

Transition policy for climate change mitigation: Who, what, why and how

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Abstract

The decarbonisation of the global economy, though likely to enhance aggregate well-being, will create many losers. The main categories of potential losers are owners of carbon-intensive business assets, workers in such businesses, communities in which such businesses account for a disproportionately large share of economic activity, and owners of carbon-intensive household assets. As decarbonisation processes accelerate, losers will increasingly press for transitional assistance, such as compensation payments and subsidies to facilitate their adjustment to carbon-constrained circumstances. Where decarbonisation depends on new policies and laws, the actions of putative losers will also affect the enactment and implementation of such reforms, potentially leading to stalled transitions or policy reversals.

In the face of this increasing demand for “transition policy”, policymakers require expert guidance on how to develop coherent and desirable transition policy packages. Yet there is a dearth of policy-focused academic literature on this topic. This paper aims to provide a foundation for filling this gap. It first provides a definition of transition policy, identifying its key parameters. It then explores possible values of these parameters, resulting in an original map of the “logical space” of transition policy: the possible combinations of policy objectives, policy scope, and target actors that transition policy could encompass. To move from the possible to the desirable, the paper finally suggests three criteria for normatively evaluating transition policies: fairness; political transformation potential; and expected effectiveness. An appendix to the paper provides a literature overview of relevant works from multiple disciplines.

Keywords:

Low-carbon transition; just transition; structural change; climate policy; losers; stranded assets; climate politics

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1 INTRODUCTION

The decarbonisation of the world economy is one of the most urgent and difficult challenges facing humanity this century. The transition to a zero carbon world will bring immense benefits, quite apart from the mitigation of climate change (GCEC 2014; Green 2015; Stern 2015b). As the World Bank has put it, “[t]here is no reason to think that a zero-carbon economy would be any less prosperous in the long run than a high-carbon one (if anything, it is likely to be more prosperous)” (Fay et al. 2015, 154). But it will also cause profound disruption, dislocation and loss to many, at least in the short term.

As a result of new climate-related government policies, new technologies, and associated economic changes, a variety of groups will experience numerous kinds of losses. The *owners of carbon-intensive business assets*—in sectors such as fossil fuel production, electricity production, energy-intensive manufacturing, transportation, agriculture and forestry—will find themselves facing higher production costs and/or greater competition from lower-carbon substitutes; in some cases their assets will be “stranded”, forcing costly write-downs and even bankruptcies (a fate already being experienced by many US coal companies). For example, one study estimates that a carbon price consistent with the 2°C target could cause US\$165 billion of stranded assets in coal-fired power generation alone between 2011 and 2050 (Johnson et al. 2015). *Workers* in such carbon-intensive sectors—numbering in the millions worldwide—will also be affected, and many adversely so, in multiple ways. Where these industries and jobs represent a significant share of local economic activity, there are also likely to be regionally-concentrated flow-on losses of multiple kinds in local *communities*. Billions of *households*, too, are entangled in the carbon economy, for example through ownership of energy-intensive assets like combustion-engine passenger vehicles or poorly insulated homes, rendering them vulnerable to transitional cost increases associated with climate change mitigation.

The variety and scale of potential transitional losses associated with the mitigation of climate change raises urgent policy challenges of both a normative and empirical kind that are only beginning to be explored by policymakers, civil society groups and researchers. Policymakers will find themselves increasingly having to grapple with a range of claims for transitional assistance both as they attempt to introduce climate policies and as incumbent industries and systems are destabilised by the kinds of changes just mentioned. Such changes are already happening, despite the relatively weak stringency of climate policies around the globe. Since much more numerous, more stringent and longer-term climate policies are needed to have a good chance of achieving global climate change objectives, the aggregate demand for transitional assistance will be even higher in a world that *does* mitigate climate change effectively. Governments will therefore increasingly need to develop systematic, principled policy approaches to address transitional losses—they will need *transition policy* (a more precise definition of transition policy is provided in Part 2).

Viewed—perhaps more realistically—from the opposite direction, one might hypothesise that, *absent* good transition policies to accompany proposed climate policies, the politics of climate mitigation will continue to overwhelm many governments in many countries. That is, good transition policy might be a *necessary condition* for sufficiently deep climate change mitigation, rather than as an ideally desirable afterthought to mitigation efforts that we assume will happen one way or another. We can at least be sure of this: transition policy and sufficiently deep climate change mitigation are inextricably intertwined.

Because of the normative and political issues raised by the issue of potential losers from the low-carbon transition, civil society groups—from the international labour union movement and major multinational environmental NGOs to ad hoc local groups—are increasingly mobilising to provide policy advice and on-the-ground assistance for the purpose of transition. Much of this activity is being organised around the theme of a *Just Transition*. The Just Transition concept originated in the labour movement and initiatives under its banner tend to be focused primarily on the interests of workers, though it is understood differently by different unions/movements (Mertins-Kirkwood 2018; Rosemberg 2010; Stevis and Felli 2014). The growing attention to ‘just transition’ is reflected in the successful lobbying by such groups for a reference to the concept in the preamble to the Paris Agreement, the publication by the International Labour Organization of its ‘Guidelines’ concerning just transition (2015), and the (probably related) explosion of reports and manifestos concerning just transition in the period since 2015. Much of the work on just transition is highly practical and locally specific, and it is increasingly being adopted as an organising ideal by mainstream unions, political parties and legislatures in various countries (Green 2017a,

100; Mertins-Kirkwood 2018; Wiseman, Campbell, and Green 2017). From an academic perspective, however, the literature on just transitions is embryonic (see Appendix, sec. A(ii)). Accordingly, the present paper does not limit itself to the notion of just transition, but rather is concerned with a wider logical space of transition policy.¹

Researchers engaging with this wider field of transition policy face the challenge of integrating multidisciplinary insights from across the social sciences and humanities to facilitate good transition policy. In the Appendix to this paper, I provide an overview of the many bodies of academic literature that are relevant to transition policy. I conclude that there is no mature body of literature that systematically analyses and compares transition policies—let alone transition policies *for climate change mitigation*—as there is, for example, for climate change mitigation policies themselves (e.g. Chapter 15 of the IPCC’s Working Group III report). The envisaged literature would provide much-needed theoretical and evidentiary guidance to inform the rapidly growing demand from policymakers and civil society for transition policy advice. It would also have similarities to the literature on climate change adaptation policy and planning, since responding to the changes brought about by climate mitigation itself involves a kind of “adaptation” (Green 2017b). Accordingly, this should be an urgent priority area for academic research—as Nicholas Stern (2015a, 7), for example, has recently argued.

This article is intended as a first step toward the development of this new body of literature. Specifically, its purpose is to develop a framework to structure the design of transition policy for climate mitigation. The substantive discussion begins, in Part 2, with a proposed definition of transition policy. Part 3, entitled “the logical space of transition policy”, develops a framework that systematically specifies and classifies the key elements (or “variables”) of transition policy and their possible broad parameter values: (i) the possible target groups of transition policy (the kinds of agents typically adversely affected by climate change mitigation-related structural changes); (ii) the kinds of losses caused by climate change mitigation; and (iii) the instruments, objectives and rationales of transition policy (these are linked to develop a four-fold scheme of transition policy “ideal types”). From these elements, a typology of transition policy is developed (see Table 2), which provides a parsimonious map of the logical space of transition policy possibilities. In Part 4, three criteria for evaluating particular transition policy options are proposed and discussed: “fairness”, “political transformation potential”, and “expected effectiveness”.

The framework developed here draws principally on Schneider and Ingram’s (1997) policy design framework, in which policy designs are conceived as institutional structures consisting of identifiable elements including normative goals/objectives, target groups, tools/instruments, rules, rationales, implementing agents and structures, and causal assumptions. These elements are used to structure the paper’s analysis of transition policy possibilities, while the literature on policy evaluation criteria (e.g. Nagel 2001) is drawn on in the discussion of transition policy selection criteria.

The paper’s scope covers climate change mitigation-related² structural change at the national (and subnational) level,³ including (i) structural changes caused by both proximate climate policy interventions, such as carbon pricing or so-called “command and control” regulation, in the relevant jurisdiction and (ii) structural changes not resulting from any proximate climate (or other) policy interventions in the relevant jurisdiction, such as those resulting from changes in the availability and costs of clean technologies or the market structure and business strategies used in relevant sectors.⁴ The paper’s focus is on the role of government in response to such transitions.

¹ It is also notable that the scope of some conceptualisations of just transition extends beyond transitional losers to include those already badly off not who could potentially benefit from policy and other changes associated with decarbonisation, such as energy poor households who lack access to an energy grid (Healy and Barry 2017; Mertins-Kirkwood 2018; Newell and Mulvaney 2013). My discussion of transition policy is limited to transitional effects—particularly transitional losses—and is in this respect narrower than some conceptions of just transition, since there are already strong normative justifications for addressing such existing injustices.

² I am therefore leaving aside issues associated with climate change adaptation, ‘loss and damage’ and geoengineering.

³ By excluding international policy, I am therefore leaving aside the UNFCCC debate over “impact of response measures” and the related, more general issue of international finance and assistance for climate mitigation.

⁴ The distinction is admittedly a crude one, since policy or its absence inevitably affects technology diffusion and market structure. Economy-wide institutions pertaining to corporate governance, property (and intellectual property) rights, contracts, finance, labour markets, and research, education and training all condition the kinds of

2. TRANSITION POLICY, DEFINED

A transition policy can be defined as *a government policy concerning the procedural and substantive entitlements of a defined class of agents who have been or are expected to be made worse-off as a result of a structural change in the economy*. The two dimensions of transition policy—substantive and procedural—can further be defined, in relation to climate change,⁵ as:

- a) the nature, scope and magnitude of transitional assistance (if any) to be provided to a class or classes of agents made worse-off as a result of a climate change mitigation-related structural change in the economy (*substantive dimension*); and
- b) the nature, scope and magnitude of consultation or other participatory procedure (if any) to be engaged in by the relevant government with affected agents in respect of the content of proposed climate policies (if applicable) and/or the substantive component of transition policy (*procedural dimension*).

