UNDERDEVELOPING APPALACHIA: TOWARD AN ENVIRONMENTAL SOCIOLOGY OF EXTRACTIVE ECONOMIES

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DISSERTATION ABSTRACT

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This dissertation uses mixed methods to examine the role of the coal industry in the reproduction of Central Appalachia as an internal periphery within the United States and the economic, ecological, and human inequalities this entails. It also analyzes the related political economy and power structure of coal in a national context. Particularly important for analysis of the region's underdevelopment are the class relations involved in unequal ecological exchange and the establishment of successive "modes of extraction."

I employ a historical comparative analysis of Appalachia to evaluate Bunker's thesis that resource dependent peripheries often become locked into a "mode of extraction" (with aspects parallel to Marxist concepts of mode of production) triggering economic and ecological path dependencies leading to underdevelopment. This historical comparative analysis establishes the background for a closer examination of the political economy of the modern US coal industry.

After sketching the changes in the structure of monopoly and competition in the coal industry I employ network analysis of the directorate interlocks of the top twenty coal firms in the US within the larger energy policy-planning network to examine their

connections with key institutions of the policy formation network of think tanks and business groups. My findings show the importance of the capacities of fossil fuel fractions of the capitalist class in formulating energy policy around issues such as the 2009 climate legislation.

As a contribution to the growing literature applying the concept of metabolism as link between contemporary and classical theory, I examine the conflict at Coal River Mountain from the vantage points of ecology, political economy, and human development in dialectical rotation. Utilizing Marx's method of successive abstractions, the mountain is presented as a nexus of metabolic rifts in the human relationship to the earth's natural systems and an impediment to genuine human development. Finally, I conclude with some implications of this analysis for building a critical environmental sociology of extractive economies.

This dissertation includes previously published materials.

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For the newest generation, Danerys, Epenai, Eli, Max, Gabe and West and the struggle for the world they will inherit.

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CHAPTER I

INTRODUCTION

Appalachia is a place of both great natural wealth and persistent underdevelopment within the most advanced capitalist nation in the world system. While it is not unique in its underdevelopment (the timberlands of the Northwest or Indian lands are other examples), its long history of frequent political and scholarly attention as an example of underdevelopment make it a valuable vantage point from which to examine historical processes and problems of extractive economies. The problems of the Appalachian region are in some ways characteristic of what Amin (1976) has called the "social formations of peripheral capitalism." I believe that what appears as exceptional about the region (i.e. an exception to the prosperity of the US) (Harrington 1997) can in fact be traced to the working of general laws of capitalist development as shaped by the contingencies of history (Amin 2010; Dunaway 1996a). This dissertation has the twin goals of, on the one hand, demonstrating the fruitfulness and necessity of a historical and dialectical approach for examining the social problems surrounding the underdevelopment of the Appalachian coalfields and, on the other, to advance the literature in the political economy and power structure of extractive economies.

The relative importance of relations of production within a peripheral area versus the relations of exchange that link it to the center economies has been a point of contention in the evolution of (neo)Marxist approaches to underdevelopment. In fact, the two aspects are inextricably linked through their material basis as part of the human metabolism with the rest of nature (Foster 1986; Foster and Holleman 2014). A main feature of peripheral areas is their unequal exchange relations with center economies. The exchange relations are unequal in both terms of labor value and natural use values. Approaches that neglect the latter form an incomplete analysis that misses crucial factors for gauging sustainable human development (Bagchi 2005; Bunker 1984; Foster and Holleman 2014). These unequal relations are in turn tied to special features of the subordinated class structure of peripheral areas. The politics and economics of the center

have an asymmetrical effect on the regulation of the social metabolism of the periphery (Amin 1977; Clark and Foster 2009; Meszáros 2008). The overarching argument of this dissertation is that Central Appalachia's reproduction as an extractive periphery within the United States has been a process of unequal exchange contributing to the development of the national economy while degrading the land and people of the region. The historical dominance of coal in the region is built upon path dependencies created by previous extractive practices and continues to be driven by the contradictions between capital and labor as well as the political and material consequences of capitalism's metabolic rift. The reproduction of this regime is dependent upon the ability of coal capital to thwart attempts by competing class fractions, as well as from those below, to undermine its ability to externalize costs. This mode of extraction is able to reproduce itself only at the cost of deepening the underlying contradictions.

The coal industry presents a vantage point from which to examine the political economic linkages that connect the class structure and developmental trajectory of this subordinate region to the wider capitalist system and its class relations. The development of industrial power upon coal was simultaneously a struggle for social power with those who produced it and those who owned it—those who appropriated its rewards and those who suffered its harms (Mitchell 2011; Salstrom 1994; Sweezy 1938). Paul Sweezy pointed to the centrality of social relations around coal to capitalist development in his earliest work on monopoly and competition in the English coal trade:

> The first half of the nineteenth century, the period of capitalism triumphant, is well summed up in three events…First, the opening of the Stockton and Darlington railroad; second, the formation of the first union among the miners; and third, the passage of the Act of 1831. They symbolize, as it were, the industrial revolution, the growth of the proletariat, and the victory of free trade…that such striking examples should all occur in the same trade and within the space of six years…It may be taken to reflect the basic character of coal, without which all of the other developments would have been impossible. (1938:55)

Until eclipsed by oil, coal was the fundamental commodity of capitalism's fossil energy regime (Foster and Holleman 2012; Podobnik 2008; Sweezy 1938). The coal industry has been a flashpoint of labor struggle and has sparked environmental movements from the local environmental justice battles to the global level in the fight against climate change.

The social and environmental histories of coal are part of evolving metabolic processes at the local, national, and global scales. While the peripheralization of Appalachia predates the importance of coal extraction, its continued reproduction as a periphery cannot be understood without examining the place of coal in the center of the political-economic system to which the region remains an appendage.

Marxist Ecology and Political Economy: The Importance of Marx's Method for Integrating Ecology and Sociology.

The foundations of modern environmental sociology in the US began in the 1970s with criticism of the larger discipline's tacit (or sometimes explicit) acceptance of human exemption from the laws governing the rest of nature (Catton and Dunlap 1978). The importance of political economy in shaping social-environmental relations was subsequently established as a pillar of US environmental sociology with Schnaiberg's (1980) publication of *The Environment* and its "treadmill of production" approach. There has since been a growing body of literature showing the integral connection of classical social theorists' (i.e. Marx, Durkheim, and Weber) views on the laws of nature and what may be called "laws" governing human societies (Foster 1999a; 2000; Foster and Holleman 2012; Rosa and Richter 2008). The classical social theorists, particularly Marx and Weber, were less hindered by the academic boundaries of disciplines than later writers and it is arguably this fluidity and breadth that should give their ideas an enduring foundational status in sociology.

Once the first step is made in rejecting the "human exemptionalist paradigm" that treats humankind as somehow separate from the rest of nature we must also recognize that "[the] intrinsic unity of social and natural science is, of course, a logical corollary of the intrinsic unity of humanity and nature" (Burkett 2005:50). However, to deal with this unity in a productive way that is capable of recognizing both unity and difference in human social systems and the rest of nature requires a dialectical process of abstraction. As a historical science, this is no less true for ecology than for sociology.

> Both the internal theoretical needs of ecology and the social demands that it inform our planned interactions with nature require making the understanding of complexity the central problem. Ecology must cope with interdependence and

> relative autonomy, with similarity and difference, with the general and the particular, with continuity and discontinuity, with contradictory processes. It must become increasingly self-conscious of its own philosophy, and that philosophy will be effective to the extent that it becomes not only materialist but dialectical" (Levins and Lewontin 1985:160).

No figure has contributed more to the materialist application of dialectical reasoning and its central problem of abstraction than Marx. Marx studied materialism from Epicurus and Lucretius, to its foundation of the scientific revolution in Europe, and, as is made clear in his famous critique of Feuerbach, drew on Hegel's development of dialectics to push beyond a simply contemplative materialism (Foster 2000). Marx's influence in this regard is not limited to social science. Recent work has shown the interface of Marx's materialist and dialectical ideas with the discipline of ecology from its earliest to days to the present (Foster 2013; Foster and Clark 2008; Padovan 2014). For scientists working to understand the complexity of life on earth, especially its social forms, the problem of abstraction is central: how to tease out different aspects of a complex and constantly changing world for study and the advance of knowledge (Haila and Levins 1992; York and Mancus 2009).

From London, Marx traced out social relations across space: the growing world economy, and time: back through human history. Holding to Hegel's maxim, "The truth is the whole," Marx set about his analysis of capitalism by tracing back through time how the system's most developed representation came into being (Fracchia 1991; Ollman 2003; Paolucci 2007). As his study of British capitalism informed his analysis of the wider world, what he found about the history of British and other contemporary examples of capitalist development brought into focus new aspects of his British case. His materialist approach also led him early on to reject the division of social and natural science. In a draft of their work *The German Ideology* Marx and Engels wrote, "We know only a single science, the science of history. One can look at history from two sides and divide it into the history of nature and the history of men. The two sides are, however, inseparable; the history of nature and the history of men are dependent on each other so

long as men exist" (1845).[1] Their method of inquiry rejects attempts, common today, to artificially divorce questions about socioeconomic systems of production, distribution, and ideology from questions about the natural systems of the world that form their foundation and ultimately determine their sustainability.

Key aspects of Marx's method include an ontology of "internal relations" that takes *relations*, and the *processes* they imply (rather than ontologically independent, externally related "things") as the units of analysis (Ollman 2003; Paolucci 2007). A consequent effect is that analysis must take place from distinct *vantage points* within a web of relations, and at different *levels of generality*, according to the problem at hand (see figure 1.1).[2] The interaction between processes operating at different levels of historical and structural generality is critical for probing social-ecological problems (York and Mancus 2009). For example, what can be generalized of humans as a species of animal like any other is distinct from what can be said of human societies in general, class societies in general, capitalism in general, or even capitalism's modern form in particular. At each successive level the systemic relations are subject to the constraints of the broader levels but also exhibit emergent "laws" within these that interact with historical contingency. This multi-level conception of systems and causality emphasizes that the constraints of "higher" levels, of human societies in general, for instance, shape but do not determine in mechanistic fashion the operation of systems at narrower levels of generality, for example, that of class societies or capitalism. The potential also arises of chance occurrences at one level of causation forming path dependencies, i.e. structural constraints, at other levels.

For example, one might argue that capitalism became self-reproducing and dominant first in Britain due to national level causes (be it the contingent, from a social vantage point, location of coal deposits or the structurally evolved economic situation of

[1] Some theorists within the broader tradition, such as Moore (2011), have rejected this notion that it is possible to abstract the relation from two sides as representing a Cartesian dualism, rather than a dialectical unity as Marx and Engels treat it here.

[2] Levels of generality represent scales at which the abstractions of abstract/general and specific/concrete are made, the highest level involving the properties of matter and energy and the lowest concrete historical individuals (which Marx himself involved with as part of the communist project (CP))(Ollman 2003:86-98; Paolucci 2007:114).

the peasantry) distinguishing it from the general capitalist tendencies emerging across Western Europe. Alternatively, one could emphasize the British relationship with the New World colonies providing food and fiber that allowed it to overcome historical limits of its own land-base (limits similar to those faced by other hypothetical candidates

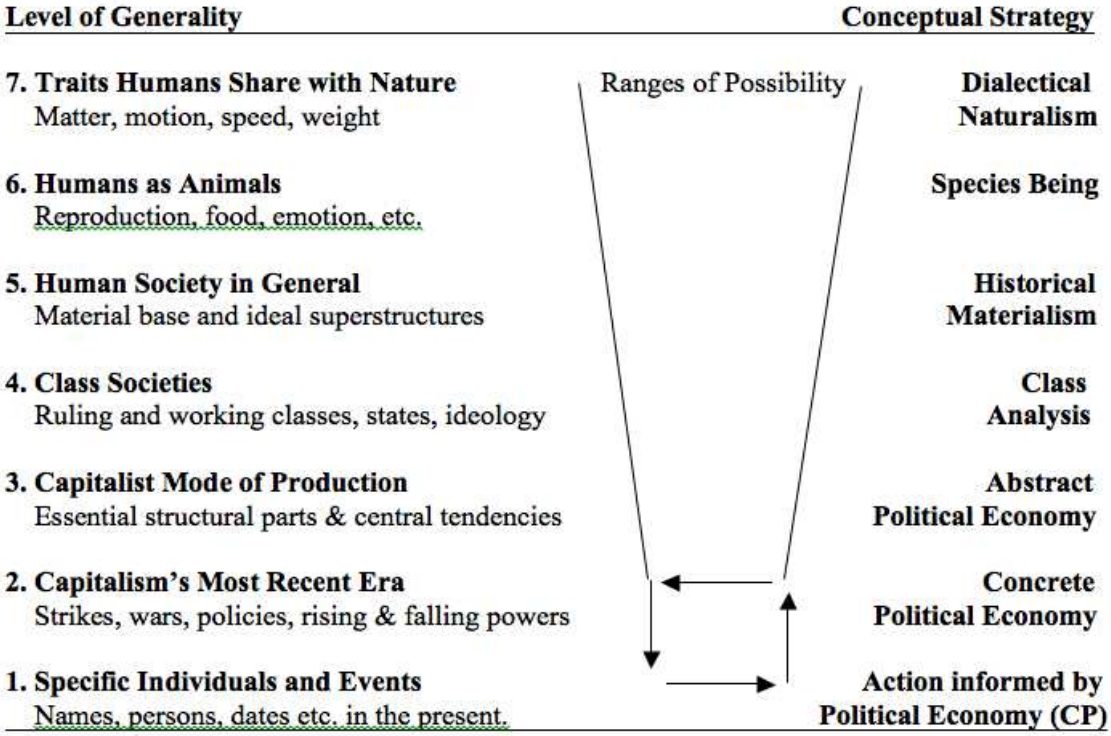

Figure 1.1. Marx's Levels of Generality and their Associated Conceptual Strategies (adapted from Paolucci 2007: 114)

for capitalist development) (Pomeranz 2009). However, it is clear that once British capitalism was fully established, it's hegemony created constraints on all subsequent development in the evolution of capitalism at a world-system level. Britain's fortuitous natural conditions allowed for the development of social relations that would restructure the world socially and ecologically (Moore 2000).

Marx's ecological conceptions about the natural world form a "higher" level of generality that structures his theories at the "lower" levels of human societies and, lower still, the political economy that he fashioned to express the laws of capitalist economies and states. Marx's method underlines the ways in which transhistorical (including ecological/biophysical) problems of production in general are confronted by the specific

and concrete historical forms of different modes of production with their socialized needs and means of fulfilling them (Fracchia 2004). Historical Materialism is a non-reductionist paradigm that can move fluidly between the levels of generality appropriate to laws of ecology and laws of societies. Marx and Engels recognized in Darwin's theories the same dialectical principles at work, if resting upon different key elements (e.g. random variation and natural selection), as the process of contingent historical development of society they had sought to lay out in their unpublished work *The German Ideology*. The great methodological challenge in science lies at the borders of where mathematical modeling and the like can be applied at a given level of abstraction and where the level of contingency and the unknown require a more qualitative and historical analysis (cf Amin 2010). This challenge holds true across the disciplinary boundaries of ecology and social analysis (Amin 2010; Haila and Levins 1992; Lewontin and Levins 2007; York and Clark 2011). For social scientists concerned with the increasingly dire question of societies' coevolution with their environments such an encompassing approach is essential.

Literature Review

Contradictory processes that on the one hand homogenize societies, and, on the other, polarize and differentiate societies characterize capitalist development. These processes operate at multiple spatial scales: North to South, nation to nation, region to region, urban to rural. There is, of course, a natural differentiation in geography on which explanations of development patterns have been based, some more geographically determinist (Diamond 1997; Lenski and Nolan 1984) and some more dialectical (Bunker and Ciccantell 2005; Cronon 1992; Pomeranz 2009).[3] The power of the social in the explanatory tension between geography/ecology and social relations for development patterns is arguably weighted toward the social with the historical replacement of "first nature" by "second nature" and the rapid development of the forces of production (N. Smith 1984). Capitalist development involves both an increasing division of labor and an expanded "division of nature" that are uneven in space (Foster 1999b). Spatial effects are also implied in Marx's discussion of the centralization of capital, the uneven penetration

[3] Baran (1962)and Frank (1979) both make reference on occasion to geographical factors in explaining development trajectories (e.g. Europe's location for maritime development and the climate in North America's effect on the division of labor between it Europe, and the West Indies).

of capitalist forms and productive relations into different regions, the place-based power of landed classes and rents, and, last but not least, the importance of the territorially defined modern State. From a review of these, Edel et al. (1978) conclude that, while there are various insights, it is difficult to attribute any coherent or singular "law of uneven development" as applied to regions by Marx himself, though later Marxists such as Lenin, Trotsky, and Luxemburg do treat the issue somewhat more directly.

Dependency and world-systems traditions in sociology have focused on the uneven spatial development of capitalism at the nation state level between core and peripheral areas of global capitalism (Amin 1974; Baran 1962; Wallerstein 1974). There is not a developed sociological literature on "internal peripheries" *per se,* rather a number of works have extended the core-periphery model of radical approaches from other scales to the regional. In their introduction to a special issue of the Review of Radical Political Economics, Edel et al (1978:1) set the goal of filling a gap in radical approaches to uneven development: "The spatial dimension has been incorporated explicitly in two distinct traditions of radical thought: studies of international development and imperialism, and studies of urban political economics. Neither of these literatures, however, addresses *regional spatial differentiation within the nations at the center of the world capitalist order* [emphasis mine]."[4] "Internal colonialism" is a term that was used casually in related literature and then became a more systematic approach that was widespread in the early 1970s. Many uses of the concept have been criticized for unconvincing application and confusion of issues of nationalism and the causes of regional poverty (Billings 2009; H. M. Lewis, Johnson, and Askins 1978; Lovering 1978; Walls 1978).[5] The internal colony model too often fell prey to homogenizing the class

[4] Edel (1992) does note that some anarchist or utopian socialist authors have put forward proposals for future social organization based around regional autonomy. However, these are not connected to a broader and rigorous systematic framework for understanding existing relations of dependency and uneven development in the same way the Marxist tradition is.

[5] There are scattered references to "internal colonies" in the work of dependency theorists. "It is thus no exaggeration to say that the main source of primary accumulation of capital in Japan was the village which in the course of its entire modern history played for Japanese capitalism the role of an internal colony" (Baran 1962:155). Similarly the "Southern states" are said to have "represented for a long time the internal colony of American capitalism"(Baran 1962).

interests within regions and focusing on distribution at the expense of productive relations.

Debates about regional underdevelopment have reflected the international literatures' divisions over the proper integration and relative explanatory weight of internal class dynamics of accumulation and the exchange relations linking an area to the larger system. The "staples theory," pioneered by Canadian political economy, has always had a regional component, but one limited to certain types of settler societies with resource extraction centered economies (Watkins 2006).[6] The Maritimes of the Atlantic region of Canada have been the subject of analysis of what can be considered an internal periphery (Barrett 1980). Veltmeyer (1978) locates the region's underdevelopment in its large reserve army of labor in contrast to the centralization of capital in Central Canada. Wood (1989) criticizes Veltmeyer and suggests that the process of incorporation may have created an insufficient proletariat, and, instead of a reserve army contributing to higher rates of exploitation, the region's rate of exploitation may have been *too low* to offset increased transportation costs. This debate also reflects controversies between orthodox Marxists' emphasis on the fundamentals of modes of production and World System and Dependency writers' use of exchange and transfer of surplus as additional explanatory factors (Foster 1986; McNally 1981). At the heart of the matter is the problem of social formations, integrated into the capitalist world system, that contain capitalist and non-capitalist productive relations and how these relate to the accumulation of surplus value based upon capitalist class relations.

Paul Baran (1962) introduced the concept of economic surplus as a more encompassing supplement to Marx's concept of surplus value (Baran and Sweezy 2012) as part of a method to deal with the complexity of peripheral social formations. Because the class structures of peripheries are subordinated politically and economically, the extraction of surplus labor at the point of production must be understood within the larger system that reproduces their class relations. "In circumstances such as these, the issue of the expropriation of surplus labor, i.e., the issue of exploitation and class, is less than ever

[6] Although staples theory originated from fairly orthodox considerations, it was later expanded upon by radical and Marxist theorists (Watkins 2006), most recently by Bunker and Ciccantell (Bunker 1989; Bunker and Ciccantell 2005).

divorced from the issue of the utilization of the surplus product, which stands between the level of production and the reproduction of society as a whole" (Foster 1986:169). It is precisely because the conditions of appropriation and utilization of the surplus and those of its production are so complicated in the periphery that a mechanical application of Marx's model of capitalist accumulation in the center is insufficient. Building on Baran, Samir Amin proposed a new model of "accumulation on a world scale" (Amin 1974). For some Marxists, however, theorists like Baran and Amin

> were "guilty" of advancing an understanding of accumulation in a class society that did not stop at what went on within the labor process itself, but also considered the matter in terms of the larger multifaceted context of social reproduction as a whole. And this demanded the scrutiny of various parasitic elements like merchant capital, a deformed peripheral state, foreign capital, etc.- even though the direct connection of these particular interests with production itself was tenuous at best (Foster 1986:191).

The South, as a classic example of a social formation with complex class relations of production, has long been discussed as an internal periphery or internal colony of the United States (Agnew 1987; Baran 1962; K. Fox 1978; Frank 1979; Malizia 1978). As a slave economy inside capitalist nation state, the South represented a social formation whose productive relations could not be analyzed without the role of the larger capitalist system in shaping its class dynamics. Marx also commented on this relationship and its class and political aspects, not the least of which being the Civil War. For example, he noted "as soon as people, whose production still moves within the lower forms of slave-labour, corvée-labour, &c., are drawn into the whirlpool of an international market dominated by the capitalistic mode of production, the sale of their products for export becoming their principal interest, the civilised horrors of over-work are grafted on the barbaric horrors of slavery, serfdom, &c. Hence the negro labour in the Southern States of the American Union …[came to be governed by] a question of production of surplus-labour itself" (Marx 1990:345). The quarter century after the Civil War saw the definitive subordination the South to the industrializing core in the North (Agnew 1987).

Indeed, given its long peripheral status, the evidence of convergence of levels of economic development in the South with the rest of the US has been a major historical shift in the economic geography of the US (K. Fox 1978; Malizia 1978). Fox (1978)

attributes this to capital's flight from the increased strength of labor in older industrial regions and to a historical trend away from the importance of natural resources in regional development patterns. However, Fox does not give adequate consideration to the problem of sufficient outlets for surplus as an additional motivation for monopoly capital's investment in a "spatial fix" that the capital-intensive urbanization process of the South offers, nor does she deal with the persistence of smaller regions such as Central Appalachia where natural resources continue to play a powerful role (Harvey 1996; Latimer and Mencken 2003). Despite a historical convergence, significant spatial social inequalities remain, and are now reproduced at more variegated geographic scales within the South along racial and rural-urban dimensions (Deavers and Hoppe 1992; Lobao 2004; Ziliak 2012a). Such outcomes should draw our attention to the causes of persistent peripheralization.

Contemporary with Fox's study, Malizia (1978)found evidence of unequal exchange within the US: significantly lower wages in the South despite identical labor productivities. While unequal exchange in terms of "more labour in exchange for less,… this difference…pocketed by a particular class" was described by Marx (1991:345) as contributing to the benefit of the developed countries at the expense of the colonies, the full development of unequal exchange in labor value was completed by Amin (1976; 2010). Amin (1977) also recognized early on the importance of non-labor unequal exchange in the form of destruction or transfer natural wealth between the center and the periphery. However, the full development of a theory of unequal ecological exchange and its relation to unequal exchange of labor value remains incomplete (Foster and Holleman 2014). This is true as well at the subnational scale. One of Amin's controversial contributions is that, in part, the way internal disparities are lessened in center nations is through increased surplus made available by penetration of monopoly capital in the periphery (a share of which the "aristocracy" of labor has won.) This results in more polarization at the global scale. But, expansion of multinational corporations is in many ways an extension of the spatial division of labor that was developed *first within the US* by large corporations in the early 20th century (Hymer 1979; Porter 2006).[7] Therefore, it

[7] These corporations practiced the discharging of new armies of reserve labor in the center as certain types of production moved to the periphery in stages, first national, then international. However, natural

is plausible that a similar process may have occurred within the US between the monopolistic, often unionized, industries such as steel and their suppliers of inputs. However, such a process creating regional effects would be checked to a degree by the greater mobility of labor between national regions relative to nation states.

Dependency and World-Systems theorists' regularly recognized such uneven development within the nation state as part of the global system, even as their focus remained on nation states. Frank's dependency theory posited the "the contradictions of capitalism are recreated on a domestic level and come to generate tendencies toward development in the national metropolis and toward underdevelopment in its domestic satellites just as they do on the world scale… the regional, local, or sectoral metropolises of a satellite country find the limitations of their development multiplied by a capitalist structure which renders them dependent on a whole chain of metropolises above them" (Frank 1967:10-11)**.** Amin observes "The mechanisms of centralization for the benefit of dominant capital also apply as between different regions of the center: the development of capitalism is everywhere a development of regional inequalities. Thus, each developed country has created its own underdeveloped country within its own borders" (Amin 1974:27). However, "[d]ependency theory thus seems to suggest that internal peripheries, if they exist, are not analogous to the world periphery. Permanent or increasing polarization need not occur…The issue is not whether there can be internal peripheries, but rather *what conditions might allow them to exist, and whether those conditions are being overcome in at least some cases*" (C. K. Edel et al. 1978:7 emphasis mine). Edel et al. offer some orienting variables for consideration "(1) the degree of local or non-local control of production; (2) geographic market orientation; (3) the mix of pre-capitalist, competitive or monopoly relations of production; (4) the extent of local State autonomy and power; and (5) local resource endowments" (1978:10). These, they say, should be considered within the context of the wider political economy they are embedded in and the region's class structure and forms of class-consciousness. Smith (1987) also emphasizes the analysis of contingent regional dynamics within the world-system processes operating at broader levels of abstraction. The uneven overlapping of state

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conditions and the development of the forces of production around transport and extraction form historical limits to this process.

regulatory, economic, and ecological processes complicate the study of internal peripheries. The question of state boundaries is particularly relevant for internal peripheries.

Marx and Engels argued "the bourgeoisie has at last, since the establishment of Modern Industry and of the world-market, conquered for itself, in the modern representative State, exclusive political sway. The executive of the modern State is but a committee for managing the affairs of the whole bourgeoisie" (Marx 1978:475). Yet to perform this role it follows that the state must have a degree of autonomy from the competing fractions of capital. Virtually all theories of the state recognize its relative autonomy and the importance of its role in the development process. Marxist (Miliband 2009; Poulantzas 1978) and other class-dominance theories of the state (Domhoff 1990; 2010; Gonzalez 2001; Mills 2000a; Mizruchi 2013) are centrally concerned with the political process by which dominant class interests determine their shared interests and maintain their hegemony over state power in the face of internal division and challenges from other social groups. In world-systems theory competing nation states play a key role in maintaining capitalism as a world economy rather than reverting to a world empire. Wallerstein (2004) summarizes state functions as follows: 1. They determine what crosses their borders. 2. They maintain regimes of property rights. 3. They determine the rules of the labor process. 4. They determine which costs firms must internalize through regulation and public investment. 5. They control monopolization of goods and activities. 6. They levy taxes. 7. They apply pressure to the decisions of other states. Subnational levels of government do all of these things as well, but they do so in a manner proscribed by their subordinate position within the larger state structure. The variation of influence by different social groups at the different levels of state power can make for complex configurations of social regulation and conflict. Not only the willingness, but also the capacity of the state to effectively intervene at different scales is an important question affected by the balance of class forces and fractions (Bunker 1985). National boundaries are firmer boundaries than regional and state boundaries, they are more capable of regulating the flow of labor, capital, and commodities. Regions often lack a coherent political structure. Regions created by a shared a watershed, coal seam, or other

landscape features may be both united and divided among a hierarchy of multiple state boundaries.

Since the peak of radical political economy in the late 1970s there have been a number of important studies of internal regional peripheries in the US. The foremost being David Walls rejection of the then dominant colonial model in favor of viewing Appalachia as an internal periphery in the world-systems tradition (Walls 1976; 1978). Some later scholars have examined the regional patterns of the US as a whole (Agnew 1987) while others have focused more on particular regions (Driscoll and Kick 2013; Dunaway 1996a; Leitner 2004; Taylor 2004) and a few down to the county scale (Hanna 1995). With the exception of Hanna, none of the literature examines the reproduction of Appalachia as a periphery post-Civil War, nor advances a framework to integrate the nature of unequal exchange occurring with the class structures that reproduce it.

I posit that a major factor allowing internal peripheries to exist and persist over the long term, distinct from labor immobility or labor market segmentation as seen in racialized or "internal colonial" configurations, are the socio-metabolic dynamics involved in successive modes of extraction. Locally dominant classes in competition and collaboration with national elites have reproduced Central Appalachia as an extractive periphery, first building a metabolic regime that matured around a mode of extraction premised on super-exploitation and profits by deduction. Following the national rebalancing of class forces during the New Deal and WWII the coal economy produced a new metabolic regime whose central contradictions of dependent development revolved around the reproduction of the region as an environmental sacrifice zone. The concept of mode of extraction can highlight the complex and peculiar interaction of class relations of production and the appropriation and utilization of surplus that emerge from the contradiction of capitalist valuation and the natural basis of extractive commodities.

Reformulating Bunker's mode of extraction. A mode of extraction must be rooted in a particular space where the extracted resource is located. This problematizes the overlap of political, economic, and ecological boundaries. As Bunker remarked:

> The concept of regions, or regionally defined social formations, and of regional ecosystems are crucial to analysis of extraction-production relations. Modes of

> extraction may emerge within nations dominated by modes of production; Appalachian mining and northwestern forestry in the United States are easy examples; Amazonian extraction and the growing industrial plant of south-central Brazil provide another. Inclusion of extractive regions under the authority of modern industrial states requires us to pay close attention to the different boundaries of overlapping political, legal, economic, social, and ecological systems (Bunker 1985:57).

Theories of underdevelopment involve both the "internal" political economy of the region in question and the "external" articulation it has with the larger world-system. An extractive region is by definition peripheral because it is a social formation oriented towards meeting the material demands determined in productive centers elsewhere. Therefore, internal structures must always be analyzed in relation to the influence of the center or core economies to which it is tied. The relationship between center and periphery is one of unequal exchange, both in economic value and in natural use values of the earth.

Although Stephen Bunker (1984) is widely viewed as the first modern theorist to directly employ the concept of unequal ecological exchange (Hornborg 2009; Jorgenson and Clark 2009; Rice 2009), direct and indirect references can be found in earlier literature (Foster and Holleman 2014). Nevertheless, his analysis had significant impact on the discipline. In his first major book on the subject Bunker argued "production models cannot explain the internal dynamics of extractive economies because the exploitation of natural resources uses and destroys values in energy and material which cannot be calculated in terms of labor or capital" (1985:22). Instead, he proposes an economic model with an unequal and dialectical relationship between "modes of production" which primarily transform materials and energy and "modes of extraction" in which materials are directly appropriated from nature.

> Because this appropriation and its ecological results affect the class structures, the organization of labor, systems of exchange and property, the activities of the state, the distribution of populations, the development of physical infrastructure, and the kinds of information, beliefs, and ideologies which shape social organization and behavior, I introduce the idea, mode of extraction, to suggest the systemic connections between these phenomena. My usage thus parallels the more inclusive definitions of mode of production… I will argue, though, that both modes of extraction and modes of production can only be understood in terms of their integral interdependence and their impacts on natural ecosystemic processes.

> Orthodox Marxist notions of the reproduction of modes of production must be reformulated to account for these ecological interdependencies (Bunker 1985:22-3).

Despite initially dismissing too quickly Emmanuel (1972) and Amin's (1976) labor value focused theory of unequal exchange and flirting with reductionism toward energetics, Bunker made some key insights that he continued to develop over his lifetime. As Bunker (2007) later came to recognize, Marx himself had recognized these ecological interdependencies and the problems of their spatial disruption in his theorizing of capitalism's metabolic rift (Foster 1999a). The problem with "productive models" neglecting the values Bunker identified as critical to extractive economies was a real reflection of the contradictory functioning of capitalist production.

Bunker advanced the linkages between the socio-natural relations of his mode of extraction and its correlation with persistent underdevelopment, yet struggled to satisfactorily theorize the relationship of natural wealth and exchange value:

> Regions whose economic ties to the world system are based almost exclusively on the exchange of extracted commodities (that is, resources which occur in nature and in whose existence or continued reproduction there is no deliberate human intervention), can be characterized as extreme peripheries because of the low proportions of capital and labor incorporated in the total value of their exports and because of the low level of linkages to other economic activities and social organization in the same region. (Bunker 1985:24).

For Marxist labor value approaches, the "low proportions of capital and labor incorporated in the total value" of exports is a reflection of the high importance of rents and the transference of surplus value (Foster and Holleman 2014; Higginbottom 2014). Indeed, the concept mode of extraction should serve to highlight the implications for the geographical flows of value as these forms of income accrue to different classes in different locations. Extraction is geographically tied to the location of the resource and to the extent this separates it spatially from other economic activity the advantages of "external economies" are denied. Bunker's work (Bunker 1989; Bunker and Ciccantell 2005) drew more explicitly on Harold Innis's (1956) investigation of why some areas transitioned out of extractive, export led, development better than others. The dependence of a regional economy on a single or handful of extractive commodities increases structural vulnerability to fluctuating markets and tends to raise difficulties in creating

final demand linkages (Watkins 2006) that are necessary for auto-centric development. Yet, these peripheral regions may be subordinated to core regions within the same or different nation state boundaries so that the long-term vulnerability of these regions varies accordingly. A peripheral region within a nation state that is ascendant in the world system may have better prospects for political demands for redress of the problems of underdevelopment.

The development of the forces of production in extractive economies has an inverted relation to that in "productive" economies. By accelerating resource depletion productivity-enhancing innovations often shorten the period of prosperity while increasing dependency on capital imports from outside the region. Furthermore, the development of productive forces often reduces the need for labor, which can further limit effective demand in the region. This is in contrast to the agglomeration effects and external economies associated with economies of scale created by production in urbanizing areas (Bunker and Ciccantell 2005).

Rather than the theoretically eclectic approach to unequal exchange upon which Bunker originally built his concept of "mode of extraction," I propose to reground this concept within a consistently Marxist framework. I argue that "orthodoxy" in *method* (Lukács 1968) is actually essential for improving the conceptualization of a mode of extraction with the kind of explanatory power desired by Bunker. Marx highlighted the special case of "the extractive industries, such as mining, hunting, fishing (and agriculture, but only so far as it starts by breaking up virgin soil), where the material for labour is provided directly by nature" (1990:287) as an exception to the typical relations governing the labor process and valorization process under capitalism. The destructive practices encouraged by the free appropriation of these materials, their self-undermining character under capitalism, and the contradiction between wealth and value were, contrary to Bunker and others' assumptions, not overlooked by Marx's value theory but at its heart (Burkett 1999a; 1999b; Foster and Holleman 2014). The unitary nature of value and price cannot be made commensurable with the many-sided forms of wealth that exist in the relationship of humans to the rest of nature. It is this heterogeneous, historically specific and concrete aspect of wealth and its appropriation or destruction that

is so difficult to reconcile with the homogeneity of capital accumulation. Marx conceived of extraction under capitalism as a special case of capitalist production that could be identified as having general properties in the abstract, but subject to specific constraints based on the diversity of concrete historical forms taken.

Reviewing Paolucci's (2007) arrangement of the moments of Marx's analytical method allows for a theoretically consistent reinterpretation of Bunker's (1985) concept of "mode of extraction" in a Marxist framework. "The categories that make up determinant abstractions – the abstract and the concrete, the general and the specific – allow for four 'synthetic unities,' ranging from the most specific and concrete to the most general and abstract" (Paolucci 2007:164). The *specific concrete* represents history in all its detail and contingency while the *general abstract* represents the most universal laws *within a given level of generality*. These synthetic unities can therefore be applied within each level of generality iteratively as a process of successive abstractions.

> To be a submode – class systems as a submode of production in general and/or capitalism as a submode of class systems – a concrete reality must possess all the essential qualities of a general category (identity), and possess a unique institutional configuration that sets it off from other submodes of the same category (difference)… For example, once capitalism (general concrete) is abstracted out of class systems (specific abstract), it can be re-abstracted as a specific abstract category and then broken down again – always using observations of the specific concrete – into its own general concrete subcategories [e.g. industrial capitalism or monopoly capitalism]… (Paolucci 2007:166).

What Paolucci is describing is the necessary relationship between abstract theoretical categories and concrete empirical data as Marx's method proceeds. "This method of gaining historical knowledge recognizes the existence of an inescapable epistemological tension between conceptual and empirical analysis, and it is a method of dialectical movement between them. The role of theory is to reach the inner bond behind the empirical data, and that of empirical analysis is to correct theoretical abstraction. Each is necessary, and each alone is insufficient" (Fracchia 1991:172).

Identity and difference: extraction and production in capitalism. Taking the capitalist mode of production as the *general abstract*, and the world-system as the *general concrete*, I abstract out submodes upon two poles in the method of accumulation

by capitals—those based primarily upon the transformation of raw materials, the subject of previous labor collected from any space and those situated mainly around the direct appropriation of raw materials, of necessity, within particular spaces in nature. The identity is that they are moments of capitalist production in general, and are organized under the drive of capitalist accumulation and the worldwide law of value (Amin 2010), while the difference is found in their geographical separation in space and, relatedly, the configuration of capitalists involved and how they appropriate and utilize surplus value.

