Smart Governments*. Forthcoming.
- Rausser, G.C., Swinnen, J. and Zusman, P. (2011) *Political power and economic policy: Theory, analysis, and empirical applications*. Cambridge: Cambridge University Press.
- Rausser, G.C. and Foster, W.E. (1990) 'Political Preference Functions and Public Policy Reform', *American Journal of Agricultural Economics*, 72(3), pp. 641-652.
- Reichelderfer, K. and Boggess, W. (1988) 'Government Decision Making and Program Performance: The Case of the Conservation Reserve Program', *American Journal of Agricultural Economics*, 70(1), pp. 1-11.
- Ribaudo, M.O., Hoag, D.L., Smith, M.E. and Heimlich, R. (2001) 'Environmental indices and the politics of the Conservation Reserve Program', *Ecological Indicators*, 1(1), pp. 11-20.
- Rijkers, B., Freund, C. and Nucifora, A. (2016) 'All in the family: State capture in Tunisia', *Journal of Development Economics*, 124, pp. 41-59.
- Rodrik, D. (2004) *Industrial Policy for the Twenty-First Century*. CEPR Discussion Paper No. 4767.
- Rodrik, D. (2008) *Normalizing Industrial Policy*. Commission on Growth and Development Working Paper No. 3. Washington, DC: World Bank. Available at: <https://openknowledge.worldbank.org/handle/10986/28009> (Accessed: date). License: CC BY 3.0 IGO.

Rodrik, D. (2014) 'Green Industrial Policy', *Oxford Review of Economic Policy*, 30(3), pp. 469-491.

Sánchez-Azofeifa, G.A., Pfaff, A., Robalino, J.A. and Boomhower, J.P. (2007) 'Costa Rica's payment for environmental services program: intention, implementation, and impact', *Conservation Biology*, 21(5), pp. 1165-1173.

Schultze, C.L. (1983) 'Industrial Policy: A Dissent', *The Brookings Review*, 2(1), pp. 3-12.

Sobel, R. and Graefe-Anderson, R. (2014) 'The Relationship between Political Connections and the Financial Performance of Industries & Firms', *Mercatus Working Paper*. Available at: <http://dx.doi.org/10.2139/ssrn.3211630> (Accessed: date).

Stigler, G. (1971) 'The theory of economic regulation', *Bell Journal of Economic and Management Science*, 2, pp. 3-21.

Stiglitz, J.E. and Lin, J.Y. (eds.) (2013) *The industrial policy revolution I: The role of government beyond ideology*. New York: Palgrave Macmillan.

Tweeten, L. and Thompson, S.R., 2002. *Agricultural policy for the 21st century*. Ames: Iowa State Press.

Wade, R.H., 2012. Return of Industrial Policy? *International Review of Applied Economics*, 26(2), pp.223-239.

Walton, G.M. and Rockoff, H., 2005. *History of the American Economy*. 10th ed. Mason: South-Western.

Wang, S.L., Heisey, P., Schimmelpfennig, D. and Ball, E., 2015. *Agricultural Productivity Growth in the United States: Measurement, Trends, and Drivers*. Economic Research Report Number 189. Washington, D.C.: U.S. Department of Agriculture, Economic Research Service.

Warwick, K., 2013. *Beyond Industrial Policy: Emerging Issues and New Trends*. OECD Science, Technology and Industry Policy Papers, No. 2. Paris: OECD Publishing.

Williams, G.W. and Capps Jr, O., 2006. Overview: Commodity Checkoff Programs. *Choices*, 21(2), pp.53-54.

Wolf Jr, C., 1979. A Theory of Nonmarket Failure: Framework for Implementation Analysis. *The Journal of Law and Economics*, 22(1), pp.107-139.

Wu, J. and Weber, B., 2012. Implications of a reduced Conservation Reserve Program. *The Conservation Crossroads in Agriculture*, pp.1-64.

Wu, J., Zilberman, D. and Babcock, B.A., 2001. Environmental and distributional impacts of conservation targeting strategies. *Journal of Environmental Economics and Management*, 41(3), pp.333-350.

Wunder, S., Engel, S. and Pagiola, S., 2008. Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries. *Ecological Economics*, 65(4), pp.834-852.

Yergin, D. and Stanislaw, J., 1998. *The Commanding Heights: The Battle Between Government and the Marketplace That Is Remaking the Modern World*. New York: Simon & Schuster.

Young, C.E. and Westcott, P.C., 1996. *The 1996 US Farm Act increases market orientation*. Washington, D.C.: USDA Economic Research Service.