As noted in the introduction, the relevant structural change could result from a proximate climate policy introduced or proposed by the relevant government, or from structural changes that are not caused by a proximate policy intervention.

From the above definition, numerous policy design elements (Schneider and Ingram 1997) are identifiable: the class(es) of agents to be targeted by the transition policy; (ii) the scope of transitional assistance to be provided or procedure to be engaged in (which relates to what it means to be made “worse off” as a result of a relevant structural change); and (iii) the nature and magnitude of assistance to be provided or procedure to be engaged in (which relates to the policy’s objectives, instruments and rationale). Part 3 considers the possible broad parameter values of these elements, focusing on the substantive dimension of transition policy.⁶

3. THE LOGICAL SPACE OF TRANSITION POLICY

In this part of the paper, I attempt to map the logical space—i.e. the set of possible options—of (substantive) transition policy by identifying possible parameter values of its above-mentioned elements.

3.1 Possible beneficiaries of transition policy

The first key variable of transition policy is the class of agents targeted by the transition policy, i.e. the main “losers” from the structural change or, in other words, the main potential “beneficiaries” of the associated transition policy. Inductively from the literature on causal dynamics relevant to structural transitions (see Appendix), the main categories of agents at risk of incurring losses as a result of climate policy are:⁷

- a) Individual owners of energy-intensive or emissions-intensive household assets (*consumers/ households*);
- b) Corporate owners of energy-intensive or emissions-intensive business assets (*corporations*);
- c) Workers currently employed in energy-intensive or emissions-intensive industries (*workers*);

technologies, market structures and business strategies that emerge. And the effects of many specific climate policies—for example, support for renewable energy research, development, demonstration and deployment—will likely have their most far-reaching impacts at significant temporal and even geographic remove from the original policy (e.g. as with German feed-in tariffs for solar energy in the 1990s). Most of the losses arising from decarbonisation will likely result from some combination of policy and non-policy causes. Accordingly, whether or not policy is a “proximate” cause of transitional losses will be a matter of judgement in context, case-by-case. Nonetheless, the distinction is analytically useful. For example, as I discuss in Part 4.2, the direct or close proximity of climate policy to the causation of transitional losses has particularly strong implications for the politics of policy reform.

⁵ Although we are presently concerned with structural changes relating to climate change mitigation, this definition of transition policy can readily be adapted to other policy domains.

⁶ Space constraints preclude further discussion of the procedural dimension of transition policy, which would require a paper of its own.

⁷ In particular cases, there may be other categories of agents significantly affected by climate-related structural changes. For example, in the case of fossil fuel developments, landowners, where they are not covered by the listed categories, would be a further relevant stakeholder.

- d) Communities or regions in which energy-intensive or emissions-intensive industries account for a large share of economic activity (*communities*).

In special cases where suppliers of goods or services to energy-intensive or emissions-intensive companies are highly dependent on their energy-intensive or emissions-intensive customers (e.g. due to highly specific assets and highly limited alternative markets to sell into) it is conceivable that the above categories (especially (b) and (c)) could be expanded to include such suppliers.

There is a tendency, in the vast literature relevant to transitions, to focus on only one or two of these kinds of agents to the exclusion of the others. For example, the ‘just transitions’ literature—understandably given its origins in the labour movement—focuses primarily on workers and communities (Mertins-Kirkwood 2018, 11). If, however, analysis of transition policy is to be comprehensive and relevant to policymakers, all categories must be considered. But this is not to say that the government response to all kinds of agents must be the same, let alone that all agents should receive transitional assistance (see Part 4). For now, the aim is simply to identify and classify agents likely to be adversely affected by climate mitigation-related structural change—i.e. the *potential* beneficiaries of transition policy.

Some discussion of the collective entities mentioned in this classificatory scheme is warranted. First, it is suggested that corporate agents be treated straightforwardly as unitary agents for the simple reason that in most jurisdictions they are legally defined as separate legal entities (again, this does not imply that transition policy should treat them in the same way as natural persons, or that their treatment should be justified by the same reasons that apply to natural persons).

By contrast, it is suggested that “communities” be understood somewhat more flexibly. The economic geography literature (see Appendix, sec. B(ii)) attests to the causal relevance of location, spatiality and scale in processes of structural change, but also the diversity of characteristics that affect regional transitions. The above definition of beneficiary categories is intended to capture concentrated regional/community impacts, yet be ambiguous as to the appropriate agential object of region-focused transition policy, since this may vary from case to case. Consider four possible examples. In some cases it may be most appropriate for transition policy to focus on (1) representatives of the community, as with grants from a higher level of government to the representative local government. In this example, the local government would be a unitary agent. In other cases, however, it may be more appropriate to, say, (2) invest directly in community-level public goods, (3) subsidise local businesses in growth industries, or (4) compensate strongly-indirectly affected local businesses. In examples (2) and (3), the policy would merely imply a recognition that the relevant community has higher-level, structural properties that make it appropriate to intervene at the community level (as with direct investment in public goods) or to target businesses in virtue of their community functions (as with support to businesses in growth industries). In example (4), community proximity is used to identify a strong indirect effect.

A final point about agents is that *governments* at all levels will also typically be affected by climate-related structural change, in particular through reduced taxation revenue and increased social welfare expenditures. Since the relevant distribution of governmental capabilities and authorities will inevitably vary considerably across contexts, “governments” are not considered here as a separate class. However, local governments can be included within the fourth (community) category insofar as they can relevantly be considered the *beneficiaries* of transition policy in a particular case. Otherwise, it is assumed that governmental actors—including at the local level where applicable—are the *sources* of transition policy, and therefore do not feature in this classificatory scheme.

3.2 *The possible scope of losses recognised and assistance granted*

The second key variable of transition policy is the scope of assistance. This relates to the deeper question of what kinds of losses are recognised as worthy of assistance. In economic, policy and even philosophical discussions of transitions, there is a tendency to focus on either *financial* losses (e.g. lost asset value; lost profits; lost wages) to the exclusion of other kinds of losses, or to assimilate all losses into the broader category of *economic* losses (according to which any loss is in principle expressible in terms of money) (Green n.d.). The purpose of the following discussion is to posit the normative relevance of a

conception of loss that recognises: (i) a larger set of losses than financial losses; and (ii) a more finely-grained set of losses than economic losses.⁸

Consider first the reasons why focusing on financial losses is too narrow. Financial losses are a relevant kind of loss, but limiting one's understanding of loss to financial losses ignores a wide range of other kinds of losses that are often experienced by individuals and groups in the course of structural change. Broadly, these include diminutions in: instrumentally-valued external resources of a non-financial nature, such as social support networks and the institutions through which such networks can be formed, accessed and sustained; intrinsically-valued attachments a person has to particular people, material things, places and traditions; and (intrinsically- or instrumentally-)valued mental and physical functionings, such as self-esteem, self-efficacy, time-structure, identity, and physical health, vigour and energy (Green n.d.). More foundationally, the standard approaches to loss underemphasise the extent to which loss is not a purely objective phenomenon but rather one that is "given meaning through lived, embodied, and place-based experiences, and so is more felt than tangible" (Tschakert et al. 2017, 1).

The significance of incorporating this wider set of losses into our understanding of the impacts of structural change can perhaps best be illustrated by considering workers who lose their jobs. Of course, workers who lose their jobs typically incur financial losses—at least in the short term and often over the long term, too—such as a lost income stream and perhaps a diminution in the market value of their skills (Brand 2015, 363–64). But job loss threatens not merely the "manifest", material function of work as a source of income; it also threatens a variety of "latent" social, cultural and psychological functions that work provides (Jahoda 1982). Psychologists who study the psychological impacts of job loss have found that, by undermining these various functions, job loss can have profound psycho-social and other non-financial impacts on the job-loser (see Brand 2015, 365–68). For example, job loss places stress on the multiple—typically highly valued—social roles which are used to construct and sustain a person's (positive) sense of self. These roles may not only include the worker's specific job function, organisational affiliation or industry/profession, but may also include more general social roles such as being a valued contributor to society, a colleague/friend, and a "breadwinner"/"family provider" (Price, Friedland, and Vinokur 1998, 308–9).⁹ Furthermore, insofar as job-losers remain unemployed, they may acquire a stigmatised social status that can be a significant source of mental stress (see Brand 2015).¹⁰ Job loss can also undermine personal perceptions of mastery and control, of meaning and purpose, and of belonging, which are critical to mental health (Ashforth 2001). "Although reemployment mitigates some of the negative effects of job loss, it does not eliminate them" (Brand 2015, 359).

Social-scientific research also emphasises the indirect or secondary effects that flow from the above-mentioned primary impacts of job loss—on job-losers themselves and on their families, communities and other close personal relationships (Brand 2015, 368–370; McKee-Ryan et al. 2005; McKee-Ryan and Kinicki 2002; Price, Friedland, and Vinokur 1998). Meso- and macro-level social-scientific studies provide additional evidence of potential socio-economic problems in economically depressed communities affected by industrial transitions (Case and Deaton 2015, 2017; Gest 2016; Lamont 2000; Newman 1995; Pugh 2015, 2016; Vaccaro, Harper, and Murray 2016).¹¹

The *economic* (as distinct from "financial") approach to loss purports to be able to accommodate all such kinds of loss, but suffers from a different problem: rather than being too narrow, it is too coarse-grained. For the welfare economist, all mental activity can be reduced to a set of preferences over goods,¹² which are in principle expressible by the notion of a representative agent's "willingness to pay" (WTP) for a good (a proxy for preference satisfaction). On this approach to valuation, all effects of a structural change

⁸ This section draws heavily on an unpublished working paper on file with the author (Green n.d.).