In the cases Bunker treats as typical of "modes of production" surplus value is appropriated as profit in the sense of Marx's basic capitalist model—from the productive labor of workers employed directly by the capitalists involved (including both formal and real subsumption of labor)—with the object of labor being the product of previous labor. In the instances of Bunker's "modes of extraction" the greater portion of the potentially realizable surplus value in the price of the commodities produced constitutes a resource rent (primarily differential rent, but also possibly "absolute" or monopoly rent) on a natural resource *subject to exhaustion*, rather than the value contributed by labor in the extractive process itself (see (M. Edel 1992) on forms of rent).[8] When the resources in question are controlled by the same fraction of capital engaged in extractive production (that is "freely appropriated"), this additional potential surplus does not appear as a distinct rent but simply as higher profits due to greater productivity and/or monopoly power. The mode of extraction approach can provide a stronger ecological dimension rooted in the specific nature of the use values involved compared to the typically one-sided political emphasis around "resource curse" theorizing of rentier economies (while recognizing that dimension as well). The importance of struggle over the size and realization of this rent/monopoly surplus and the constraints inherent in the appropriation of natural use-values is what distinguishes the class dynamics in an "extractive" mode. These constraints have a spatial component as resources are located in particular areas and rich deposits tend to be located further and further from established productive centers as the closest are depleted over time (Bunker and Ciccantell 2005). As a result, transportation infrastructure linking resources and productive centers is a key factor in the

[8] Of course, this value realized as rent is a claim on socially necessary labor produced elsewhere in the system.

capture of rents. While elements of this spatial differentiation of the production process in general exist in tributary societies and feudalism, their full development and their relation to the law of value is only visible in capitalist society and its world-system ((Amin 2010), see also (Pomeranz 2009) on the historical novelty of persistent peripheries).[9]

Marx developed his own value theory out of a critique of previous labor value approaches in classical political economy. Classical political economy had long recognized the contradictory relationship between use values and exchange values. "Marx analyzes human history from the standpoint of the production of *wealth*, defined as *use values*, that is, anything that (directly in consumption or indirectly as a means of production) satisfies human needs" (Burkett 1999a:25). Exchange values have a precondition of usefulness but also require an element of scarcity. The Earl of Lauderdale pointed out the paradox that a loss of useful public wealth that created scarcity could increase private riches through generating exchange value where before there was none (Daly 1998; Foster, Clark, and York 2010). Marx drew on Lauderdale, but went much further in developing his analysis of the underlying contradictions between use values that make up public wealth and capitalist forms of valuation. In classical political economy the theory of rent was used to explain the valuation of nature, which is not the product of human labor. Unlike Ricardo, Marx recognized that natural conditions could be degraded or improved by human activity and incorporated this into his criticism of capitalist agriculture and his theory of rent (Foster 2000; Nwoke 1984). Where there is no effective scarcity of a natural use value it is freely appropriated by capital. It is only where scarcity exists by virtue of the monopolization of some natural use value that the owner can demand a portion of the surplus value produced from capital. For Marx, the existence of rental charges manifested the tension between the material dependence of capitalist production on use values found in nature and their abstract valorization as "free gifts" in the production process. Likewise capital's reliance on the reproduction of labor power by households, particularly when they engage in subsistence activities, constitutes

[9] Pomeranz (2009) argues in a historical comparative study of Western Europe and China that the creation of raw material producing peripheries that are persistently subject to unequal exchange required the historical development of a sufficient gradient of technology that could not simply be adopted by the periphery when terms of trade became onerous. Capitalist development of industrial technology and the political force of imperialism were the necessary impetus to the reproduction of resource peripheries through market relations.

another manifestation of the contradiction between use value and exchange value. "These activities certainly involve appropriation of natural wealth including not only extra-human natural conditions…but also the natural force of household labor power. But the maintenance and development of exploitable labor power associated with such domestic activities is *freely appropriated* by capital. It is a use value, not a value" (Burkett 1999a:105). Such free appropriation of the metabolic activities of households is a pervasive part of the modern capitalist world system and is intimately connected to the unequal exchange of labor values and natural use values that occurs along commodity chains along the core-periphery continuum (Dunaway 2001; 2012; J. Smith and Wallerstein 1992).

In Europe rents accrued to a distinct landlord class, but such a class distinct from capital was never present in the US. However, rent can also applied to claims on the surplus value made by the State. "In Marx's view, there is no reason why such rents cannot be designed and enforced by the state" (Burkett 1999a:94). The State crucially is capable not only of claiming land and resource rents for itself but of determining the legal basis upon which capital may freely appropriate or be forced to pay for natural use values. A severance tax on minerals is an example of the former, while the granting of eminent domain, permission to dam or redirect waterways, and the terms of nuisance law are examples of the latter. The State is the venue of conflict over so-called externalities both through the regulatory process and the courts. Unless regulation effectively forbids certain environmental practices, it, in effect, sets a price for them. However, these costs are not and in the many cases of non-renewable resources could never be equivalent to the costs of reproducing the appropriated use values or the web of surrounding ecological relations disrupted in the process (Burkett 2006; Perelman 2003). The price of coal reserves, for example, is, in effect, the capitalization of the rent they are capable securing. "Mining rent can be defined in general terms as the difference between the market price of a unit of mineral resource sold in the form of finished products and the total average costs [including amortization and average profit] incurred in discovering, producing, transporting, refining, and marketing the unit of that particular mineral resource" (Nwoke 1984). State policy that affects the demand for all coal, certain types of coal, or the

production process in turn affects such rents and therefore price. This brings to bear different class fractions upon relevant state policy.

Marx analyzed the shifting alliance of forces between the landed classes, labor, and capital over agricultural and industrial policy in his day. The treadmill of production approach applied to the post-WII period in contemporary sociology has highlighted the tendency for capital to bind labor to opposition of policies that would curb capital's free appropriation of nature.[10] The forces giving rise to such class fraction alignments are particularly salient in extractive economies as the costs of natural resources and the limitation or pricing of externalities are contested. For an internal periphery subject to overlapping state jurisdictions there is added complexity from the different balance of class forces at local to national scales. Coal is one example where the terrain of regulation has repeatedly shifted from local to national over conditions affecting both supply and demand along the commodity chain (Clark, Jorgenson, and Auerbach 2012).

Expressed in terms of the synthetic unities posed above, "mode of extraction" can thus be theorized at the *specific abstract* level within the *general abstract* theoretical level of the capitalist mode of production. The *specific concrete* examples of modes of extraction would include the Amazon, Central Appalachia, or the Niger Delta (see Table 1.1).

Table 1.1. Synthetic unities applied to differentiating extraction and production.

	ABSTRACT	CONCRETE
GENERAL	Capitalism	Modern World-System
SPECIFIC	Mode of Extraction	Central Appalachia, the Amazon, Indonesia, Pacific Northwest Forests

[10] In Daly's terms the rents of the "landlords" have been sacrificed to provide growth and peace between capital and labor and "…it has become evident that, however, unworthy of his rents the landlord may be, the social cost of today's low resource prices is being shifted to future generations, and to the other species whose habitats we are taking over" (Daly 2007:26).

This approach can avoid the confusion over the relationships between use-values, labor-value, and exchange-value in the process of unequal exchange frequently arising from Bunker's early works while building upon his insights into the path dependencies and unequal exchange involved in extractive regions.

A lack of a clear theoretical relationship to the original labor-value based theory of unequal exchange or its connection to natural use-values has persisted and proliferated in literature on uneven development associated with unequal ecological exchange (cf Foster and Holleman 2014; e.g. Hornborg 2009; Rice 2009). A vital exception to this is Amin's (2010) incorporation of unequal exchange in use values into his elaboration of Emmanuel's original unequal exchange approach.

Amin uses the concept of "imperial rent" to represent the totality of unequal exchange between the center and periphery—comprising both labor values and use-values in nature. Amin distinguishes peripheral, dependent forms of capitalist development from the auto-centric forms of accumulation found in the center. *Both* the social and the natural basis of a "mode of extraction" inhibit the type of auto-centric accumulation found in the core. Both the peripheral forms of accumulation of value and the way in which natural wealth and labor use values are degraded or dispersed create barriers to auto-centric capital accumulation and human development. Delineating the realm of phenomena that can been modeled economically using observable exchange values from the broader materialist historical process that determines the parameters of the economic system allows us to better problematize the historically determined process of unequal access to, and exchange of, use values and natural wealth (Amin 2010). The core exploits the periphery through the political maintenance of privileged economic access to the globe's natural wealth and technologies. Core monopolies in key technologies provide economic and, when necessary, military leverage for continued unequal exchange of the products of labor and the earth.[11]

[11] Viewed in this way the "transformation problem" of values and prices is more a historical than a mathematical problem (Higginbottom 2014).

Bunker and Ciccantell (2005) recognize the importance of peripheral nations capitalizing on their resources and increasing their rents as a way to combat their peripheral status, but they understate the importance of imperialism and the limits peripheral class structures put on the investment of rents successfully captured.[12] The way in which Amin systematically approaches the complex historical relation between use values and exchange value in the unequal development of the capitalist world system can be used to reground Bunker's mode of extraction. More specifically, it can be used to better distinguish and analyze the forces driving peripheralization specifically related to extraction in an "extreme periphery" like the Amazon from those associated with peripheralization more generally, or those associated with low-wage manufacturing.

Paolucci reminds us that concepts should be carved at the level of generality of their data. The sub-modes of extraction/production should be reflected in the abstract across the capitalist mode of production's history and geography but will be demarcated concretely by regions not likely to match state boundaries. This makes data collection and analysis more difficult. What constitutes a region dominated by extractive versus productive activity fluctuates over time. Bunker and Ciccantell's later work seizes upon transportation system development as the key to the dialectical development of the scaling up of both production and extraction. Both commercial transportation systems affecting both the flow of commodities and labor and natural metabolic systems are important to identifying boundaries of extractive regions for analysis (Bunker and Ciccantell 2005).

Appalachia. Although sociology has not always integrated spatial questions into its theorizing of inequality, in the US, the subfields of rural sociology and environmental sociology have been at the forefront of research on social problems at the regional level—located between the more common units of nation and city (Lobao 2004; Lobao and Hooks 2007). This is because they are compelled to deal with space relationally with a focus on the unevenness of capitalist development and how people relate to the land. While analysis at the urban and national level is well established, it is at the intrinsically

[12] For example, it is not at all clear how much difference in Central Appalachia's development higher profits via coal rents would have made given the level of absentee ownership and the investment patterns of local capital.

more difficult to define subnational or regional level that theory building must take of the challenge of overlapping political, economic, and ecological boundaries that are themselves historically changing.

The difficulty in defining Appalachia as a region reflects the complex way in which space and place are defined. Appalachia is one of the oldest place names in North America recorded by Europeans (originally in what is today Florida). By the 20th century, Appalachian had come into use defining not only the oldest mountain range in the world but also the people who resided there (Montrie 2003). The mountains stretch from Pennsylvania and Maryland down through Ohio, Virginia, West Virginia, Tennessee, Kentucky, North Carolina, South Carolina, and into northern Georgia and Alabama (Davis 2000). The southern portion of Appalachia, from West Virginia on south, was identified by popular writers as early as the late 19th century as being peculiarly backwards in cultural and economic terms—an image that survives in popular culture today (Billings, Pudup, and Waller 1995; Scott 2010). This image of the region as an isolated cultural and political economic holdover, bypassed by capitalist modernization, persisted in the academy into the 1960s (through application of "culture of poverty" analyses and modernization theory) before it was challenged by a new generation of historians and social scientists (Pudup, Billings, and Waller 1995). These scholars, organically linked to the social struggles and conflict of the period, labeled the region an "internal colony" whose poverty was the result of the domination of outside political and economic powers interested only in the regions rich natural resources (H. M. Lewis et al. 1978). This perspective reinterpreted the claims of a distinctive pre-modern culture as a vernacular form of resistance and perseverance against the predation of industrial capitalism that had fallen upon a previously independent and egalitarian people. Soon, however, better historical accounts and the influence of world systems theory and dependency approaches situated the importance of absentee ownership and external forces with reality of incorporation of the region as capitalist periphery from before colonial resettlement (Billings 2009; Dunaway 1996a; R. L. Lewis 1998; Walls 1976). Closer attention to the role of internal elites and the class dynamics in which they struggled has brought out greater appreciation of the significant variations in development trajectories across the region (Egolf, Fones-Wolf, and Martin 2009). Feuds

between rival families, such as the Hatfields and McCoys, once seen as indicative of a peculiar culture are now understood as intra-elite conflicts over political and economic power common to capitalist frontiers throughout US history (Waller 1988).

Appalachia reentered the popular consciousness in the 1960s as a major target of the Johnson administration's War on Poverty. While the Appalachian Regional Commission (created in that era as a regional development agency) has come to politically define over 420 counties as part of the region, it is in the Central Appalachian region encompassing West Virginia, eastern Kentucky, as well as part of Tennessee and Virginia that poverty and underdevelopment remains most concentrated today (Duncan 1992; Lobao and Hooks 2007; Ziliak 2012b).[13] In particular the coalfields of southwestern West Virginia and eastern Kentucky remain places of significant suffering and deprivation fifty years after Johnson stood with a camera crew in Martin county Kentucky to launch his initiative. In addition to the legacy of ills associated with the high levels of exploitation and danger in the coal industry there, today the ravages of surface coal mining on the environment pose an increasingly documented threat to the health of residents and the entire bioregion (if not the planet itself) (Austin and Clark 2012; Wishart 2012). To explain why this subregion has remained such a persistently peripheralized area, even as other parts of historically marginal Southern Appalachia have seen the rise of new urban growth poles and improving prospects, I argue it is necessary to trace the overlapping socio-metabolic relations created by successive regimes of resource extraction that involve the interplay of both local and national politic economic processes. Marxist ecology is equipped to apply such a metabolic approach to the contested reproduction of central Appalachia as an internal, extractive periphery through which large, often multinational, corporate actors exert their power to reshape the landscape of the region. Such domination has always been met with resistance in the local to national political systems that govern life in the region.

Internal peripheries that start as part colonial peripheries in the world system but maintain their peripheral status, even as the nation in which they are embedded rises to

[13] I am using the terms Central and Southern Appalachia in a different sense than the common definitions applied by the Appalachian Regional Commission. The ARC includes only the southern counties of West Virginia in Central Appalachia and treats Central and Southern as separate rather than overlapping.

central status, should be of particular interest. Central Appalachia has persisted as a periphery and presents a case study with which to examine the utility of the mode of extraction concept in explaining persistent underdevelopment of a resource rich region.

Overview of Chapters and Methods

I have laid out the fundamental ontological and methodological blocks upon which this work rests. There are many methods, tools with their own virtues and limitations, which can be integrated within such an approach. In this dissertation I intend to follow C. Wright Mills in eschewing the divorce of theory and method, still popular despite his canonization in sociology (Mills 2000b). I employ several different analytical techniques drawing on different areas of the sociological literature: historical comparative methods, regression analysis, and network analysis while drawing from the power structure, political economy, dependency and world-system literatures. It is the adoption of the meta-theoretical underpinning described above, and developed most fully by the Marxist tradition, that provides the opportunity for a more integrative synthesis using multiple approaches. Different tools are useful for different levels of analysis and explanation but their use in a consistent and integrative manner requires such an orienting framework as I have proposed. I will only sketch the methods to be used here, later presenting each chapter's methods in more detail together with the relevant literature.

I begin in chapter II with the question of underdevelopment and a historical analysis of the Appalachian region as an internal extractive periphery in the period leading up to World War II. Next, in chapter III, I examine how the mode of extraction dominating the coalfields of Central Appalachia was reproduced in the face of political challenges in the decades following the Second World War and conclude with a brief comparison with Bunker's study of the Amazon. In chapter IV, I employ time series regression to investigate whether surface mining exacerbates the negative developmental outcomes of coal mining in general. For chapter V I turn to the structure of economic competition and political coordination in the coal industry and apply network analysis to examine how coal's place in the capitalist policy-planning network relates to elite policy positions on the 2009 climate legislation. Finally, in chapter VI (previously published as (Wishart 2012)), to show the linkages between all the levels of analysis in chapters II-IV,

I analyze one mountain, Coal River Mountain, and examine the ongoing process of underdevelopment and capitalism's metabolic rifts there from the vantage points of ecology, capital, and human development.

CHAPTER II

INTERNAL PERIPHERIES AND MODES OF EXTRACTION PART I: APPALACHIA AS PERSITENT EXTRACTIVE PERIPHERY

This chapter analyzes Central Appalachia's underdevelopment as an internal periphery and the emergence of a mode of extraction dominated by coal production. The metabolic restructuring of the social formations of this extractive periphery fed the developing centers of the US economy while ecologically degrading the region and increasing the vulnerability of the labor force to super-exploitation. As the US established itself as a core power in the world system the Central Appalachian region's coal industry fed an unequal exchange of surplus labor and natural wealth. These relations were reproduced until the shifting balance of class forces at the national level undermined the conditions of labor exploitation through unionization associated with the New Deal. The subsequent realignment of capital fractions and labor are dealt with in the following chapter.

The Appalachian region was incorporated into the capitalist world-system from the very beginning as an extractive periphery (Dunaway 1996b; 1996a). This was initially true of the Americas as a whole, but Appalachia's structural position (and that of Central Appalachia most enduringly) remained one of an extractive periphery even as the United States became a productive core nation and rose to hegemonic status within the world-system (Bunker 1985; Bunker and Ciccantell 2005; Dunaway 1996a; Walls 1978). Appalachia's topography, waterways, and natural resources combined historically with its starting place in global commodity chains to create path dependencies shaping its developmental potential in an iterative process similar to the successive "modes of extraction" described by Bunker (1984) in the Brazilian Amazon. Comparison of the two regions will be used to identify analogous processes unfolding through extraction based capitalist development within the evolving world-system as well as divergences based upon their political, economic, and geographical embeddedness in nation states with very different historical world system trajectories.

Though there is a large and long running body of literature in the dependency and world-system traditions that examines the role of raw materials in uneven development and unequal exchange between core and peripheral nation-states, integration with *ecological* studies on the historical development process is relatively more recent (Bunker 1989; 1992; Moore 2000; Watkins 2006). Such integration is an area of rapidly growing interest (Ciccantell, D. A. Smith, and Seidman 2005; Hornborg, McNeill, and Martinez-Alier 2007; Roberts and Grimes 2002), but, as in the development literature, most of these studies have not attempted to analyze the dynamics of *internal* peripheries within nation-states and the complex ways in which nation-states' world-system positions mediate in the connection of extractive regions to raw materials commodity chains (for exceptions see (Driscoll and Kick 2013; Leitner 2004)). It is precisely the interrelations of social and ecological forces that present an important advance in understanding persistent peripheralization within developed nations. Internal peripheries typically lack the immobility of labor so important in unequal exchange between nations. The spatial organization of extraction is therefore of great importance in accounting for persistent peripheralization (Brookfield 1975).

Underdeveloping Appalachia: Extraction and Unequal Exchange in an Internal Periphery of the United States

Building upon analysis by Wilma Dunaway (1996a; 1996b), I focus on the dominance of extractive industries in Central Appalachia from 1860 through 1940, particularly timber and coal, analyzing them as part of a mode of extraction. To fully understand the relation between extraction and underdevelopment at least three vantage points must be employed: the perspective of ecology, of human development (human "social" ecology), and of capital accumulation (political economy); each alternatively at the level of the community, the state/region, the nation, and the globe—a task beyond the scope of this dissertation. Therefore to first establish the most important structural relations and the extent they can be generalized for the region as a whole, I begin here primarily with the political economy vantage point dominant in the literature. The extension of this vantage point must still include ecological relations as these are, of course, not mutually exclusive categories but will not be as comprehensive of ecological

relations as would be necessary, for example, from Marx's vantage point of capitalism's *metabolic rift* focused on human development (which will gain greater focus in chapter 6).

Abstracting Central Appalachia. Appalachia is a region in the eastern United States that has been historically defined by its mountainous geography. The term "Appalachia" originally referred only to the mountain ranges but has come to encompass the people and cultures that inhabit the mountains as well (H. D. Shapiro 1986). These mountains have been metabolically linked to human societies for over a thousand years (Guffey 2005). The number of humans, their social metabolism with each other, and the mountain ecosystems they inhabit changed drastically over the past 400 years as the region has been incorporated and evolved within the capitalist world system. Central and Southern parts of the region have followed significantly different development paths from other core industrial areas in the United States. *Southern Appalachia* is referred to in this work as the region from what is today West Virginia all the way south to Georgia and Alabama. *Central Appalachia* for my purposes, more narrowly, encompasses the entire state of West Virginia as well as the eastern parts of Kentucky and Tennessee and western Virginia (see Figure 2.1). The economy of Central Appalachia, particularly the coal fields of the Kentucky-West Virginia borderlands, has been especially dominated by the appropriation of materials from the land and their export in relatively unaltered form to core areas of the US economy but also other core and semi-peripheral areas of the globe (Austin and Clark 2012; Dunaway 1996a). I would modify Simon's prescription "one does not study Appalachia; rather he or she studies the social relations which characterize Appalachia in a given instance" (1983) to encompass "socio-metabolic relations." Many of these relations span the whole Southern region while others are specific to the Central range, but it is their interaction and overlap that explain persistent peripheralization.

Although "epochs in the history of society are no more separated from each other by hard and fast lines of demarcation, than are geological epochs" (Marx 1990:492), the material bases and productive relations characterizing Central Appalachia's economy following incorporation into the capitalist world-system may be viewed as having gone through four overlapping successive modes of extraction. First, extraction of

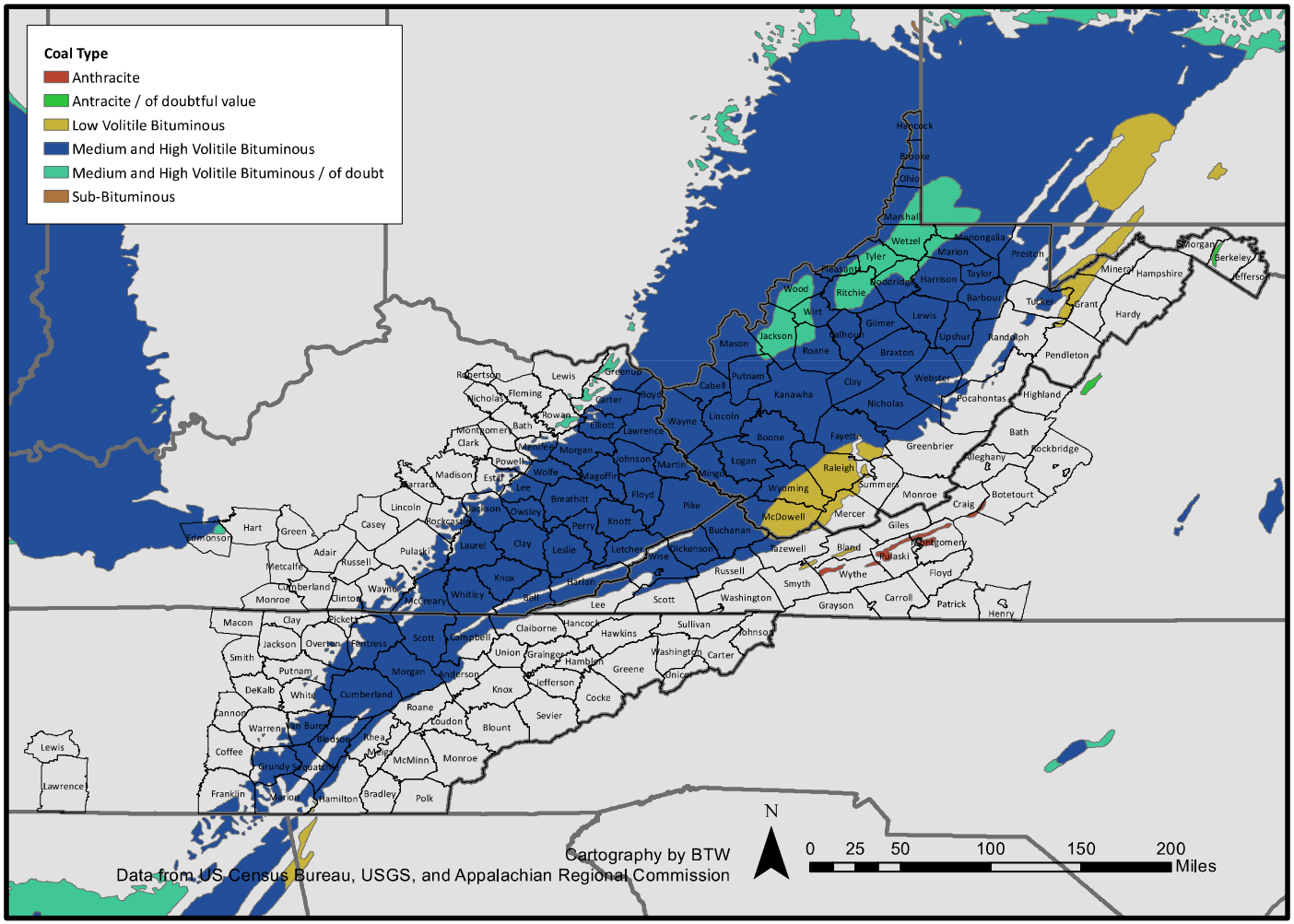

Figure 2.1. Coalfields and Central ARC Counties

plants and animals through hunting, gathering and trapping; second, extraction of agricultural products both directly by grazing livestock on wild foods and less directly by converting forestland to rapidly soil-depleting agricultural practices for capitalist markets; third, extraction of timber for export; and finally extraction of coal, initially through labor intensive and later by more capital intensive forms. The spatial association of economic underdevelopment and extractive activity is the result of complex historical progression of Central Appalachia as an internal periphery within the United States. Such a process is particularly suited to analysis by historical and comparative methods that allow for better understanding of what are often referred to as "path dependent" outcomes (Mahoney 2000), involving reciprocal causal relationships over long periods of time that are difficult to tease out through quantitative models.

For example, absentee ownership established long before the turn 21st century (the period examined in chapter 4) may later facilitate both a shift toward surface mining and worse socio-economic outcomes. At one level these ownership patterns are a structural outcome of global capitalism (Dunaway 1996a), but at lower levels of generality we see variation that subverts mechanical determination. A historical approach can also be used to examine how these processes shaped and were shaped by social groups' struggles both along and across class lines. Communities that are drawn into struggles around labor and environmental conflicts face complex and shifting power structures at local, state and federal levels of the political battlefield. The outcomes of these struggles at *the state level,* such as the interpretation and earlier or later abolishment of the "broad form deed" giving mineral rights priority over surface rights, should certainly affect the relationship of surface mining today to the future developmental trajectories in different states. Studies of the socio-economic effects of coal mining have usually relied on *county level* data because of the availability of data at that unit of analysis. However, the some effects of the mining process manifest themselves in the immediate sense at the community level (Bell 2009) while the development of mines and community responses are shaped by interactions at the larger level. It is at the *community level* that companies apply social pressure, environmental effects from surface mining are most keenly felt, and where workers wages are spent. Governments overlap in their regulation and redistribution of property and income in ways that are complex and vary across the region. While on the

one hand this means there is no "right level/scale" for analysis, on the other hand the methods discussed above provide a flexible approach able to bridge between these levels of abstraction used by chapter 4's quantitative analysis and the richer description available from a historical comparative approach to which I now turn.

Colonial-Native Articulation—Slaves, Pelts & Herbs (1600s-1780)

Before contact with Europeans, a number of densely populated agricultural societies occupied Appalachian river valleys. Many of them cultivated beans, maize and squash as staple crops and supplemented them with walnut and mulberry orchards and by hunting, gathering, and fishing of wild foods (Guffey 2005). Fire was used to open up new areas for agriculture, enrich existing soils, create habitat for game and maintain river cane for building construction and weaving. These ways of life were all but destroyed by 1600 via European diseases that killed 90 percent of the Native American population. This pandemic drastically changed socio-ecological structures of these indigenous people, even prior to the arrival of substantial European populations. Forest cover increased as lands fell out of cultivation and management. Bison and elk herds expanded into the area and grew in number while deer populations leveled off as their preferred habitat decreased with reduced land management(Guffey 2005). By the next century the Cherokee were perhaps the only remaining indigenous group with a large population stretching the Appalachians.

"Indian slaves were the first Southern Appalachian commodities to be marketed. When African slaves replaced Indian labor on the world market, Southern Appalachia provided raw materials to support core manufacturing and British re-export to the Orient" (Dunaway 1996a:49). Indigenous societies were restructured by articulation with capitalist world system through the colonialists' demands for commodities such as deer or elk hides, and beaver pelts as well as by readily adopting firearms, steel traps and other European practices in their hunting, agriculture, and culture. By the middle of the 18th century they had become economically dependent on extracting and trading these commodities and by the end of the century, beaver, bison, wild turkeys, passenger pigeons, and most predators had been wiped out (Dunaway 1996a; Guffey 2005). The European leather industry was a practically unlimited source of demand for the native

deer (Dunaway 1996b). Pigs, cattle, sheep, goats and other invasive species introduced by European settlers also significantly altered the ecosystems as they penetrated and threatened existing species. European plants began to displace indigenous flora and plants such as snakeroot and ginseng, which were prized commodities in European and Asian markets and nearly vanished(Dunaway 1996a; Guffey 2005). Continued epidemics and entanglement in warfare between European powers and colonialists in the 18th century further reduced the indigenous population by another 90 percent(Dunaway 1996a).

The early and widespread adoption of European technologies for trade, subsistence and defense, day-to-day dealings with the settlers and traders, and their already vast knowledge of Appalachian ecosystems thus allowed the Cherokee to rapidly exploit animals and plants that became desirable commodities. This extractive frontier was so lucrative and appealing that the British felt compelled to take steps to try and regulate the flood of colonialists who were threatening indigenous political alliances key to their competition with other core powers on the continent by setting up trading operations to capture their own share of the profits(Dunaway 1996a; Guffey 2005). The Cherokee registered numerous complaints with the local governments about "long hunters" from nearby settlements poaching within indigenous territories in an attempt to cash in on the booming export market (Guffey 2005). But these new social productive relations resulting from indigenous societies articulation with the world-system also left them dependent on imports of food, clothing, and tools while local game being extracted were increasingly depleted (Dunaway 1996a). This dependency on European and colonial commodities contributed to their involvement in military conflict between the British and the colonialists later in the century and subsequent hardships when goods were cut off (Guffey 2005).[14] Although the extractive "putting-out system financed by foreign merchant-entrepreneurs" economy of the Cherokee and colonialists was not characterized by capitalist productive relations, the insatiable demand of the markets they produced for was part of the capitalist world-system (Dunaway 1996a:49). Despite the non-wage social productive relations in Appalachian indigenous peoples' and settlers' mode of extraction,

[14] Shifting alliances cut off the Cherokee's supply of guns and ammunition resulting in a return to having to hunt increasingly scare game, and defend against well armed foes, with bows and arrows (Guffey 2005).

their social metabolic relations had already become part of a capitalist social formation.[15] The ecology of the region was being reshaped by the needs of accumulation in the core and the rivalries of colonial powers.

> Relentlessly, the Cherokees were locked into an "unequal exchange" that drained Appalachian surpluses away to benefit the expanding core. Within less than fifty years [they] lost economic and political autonomy and became dependent upon the worldwide network of production…Wildlife was decimated by export activities, forests were destroyed as part of the hunting process. Most significant, however, …[b]y 1780, the Cherokees had lost nearly three-fifths of their ancestral lands to cement trade agreements, to pay trader debts, and to settle boundary disputes with the British. (Dunaway 1996a:49-50)

Even under British rule, land tenure laws were revised away from feudal relations toward capitalist ones to allow for speculation that in practice went far beyond the official 1763 boundary for settlement. By the mid 18th century Virginian and West Virginian lands were absentee owned (Dunaway 1996a). US independence opened up the remaining lands of Appalachia for native displacement and white resettlement, but there was to be no public-domain of access to land for average settlers.

Although trade in pelts continued after resettlement, by 1830 it had virtually disappeared on account of the scarcity of game (Salstrom 1994). For Veblen this extractive phase that characterized the American frontier was a prime example of the "American plan" for "converting all public wealth to private gain":

> First among these natural resources to fall under the American plan were the fur-bearing animals. … it does [not] now count in any appreciable degree among the useful means of livelihood, in great part because business enterprise has run through that range of natural resources with exemplary thoroughness and expedition and has left the place of it bare. It is worth while to speak of it here only because it shows a finished instance of business-as-usual converting

[15] "Within its circulation process, in which industrial capital functions as either money or as commodity, the circuit of industrial capital, whether in the form of money capital or commodity capital, cuts across the commodity circulation of the most varied modes of social production, in so far as this commodity circulation simultaneously reflects commodity production. Whether the commodities are the product of production based on slavery…or of half-savage hunting peoples, etc.-as commodities and money they confront the money and commodities in which industrial capital presents itself, and enter into the latter's own circuit and into that of the surplus-value born by the commodity capital… The character of the production process from which they derive is immaterial…as commodities they enter both the circuit of industrial capital and the circulation of the surplus-value borne by it. Thus the circulation process of industrial capital is characterized by the many-sided character of its origins…" (Marx 1992:189-90)

> community goods to private gain without afterthought. It is a neat, compact, and concluded chapter of American business enterprise. (Veblen 1964:168)

This, like the extractive agriculture that followed, was a general part of capitalist development in the US. Yet the metabolic restructuring of this phase worked with the property relations to build an agriculture that remained extractive and therefore self-undermining at an important historical juncture in the regions' integration into national industrialization.

Extractive Agriculture (1780-1880)

This period saw the establishment of important characteristics of regional investment and political priorities for transportation, agricultural, and industrial extractive activities that produced few backward and even fewer forward linkages. It also produced the semiproletarian labor force in the region and ecological changes increasing the extent of its function as a reserve army for manufacturing and extractive industry.

The 19th century was bleak for the Cherokee. White settlers continued to invade their territory, and they were soon outnumbered and displaced. In the winter of 1838 the last large segment of their population were forcibly removed from Appalachia to the Oklahoma territory by the United States government in a death march known as the "trail of tears" (Guffey 2005). This seizure of native people's lands and the severing of their political claims to the resources there was a precondition for their "free appropriation" by capitalist interests. It allowed land to be reconstituted as a commodity and the settlers to expand into their territories and produce crops, livestock, and raw materials to help feed growing demands for these commodities in other regions. The way in which land was commodified is particularly important because in Southern Appalachia (in contrast to the later resettlement of the frontier west of the Mississippi) there was no homestead provision and precious few other mechanisms for lower class immigrants to gain ownership of land, even for squatters who had resided on lands prior to sale (Dunaway 1996a). Though many locals, even landless ones (who were often paid to make required "improvements" for absentee owners), *participated* in land and resource related speculative activity in some fashion, the process inflated the price of land and most residents did not come away with land holdings (Salstrom 1994). Instead, capitalist

speculation on land concentrated ownership in the hands of absentee holders and a minority of wealthy local elites(Dunaway 1996a).

The high level of absentee ownership in the Southern Appalachian region (75.9% by 1810) was in many ways more important to the closing of the "frontier conditions" of resettlement than actual occupation of land, and a good deal of later swindling on the part of absentee and local elites helped to consolidate holdings further (Dunaway 1996a:73-4; Gaventa 1982). The extent varied but was pronounced in Central Appalachia—in Kentucky at least 56.2% of the land was absentee owned (probably 3/4ths or more in the eastern counties), in Tennessee 68.9%, in Virginia 89.3%, and in West Virginia 93.3%. Of the land not absentee controlled in Central Appalachian counties of Kentucky and Tennessee 25% of families owned 66%, and in West Virginia and Virginia counties the top 25% owned 90% (Dunaway 1996a). A majority of the best agricultural land was therefore inaccessible to simple subsistence farmers because land not held by non-residents was highly concentrated in elite hands, leaving the bottom half of farmers to scrape by on one-seventh of the farmed land. According to Dunaway, less than one-third of the agricultural labor force in Southern Appalachia actually owned farmland and the landless rate in Central Appalachia remained close to 50% in 1860 (1996a).

As Marx noted "The monopoly of property in land is even the basis of the monopoly of capital" (Marx 1978:527). However, other studies suggest there was considerable variation between and within states of the sub-region. Some counties on the borders of Kentucky, West Virginia and Virginia appear to have had relatively lower rates of landlessness and more equal distributions of ownership (a majority of farmers owned their land in Pike, Logan, and Wise counties respectively) (R. L. Lewis 1998). Still, in general, it seems land's unequal distribution discouraged true subsistence farming because smaller producers were located on the most marginal lands, particularly in mountainous regions where land ownership was even more concentrated, and within those parts steep terrain that might otherwise have been cheaper land affordable to smallholders was reserved by interests in extractive industry and tourist resorts (Dunaway 1996a).

Dunaway emphasized this regime of land tenure created a significant semiproletarianized landless labor force that was integral to ways in which the upper classes organized agricultural production for the Southern Appalachian and national economy. An often-underappreciated feature of semiproletarian households engaged in subsistence agriculture is the gendered way in which reproduction of the wage earners are subsidized by the other members of the household (Dunaway 2001; 2008). Drawing on E.P. Thompson and Nancy Folbre, Billings and Blee (2004) characterize the relations of production in subsistence households of Appalachian Kentucky as part of a "patriarchal moral economy" in which adult men controlled the labor and appropriated the surplus of other members of the household as governed by cultural norms of kinship and reciprocity. They criticize Dunaway as prematurely characterizing households as semiproletarian. "The question is not how much early economic actors produced for exchange (which may have been extensive), nor whether they consumed certain quantities of manufactured commodities …, but rather, to what extent Appalachian households were able structurally to reproduce themselves independently of these exchanges—that is, independently of the local slave-based and external market economies" (Billings and Blee 2004:29). The extent and chronology of households' integration into capitalist productive relations and dependency on the economic dictates of center economies has implications for the later emerging modes of extraction around timber and coal commodity chains.