⁹ Due to the gendered nature of family roles and the especially central role that paid work plays in the construction of masculine identities, job losses often disproportionately affect the self-image of men (Lee and Owens 2002; Pugh 2015).

¹⁰ Even when workers return to employment, they often find themselves in inferior jobs or industries—inferior not only in terms of pay, conditions and regularity, but also in terms of the psycho-social dimensions (see, e.g., Strangleman 2001, 257–60).

¹¹ On self-reinforcing causes of loss within geographic areas, see Abramovitz and Albrecht (2013).

¹² I use the word "good" in a very broad sense, as in "something about which a person can have a preference".

on any given individual could in principle be ascribed a monetary value and aggregated, with the net impact on that individual ultimately being negative (loss), positive (gain) or zero (no transitional effect).¹³

This monistic approach to value and loss is too coarse-grained because it fails to distinguish between goods valued *intrinsically*—that is, for their own sake, as part of an agent’s final scheme of ends—and goods valued merely *instrumentally*, as mere means to those ends (and, insofar as goods are valued for both instrumental and intrinsic reasons, it fails to distinguish these distinctive components of the good’s value to an agent) (Goodin 1989, 63–66; on the distinction generally, see Hausman 2012, 78).¹⁴ Intrinsically-valued goods are *qualitatively* different from instrumentally-valued goods, but this qualitative distinction is simply not captured in the notion of preference satisfaction, or its monetary proxy (WTP), which admit of purely quantitative distinctions.¹⁵ In the case of intrinsically valued goods, it is literally nonsensical to ask what one is “willing to pay for them” since that very question implies an instrumentality of which the good in question by definition does not admit.¹⁶ Many of the kinds of goods that are typically lost in the course of structural change—including attachments to particular persons, places, social roles and cultural practices—are intrinsically valued and should be distinctly conceptualised as such (Green n.d.).

This conceptualisation of loss—as wider than financial losses and more fine-grained than the welfare-economic understanding of loss—has important implications for the classification and design of transition policy. Specifically, it opens up a larger set of possible transition policy responses than is typically conceived, encompassing policies that respond to the oft-ignored psycho-social and other non-financial dimensions of loss, as discussed further below.

3.3 Transition policy instruments, goals and rationales

The third and final set of transition policy design elements is conceived here as *clusters of policy instruments and the rationales that link them to the achievement of transition policy objectives*. I use these clusters to delimit four “ideal types” of transition policy.

Surveying the literature relevant to substantive transition policy (see Appendix), it is clear that governments often have a wide range of instruments at their disposal to mitigate transition losses (some are more applicable to particular types of agents, and particular types of losses, than others), including: grants; loans; cash payments;¹⁷ and the provision of public goods and services. Additional options available where the transition is proximately caused by a (climate change) policy in the relevant jurisdiction include exemption from the policy, relief from liability, temporal delay in the policy’s application, or graduated implementation (Trebilcock 2014).

Policy instruments become linked to policy goals through different policy *rationales*. From an inductive analysis of the literature (see Appendix), and abstracting for the moment from the issue of target groups, two distinctive components of transition objectives can be discerned. The first component concerns the *scope* of the losses that the policy is intended to address. As discussed in Part 3.2, transition policies tend to aim to address only financial losses or to assume that money is substitutable at the margin for anything of value that has been lost. However, it is possible for transition policy to recognise and address a wider range of losses, including losses of non-financial external resources, losses of intrinsically-valued goods,

¹³ The utilitarian/efficientarian theories of legal transition discussed in my literature review (see Appendix, sec. B(i))—by which I mean the Pareto improvement principle, the KHE principle, and the “Law & Economics” literature—adopt this approach to valuation.

¹⁴ My aim here is not to present a particular account of value but rather to establish the importance of this distinction in order to discredit WTP as a currency of loss.

¹⁵ As Goodin puts it, referring to the welfare economics tradition: “What underlies welfare economists’ insensitivity to the distinction ... is their studied indifference to the deeper structure of people’s preferences. With conventional consumer theory, everything is presumed to substitute for everything else at the margin” (Goodin 1989).

¹⁶ It is arguably only meaningful to speak of intrinsic value for persons; collective agents cannot value things intrinsically. It is, however, meaningful to speak of certain collectives, such as communities, as losing goods other than money—for example, communities may lose “social capital”—in recognition of the importance of place-based social services, networks, norms and practices to the well-being of the community’s inhabitants, which can also be diminished as a result of structural change (Abramovitz and Albrecht 2013).

¹⁷ Grants, loans and cash payments can be unconditional or (more or less) conditional on the money being spent on a certain class of eligible goods/services/projects (e.g. training; infrastructure) or on the agent taking particular actions (e.g. workers actively seeking employment).

and losses of valued mental and physical functionings. Hence there are two broad options with regard to this “scope” component of transition policy: “narrow” (money only) and “broad” (money and these other kinds of valued goods).

The second common component of transition policy goals concerns the policy’s *orientation*: whether the policy is “backward looking”, in the sense of seeking to maintain (partially or fully) the economic *status quo ante* as it applied to the relevant agent—i.e. the economic position the agent was in before the structural change—or forward-looking, in the sense of aiming to facilitate the relevant agent’s *adjustment to the new circumstances*.

Integrating the “scope” and “orientation” components yields four possible generic (and, for the moment, agent-neutral) transition policy objectives, as depicted in Table 1.

Table 1: Transition policy “ideal types” based on their “scope” (rows) and “orientation” (columns)

	Backward-looking	Forward-looking
Narrow	1. Compensation	3. Structural adjustment assistance
Broad	2. Exemption	4. Holistic adaptive support

We are now in a position to organise transition policy instruments under each of these four categories, linking the instrument to its objectives via a policy rationale:

1. Compensation: this category covers instruments involving monetary payment to an agent to mitigate financial losses incurred by the agent. This could include, for example: government-funded early retirement, redundancy or special unemployment payments to workers;¹⁸ compensation payments to firms for lost business asset values; compensation to households for increased costs of living or reduced value of household investments (e.g. energy inefficient homes, vehicles or appliances); and compensation to local authorities for lost tax revenue. The rationale for such instruments is that they seek to maintain the agent’s financial resources (fully or partially) at the level that obtained before the structural change. Since intrinsically-valued goods are in principle non-compensable (see Part 3.2), compensation assistance is necessarily narrow in scope.

2. Exemption:¹⁹ legal exemptions from climate change laws include various mechanisms built into the design of the climate change law that temporarily or permanently, partially or fully, exempt a class of agents from the application of the new law, thus *de facto* maintaining the pre-reform legal position of that class of agents. Possible options include “grandfathering” of the agent’s interests, “postponed implementation” of the policy/law, or “graduated implementation” of the policy/law insofar as it applies to those agents (Trebilcock 2014). The rationale for instruments in this category of assistance is to maintain (partially or fully) the *status quo ante* as it applied to the relevant agent. As such, assistance in this category has a “backward-looking” orientation, but it is broad in scope, since the agent’s actual position before the structural change (i.e. in all relevant respects, not merely financial) is maintained, at least for some time.

3. Structural adjustment assistance: This category involves monetary payments or in-kind assistance to facilitate agents’ adjustment to the new market conditions that exist as a result of the structural change. For example, this could include: wage subsidies, subsidised education/training,

¹⁸ I say “government-funded” because this discussion is focused on government transition policy. Of course, firms themselves may have legal obligations to pay redundancy, retirement or other benefits to redundant workers. Where governments provide compensation payments to workers in addition to any legal entitlements to such payments already held by workers immediately before the structural change, then the directly-benefiting agents are the workers. Where firms are unable to pay their employee liabilities (e.g. due to bankruptcy) and governments step-in to fund those existing liabilities, the direct beneficiaries are the firms (though the workers may benefit indirectly if they would otherwise not have been paid the benefits that the relevant firm was legally obligated to pay them).

¹⁹ By (my) definition, this class of compensatory relief is only available in the case of structural changes induced by a proximate legal/policy change. While governments could of course pass new laws that protect incumbents against changes in technology or market conditions, I consider this to be outside the scope of transition policy.

and relocation assistance for workers; subsidies to firms to purchase energy-efficient or low-carbon technology; subsidies to households to purchase energy-efficient or low-carbon household assets; or investment in local-level public goods (infrastructure, innovation, skills) to facilitate economic activity in new (less-carbon-intensive) industries. The rationale underpinning instruments in this third category of assistance is one of forward-looking adaptation, albeit narrow in scope.

4. *Holistic adaptive support*: this category includes financial or in-kind support to assist the agent to mitigate or adapt to the full range of recognised losses (see Part 3.2)—not merely financial losses but the loss of a wider set of resources or functionings that has been diminished, including non-financial external resources, intrinsically-valued goods, and mental and physical functionings. There is a wide range of possible assistive instruments here, which may include things like: comprehensive transition planning; counselling and other social services to workers and their families; investments that support worker-reemployment in industries of a similar social standing, in a similar industry and/or in the same community; and investments in community social, cultural and environmental goods (i.e. not merely economic goods). Adapting to the full range of losses experienced by persons in structural changes, including job losses for workers, typically involves both backward- and forward-looking cognitive work (Thompson 1998), therefore achieving the policy goal of holistic adaptation cannot ignore the value of what the agent has lost. Accordingly, this category of assistance, though ultimately forward-looking, must entail processes that involve past-oriented cognitive work.