The two most comprehensive works on Southern Appalachia by Wilma Dunaway and Paul Salstrom differ on when this ability to reproduce independently was lost for the majority of Appalachians with the former indicating a century or more before the latter. Subsistence is, in the Marxian sense, historically determined and varies according to time, place, and social stratum. Producers engaged in *subsistence production* are of necessity oriented toward obtaining use-values. Dunaway uses a definition of subsistence farms that has the virtue that it distinguishes them clearly from ownership *capital* in the Marxist sense of a social relation. Specifically, a subsistence farmer is a farm owner with less than 100 acres, less than $100 in assets, using only family labor, with no cash crops, no second source of income, and who consumed 80% or more of grain and livestock. Households with more assets than that have the potential, and often demonstrate the ability, to employ the labor of others as is indicative of appropriation of surplus labor

rather than subsistence relations. “Any farm that cultivates more than its family survival needs in order to support paid or coerced laborers or to feed surplus livestock is *not subsistent,* even if that farm consumes all its major food crops” (Dunaway 1996a:125). Between one-tenth and two-fifths of grain and livestock, varying by area, was reinvested in labor, livestock, or seed for future surplus. Although he criticizes Dunaway’s definition of subsistence farmers as those producing no surplus as excessively narrow (Salstrom 1996b), Salstrom’s use of the term is confusingly broad, including most households which simply consume *the majority* of their food crops—thereby including *even plantations employing slaves and wage workers*. Such a definition obscures key aspects of political economy: the extraction of surplus labor/value from others and the orientation toward investing that surplus in the interest of expanded accumulation.

Values of goods and labor in the subsistence, borrow and barter economy were increasingly determined in relation to their value in capitalist markets (Salstrom 1996a). This was true even in transactions among families often held to be part of a distinct moral economy (Dunaway 1996a). The unequal exchange contributing to the region’s peripheralization did not depend on the dominance of capitalist productive relations in the lives of households linked to its commodity chains. These social formations were subordinated early on to the metabolic needs of accumulation in the core and went into crisis when the larger system to which they were linked did (see Billings and Blee 2000 on the cascading collapse of promissory notes in the borrow and barter economy during national economic crises). By the middle of the 19th century the region was experiencing an agriculture decline and a stagnating economy with falling terms of trade (Billings and Blee 2004; Dunaway 1996a; Salstrom 1994). Despite the decline in per capita agricultural output, at mid century “…Appalachian counties produced one and one-half times more food and grains and meats than were required to meet local subsistence and reinvestment demands” (Dunaway 1996a:137). These food surpluses were double the global average and demonstrate the regions peripheral articulation into the wider commodity chains.

Salstrom (1994) argues that the determining factors for agricultural households choosing to supplement their farming with wage labor were population pressure, soil

depletion and erosion that made subsistence farming more difficult in the mid 19th century. Indeed the catastrophic collapse of many local ecosystems and degradation of regional ecosystems prior to 1860 is well documented by Dunaway and must have placed pressure on subsistence forms of agriculture that relied on the commons (Dunaway 1996b). “Gone now were the days when ginseng covered the hills and bought many of its diggers most of their store purchases. Gone also were the decades (roughly the first one-third of the nineteenth century) when the Plateau in particular had offered an easy livelihood for livestock raisers” (Salstrom 1994:16).Salstrom describes such agro-ecological consequences spreading westward across the region, but his Malthusian explanation must ultimately (like its eponymous predecessor) be qualified by the class relations dictating access to land and its use—particularly if well before his tipping point of agricultural decline around 1860 more than half of the acreage of Appalachia was controlled by outsiders and only a third of those working in agriculture owned any land (Dunaway 1996a). To gauge the importance of ecological factors it is necessary to look more closely at the extractive character of agriculture as practiced in this period and the wave of timber extraction that came after.

Appalachia was directly and indirectly connected to core markets. Cities such as Knoxville, Tennessee and Asheville, North Carolina emerged as transportation hubs and bulking centers of mountain goods bound for external regional and international markets (Guffey 2005). Early on the region provided a significant proportion of livestock and salt, as well as grains and some luxury commodities like tobacco and liquor, to the Deep South and, often via re-export from Southern ports, the Northeast (Dunaway 1996a). Two major agricultural commodities were corn and hogs. Both of these could be consumed for subsistence, sold individually, or as inputs into other commodities for exchange—feeding excess corn to hogs to increase their sale price, or distilling it into whiskey (Guffey 2005; Salstrom 1994). Hogs were particularly well suited to foraging in the forests for mast from oak and chestnut (inhibiting their regrowth as well), but they were less mobile for export than cattle (Guffey 2005). Because elites and absentee investors always controlled the majority of prime farmland, poorer and later arrivals settled into more marginal agricultural lands in the hollows, ridges, and terraces (Dunaway 1996a; Guffey 2005). Foraging of livestock on wild foods, although prominent and easy during frontier

conditions, was increasingly supplemented with grains and by 1860 three-fifths of corn produced in Appalachia was used as feed (Dunaway 1996b). Efforts by large landholders to restrict access to their lands being used as foraging commons increased following the Civil War (Salstrom 1994). The first "wildlife laws" were passed to protect the interests of livestock producers by creating bounties for wolves and cougars and mandating their extermination (Guffey 2005; Salstrom 1994).

Agricultural production for export used much more additional land and labor than simple subsistence reproduction would have. For example, on average livestock consumed three and a half times more food than a 19th century Appalachian household and required four times the amount of labor to produce compared with subsistence farming (Dunaway 1996b). More land needed to be cleared to do this, often by burning, and at a scale unimaginable to indigenous inhabitants. Early settlers without slaves and lacking the labor to clear land opened up areas by "girdling" trees to kill them and simply planting between them. Trees were felled later as need allowed. Cultivation without rotation or use of cover crops or fertilizer combined with widespread erosion to deplete the soil. Common responses by farmers were to simply clear more land and apply more labor or to sell and move on to virgin lands further on the frontier.

Complementary light manufacturing (mostly processing raw materials) and small-scale extractive industry that had their own metabolic effects joined this agricultural regime. Salt production was one such complementary industry. In Clay County, Kentucky salt production from local brines was vertically integrated with slave agriculture, whereas in Kanawha County, West Virginia the industry was more of a capital rather than land and labor-intensive model. Advantages in transport and a more flexible model of accumulation resulted in linkages to new industries in coal and glass for Kanawha capital that never materialized for those in Clay (Billings and Blee 2000; Dunaway 1996a). Slave labor, an important indicator of embeddedness in larger markets, was particularly important in antebellum extractive industries such as salt and iron. Despite variation within the region, the general trend in manufacturing was clear.

> In sharp contrast to the rest of the United States, Southern Appalachia's antebellum manufacturing investments were heavily concentrated in low-wage

> mining, quarrying, smelting, intermediate ore processing, and timbering. As a result, extractive industries comprised the region's predominant employer of nonagricultural laborers and accounted for the second most important industrial category in terms of annual gross. Consequentially, the emergence of diversified manufacturing was deterred by investment of capital, labor, and infrastructure into the production of agricultural and extractive materials for export to world markets. (Dunaway 1996a:192-3)

Deforestation and agricultural practices resulted in widespread soil depletion and erosion that was exacerbated by overgrazing livestock that destroyed seeds and young plant growth. Consequently, non-native plants, grasses, and weeds rapidly displaced native varieties and over half of Southern Appalachia had been logged by the Civil War. The overall ecological consequences were a highly degraded, more homogenized and less biodiverse regional ecosystem. This amounted to a reduction in the adaptive capacity of ecosystems and a reduction in their resilience sometimes resulting in catastrophic collapse.[16] Similarly soil fecundity that was lost from the mountains will only return on a timescale broader than most human concerns, if ever (Dunaway 1996b).

The greater prevalence and persistence of a significant semiproletarian labor force is characteristic of peripheral social formations. Before the Civil War, Appalachia's agrarian capitalism was already in decline, adding agricultural workers into the reserve of the unemployed (comprising the "latent" portion in Marx's terms), and, with relatively little other development outside of agriculture, pressure on the land intensified. Although food production per capita and grain and livestock exports decreased by 30% on average each, more land and labor went into the production of export staples, growing on average at twice the rate (60%) of decline in per capita food production (Dunaway 1996a:296). Salstrom underplays the importance of this latent portion of the reserve army of capital and its contribution to the economic surplus produced by the region before the industrialization. With his thesis focused on population growth and partible inheritance by petty producers employing only family labor this is inevitable. But declining agricultural returns and increasingly subdivided family farms after 1860 were not the main source of exploitable laborers willing to work for low pay if Dunaway's figures correctly identify the pre-existing supply of not only intergenerational landless laborers

[16] Although Appalachia remains the most biodiverse region in the nation, many of the species which survived the glacial advances of the ice age in its mountains were lost forever during this period.

but also indentured, enslaved, or otherwise unfree workers. Half or more of farms in Central Appalachia in 1860 employed paid or coerced labor (from a low of 47% in Kentucky to a high of 72% in Virginia) (Dunaway 1996a:89). Rather than being driven to forms of wage-labor primarily by declining subsistence capability on their own land, lower classes had from the start largely gained access to land for subsistence farming through forms of surplus value producing labor including share-cropping and cottage tenancy. A clear picture must account for the full socio-metabolic regime of both ecological relation and the class-based social relations governing them. In such situations "the export sector drains off labor and capital from subsistence producers to augment production for external markets. Moreover, infrastructure and state priorities are directed towards expansion of external trade, to the neglect of local roads and services. Progress in the export sector, therefore, blocks economic growth in local market activities, and subsistence agriculture is actually deterred. Because of such pressures from the transition to capitalism, the true subsistence sector [those without dependence on export commodity chains] was, by 1860, very small…" (Dunaway 1996a:232).

The forests of east Kentucky, middle Tennessee, and the Kanawha Valley in West Virginia had been degraded by the extractive agricultural practices there. Iron and salt furnaces in Tennessee, Kentucky, and West Virginia consumed thousands of acres of trees in their vicinities for charcoal. Extractive industries were given powers in every Appalachian state to confiscate land, appropriate timber and stream flow for their operations, transportation, and material needs (Dunaway 1996a), even in some cases to compel the labor of nearby residents (Billings and Blee 2000). They displaced farm land directly through appropriation and indirectly through damages such as flooding(Dunaway 1996b). Like the coal industry over a century and a half later, capitalists purchased damaged lands at below their pre-degradation value. Because a significant portion of the agricultural labor force relied on the opening up of virgin forest for agriculture or its use as a commons (even when said "commons" was legally under absentee ownership) their reproduction was squeezed by the changes in the land. Semiproletarianziation and semisubsistence capacity, while lowering the cost of labor power can also mitigate its exploitability. Even when there was a recognized supply of local labor willing to work at low wages, capital sometimes preferred to import workers from outside the region who

would be more “obedient” on account of having no access to subsistence resources (Dunaway 1996a; R. L. Lewis 1998). Population growth, certainly favored by the gendered household relations of the patriarchal moral economy where it persisted (Billings and Blee 2004), must have contributed to the reserve army of potential wageworkers. Those *land owning* families semiproletarianized into growing industries or manufacture by smaller individual plots and declining yields must have been an addition of downward pressure on wages to the already significant reserve army of landless workers and sharecroppers. Already in 1860, 15 percent of tenant farmers and two-fifths of sharecroppers were employed in a second *non-farm* job; with the latter having triple the chances of being food deficient. Both types were more likely to be employed in Tennessee, Virginia, or West Virginia counties than in Kentucky counties that did not experience the same decline in food production (Dunaway 1996). Even though, as Salstrom notes, the average farm size in the Plateau region declined by half between 1850 and 1880 (Salstrom 1994), given the skewed starting distribution, this figure is likely disproportionately influenced by of subdivision among heirs of the relatively larger landholders.

In any case, the threat to subsistence agricultural practices posed by ecological degradation, although significant from agricultural and industrial activities in the period leading up to 1880, paled in comparison to the scale of industrial extraction that would come afterward with the railroad lines extending into the hinterlands. The terms of semi-proletarianization would become increasingly tenuous as subsistence strategies were undermined by ecological degradation and the closing of the commons, offering capital not only a lower cost of labor power subsidized by subsistence but a super-exploitable labor force reserve army. Appalachia’s peripheral position was well established during the restructuring of this period’s social and ecological systems around the requirements of commodity chains for external markets. Because Appalachian counties were less politically influential in their state legislatures, they had difficulty procuring State funds for transportation systems. Although dominated by eager export interests, county governments lacked the capital pooling capacity needed for such investment. The inability of Appalachian counties to improve transportation linkages to markets as fast as other regions caused a loss of agricultural market share as early as 1845. These structural

conditions according to Dunaway limited the potential of Appalachia and many of its people:

> As privately owned public monopolies, transport infrastructure opened those geographical locations where extractive industries, travel capitalism, and large export monopolies were being developed, leaving isolated those small farmers and poorer Appalachians who were less articulated with external trade. (Dunaway 1998:120)

Whereas livestock could be shipped out "on the hoof," bulky raw materials like timber and coal were largely dependent on waterways in the absence of rail or highway. This limited the geographic penetration of those industries and the scale of capital investment. In spite of efforts by Appalachian Kentucky salt makers (salt was a crucial input to livestock trade for meat and tanning but these were generally processed outside the region) and an 1840 state report that six million dollars worth of resources were being lost annually, investment in the desired water route was not forthcoming nor did a proposed rail line succeed (Billings and Blee 2000). Investments that did occur for improvement of water routes such as the Ohio River and canals linking it to the Mississippi actually marginalized Central Appalachian regions that had relied on overland cattle drives (Pudup 1990).

> [C]ounties and local-states engaged in policies and fiscal practices that were aimed at promoting the types of agriculture, commerce, and industry that spurred the local expansion of peripheral capitalism… Despite intensified political rivalries with the richer nonmountainous sections of their home states, most Appalachian elites aligned themselves with the planter-merchant aristocracies of their home states. As a result, Appalachians steadily fell behind other Americans in wealth accumulation, in literacy, and in the development of transportation infrastructure. (Dunaway 1996a:284-7)

The effects of decisions made by state legislatures and federal authorities on how public transportation funds were spent (or not spent) meant that the Appalachian regions of their states were neglected until outside capital invested in linkages on terms that limited the realization of value and rents for producers. As a result, "commission middlemen drained off 10 to 15 percent of the surpluses that might have accrued to the original producers. An even larger drain of regional capital was effected by speculators who originated from external metropoles" (Dunaway 1996a:248).

The antebellum routes of major rail lines through the region shaped the economic interests that split the region during the Civil War. The counties that split from Virginia to form the state of West Virginia were led by middle classes (who dragged along 24 additional counties and 40% of residents with more Southern loyalties) involved in commodity chains linked to the North by the Baltimore and Ohio Railroad (B&O) (R. L. Lewis 1998). Virginia's major rail line, the Virginia and Tennessee, linked them (and the southernmost counties of West Virginia) to the South. The first trans-Appalachian railroad lines were initially interested primarily in connecting major markets, not the resource base along the way. By the 1880s this had changed. The Norfolk and Western line was built through the southernmost counties of West Virginia for their resources. They used land companies to concentrate ownership of timber and coal which they then leased to operators (R. L. Lewis 1998). As rail construction approached, "county seat wars" broke out between competing industrial and agricultural elites. In the past the county seat had been viewed as logically in the center of the county, but the railroad transformed the center from a geographical to a strategic and economic one corresponding to rail access. Armed conflict loomed when court battles became dragged on between towns over who would hold the political and economic advantage of the county court house (R. L. Lewis 1998). The Republican leadership of West Virginia, up until 1871, had treated railroads with great favor as engines of development; then Governor William E. Stevenson advocated to compete for investors by passage of "'the most liberal legislation in favor of capitalists who propose to make actual investments within the state, and who give satisfactory assurances that they mean to execute what they promise'" (R. L. Lewis 1998:61). But the Bourbon Democrats who succeeded them were less favorable. The B&O's refusal to pay taxes owed led to a constitution redrafting in 1872 barring railroad officials from the legislature and declaring railways public highways.

The West Virginia Grange, while supportive of railroads' stimulus to the state economy, battled the B&O on behalf of the state's agricultural interests over rates, liability, and eminent domain during the 1870s but political power was already in the hands of industry. The depression of 1873 began a long decline for agriculture at the same time that capitalist monopoly power was on the rise (R. L. Lewis 1998). The

disruption of agricultural markets by the Civil War and the increasing productivity and market penetration of mid-western agriculture had greatly undermined Appalachian commercial agriculture. With the exception of Virginian (and perhaps Tennessean) agriculture, Central Appalachia lost its ability to compete by the 1870s (Salstrom 1994). Falling prices exacerbated tight credit for farmers in West Virginia as interest payments remained steady. Farmers also bore a higher share of the tax burden relative to business properties that were undervalued or untaxed. A study of 1895-96 showed that farmers possessed 65% of wealth but paid 80% of taxes. The gap between wealth and tax burden was highest in counties with railroads. "After 1871, big business appeared to be in control of both parties; therefore the Grange and then the [Farmers'] Alliance movement offered farmers their only voice of organized protest" (R. L. Lewis 1998:243). But the West Virginia Grange reflected the class structure of capitalist agriculture in Central Appalachia and “restricted membership to substantial farmers and questioned admission of farmers from the underdeveloped interior counties who practiced a mixed economy of small farming, hunting, and gathering or worked as part-time employees in lumber mills, coal mines, and factories..." (R. L. Lewis 1998:244). Given the prevalence of this semiproletarian demographic it severely limited its base. In 1896, when Jennings Bryan was defeated, the Farmers Alliance and Populist party disintegrated along with it the last organized agricultural resistance to railroad and extractive interests.

> Farmers understood that the railroad would connect their farms as well as the forests to the national markets and that competition would be dictated by the national marketplace rather than the local economy. They were essentially correct that this was a competition they could not hope to win. The process of deforestation fundamentally altered the agricultural economy in the timbered areas, first by removing the forest where farmers traditionally ranged their livestock and acquired much of the basic supplies for their subsistence agricultural system. Second, deforestation forced farmers to practice commercial agriculture or face ruin as free and independent producers. The commercial orientation of farmers in the older developed counties found outlet to the markets by way of roads and waterways that had gradually evolved as part of the national market system. The underdeveloped counties, conversely, were forced into the new system through swift and wrenching changes in their economy. (R. L. Lewis 1998:245)

Although deforestation increased the amount of land improved for farming, the size of farms decreased even as the number rose. The isolation of backcountry counties of

Central Appalachia hindered their ability to benefit from exports but also protected their own markets from economies of scale elsewhere. When integration finally came it was often jarring. The form of extractive agriculture that depended on opening up new lands for planting and the forest commons for livestock could not survive the changes in the landscape and local agricultural markets that came with the railroads and the timber boom. Those that continued on in agriculture had to adopt the methods of investment in fertilizer and stock bred for pasture, thus bringing to a close the dominance of extractive agriculture. Railroad and extractive capital would use state powers for determining externalities, eminent domain, and the reserve army remaining on the land to overcome spatial isolation as an obstacle to profitability. Although the period dominated by agriculture can be characterized as extractive, the dominant classes of that regime were displaced or assimilated into a new industrialized modes of extraction whose method of accumulation was dependent upon a greater disarticulation of local ecology than ever before.

Timber Extraction (1880-1920)

Rail lines steadily penetrated increasingly remote areas in Central Appalachia during the two decades after the Civil War providing efficient transport to industrial markets for export of raw materials and import of core produced commodities. Shaping these new connections with the national and international markets were local elites, petty bourgeois, and American and British capitalists who scrambled to obtain land and resource rights. As the turn of the century approached, absentee capitalists and dependent local capitalists created and molded political and material infrastructure to cash in on the industrializing nation's demand for resources. Industrial resource extraction that had started in the early 1800s rapidly expanded and became the major commodity chain linking the region to globalized markets. Timber and coal came to be more important than the old industries of salt and iron. Interests related to industry and resource extraction that sought to maximize their externalities to capitalize on resource rents dominated state policy.

Completion of the Erie Canal in 1825 connected the pine forests of the Great Lakes to eastern markets. By the late 1800s those north woods had been decimated and,

even as discussion of a "timber famine" began, logging operations fanned out to the west and south— into Central Appalachia (Williams 2006). Capital from those northern logging operations was transferred to the region but so were ephemeral "peckerwoods" operations opening and closing with market fluctuations. "Two-thirds of West Virginia was still covered by ancient growth hardwood forest on the eve of the transition in 1880, but by the 1920s virtually the entire state had been deforested. Moreover, as the only Appalachian state entirely within the region, West Virginia serves as a microcosm of the region itself" (R. L. Lewis 1998:3). The lumber industry peaked in the first decade of the 1900s just as new building materials were invading the construction market. As late as 1902, 75% of West Virginia was forest cover; however, the industry's expansion inevitably led to overcapacity of land and mills setting off destructive competition. Borrowing to finance their operations encouraged a timetable of liquidation for loggers, and sunk investments in larger mills encouraged operating at a loss during downturns for lumber and paper operations. "Nearly fifty thousand sawmills were counted in the census of 1909, but three-fourths of them cut less than a million feet of lumber a year; the other one-fourth cut between 100 and 200 million board feet in a year" (R. L. Lewis 1998:5). There was also a legal shift in the principle of "reasonable use" that pitted industrial and extractive against farming interests. The political power of these class factions had a distinct geography whereby local juries favored farmers but appeals courts overturned them—a major departure from the legacy of antebellum Virginian dominance by agrarian landowners.

The mode of extraction around timber accelerated the pressures that had been built up over previous decades on the semiproletarianized labor force. "The cutting of the mountainside forests where farmers traditionally ranged their livestock and acquired other staples removed the very foundation of backcountry agriculture, and within a generation the system collapsed. Farmers were forced to shift to a commercial system by acquiring better grades of stock, to rely on machinery, and to use commercial fertilizer" (R. L. Lewis 1998:8). They could not compete with the Midwest, and between 1880-1920 even greater numbers of farm families were driven off the land and into wage labor in extractive industry. The ecological consequences of extraction accelerated this. Forest fires raged through over 1.7 million acres in 1908. Streams were choked and valleys

flooded, with vital topsoil washed away. By the time the federal government set up the Monongahela National Forest to preserve the Ohio and Potomac watersheds the damage was done. The development that industry had brought with it was largely ephemeral. With the ecological base of the timber and paper industries laid to waste, the lower classes faced the choice of joining the swollen reserve army or migrating for better chances. Those that stayed on in the coalfields would join labor struggles reshaping the entire structure of that national industry.

The forests' timber had been an important resource since white resettlement but in the first century transportation infrastructure limited the geography and scale of extraction. Timber provided not only lumber for construction but charcoal for industry, tannin for leatherworking, and pulp for paper among other uses. Up until the Civil War most mills relied on waterpower and produced on demand. It was not until after the War that there was sufficient demand to drive levels of investment needed for steam-powered mills to become dominant. Those areas where smaller timber operations had preceded the coming of the rail lines had some advantages, and there was a great deal of competition between localities over who would host the rail lines. Railroads increased property values and taxes for farms but were unlikely to significantly improve farmers economic prospects by putting them in competition on the larger market. The major beneficiaries of rising land prices were, of course, land speculators and their local agents.

The limited size of local capital was reflected in a hierarchy of investment within the timber boom. Residents with small amounts of capital tended to invest in contracting companies and hiring independent laborers to deliver timber. Early on these were more often experienced loggers from further north but as time went on more locals became involved. Members of the local capitalist class proper were focused on land sales and railroad development while external capitalists were necessary for the scale of investment required for major milling centers and for the market connections to move their production. The ownership structure of this period was predominantly individuals and private partnerships and, as in other industries, public corporations in timber were few until WWII. Of the 508 timber firms that were incorporated in West Virginia between 1866 and 1909, 285 were resident firms. 136 (26.7%) of those had total or majority

absentee control, and 223 (43.9%) had some absentee control. It would be a mistake to underestimate the involvement of local elites as 71% of persons involved as incorporators were residents. While it is difficult to determine from scale of ownership the distribution in value of timber controlled available evidence favors absentee owners (R. L. Lewis 1998).

Timber companies acquired increasingly large holdings of land, often from other major local or absentee owners, but not infrequently by using their superior resources to purchase or contest the legal claims to land of smallholders. Timber processing and manufacturing often clustered together, but logging and milling lasted only as long as the local supply of timber. The dispersed ownership, both between individual and firms and across space, along with the diversity of firm size and range of products made coordination and rationalization of the industry impossible in this period.

> With thousands of producers manufacturing hundreds of different grades, sizes, and products, control was nearly impossible. Economic and cost structures presented the most difficult obstacles to industry. In medium and large-scale units that had substantial overhead costs, survival depended on controlling these costs. Therefore, the producers required stability and predictability, commodities that were in short supply because thousands of small producers with negligible overhead costs entered or withdrew from production depending on market conditions. Together all these operators glutted the market and drove prices down just as expanding demand should have sent prices up. Market pressures, therefore, perennially pinned prices at their lowest possible level and forced firms to cut relatively elastic labor costs to the bone. Aggravating these structural difficulties was the long-term decline in demand for wood...in building construction, a trend that had already begun by 1906.
>
> The pressures to reduce costs to their lowest possible levels resulted in wasteful logging methods such as clear-cutting, which were frowned on by conservationists. Forced to convert timber into lumber as soon as possible to stay in business, the lumbermen's methods of extraction and processing often served the moment without regard to the future. They viewed timberland as a resource to be 'mined' and abandoned, rather than as a 'crop' that was indefinitely renewable if cultivated and harvested wisely.
>
> The large companies operated by men with considerable experience in the industry, established sources of capital, and well positioned in the markets were most likely to survive over the long term. Their size allowed them to benefit from economies of scale, and their access to capital enabled them not only to weather the booms and busts of the business cycle but also eventually to drive the multitude of small to mid-sized competitors from the field. These large absentee

> firms also acquired a disproportionate influence over West Virginia's back county economy, however, and with legislators and jurists eager to secure their investments in the law, they also acquired inordinate political influence as well. (R. L. Lewis 1998:101-2)

Even at the earliest stage of the transition from frontier to industrial extraction that followed rail integration, politics reflected the power of capital to freely appropriate natural use values without much competition from state or other interests. While the power of extractive industry over other class fractions like farmers was not unique to Central Appalachia, the region was certainly among the most extreme cases and among the most enduring. The West Virginia Tax Commission in 1884 issued a formal warning against the effects of absentee ownership of the state's resources. Already there was some recognition that natural resources were being exhausted without contributing to the development of the state. "Twenty years have passed; the treasures, untouched in 1865, have been considerable exhausted, vast private fortunes have been accumulated, but not by those who are our permanent citizens, and to-day the home population probably does not own one-half the property which it owned when the war ended" (quoted in R. L. Lewis 1998:64). The commission outlined illegal collusion between rail and coal and lumber companies' leaders, under the secretive Coal and Lumber Agency. They complained of speculative practices in construction of the rail lines and their assumption of "the power to appropriate the entire net earnings of the community" (quoted in R. L. Lewis 1998:65) through their monopoly power over transport. This was worsened in cases where local governments issued bond for stock in the railway, with costs exceeding benefits by three to one in one county. The Commission also recognized that half the State's land was absentee owned. The Tax Commission was further convinced that the West Virginia legislature was complicit in these events but the best remedy they had to suggest was a railroad commission to protect the public interest (R. L. Lewis 1998).

Central Appalachian states varied in their capacities to create investment in transportation and industry that required the pooling of capital beyond individual capitalists. The most common method, particularly when state law forbade direct public investment, was to grant corporations special legal privileges, for example to dam and re-route streams and condemn through eminent domain, in order to encourage private capital investment. The timber industry lacked the organizational capacity of the railroads

to influence state governments directly. The water transport they relied on before the coming of the railroads did not receive the same favors for improvement (though the federal government did invest in some of the major rivers). Nevertheless, the timber industry would benefit greatly from a revolution in legal interpretations of liability that railroad interests spearheaded. Part of the industrial revolution across the US involved the discarding of the principle of strict liability rooted in a philosophy of natural rights carried over from British Common Law in favor of looser standards for negligence and consideration of the "public interest."[17] There was some variation within the region in how this process played out, but evidence suggests in West Virginia and Kentucky it was significantly accelerated by the balance of class fractions. Although agrarian gentry continued to dominate politics in Virginia, in West Virginia a rapid change in state legal standards occurred in 1889-1890.

> After 1890 the court abandoned the traditional strict liability principle favoring agrarian over industrial users of the land and adopted an approach that accepted multiple economic uses for the land. The timing of this pivotal redirection is explained in part by the rapid influx of capital into railroad, timber, and coal development. The older system was incapable of withstanding this deluge of capital, which accentuated the inadequacies of the traditional approach and then dissolved it. (R. L. Lewis 1998:110)

Whereas in Virginia state code required railroads to construct fencing to protect livestock, in West Virginia farmers by contrast had to prove negligence on the part of the railroad. In 1919 this was pushed further by legislation fixing responsibility for fencing and liability for livestock on railroad right of ways *on their owners*. While neither state could provide direct public subsidy to business under their constitutions, West Virginia courts were "so bold in reversing the strict liability standard in nuisance and negligence cases that its decisions can only be interpreted as the judicial subsidization of industry to the disadvantage of other segments of society"(R. L. Lewis 1998:117). The court adopted a "reasonable use" doctrine that apportioned blame and treated industry and agriculture as competing interests both with rights to property use. The infringement of another's property rights was "unreasonable" unless the "public good" outweighed the harm. This

[17] "One must quite naturally hesitate about speaking of a 'public interest' or 'public utility' which is carried on the books of a private corporation as a capitalised source of income. It seems incongruous" (Veblen 1964:172).

change in legal standards did not reflect a change in public opinion. While there was widespread hostility toward railroads on the part of local juries these cases were overturned upon appeal. Railroad lawyer, and coal and rail investor Zachary Vinson bemoaned in 1902 the bias of state court juries against railroads they viewed as rich on ill-gotten gains and so would take any opportunity to punish them regardless of the facts. He, exaggeratedly, claimed this was from a "strong and insidious current of socialism flowing through the minds and thoughts of the people, poisoning them to the extent of making them believe that it is wrong for one man to be rich and live in luxury while another is borne down by perpetual labor and poverty" (quoted in R. L. Lewis 1998:127).

Transportation was the greatest obstacle to the growth of the timber industry and the legal facilitation of externalities on the part of the railroads would also be a precedent for the externalities of the timber mode of extraction. Soil from eroded hillsides choked streams that were increasingly polluted by factories, mills, and tanneries. The decomposing sawdust dumped (illegally) by lumber mills eliminated the oxygen from streams (a 1901 report by the West Virginia fish and game warden said "more fish are destroyed and driven from the streams from this than any other cause" (R. L. Lewis 1998:283)) and combined with the toxic byproducts of the paper process to kill off life and clog facilities' intake pipes. Towns were opposed to upstream mills but not their own, with naysayers being charged with opposition to "progress." Terrestrial sources of subsistence were also extirpated. "After the mountains were cutover, hunters stalked through the woods for weeks without sighting either deer or wild turkey, and the once abundant fish all but disappeared from the streams... Logging and then fires either removed or destroyed the plant life that created mast, depriving animals of a source of food. Consequently, even the small game such as rabbits and squirrels became scarce in West Virginia's woods" (R. L. Lewis 1998:268). West Virginia undertook some measures to regulate hunting and fishing and the shipping of game across state lines.[18] The export of game, though lacking the scale of the previous trade in fur and hides, was extensive and involved a number of firms. While the state had some success in returning fish and

[18] Unfortunately, programs to eradicate predators to restore game species increased the holocaust of wildlife. In 1933-34 nearly 200,000 and in 1934-35 nearly 300,000 varmints were turned into sponsored competitions (R. L. Lewis 1998).

game to local markets by 1901, it did little to check the extractive industries fundamentally driving the ecological destruction. "A speaker at the annual meeting of the West Virginia Bar Association in 1905 acknowledged this inequity in the law when he remarked that 'the poor wretch who took a stick of dynamite and killed a few fish committed a felony,' whereas 'the corporation that polluted the waters of a stream for fifty miles and rendered them totally unfit for fishing or any other purpose, escaped all punishment'" (R. L. Lewis 1998:280). This reflects the class bias of valuation and rent collection by the state and the subsidy to capital provided through continued free appropriation of natural wealth and externalization of costs.

In 1908 every county in West Virginia was affected by forest fires that burned over 1.7 million acres and caused economic losses estimated at more than $5 million. Estimates indicated 91% of fires were caused by trains and lumber operations with the remainder being clearing pasture for livestock and various causes. These fires destroyed the soil directly as well as increasing vulnerability to erosion afterward. No plan was made to evaluate or address soil erosion in West Virginia until 1937 when it was included in the federal Soil Conservation Service programs. A survey found that accelerated erosion affected 90% of the state's surface area, nearly two-thirds of the land had lost between one-fourth and three-fourths of its soil and 4 million out of 15.5million acres of the state had lost over three-fourths of its soil. It reported soil loss, low quality soil, unsuitable (too steep) lands pressed into agriculture, etc. (R. L. Lewis 1998). The bust of the timber industry discharged many into the reserve army and intensified the pressure of subsistence agriculture on the local ecology. Government investigators found that "further exacerbating the land problems were the 'squatters or industrial people temporarily out of work who have little interest in conservation and improvement, deplete the land, and leave as soon as employment opportunities arise in the industrial world'" (R. L. Lewis 1998:272).

A USGS report in 1911 found that, following the railroads, deforestation had dried up springs and streams: "The summer sun now beats down on a bare and parched land, forest, stream, cool shade, and cold spring are all gone, and the land is desolate" (quoted in R. L. Lewis 1998:276). The disruption of the hydrologic systems by pervasive

deforestation was in no way unique to Central Appalachia. But unlike the deforestation that had preceded it further to the north, the hydrologic systems with their headwaters in the Appalachian Mountains flowed into densely populated and industrialized areas. The disruption of water flow caused mills reliant on adequate water supply to shut down periodically or entirely. Though the federal government had spent one-twelfth of total improvements on rivers and harbors in WV up untill 1907, the floods and droughts seriously impacted navigation. This was a significant impact on the region's economy as rivers flowing through WV accounted for more than one-fifth of total river commerce (R. L. Lewis 1998).

Attempts to mitigate some of this damage started as early as 1905, when the governor of West Virginia declared that headwater lands of no value except for forest growth should be purchased by the state. In 1909 that state's legislature empowered the federal government to acquire cutover lands through condemnation or otherwise for national forest reserves. The creation of the Monongahela National Forest in 1915 was a response to the deforestation related destruction designed to preserve the headwaters of the river and stabilize it.[19] Still, West Virginia lagged behind its Northern Appalachian neighbors in conservation spending. In 1928, West Virginia spent only $176,000 on the Game and Fish Commission (also responsible for forestry) while Pennsylvania spent $1 million on game alone and New York spent $3 million on conservation.

In 1909, nearly half of US timber extraction was from the hardwood forests of Appalachia (Clarkson 1964). The unequal exchange of this resource built up some parts of the country while drastically reshaping the ecology of the region. While Appalachia's contribution was significant it was not unique. By 1920 80% of US virgin forest had been cut, with half the land going into agriculture. Eighty one million acres had been burned and left barren. Timber extraction followed the "usual course" for staple commodities. The initial competitive phase was characterized by "speeding up the output…low prices… and a rapid exhaustion, with waste, of the natural supply" (Veblen 1964:127). For Veblen, the case of timber demonstrated the transition from the rapid and wasteful

[19] The 1911 Weeks Act relating to headwaters of navigable streams brought forest conservation to West Virginia followed by the 1924 Clarke-McNary Act for those not related to navigable waters.

exploitation of abundant resources into monopoly and centralized absentee ownership. He emphasized that the waste involved in the frantic and under-capitalized/skilled competitive operations directly contributed to reducing the public wealth of those resources to a level that could effectively be dominated by an oligopoly to draw substantial rents. The forms of waste involved then shifted from the accidental to conscientious and planned (Foster 2011b; Veblen 1904).

Often the same people who found their previous forms of livelihood undermined by the timber boom became the laborers who joined migrants drawn to the area and accelerated the socio-ecological transformation.

> A publicist for the coal industry had seen land companies acquire property and lease it back to the head of household who had once owned it, "thus leaving a friendly guardian to keep ... their titles clear." This is how households accepted wage work. They entered a feed-back loop set off by population increase and accelerated by forest destruction. As their old economy became more risky they participated increasingly in its destruction. (Stoll 2014:81)

The tension between the independence offered by household subsistence practices on the one hand, and their contribution to super-exploitation of labor on the other, intensified as the timber mode overlapped and was succeeded by coal. In the first three decades of the 20th century, agriculture in Appalachia remained less capital intensive than in the rest of the country and even with high population growth a comparatively larger percentage of youth stayed on becoming wage workers subsidized by their families subsistence activity(Salstrom 1994). The massive deforestation that spread across the region had a profound effect on the social formations that depended the forestlands household reproduction. Continuing erosion of access to viable land and this growing reserve army meant practices that had offered at least a modicum of resistance to resident wage-laborers were increasingly instead a contribution to their own super-exploitation by extractive industry.

Labor Intensive Extraction and the Rise of King Coal (1800-1940)

Mineral exploitation in Appalachia was already having a greater relative environmental impact in Southern Appalachia than in any other region of the country as early as 1810 (Dunaway 1996b). All of the regional state governments had financed

geological surveys of their minerals by the late 1820s, complementing a project already underway by private investors (Dunaway 1996a). Iron, salt, gold and copper production had consumed large areas of forest for charcoal and left blighted wastelands, some of which still persist today (Dunaway 1996a; Guffey 2005). “By 1860, timbering and extractive industries were underway in two-thirds of the region’s counties” (Dunaway 1996b). "Although coal quickly dominated economic life in southern West Virginia, timbering came first and already had reached peak levels by 1895...Even before the railroads, several major commercial companies entered the region such as the Little Kanawha Lumber Company (from Maine)..." (R. L. Lewis 1998:60). In McDowell and Wyoming Counties in West Virginia the major timber operations were reliant on railroads from the start and so timber and coal developed together. By 1880 some four thousand coal miners could be found at work in Southern Appalachia (Salstrom 1994).