5. *No transitional assistance*: for completeness, it should be acknowledged that not offering any transitional assistance is itself a policy choice and therefore should be considered as one of the categories of transition policy options.²⁰

3.4 *Transition policy options: a typology*

In light of the above discussion of key variables and their range of plausible parameter values, Table 2 provides an original typology of options that attempts to map the logical space of substantive transition policy. The typology is structured by *agent type* (see Part 3.1) and *policy “ideal type”* (see Part 3.3). Of course, a transition policy package may encompass more than one combination of agent types and policy types.

This typology abstracts from a number of complexities, and these must be borne in mind. First, it implicitly assumes that a single government is the relevant source of transition policy. In reality, jurisdiction over relevant transition policies may well be fragmented across multiple levels of government. This will be particularly relevant to federal systems of government, to the member states of the European Union, and to those countries reliant on development aid or assistance from international institutions. Second, the classificatory scheme abstracts from important questions of policy implementation, including the broad governance mode (hierarchy, market, network) through which policies are to be implemented (this is discussed further in Part 4, below). Fourth, the scheme does not explicitly account for the reality that non-state actors and hybrid institutions are increasingly involved in climate governance (Andonova, Betsill, and Bulkeley 2009; Bailey and Compston 2010, 1110). This reality can, however, be accommodated into the scheme in two ways: non-state or hybrid governance providers can themselves use this scheme as a starting point for their own analysis of transition options (albeit that the set of options available to them will likely be distinct from, but overlap with, the set available to governments); or states can choose to develop or implement transition policies using networked modes of governance that involve partnering with non-state actors.

²⁰ Some persons may be entitled to social protection policies available to a wider class of persons, such as unemployment benefits. I exclude these from the definition of transition policy because they are not specific to the kind of structural transitions that are the focus of this paper.

Table 2: Typology of substantive transition policy options

	1. Compensation	2. Exemption	3. Structural adjustment assistance	4. Holistic adaptive support
Consumers/ households	E.g. Lump sum payments; tax reductions; increased transfer payments	E.g. certain consumers exempted from new laws	E.g. subsidies for home insulation, energy efficient appliances, solar panels	E.g. schemes to prevent household displacement due to rising costs associated with climate policies (e.g. for fuel poor households)
Corporations	E.g. lump sum payments; corporate tax cuts	E.g. “grandfathered” emissions permits, exemptions, delayed application of new laws	E.g. conditional grants to upgrade plant and equipment; R&D subsidies	n/a
Workers	E.g. government-financed redundancy benefits; early retirement benefits / pension “bridging”; special unemployment insurance	(Indirect effect of exemptions to companies employing the workers)	E.g. wage subsidies; training subsidies; relocation subsidies; job transfer schemes	E.g. comprehensive transition planning; counselling and other social services to workers and their families; facilitating reemployment opportunities in industries of a similar social standing, in a similar industry and/or the same community (e.g. through place-based public investment—see bottom row).
Communities	E.g. Revenue replacement grants for local governments	E.g. Geographically-defined exemptions to new laws; geographically differentiated timelines for the implementation of new laws	E.g. place-based public investment in economic infrastructure, innovation (e.g. regional innovation strategy), education and training	E.g. place-based investment in local public goods of a social, cultural or environmental nature.

Notes: policy “ideal types” (column headings) are described in Part 3.3 (which draws on Part 3.2). Agent types (row headings) are discussed in Part 3.1.

4. CHOOSING PARTICULAR TRANSITION POLICIES: THREE CRITERIA

Having mapped, in broad terms, the logical space of transition policy, this Part turns to the question of how policymakers should go about designing a *particular* transition policy, involving one or more instruments from within one or more of the “agent-type” categories depicted in Table 2. This is obviously a much bigger question than can be addressed here, and “good” answers to it will vary considerably from context to context, based on a wide variety of factors, including but not limited to the kinds of political and economic institutions prevalent in the relevant jurisdiction (Wiseman, Campbell, and Green 2017). In any case—for these and other well-understood reasons relating to the illusions of control, predictability and first-best policy design—one should be sceptical of any attempt to specify a singular transition policy “solution”. It is recognised that the principled policy designs of governments and bureaucrats will be influenced at all relevant stages by prevailing ideas and assumptions, by the interests and claims of various stakeholders, and by various institutional constraints and opportunities. Policymaking is a process, and “instead of identifying ‘first-best’ ideal solutions *a priori*, the process perspective highlights the importance of iteratively developing ‘second- or third-best’ answers that stakeholders can agree on over the life of the policy” (Brinkerhoff 2001).

With these qualifications in mind, the following three selection criteria are posited as a structured means by which policymakers can engage in the process of designing principled transition policies: “fairness”, “transformative political potential”, and “expected effectiveness”. These are briefly discussed individually followed by a short discussion of their interactions. These, of course, are not the only criteria that should be used. For example, cost-effectiveness considerations, as well as cross-cutting problems of “interplay”, “fit”, “scale” and “path dependency” (Young 2002) will be highly relevant. But the three criteria discussed below are emphasised for their particular relevance to transition policy.

4.1 Fairness

The first selection criterion posited is “fairness”, which is shorthand for the ethical or normative political justification for transition policy. As discussed in the literature review (see Appendix, sec. B(i)), there is no consensus or consistency within the normative debate over legal transitions and structural transitions

more generally, but this literature can at least help policymakers attend to normatively relevant questions. These include: what is the expected effect of a transition policy choice on the distribution of well-being? How is well-being defined for this purpose? What would an efficient transition policy be, keeping in mind that transition policy is not a “one shot game” but rather sets a precedent concerning how governments will respond to future structural changes (Shaviro 2000)?²¹ Under what conditions and for what reasons are individual persons justified in receiving transitional assistance? Given that transitions also create benefits and winners, how should the risks (positive and negative) of legal change and other kinds of structural change be allocated across society? What kinds of behaviour should transition policy reward and encourage? What, if anything, normatively justifies giving transitional assistance to corporations or to collectives such as “communities”? When are agents’ expectation of structural (including legal) continuity legitimate, and how should this affect their entitlement to transitional assistance? Should transition policy distinguish between claims for assistance arising from policy-induced structural change²² and non-policy induced structural change?

Answers to these questions will vary, and it is beyond the scope of the present paper to defend particular principles for structuring transitions fairly. However, based on work in progress by the author, it is suggested that transition policy should be guided by the following principles:²³

- We should understand the impacts of structural transitions on individual human well-being in terms of a version of the capability approach, according to which *well-being* is understood as people’s real opportunities to achieve valued functionings (functionings are “beings and doings”) (see Nussbaum 2000; Robeyns 2016; Sen 1999) and *real opportunities* are understood in terms of people’s *internal resources* (e.g. natural abilities, aptitudes, skills), *external resources* (e.g. money, property, support networks) and *structural conditions* (e.g. material structures, laws, formal power relations, and cultural and social norms) (Green 2017b; Wolff and De-Shalit 2007).
- Transition policy should respect agents’ expectations of structural continuity only where these expectations are reasonable. Reasonableness should be interpreted in light of (i) agents’ relevant social roles (e.g. corporation, investor, worker, citizen) and the social practices and standards of excellence with which they are associated in the relevant context, and (ii) systematic differences in individuals’ capabilities that are relevant to their performance of standards associated with those roles, including the capability to self-insure against risks associated with structural changes (e.g. through diversification, hedging and third-party-provided insurance). These considerations imply, for example, that corporations (and other group agents) should be treated very differently from natural persons; that shareholders should be treated differently from workers and households; and that high-capability householders, workers and shareholders should be treated differently from those already more disadvantaged. Indeed, persons who are the most vulnerable to the impacts of transition should receive special attention in transition policy.²⁴
- Special attention in transition policy should also be paid to potential “shocks”, where shocks are understood as transitions that cause sudden and severe losses in well-being. The idea here is not necessarily to preserve all pre-existing subjectively-valued functionings or resources, but to consider the case for “smoothing” losses of particular persons/groups so that they are able to adapt to the new circumstances.
- Transition policy responses, where justifiably provided, should be appropriate to the kind of loss incurred (see Part 3.2).
- Transition policy responses should take into account the distribution of costs necessary to finance such responses. Transitional assistance will often involve allocating resources from a government’s consolidated revenue fund to particular agents or groups, and these resources have

²¹ The relevant assumption here is that the transition policy applied to the coal sector today constitutes information on the basis of which rational agents will form expectations about how the government will respond to the transport sector tomorrow, etc., and adjust their behaviour accordingly.

²² By which I mean “structural change induced by a proximate policy in the relevant jurisdiction” (see Parts 1 and 2).

²³ These principles are based on the author’s PhD research-in-progress and should not be taken to be the author’s last word on the subject.

²⁴ For such persons, it will typically be important to consider the (in)adequacy of existing social policies (particularly social insurance policies), i.e. whether the state has performed its existing duties of social justice in respect of such persons.

an opportunity cost. For transitional assistance to be normatively justified “all things considered”, this wider distributive trade-off has to be included in the normative analysis. This consideration is likely to militate in favour of carefully-targeted assistance.

- In some cases, it may be more efficient or otherwise normatively preferable to target transition policy responses at the community or other group level (e.g. as with investment in regionally-specific public goods). In such cases, particular attention should be paid to the value of structural conditions (e.g. material infrastructure, institutional arrangements) to the flourishing of individual community members.