The boom in timber extraction overlapped with mining but peaked earlier (around 1912), due in part to the reckless destruction of the regions forests by industry and agriculture. During the preceding period companies had acquired the control of mineral and surrounding property rights through a combination of deception, mercenary violence, and manipulation of state judicial power and violence (Gaventa 1982; Wright 1978). As noted above, while Salstrom (1994) suggests that the system of “partible inheritance” significantly increased the number of families living off a given piece of land over time and consequentially created strains on subsistence capabilities, however work by Dunaway (1996a) paints the significance of this process as one of several factors. Nevertheless, accounts show that population growth and the subdivision of property within families accelerated the process of accumulation by dispossession within the coalfields, particularly in the Plateau region where population growth was highest. For example, if only one heir of many to a property decided to abandon farming and sell, the coal companies could often force the other heirs off their land through legal action:

> A common pattern, which extended into the 1930s, was for the Company to acquire the rights of a single heir to a property left to several family heirs. When the other heirs refused to sell, the Company would go to court and ask for a judgment on whether the property could be ‘fairly and impartially partitioned’ and on whether the ‘said property is of such a nature so that its sale could be of manifest interest to all parties’. Almost invariably, the court would rule that it

> could not be divided, and that it should be sold at a 'public auction to the highest bidder'- usually the [Company]. (Gaventa 1982:54)

Given the lack of money assets that most smallholder families possessed (Salstrom 1994), forcing the sale at auction rather than at an appraised price must have been particularly devastating.

Around the turn of the 19th century, many struggling farmers or those looking for extra cash sold or "leased" their mineral rights to supplement their farming activities. Leases were for extremely long periods of time, often hundreds of years, which was only possible through coal interests ability to influence courts to ignore clear violations of other state laws, for example, regarding "perpetuities" (Montrie 2003; Wright 1978). Selling or leasing only the mineral rights to property appeared advantageous to locals but often was devastating for both the owner and the surrounding community in the long run. Those purchasing or leasing the mineral rights as a capital investment were usually free from most or all tax responsibility attached to "land" ownership but given effective superiority over surface owner rights as well (Montrie 2003; Salstrom 1994). When local owners would not sell, industrial interests often were able to avail themselves of the disorganized system of land titles inherited from the frontier period. Through superior access to the legal and political system industrial and speculative interests were more likely to persevere in cases of contested title (Eller 1982; Gaventa 1982).

Ecological degradation and legal restriction of access to the means of subsistence that deepened (but did not decisively complete) the proletarianization of Appalachian people was combined with the creation of new socio-cultural needs for industrial goods as well as joint state-corporate policies to encourage immigration. There are accounts of frustrations by both timber operator and coal operators of the greater difficulty in disciplining workers from households with independent subsistence capacity. These workers' willingness to accept low pay was to an extent counterbalanced by their resistance to attempts to ratchet up exploitation as competition put pressure on wage costs. For example, in 1905 local miners in West Virginia walked off the job when the Louisville Coal and Coke Company increased the size of coal cars without increasing the piece rate. The company responded, like others at the time, by implementing a policy of

refusing to hire those who had too much alternative means of livelihood or who expressed an interest in acquiring them (Stoll 2014). As in many industries in the late 19th and early 20th century capital brought in migrant labor displaced from other parts of the world system as a more vulnerable alternative when local workers proved too few or too restive. The Louisville Coal and Coke Company in the case above evicted the miners on their land within days and had a trainload of migrant laborers to replace them within a week. "The strategy of retreating to the hollows would never work the same way again. All of a sudden, survival required local men to adhere to industrial discipline" (Stoll 2014:82-3)." Miners had the most autonomy in the labor process of perhaps any sector of industry, and the extraction of surplus took place in the absolute form of increasing the length and intensity of work by simply lowering the real wage (R. Lewis 1993; Simon 1981). The dependence during this period on the formal rather than real subsumption of the labor process meant that capital focused on maintaining a sufficient reserve army and fought unionization on this basis, with aspects over the labor process itself distinctly secondary.

The use of migrant labor was widespread and well recognized as part of a larger effort to create labor discipline, not simply respond to labor shortages. "Testimony given to Congress in 1888 revealed how mining corporations succeeded in keeping 'thousands of surplus laborers on hand to underbid each other for employment ... hold them purposely ignorant when the mines are to be worked and when closed, so that they cannot seek employment elsewhere'" (Stoll 2014:82). Many of these imported workers were Southern blacks or recent immigrants to the US and were sometimes brought in directly as strikebreakers. Although miners eventually formed solidarity across racial and ethnic lines in many areas (most successfully in West Virginia), these tactics were temporarily successful in creating an exploitable labor force for the mines (Gaventa 1982; Salstrom 1994). Although the state legislature in Tennessee had passed laws in the 1880s forbidding the coercion of workers on political matters, or whom they purchased goods and services from, as well as on mine ventilation and checkweighmen, the enforcement of these was totally dependent upon the aggrieved until a solitary Inspector of Mines was established in 1891 (Gaventa 1982). In the early 1890s there were a number of militant strikes in eastern Tennessee and Kentucky over proper measurement of coal for piece

rates and the use of, mostly black, convict labor. At Coal Creek, Tennessee this resulted in repeated battles with and eventual subjugation by state militia as miners freed the prisoners brought in as strike breakers in a remarkable case of cross-racial class solidarity at the time (Gaventa 1982).Whenever mining markets went bust blacks and more recent foreign immigrants left in disproportionately higher numbers (Davis 2000; Salstrom 1994).

In Central Appalachia this imported labor force combined with the latent reserve army of an ecologically crumbling and socially strangled subsistence economy to increase the exploitability of the later. In West Virginia 40% of the increase in coal employment between 1880 and 1930 was from migrants, which "left a large portion of the native population tied to the land…as much as one-third of the labor was redundant. But it was underemployed, not unemployed" (Simon 1981:178).When brought under the total control of the company town, these relations reached their extreme. First established by antebellum iron, coal, salt and copper mines, they increased rapidly after 1880; by 1910 seventy percent and in 1923 "between two-thirds and four-fifths of [the coal] miners of these Southern Appalachians lived in 'company-controlled communities'" (Dunaway 1996a; Gaventa 1982:86; Salstrom 1994).[20] During this same period the wage share of Appalachian miners went from being similar to Midwestern miners to significantly lower (Salstrom 1994:74-5).[21] Wages per ton fell continuously in Appalachia but rebounded in the Midwest with the help of unionization under the United Mineworkers.

Engels pointed to the continued subsistence capacity of German workers, and the lower than average wages it allowed them to survive on, as a key for German manufacturers whose profitability was propped up by this "deduction from normal wages" (Engels 1955). Marx also noted that monopoly pricing power could "depress wages below the value of labor-power, of course only to the extent that wages would be higher

[20] At the high end, in 1923, 80% of miners in West Virginia lived in company housing (Simon 1981). By comparison, only 8.5 percent of miners in Indiana and Illinois lived in company towns in 1910 (Salstrom 1994).

[21] In West Virginia piece wage rates were between 62-79% of the rate of miners in Ohio, Illinois, and Pennsylvania during the early unionization period of 1898-1923 (Simon 1981).

than the physical minimum of subsistence" (Marx 1991:1003). The historical development of mining in Appalachia allowed coal capital to avail itself of multiple sources of "profits by deduction" stemming from both the reproductive efforts of households' subsistence labor and the monopoly power of company stores. This contributed to a situation of super-exploitation as "several government studies indicated the below-subsistence consumption of mine workers" (Simon 1981:178). These sources of profitability were protected by a violent commitment to company control and opposition to unionization. As a result of this highly exploitative regime and the high quality coal reserves of the region, Central Appalachian coal operators were able to undercut competitors in surrounding markets, overcome distance and transportation handicaps and undermine attempts to rationalize the national coal industry for over half a century.

Among the venerable methods of coercion used in company towns was indebtedness. Company stores were an important part of the profitability and labor discipline in the coalfields. Initially companies often paid wages in company "scrip," a currency of their own minting which was exchangeable at the company store. Scrip could usually be exchanged for cash outside the camp but only at a discount of 60-90% (usually in the middle of that range), at least until laws were passed allowing companies to make it non-transferrable.[22] There is some debate as to the degree to which payment in scrip was a cause versus a consequence of lack of circulation of cash but the relationship was surely reciprocal (Salstrom 1994; Weiner 2009). After laws were passed requiring the payment of wages in cash, companies continued to advance workers their wages in scrip. There is some disagreement over the extent to which stores were able to price gouge and force their employees to shop there, but, clearly, there were plenty of examples. A 1911 study by the US Immigration Commission found that companies were able to exclude independent stores simply by their monopoly of land in the area. The police apparatus generated by companies to guard against unions also facilitated this when desired. Although, in at least one case in West Virginia in 1915 a mine owner chastised his

[22] This occurred in Virginia in 1919 and a half-decade later in West Virginia(Weiner 2009). The role of credit and debt would have been familiar to those moving into company towns from the reserve army of tenant famers and share-croppers (R. Lewis 1993).

operator for being overzealous in restricting access to other retailers, preferring to save the publicly antagonizing use of force for union organizers (Weiner 2009).[23] In 1915, *Coal Age* reported the results of a government survey finding more than a few mines had losses in coal counterbalanced by their retail and housing monopolies, a finding that at least one letter to the journal reluctantly agreed with. The New York Times reported that many of the mines in Harlan County, Kentucky were profitable only at their commissary. Accounts of profits on the stores range from 10-15%, up to 80% or even 170% at one Harlan mine between 1934-37(Simon 1981; Weiner 2009). *Coal Age* defended companies relying on their stores arguing that losing money in one venture was no reason to lose it in all others. Yet writers to the journal complained it was an obstacle to rationalizing the industry through reducing overproduction by eliminating less efficient mines. Mines "can easily afford to lose three cents a ton in the cost of production if 40 percent of the men's wages goes into the store," a rate by no means unheard of (quoted in Weiner 2009:41). This also encouraged the placement of the most indebted rather than the most skilled miners in the best productive seams. Such favoritism was simple good business for mine operators but of course also encouraged patronage of the company store. Other more direct forms of coercion were commonly reported. Miners at one (non-union) mine in Mingo County, West Virginia in 1920 negotiated a nine cent per carload raise only to find that their work inputs had been marked up by five to twenty five cents, and it was compulsory to purchase them from the company store (R. Bailey 2009). In any case, it is certain that coal company store profits with their high rate of absentee ownership were more likely to be siphoned out of rather than reinvested in the region. "Coal company stores therefore constituted an integral part of a single industry order that proved unable to sustain a health economy" (Weiner 2009:50).

The Irish, Italian, and Eastern/Southern Europeans that companies imported often were similarly recently displaced from agricultural life and so had similar skills to the mountaineers that coal operators could put to work in "captive gardens" lowering the cost of labor power (R. Lewis 1993; Stoll 2014).

[23] Often the only store in newly opened areas, and in such cases they offered companies customers beyond their miners.

> The garden solved a problem for the coal operators. Scrip still required company stores to purchase food, usually from outside the region. But currency was scarce in Appalachia as late as the 1940s, and companies had begun to make purchases by check, transferring money directly to eastern banks, which compounded the scarcity of circulating currency. This motivated managers to link surplus family labor with surplus land above the mines. (Stoll 2014:83)

At the captive mines of US Steel in Gary, West Virginia, one study estimated the average yearly value of subsistence gardens at $100 and the total for the camp of $15-20,000 (Stoll 2014:84).[24] Estimates in the 1920s indicated that between fifty and seventy percent of miners raised crops and livestock (Corbin 1981).[25] In company towns this was sometimes mandated by rule or by circumstance and almost always encouraged with contests and prizes (Gaventa 1982; R. Lewis 1993; Salstrom 1994).[26] The scale of the household subsistence activity and its subsidy to coal capital was a factor along with the control of the company town that made the Appalachian coal fields a destabilizing force in the national coal industry. In 1896 a UMWA official wondered after seeing the extent of subsistence gardening "If the land of West Virginia was used as an adjunct to the pluck [i.e. company] store in the production of coal, how were our miners in other parts of the country to meet this kind of competition?" (quoted in Stoll 2014:84).

When capital controlled the land on which subsistence was practiced, the lack of wages was even more devastating in trying to persevere through a strike. In the major Paint Creek Strike of 1912, although the strike began in April, the company waited a month or more, until after gardens were planted, to evict the miners. Starving miners clashed with guards trying to retrieve their livestock (Stoll 2014).

> Beans tasted the same on the ridge as they did in the Pocahontas coalfields … but beans in such differing circumstances transmitted different social relations. Before the enclosure and clear cutting of the forest, beans on the ridge complemented a

[24] It may not be a coincidence that when US Steel agreed under pressure to voluntarily honor the National Industrial Relations Act codes in its Pennsylvania mines (such captive mines were exempt from the law), in Central Appalachian mine operations, like Gary, the company stood its ground and resisted miners demands violently (Myers 2009).

[25] The West Virginia Coal association estimates in 1924 indicated that 70% of miners in the southern portion of the state were involved in household subsistence activities (R. Lewis 1993).

[26] Such mandates were not exclusive to the coal industry. Henry Ford required as a condition of employment at his Iron Mountain plant in Michigan that workers plant a garden to provide a portion of their winter vegetables (Stoll 2014)

> complex land use that included grazing cattle, planting rye, distilling whiskey, collecting tanning bark, and gathering chestnuts. Beans in the coal camps served the interests of capital over those of households. All their garden products must have given workers and families a sense of place and sufficiency, yet the ultimate economic advantage from these plantings belonged to the companies. (Stoll 2014:90)

Domination of local governments and institutions by the servants of coal capital was not only consciously designed to provide material control over the local inhabitants but also reflected the realization that "[through] control of the socializing agencies of government, church and school…values could be shaped" (Gaventa 1982:67). Coal operators had both deputies appointed by the county sheriff and private police on their payroll to control miners. The effectiveness of private police was enhanced by the legal authority they were given by state courts to arrest and evict union sympathizers (Simon 1981). After the establishment of federal support for extension services, county agents were dispatched to help improve the productivity of miner's subsistence activities in Mingo County, West Virginia (Salstrom 1994).Through establishment of opulent resorts and health spas in Appalachia's rural regions, "the industrial order was introduced to the mountaineers' society by conspicuous consumption, with an exaggerated demonstration of its benefits" (Gaventa 1982:63). The glamour during boom conditions encouraged both the sale of potential subsistence farmland and encouraged migration to (often company-controlled) mining boomtowns. When boom conditions inevitably failed and companies ratcheted up exploitation, their workforce had few options for escape (Gaventa 1982). The forces driving boom and bust originated outside of this peripheral region.

The integration of regional coal markets into an increasingly national one led to increased competition and falling prices between 1880 and WWI, which increased demand and prices until 1922, when a new downturn continued into the 1930s. Control of the industry was initially highly dispersed among different capitalists and fierce competition between mining companies drove a typical extractive cycle of boom and bust. The coal market consists of long and short-term contracts, which added pressures to cut prices in the bidding to secure long-term contracts. Mining has a high degree of fixed and sunk operating costs that encourage overproduction and prevent bankruptcies from reducing productive capacity as mines are usually taken over rather than abandoned. Like

the highly competitive timber industry it survived, coal varied in quality, e.g. from Anthracite to sub-bitumious, and in the degree of processing for cleaning and sizing—all of which contributed to difficulties in rationalizing competition. Furthermore, operators found it difficult to organize across regions and firm sizes. Voluntary consolidation of firms was hindered by the high importance of valuing not only sunk capital costs but capitalizing the rent-producing potential of the different coal reserves in unstable and fluctuating market conditions. Like timber, the coal industry had a large number of private rather than public companies early on. Unlike timber, coal resources were too plentiful for exhaustion to play a timely role in fostering consolidation. By offering preferential long haul rates, railroads helped increase competition between different fields, and a common practice of allocating cars during shortages by previous production provided additional incentive to keep production high.

Coal operators had far more influence over labor costs than freight costs or demand for their variety of coal—particularly when their customers were monopolistic industries like steel or rail (Simon 1981). The wage-share of mine-mouth coal costs ranged from 63-84% in 1916 and 69-73% in 1918-20 for the Appalachian coalfields and their Eastern Interior competitors in the Midwest (Bowman 1989). Although labor was the highest cost of production, the price of coal was still primarily determined by transportation costs accounting for half or more of the price for consumers into the 1930s. Before WWII, there were five interdistrict coal markets: the tidewater market of the Atlantic ports, New England, the lake-cargo market of the Great Lakes, the central all-rail market of Ohio, Michigan, and part of Indiana, and the Midwestern market. Pennsylvania was the unrivaled top coal producing state until the late 1920s when West Virginia began to overtake it. Still, West Virginia coal competed in all district markets on account of a varying combination of favorable rail rates, higher quality coal, and lower labor costs. For the same reasons Appalachian Kentucky maintained a significant presence in three of the five districts. Lower wage costs in particular helped increase Kentucky and West Virginia coal operators market share in the tidewater district from 40 to 63% between 1919 and 1934 (Bowman 1989).

In the late 19th century as competition increased prices fell faster than productivity, suggesting a loss in rents, profits, or both on the part of the industry. In 1898 the Central Competitive Field of Ohio, Pennsylvania, Illinois, and Indiana was unionized under the UMWA, an outcome both capital and labor hoped would rationalize competition by limiting price cutting. The union agreement, in practice, authorized mines at a competitive disadvantage due to their coal reserves or transport costs to pay lower wage rates (Bowman 1989). As a result these mines began mechanizing, using automated cutting machines and later automated loading of coal, techniques that would not be adopted in Central Appalachia for decades. Around this same time operators in the tidewater market, failing to achieve any voluntary agreement had turned to the railroads connecting them to the market to rationalize production. However, this only worked where there was no competition between railroads, and it backfired on operators in at least one instance in West Virginia when the railroads offered to concession in rates to raise workers' wages and avoid a strike. The coal companies responded with a lockout to show that the railroad would not maintain its tonnage at the expense of their authority (Bowman 1989). The rapid expansion of production and transportation access of the non-union Kentucky and West Virginia coalfields undermined previous efforts to rationalize the industry undertaken by the Central Competitive Field. Capital investment in mining was attracted to internal periphery of Central Appalachia for the same reasons it would be drawn to the global periphery nearly a century later: higher quality deposits *and* lower labor costs (Pollin 1980). Whereas in 1885 the states of the Central Field produced 80% of coal consumed in their region, by the start of WWI they produced less than two-thirds (Bowman 1989). Central Appalachian coal was their main source of competition.

Both coal operators and miners unions saw wage suppressing power of Central Appalachian coal operators as a destabilizing force in the industry. A period of consolidation during the first decade of the twentieth century, peaking in 1905, was not sufficient to curb price-cutting. Related divisions also appeared between Central Appalachian and other coal operators over mine safety with the former most opposed, viewing reform as a threat to their advantage (Bowman 1989). Between 1890 and 1907 there were over a quarter million fatalities in US mines. While in Pennsylvania miners had a 22% chance of being killed and a 28% chance of being seriously injured, in 1907

West Virginia miners had rates double those. At the turn of the century Pennsylvania had set the minimum age for miners at 16 while West Virginia required only 14 years of age. West Virginia coal interests fended off state laws after the 1907 Monongah disaster that killed somewhere between 362 and 500 miners and made sure the 1910 Federal Bureau of Mines was focused on research rather than enforcement (Rakes 2009). While many in the coal business, as in numerous other industries, hoped the intervention of the Federal Trade Commission would provide stabilization and rationalization of the industry, it was the outbreak of the First World War and its increased demand that finally brought meaningful state intervention(Bowman 1989; Kolko 1963). Coal prices increased for consumers by 500 percent between 1915 and 1920 resulting in federal government control over prices and distribution—not the sort of intervention capital desired, though by the end of the war profits and production were stable (Bowman 1989).

Booming industry after the war and supply disruptions from strikes kept prices high but proposals by the United Mine Workers, among others, to nationalize the industry set coal capital on edge by 1920.[27] The governor of West Virginia, Cornwell, who had claimed to be a trade union supporter, praised the non-union mines that had broken the 1919 strike and claimed that if the non-union fields were organized it would result in the nationalization of the coal industry—making his allegiance clear (R. Bailey 2009). Industry now opposed any binding federal intervention, even that of data collection by the Federal Trade Commission, as a slippery slope. After 1920, in the face of increased competition from oil and gas and more efficient use of coal by plants and mills, demand stagnated. The non-union fields responded predictably with wage and price cuts (Bowman 1989).

It was against this economic backdrop that violence broke out in Mingo County, West Virginia. Having gained a foothold in the north of the state the UMWA began a push to organize the southernmost county in the spring of 1920. Following a number of violent incidents that year, a force of over 10,000 miners marched and rode commandeered freight trains south toward Mingo but were met by the sheriff and a

[27] Indiana passed a law in that year giving the governor the authority to set coal prices and confiscate the mines of operators who resisted. The following year a federal grand jury indicted 226 Indiana coal operators, the UMWA and the National Coal Association for anti-trust violations (Bowman 1989:141).

private military fielded by coal interests at Blair Mountain in Logan County. Though having superior numbers the miners were severely outgunned from fortified positions and facing aerial bombardment with homemade and leftover chemical munitions from WWI. Two thousand federal troops and an air force detachment of bombers arrived within a few days and both sides disarmed. The end result was a failure to organize the southern West Virginia fields.

The stage for a massive nationwide strike in 1922 was set, and the wage structure of Central Appalachia was at the heart of it. Union operators had responded by demanding contracts at a district rather than national level and proposed cuts of 30 percent to wages. Bowman's analysis of industry communications at the time makes clear that those outside the non-union Central Appalachian fields viewed themselves as unable to compete with low wages there and with organization of those fields having been crushed at Blair Mountain by industry, state, and federal forces, outside operators moved against their own unions. The coal shortage from the ensuing strike brought the federal government back into a regulatory role through emergency legislation and allowed the UMWA to hold on to an agreement across Ohio, Illinois, and Indiana, but it lost Pennsylvania (Bowman 1989).

Between 1923 and 1925 union coalfield production shrank from 53% to 30% of total production with the union losing most of the small presence it had in Central Appalachia (Bowman 1989). West Virginia and Kentucky's share of national bituminous coal production had increased from 23% in 1920 to 41% by 1927 (Salstrom 1994). In that same year another strike had even worse outcomes for the UMWA leaving them at less than one-fifth the membership of five years earlier and all but gone from Appalachia. The political and economic elite of West Virginia positioned themselves as securing the nation's fuel supply to legitimate their war on the working class. They responded to the jury acquittal of the Matewan defendants' killing of the coal company Baldwin-Felt's agents with a bill to limit defendants' rights, which was upheld by the Supreme Court. They empowered coal companies to seek compensation for strike losses from parent unions, leading to over 200 injunction victories by coal forces by 1928. "Denied the basic constitutional right of freedom of speech, West Virginia's miners believed that they had

not only been silenced, but also enslaved" (R. Bailey 2009:190). This ushered in a period of unchecked cutthroat competition and price warfare that lasted until the establishment of the National Industrial Recovery Act in 1933. Consolidation of mines that began again in the mid1920s was too little to change the structure of competition. Northern Appalachian mines, even after breaking their union contracts were still weakened compared to the non-union Central Appalachian operators. The depression hit the industry hard: "Between 1928 and 1932, the bituminous coal industry experienced the largest aggregate losses of any U.S. industry" (Bowman 1989:179). By the end of the 1920s coal operators increasingly complained of "unfair" competition by competitors selling "below cost." The Southern Appalachian Coal Association was the first to adopt voluntary codes prohibiting such practices in 1929. In 1931 the governor of Kentucky convened a meeting of the region's governors at the behest of the National Coal Association to develop a plan for the industry. The result was an effort to establish selling agencies to control competition, but only a couple were actually in operation at the time NIRA arrived (Bowman 1989).

Coal, like the National Association of Manufactures, was opposed to the collective bargaining provisions of NIRA. It was these provisions that allowed for a successful unionization across Central Appalachia for the first time in history and which had a longer effect on the industry and the region than the contested and short-lived coal codes of the NIRA period. "Whatever stabilization was achieved…was achieved by the United Mine Workers, not the state" (Bowman 1989:202). Union miners would actually strike violators of the code, which the state did not really enforce.[28] The Appalachian Agreement also came out of the deal to set NIRA codes. It set an eight-hour day and forty-hour week, granted miner selected checkweighmen, ended company store mandates, set the minimum employment age to 17, and, most important, recognized the right to bargain collectively. The UMWA organized a drive with the slogan "the president wants you to join the union" (indicating they meant UMWA president John Lewis if pressed). The drive increased wages from a low of $1.50 a day to $4.20, around fifty cents below

[28] NIRA did not originally include captive mines, but wildcat strikes in western PA got US Steel to honor it at those mines; the coal industry held out longer, continuing to use violence, in places like Gary, WV. Some operators shut down rather than recognize the union(Myers 2009).

the minimum for the already unionized Central Competitive Field (Myers 2009). Even once unionized, the Southern Appalachian region squared off against other regions of operators who wanted government enforcement after the invalidation of NIRA—they wanted to maintain their ability to cut into others markets. Central Appalachian operators remained opposed to government intervention that would regulate prices above the district level. By the time an agency with the power to successfully set prices had been put into practice, demand from WWII had changed the situation.

Coal operators outside of Appalachia had invested in mechanization much sooner and more intensely due to their higher labor costs from unionized workforces (Salstrom 1994). In Appalachia coal companies were better able to regain profits by cutting labor costs through slashing wage rates and jobs. In the absence of unionized resistance coal companies had lowered the cost of labor-power by laying off workers (leaving them to eke out a subsistence as they could) and driving remaining workers harder through wage cuts forming a vicious cycle.[29] Coal miners were relatively autonomous in the actual labor process and in Central Appalachia capital substituted control of life outside of the mine as a way of appropriating additional surplus for increased control over the labor process that mechanization entailed(Simon 1981) WWI had led Appalachian operators to rapidly increase their use of mechanized cutting of coal but in 1933 still just over one percent of coal was loaded by machine in West Virginia compared with nearly fifty-nine percent in Illinois (Myers 2009). In 1940, Central Appalachian mines were still employing mechanized loading at half the rate of the Midwest. Mechanization reduced jobs and also potential customers for company controlled retail. Typical of the backwardness of class structure that Baran (Baran 1962) and Amin (Amin 1976) describe in the periphery, the "coal operator was forsaking the uncertain profits of mechanization for the certain profits of the company store" (Simon 1981:175). Instead, companies invested in repression, with expenditures on police and spies reaching over 6.5% of the wage bill at one mine (Simon 1981). After finally succumbing to unionization, Central Appalachian coal operators utilized high coal prices to invest in catching up with their unionized competitors in levels of mechanization. This dramatically increased the reserve

[29] Gaventa illustrates this process in the case of three Central Appalachian counties early in 1931 (1980:96).

army in the region by reducing the labor-intensiveness of mining and spurred enormous outmigration, even during the war-driven economic recovery.

Mechanization of mining had dramatic changes first on miners' work environments by increasing the level of dust and resultant black lung disease. Whereas British miners were already persuading the government to implement dust control and other safety measures in the 1930s, black lung legislation was not passed in the US until 1969 (Salstrom 1996b). In 1950, three-quarters of coal was still mined below ground in the US and the majority of it from Appalachia. Facing lower quality reserves and higher labor costs, coal operators in Illinois and Ohio were not surprisingly some of the first to adopt mechanized forms of surface mining. By the 1940s around half of the coal in those states was produced at surface mines. Due to the steep terrain in Appalachia, contour and auger mining, in which the hillside is progressively cut away and the coal seam drilled out, preceded by some time the deployment of full scale leveling of ridges. These forms of production made inroads in Central Appalachian and Pennsylvania's coalfields as surface mining technology by the early 1960s was on average more than twice as productive per man hour as underground mining (Montrie 2003). Yet, the application of these productivity increases was limited by two factors. First, the size of the overburden that could be profitably removed for a given quantity of coal was a factor historically determined by the state of the technology. Second, the ability of coal operators to externalize the ecological costs of these extraction techniques was a product of their power relative to other classes and class fractions in the state apparatus. The events leading to the increased importance of these two factors for reproducing a mode of extraction around coal in Central Appalachia will be examined in more detail in later chapters.

Conclusion

Unequal ecological exchange began with the incorporation of native peoples into the capitalist world system feeding both the leather trade in Europe and merchant capital in America. The limitless demand of capitalist industry extirpated many species from the region and restructured the forest ecology. The commodification and concentration of land swept ahead of the frontier of white resettlement, structuring the long-term class

basis of the extractive agriculture that would be practiced. While it is clear that agriculture in this period was extractive and unsustainable, in the early-to-mid 19th century industries such as salt and iron temporarily raised the possibility of greater internal articulation. However, the way in which transportation networks shaped commodity chains marginalized the competitiveness of regional industry and agriculture, as did the labor-intensive production methods reliant on slavery and coerced labor particularly in the southern counties.

The metabolic disarticulation of agriculture was magnified by the new political and economic priorities of the timber boom as it moved across the region. These processes accentuated the precariousness of the latent reserve army of labor made up of households engaged in semisubsistence dependent on virgin forestlands. Combined with natural and migratory population growth, the unequal ecological exchange of previous regimes contributed to the unequal exchange in labor values that would be a major characteristic of the region's coal industry before the 1930s. It is in this period that the dominance of coal interests most clearly creates a mode of extraction in the region's coalfields. Less productive labor and higher transportation costs were counterbalanced by the higher rate of exploitation made possible by the semiproletarian labor force and the differential rents offered by the advantageous qualities of local coal seams. This allowed Central Appalachian coal to act as a destabilizing force in the industry on a national scale for the forty years before the New Deal, which brought unionization and helped equalize the level of exploitation between regions. The share of US coal production held by Kentucky, Tennessee, Virginia, and West Virginia grew from 4.4% in 1880 to 40% in 1930 (with West Virginia alone accounting for 25%) (Simon 1981). The region received little in return for producing much of the coal that provided over three-quarter of the industrializing nation's energy needs (Long 1989). The remarkable history of oppression and violence in the region's coalfields was linked to the social and natural conditions inherited from previous extractive economies that put miners there, as a class, at a disadvantage relative to other mining regions.

The post war period marks a shift in the balance of the contradictions driving the historical development of Central Appalachia's mode of extraction around coal. Simon

(1983)suggests that the exchange relations around the coal sector before WWII likely had a greater importance for Central Appalachia's underdevelopment than afterward when the character of productive relations became more determining. The prewar period was characterized by uncontrollable price warfare and a focus on increasing surplus extracted from coal miners by extending the work day and profits by deduction through the subsidy of household subsistence and the company store. The metabolic regime that made this possible was in large part the result of the worsening position of labor in the semi-subsistence regime that had supported the previously dominant extractive commodity exports of agricultural goods. The boom in timber that either preceded or accompanied coal extraction accelerated the destruction of the natural base of this semi-subsistence regime.

The social metabolism approach draws our attention to how land tenure and access shaped land use and vice-versa in dialectical fashion. The effective reserve army created by this metabolic regime, so crucial to the mode of extraction around coal, was a product of exploiting the land for export surpluses, population growth, deliberate importing of additional labor, and encouragement of continued subsistence by capital. Combined with the potential for differential rents from superior coal reserves, the difference in the productivity of labor in the Central Appalachian coalfields was undoubtedly less than the difference in the cost of labor power. The question of how much of this surplus was captured by which fraction of capital requires more empirical detail than can be mustered here. However, it is clear that the portion reinvested within the region must have been a minority. Of that portion reinvested, a greater amount was dedicated to increasing the exploitation of labor through maintaining the coal camp system than in fixed capital to increase the productivity of labor.

The governments of states in the region, particularly in Kentucky and West Virginia, were an integral part of reproducing this mode of extraction in the face of militant resistance by miners and the efforts to control competition from other coal operators. The ability of coal operators to reap such "profits by deduction" from the semi-subsistent labor force was both the contingent result of the free appropriation and

externalization of costs by previous extractive activity and conscious design via recruitment and policy. As Amin notes:

> It is true that the productivity of labor depends not only on the technologies used but also on the normal framework within which labor, supplied with suitable capital equipment, operates in a given social system. These natural resources have no intrinsic productivity, but they have an effect on that of labor. The social and economic conditions of capital's access to these resources vary, however, and a whole series of cases of "unequal exchanges" are characterized by factors other than unequal reward to labor (1977:211-12).

Amin criticizes Arthur W. Lewis (1954) for oversimplifying the way in which the reserve army in marginal agriculture is reproduced and its contribution to low wages in industry, and the same criticism must be laid on Salstrom's (1994) application of Lewis's theory to the low wages in Central Appalachia. The semiproletarian and latent reserve army squeezed by a destructive social metabolism joined migrant laborers from other peripheral areas of the world system in becoming the most exploited labor force in US coal mining. The company town and the company store with their local operators and absentee owners represented a merger of the dependent merchant and industrial capital commonly seen in the global periphery. The sizable contribution of the gendered household reproductive labor in the semi-subsistence metabolic regime is also characteristic. These forms of appropriation and siphoning off of the surplus, though not directly related to the production process, are no less important to class struggle and the pattern of underdevelopment. The accounts of both miners and coal operators leave little doubt that the rate of exploitation of was higher in the extreme periphery of Central Appalachia and the patterns of surplus extraction and investment were significantly different than in other parts of the country. Despite the general similarities with peripheral regions around the globe, the dramatic transformation of this regime came about because of the regions status as an *internal periphery*. Events at the national level transformed this internal periphery through the unionization fostered by Federal policy and the outmigration of much of the reserve army by the push of mechanization and the pull of wartime full employment opportunities. Both the superordinate political governance and the mobility of labor are peculiar to internal peripheries.

What Bowman's (1989) analysis of collaboration and conflict among capitalists in the coal industry highlights are exactly the dynamics around the importance of rents and transportation that characterize modes of extraction. The location of resources is fixed and so the annihilation of space by time through transport infrastructure becomes paramount. As the potential for differential rents in Central Appalachian coal quality combined with growing transport connectedness, coal operators also brought to bear a favorable balance of class power with labor. Anxieties that are essentially about the effect of legislation on rents available to different types of coal deposits recur repeatedly in documents recording the opinion of coal interests. In the new political economic system emerging after WWII, the importance of the State's regulation of the way in which the natural conditions of production could be appropriated in the coal extraction process would come to rival and even eclipse those regulating labor. The mode of extraction established in the region would increasingly rely on the ability and the intervention of class forces at the national level for its reproduction.

CHAPTER III

INTERNAL PERIPHERIES AND MODES OF EXTRACTION PART II: THE SHIFTING CONTRADICTIONS OF COAL'S SOCIOMETABOLIC REGIME

National level events had overwhelmed the socio-metabolic regime of the Central Appalachian coal operators. NIRA had finally brought the unionization they had resisted with previous state and federal cooperation. This set into motion major changes in the structure of the coal industry. The post-war period coal industry was characterized by consolidation and increasingly rationalized competition in response to changes in the energy market. With labor costs bounded by unionization, coal operators turned to increasing the surplus extracted through greater capital investment in productivity enhancing technology and increasing political investment in maintaining the externalization of the ecological costs of coal production and consumption. This new socio-metabolic regime was challenged in the 1960s and early 1970s at the state and national level but ultimately the mode of extraction was reproduced, designating the region as a national sacrifice zone for cheap energy.

The shifting of capital's contradictions between capital and labor onto ecological conditions was reflected in patterns of changes in mining techniques. The price increases of NIRA had encouraged more marginal mines into production. The region's roadways were expanded by the WPA and gave rise to new "truck mines" going after coal seams previously deemed unattractive. Utilizing free public roads and non-union labor (often only 5-6 men), these small but highly profitable mines were particularly prevalent in Kentucky, accounting for nearly 38% of production (Eller 2008). In general, however, the increased labor costs provided a check on smaller mines and encouraged those who could (mainly larger mines) to increase mechanization, including surface mining. The rapid mechanization of the 1930s was driven by a confluence of factors. A national agreement with United Mine Workers of America (UWMA) setting a wage floor coincided with low interest rates and capital costs as well as an increase in demand for coal in 1934-5. The increasing share of production in large mines offered the opportunity for returns to scale.

John L. Lewis, the UMWA's president, was able to block a proposal to oppose mechanization at the 1934 UMWA convention, over rank and file opinion (Myers 2009).[30] Towards the end of the decade, smaller marginal mines increasingly folded. The throwing out of NIRA by the Supreme Court in 1935 did not undo the agreements made with the UMWA, so price competition resumed but with the wage floor. This increased the pressure for mechanization but adoption still came slower in non-union strongholds like McDowell County, West Virginia where operators didn't embrace mechanical loading until the labor shortages of the war (Myers 2009). The rapid expansion of mechanization and surface mining was the result of contradictions in the socio-metabolic regime brought to a head by changes in the larger political economy.

Although a significant portion of Central Appalachian coal was being mechanically cut after WWI, this had relatively little effect on the labor process within the mines. Furthermore, as long as the coal being cut was still loaded manually, it could actually serve to increase rather than decrease the demand for labor (Eller 2008). Mechanical loading, which required the reorganization of labor into "work crews" was relatively insignificant in the region until WWII (R. Lewis 1993). Federal agencies helped finance mechanization of the mines during the war and wartime jobs fueled outmigration leading to an actual labor shortage in the region. An estimated 19% of the population of eastern Kentucky left between 1940 and 1942 (Eller 2008). It was not until the implementation of the "continuous miner" system in the 1940s, which integrated cutting and loading that mechanization revolutionized the labor process and led to dramatic declines in employment.[31] In 1946 the UMWA, having organized 90% of production, began a series of strikes for a period of years to fund their Health and Retirement Funds and so mines large enough to do so invested further in mechanization (Couto 1993; Eller 2008). At the same time that coal faced increasing competition from other energy sources, the post-war boom came to an end in 1948, bringing home to capital and labor the precarious state of the industry.

[30] Lewis had also been a key force in thwarting the popular support within the union for nationalization of the coal industry (Jameson forthcoming).

[31] With the continuous miner system 10 men could mine three times as much coal as 86 had been able to load by hand (Eller 2008:20).

The Bituminous Coal Operators Association (BCOA) in 1959 made a historic agreement with the UMWA to secure uninterrupted production for their customers and further mechanize production to bring down costs, thus securing a future in the growing electrical power market (Couto 1993). In return for increased wages and the funding of benefits sought, the UMWA committed itself to the process of mechanization. To offset the inevitable loss of jobs a royalty was placed on each ton of coal to provide for those displaced. Yet, John Lewis would not allow the royalty to rise to a point that might harm the competitiveness of coal visa vie other energy commodities and so the amount of benefits and the number of beneficiaries of the program were reduced below the already insufficient quantity—leaving many displaced miners abandoned by their union (Couto 1993). The agreement marked a pivotal moment in the establishment of a "treadmill coalition" (Schnaiberg 1980) between coal capital and labor, one that would continue to undermine the union's role in representing the class interests of coalfield communities. Between 1950 and 1970 employment in coal mines dropped by 75% nationally and only slightly less, 70%, in West Virginia (R. Lewis 1993). Many of the region's small and medium sized mines were forced under. In the 1970s automation of mines increased underground with the development of long-wall mining, while above ground surface mining dramatically expanded to new scales. Between the 1940s and 1970s some three million people left Appalachia (Eller 2008). The region's underdevelopment, exacerbated by falling mining employment, raised a potential challenge to the legitimacy of the State in post-war capitalism, and the policy response created political opportunity structures for both reproducing and challenging the mode of extraction around coal.

Development Policy in Appalachia and the War of Poverty

Many Central Appalachian counties lost more than 70% of their farm populations in the 1950s, often leaving fewer than 100 families per county. Even the livestock business "all but disappeared with the elimination of woodlands for pasturage as a result of mining, logging, and absentee ownership" (Eller 2008:29). State planners, like the Appalachian Regional Commission, often encouraged such depopulation as an inevitable outcome and solution to poverty. The region lagged behind in manufacturing growth and suffered rising unemployment, with rates in the coalfields reaching three or four times the

national average. Per capita incomes were a third or less of national averages. Education levels had continued to lag far behind other regions with half the average spending and in 1960 the region had a high school attainment rate of less than one-third of adults. The previously established patronage system of local government contributed to a poorly functioning education system. Eller (2008) argues that as the outside corporate interests which had dominated many areas lost direct interest, local economic elites expanded their existing influence over land, and credit, and etc., to control a patronage system of state funds and programs—creating powerful political machines. The core of these machines, which included many middle class professionals, were the land developers, real estate brokers, and lawyers who had always managed the affairs of absentee capital. "These local entrepreneurs accumulated small fortunes where the majority of their neighbors lived below the poverty level, and they were not opposed to using the political system to maintain their good fortune" (Eller 2008:36).

In coal counties, local operators dominated political structures. The Harlan County, Kentucky Republican Committee was chaired by the secretary of the coal operators association while the Democratic Committee was chaired by the president of coal operators association (Eller 2008). These local power structures facilitated the spread of small strip mining operations by providing public infrastructure, favorable credit, and freedom from regulatory enforcement. They blamed the union and the lack of infrastructure as responsible for coal's declining position. When Kentucky created a development agency, the Eastern Kentucky Regional Planning Commission, it had an advisory council of some 200 citizens but the commission itself was dominated by coal and land interests(Eller 2008). The same problems of the 19th century, priorities for extractive infrastructure but insufficient sources for public or private investment, repeated themselves.

The endemic corruption at the local and state levels led to calls by concerned individuals and organizations for more national level intervention (Eller 2008). However, in addition to local and state level influence by coalitions of extractive interests, federal institutions also contributed to ensuring continued dependent development around coal. The Tennessee Valley Authority had originally been established in 1933 with a broad

development and planning mission of rural electrification, soil and forest conservation, and flood control. However, by the 1950s, the TVA increasingly narrowed its mission to focus on the provision of cheap electricity, building some of the world's largest coal-fired electrical plants (Nolt and Bustos 2005). To this end it provided financing and purchasing agreements for non-union and surface mined coal, becoming a significant owner of coal rights across Kentucky and Tennessee. In 1957 a series of disastrous floods swept the Central region and government investigators identified surface mining and logging as prime contributors (Eller 2008). While these TVA policies were justified in the name of development, workers in the mines it backed had poorer wages, safety conditions, and benefits than the UWMA-BCOA established standards (Couto 1993). These policies helped coal become the US's largest source of electricity by 1961. TVA also demanded that mines subject to the agreement meet the low prices of its sponsored operations. UWMA president Lewis succumbed, while waging economic war against these TVA sponsored mines, to pressure to allow wage variances and further cut pension and benefit costs to meet this objective (Couto 1993). However, "few coal miners realized that the reason for the sweet-heart contracts, the withdrawal of UMW hospital cards, and the starvation economy was in part the steam coal policies that TVA was pursuing quietly in Knoxville" (Branscome 1978:287).

By 1960, as West Virginian coalfield poverty was receiving presidential campaign attention, the governors of the other Southern Appalachian states were releasing a "Declaration for Action Regarding the Appalachian Region," framing the problems in the area in terms of "underdevelopment" and calling for national investment and planning (Eller 2008).[32] The region faced the problems that it was unattractive to private capital and could not meet the requirements of for federal programs that depended on population and matching funds by state or local government. When the UMWA health program collapsed in 1962 with the failing economy, class warfare broke out in the coal fields with "jobless families on one side and coal operators, businesspeople, and local

[32] This conception of underdevelopment should not be confused with that of dependency and world-systems theories. Although the head of the study group which would eventually give rise to the Appalachian Regional Commission compared Appalachian underdevelopment to that in Latin America (Eller 2008), it was with an understanding based largely on Rostow's (1960) stages of development. In the same way, when the region was discussed as an underdeveloped nation "within" the US, it was usually without the implication that its underdevelopment was related to US development.

government officials on the other" (Eller 2008:68). Wildcat strikes and attacks on mines that had avoided payment of union-required royalties involved widespread violence and property destruction. The following year more disastrous flooding struck. As the region became a national icon for poverty in the midst of plenty, the Appalachian Regional Development Act (ARDA) was passed in 1965. To distinguish it from the Lyndon Johnson's War on Poverty initiative and the Economic Opportunity Act (also launched by a press event in Central Appalachia), the Appalachian Regional Commission (ARC) created by the ARDA would focus primarily on infrastructure desired by local elites, to the neglect of human development goals that were originally proposed.[33] In addition to the dubious inclusion of additional counties and states for political support, the final bill removed proposals that might have competed with private business (Eller 2008). Four-fifths of the Appalachian Regional Commission's spending would go towards road building. Less than one quarter of the funds would go to the Commission's central Appalachian counties of southern West Virginia, east Tennessee and western Virginia over the first decade. Such transportation funds, channeled through local power networks would help feed the rise of non-union and surface mines.

The War on Poverty's Office of Economic Opportunity's anti-poverty Volunteers in Service to America program and some Community Action Agencies would have unanticipated and unintended effects in the region's coalfields. Although conceived of in the "culture of poverty" frame of analysis and intended to instill middle class values in "deficient" communities, some of its volunteers would generate a more radical praxis. While by and large the federal programs could be coopted into patronage networks of local elites, some of the student volunteers turned from their service and education mission to political organizing against local power structures around issues of welfare rights and strip mining (Eller 2008; Walls 2009). As these Appalachian Volunteers increasingly came to see from their time in coalfield communities that the economic and political power of local and absentee elites were structural causes of poverty and underdevelopment, they provided new energy and skills to old traditions of resistance and class consciousness. By the late 1960s the anti-poverty programs were widely seen as a

[33] The agency would take a relatively more human development focused approach during the Carter years but infrastructure remained primary.

political threat by the Appalachian county elites who feared the poor masses mobilizing against them. In West Virginia this threat took the form of election reform. In Mingo County, which the miners' army had set out unsuccessfully to liberate in the mine war of 1921, election corruption was rampant, and, even after a statewide reform campaign, estimates were that two-thirds of votes were bought in 1964 (Eller 2008:143). A central point of contention in mobilizing resistance to coal's hegemony was the new socio-metabolic relations around surface mining.

New Metabolic Relations in Central Appalachia's Mode of Extraction

Surface mining reached significant levels first in eastern Kentucky's truck mines in the 1940s and later that decade in West Virginia. The practice came in earnest to Tennessee and Virginia in the 1950s. The use of diesel powered earthmoving equipment to cut away at exposed hillside seams was the earliest form employed. This created a "bench" as the hillside was cut away along the contour of the ridge and left a "highwall" of sheer rockface that was often unstable. Additional coal could be recovered by use of large drills, or augers, to remove coal from the seam after the size of the highwall became prohibitive of further excavation. Such contour and auger mining was initially more common due to terrain than open cut mining that removed the entire surface layer of overburden to expose the coal underneath. The latter type of mining expanded across Kentucky and West Virginia in the late 1960s, eventually reaching a scale appropriate to being called Mountaintop Removal as equipment began to allow for just that in the 1980s (Montrie 2003). All types of surface mining produced the risk of acid mine drainage and sedimentation, which increasingly threatened residents' water supply while landslides, floods, blasting, and a lack of reclamation threatened homes and productive lands (Shover, Clelland, and Lynxwiler 1986). The ecological effects of surface mining are discussed in more detail in chapter VI.

Contesting the mode of extraction. Some of the earliest challenges by environmental movements of middle class reformers and working class sportsmen to surface mining were supported by UMWA locals who saw the mostly non-union operations as threatening not only community interests through their environmental degradation but also as a threat to unionized underground jobs. West Virginia was the

first state to implement regulations in 1939 while Kentucky did not do so until 1954 (even then, the enforcement agency was abolished by the subsequent governor) and Tennessee had no legislation until 1967 (Montrie 2003). As a rule, state legislation was weak with little resources for enforcement and minimal penalties and standards. During the early 1960s, TVA, under pressure from citizens and some state officials, did add language to its contracts requiring control of runoff during mining and reclamation afterwards. However, the agency would continue to lobby strongly against effective federal controls over the next decade(Vietor 1980). In political battles over regulation, protecting productive agricultural lands and steep slopes prone to landslides or flooding were of prime contention. Usually some type of bond payment was required in advance to insure the costs of reclamation in case the mining company went bankrupt. But in practice these funds were inadequate to restore the land to its previous condition, which was often impossible because no amount of labor or capital could restore the previous ecosystem. For this reason, opponents of strip mining often compared the reclamation process to "putting lipstick on a corpse" (Montrie 2003).

In struggles over legislation and regulation, the underlying power of capital employed in coal extraction to freely appropriate natural use values and externalize costs was both *de jure* and *de facto.* While weak regulatory regimes allowed for the latter, in Kentucky the broad form deed was a critical example of the former.

> Written in finely printed legalese… the broad form deeds often signed over the rights to "dump, store, and leave upon said land any and all muck, bone, shale, water, or other refuse," to use and pollute water courses in any manner, and to do anything "necessary and convenient" to extract subsurface minerals (Montrie 2003:66).

While courts in West Virginia ruled that such deeds only applied to the use of mining techniques known at the time (primarily the late 18th, early 19th century), in Kentucky courts upheld the superiority of mineral right owners over surface owners—even going so far as to release them from any liability to surface owners property in the mining process except where "oppressive, arbitrary, wanton, or malicious" (Montrie 2003:67-8). The Kentucky courts were so deferential to coal that they overturned legislation passed to reign in the use of the broad form deed, which was only ended by a 1988 constitutional

amendment through popular referendum. Local groups trying to protect residents' land from the strip miners used civil disobedience, protest, petitioning, industrial sabotage, and threats of violence. Anti-poverty volunteers who had helped organize community opposition across the state were arrested by the Pike County, Kentucky sheriff following an investigation by the Independent Coal Operators Association and charged with sedition. The head of the Coal Operators Association took aim at Kentucky governor Breathitt, who had been somewhat sympathetic to landowners, and, according to the Operators, "outsiders, and communists" (Montrie 2003). Breathitt's request to the federal government to cut off funds for the more active groups did not persuade the threatened local establishment and a candidate who ran on a platform to run the anti-poverty groups out of the state replaced the governor in 1967. His successor, governor Nunn made good on his promise in part by creating the Kentucky Un-American Activities Committee (G. Carawan and C. Carawan 1993; Montrie 2003).

Despite the passage of more stringent regulation in 1967, the ecological and economic impacts of surface mining in West Virginia continued to grow as enforcement failed. For every acre directly strip mined another three to four acres were degraded (Montrie 2003). As momentum built for a ban, coal operators had support from district 31 and the International vice president of the UMWA and the West Virginia Labor Federation. The latter state body of the AFL-CIO argued a 6.6 unemployment rate meant regulation should be given one more chance. Contrawise, West Virginia Black Lung Association president Arnold Miller (and future UMWA president under the Miners for Democracy reform ticket) rallied underground miners in support of a ban. The West Virginia Surface Mining Association (WVSMA) launched a media campaign emphasizing reclamation laws and the economic importance of the industry. The 1971 compromise bill that passed placed a two-year moratorium on stripping in the 22 counties that did not currently have mines (only half of whom had coal to begin with). A measure of the impact on the coal industry was the WVSMA's praise of the bill as "fair and equitable" (Montrie 2003:123). The Stanford Research Institute, whose president was a board member of the parent company of the second largest strip miner in the state,

Consolidated Coal Company, was commissioned to study surface mining in the state.[34] Their results unsurprising recommended that existing regulation was largely adequate (Montrie 2003:124-5). A number of anti-strip mining political candidates did well in the subsequent election but Democratic candidate John D. Rockefeller was soundly defeated in the governor's race, resulting in his transformation from a proponent of surface mine abolition to one of its most prominent defenders.

The energy crisis of the early 1970s caused a dramatic increase in demand for coal, triggering a new boom in the industry and cementing its connections to the larger energy industry. The increased presence of the coal in the national power structure achieved over the previous decades facilitated favorable federal policy and helped stifle a national movement for federal surface mine regulation (Vietor 1980). The 1965 ARDA had commissioned a federal study of the effects of surface mining, and the following year the results concluded that over 700,000 acres had been affected across the wider region with less than three-eigths undergoing reclamation (Montrie 2003:133). While state regulation was shown to be a dismal failure, but there was hesitancy among the policy formation network on all sides to pursue federal regulation of diverse mining conditions across multiple states. In the mid-1960s secretary of the Interior Udall had compared the degradation of surface mining to the Dust Bowl of the 1930s, and in 1970 the New York Times editorialized along similar lines calling for a federal ban on the practice (Montrie 2003). This public sentiment and the threat of federal abolition bills brought large coal capital to take a more conciliatory position (Shover et al. 1986). It also reflected a growing tension between establishment coal operators and the union in Central Appalachia. By 1970 two-thirds of the coal mined in Appalachian Kentucky and Tennessee was non-union, largely from surface mines (Montrie 2003:23). Underground coal production had peaked in 1950, and after 1970 surface mining continued to grow rapidly overtaking underground production after 1973. The use of surface mining as a method to lower labor costs would divide and eventually fatally undermine the UMWA

[34] The vice president of Consolidation Coal had two years earlier addressed the American Mining Congress and attacked those pressing for improved mine reclamation as "stupid idiots, socialists and commies who don't know what they are talking about" (quoted in Montrie 2003:140).

in Central Appalachia. The seeds of this divide emerged in the early 1970s as movements pressed for federal intervention to curb surface mining.

The late 1960s and early 1970s were a period of dramatic struggle within the UMWA. Union leadership under Tony Boyle had collaborated with coal capital to try and crush the rank and file movement for workplace health and safety and legislation for Black Lung compensation. Rank and file workers won these through multiple forms of agitation and the "longest political strike in modern U.S. labor history," efforts that were all against the orders and lobbying efforts of the union leadership (Nyden 2007:41). The same social movements fighting surface mining, which recognized the damage to miners' bodies as another unpaid cost of the industry, aided miners in these battles (Judkins 1993). The increased productivity underground created by more powerful machinery had also elevated new dangers for miners, such as black lung disease, which undercut the reproduction costs of labor, foisting them back upon households left to care for those crippled by occupational disease. The removal of these externalities, through miners success at forcing regulation, was a major factor in declining productivity for the industry in the early 1970s (Darmstadter and Kropp 1997).

After Boyle ordered the assassination of democratic reform candidate Joseph Yablonski and his family, the Miners for Democracy movement elected Black Lung Association president and anti-strip mining activist Arnold Miller to the presidency in 1972. While the UMWA under Boyle had mirrored the coal industry's position on federal regulation, first denying its necessity and then supporting regulation over a ban, Miller was an old ally of the leading abolitionist, Ken Hechler, who had played a key role in the Coal Mining Health and Safety Act of 1969. Both Hechler and Miller had campaigned in 1971 for abolition of surface mining in West Virginia as a route to more underground union jobs and a necessary protection for affected communities. Once in office, however, Miller faced internal divisions, ultimately supporting a policy of protecting the small number of union surface mine jobs and trying to organize the non-union majority. The per-ton royalty payments for the union healthcare and pension funds were an important consideration independent of the lower number of jobs. Although initially taking a strong position on regulation and reclamation, arguing for permitting surface mining only where

it was the only economically feasible choice, by the time president Ford had vetoed a second regulatory bill in 1975, the union had overturned Miller's initial stance and began, like the coal industry, to testify against federal regulation (Montrie 2003).

The mine safety, black lung, and anti-strip mining movements were part of a larger counter-hegemonic mobilization catalyzed by the influx of anti-poverty volunteers. The coalfields of the late 1960s and early 1970s reflected larger political forces at work in the nation.[35]

> Nothing quite united Appalachian activists, small landowners, and mountain intellectuals across state borders in the late 1960s and 1970s like the anti-strip mining movement. Few causes touched on a broader range of social issues confronting the region: landownership, taxation, jobs, environmental quality, and even traditional values. (Eller 2008:161)

The Miners for Democracy movement within the UMWA could have marked a significant turning point in the formation of continuing counter-hegemonic movements in the region, but ultimately the union succumbed to treadmill forces. By the late 1960s the anti-poverty organizations' federal funding was being withdrawn and repression was dismantling their operations. Although the union launched a wave of strikes in the 1970s to capture for its membership a share of the rising price of coal and improve working conditions, by the 1980s it was again on the defensive as firms began to break away from the BCOA industry wide agreement. By 1977 the union was in a weakened state, producing only 50% percent of the nation's coal, down 40% from 30 years earlier, and the strike beginning that year was the longest and least effective since the BCOA agreement began (Couto 1993). The fateful decision to attempt to organize rather than suppress surface mining would progressively deepen the rift between the UMWA and other progressive movements opposing the capitalist exploitation of land and labor (Burns 2007).

Although one might have expected the oil shortage to secure coal against competition and allow it to absorb the costs of expanding deep mining, the major effect at the national policy level was hostility to anything that might increase energy costs and

[35] "'The same values and national priorities which allow this country to inflict massive destruction upon the Vietnamese,' declared one Appalachian movement publication in 1971, 'are responsible for poverty, cultural imperialism, and the attacks upon the land and people of Appalachia'" (Eller 2008:173).

threaten economic growth. Working class and petty bourgeoisie movements Appalachia reached their peak influence in calling for a total or partial ban on surface mining in 1971-2 as part of the National Coalition Against Strip Mining with mainstream environmental groups (Eller 2008; Montrie 2003). The ecological contradictions of coal extraction were dramatized by the 1972 Buffalo Creek disaster were a coal waste dam broke, killing 125 and displacing thousands (Bryant et al. 2007). A split emerged in the years following between more radical regional multi-issue organizations who saw the social relations of extraction within the region rendering rational regulation of surface mining impossible and national conservation groups most concerned with the non-human nature damaged by surface mining and political legitimacy. Yet even the Issac Walton League remarks reflect on the unequal ecological exchange affecting the region "Our economic system is the best in the world but it sometimes exposes a questionable face… for it is paradoxical that we are destroying the beautiful mountains and valleys of one area to create an Eden in another" (quoted in Montrie 2003:137).

Coal representatives had been united in opposition to federal regulation in the late 1960s, but by the early 1970s the largest industry groups responded to the threat of serious restriction of their ability to externalize costs with a more conciliatory approach. In the period leading up the passage of the Surface Mine Control and Reclamation Act (SMCRA) in 1977 divisions between regions and between larger capitals and smaller played out.[36] The largest coal companies feared for the value of their Western assets as lawmakers from states like Montana proclaimed they "do not want our beautiful state…ruined…in order to decrease the air pollution in the East when the true motive behind strip mining is a higher margin of profit for coal companies" (quoted in Shover et al. 1986:34). State lawmakers had voiced hesitancy to enact regulatory programs that might undermine their coal industry's competitiveness, but also recognized that uniform regulations would benefit some states over others due to natural conditions. By claiming to support "reasonable" federal regulation but working to defeat any specific bill proposed coal interests progressively weakened the bills passed in 1974 and 1975 and

[36] This divide was visible in the organization structures employed. The large companies operated through the American Mining Congress and National Coal Association while smaller companies formed the Mining and Reclamation Council of America.

convinced President Ford to veto them on energy supply and employment grounds (despite concession in those areas by lawmakers). With the election of President Carter the equation had changed, some form of federal regulation seemed inevitable. Uncertainty over future regulation was inhibiting the attraction of investment capital and planning for increasing the scale of operations. The need for rationalization applied particularly to the largest companies who were also more likely to have Western operations. In 1977 the Independent Coal Operators Association representing Appalachian producers expressed fears that without some form of regional coordination they would face increasing loss of market share to western strip mines (Shover et al. 1986). Such fears would prove well founded. While the industry unanimously reversed their earlier position supporting "reasonable" federal rules and opposed SMCRA in 1977 on the grounds that state regulation was now sufficient, for many Eastern operators the opposition was more desperate. Due to their average size and the Appalachian landscape they were more vulnerable to the higher costs and requirements around mitigating environmental damage, particularly the law's provision for restoring land to its "approximate original contour." The industry was united however, in opposition to provisions for public comment on permitting, citizen lawsuits over compliance, and analysis of hydrological impacts. In this sense, although much weaker than the previously vetoed bills, SMCRA represented a defeat for the industry, as one study put it strongly: "there is nothing…that indicates the act was a consequence of efforts by enlightened corporate liberals to dampen competition or to control markets. It might even be said that are *no* enlightened corporate liberals in the coal industry" (Shover et al. 1986:125). The bill was much stronger than the coal industry would have preferred but contained key provisions granting primacy of enforcement to the states, which would allow the coal industry to bypass this threat to the mode of extraction by exercise of direct as well as structural power at the state and federal levels.

The failure of regulation and the reproduction of extractive relations. SMCRA created the federal Office of Surface Mining (OSM) within the Department of the Interior to establish a broad regulatory framework of standards that would then allow for states to create their own tailored to local issues. Immediately after passage of the bill the coal industry unleashed a barrage of legal challenges that were largely ineffective in doing

much besides delaying promulgation process. The level of autonomy shown by the OSM was shocking to both coal companies and state officials who perceived the agency to more sympathetic to environment groups concerns (Shover et al. 1986). State level politicians revolted, with former abolitionist gubernatorial candidate and now West Virginia senator Rockefeller introducing legislation just two years after passage to weaken SMCRA. The states, who, given their history of capture the OSM had held at arms length, opposed both the stringency of the regulations and particularly requirement for greater citizen participation in the enforcement process that undermined their rent allocating abilities. Major Central Appalachian coal states feared capital flight to areas where coal production had less costly to mitigate social and ecological consequences. For Appalachian producers the added costs per ton to meet the OSM standards were estimated to be $5.24, compared to only $1.80 in the Midwest or $0.57 in the West (National Resarch Council 1981). The economic downturn and problems in the steel industry softened demand, and although more concentrated than ever, the industry still could not hope to pass on all the costs of regulation to consumers.

> There is a fundamental lesson here: local state agencies serve as a proxy for capital in their battle against relatively autonomous federal-level state managers. Local state managers are more responsive to economic conditions than are federal-level managers. In revolting against the OSM, local state managers were not acting as instruments of capital, they were simply doing their job, "steering" the local economy by promoting a good business climate (Shover et al. 1986:122).

Were the regional mode of extraction was an important part of the larger state economy it was not simply a matter of regulator capture but the very structure of accumulation.

Between the political and public relations campaigns claiming economic cataclysm waged by the industry the OSM was already weakening its enforced compliance approach in favor of more flexibility for states when Ronald Regan assumed the presidency. Following the recommendation of the Heritage Foundation to "make and example of OSM and its regulatory excesses" Regan appointed some of the agency's most vocal opponents as its top officers (quoted in Shover et al. 1986:150). In contrast to the earlier career regulators and bureaucrats, the new OSM leadership created a revolving door with industry, gave great latitude to the states in their own enforcement policies, and established rules forbidding federal intervention once a state had taken over primacy

except in cases of “arbitrary, capricious, or an abuse of discretion.” The bounds of such discretion would become the center of many legal battles as mountaintop removal mining became increasingly common (Burns 2007). SMCRA had banned the highwalls left by contour mining and so the coal industry increasing employed ever-larger equipment to remove the entire mountaintop. State level control gave coal companies the ability to ignore some aspects of the law such as the requirement to return land to its approximate original contour, and face minimal repercussions for violations of others such as waived or reduced fines, and late payment of fines with impunity.

The victims of surface mining and their Citizen groups working with the Highlander Center were able to secure ARC funding for a 1978 study of land ownership patterns (Appalachian Land Ownership Task Force 1983). The results of the study showed further how the mode of extraction with its absentee ownership contributed to underdevelopment and were important to tax reform in some states but ultimately could do little to change the underlying property relations. Mineral wealth across the region was subject to low rates of taxation making the counties richest in coal the most underfunded and dependent on state and federal transfers to meet their responsibilities. When in 1976 Kentucky lawmakers had attempted to levy a 31 cent per $100 value tax on unmined coal, mineral owners simply refused to file and the state abandoned the effort after two years; instead, they directed local assessors to try and gather a mere 10^{th} of a cent per $100 value. Subsequently, in Martin County, the property tax revenue from the largest coal interest *owning over half the county* was insufficient to “buy a bus for the county school system, and the $76 it pays on its mineral rights would not even buy the bus a new tire, to replace the wear it receives on the county’s unpaved and rough coal-haul roads” (Appalachian Land Ownership Task Force 1983:61). Kentucky community organizations rallied public outrage over such conditions to make improvements to the tax code over the following decade but fundamental structural problems remain(Szakos 1993).

Whereas Western coal states Wyoming and Montana created permanent coal/mineral trust funds in the mid 1970s that have been used to fund alternative forms of economic development, Central Appalachian states often did not even levy state severance taxes on minerals until later and then without long term planning. Kentucky

enacted a severance tax on coal in 1972 but West Virginia did not until 1987; neither has implemented a similar trust fund (Central Appalachia Regional Network 2012). When the recession hit in 1983, Central Appalachia was particularly devastated and over the next two decades the region's position relative to the rest of Appalachia and the nation, which had converged in the 1970s, widened yet again. ARC investments had taken an urban growth center approach that further polarized urban-rural development patterns. Like their national counterparts, extractive community capitalists preferred to invest in the rapidly urbanizing transportation hubs of the region (Eller 2008). The recovery in coal production took place through much larger more mechanized mines, while smaller mines folded and the elites who had accumulated wealth from them often left for urban areas. Older more marginal metallurgical coalmines that had depended on the US steel industry were pushed under by its decline. Appalachia lost 70% of coal jobs between 1980 and 2000 (Eller 2008:225). The changing structure of the coal industry increased its ability to adapt and subvert environmental controls and launch a new offensive against labor.

The UMWA continued to weaken as it lost ground to the aggressive tactics of Massey Energy in the 1980s. During this decade, the A.T. Massey Coal Company began to use its subsidiary structure to avoid union agreements and undermine the BCOA standards. A key issue in the strike against Massey, and later Pittston, was their shirking of payments to the pension and benefit funds that retired and disabled miners depended on (Couto 1993). The last great mobilization of the union and wider community organizations together was the 1989 Pittston strike, which still ended in a compromise that emboldened more mines to break their union contracts (Eller 2008; Sessions and Ansley 1993). As coal continued to shed jobs through mechanization the externalities of mining accelerated the depopulation of the coalfields. The Clean Air Act of 1970 had already spurred increased surface mining of low sulfur coal in southern West Virginia and eastern Kentucky. In 1978 the Appalachian Alliance had warned of the region becoming a national sacrifice zone for cheap energy and by the 21st century this was firmly established (Eller 2008; J. Fox 1999). The Clean Air Act amendments of 1990 were an example of rifts and shifts that further set up part of the region as a national sacrifice zone. This reflected the difference in power structure, which divided coalitions around clean air in urban areas and the continued hegemony of extractive industry at the

state level. While urban growth coalitions brought fractions of capital into opposition with citizen groups against the national coal coalition on air pollution (Gonzalez 2005; Vietor 1980), the mode of extraction in the coalfields produced no such fractures.

By 2000 nearly half of Appalachian coal came from MTR and Central Appalachia, again, had a poverty rate twice the national average. Most of the counties determined to be "economically distressed" by the ARC in 1960 remained so. The gap in college education between Central Appalachia and the rest of the national had increased. The same problems of tight control of politics and economics by local elites remained, and falling coal employment did not reduce coal's hegemony in state politics (Bell and York 2010). Outmigration from the coalfields continued as coal companies, in the opposite policy of a century earlier, adopted policies of persuasion and coercion to encourage outmigration (Burns 2007). Coal's needs were no longer primarily for an exploitable labor force but for freedom from regulatory or legal challenge to their destruction of natural values in the process of coal extraction. The mode of extraction continued to operate in the economic and political realms, but on the basis of a new soico-metabolic regime. These issues are examined in more detail in chapter 6.

Conclusion

The coal industry in Central Appalachia responded to the loss of its advantage in labor costs by investing heavily in labor saving fixed capital. The increased labor productivity of underground mining equipment also increased the risk of different types of injury and disease such as black lung. Miner and community struggles against these profits by deduction faced not only capital but also their own union's collaboration. Simultaneously the increased productivity of surface mining and its ability to bypass the organized labor pool of underground miners, lowered barriers to entry and increased competition within the industry. The major labor saving advantages of surface mining, and thus their ability to increase profits, rested on the ability to freely appropriate and destroy use values. These included not only ecological use-values such as the function of hydrologic systems of mountain watersheds that unavoidably transverse capitalist property boundaries but also the homes of working class and smallholder agricultural families through the broad form deed. The disruption of residents' lives by this new

social metabolism of mining also brought challenges both direct and through the State. Residents attacked not only mining practices but also evasion of taxation on land and mineral rights that had starved local governments and contributed to the neglect of infrastructure for human and economic development. However, the political dominance of coal capital at the local and state level continued to thwart attempts to reign in mining practices drove regional and national level mobilization.

Having managed to maintain their dominance at the state and local level coal owners, operators, and their allies faced the threat of national level action. This possibility of superordinate State intervention distinguishes internal peripheries. A coal coalition had already begun to emerge around the threat of national air pollution regulations (and their implementation after 1970) when surface mining became a national issue. By the time the industry faced both new air quality and surface mine regulation in 1977, it was better prepared to challenge the environmental movement thanks to greater economic concentration and political organization (Vietor 1980). This was true both on technical grounds through its own network of experts on establishment of standards that threatened profitability and in designing the enforcement process to allow for subversion of those they could not block. The stagflation of the 1970s allowed for the coal industry to claim that any restrictions would raise energy prices and harm the national economy. While other significant sectors of capital were aggrieved by air pollution, the underdevelopment of the dominant mode of extraction in Central Appalachia left little internal class division over restrictions in that area. While the rentier classes of urban growth coalitions have incentives to oppose ecological degradation that devalues their assets (Gonzalez 2005), in the coalfields the assets the rentier classes seek to protect rest on the profitability of extraction that results in the destruction of the ecological commons. Thus in an area dominated by a mode of extraction, ecological protection and economic development limit the scale and destructiveness of extractive technology and so result in a devaluation of those assets. Although earlier bills would have required surface owner consent before mining in all cases, the final version of SMCRA protected only lands where the mineral rights were federally owned, located only in the West. When energy and coal interests captured the executive branch and devolved regulatory authority back

to the already captured states it ensured the continued reproduction of the mode of extraction in the region.

While conflict with labor remained an unresolvable contradiction, its primacy was displaced. Unions continued to lose ground to aggressive companies employing surface mining and renewed union busting. As they grew progressively weaker, they could at best offer symbolic support for rule of law and a balance between environmental protection and community health and at worse threw real political weight against any restrictions that might lead to loss of jobs. Major symbols of class struggle in the region's history have had their meaning turned upside down. The site of the pinnacle of class conflict in the West Virginia coalfields in 1921, Blair was added to the National Register of Historical Places in 2009. However, property owners, some of whom had already begun the early stages of preparation of surface mining, successfully petitioned the National Park Service to have it delisted (in part by including the names of land owners already deceased or otherwise without standing in their petition). While the UMWA has expressed support for its listing on the Register, it has done little else. Union president Cecil Roberts who once declared "class warfare" in the 1989 Pittston strike can sing "which side are you on" arm in arm with coal executives who were former class enemies, indicating they are now on the same side and environmentalists on the other.

The emergence of a treadmill coalition between capital and labor in the coal industry following WWII both helped maintain the political power of the coal industry and set in motion changes in production toward surface mining that would undermine labor in the industry while increasing unequal ecological exchange by increasing the industry's ability to externalize costs. The existence of a mode of extraction in the region, with a powerful influence on the states of Kentucky and West Virginia in particular, was well established by the Second World War. The economies of the region and these states have been vulnerable to fluctuation in the markets for the raw materials they produce and the competition of other sources and substitutes throughout their history.

Land ownership studies of the 1970s were updated in West Virginia in 2013, indicating similar patterns of absentee ownership. Concentration overall had declined from a dozen firms holding a third of private lands to the top 25 holding nearly 18%, but

the southern coalfields of the state remain the most concentrated with the top ten owners still controlling more than half of the surface rights (West Virginia Center on Budget and PolicyAmerican Friends Service Committee 2013). Consolidation Coal Company was the top landowner in 1972 but by 2011 was only tenth, while timber management companies that emerged from the financialization of the 1970s have become the dominant owners (Gunnoe and Gellert 2011; West Virginia Center on Budget and PolicyAmerican Friends Service Committee 2013). Today coal is in what most analysts agree is a permanent decline within the region as it faces the exhaustion of most of the prime deposits and increased competition from natural gas as well as limitations on the environmental externalities it produces as an energy source. The "exhaustion" of the region's socio-ecological relations (Marley and S. Fox 2014) is characteristic of the self-undermining features of a mode of extraction (Bunker 1984).

It is an open question whether the calls for rethinking the region's future as an extractive sector will lead to state intervention for an alternative development path or whether the region will see continued decline accompanied by a continued reliance on extraction for an ever-smaller number of people in an increasingly degraded environment. This question will depend in large part on what happens in the national context. Therefore, let us first examine the relation of Central Appalachia as an extractive region in the US in comparison with Bunker's original analysis of the Amazon within Brazil.

Internal Peripheries of Core versus Semi-peripheral nations: Some Initial Comparisons with Brazil's Amazon

There were initially broad similarities between Appalachia and the Amazonian highlands. "On a world scale, Southern Appalachia's role was not that different from many other such peripheral fringes at the time, including inland mountain sections of several Caribbean islands, Brazil, the West Indies, and central Europe" (Dunaway 1996a:196). Bunker (1984) describes Brazil's Amazon as transitioning though modes of extraction based first around spices and animal products, followed by collapse and stagnation and then reorganization around rubber production, and finally followed by a mix of mining, large scale ranching, and timbering. The first mode of extraction, as in Appalachia was organized by an external colonial class and drastically reshaped

indigenous societies in organizing labor for the extractive economy. Similarly, the key export plant and animal species were decimated and the sustainable farming techniques of the indigenous were lost to later inhabitants. However, unlike the Appalachian case, the Portuguese relied on extensive and prolonged enslavement of indigenous peoples for their extractive labor force resulting in the death or displacement of the major population base along the river system. Native peoples in Appalachia, while suffering great population losses from war and disease, ultimately faced later displacement by settlement policies.

The greater colonial state support for settlement of North America and parts of Appalachia by the British and the duration of the supportive relationship of the colonies which became the US (Bunker and Ciccantell 2005) stands out as a key difference between Appalachia and the Amazon. Whereas Appalachia has been characterized by "a relative *abundance* of labor but a *scarcity* of local capital," (Dunaway 1996a:314) the Amazon since the collapse of the initial mode has been hampered by a scarcity of labor and capital. When responding to the rubber boom after 1839, the landed classes had to import labor into the region from other parts of Brazil (Bunker 1984). They extracted surplus from the tappers through the system of *aviamento*. By controlling river access to the territories, worker debt, and a monopsony on rubber purchases the *aviadors* achieved a high rate of exploitation making up for the inefficiency of the labor structure and expensive food imports (Bunker 1984). In contrast to Central Appalachia, the overwhelmingly imported labor force in the Amazon was totally dependent on food imports, indeed they were often prohibited from growing their own food (Bunker 1985:66).