4.2 *Political transformation potential*

As noted in the introduction, it is reasonable to think that some form of transition policy, independently of its fairness justifications, may well be a necessary condition of the political acceptability of sufficiently stringent and transformative climate change mitigation policies. This is especially (but certainly not exclusively) relevant in cases where the structural change follows from a proximate change in policy/law, because policymaking generates political attention and entails processes—e.g. the passage of legislation—that can be exploited by special interests seeking to block or weaken the policy, or be derailed by public opposition (Trebilcock 2014). It is much harder, by contrast, for special interests or the public to block changes in technology and market conditions that are not attributable to a proximate policy/legal change in the relevant jurisdiction (though powerful interest groups regularly lobby to have policymakers introduce legal or administrative measures that would block or retard such changes, and among the wider public the accumulation of transitional losses can lead to a political backlash). Transition policy can thus be conceived as “a strategy for expanding the politically feasible scope for socially desirable policy changes by muting or mitigating the resistance of losers to these changes” (Trebilcock 2014). At the very least, to design transition policy without this instrumental *political* purpose in mind would be naïve.

For a wide range of reasons, climate change mitigation policy is an especially challenging kind of public interest policy to enact. Accordingly, transition policies are likely to be instrumental to the political feasibility of the associated climate policies (Trebilcock 2014, chap. 8). But this does not mean that simply showering cash on losers will necessarily be an effective political strategy. It is true, as Denniss and Macintosh note, that the policy and political science literature on major policy changes contains “an element of ‘whatever it takes’ about the advice offered to reformers”; in that literature, virtually “[a]ny strategy, short of a coup, is justified if it helps ensure the passage and sustainability of the reform” (2014, 219, citations omitted). As the case study of Australian carbon pricing demonstrates perhaps most vividly (Chubb 2014; Denniss and Macintosh 2014), this “transactional” approach to transition policies can backfire—at the level of both elite interests and the general public.

Yet, much of the literature on climate policy tends to implicitly adopt this transactional approach to the transitional aspects of climate policy design via the simplistic discussion of “political feasibility” (Somanathan et al. 2014). Weak emissions trading schemes with free permit allocation, for example, are often justified on the ground that they are the most feasible form of carbon pricing (e.g. Caney and Hepburn 2011), but without serious consideration of the political *effects* of transition policy beyond securing political enactment of a proposed climate policy. This approach is problematic because the “feasible” policy, even with compensation in the form of free permit allocation, will, under current political conditions, inevitably be far from sufficient to meet ambitious mitigation goals in most jurisdictions (Jenkins 2014; Jenkins and Karplus 2017). Given that more stringent, future climate policies will inevitably be needed, some political scientists have argued that a dynamic approach to climate policy is required: we need policies today that create the political conditions that facilitate more ambitious climate policies tomorrow, thus gradually overcoming the political barriers to sufficiently ambitious climate policy (Meckling et al. 2015; Urpelainen 2013). The same dynamic approach, I argue, should be taken when designing transition policies.

In this vein, Urpelainen (2013) proposes a criterion for the selection of climate mitigation policy that captures this dynamic aspiration better than the more static “political feasibility” criterion. He calls this criterion “political transformation potential”: the potential of a climate policy to “help tilt the balance toward, and create new, constituencies who will mobilize in support of ever more ambitious mitigation policies” (at 119). It is not enough that the mitigation policy be “feasible” and “reduce emissions”, rather it must “change the payoffs of the global warming game in a way that facilitates more ambitious climate

cooperation in the future” (at 115). More specifically, it “must increase the profitability of mitigation policies for key segments of the society, such as businesses and labor unions” (at 119). I propose that this same criterion be used (*mutatis mutandis*) to guide *transition* policy to accompany climate mitigation: *viz.* that transition policy mobilise a coalition of political supporters, or demobilise opponents of transition,²⁵ so as to facilitate progressively more ambitious climate mitigation policies.

Again, the interpretation and application of this criterion will be highly context-sensitive. Nonetheless, it is suggested that assistance to three of the potential target groups of transition policy warrant particularly close consideration in respect of this criterion: workers, households, and communities. It appears possible that well-designed transition policy benefiting these groups could facilitate the cultivation of a coalition of support for decarbonisation policy that is economically and politically sustainable over the long term of a transition. By contrast, providing assistance to corporations appears likely to achieve only narrow, short-term climate policy wins that entrench the power of energy- and emissions-intensive businesses while setting a precedent that could lead to extremely expensive transition payments over the long run if climate change is to be addressed at sufficient scale (Menezes, Quiggin, and Wagner 2009). While the latter may appear sensible on the transactional approach to the politics of transition policy, it seems likely to be financially and politically unsustainable on the dynamic approach proposed here.

4.3 *Expected effectiveness*

The third suggested selection criterion for transition policy is “expected effectiveness”, which means simply the likelihood that the chosen transition policy, once enacted, will achieve its stated goals. This criterion can usefully be informed by the social science literature, discussed in the literature review (see Appendix, sec. B(ii)), pertaining to regional studies, economic geography, regional innovation systems (RIS), transition studies, innovation studies, and studies of specific sectoral issues (e.g. mine closure studies), as well as by more general work in public policy and administration.

The effectiveness of different transition policies will vary from context to context, but we can state some general theoretical expectations. Backward looking policies (compensation and exemption) will tend to be administratively simple to implement, requiring less in the way of institutional capacity. Yet the narrowness of the objectives of such programs, as we have seen, threatens to undermine their fairness and political transformation potential. Forward-looking policies (structural adjustment assistance and holistic adaptive support) have more ambitious objectives and greater potential to be fair and transformative, yet are more complex to implement and require greater institutional capacity to succeed.

Consider, for example, the complexity of designing and implementing forward-looking strategies to facilitate regional development in specially-affected communities—hence the importance of institutional capacity. Scholars of “regional innovation systems” have identified various barriers—organisational, institutional, and network-related—to economic diversification in old industrial regions, and have emphasised the complex mix of institutional capacities required to overcome them (Coenen, Moodysson, and Martin 2015; Grabher 1993; Tödtling and Trippel 2005). Governments typically require not merely the financial resources and hierarchical authority to “push” new technologies into such regions, but also the capacity to steer long-term, participatory, cooperative processes that empower diverse local actors to recombine their existing knowledge, skills and competences in new ways. These may include the capacity to experiment with new governance processes, to broker dialogue among the various actors (especially firms), to build or reconfigure networks, to disseminate information, and to facilitate shifts in cultural norms and worldviews (Campbell and Coenen 2017, 5–12).

The importance of the latter set of “softer”, but no less important capacities, implies that the effectiveness of regional innovation strategies (to continue with this example of complex transition policy) is likely to vary substantially, *even across relatively wealthy countries*. For example, scholarship on “varieties of capitalism” (Hall and Soskice 2001) emphasises that the kind of long-term, cooperative steering capacities just mentioned are characteristic of coordinated market economies, like Germany and Denmark. By contrast, the institutions of liberal market economies, like the UK, the US and Australia, characteristically foster competitive-market modes of interaction, respond to short-term incentives, and

²⁵ With respect to opponents, it is worth remembering that: “Some sources of resistance are embedded in localities and spatial scales. Others, especially those allied to corporate interests, transcend conventional spatial boundaries.” (Bailey and Compston 2010, 1111).

adopt a more *laissez fair* approach to innovation and development. Basic political institutions (e.g. system of government, electoral institutions) also condition such capacities in predictable ways (Lijphart 2012). As discussed further in the Appendix (sec. B(ii)), case studies and comparative analyses of low-carbon regional diversification strategies have emphasised the influence of such background political-economic institutions on the type of strategy adopted and its success (Birch, MacKinnon, and Cumbers 2010; Dawley et al. 2015; Stroud et al. 2014; Wiseman, Campbell, and Green 2017).

Of course, much of the above analysis assumes that policymakers in the relevant government are at least motivated themselves to pursue both a low-carbon transition and (fair and politically transformative) transition policy. Yet clearly government itself—or rather, the relationship between government and vested interests—can be a major barrier to effective transition policy. In regions and countries overly-reliant on a particular (carbon/energy-intensive) industry or industries, the patterns of mutual dependence among industry stakeholders and governments can create a political “lock-in” effect that is difficult to overcome (Baeten, Swyngedouw, and Albrechts 1999; Grabher 1993). Action at other levels of government (higher or lower, as the case may be) can help to bypass or counteract such political lock-in effects (Campbell and Coenen 2017, 14). Additionally, reformers may attempt to destabilise existing networks between governments and vested interests, for example by empowering political entrepreneurs and other new voices (Campbell and Coenen 2017, 15). In any case, motivated policymakers must be attentive to the way that low-carbon transitions and transition policy processes interact with existing power relations to create new political constraints and opportunities as transitions unfold (Baeten, Swyngedouw, and Albrechts 1999; Hess 2014).

4.4 Trade-offs and complementarities among the criteria

At first glance, these criteria may seem to pull in different directions. No doubt there are likely to be trade-offs. For example, it is often assumed that fair transition policies will not be politically feasible, since the groups that are most vulnerable to losses from climate-related structural change (low-income households; low-skilled workers in weak labour markets; old industrial regions), and who are therefore the most obvious beneficiaries of fair transition policy, are often the most politically marginalised, whereas the agents that are most wealthy and resilient to structural change, such as multinational oil companies, are often the most politically powerful.

Upon closer inspection, some potential complementarities among the criteria emerge. In particular, the potential to use *fair* transition policy to build a viable coalition of *political* support among households (and hence voters), workers, and the constituents of vulnerable communities should not be dismissed. While people are sensitive to the perceived costs of a climate policy (to themselves and society more broadly), they are also sensitive to the *perceived fairness of the distribution* of those costs across society (Drews and van den Bergh 2015, 861–862). Survey evidence (Cai, Cameron, and Gerdes 2010) and case studies from carbon pricing attempts in Australia (Chubb 2014) and Canada (Harrison 2012) suggest that people are more likely to support a climate policy where they perceive that the incidence of the policy’s costs will likely lie with polluting industries, and more likely to oppose it where they perceive the costs will lie with vulnerable groups. This suggests there is potential for policymakers and supporters of decarbonisation to build a “just transition” narrative by targeting transitional assistance to the most vulnerable among these groups, rather than to the most powerful corporations.