By the late 19th century the increasing integration of the region by rail created rapid changes in this pattern across Appalachia. Central Appalachia had a significant settler population, but during the timber boom of 1880-1920 there were also labor shortages and efforts to recruit and coerce labor through debt peonage (R. L. Lewis 1998). However, the earlier penetration of the railroads into the region and pattern of settlement density meant that labor exploitation took different form than that of the *aviamento* system. In many ways, the *aviamento* system had much more in common with the way in

which economic surplus had been extracted from Cherokee society. Instead of forbidding subsistence production, timber and coal often grew out of the regional semiproletarian labor force with capital supplementing it with imported workers when demand or the need for labor discipline called for it. While debt peonage also took place in timber production it lacked the centrality for the appropriation of surplus as a wider range of productive relations from petty production to wage labor were also employed. One may still apply Bunker's description of the Amazon's rubber boom to timber in Appalachia: "even though market opportunities inspired the local reorganization of modes of extraction, the specific socioeconomic forms that modes of extraction took were influenced more by the socioeconomic and environmental conditions created by prior modes of extraction than by the political and economic characteristics of the capitalist world-system" (Bunker 1985:70).

Early on Amazonian rubber was a commodity chain more directly connected to an industrializing core than was seen in Appalachia where much of the region's exports went to other peripheral or semi-peripheral regions such as the Deep South or Midwest who were producing commodities for core markets in the Northeast and Europe. Ultimately, however, the result was the same, in both cases much of the value of commodities was realized by middlemen at key trade junctures outside the region. Also similar in both cases is an orientation in private investment toward export markets and state policy that thwarted endogenous industry. This was due to two factors, first, lack of internal markets due to high inequality, unequal exchange, and lower multiplier effects of raw materials production and processing. Second, the competition of increasingly advanced manufactured goods, returning via transport networks built for taking away the regions' extractive commodities, undercut local manufacturing.

As with rubber, Appalachian timber faced resource substitution and development of competing source areas but the end of the boom was brought about by exhaustion, not competition from alternative sources and substitutes. The dilemma posed to Bunker in the form of the higher labor value of the imported goods compared to the exported rubber does not present itself in the same way in Appalachia's timber economy. However, this can be explained by the global monopoly on rubber and its ability to draw an absolute

rent, whereas there would have been only differential rents available to Appalachian lumber. This logical accounting of capitalist valuation does not undermine the importance of unequal ecological exchange natural wealth in these cases. In both cases the bust phase of extraction and the emptying hotels, theaters, and opera houses after 1910 revealed the ephemeral nature of the peripheral region's articulation within the larger social formation (Bunker 1985; R. L. Lewis 1998). However, the unequal exchange of timber had gone to center economies within the US, while rubber had fed centers outside of Brazil. The US had transformed the South and established itself as a core power in the second half of the 19th century while Brazil remained a periphery.

In both regions some of the migrants from the previous boom stayed on in a mixture of subsistence and market production, however the destruction of Appalachia's forests (and exacerbated soil depletion) had put greater limits on previous diversified extractive/subsistence strategies that remained available in the Amazon. While in both cases the forms of extractive activity that continued in the interwar period produced ecological degradation (depletion of valuable keystone species in the Amazon, traditional game in Appalachia, agricultural practices in both), Central Appalachia's social formation was moving away from the semisubsistence mixture of agriculture and extraction that the Amazon was now adopting. The earlier integration into national markets by transport networks further undermined Appalachian agriculture as a source of market exchange and facilitated development of a new mode of extraction in the coalfields.

Bunker does not explore in as much detail the period between 1910-1950 in the Amazon, which was decisive in Central Appalachia's mode of extraction around coal. Coal had linked the region as a periphery to the industrializing Northeast before the turn of the century. The US State had come to play a strong role in managing the dependent development of the Appalachian region as a vital energy source for industrialization and military power. The dependent development in the Center-South of Brazil to which the Amazon became an internal periphery, was slower to develop, as was the capacity of the State. When mining came to that region it was in the late 1940s as a joint venture of domestic and foreign capital employing the latest mining technologies in an enclave

economy. Highways brought extraction to the Amazon beginning in the late 1950s, creating an echo of the displacement in Appalachia, but including remaining indigenous as well as peasant communities. The legal institutions were still in frontier form, employing customary practices and a mixture of legal forms dating back to the colonial period. As in Appalachia these came under challenge as highways connected valuable land and resources to markets. Early peasant arrivals were displaced by later capitals, largely in timber and ranching, and became part of the labor reserve. This accelerated under military rule after 1964 and took place on a scale not possible under the US republic.

Like Appalachia growth in government expenditure was the largest contributor to regional income growth. The State also supported some industrial projects in the region's most urban areas with similar issues of draining investment and labor from the rural surrounding area. State investment beyond infrastructure was much more intensive in the Amazon going beyond the TVA's and ARC's efforts and was more linked to foreign capital. By 1970 the Brazilian state also faced a legitimation crisis around the rapacious development in the Amazon as well as problems repressing landless peasants in the Northeast. It implemented a program of resettlement into the Amazon and new steps to control the lawless land tenure situation. The major association of agribusiness and ranchers counter mobilized and was able to relax limits on land holdings and restore subsidies on export production. The Amazon's chronic labor scarcity persisted and eventually the Brazilian state was to intervene directly with a settlement program. Conversely, federal programs in the US sponsored out migration from Appalachia during the war on poverty (Eller 2008).

The relatively greater integration of the mountains of Appalachia with its more densely settled agricultural and commercial communities (which Bunker points to as a path not taken between the *terra firma* and *várzea)* reproduced on a smaller scale the semi-periphery—periphery dynamic. State level authorities in Appalachia pursued industrialization policies a century before the Amazon's. While the Southern Appalachian region as a whole would remain underdeveloped until after WWII, it is in the Central Appalachian coalfields where the extractive path dependencies fell most

heavily and that the greatest effects are seen even as other parts of the region reached national averages of development. The hegemony of the US after the war and enormous economic surplus created the capacity for immense transfer payments to the region on a scale impossible for a semi-peripheral country like Brazil. Even where the economic forces of peripheralization are similar, core states offer greater countervailing forces. As Hanna concludes in his case study of one Appalachian county:

> Policies of core states [such as federal transfer payments and development programs in Appalachia] are among the most important factors causing the social relations of production and the general measures of socio-economic conditions within their internal peripheries to be closer to those of the rest of the country than to those in the world-economy's periphery. It is this kind of mediation of core-periphery relations by state institutions and policies that defines internal peripheries. (Hanna 1995:475).

The Brazilian state has viewed the Amazon a resource trove to be exploited for its benefit but also had anxieties about territorial security. The coalfields of Appalachia have been largely ignored since the subsidence of the poverty campaigns of the 1960s and the labor unrest of the 1970s, but as oil prices climbed in recent decades they have been held up as a source of energy independence. This has also meant their treatment as a national sacrifice zone for energy. While the coalfields have lagged behind the rest of the US in its core nation trajectory, the sociometabolic regime around surface mining and mountaintop removal arguably is further accentuating underdevelopment in those Central Appalachian counties where it is more prevalent. The following chapter examines the empirical evidence for this process.

CHAPTER IV

SOCIOECONOMIC OUTCOMES IN COAL PRODUCING COUNTIES

This chapter examines the extent to which different trajectories *within* the Central Appalachian region may be related to differences in the sociometabolic regime of mining. The increasing ecological contradictions of mining in the region may be seen as exacerbating the negative socioeconomic effects of extractive dependency generally. Previous chapters have addressed why the region as a whole has had such a different developmental trajectory as an internal periphery. This chapter attempts to evaluate the impact that changes in the type of mining have on some standard indicators of social and economic development within the counties of the Central Appalachian coalfields.

There is a great deal of quantitative research on the problems of the "resource curse" facing areas dependent on extractive activity. For example, James and Aadlad (James and Aadland 2011) found a negative impact for resource extraction generally across the US at the county level between 1980-1995. There is also a long history of quantitative study of socioeconomic outcomes around mining, including coal mining in Appalachia. However, there has been little research to date on how the ecological effects of the shift to surface mining may be affecting socioeconomic outcomes. This is a difficult problem to analyze given the complexity of forces surrounding development and the frequent coincidence of both underground and surface mining in the same areas. More negative ecological impacts do not always translate into worse outcomes on socioeconomic indicators. For example, although industry in Appalachia tends to be more polluting than elsewhere, it is also associated with better socioeconomic outcomes within the regions (Maxwell 2011). While chapter 6 examines the impacts of surface mining on human development as distinct from capitalist conceptions, this chapter focuses on the typical measures of per capita income, poverty, unemployment, and educational attainment.

Measuring Coal Mining's Socioeconomic Effects

The cause of uneven development between core industrial and peripheral extractive economies should be understood not only as consisting of capital flows and

labor markets but also as "linked to the costs of environmental degradation, which results from economies dependent on extraction" (D. A. Smith and Nemeth 1988:237). Mining is an extractive economy that has a more significant impact on the surrounding community than others, fishing, for example. Frickel and Freudenburg indicate that the ability of mining to create sustained development has decreased over time (Frickel and Freudenburg 1996). They attribute this trend to "historically contingent levels of extractive capacities, pre-existing competition, linkage specialization and transportation" (Frickel and Freudenburg 1996:445). In Appalachia "to the extent that coal dominates an area, *other businesses may absent themselves because of environmental damage that coal production brings*, poor schools, corrupt policies, unbalanced taxation, outright opposition from coal interests, or associated reasons" [emphasis mine] (see also Latimer and Mencken 2003; Perry 1985:99). Given the tendency for the greater costs of environmental externalities there is reason to hypothesize that surface mining may have greater negative effects on long-term economic development than underground production.

The past thirty years have seen continuing debate over the ability of extractive industry to bring economic benefits to rural or non-metropolitan areas. Three of the most commonly used indicators for economic health in studies of the effect of extraction based economies are income, poverty, and unemployment. A meta-analysis of 301 studies of non-metropolitan mining regions by Freudenburg and Wilson reports that 46% of the studies found mining produced negative economic results as opposed to only 29% that found positive results (2002). The ratio of more negative than positive outcomes associated with mining was statistically significant for poverty and especially for unemployment, if neutral outcomes were ignored. The greater proportion of positive to negative outcomes for income per capita was only statistically significant if all neutral outcomes were counted as positive.

Freudenburg and Wilson (2002)also found that, overall, the studies were consistent with evidence gathered by Nord and Luloff (1993) showing that positive economic outcomes from mining have declined precipitously since the early eighties. Both studies showed that community economic success from mining is mainly limited to

the Western US and has been dwindling even there. In the South the ratio of negative to positive economic outcomes for mining in general was almost two and a half to one (Freudenburg and Wilson 2002). Nord and Luloff's (1993) study of the interaction between region and mining dependency found that *coal mining in particular* was associated with negative outcomes within the South in 1979/80 and had dramatically worsened by 1989/90 even as it appeared to have more beneficial or at least benign effects in the West. However, a more recent study has found coal mining, but not other types mining, to have a newly emerging *negative* relationship to poverty in Appalachia (Partridge, Betz, and Lobao 2013). Cleary, this further highlights the importance of the historical developmental context in which extraction takes place. Quantitative analyses of the socioeconomic effects of coal mining within Appalachia have found economic dependency on mining to be a key factor (de Young 1985; Latimer and Mencken 2003; Perry 1985). Perry's study of factors leading to the transformation of coal production into economic wellbeing in eastern Kentucky found that those factors most positively correlated with economic health from coal production were "income equality, income per capita and alternative means of production" (Perry 1985:107). However, the larger the proportion of economic activity that coal production represented within a county the less likely that county was to have income equality or alternative means of production. Local governments are often impaired in their capacity to counter this trend as coal dependent counties in central Appalachia have local government revenues and expenditures that are consistently just half of the national average, with per capita spending also steadily lagging (Latimer and Mencken 2003). The fact that the coal industry is estimated to be a net drain of nearly 115,000,000 dollars on the state of Kentucky's budget suggests that extractive industry with sufficient political influence may draw state support in competition with other spending priorities (undefined author and J. Bailey 2009). The increased desirability of surface mining methods may accentuate industry elites, absentee owners, and local compradors classes' desire to prevent economic development near coal deposits that would limit their ability to utilize surface mining techniques like high explosive blasts (Burns 2007).

Perry's (Perry 1985)conclusions about the disconnect between income per capita and income equality are also reflected in Freudenburg and Wilson's (Freudenburg and

Wilson 2002) finding that even when higher incomes are associated with mining, higher levels of unemployment and poverty often are as well. Furthermore, in reference to Appalachia, Freudenburg and Wilson hypothesize that part of these conflicting findings may come from the mechanization of mining (which would include the shift to surface mining) which is producing much fewer higher paying jobs that some of which may tend to go to those with white-collar professional skills rather than the traditional blue-collar miner demographic. Deaton and Niman (2012) found that between 1960 and 2000 increased mining employment was associated with lower poverty in the short run, but higher poverty in the long run. Such temporal complexities associated with the effects of boom and bust apply particularly strongly to the ecological legacy of surface mining.

In some cases, the contradiction between higher incomes and poverty or unemployment may be further explained by some researchers' reliance on income data collected from employers in an area rather than employees which would incorrectly include employees who live outside the area (Freudenburg and Wilson 2002). The skills needed to operate strip mining equipment are often similar to those common to construction work, e.g. front loaders and dump trucks(Montrie 2003) and studies have suggested companies hire outsiders to avoid concerns with the local effects of mining within their workforce (Bradley R Woods 2010:168). More mechanized forms of mining do need some specialists but with skills that people living near rural mining locations may not posses. In fact, there is evidence they may be less likely to posses them. A 1985 study found that, in contrast to agricultural and manufacturing sources, income from coal mining in eastern Kentucky showed no educational benefits and even had a significantly negative correlation with several indicators (de Young 1985).

Although education spending per capita in coal dependent communities in central Appalachia is similar to national averages, a greater proportion of that money must go towards transportation costs due to the area's geography (Latimer and Mencken 2003). After examining the relationship of property wealth to education spending McHaffie (1998:204) notes that within the central-southern Appalachian region "the particular characteristics of the coal economy (relative to timber, tourist, or retirement economies) seems to engender a specific geography of resistance to education spending." Therefore,

although per capita expenditures may be comparable with national averages, these local governments still spent less than would be expected given the value of properties and their mineral assets. Latimer and Menken (2003) report coal dependent counties had percentages of adults not graduating from high school that were often twice the national average. There is evidence that the relatively high paying, low skill jobs during the coal boom of the 1970s lead to increasing numbers of high school dropouts in coal producing areas (Black, McKinnish, and Sanders 2005). This was consistent with Nord and Luloff's (1993) finding of a negative relationship between coal dependency and high school completion in the South as a whole.

With the growing number and scope of strip mine sites in the region, community and government leaders are faced with choices about mine permit requests that will have consequences far into the future. Proponents of mountaintop removal surface mining (MTR) claim it produces needed flat land for development and provides good paying jobs. Yet, research has found the increasing number and size of MTR mines is not associated with increased mining employment (Brad R Woods and Gordon 2011). Additionally, there is a rapidly growing body of literature on the lack of post-mining development but continuing ecological and human health effects of surface mining in the region that is discussed in detail in chapter 6. These factors may impact labor markets, property values and tax base, capital investment and consumption decisions, as well as damage to property that would contribute to negative socioeconomic outcomes. There is also anecdotal evidence of surface mining driving outmigration, hiring practices that discriminate against local communities, and other social practices that would reduce its contribution to county level socioeconomic conditions relative to underground mining (Burns 2007). Partridge, Betz, and Lobao (Partridge et al. 2013) recently produced the only study to attempt to measure the effects of mountaintop removal on poverty outcomes. However, they do so only indirectly. Their primary independent variable is the change in proportion of employment in mining and the presence of MTR is indicated by a dummy variable. Thus, there is no accounting for the extent of or intensity of surface mining or the share of employment that is from surface mining. Between 1990 and 2000 their results do not find a significant relationship between MTR and poverty or the interaction of the MTR dummy with mining employment. Between 2000 and 2010,

however, they report their dummy for the presence of an MTR mine has a significant negative relationship to county poverty rates. Also, noting that increased coal employment share in this decade is associated with decreased poverty, they suggest that this may indicate that mining negative effects are dissipating and MTR is brining poverty reducing-jobs to those counties.

There are a number of problematic aspects of this study as an indicator of the long-term effects of mining and its ecological effects. First, as the authors note, they do not control for population change that could be caused by outmigration of those in poverty from MTR affected counties. Second, their binary MTR variable (and its interaction term with coal employment) does not indicate the prevalence of surface mining or surface mine employment relative to underground. My analysis here differs in two significant ways. First I am comparing only coal producing counties with each other, not coal with non-coal counties. Second, I use coal production data to measure the effect of the scale and type of mining directly. This presents a more straightforward route to estimating the impacts of surface mining independent of coal's extractions overall impact on socioeconomic outcomes.

Data and Methods

For my analysis I use a fixed-effects panel model. The counties which are included in the model are those in Tennessee, Virginia, West Virginia, and Kentucky defined as "Appalachian" by the Appalachian Regional Commission (Appalachian Regional Commission n.d.). My social and demographic data come from the U.S. Population and Housing Census (Minnesota Population Center 2004). Coal production data is drawn from the U.S. Department of Energy's Energy Information Agency's annual reports on U.S. coal production.[37]

[37] This includes reports DOE/EIA-0584(98-99) and DOE/EIA-01118(77,80,88-90, 00). Changes in the agency's recording methods over the period of interest include the exclusion of data from mines producing less than 10,000 short tons of coal a year from the 1980s until the late 1990s and the shift from counting the production of mines which cross county lines in both counties to only counting in the county in which the mine first opened from 1998 to the present. However, the coal production data after are not included in the model, only for referential purposes, and so do not pose a significant problem.

My dependent variables are the proportion of families in poverty, the proportion of the labor force unemployed, the proportion of the adults with less than a high school education, and per capita income. See Table 1 for a list of all variables. All dependent variables are used as defined by the US Census. The proportion of families in poverty is used as a common measure of socioeconomic wellbeing. It is expected that surface mining will have a positive relationship to the proportion of families in poverty due to greater negative externalities and weaker contributions to employment.

The proportion of the labor force unemployed is also a standard dependent variable in the mining dependency literature. However, because the census records only those actively seeking work in recent period as unemployed there is almost certainly an underestimation of joblessness because parts of Appalachia with chronic economic distress likely have a significant number of discouraged workers no longer seeking employment and who are therefore no longer included in the unemployed figures (R. Lewis 1993). Because surface mining tends to employ fewer people, creates environmental liabilities, and requires a coal industry strong enough to counter opposition, I expect a positive relationship between its prevalence and unemployment.

I have also included the proportion of adults with less than a high school education as a dependent variable, although it is less commonly used in the literature, in order to supplement the economic measures with one tapping a human development outcome. Surface mining may affect education levels within a county either indirectly or directly. Directly, destruction of the scenic landscape, contamination of drinking water, and damage to buildings from blasting may lower property values impacting school system revenues. In another example, some parents from Marshfork Elementary in Raleigh County West Virginia have complained of fear or illness caused by their schools' location adjacent to a large strip mine and coal processing plant (Morrone and Buckley 2011). Indirectly, in addition to the general influence of coal production on educational spending and attainment (de Young 1985; McHaffie 1998), surface mining externalities may lower property values and thereby available revenue for education. If surface mining does place greater constraints on long-term economic diversity those with higher education may also be more likely to leave for places where their skills can find work.

My last dependent variable, per capita income, is standard in the literature but the effect of mining on it is less clear. Some studies suggest higher per capita income may accompany mining as mechanization creates more skilled and highly paid positions (Freudenburg and Wilson 2002) while others have found that mining dependency is associated with per capita income at only 65% of the national average in Central Appalachian counties (Latimer and Mencken 2003).

My primary independent variable is the proportion of coal that is produced by surface mining. In an attempt to better represent the general influence of coal production in counties which can fluctuate somewhat from year to year, the models are estimated with the coal production of three years averaged together for each panel data year. This average conveys a more accurate measure of coal mining activity by smoothing some of the random fluctuations present in a single year snapshot. The year for which decennial census data is *actually collected* is also the center of the averaged production years. For example, coal production in 1988 1989 and 1990 is averaged together and included in the panel with the 1990 census that is based on data collected in 1989—the center of the averaged coal production. Because coal related variable are lagged in the model temporality is not an issue. In addition, the composite measure for coal production increases the number of county-year observations from 153 to 170 and unique counties included from 81 to 89 while the average observations per county remains 1.9. A side effect of this approach is that a number of counties that only produced small amounts of coal are included in the model, which alters the results slightly, however after examining the effect on the model the composite measure is still preferred on theoretical grounds.[38]

It is necessary to control for total coal production to distinguish between the developmental effects of simply more mining from those of *the type of mining* that are the primary focus here. Many of the mechanisms through which mining dependency is described as operating in the literature (e.g. absentee ownership, political corruption, tax evasion, vulnerability to market fluctuation) are likely to be more or less equally

[38] When using the nominal year totals instead of the three-year averages there are some minor variations. The relationship between surface production and poverty becomes slightly weaker and falls just under significance whereas the relationships with the other dependent variables are strengthened and become slightly more significant. Given the common fluctuations in year-to-year production an average is still preferred for analysis of long-term trends.

associated with both types of production while others (e.g. environmental degradation, reduced employment) should be more strongly associated with surface mining at a given level of production. Total coal production is standardized by county size in square miles to better represent the anticipated ecological impacts that could mediate some of the relationship between coal mining and dependent variable socioeconomic outcomes.

My other control variables include the percentage of a county's population who are urban residents, total population, change in the total population (using the census definition of total population) and the proportion of people employed who work in manufacturing and service jobs other than public administration. Often in the literature on mining outcomes researchers will restrict the population to non-metropolitan counties; here the proportion of the population considered urban serves as a control for the developmental advantages of agglomeration economies around metropolitan areas. Total population is also included as a control for this agglomeration economy effect because the absolute magnitude of population contributes in combination with urban-rural distribution. Total population is logged to correct for skewedness. Population change is included as a proxy for migration because the literature suggests that mining induced hardships can create outmigration that would mask a relationship with higher rates of poverty or unemployment (Bell forthcoming suggests a particular connection to surface mining). Likewise in-migration of wealthier retirees may also affect poverty and per capita income measures. Population change is left as a count because total population is already included in the model.

Measures of the proportion of workers currently employed in the manufacturing and service sectors provide some controls for economic diversification. A proportion with employed workers as a denominator is used to measure the employment structure as separate from the level of employment. It is possible to argue against controlling for the extent of non-mining economic activity when trying to measure the effects related to mining dependency because the literature suggests that mining can influence the dependent variables through mechanisms that operate precisely by limiting such alternative economic development (e.g. Perry 1985). Therefore, the proportions of jobs in the manufacturing and non-public administration service sectors are added as controls for

economic diversification in the *full model* for comparison with the *preferred model* that does not control for those likely intervening variables. Further discussion of model preferences consistent with this hypothesis is included in the results section.

As a note of caution, total manufacturing includes a small amount of coal-related manufacturing. The census provides the subcategory of manufacturing jobs related to coal *and* petroleum together but it is missing in many cases and was not readily available for all years making disaggregation impossible. An estimate based on the 1980 census indicates that in 10 counties combined coal and petroleum related manufacturing was greater than 5% of total manufacturing and in 3 counties it was greater than 10%.

Across all 170 county-year coal production observations, underground and surface coal production have a correlation of .48 and the total tonnage produced has a correlation of -.34 with the proportion of coal from surface mines. Over the three observation periods available the correlation between underground and surface production increases (.35, .52, .68) while the correlation between total production and the proportion from surface mines shifts as well (-.41, -.38, -.22). Because the coal production variables are lagged in my models the last period is not included in my models but is reported here to give a better indication of the trend.

I analyze data for the census years 1980, 1990, and 2000 using panel analysis with fixed-effects at the county level. I chose the 1980 census as the starting point both because the EIA has not published mine production data prior to 1977 and because it avoids some confusion that would result from comparing the effects of surface mining before and after the implementation of the federal Surface Mining Control and Reclamation Act of 1977 (Montrie 2003; Shover et al. 1986). However, there are still factors that may limit or obscure the effect of shifts in the proportion of surface mining in the 20-year period examined. As my previous chapters have indicated, the developmental trajectory of counties economically dependent on coal production is arguably well established by the period examined in these decades. Coal dependency exerts itself through economic patterns, land ownership, and political influence in a geographic manner that there is little reason to believe has varied substantially within the years examined here. For example, coal dependent counties' lower than average government

expenditures have remained steady since the 1970s, apparently relatively unaffected by fluctuations in the coal market (Latimer and Mencken 2003).

Surface mining can be hypothesized to differ from underground mining in both immediate and longer-term effects on socioeconomic wellbeing. To focus on the long-term ecological and social effects, coal production variables are lagged 10 years, in effect socioeconomic data are analyzed with coal production data from the previous panel.[39] This also neutralizes possible confounding effects of changes in the Energy Information Agency's coal production data reporting methods between 1990 and 2000 as only 1980 and 1990 production data are used in the model.

Due to the potentially large number of time constant variables affecting the relationship between coal production and economic wellbeing in counties (e.g. county size, the extent and qualitative aspects of coal seams that were originally formed there, proximity to navigable waterways for shipping etc.) and the limited number of controls included, the fixed effects model allows for a more conservative evaluation by reducing omitted-variable bias (Peterson 2004). Because the number of time periods is small, there is also a tradeoff to be made between the more efficient use of the data by the random effects model and danger of assuming the unmeasured time-constant variables are independent of the measured variables, as is done in all cross-sectional analysis (Peterson 2004). A Hausman test shows systematic differences between random and fixed effects coefficients, therefore a fixed effect model is preferred to avoid likely omitted variable bias.[40]

A final note of caution is warranted regarding the use of proportions as three of my dependent variables in an OLS model. Because such bounded variables do not have a linear relationship toward the high and low end of values (generally between 0-.2 and .8-1 in proportions), resembling a sigmoidal figure, there is the possibility of distortion from

[39] The use of lagged production data effectively sacrifices one panel from the model as production data from the last panel and socioeconomic data from the first are not analyzed. Lack of available coal production data before 1977 and socioeconomic data from the census after 2000 make this unavoidable.

[40] It should be noted that a fixed effects model answers the question of how the dependent variables co-vary with the amount and type of mining activity within individual counties while a random effects model answers *the somewhat different question* of how do counties compare on the dependent variables relative to differences between and within them over time.

violating OLS's assumption of linearity as well as the prediction of logically impossible values (Long 1997). Values for poverty and unemployment in particular are in the low range with a mean at or below 0.2 (see Table 4.2). This is a limitation of using OLS with my data. However, an examination of predicted values in all models shows impossible values in only 2-5% of cases.[41] I therefore still prefer OLS, rather than a tobit model, given the more intuitive interpretation possible and the low level of misspecification.[42]

Results and Discussion

Table 4.1 lists my variables names, describes their composition, data sources, and expected relationship to socioeconomic wellbeing. Table 4.2 contains the means, standard deviations, maximums, and minimums of each of the variables as they are used in my analysis. These are based on 89 counties with 170 county-year observations. As Table 4.2 demonstrates, the range and standard deviation of variables included in the regression models should be sufficient to provide the variance required to detect the type of relationships of interest. A correlation matrix of my variables is provided in Appendix A.

In the preferred model for proportion of families in poverty (see Table 4.3), when controlling for the total amount of coal production in the previous decade, a change from completely underground production to only surface production would predict an .03 increase in the proportion of families in poverty. This relationship is significant (p=.06).[43] When the proportion of employment in manufacturing and (non-public administration) service jobs are added as controls in the full model the predicted increase in the proportion of families in poverty drops to .007 and is no longer significant (p=.328).

[41] There are no values predicted above one. The number of predicted values below zero are as follows: Proportion of Families in Poverty Full-7, Preferred-9; Proportion of Workforce Unemployed Full-3, Preferred-5; Proportion of Adults with Less Than a High School Education Full-3, Preferred-4.

[42] A tobit model produces similar results for the key independent variable of coal from surface production.

[43] Reported P-values are for two-tailed tests, although given my expectations about surface mining one-tailed may be appropriate.

Table 4.1. Definition of Variables

Variable Type	Variable Name	Description	Data Source	Expected Effect
Dependent	Poverty	Proportion of families living in poverty.	*U.S. Population and Housing Census*. Minnesota Population Center 2004.	Inap.
	Income	Per capita income.	*U.S. Population and Housing Census*. Minnesota Population Center 2004.	Inap.
	Education	Proportion of adults (18 years and older) with less than high school education.	*U.S. Population and Housing Census*. Minnesota Population Center 2004.	Inap.
	Unemployment	Proportion of the workforce 16 year of age and older unemployed.	*U.S. Population and Housing Census*. Minnesota Population Center 2004.	Inap.
Independent	Surface Mining	Proportion of coal produced from surface mines (lagged10 years).	*Annual Coal Report.* U.S. Energy Information Agency.	—
Control	Tot. Production	3-year average of total coal production in hundreds of thousands of tons square mile of county area (lagged 10 years).	*Annual Coal Report.* U.S. Energy Information Agency.	—
	Urban	Proportion of the population that is urban.	*U.S. Population and Housing Census*. Minnesota Population Center 2004.	+
	Pop. Change	Change in county population in thousands.	*U.S. Population and Housing Census*. Minnesota Population Center 2004.	—
	Manufacturing	Proportion of those employed who work in the manufacturing sector.	*U.S. Population and Housing Census*. Minnesota Population Center 2004.	+
	Service	Proportion of those employed who work in the service sector.	*U.S. Population and Housing Census*. Minnesota Population Center 2004.	+
	Tot. Population	Total population (logged).		+

Table 4.2 Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Poverty	170	.215	.080	.090	.459
Unemployment	170	.102	.035	.051	.220
Education	170	.397	.104	.137	.615
Income	170	11067	3264	5153	20354
Surface Mining	170	.532	.378	0	1
Tot. Production	170	.078	.112	.000018	.52
Urban	170	.204	.210	0	.878
Manufacturing	170	.156	.096	.019	.494
Service	170	.336	.075	.132	.589
Pop. Change	170	-.934	3.869	-23.795	12.066
Tot. Population	170	10.06	.713	8.49	12.56
Unique "Appalachian" Counties	89				
County/Year Lagged Coal Production Observations	170				

Table 4.4 presents the regression results for the proportion of the workforce unemployed. For my preferred model a statistically significant increase of .02 (p=.09) in the proportion of workers unemployed is predicted for a 0 to 1 increase in the proportion of coal from surface mines. This is consistent with the argument that surface mining produces fewer jobs per ton of coal produced during production and is associated with relatively poorer employment in the longer term as well.

When the proportions of employment in manufacturing and service sectors are included in the model the coefficient for the proportion of coal from surface mines and unemployment decreases by about half and loses statistical significance (p.=359). However, this is not inconsistent with the hypothesis that surface mining is more likely to suppress economic diversification than underground varieties, as controlling for employment in other economic sectors would obscure this effect. This is discussed in more detail below.

Table 4.3. Proportion of Families in Poverty

	Full	Preferred
Surface Mining	0.012	0.030*
	(0.012)	(0.016)
Tot. Production	0.052	-0.168**
	(0.068)	(0.082)
Urban	0.082**	0.027
	(0.040)	(0.052)
Manufacturing	-0.279***	
	(0.098)	
Service	-0.476***	
	(0.062)	
Pop. Change	0.001	-0.005***
	(0.002)	(0.002)
Tot. Population	-0.180***	-0.189***
	(0.041)	(0.055)
Constant	2.208***	2.106***
	(0.419)	(0.557)
Observations	170	170
Number of FIPS	89	89
R-squared	0.64	0.34
Standard errors in parentheses		
* p<.10; ** p<.05; *** p<.01		

Here the model also detects a negative relationship between total coal production and unemployment, which is statistically significant for the preferred model (p=.024), but not in the full model (p=.945).

Examining the relationship of surface mining prevalence to the proportion of adults with less than a high school education, we see a pattern similar to that for the poverty rate (see Table 4.5). In the preferred model a change from 0 to 1 in the lagged

proportion of coal from surface mines predicts an .044 increase (p=.055) in the proportion of adults who never completed high school

Table 4.4 Proportion of Workforce Unemployed

	Full	Preferred
Surface Mining	0.009	0.020*
	(0.010)	(0.012)
Tot. Production	0.004	-0.142**
	(0.054)	(0.061)
Urban	0.018	-0.020
	(0.032)	(0.039)
Manufacturing	-0.243***	
	(0.078)	
Service	-0.312***	
	(0.049)	
Pop. Change	-0.001	-0.004***
	(0.001)	(0.001)
Tot. Population	-0.049	-0.057
	(0.033)	(0.041)
Constant	0.732**	0.674
	(0.335)	(0.414)
Observations	170	170
Number of FIPS	89	89
R-squared	0.59	0.35
Standard errors in parentheses		
* p<.10; ** p<.05; *** p<.01		

. In full model the relationship falls away in both magnitude and significance (p=.592). Again, the lagged total coal production is statistically significant in the preferred model but with a relatively larger effect size predicting a difference of ~.23

decrease in the proportion without high school for a change from the minimum to maximum observed value of total coal production.

Finally, Table 4.6 presents the results for per capita income. In the preferred model I find that a 0 to 1 increase in the previous decades' proportion of coal from surface mines predicts a $2726 decrease in per capita income (p=.014). This effect shrinks only to an $850 decrease (p=.165) when manufacturing and service sector employment are added in the model. The total tonnage of coal produced is also significant in the preferred model (p=.000) registering a increase of around $10550 if a county were to shift from the lowest to the highest observed value of lagged total production.

My findings require a careful interpretation. In my preferred model I find a positive relationship predicted between higher proportions of coal from surface mines and higher proportions of poverty, unemployment, and high school dropouts as well as a negative relationship to per capita income. These relationships are based on relative shifts in the proportion of surface coal production. For all counties in my model the mean lagged proportion of coal from surface mines declined by approximately .06. However, 30 counties still saw an absolute increase in the proportion of coal from surface mines. Of those 30, 17 saw less than the average reduction of families in poverty while 13 were above the mean.

The relationships between my socioeconomic indicators and surface production lose half or more of their magnitude and fall below conventional significance in the full model when controls for economic diversification are included. Proportion of workers employed in the service sector is the strongest predictor for all four dependent variables. The proportion employed in manufacturing is well below significance for per capita income. There is also a negative correlation between mining output and the proportion of workers in the manufacturing sector (see Appendix) and controlling for total coal production may affect the influence of manufacturing.

Table 4.5. Proportion of Adults with Less Than a High School Education

	Full	Preferred
Surface Mining	0.007	0.044*
	(0.012)	(0.022)
Tot. Production	-0.072	-0.468***
	(0.070)	(0.118)
Urban	0.094**	0.004
	(0.041)	(0.074)
Manufacturing	-0.208**	
	(0.100)	
Service	-0.865***	
	(0.063)	
Pop. Change	-0.002	-0.014***
	(0.002)	(0.002)
Tot. Population	-0.226***	-0.234***
	(0.043)	(0.079)
Constant	2.977***	2.753***
	(0.430)	(0.798)
Observations	170	170
Number of FIPS	89	89
R-squared	0.88	0.58
Standard errors in parentheses		
* p<.10; ** p<.05; *** p<.01		

The weakened effect of surface mining when controlling for economic diversification in the full model as compared to the preferred model is consistent with the literature suggesting that the negative outcomes related to mining economies is largely a product of mechanisms by which other economic sectors are affected. The direction of the relationship of surface mining stays consistent in all models. This suggests that surface mining may be related to poorer socioeconomic outcomes in large part by discouraging other industries (e.g. tourism), producing fewer paychecks to circulate in the local economy, or encouraging land and mineral owners to oppose development near

sites they may wish to strip mine, and that controls for distribution of the economy in these two major sectors capture and account for that same variation.

Table 4.6. Per Capital Income

	Full	Preferred
Surface Mining	-850.323 (605.669)	-2726.069** (1084.852)
Tot. Production	2503.929 (3420.802)	21059.143*** (5730.908)
Urban	-3434.323* (1994.754)	461.190 (3611.035)
Manufacturing	322.743 (4901.412)	
Service	40819.820*** (3098.178)	
Pop. Change	281.104*** (76.280)	894.067*** (112.300)
Tot. Population	11743.981*** (2077.369)	11860.737*** (3821.308)
Constant	- 119629.923*** (21015.927)	- 107728.902*** (38698.216)
Observations	170	170
Number of FIPS	89	89
R-squared	0.91	0.67
Standard errors in parentheses * p<.10; ** p<.05; *** p<.01		

When the proportion of workers employed in non-public administration service sectors is used as the dependent variable in the model, the proportion of coal from surface mines ten years previous has a negative relationship (coefficient -0.04, p=.07, two tailed). A similar regression for proportion employed in manufacturing is insignificant.

That total coal production *within* counties over time (net the influence of the type of mining) is associated with better socioeconomic outcomes in my preferred models for all dependent variables is less surprising given that the analysis is only within coal producing counties, not between coal and non-coal counties. In order to better evaluate the relationship between coal production and economic dependency on coal extraction I replicated the measure of dependency used by Latimer and Menken (Latimer and Mencken 2003) of coal income as a percentage of total personal income in a county.[44] This measure of the proportion of income from coal has a correlation of .76 with total coal production in my sample. Latimer and Menken consider counties with more than 10% of total income from coal to be coal dependent. In 1980 37 counties met this standard but in 1990 only 23 did.[45] During this time average coal production increased by 28% but coal dependency decreased by about 40%. The betas for total coal production are therefore likely not very efficient proxies for coal dependency. Furthermore, the coefficients for total production reflect the effect of increased coal production *controlling for the type of production*. Increased coal output in tons, putting the methods used aside, tends to mean more jobs and is different from coal production or employment as a proportion of county economic activity. Part of the danger of dependency on extractive industry is that fluctuations in demand and prices create havoc for workers and governments dependent on their revenue. It suggests, for example, counties who weathered the "bust" phase of the 1980s better therefore had better outcomes in the 1990s. Worsening outcomes when production fall within a county should be unsurprising in this context.

Finally, it seems likely there is a non-linear relationship between coal production and dependency related outcomes. It may be that as coal production and relative dependency increase together outcomes become poorer but once dependency is established more coal production results in more positive outcomes as coal production has already become important to the exclusion of other aspects of the economy. A test for

[44] I prefer this type of measure to one focused on employment because there is substantial evidence that the political economic influence of the industry has endured despite declining employment (Bell and York 2010).

[45] Imputation of counties for which coal income was redacted suggests that a handful more may also be coal dependent.

an interaction effect between the coal dependency measure and my coal variables proved inconclusive.

Conclusion

Evidence available from my analysis provides tentative support for the hypothesis that an increase in the prevalence of surface mining is associated with more negative long-term socioeconomic outcomes on my selected indicators. My models also suggest, in line with previous literature, that ecological effects from greater surface mining on these indicators are mediated through effects on economic diversification. This empirical evidence is consistent with the effects of a mode of extraction around coal as outlined in earlier chapters.

Quantitative modeling is always a form of abstraction that must be done as part of a larger historical materialist framework that is reflexive and explicit about the limits to the analysis (Amin 2010). I argue in chapter 6, the ecological and human effects of surface mining must be evaluated in their own right as well as in relation to their effect on the economics of capitalist development if we are to form a dialectical understanding of the problems involved. Future research should seek to apply more direct measures of mining's material impacts and introduce controls for outmigration (rather than simple population change) to avoid the common mistake of confusing the displacement of capital's contradictions with their resolution.

Furthermore, additional investigation is needed of the relationship of mining dependency beyond that indicated by mining employment (as in the case of Partridge, Betz, and Lobao (2013)). Although mining employment has been in decline the political and ideological power of coal interests has not declined in proportion (Austin and Clark 2012; Bell and York 2010; Burns 2007). Because it is through these power relations that many of the processes of underdevelopment operate, including the externalization of ecological costs and free appropriation of natural wealth, quantitative modeling will capture their effects only to the extent they are effectively included.

Another difficulty that must be recognized in the problem of abstraction is the way in which the region, as a periphery, adjusts "unilaterally" to the dominant tendencies

at the center of the system into which it is integrated (Amin 2010). Therefore, while modeling differences between areas within the region may confirm the importance of ecological relations to typical measures of socioeconomic outcomes or show them to be incidental, we should not lose sight of the way in which the political economic process at work on a larger scale are overriding factors. Because the demand for coal is determined primarily outside of the coalfields the speed and the fashion in which its inevitable decline arrives are also highly subject to external influence. Analysis of the effects of increased surface mining on socioeconomic indicators tells us under what conditions coalfield communities are likely to face the exhaustion of the sociometabolic regime around coal, but given coal's seemingly robust hegemony at the state level, for understanding when and how this exhaustion will come we must look to politics at the national scale

CHAPTER V

THE POLITICAL ECONOMY OF COAL IN THE US POWER STRUCTURE: MONOPOLY CAPITAL AND THE POLITICS OF COAL AND CLIMATE

Of all the historical threats to the reproduction of the coal-based mode of extraction in Appalachia, the regulation of greenhouse gasses is perhaps the most formidable. Because the costs of ecologically significant emissions reductions for coal-fired power plants are prohibitive, regulation of C02 would impact demand for both surface and underground production. Therefore, *effective* climate legislation represents an existential threat to the coal industry. Previous studies have examined the way in which capitalist interests have influenced US environmental policy related to coal in the past around both air quality and surface mining (Gonzalez 2001; 2005; Shover et al. 1986; Vietor 1980). These studies help point to the importance of industry trade groups and the elite policy-planning network that shapes legislation and its implementation. This chapter employs a power structure research approach and network analysis to understand the divisions that emerged within the elite energy policy-planning network surrounding efforts to pass climate legislation in 2009. Both the structural location of the coal industry and environmental organizations within the network of director interlocks and the importance of coal and other fossil fuels as the basis larger sociometabolic regime for capitalist accumulation (Krausmann and Fischer-Kowalski 2013) help explain both the weakness of the climate bill and the overwhelming difficulties it faced in legislative passage.

Environmental sociology was founded as a subdiscipline around questions regarding the rise of environmental movements and conflict over environmental degradation and state regulation in the 1970s. From its origins, the subdiscipline's approach to the State rejected the pluralist models still dominant in social science, largely in favor of neo-Marxist approaches. Yet the rise of environmental regulation also seemed to indicate at least relative autonomy on the part of the state, and there were initially few empirical examinations of environmental policy applying sophisticated state theories

(Buttel 1985). Theories of the State must account for the class basis of the capitalist state in terms of the structural constraints posed by the requirement of accumulation as well as the forms of intra and inter-class conflict that occur through the political process.

Although preceded by Anderson's pioneering work (1976), Schnaiberg's treadmill of production (1980) approach was the most influential in the early subdiscipline. Schnaiberg's approach was in part an analysis of *the politics* resulting from the ecological contradictions of capitalist accumulation (Foster 2005). The State was structurally constrained between its function in facilitating accumulation and its need for legitimation (cf O'Connor 2001). In setting up his conception of the nature of this contradiction, Schnaiberg drew on Sweezy and Magdoff's (1975) analysis of monopoly capital and stagnation and Gabriel Kolko's (1963) argument that oligopolistic sectors of the capitalist class looked to the state to provide rationalization of the economy. While ecological problems could undermine the economic interests of important fractions of capital, non-capitalist social movements also had an important influence resulting in the "managed scarcity" compromise between forces of accumulation focused on exchange value and social groups focused on preserving use values in nature that characterizes the best of US environmental policy (Schnaiberg 1994).

Although later influenced by Skocpol's (1980)state autonomy argument (Schnaiberg 1994), in many ways Schnaiberg's original work (1980) is more prescient of the politics of climate change in 2009, a period of significant movement mobilization, deep economic stagnation, and greater than ever dominance of monopoly (now monopoly-finance) capital (Foster and McChesney 2012). The structure of the capitalist response to climate change reflects both the real divisions between capitalists over the threats and opportunities they face from climate regulation as well as the continued hegemony of opposition (from the most powerful class fractions) to policies that would threaten accumulation in general. Given the preponderance of scientific evidence of climate change's catastrophically destructive effects many capitalist state actors were compelled to act to retain legitimacy and avoid threats to their institutional interests.[46]

[46] This is not to deny the simultaneous corporate offensive to undermine the science, which has been relatively successful in the US (McCright and Dunlap 2000; 2003). However, it is significant that this

However, the fossil fuel industry, and coal in particular, have a historically prominent position within the US power elite (Strangfeld 2006) and were unwilling and unable, given the state of available technological fixes, to agree to any serious emissions reductions.

There is an extensive body of literature dedicated to the analysis of the contradictions inherent in the prospect of trying to reduce fossil fuel use on a scale necessary to avoid catastrophic climate change within a capitalist economy (K. Anderson and Bows 2012; Baer 2012; Foster et al. 2010; Koch 2011). My focus here is to examine the way in which capitalist collective action played out in the failed attempt at passing climate legislation in 2009 and the influence of the coal industry. I next examine the literature on how coal industry interests are linked to broader ownership patterns, their antagonistic as well as mutual interests with other class fractions/sectors, and sketch how these corporate actors intervene in environmental and energy policy formation. I update key elements of Vietor's (1980) comprehensive study of the "coal coalition" of corporate interests influencing environmental policy in the late 1970s. I bolster the power structure research approach with attention to changing macro structural features of the coal industry. I analyze the network of directorate interlocks of the top coal companies and their industry associations within the corporate power structure and their connection to the energy policy planning network (EPPN) (Crawford 2012) for the year 2009.

Environmental Politics in the Power Structure Literature

The victories of the environmental movement in demanding the passage of major environmental legislation at the federal level in the 1960s and 1970s were viewed by some social scientists as evidence of a pluralistic political system in which capitalist interests were fundamentally divided. In this view, environmental policy was simply one particular "issue network" that pits various special interest groups against each other. For others, it was evidence of the relative autonomy of the state and the way in which the career goals of state actors and state institutional interests allowed it to draw

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offensive and the partisanship around the science increased precisely as the science around the incompatibility of capitalist growth and emissions reductions became clearer (Klein 2011).

independently on the arguments and proposals of different interest groups as well as produce its own.

Reviewing studies of corporate power and environmental policy in the US Gonzalez (2001) contends, in line with Domhoff's (1980; 1990)general argument, that analyses of environmental legislation from the pluralist and state autonomy perspectives falter by missing the capitalist class dominance through the policy planning network. Rather than autonomously drawing on diverse independent interest groups who compete for influence, state managers craft policy from a pool of ideas dominated by capitalist interests. Furthermore, even in the case of seemingly major defeats for corporate interests, final policy decisions disproportionately reflect the contributions of the most corporate dominated groups (Gonzalez 2001; 2005). The policy-planning network they argue is an example of class dominance because of the way it organizes and projects power for the corporate community.

Of course, not everyone who owns large amounts of capital is active in managing the affairs of the capitalist class. Some are simply socialites devoted to particular causes, others dilatants of one variety or another. Social scientists have long used the existence of networks of individuals linking capitalist firms and institutions to study the actual exercise of class power (Domhoff 1967; Kolko 1962; Mills 2000a; Sweezy 1939). The "corporate community" is made up of the boards of institutions controlled by the capitalist class either through ownership, as in the case of corporations, or through non-profits controlled by their purse strings and upper class presence on their boards. One way these groups are linked into a "community" is through interlocking directorates. Interlocks are formed when members of one board also serve on others, thus directors link institutions and intuitions link directors. The existence of such networks of interlocks is an example of the organizational capacity for the capitalist class to come to understand and act on its class interests. Formal network analysis was increasingly used after the 1970s to analyze the potential for capitalists to organize and act as a class and, by the 1980s, to investigate the political behavior associated with these networks (Bond and Harrigan 2011). For example, interlocks have been shown to predict political cohesion at the individual level in studies of campaign contributions, the similarity of political

ideology at the organization level and the similarity of congressional testimony as well (Bond and Harrigan 2011; Burris 2001; 2005; Dreiling 2000; Dreiling and Darves 2011; Mizruchi 1992). The influence of the corporate community is further revealed by the frequent appointment of its members to government positions and their presence on official advisory boards, further undermining the autonomy of the State. In this way, the capitalist class is able to maintain a strong degree of hegemony over State action around the environment even in the face of widespread public challenge from social movements.

The policy planning network consists of foundations, think tanks, and policy discussion groups that are dominated by the capitalist class, in particular those members of the corporate community who make up the extensively interlocked boards of directors for capitalist firms. The capitalist class provides funding and leadership for the major foundations, think tanks, and policy-discussion organizations (Domhoff 2014). It is the key structure through which the capitalist class is able to formulate and pursue its political agenda. The interlocks between firms have been shown to contribute to political cohesion and diffusion of business strategies, but the interlocks between policy planning groups are more consistently stable and meaningful (Burris 2005; 2008; Dreiling and Darves 2011; Mizruchi 1992). Brulle (2000) has shown that although the Ford Foundation was a critical source of impetus and start up funds for many of the largest environmental organizations today (such as Resources for the Future and the Natural Resources Defense Council), overall, foundation funding priorities marginalize environmental organizations associated with the environmental justice movement in favor of organizations whose goals do not directly threaten capitalist priorities. Many environmental groups involved in policy formation not only receive significant funding from the foundations of the network but are also connected to the corporate community via shared directors on their governing boards. These groups have also helped train future appointees to government office (from the very beginning of the EPA under Nixon) usually providing a moderate conservative approach favored by the corporate community (Domhoff 2014:85).

Kolko's conception of political capitalism provides an explanation as to why the capitalist class would support the formation of new social and regulatory bodies around

the environment. "*Political capitalism* is the utilization of political outlets to attain conditions of stability, predictability and security—to attain rationalization—in the economy" (Kolko 1963:3). The dominance of large firms in many sectors of the economy, even when insufficient to provide for voluntary coordination, makes more feasible political coordination of efforts to stabilize the economy and allows for more secure planning of investment, while shielding off political threats. The functioning of political capitalism does not require a fully developed class consciousness and unity on the part of the capitalist class. Indeed, rifts and rivalries inevitably exist between monopolistic and competitive sectors and rivals within sectors. The dominant organizations in the policy planning network are divided politically into moderate-conservative and ultra-conservative factions that reflect some of these divisions (Burris 1992). Since the 1970s there has been a distinct rightward shift in the center of the network toward the ultra-conservative pole (Burris 2008). Despite consistent public support for environmental protection, even at the cost of growth (Jones and Dunlap 1992), the corporate community became more aggressive in opposing any limits to growth. For example, in his study of changes in US policy around electrical utility regulation Prechel (2012:372)concludes:

> The reconfiguration of corporate–state relations between 1978 and 2008 was the outcome of political capitalism, which placed a high priority on economic growth and a low priority on environmental sustainability and public health… The analysis provides little evident [sic] to support the rhetoric that energy firms are committed to the new 'corporate environmentalism'. Instead of moving towards environmental sustainability, energy companies engaged in political capitalism to circumvent the Clean Air Act and other environmental legislation.

Underlying this trend is the increased organization and influence of the energy industry within the larger power structure (which adds to their already formidable structural power within the economy). Strangfeld found(2006) that more comprehensive director interlocks between energy firms and the policy planning network (particularly members of its inner circle) were associated with more cohesion in formulating and pursuing a corporate policy agenda in the Energy Policy Act of 1992 as compared with the Act of 1979. Policy planning groups were the key to increased ties between energy industry associations. Consistent with Burris (1992) and Domhoff (2013), the most central policy groups such as the Business Roundtable, Business Council, and Committee on Economic Development played a key role in linking large multinationals firms, with

moderate conservative ties, to smaller or more domestically oriented firms (such as utilities), with closer ties to the ultra-conservative wing (Strangfeld 2006). While both energy bills reflected the positions of the core moderate policy groups like the Business Roundtable, by 1992, along with the general shift to the right in elite politics, those positions of the moderate center were more reflective of the energy industry as a whole (Strangfeld 2006).

Crawford (2012) describes and analyzes the sector-specific energy policy planning network (EPPN) consisting of the top 20 policy planning network organizations identified in the literature as well as major industry lobbying groups and some environmental groups with a significant energy policy presence. Consistent with Strangfeld (2006), the American Petroleum Institute and National Petroleum Council were among the most central policy groups; however, in 2002 the Chamber of Commerce appears to have increased its proximity to energy firms (Crawford 2012).[47] I believe this is part of an increased polarization of the energy sector around the ultra-conservative wing of the corporate community. This polarization is arguably tied to the lines drawn around the increasing threat of climate change-related regulation. Coal, despite providing over half US electrical power between 1961 and 2008, had historically been a junior partner to major multinational players such oil and gas within the US power structure. Changes in the structure of the energy industry suggest this was not the case in 2009.

The Structure of Accumulation, Competition, and Collusion

Like other sectors, the coal industry has struggled to control price competition and maintain a favorable power relationship to workers and government. Yet coal is in many ways special because of its significance as the vastest reserve of fossilized solar energy tapped for industrial capitalism. The development of the forces of production in extraction and transport, together with labor relations formed the basis upon which competition between capitals and their interaction with the state proceeded. Industries that had reached the phase of monopoly capital were the primary players in Schnaiberg's (1980) political analysis of the national growth coalitions supporting the treadmill of

[47] There was unfortunately an error in the original analysis that excluded the Business Roundtable, therefor the results should be taken with caution.

production. In the history of US capitalism, Veblen (1964) identified coal as one of the first mature and oligopolized industries whose leaders wielded great political influence. However, Veblen seems to have overstated the case for the coal's maturity in a monopoly stage at his time, at least outside of the vertically integrated captive mines of the steel industry. As an industry with high sunk costs due to the nature of capital investments and their rural, isolated location (Barham and Coomes 2005), and with a relatively high proportion of fixed costs, coal capitalists are under particular pressure to break with corespective competition and cut prices, even to operate at a loss during market downturns (Bowman 1989). This is because the sunk nature of their investments makes divestment difficult and there is the hope that a market upturn will be quick in coming or the collapse of competitors who cannot survive will open up new market share.

Because the market structure of the coal industry has tended to have many sellers, relatively few buyers, difficulties in storing inventory, high fixed costs and sunk investments, as well as heterogeneity of product quality, firm cost structure, and transportation costs, it has not historically lent itself to the type of oligopolistic forms of competition seen in other mature sectors in the era of monopoly capitalism. The instability and character of competition in the industry are discussed in chapter 2 and 3. Due to the critical importance of this resource to the overall national economy, and to the local economies of several states, government has intervened at various times to stabilize both the flow of coal and capital-labor relations. The origin of the National Coal Association in 1917, for example, was under State pressure to stabilize the industry rocked by class struggle. Major federal intervention occurred again during the depression years and during the Second World War. The need for a pricing agreement is more pressing for firms with inflexible production costs because they cannot increase profits as easily by lowering prices (Bowman 1989:26). Such agreements have been the exception rather than the rule in the coal industry's history, as even in its most desperate hours it has traditionally been more hostile to state mediated rationalization than its mature industry peers (Kolko 1984). These factors contributed to widespread failures of firms but this was until relatively recently, also counterbalanced by low barriers to entry.

Recent decades have seen some key elements of the market structure change favorably for oligopoly. Concentration and centralization have proceeded as every major market downturn has seen more consolidation as smaller firms fold. In 1929 the 87 largest bituminous operators were responsible for just under 43% of output (Bowman 1989). In 1976 the 20 largest producers accounted for about 49% of production. In 1991 the top 20 still accounted for only 54.5% (Energy Information Agency 1993), and a year later the market share of the top four firms was 21.7% (Pryor 2001). The percentage share of production held by the top four firms was fairly steady in the low 20s from the late 1970s through the 1980s. Then, dramatically, this top four share nearly doubled to 40% during the 1990s and rose another 10% over the following decade so that in 2011 the top four producers were responsible for more than half of US output (Energy Information Agency 2013). However, production and distribution markets are shaped by economic and technological shifts, they don't really exist at the aggregate national level in terms of inter-firm rivalry. The Energy Information Agency's Western Region, which includes the massive Powder River Basin deposits, was the most concentrated in 1991 with the biggest four firms controlling almost 38% of regional production (1993). In 2009 the share of the top four in the West was nearly 80%. Concentration in the Eastern Region among coal producers also appears to have doubled from 20% to 42% while the Interior Regions saw a more modest jump of around 39% to 53% from its top four (Appalachian Voices n.d.).[48] As a contributor to this trend, barriers to entry have increased significantly with greater up-front regulatory costs for safety and environmental requirements as well as a massive increase in the scale of mining. Average mine size increased from 105,000 tons per year in 1976 to 330,000 in 1991. Though the greatest increases in scale have occurred in the Western surface mines, underground mining has become increasingly capital intensive as well with the adoption of longwall mining methods. On the international scale, there was an increase in foreign investment and control of US coal production as foreign conglomerates purchased major coal producers, but this had leveled off at around 30% of companies with foreign direct investment (10% stake or more) by the mid 1990s; it fell sharply in 1998 to around 20% and then

[48] While concentration continued to increase nationally after 2009, between 2000 and 2011 the share of production held by the four largest firms nationally in Appalachia dropped from 45% to 27% reflecting the overall drop in production levels there (Energy Information Agency 2013)

rebounded to around 27% before sliding to less than 15% in 2006 (Energy Information Agency 2007). Coal has remained, by and large, a domestic industry in contrast to oil or gas.

Differential exposure to costs of different types of environmental regulation, such as sulfur dioxide emission limits or surface mining restrictions, have been points of intra-industry conflict (Shover et al. 1986; Vietor 1980). For example, acid rain protections favored many of the producers of low sulfur coal in the West, compensating for their higher transport costs to Eastern markets. As more utilities have installed pollution control equipment the premium on low sulfur coal reserves has lessened. The Western mines' greater efficiencies of scale are offset by their high transport costs to Eastern markets (80% of consumer price on average) and their lower coal quality; whereas Appalachian producers face higher costs due to underground safety issues and greater ecological and public health scrutiny of surface mining, but they can still capitalize on higher quality coals and lower transport costs due to proximity. Concerns over regulation of mountaintop removal mining also continue to distinguish Western and Appalachian producers. The largest producer in the US, Peabody coal, spun off its Appalachian holdings into Patriot Coal Corporation in 2007 in recognition of these differences (and potentially to avoid its obligations to the unionized workforce's pensions) (Quinnell 2013).

However, all producers are threatened by the potential of limits on CO2 emissions. The regulatory policies that constrain the free appropriation of natural use values and externalization of costs paradoxically encourage the centralization of capital that increases the political organization and efficacy of surviving firms to influence future regulation. The increasing firm size, despite the complexity in relationship to competitive practices, arguably facilitates political action when coal interests are aligned and improves their capacity to organize with other class fractions.[49]

[49] Although in the 1970s large producers tied to oil and gas dominated the industry, more recently other diversified controllers have entered the market. We can expect price competition to be curtailed by concentration and particularly if the largest producers have increased their ability to absorb temporary losses caused by price warfare and exert price leadership. Large diversified firms can more easily draw on profits from other areas or creditors. This, along with rising barriers to entry and strategic excess capacity,

The History of the Coal Industry in the US Corporate Power Structure

Following WWII the coal industry was in decline as other energy sources (oil and nuclear) received better state support and captured more market share. The thousands of coal operators lacked the ability to economically rationalize their industry (Vietor 1980). Towards the end of the 1950s coal industry executives joined inter-industry associations and gained appointments to governmental councils providing the needed coherence to start to stabilize and rationalize their business. Influence over the state was crucial both for rationalizing competition within the industry and for minimizing the "internalization" of the human and environmental costs of coal production and combustion. Most pressing to the minds of coal operators, though, was the need to counteract government policy in favor of competing energy sources. In 1944 congress passed the Liquid Synthetic Fuels Act, which allocated tens of millions of dollars into coal to liquids research. However, the process came to a halt when the National Petroleum Council paid for a study to show the process was grossly inefficient. Meanwhile, the US continued to help develop commercial nuclear, build oil infrastructure and give tax credits for foreign exploration, and regulate the price of natural gas below that of coal (Vietor 1980). By 1957 the head of the National Coal Association was explicit about the need for more organization for greater political power (Vietor 1980).

With fewer producers after mid-1950s mergers, coal producers formed the National Coal Policy Conference with railroads, mining equipment manufacturers, electric utilities, and labor in 1959. They also won a department of coal research, although within the Department of the Interior rather than independent due to oil industry opposition. The stronger position the coal industry achieved through consolidation and government support made it an acquisition target for firms who had been riding the post war boom and now had large surpluses to invest. In 1950 all but captive steel industry mines were independent, but by 1976 all but 3 of the top 40 coal companies were subsidiaries. Oil and gas companies flush with profits from the OPEC embargo and

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should provide a threat of retaliation with a greater impact on competition than simply the concentration of production among firms would imply on its face. More careful examination of the importance of transport infrastructure and its ownership is also necessary to understand market boundaries and competitive dynamics. The connections between these dynamics and political action are a subject for future research.

facing limits to domestic reserves were particularly interested in shoring up their energy supplies, and in 1976 they controlled 37% of total coal production and 38% of reserves, the largest share of any group (Vietor 1980:20).

"By the mid-1970's, an identifiable coalition of coal interests had emerged, its foundation resting on seven industrial sectors: coal production, oil and gas, metals, electric utilities, railroads, mining equipment manufacturers, and commercial banks" (Vietor 1980:21). Each coalition sector had reasons to oppose environmental (or labor) regulation that would limit growth, and so each contributed resources to politically active association groups as well as often engaging in political action themselves. Labor is absent from this coalition as outlined by Vietor. The UMWA feared the resilience to strike action created by king coal's new owners, the oil industry's financial resources in particular, and in a 1973 editorial suggested "A coalition with other unions, environmental organizations, and consumer groups would be necessary…" to pass anti-trust legislation to force big oil to divest from big coal (Vietor 1980:29). The Marine Engineers' Beneficial Association who desired to push big oil into more foreign investment that would create shipping jobs for their membership joined the UMWA in pushing for anti-trust action (Vietor 1980). However, as discussed in chapter 3, such a coalition with environmental and consumer groups failed to materialize, with the union siding with industry against federal surface mine regulation.

Large-scale incorporation into the oil industry brought big oil's formidable financial and political influence to bear on behalf of the coal industry. As subsidiaries of these and other dominant capitals like the steel industry, coal companies' director interlocks increased dramatically. Interlocks with large commercial banks, previously rare, provided new communication lines for coordinating policy. Beyond increased interlocks, major banks invested in long-term projects for increased coal use that tied their own business interest to avoiding regulatory burdens on coal. The scale of investments corresponded to the scaled up production of larger machinery along with dedicated rail lines and shipping facilities for utilities that were also building new generation facilities and looked to coal for a stable cheap energy source. Only the largest companies could finance such investments out of profits, the rest turned to financial

markets, which in turn created new network connections. Chase Manhattan Bank even became a member of the National Coal Association (Vietor 1980).

The coal coalition's place in the policy formation network. In the 1960s the coal industry outmatched environmentalists seeking to influence regulators in their control and use of data necessary to make or contest arguments for policy. Local and state regulators were particularly easy to intimidate (Vietor 1980:9). For example, as discussed earlier, in the case of the coal producing Appalachian region, particularly West Virginia, government was tightly interlocked by a revolving door with the coal industry (Burns 2007; J. Fox 1999). Vietor (1980) points to Nixon's National Industrial Pollution Control Council as a particularly grievous case of government and corporate collusion in closed-door policymaking. However, as the environmental movement continued to grow, industry found itself under increasing pressure to respond and did so on multiple scales.

In 1970s the political organization of the coal coalition was stratified at four levels. First, *state and regional trade groups* operating mainly from the state down to the county level. Because their interests were divided by particulars of geographical differences in production and markets, they did not coordinate very well with each other or national groups. Second, *national level trade associations* that did the bulk of lobbying and studies aimed at federal policy. Third, *inter-industry associations* including the National Association of Manufacturers and the Chamber of Commerce, but the National Coal Policy Conference and the American Mining Congress were more important for organizing against environmental policy threats. Finally a fourth level consisted of *government industrial advisory councils* working directly with government. Because these are interrelated in their development, I review Vietor's findings at each level and discuss some evident changes since his research before turning to an empirical analysis of the national and inter-industry associations in the 2009 EPPN.

The effectiveness of *state level* organizations in shaping policy was influenced not only by the industry's centrality to the individual State's economy but by their ties to larger more powerful organizations. Vietor (1980:41-2) illustrates the point by comparison of the shortcomings of the insular Pennsylvania Coal Mining Association and

the more successful large producer dominated, nationally and cross-industry networked West Virginia Surface Mining and Reclamation Association.

At the *national level*, the National Coal Policy Conference (NCPC) emerged with UMWA's infamous Tony Boyle on board with coal, mining equipment manufacturers, utility, and transport interests. It was initially dedicated to pushing federal policy away from oil, gas, and nuclear and toward coal. However, when air pollution became a policy issue in the late 1960s, NCPC was influential in weakening clean air legislation but by 1971 it dissolved due to conflict with labor, the new influence of former rivals in oil among its members, and the increased power and sophistication of the National Coal Association (NCA), which became a new center of power for the industry. Although founded in response to WWI coal demands, the NCA did not become truly influential until the late 1960s when it cultivated leadership with strong ties to the federal government and expanded its membership and activities. It had the extensive staff to be an effective lobbying organization.

The American Mining Congress (AMC) was an important source of *inter-industry* collaboration. AMC members, rather than staff, were its primary political operatives. Out of 471 members in 1974, 135 had business interests in coal and thirty-one made coal their primary business (Vietor 1980:49). The AMC's board of thirty-two directors had a year earlier contained twenty-two with coal interests but only two for whom coal was primary. AMC was therefore broadly concerned with the mining process and some of the industrial end uses of coal such as smelting. This was an important link for coal capitals not already tied through big oil and gas owners to the larger mining community. "More than any other single institution, the American Mining Congress has come to represent the inter-industry political coalition of coal" (Vietor 1980:51).

Influence was wielded most directly on the *government advisory boards*. Nixon's National Industrial Pollution Control Council (NIPCC) was a major venue for coal interests to influence executive branch policy. They met in secret and were able to use the Department of Commerce as a public relations tool, publishing numerous reports praising industry initiative and warning of economic consequences from environmental protection. The NIPCC collaborated with the AMC, Edison Electric Institute (EEI), and other

members of the coal policy network to produce studies that dramatized the economic costs of environmental clean air protections and, critically, pushed to have cost-benefit considerations added to regulation process. In 1973 when the NIPCC's ability to meet in secret was revoked by Congress it was substantially weakened. NIPCC members had contributed over $700,000 to Nixon's campaign and several were investigated for illegal contributions.[50] Because of horizontal integration by oil companies, the National Petroleum Council had by the 1970s absorbed not only substantial coal interests but even nuclear interests and became established as the most influential governmental advisory group on energy issues generally(Strangfeld 2006).

It was not only the shared the financial, material, and institutional integration but the recognition of a common class enemy that drove the formation of the coal coalition. "There can be little doubt that by the mid-1960s a cohesive political coalition of coal-related industries was evolving from post-World War II financial and technological interdependencies. Interlocked trade associations and industry advisory councils provided the institutional order for the coalition's political activity. Environmentalism provided a common cause" (Vietor 1980:57). The easing of the energy crisis and falling prices for energy commodities in the 1980s appear to have shaken up the oil-coal ownership structure that helped form Vietor's Coal Coalition. The percentage of coal production owned by oil and gas companies increased from thirty-two in 1976 to forty-four in 1986 but had declined to less than thirty by the early 1990s (Energy Information Agency 1993). Today, the divestment trend appears to have continued.

Since Vietor's study there has been both continuity and divergence in the trends he recorded. At the State level, the West Virginia and Kentucky Coal Associations appear to have grown in influence and sophistication, and they continued to develop regional interstate ties through groups like Friends of Coal (Bell and York 2010). Evidence also indicates the coal industries of those states have continued to receive substantial direct and indirect government support. So much so that they constitute a net drain on state

[50] When the chairman of leading coal producer Ashland Oil was convicted of making illegal contributions, he defended it in a statement to shareholders saying, "There was a good business reason for making the contribution and, although illegal in nature, I am confident that it distinctly benefited the corporation…" (Vietor 1980:54-5).

budgets (undefined author and J. Bailey 2009; Boettner and McIlmoil 2010; McIlmoil and Boettner 2010; McIlmoil et al. 2010). Reflecting growing concentration, the National Coal Association and the American Mining Congress merged in 1995 to form the American Mining Association. According to their website their objective is “engage in and influence the public policy process on the most significant and timely issues that impact our ability to locate, permit, mine, process, transport and utilize the nation's vast coal and mineral resources” (National Mining Association n.d.). They were a major contributor to the Air Quality Standards Coalition formed in the late 1990s and chaired by the National Association of Manufacturers to oppose new EPA air regulations. Another important new policy group, the Center for Energy and Economic Development (CEED), emerged in 2000. The CEED has been a central actor in opposing climate change regulation and is the parent organization of Americans for Balanced Energy Choices, later renamed more forthrightly as the American Coalition for Clean Coal Electricity (ACCCE), whose members include many of the largest mining, rail, and utilities companies in the US. The group spent $30 million in 2007 and was the primary sponsor of a Democratic presidential debate in early 2008 at which climate change was never mentioned.

Government advisory boards became more conspicuous during the George W. Bush administration. Vice President Dick Cheney’s National Energy Policy Development Group was a broader and even more secretive incarnation of Nixon’s NIPCC. Even identities of who met with this group was a closely guarded secret, with Cheney successfully fighting against disclosure for years until finally a Supreme Court ruling upheld exemption for executive privilege. Although the proceedings are still secret, leaked documents do show that “Jack N. Gerard, then with the National Mining Association, … [met with the group and]… urged the administration to give the Energy Department responsibility for promoting technology for easing global warming and to keep the issue away from the Environmental Protection Agency, which could issue regulations on greenhouse gas emissions” (Abramowitz and Mufson 2007). His advice appears to have been followed. Members of the coal coalition, the mega-utility Southern Company in particular, successfully lobbied for repeal of the Clinton era New Source Review (NSR) rule requiring utilities who upgrade generation capacity to install the best

available pollution controls. There were an enormous number of NSR violations pending as George W. Bush took office and after the repeal these cases were dropped. Bush also placed the CEO of Peabody Energy, Irl Engelhardt, on his EPA transition team along with Peabody VP John Wooten on the Department of Energy team and others corporate coal leaders in that Department and Department of Interior. His chief of staff for Environmental Quality was the former head of the American Petroleum Institute's anti-climate science team (Goodell 2007).

When G.W. Bush's head of EPA, Christine Whitman, reiterated on national TV his campaign position of accepting the reality of anthropogenic climate change and the need to address it, it was an opportunity to see the class and institutional ties of the coal policy network swing into action. Thomas Kuhn, Bush's Yale roommate and head of the Edison Electric Institute, dropped a personal call. The Competitive Enterprise Institute also lashed out, as did Southern Company's lobbyist and former Mississippi governor, Haley Barbour. Within days the White House had rejected Whitman's claims (Goodell 2007). Similarly, when the courts ruled that mountaintop removal's disposal of mine waste in streams was subject to the Clean Water Act, the fossil fuel-dominated Department of Interior issued a rule redefining mine waste as "fill" to negate the impact. G.W. Bush received record donations from the coal industry during his election campaign against Gore. Coal mining campaign contributions peaked in 2002 at about $3.7 million while lobbying expenditures exploded from less than three million at the start of the decade to consistently over fifteen million by the end. Obama's stated support for clean coal did not sway the industry. In 2008 Democrats as a whole received only 27% percent of coal industry federal campaign contributions (Center for Responsive Politics 2014). Still this was nearly double what Democrats tended to receive during the Bush years, reflecting some hedging of bets.

The most substantial new regulatory issue in the Twenty-first Century was obviously the possibility of climate regulations, but regulation of mountaintop removal mining in the Appalachian region has also become an increasingly pressing issue, creating tension between the Obama administration's constituency of environmentalists and the Democratic congressional representatives of key coal states like West Virginia.

Nevertheless, at the national scale of politics the interests of coal and utilities in mountaintop removal regulation pale in comparison to those interests threatened by climate change. The nuclear and natural gas industries are the most obviously positioned large energy interests to leverage constrained coal use for their benefit. Coal, nuclear, and gas were in competition over energy priorities in the late 1970s but had developed more indirect network ties and cooperative lobbying by 1992 (Strangfeld 2006). In the absence of common ownership structure like that in the late 1970s, coordination in the face of competing interest would depend more than ever on the policy planning network organizations acting as mediator.

The Climate Threat and Political Capitalism Response

Pressure for action to address climate change continued to grow in the first decade of the Twenty-first Century. Europe had implemented regulations in 2005 and as it became increasing likely that fossil fuel interests would face a US government controlled by the less loyal Democratic Party, some kind of climate related regulation seemed a strong probability. In early 2007, four environmental groups, including three of the largest mainstream groups, and ten major corporations, including major fossil fuel interests such as BP America, Caterpillar, Alcoa, and Duke Energy, announced the formation of the US Climate Action Partnership (USCAP). The group released a statement promising "to work with the President, the Congress, and all other stakeholders to enact an environmentally effective, economically sustainable, and fair climate change program consistent with our principles at the earliest practicable date" (US Climate Action Partnership 2007). In a much-anticipated ruling three months later, the US Supreme Court ruled that the EPA already had the authority to regulate greenhouse gases, raising the stakes for business further. An additional two environmental groups and 13 firms had joined USCAP by 2008. The partnership was to be one of the primary architects of the cap and trade legislation put forward in 2008 and 2009 (Pooley 2010).

The lead environmental group was Environmental Defense, which, under the leadership of Fred Krupp, had become the leading advocate of market environmentalism

and the cap and trade approach.[51] Major fossil fuel companies attracted to the group were those who already were exposed to similar legislation in the EU, such as BP and Shell. The other sector heavily represented was the utilities and energy technology sector desiring rationalization. With much of utilities' generation capacity reaching the end of its lifespan these firms looked for predictability for their investments and security from policy initiatives outside their influence. Finally, there was the financial services sector, Lehman Brothers was a founding member, which stood to profit handsomely from the privatization and securitization of the atmospheric commons. Firms from other sectors also had readily identifiable strategic interests (Carney 2008).

Theda Skocpol (2013), in the most comprehensive study to date, has analyzed the failure to pass climate legislation in 2009, despite the support of major environmental and business organizations as represented by USCAP. Applying a form of pluralist state theory known as the "polity centered approach" (Skocpol 1992), she argues that grassroots ideological mobilization by elements on the fringe of establishment views, rather than widespread elite opposition, were the primary causes of the legislation's failure. This analysis was echoed by the head of the EPA under George W. Bush, Christine Todd Whitman: "It's a shame that we find ourselves in this stalemate, as business leaders have not resisted capping carbon as some might assume they would. In fact, business leaders joined with environmental leaders [to ask for] consistent federal rules on carbon emissions" (Dickinson 2010). Skocpol focuses on the congressional politics and concludes that the root problem was a lack of any Republican support, but this was not a product of business dominance in politics: "…business people are not, right now, the prime arbiters in the Republican Party. Ideological advocates, carbon industry dead-enders, and populist anti-government forces are…including billionaire elites and grassroots activists fiercely opposed to any and all government efforts to fight global warming" (2013:130). No evidence is presented as to asserted marginality of the carbon industry "dead enders" within the corporate community, other than the existence of USCAP, nor does Skocpol sufficiently address the substantive basis on which a

[51] Environmental Defense spearheaded the market environmentalism compromises into the 1990 Clean Air Act amendments that won over the assent of the Business Roundtable.

number of major environmental groups with a more justice oriented approach came to oppose the climate legislation being considered as a failure.