Moreover, strategic actors, including emissions- and energy-intensive corporations and their industry associations, even if they are brazenly self-interest maximising, will typically attempt to *frame* their claims in terms of fairness, especially as they attempt to build *public* support for their claims (Trebilcock 2014). Framing climate policies in a way that makes them seem unfair to the wider public is a key tactic used by such groups (Bomberg 2012). If policymakers and other proponents of low-carbon transition lack a plausible fairness narrative and instead use transition policy for transactional vote-buying, they are likely to be ill-equipped to win the public debate over a proposed climate policy in the short term, let alone to build viable coalitions for increasingly ambitious climate mitigation action over the longer term.

That said, developing fair transition policies/strategies capable of building the relevant political constituencies to support deep climate mitigation is likely to require significant institutional capacity, as discussed above. The latter may therefore be a key variable affecting the success of transition policy, which would suggest the value of capacity-building initiatives in this area.

5. CONCLUSION: TOWARDS A RESEARCH AGENDA FOR LOW-CARBON TRANSITION POLICY

This paper has identified a wide range of academic literature containing insights and arguments relevant to the design of transition policy—in general and for climate change mitigation specifically (see Appendix). However, it has also identified a dearth of literature whose aim is to examine systematically the benefits and drawbacks of various transition policy instruments, and that is aimed at informing policymakers and civil society actors. This is a pressing problem, as these actors are coming under increasing pressure to respond to the impending losers of decarbonisation. This paper has tried to make a first step towards the development of this missing literature by positing a definition of transition policy, mapping the logical space of transition policy options, and positing three criteria for selecting particular transition policies from among the possible options.

Further research in this area could usefully be advanced from within the three broadly defined domains that roughly correspond to the three selection criteria discussed in Part 4. First, normative theorists (moral and political philosophers, and normative political, legal and economic theorists) could usefully attend more closely to the issues of distributive fairness/justice and other normative issues that arise in climate-related structural changes of both a legal and non-legal variety, and develop action-guiding principles that can be used by policymakers. Second, political scientists and political economists could usefully pay closer attention to the dynamic use of transition policy to build coalitions of supporters for climate policy reforms. Third, social scientists from a variety of disciplines could usefully pay closer attention to the factors affecting the success of transition policies. The development of datasets on historical transition policies that can be used for comparative analysis, including large-N quantitative analysis, would be especially useful, in addition to detailed case studies of transition policy initiatives.

Finally, three issues beyond the scope of this paper merit greater attention within complementary research programmes. First, this paper has focused on the *substantive* dimension of transition policy, but the *procedural* dimension of transition policy is also critical. Climate policies and substantive transition policies should be developed as part of a wider process of participatory deliberation and consultation, the design and implementation of which are also likely to be highly important to the success of decarbonisation efforts. Second, this paper has focused on the role of governments as the sources of transition policy. Further work is needed on the role of individuals, civil society and the business sector in low-carbon transition planning, including the role of financial institutions in allocating capital that considers the social dimension of such transitions as well as the climate dimension (Robins 2017). Thirdly, the scope of transition policy considered here has been limited to addressing the *transitional losers* from decarbonisation.²⁶ However, there is great potential for decarbonisation, if combined with improved economic, industrial, education, regional and social policy to provide broad-based improvements in well-being and to reduce *existing* forms of injustice (Green 2015; Jacobs and Mazzucato 2016). While fair transition policy targeted at losers is an important and under-researched area, the larger transformative agenda of which it is a part should not be forgotten.

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²⁶ See footnote 1, above.

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APPENDIX: LITERATURE OVERVIEW

This appendix provides an overview of literature relevant to the design and evaluation of transition policy. The review is divided into two sections. The first section deals with work that explicitly relates to climate change mitigation. It begins with a look at the most recent findings of the Intergovernmental Panel on Climate Change's Working Group III on the Mitigation of Climate Change (IPCC WGIII), which should provide a broad indication of the extent to which transition policy features in climate-related academic literature, at least among works accepted for publication by October 2013 (the cut-off date for consideration by WGIII for the 5th Assessment Report).¹ This is followed by a review of other relevant academic (and some grey) literature concerned with climate change mitigation. The second section discusses more general (i.e. not necessarily climate-specific) academic literature that is relevant to transition policy. It begins with an analysis of normative theories and literatures relevant to the distributive justice of transition policy, and is followed by a discussion of social science literature concerning the technical, economic political and social aspects of transition policy.

A Climate change-specific literature on transition policy

(i) IPCC findings

IPCC WGIII, in its regular Assessment Reports, produces a chapter on “National and Subnational Policies and Institutions” (most recently Somanathan et al. 2014). That chapter includes an evaluation of the main climate policy instruments (e.g. carbon tax, emissions trading, regulated standards etc.) against four criteria: “economic effectiveness”; “environmental effectiveness”; “distributional equity”; and “political and institutional feasibility” (see p.1156). It is the last two of these criteria that are relevant to this article's focus on transition policy. Summarising its evaluation, the IPCC remarked on the lack of research relevant to these two criteria (Somanathan et al. 2014):²

Among the four policy evaluation criteria, literature is rich for economic and environmental effectiveness. The distributional incidence of taxes has been studied quite extensively, *much less is known about other policy instruments*. Political and institutional feasibility was also discussed as a design issue of economic instruments. The reasons for which sector specific policy instruments such as regulations and information measures have higher political feasibility than economy-wide economic instruments were briefly discussed in Section 15.2, *but there is a dearth of literature really analyzing this issue*.

As noted in this quote, there is an extensive literature concerning the distributional impacts of fiscal policy instruments for climate mitigation, including carbon taxes, energy taxes, and the removal of fossil fuel subsidies (Somanathan et al. 2014). The IPCC's key conclusions from its review of that literature are that (i) the distributional incidence and feasibility of fiscal instruments can be affected by both the design of the instrument itself (e.g. which sectors and fuels are covered) and (ii) the way the revenues from the scheme are used. With respect to (ii), revenues can be “recycled” to various groups adversely affected by the climate policy reform in ways that affect the distributional impact and feasibility of the scheme, though there will often be a trade-off between ethical and political objectives.³ While the IPCC includes a

¹ The October 2013 cut-off date provides a further reason for reviewing the wider academic literature relevant to transition policy, as I do below. It should also be noted that the IPCC's Working Group III also discusses the impacts of mitigation on livelihoods/poverty (see Ch 13.3.1, pp. 813–15).

² The sentiment is echoed in the IPCC WGIII's chapter 4 (“Sustainable development and equity”): “[other topics] remain scarcely addressed. In particular, distributional issues (both distributional implications of mitigation policies and implications of different distributional settings for climate policies), employment, and social cohesiveness, have limited coverage—despite being among the key SD goals that policymakers will consider” (Fleurbay et al. 2014, 324); “A better understanding of the distributional impacts of prospective climate policies would provide guidance for designing equitable policies, and insight into the present political economic landscape wherein some actors support climate action and others oppose it” (at 326).

³ The issue of fiscal transfers to mitigate “leakage” of carbon-intensive production overseas is also discussed in that chapter. Insofar as the climate policy and any associated transfers are designed purely to mitigate *global carbon leakage* (i.e. an increase in *global* emissions as a result of the climate policy) then this does not strictly fall within the definition of transition policy, as it can be justified on “environmental effectiveness” grounds. However, often the object of

few examples from the literature, there is no systematic analysis of transition policy options and their attendant distributional, political or institutional feasibility considerations.

It is important also to understand the scope of the IPCC's analysis. Insofar as the distributional impact and political/institutional feasibility criteria are discussed in the IPCC chapter, the focus is on the design of *climate* policy instruments⁴ in such a way that they will improve “distributional equity” and be more “feasible”. But *sui generis* transition policies can also be envisaged. Such transition policies could be independent of any climate policy (e.g. to assist losers from low-carbon structural changes that are not proximately related to a climate policy in the relevant jurisdiction) or they could accompany a climate policy but involve a different instrument from the climate policy itself (e.g. an accompanying change to the income tax or welfare system). The possible instruments of transition policy associated with climate mitigation are therefore not exhausted by those design features of *climate policy instruments themselves* that affect their distributional incidence and political/institutional feasibility. That said, there is not always a clear dividing line between transition policy and climate policy. For example, exempting an industry from a carbon tax and allocating revenue from the tax to low-income households could each be seen as simply a design feature of the climate policy or as a distinct transition policy. In sum, the scope of the IPCC's analysis overlaps with the analysis of transition policy, but it does not “cover the field”.

There is some more detailed consideration of issues relevant to transition policy—including distributional impacts of climate policies, substantive transition policies, participatory processes and other procedural mechanisms associated with transition—in the sector-specific chapters of the IPCC's WGIII report. For example, chapter 7 (Energy) reviews the employment impacts of climate policies in the energy sector, as well as the nexus between climate mitigation and energy poverty/access. Chapter 9 (Buildings) considers employment and fuel poverty issues associated with climate policies in the building sector. Chapter 10 (Industry) focuses on employment impacts of eco-innovation and investment, noting that substantial impacts require job support mechanisms, and that the distributional effects of these policies locally and across different countries remain unclear (at section 10.10.2). And Chapter 11 (“Agriculture, Forestry, and Other Land Use” (AFOLU)) discusses the complex distributional issues that arise from climate policies in that sector, which can have significant impacts, including gendered impacts, on land tenure/access, on employment, and on prices for land, natural resources and food.

In sum, the IPCC WGIII report demonstrates that distributional and feasibility issues that are of critical concern to transition policy for climate mitigation are under-researched. Consideration of these issues is patchy, with considerable attention in some areas (e.g. fiscal instruments; energy poverty/access; AFOLU) but little in many others. Moreover, a comprehensive, systematic discussion of transition policy in the context of climate mitigation is lacking.

(ii) Other climate-specific academic literature

This section surveys social science work on transitional policy in the climate change domain.⁵

Various papers from the Coal Transitions Project (Research and Dialogue on the Future of Coal)⁶ have used a range of methods to develop insights to inform contemporary transitions away from coalmining and coal-fired power generation. Spencer et al. (2018) analyse the impacts of a global coal sector transition consistent with limiting climate warming to 1.5°C, and considers normative and political economy issues raised by such transitions, in theory and in numerous particular countries. That paper also draws on a collection of six country case studies of past coalmining transitions and transition policies. The case

climate and transition policy in this area is to reduce *national production* leakage (i.e. the migration of carbon-intensive production from the country introducing the policy, regardless of the global carbon implications). The result is often the provision of transitional assistance to emissions intensive industries that can be considered a type of transition policy (see Part 3 of the main article).

⁴ At most, the chapter discusses the recycling of revenues from fiscal policies to mitigate climate change, as discussed above. This can be considered a distinct transition policy, albeit one that may be contingent on the revenues raised by the associated climate policy.

⁵ I exclude from this the voluminous, but more narrow, literature on carbon “leakage”, since the rationale for leakage mitigation policies differs from the potential rationales for transition policy (see above, note 3).

⁶ See <https://coaltransitions.org/>.

studies, written by academic experts from each of the six countries, provides further insights relevant to contemporary decarbonisation efforts in the coalmining sector (Caldecott, Sartor, and Spencer 2017 summarise the findings from the case studies). Campbell and Coenen (2017) review the literature on the revitalization of Europe's old industrial regions with an eye to recommendations for transitions in the coal sector. Spencer, Berghmans and Sartor (2017) provide a plant-level assessment of stranded assets and retirement pathways for coal-fired power plants in China. Wiseman, Campbell and Green (2017) provide a detailed case-study and political economy analysis of the closure in 2017 of Australia's dirtiest coal-fired power station and the state and federal governments' transition policy responses to that closure.

Beyond the Coal Transitions Project, numerous papers empirically analyse climate change policies in the light of their transitional implications or associated transition policies. González-eguino, Galarraga, and Ansuategi (2012) examine the specific effects of climate policies on old industrial regions in Europe and offer general transition policy recommendations. Caldecott and Mitchell (2014) consider the design of compensation schemes for owners of sub-critical coal-fired power generation assets, and Jotzo and Mazouz (2015) develop a novel market mechanism that entails intra-industry payments for the closure of coal-fired power stations. Schulz and Schwartzkopff (2016) analyse German and international experiences of managed transitions away from coal. The long green transition in Germany's Ruhr region is also analysed by Galgóczi (2014). In the context of Australian carbon pricing, Menezes, Quiggin, and Wagner (2009) considered the normative case for various kinds of transition policy, and Green (2011) analysed the industry transition policy package actually adopted by the Australian government in its 2011 carbon pricing scheme.

There is also a growing climate-focused literature that invokes the concept of "just transition". While traditionally concerned with the impacts of decarbonisation on workers and their families and communities (Rosemberg 2010), social science scholars invoking the concept have expanded its scope to encompass household energy users and other traditional concerns of the "energy justice" and/or "environmental justice" literature⁷ (Healy and Barry 2017; Heffron and McCauley 2018; Newell and Mulvaney 2013; Swilling and Annecke 2012; Swilling, Musango, and Wakeford 2015). Altintzis and Busser (2014) draw lessons for just transition policies from past experience with trade agreements. Though not framed explicitly in terms of just transition, Gough's (2017) work on "eco-social policy" shares an explicit focus on social justice, and is notable for its rigorous focus on the interplay between climate change and social policy. There remains, however, much conceptual and normative work to be done in relation to the just transition concept (e.g. what is the scope of the concept? What constitutes a transition? And what are the normative conditions for a transition to be "just"?). And there is a great need for empirical research on just transition policy experiments, especially of a comparative nature.

Recent work on the governance of "green growth", "green transformations" and "low-carbon transitions" tends to be less focused on justice, but incorporates normative concerns of a transitional nature via a (typically implicit) focus on maximising the utility of present generations through low-carbon economic transformation. This literature emphasises a number of key themes of relevance to transition policy. One is the importance of institutions to govern such transitions (Gonzalez-Ricoy and Gosseries 2016; Grubb, Hourcade, and Neuhoff 2014; Kuzemko et al. 2016; Lockwood 2014). A related key theme is the need for an enhanced role of the state in shaping the direction of economic activity (Bowen and Hepburn 2015), including via: the direct provision, financing and facilitating of clean technologies and processes (Aghion et al. 2014; Grubb, Hourcade, and Neuhoff 2014; Mazzucato 2015; Perez 2013; Stern 2015); green infrastructure provision/financing (Zenghelis 2014); and green industrial policy (Rodrik 2015). Similarly, Ahmad and Stern (2009) have highlighted the importance of fiscal levers to create inclusive, low-carbon transitions, building on their earlier work on fiscal reform to steer inclusive economic development in developing countries (Ahmad and Stern 1991; see also Stern 2015). There is great potential for interplay between the more justice-focused just transitions research and the more utilitarian green growth/transformation work.

Two further themes concerning institutions and governance have emerged from social scientific work on climate policy. One is the importance of "policy integration" (Lafferty and Hovden 2003). "Horizontal integration" across government departments and agencies is crucial to avoid "anti-climate policies" undermining climate mitigation policies (Compston and Bailey 2013), while "vertical integration" reduces

⁷ I leave aside here the large literatures on "energy justice" and "environmental justice".

policy dissonance among different levels of government—and is often especially challenging in federal systems (D. M. Brown 2012). The other is the importance of non-state and hybrid governance, and hence of state capacities to “steer” complex, multi-agent processes and engage in “network” modes of governance (Andonova, Betsill, and Bulkeley 2009; Bailey and Compston 2010; Chan et al. 2015; Hale 2016; Kuyper, Linnér, and Schroeder 2018).

B Literature relevant to transition policy (non-climate-specific)

I now turn to the large body of work that is not specific to the climate change context. A wide variety of literatures have grappled with issues relevant to transition policy, spanning multiple disciplines (e.g. economics, political science, philosophy, geography, sociology), purposes (empirical, positive, normative) and methods (statistical analysis, modelling, case studies, normative argument). Given the sheer breadth of material, this review is not intended to be exhaustive. Rather, it is focused on what the author considers to be the contributions in the academic literature that are most significant and relevant to (i) the *ideal normative objectives* of transition policy (including justice, economic efficiency and other normative criteria); (ii) the *social scientific analysis* of transition policy—including the policy-relevant political, economic, social, cultural, and geographic factors implicated in structural transitions.

(i) Normative approaches to transition policy⁸

Two approaches from neoclassical welfare economic theory—Pareto efficiency and Kaldor–Hicks efficiency (KHE)—illustrate the two extreme normative positions available in the transition policy debate. A Pareto improvement is a distribution of resources that makes at least one person better off without making anyone worse off. A KHE improvement increases society’s *aggregate* economic resources—it produces *net*-benefits, in the sense of economic gains that outweigh economic losses—but doesn’t imply that there are no *individual* losers/losses (see Kanbur 2003). In theory, the winners from a KHE improvement *could*, assuming costless transfers, compensate the losers and still leave at least one person better off (Hicks 1939, 1941; Kaldor 1938, 550), meaning that KHE improvement is *potentially Pareto-improving*. However, application of the principle does not require that the losers *actually* be compensated (Kanbur 2003; Mishan 1952, 312).

Whether a structural change is policy-induced or otherwise, debates about transition policy are often framed in terms of the opposing poles of Pareto efficiency and KHE. One significant debate is whether transition policy should ameliorate the effect of non-policy-induced structural changes, such as those caused by technological innovation, thus effectively turning a KHE improvement into a Pareto improvement. Neoclassical economists in the 20th century often justified the KHE-improving structural changes associated with globalisation on the ground that self-correcting markets would enable broadly Pareto-improving outcomes, as goods would be cheaper for all, and labour and capital would be redeployed in more productive uses (see Autor, Dorn, and Hanson 2016, 206–8). However, this is not always the case. For example, recent evidence from the impact of China’s dramatic expansion in manufactured goods trade at the turn of the 21st century attests to the persistent distributional effects and long adjustment costs in the United States that can follow from trade liberalisation (Autor, Dorn, and Hanson 2013, 2016). With this maladjustment in mind, a stream of work in neoclassical economics (and related work in public policy) has debated the economically “optimal” design of transition assistance/compensation for structurally displaced workers (Brander and Spencer 1994; Davidson and Matusz 2006; Lawrence and Litan 2012; Neary 1982). This literature often *assumes* that such assistance is justified for reasons of Pareto efficiency, distributional concerns, or political pragmatism.

Since the publication of Rawls’ *A Theory of Justice* (1971) and Sen’s pioneering work on capabilities (e.g. Sen 1993, 1999), philosophers of social justice and social policy have had much to say about individuals’ normatively justified socio-economic entitlements in general (e.g. Lippert-Rasmussen 2015; Nussbaum 2000; White 2003; Wolff and De-Shalit 2007). Every general normative theory of justice has particular implications for people’s entitlements when they have incurred losses. “Luck egalitarians” have argued that people’s welfare (or set of relevant goods, functionings or opportunities) should be sensitive to certain risks that they voluntarily take (e.g. Lippert-Rasmussen 2015). By contrast, “sufficientarians”, “political liberals” and “relational egalitarians” have argued that basic entitlements should not be so

⁸ This section focuses on distributive justice and draws from the author’s PhD (in progress). Future work by the author will review the literature on procedural justice and the role of “recognition”.

sensitive to choice (e.g. Anderson 1999; Rawls 1971). Among these latter groups, relatively little has been said about the normative entitlements of *losers*, where such losers incur their losses from private processes⁹ but retain a level of welfare (or set of relevant goods, functionings or opportunities) above the minimum to which their preferred theory of distributive justice would entitle them. This issue has, however, been explicitly addressed by Goodin (1990, 1995) within a broadly utilitarian framework.

What of losers who incur losses as a result of *legal/policy* change? Mirroring the general discussion of Pareto-improving and KHE-improving policies in general, neoclassical welfare economists ask whether the government should tax the winners to compensate the losers from a policy change (making it Pareto-improving), or should merely implement KHE-improving policies and let the losses and gains lie where they fall (Kanbur 2003). This is, however, a false binary. There is actually very little in the way of philosophical justification that can be said for either position (for a good overview of the historical debate and philosophical criticisms of economic efficiency concepts and their common applications, see Adler and Posner 1999, 189–93; Hausman and McPherson 2006, chap. 9).

More sophisticated normative approaches to legal/policy-induced structural change have been debated in various sub-fields of law and philosophy. The most theoretically mature of these is the transition policy literature in the “law & economics” tradition, though most of this literature is limited to tax transitions and property acquisitions (“takings” in the US context).¹⁰ This literature shares neoclassical welfare economics’ foundational concerns with efficiency and utility, but takes seriously the “repeat play” characteristics of institutions (Shaviro 2000). Scholars in this tradition accordingly seek to develop transition *principles/rules* that would maximise utility or efficiency over the long run. A major limitation of this approach, however, is that one’s preferred principle turns on a range of empirical matters, about which information is typically deficient. This leads scholars in this tradition to reach widely varying normative conclusions on the basis of different empirical assumptions/predictions (for a good overview, see Graetz 1977; Kaplow 1986; Logue 1996; Shaviro 2000; Wonnell 2003)—a problem that afflicts utilitarianism more generally (Lamont and Favor 2016, sec. 5). Moreover, the so-called “empirical” assumptions made are rarely value-free; they typically involve normative considerations concerning what kinds of policy/legal changes people *ought* to expect, and what consequences of such changes they *ought* to be stuck with (Fried 2003).

Other philosophical approaches to transitional issues arising from legal/policy changes have been discussed in the literatures on “legitimate expectations” (A. Brown 2011, 2012, 2017a, 2017b; Buchanan 1975; Green 2017; Matravers 2017; Meyer and Sanklecha 2011, 2014; Moore 2017), “security of expectations” (Bentham 1931; A. Brown 2011; Goodin 1995), and “grandfathering” (Bovens 2011; Knight 2013, 2014). However, it is fair to say that these debates are relatively immature and a consensus on appropriate principles has to date proved elusive (Green 2017).

(ii) Political and social science literature relevant to transition policy

Porto (2012) reviews the economics literature on trade adjustment costs for the purpose of extracting lessons for low-carbon policies. There is also a small political economy literature (in the rational choice tradition) focusing specifically on transition policies, including examination of particular types of transition policies using public choice models (Fernandez and Rodrik 1991; Jain and Majumdar 2016; Jain and Mukand 2003; Magee 2003), statistical analyses of actual transition policies (Gray 1995, 2001; Magee 2001), and case studies (Trebilcock 2014).

A large political science literature addresses the politics of policy reform in general (e.g. Streeck and Thelen 2005), and of environmental and climate policy reform specifically (e.g. Bernauer 2013; Keohane, Revesz, and Stavins 1998). Though too voluminous to mention all of this literature here, Cherp et al. (2018, 181–183) provide a useful overview of the main theoretical frameworks and causal mechanisms utilized by political scientists studying the politics of policy reform, including examples of the application of each to the study of national energy transitions.

⁹ I say losers “from private processes” because much has been said about losers *from legal/policy change*, as noted below in the immediately subsequent paragraphs.

¹⁰ Some of the literature is framed as applying to all kinds of rule changes, albeit with fiscal policy changes and property takings as the most common examples.

Various social science literatures focus on issues relevant to transitions at the regional or sectoral level. Literature on *regional* economic processes is particularly relevant for low-carbon transitions that affect regionally concentrated industries, such as coalmining. Some work in economic geography has emphasized the importance of place-based approaches to investment and innovation (Barca, Mccann, and Rodríguez-Pose 2012; Iammarino, Rodríguez-Pose, and Storper 2017). The evolutionary economic geography (EEG) literature focuses mainly on the aggregate effects of firms' activities on regional patterns of economic growth and innovation, and thus provides useful, firm-centric insights about how regions evolve. On natural resources in particular, recent work has examined the phenomenon of a "regional resource curse" (Fleming and Measham 2015; D. G. Freeman 2009; Iacono 2016; Xu et al. 2016). A broader and longer-standing literature within regional studies focuses on the particular socio-economic challenges faced by so-called "old industrial regions" (Boschma and Lambooy 1999; Cooke 1995; Eckart, Kowalke, and Mazeland 2003; Hudson 2005; Morgan 1997; Steiner 2003), including some case studies of coal mining regions (Baeten, Swyngedouw, and Albrechts 1999; Harfst 2015; Harfst and Wirth 2011; Wirth 2012). The latter intersects with a specific literature on mine closure, which focuses primarily on the effects of mine closures on workers and local communities (e.g. Laurence 2006; Neil, Tykkyläinen, and Bradbury 1992).

Literatures on transition studies and innovation studies are more relevant to the *sectoral* socio-technical transitions implicated by climate change mitigation. These literatures typically encompass a wide range of social actors (those which comprise a "socio-technical regime" or "innovation system") and a considerable portion of them is concerned with sustainability transitions, such as the development of low-carbon and energy-efficient technologies (Dosi 1982; C. Freeman 1997; Geels, Berkhout, and van Vuuren 2016; Kemp, Schot, and Hoogma 1998; Kuzemko et al. 2016; Mazzucato 2015; Mitchell 2008; Perez 2013; Scoones, Leach, and Newell 2015; Turnheim et al. 2015).

Several hybrids of the above-mentioned social science literatures provide particularly useful insights for thinking about *innovation and sectoral diversification in regions*. For example, literature on Regional Innovation Systems (RIS) applies the innovation systems approach (Dosi 1982; C. Freeman 1997) to the study of regional development (Asheim and Coenen 2005; Asheim, Lawton Smith, and Oughton 2011; Cooke 1995, 2013). According to the RIS approach, a region's capacity to adjust to economic shocks and to renew itself through the development of new growth paths is determined by the interaction of firms and other actors within networks and institutions (Boschma 2015). This approach has been widely used in regional innovation policy design, implementation and evaluation (Campbell and Coenen 2017, 4). More recently, the regional focus of the old industrial regions literature has also been combined with approaches from EEG and transition studies (Coenen, Moodysson, and Martin 2015; Truffer and Coenen 2012),¹¹ so as to examine the growth and innovation challenges and opportunities in old industrial regions.

These political and social science literatures provide a useful foundation for the design of transitional policy responses at the community/regional and sectoral levels, though they rarely consider the benefits and drawbacks of specific transition policy approaches and instruments (Coenen, Moodysson, and Martin 2015).

Sectoral and regional innovation occurs within a wider set of political and economic institutions, within which transition policy must be designed and implemented. The "varieties of capitalism" (VoC) literature (see Hall and Soskice 2001) provides a theoretical basis for classifying and explaining variation in transition policies in the light of systematic differences in such institutions. With regard to sectoral innovation, scholars working within a VoC framework have identified the effect of such institutions on variation in the kinds of sectoral innovations that countries produce and in the kind of innovation policy instruments they choose (e.g. Borrás and Edquist 2013; Edquist and Zabala 2012; Hall and Soskice 2001). With regard to regional innovation, Birch et al. (2010) provide evidence that such background political-economic institutions shaped variation in regional diversification strategies and their outcomes across the UK, France and Germany. Stroud et al. (2014), focusing on green transformation initiatives in former coalmining regions, reach a similar conclusion, emphasising the importance of differences in the

¹¹ EEG and transition studies focus respectively on regional patterns of economic growth/innovation, and sectoral socio-technical transitions (the former focusing more on the aggregate effects of firms' activities and the latter engaging with a broader range of actors, networks and institutions) (see Boschma et al. 2017).

institutional capacities for skill development as between coordinated and liberal market economies. Dawley et al. (2015) reveal the importance of political institutions in explaining the varied outcomes of low-carbon industrial diversification attempts in north-east England and Scotland. And in a detailed case-study of a coal plant closure in regional Victoria, Wiseman, Campbell and Green (2017) emphasise the barriers to long-term, cooperative transition planning in Australia, given its liberal market political-economic institutions, fluid and competitive electoral dynamics, and the particular ideational legacies of past policies affecting the relevant region. In the Australian case, the authors point to the importance of private sector engagement in the short term, and institutional reform over the longer-term, as possible pathways to achieve better transition policy outcomes in that country.

Finally, the public policy and administration literature, as well as literature on governance and regulation, has a more explicit focus on *policy domains* that are relevant to low-carbon transitions, such as industry, labour market, regional, and social policy. However, to my knowledge there is no literature on *transition policy* per se, with the notable exception of Trebilcock (2014).

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