In fact, the National Wildlife Federation withdrew from USCAP in early 2009 after determining that the process was hopelessly compromised and other more justice-oriented groups such as Greenpeace and Friends of the Earth had been opposed to major tenets of their agenda such as free pollution permits and other loopholes from the beginning. Primary among the reasons for opposition by many greens and scientists was the legislation's reliance on miraculous breakthroughs in carbon capture and storage technology or "clean coal" that were viewed as unlikely to occur on the timetable needed for carbon reductions, if ever. As top NASA climate scientist James Hansen put his opposition:

> The dirtiest trick that governments play on their citizens is the pretense that they are working on "clean coal" or that they will build power plants that are "capture-ready" in case technology is ever developed to capture all pollutants…Cap-and-trade is the Temple of Doom. It would lock in disasters for our children and grandchildren. It would do nothing to preserve a planet resembling the one that we inherited from our elders, and to allow continued existence of the remarkable species that co-habit Earth with humanity. (J. Hansen 2009a)

Although never discussing the science in any detail, Skocpol dismisses such opinions out of hand, arguing that any legislation would *a priori* be a positive step toward more effective regulation in the future (Skocpol 2013). Such an outcome would be a contrast with the history of coal surface mine regulation, where a compromised bill effectively demobilized social movements for national legislation and has led to continued and accelerating ecological impacts through exploitation of loopholes around MTR (Montrie 2003; Palmer et al. 2010). This is typical of disagreements between the class dominance and historical institutionalism approaches over the degree to which new agencies are accepted by function routinely once established (Domhoff 2014:210).

Skocpol compares the "insider bargain" strategy of USCAP unfavorably to the more successful and movement mobilization oriented Health Care for America Now (HCAN) effort to pass healthcare legislation during the same period. Although producing valid discernments into the superiority of the latter strategy for countering rightwing mobilization at the level of congressional politics, her polity approach comparison

overlooks major substantive differences in the nature of the legislation and its relation to class interests involved. A power structure approach, viewing these legislative processes through the lens of political capitalism, reveals major differences. Although both bills were fundamentally based on proposals from the capitalist policy planning network, Environmental Defense most prominently in the cap and trade case and the Heritage Foundation in the case of mandated private insurance, their final forms were received much differently by most central policy planning organizations and key trade associations. Furthermore the threat of irreversibility of climate change, affecting all future generations, poses an important policy distinction from healthcare reform on the feasibility of incremental change that the polity approach, lacking a materialist political economic grounding, is deaf to, instead seeing only a myopic ideological unwillingness on the part of left groups to work with business.

By mapping the director interlocks of the EPPN and organizations' climate change policy positions it is possible to examine the extent to which opposition to legislation was confined to "carbon industry dead enders" as well as how the level of integration into the wider corporate community correlates with environmental organization opinion on the cap and trade bill.

Data and Methods

I perform exploratory analysis on a network database constructed from data on directorate interlock ties retrieved from organizational websites, tax filings, Mergent Online, and the Wharton School Corporate Library database. My sample of firms consists of publicly held Fortune 500 companies for 2009, supplemented with any of the publicly held top 20 producers among electrical utilities (megawatt hours), along with the top 20 producers and reserve holders for coal (tons), oil (barrels), and gas (BTUs) not already included. In addition, I added any of the firms in those sectors who were among the top 20 federal political contributors in the 2008 or 2006 election cycles (Center for Responsive Politics 2014). Following Vietor I identify members of the coal coalition, beyond the top coal producers, as publicly held firms among the top 20 utility consumers of coal, the top 10 industrial consumers, the top 20 coal reserve holders, the top 3 rail haulers, and the 5 banks with the highest investments in coal. Finally, I also included

publicly available firms that were part of USCAP. The corporate sample includes 473 total firms, 59 top energy firms, 20 coal firms and 46 firms in the coal coalition.

My energy policy planning network sample builds from the organizations identified by Crawford (2012) as major policy planning groups involved in energy-related policy and extends to organizations active on climate change. I was able to obtain director lists for the National Mining Association, Nuclear Electric Institute, and the American Coal Council that were unavailable for Crawford's study.[52] I also add the most prominent coal industry associations identified in the literature above, as well as additional prominent environmental organizations identified as involved in shaping climate policy. A total of 37 organizations are included in my EPPN sample (see table 5.1).

Table 5.1. EPPN Sample

Organization	**Status**
National Petroleum Council	Advisory group to US DOE
American Petroleum Institute	Oil and gas trade association
Interstate Natural Gas Association of America	Natural gas pipeline industry trade organization
Independent Petroleum Association of America	Oil and gas trade association
American Gas Association	Natural gas utility trade organization
National Rural Electric Cooperative Association	Cooperative electric utility trade organization
Edison Electric Institute	Shareholder-owned electric utilities' trade
Nuclear Energy Institute	Nuclear energy trade organization
National Mining Association	Mining/coal trade organization
American Coal Council	Coal industry trade organization
American Coal Foundation	Coal industry trade organization
National Coal Council	Coal industry trade organization
American Coalition For Clean Coal Electricity	Coal industry trade organization
Bituminous Coal Operators Association	Coal industry trade organization
Solar Energy Industries Association	Solar industry trade organization
American Wind Energy Association	Wind industry trade organization
National Association of Regulatory Utilities	Public utility commission trade organization
National Association of Manufacturers	Trade organization
The Business Council	Trade organization
Business Roundtable	Trade organization/think-tank
US Chamber of Commerce	Trade organization

[52] I also include the Business Council. Although Mizruchi and others have remarked on the decline of influence held by the Committee on Economic Development, they should be included in my final analysis as well.

Committee for Economic Development	Trade organization
Conference Board	Conservative think-tank
Heritage Foundation	Ultra-conservative think-tank
The Brookings Institution	Conservative think-tank
Council on Foreign Relations	Conservative think-tank
American Enterprise Institute	Ultra-conservative think-tank
RAND Corporation	Conservative think-tank
Natural Resources Defense Council	Environmental group
Union of Concerned Scientists	Liberal think-tank
Resources for the Future	Environmental group
Environmental Defense Fund	Environmental group
World Resources Institute	Environmental group
Alliance For Climate Protection	Environmental group
Climate Works Foundation	Environmental group
International Research Center For Energy & Economic Development	Think-Tank
Sierra Club	Environmental group
The Nature Conservancy	Environmental group
Greenpeace	Environmental group

Drawing conclusions based on public statements of policy groups can be difficult as they are sometimes contradictory and may reflect a public relations strategy or strategic goals rather than actual policy preferences: for example when a group opposes a policy ensured of passage in their favor as being too weak when they would support it if passage was questionable (Domhoff 2014; Union of Concerned Scientists 2012). To minimize the confusion stemming from contradictory statements and actions, I applied a simplified version of the methods used by Goldman and Rogerson (2013) in assessing trade and policy groups' positions on climate change. I coded organizations into three categories, those that reject the climate science consensus, those that accept the scientific consensus but do not support "significant" action, and those who both accept the science and support "significant" action.[53] Organizations without sufficient data to make a determination such as the Conference Board, or groups that do not take explicit policy positions as a matter of course like the Business Council, are treated as missing.

[53] This definition of "significant" includes support for the cap and trade bill and so should be distinguished from "sufficient" action to realistically address climate change.

I construct an adjacency matrix of firms and EPPN organizations using UCINET software to describe the structure of the EPPN and the coal industry and wider coal coalition's connections to it. For my exploratory purposes here, I do not distinguish between inside and outside directors and ties are treated as non-directional/symetrical.[54] I then graph the network using the NETDRAW software's Multi Dimensional Scaling graph theoretic layout that arranges network nodes in space according to similarity of ties. After comparing these exploratory findings on the networks' properties, I analyze the relationship of organizational network location to positions of policy groups on climate change action.

Results

In 2009 the 20 major coal producers and reserve holders were relatively independent of major oil and other sectors that first drew the industry into the inner circle of national policy. Twelve of the major producers are independent, three are controlled by utilities, two by big oil, one by a railroad, and one by a conglomerate. However, despite this marked change from ownership structure of the coal coalition of the late 1970s, coal firms exhibited robust interlock ties through the larger coal coalition to the EPPN.

Figure 5.1 shows the coal coalition firms and the EPPN. Firms are represented by squares and the primary role within the coalition is indicated by color.[55] The EPPN organizations are represented by circles and are colored green if they specialize in environment related policy or are a renewable energy trade group and colored red otherwise. Lines connecting the nodes represent ties formed by director interlocks; thicker lines indicate multiple shared directors. Every major coal producing or reserve holding firm is tied to the EPPN except the smallest, James River Coal Company, which is connected by other members of the coal coalition to the network. Coal firms outside of the bottom left corner are firms who, despite being a top producer or reserve owner, have

[54] Ties formed by vice presidents of EPPN groups who are not also directors are still included, but not in the case of firms, as the data from Wharton only included directors.

[55] The National Petroleum Council is mislabeled as "American" in the graphs; there are also inconsistencies in capitalization. I have corrected these in the data and will rerun the graphs for the final draft.

their primary business in other sectors, primarily utilities. No firms are isolates, though several policy groups are, including the left leaning Greenpeace, the ultraconservative Heritage Foundation, and the solar energy trade association. The network exhibits a clear polarity between policy groups with ties to the coal firms and those with ties to environmental organizations. This polarity falls along expected lines of liberal and environmental organizations on one pole, moderate-conservatives in the center and ultraconservative policy organizations and the coal industry on the other pole. Utilities occupy an intermediate position between the main policy groups and the coal firms. Other than the extractive-oriented International Paper Company, the industrial coal consumers occupy a more central position, as do the railroads that are not also major coal producers/owners. The banks are the most consistently on the moderate-conservative side of the policy spectrum.

Figure 5.2 shows the EPPN with their size indicated by their 2-local eigenvector centrality (the number of other nodes within 2 ties) and color coded according to their position toward climate change and climate policy with red representing hostility to science and policy, yellow indicating acceptance of climate science but lack of policy support, green representing significant policy support, and blue missing data. Unsurprisingly the ultraconservative groups are all hostile to climate science and policy. The major fossil fuel organizations with the exception of the gas industry are also. Gas industry trade associations are joined by the Business Roundtable in taking an intermediate position of accepting the science but not significant action. Thus, following the general political alignment the network is polarized between environmental and coal groups. Exceptional cases to this trend are the Edison Electric Institute and Nuclear Energy Institute trade associations that appear closer to the coal/ultraconservative end.

Figure 5.3 shows the EPPN, coded for policy position as above, with ties to the top energy firms and USCAP firms, all with sizes based on 2-local eigenvector centrality. This network has one additional isolate, XTO Energy, and one fewer isolate; a board tie with the utility Calpine Corporation now connects Sierra Club to the network. Figure 5.4 shows these nodes without labels for better examination of ties. The same rough spectrum

shows itself here with oil and gas in a generally more central position and USCAP firms more toward the liberal environmental end.

Table 5.2 displays the centrality scores of the EPPN organizations using a variety of measures. Coding support for climate action on an ordinal scale (1,0,-1), centrality within the EPPN is negatively correlated with support for climate action. This correlation is statistically significant when centrality is measured by the eigenvector of geodesic distances or Bonacich's power algorithm (rho= -0.483, p= 0.004). To further test this relationship I regressed climate stance as categorical variable to predict centrality using OLS. The results indicate that organizations supporting climate action are significantly less central within the network than those rejecting science and climate action (p= 0.01) but those groups accepting the science but not supporting action are not (p= 0.93). Johnson's simple hierarchical cluster analysis indicates the environmental and "liberal" end of the moderate-conservative wing such as RAND, Brookings, and the Conference Board are groupings more similar and organizations related to coal have more similarity of ties with the ultraconservative think thanks. The cluster analysis dendogram is reported in the appendix.

Discussion

Coal's increased autonomy from the ownership structure of previous decades presents both the potential opportunity of pursuing a more independent agenda and, alternatively, of being left out in the cold. It is difficult to distinguish between the role of network ties, general ideological positions, and the economy's structural dependence on coal as cheap energy for economic growth in swaying the broad based multi-issue policy organizations such as the Business Roundtable against support for climate action. However, it is clear that coal's director ties among the top companies have remained robust and kept it connected to the larger EPPN. EPPN organizations missing from earlier studies (Crawford 2012), The Nuclear Energy Institute (NEI) and National Mining Association are clearly important nodes in the overall network with higher than average ties, and so their inclusion gives a better understanding of the overall structure of the network.

Table 5.2 Centrality Scores

	Degree	Bonpwr	Eigen
National Petroleum Council	14	2537.263	0.372
Business Roundtable	11	2309.299	0.339
National Association of Manufacturers	11	2506.914	0.368
National Coal Council	10	2289.501	0.336
Edison Electric Institute	9	2178.603	0.32
American Coalition For Clean Coal Electricity	8	1627.481	0.239
US Chamber of Commerce	8	1438.056	0.211
World Resources Institute	8	726.539	0.105
National Mining Association	7	1298.764	0.19
Nuclear Energy Institute	7	1907.499	0.28
The Business Council	7	1201.083	0.176
American Petroleum Institute	6	1302.385	0.191
Council on Foreign Relations	6	1079.132	0.158
Resources for the Future	6	438.698	0.063
The Brookings Institution	6	817.895	0.119
American Coal Foundation	4	771.929	0.113
American Gas Association	4	736.408	0.108
Bituminous Coal Operators Association	4	505.175	0.074
Conference Board	4	492.827	0.072
Independent Petroleum Ass Of America	4	618.216	0.09
The Nature Conservancy	4	195.171	0.028
Alliance For Climate Protection	3	167.999	0.024
American Enterprise Institute	3	532.69	0.078
Climate Works Foundation	3	108.525	0.015
Environmental Defense Fund	3	92.95	0.013
Interstate Natural Gas Association of America	3	465.788	0.068
Natural Resources Defense Council	3	108.525	0.015
American Coal Council	2	325.646	0.048
American Wind Energy Association	2	104.896	0.015
Committee for Economic Development	2	64.243	0.009
RAND Corporation	2	17.61	0.002
Union of Concerned Scientists	2	17.61	0.002
GreenPeace	1	1.141	0
Heritage Foundation	1	1.141	0
Sierra Club	1	1.141	0
Solar Energy Industries Association	1	1.141	0

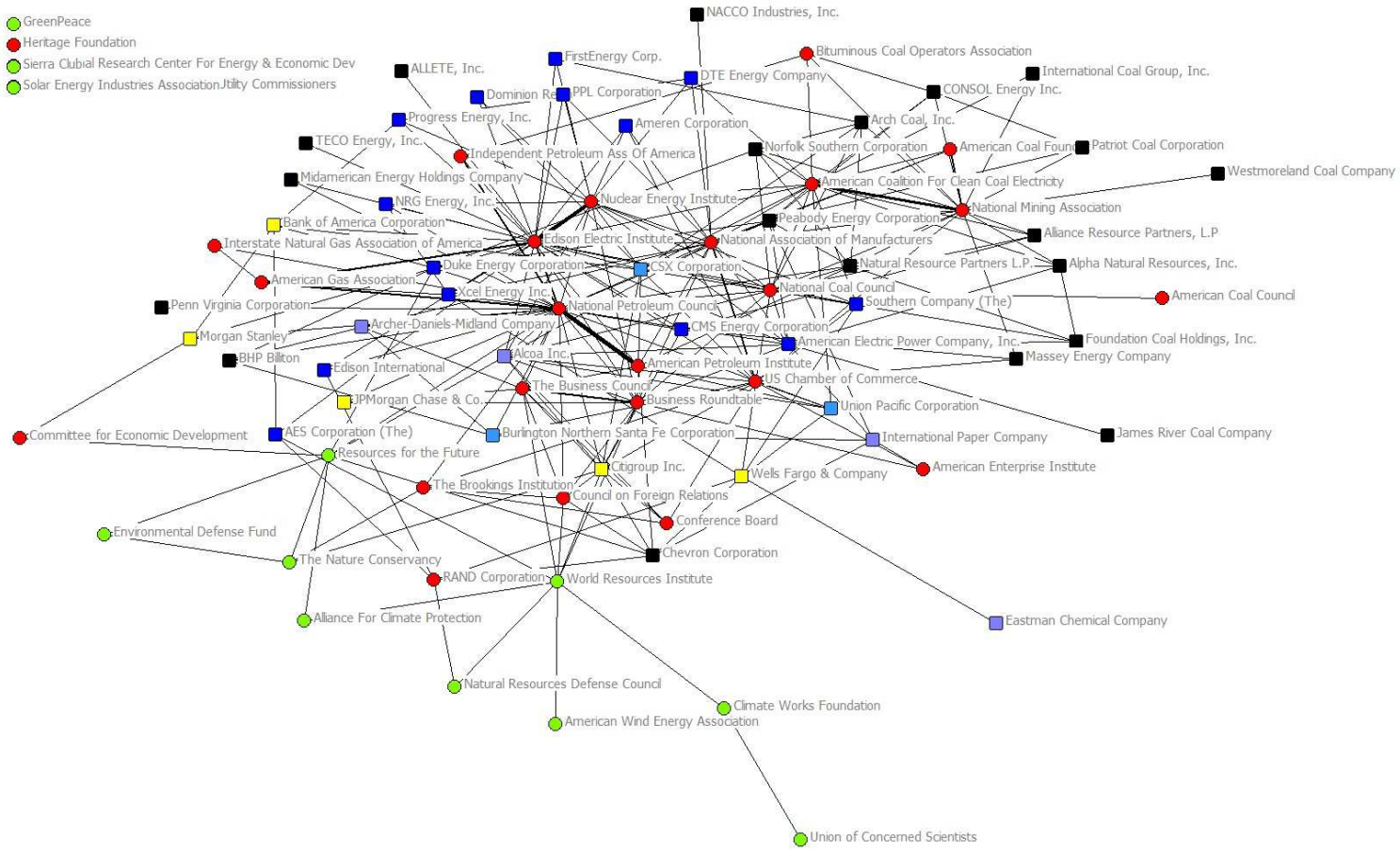

Figure 5.1. EPPN and Coal Coalition. Black indicates top coal producers and reserve owners (this coding takes precedence over others where there is overlap). Dark blue indicates top coal burning utilities. Purple indicates top industrial consumers of coal. Light blue indicates top coal hauling railroads. Gold indicates top coal financing banks.

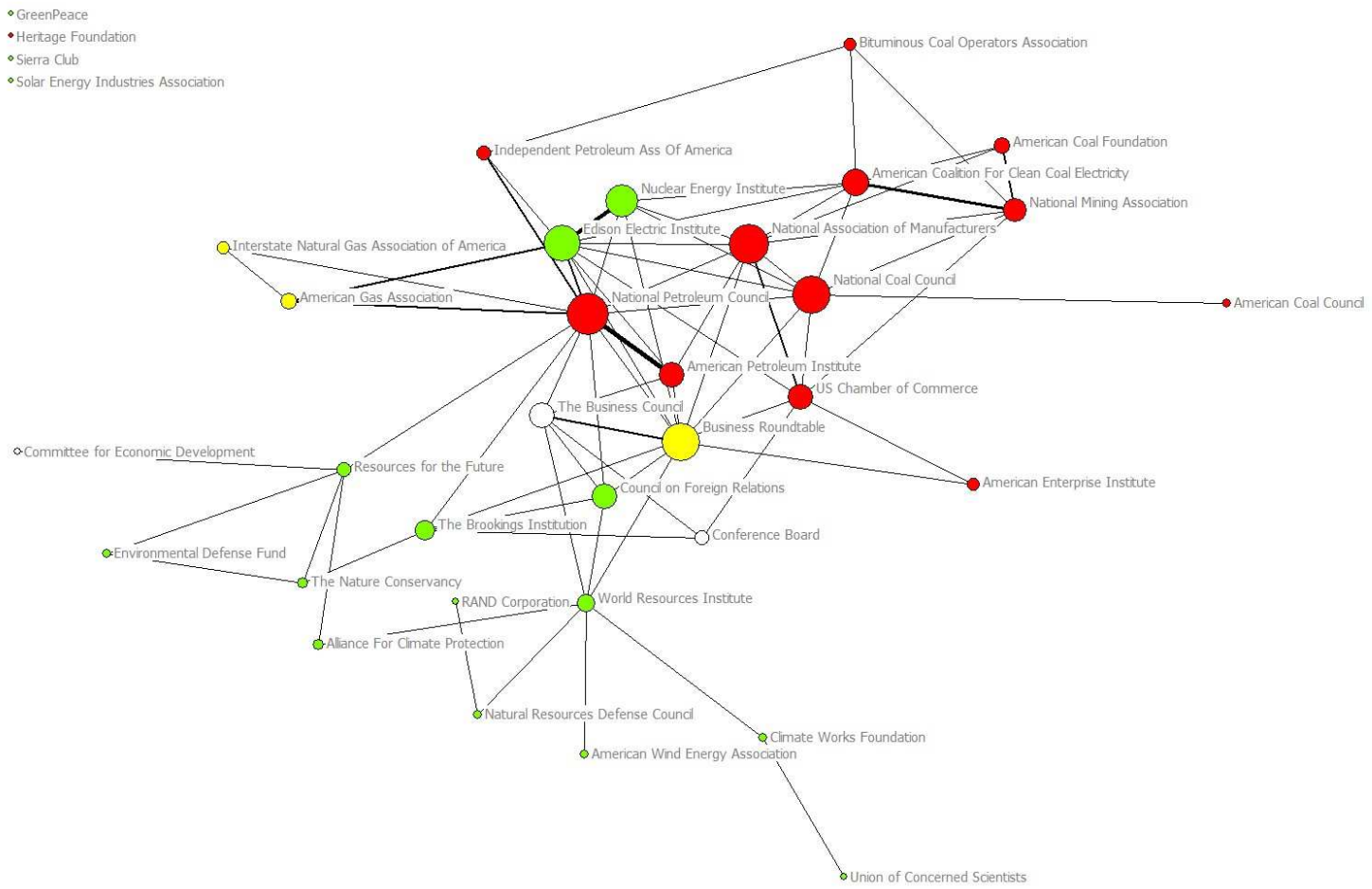

Figure 5.2. EPPN. Green indicates support for climate science and significant action. Yellow indicates acceptance of science but not action. Red represents the rejection of science and action. Blue indicates no position or missing data.

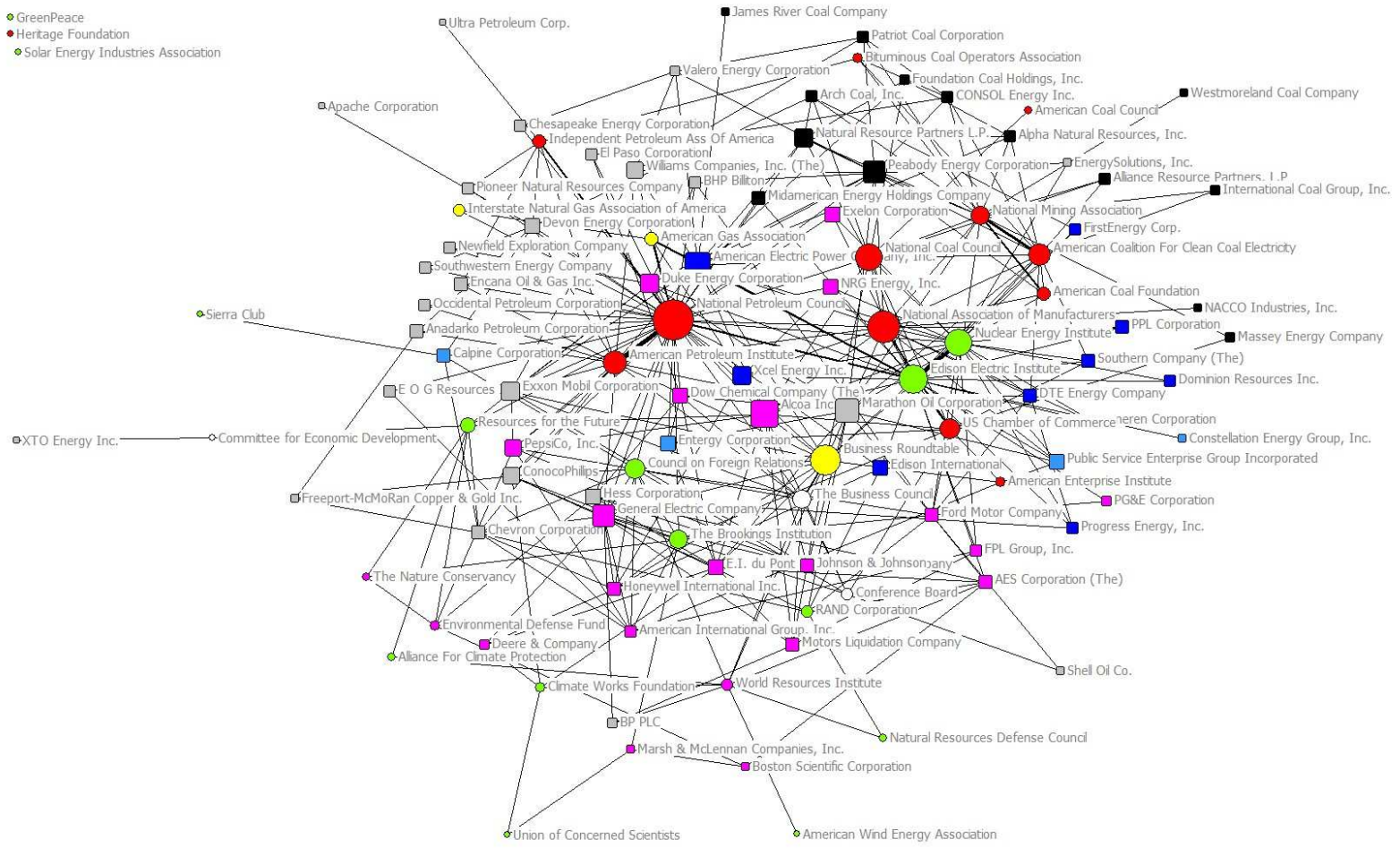

Figure 5.3. EPPN, Top Energy Firms, and USCAP. Black indicates top coal firms. Grey indicates oil and gas firms. Dark blue indicates top coal burning utilities. Light blue indicates top utilities that are not also top coal consumers. Magenta indicates USCAP organizations.

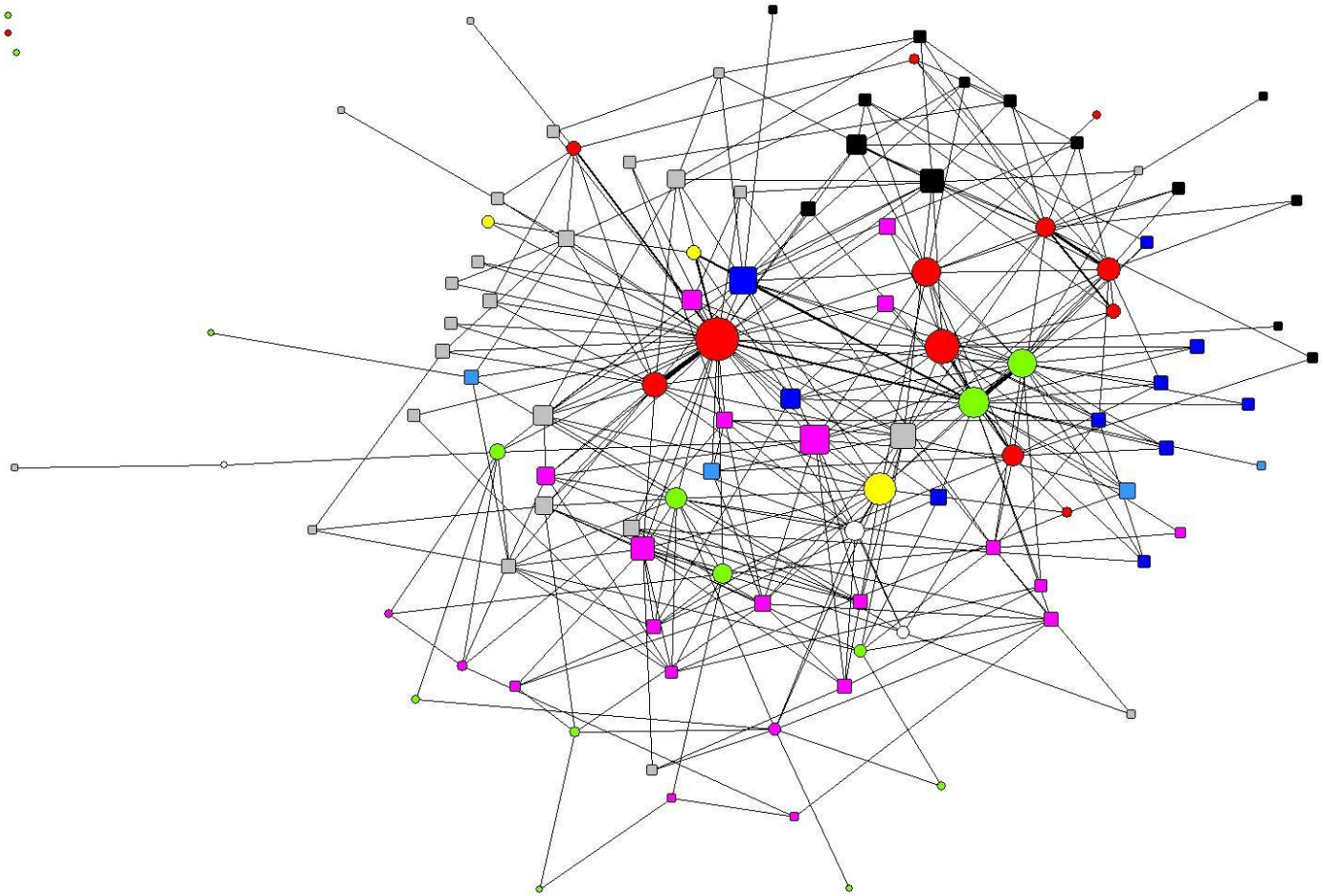

Figure 5.4. EPPN, Top Energy Firms, and USCAP (No Labels). Black indicates top coal firms. Grey indicates oil and gas firms. Dark blue indicates top coal burning utilities. Light blue indicates top utilities that are not also top coal consumers. Magenta indicates USCAP organizations

Of the fossil fuel related industries that would be potentially negatively impacted by the regulation only the Edison Electric Institute had a favorable position on climate action. The Business Roundtable, though accepting the science, did not support legislative action and no environmental legislation has passed over its opposition since 1975 (Domhoff 2014). The aloof center and hardcore opposition of the majority of industry groups in the EPPN is in stark contrast to Skocpol's (2013) comparison case of healthcare reform. The Business Roundtable commissioned a strongly supportive study for the legislation in that case (Hewitt Associates 2009). American Health Insurance Plans, the main insurance industry association, publicly supported the legislation as did the Pharmaceutical Research and Manufacturers of America and the American Hospital Association (Ungar 2012; Vaida 2011). The Affordable Care Act is a textbook case of political capitalism in action. A modified version of a healthcare policy crafted by the ultraconservative end of the policy planning network was embraced by the impacted industries and the moderate conservative center of the policy network. However, the polity approach evidently finds these (polar opposite) positions of the most central business policy group and affected industry as unimportant for a case study comparison (Skocpol 2013). Indeed, the Business Roundtable vies are unworthy even of mention. Skocpol's focus on mobilization of the masses and public opinion for influencing legislators on climate legislation is typical of the tendency of pluralist approaches to miss the way in which the terms of the debate had already been determined outside of congress (Domhoff 2014). Traditional pluralist assumptions of a flat and open policy formation process are undermined by the marginal position within the EPPN of the wind trade association (with only an indirect link to the central policy groups via an environmental group) and isolation of the solar trade group. The strong correlation between centrality within the EPPN and hostility to climate action betrays the notion that there is the kind of consensus within the corporate community implied by Skocpol or Whitman.

Only two centrally connected organizations were climate action supporters. Because nuclear is a relatively low carbon energy source, the NEI had clear economic interests in proposed climate legislation and, like EEI's embrace of action, NEI's support came alongside highly favorable legislation providing (additional) massive government subsidies and loan guarantees in a context of the need for rationalization after a long

period of stagnation in their sector (Gonzalez 2013). EEI is the most anomalous case in terms of its interlock ties and climate position given its significant links to coal dependent utilities, although, this is qualified by its dense ties with the NEI as well. One key actor, Jim Rogers, tied major coal and nuclear utility Duke Energy to both EEI, who was helping to craft climate legislation, and ACCCE who was out to destroy it. Rogers was a key player protecting coal in the climate legislation negotiations inside USCAP, and he had a leadership role in EEI's embrace of climate action. He was considered a visionary by groups like Environmental Defense, a conman by groups like Greenpeace, and a traitor by the coal industry (Pooley 2010). Regardless of his sincerity in the process (he eventually withdrew Duke from ACCCE, but remained in the Chamber of Commerce), Rogers is a prime case study of the role of director interlocks can play in shaping policy within the network. In return for EEI's support the legislation proposed support for coal lavish enough to allow coal-supporter and Virginia Congressman Rick Boucher to point to EPA's analysis that it would *increase* coal usage and usher in a "golden age" of coal use (Pooley 2010; Ward 2009). BP's CEO Tony Hayward, shortly before his company joined others abandoning USCAP, complained to Rogers regarding the climate legislation " you guys got everything you wanted and we got nothing," to which Rogers' attributed Duke's "head start" in the policy formation process (Pooley 2010:437).

In explaining Environmental Defense and NRDC's continued involvement in the hopelessly compromised climate bill, Michael Dorsey, a Sierra Club board member and environmental professor at Dartmouth, concludes they were "well-meaning liberals who do not pay enough attention to political economy…They got outmaneuvered, they got hoodwinked, because they were in over their head" (quoted in Pooley 2010:379). While there is certainly some truth in the appraisal, this analysis shows the extent to which "well-meaning liberals" in major environmental organizations are integrated into the corporate community and its hegemonic capitalist norms and political sensibilities. It would be a mistake, in particular, to underestimate Environmental Defense's commitment to the fundamental ideology shared by the moderate-conservative wing of the EPPN. Environmental Defense had 11 interlocks with capitalist firms in my sample, the Nature Conservancy eight, Resources for the Future four, and NRDC two. Even Sierra Club, which gave lukewarm support for the USCAP process at first before opposing the final

product, had an interlock connecting them indirectly with the EPPN. Sierra Club's marginal connection to the corporate community mirrors their behavior of hovering "on the edge of supporting the USCAP effort" before rejecting it in 2010 (Skocpol 2013:101). Greenpeace (while having a prominent environmental sociologist on their board) had no corporate interlocks in my sample and were opposed to the route taken by the legislation from the beginning.

Conclusion

The analysis of the EPPN in this chapter shows significant divisions over the prospect even of legislation that would be primarily symbolic action on climate change. While the Teaparty was certainly a highly visible source of opposition and pressure on Congress, it would be a mistake to assume widespread support among big business leadership based on the actions of USCAP as Skocpol does or to write off the fossil fuel industry as marginal "dead enders". If we consider the number of groups likely employing a co-optation rather than good-faith collaboration strategy this is even more apparent. Skocpol recognizes (and even normatively supports as pluralist functionalism) the duplicity of corporations involved in crafting climate policy:

> The corporations that participated in USCAP could double their bottom-line bets – [working] to hammer out draft climate legislation that was as favorable as possible to their industry or their firms, and at the same time participating in business associations likely to lobby against much or all of the terms of that insider bargain once it faced Congress or the general public. As they should do given their role as heads of profit-maximizing businesses… (Skocpol 2013:48)

Former Businessweek editor (and future EDF board member) Eric Pooley (Pooley 2010:385-6) summarizes the sensibilities of the liberal wing of the EPPN regarding need for accepting inequities and ineffectiveness in climate legislation:

> Unless powerful people and institutions stood to profit from global warming solutions, global warming wasn't going to be solved…Without lobbyists from Goldman and Credit Suisse and USCAP pushing hard for a climate bill…coal and oil industries would never be defeated.

However, as enticing as fees and derivatives markets for carbon may be to major financial institutions these must be weighed against the threat posed to them by the popping of the "carbon bubble" consisting of assets in the global economy, such as the

fossil fuel reserves of major extractive firms, whose valorization is premised on continued emissions. Between 2005 and 2011 Goldman and Credit Suisse invested 8.6 billion and 12.1 billion dollars respectively in the coal industry; making them the 11th and 9th largest investors in the sector globally. The rents and speculative gains offered by cap and trade would need to be formidable indeed if these assets were in fact to be rendered mostly valueless, as climate action requires. Beyond the carbon bubble, of course, is the strong interest of finance in overall growth rates potentially threatened by carbon limits.

Overall, this study provides more support to the contention of those like Domhoff, who argue that in practice policy-planning groups tend to try and subordinate scientific discourse to the capitalist interests, as opposed to Scokpol's assertion that they represent the independent professional assessments of objective science (Gonzalez 2001). Social and natural scientists who point to the incompatibility of controlling climate change while maintaining the growth rates required for a stable capitalism, much less without harming fossil fuel interests, continue to be marginalized within mainstream policy circles and sometimes even accused of politically counterproductive "catastrophism" on the left. A power structure analysis of the failure of climate legislation in 2009-2010 helps reveal the structural obstacles to meaningful regulation even when there is some division among capitalist elites. It further shows the limits of that division. The coal industry in 2009 remained well connected and arguably influential in the EPPN. Further research is needed to trace the history of Vietor's coal coalition through the 1980s and 90s and to examine more systematically the role of government advisory groups and appointments that are also part of the policy-planning network. On an issue with as far-reaching effects on the economy as carbon limit, the special interest approach to the study of policy, such as that put forward by Laumann and Knoke (1987), does account for the way which class-wide interests are debated and defended in the centers of the network.

Mark Mizruchi's most recent book the *Fracturing of the American Corporate Elite* (2013) lays out the case that between the 1930s and 1960s threats from rivals abroad and organized labor domestically pressured the leadership of the capitalist class to engage in rationalizing projects that stabilized society and legitimated the State. In the 1970s the capitalist class unified under a new banner and, led by the Business Roundtable, defeated

labor and ushered in a weaker, more subservient neo-liberal state (cf Dreiling and Darves 2011). This victory, Mizruchi argues, has led to the atrophy of class unity but not class power. The result is a ruling class that cannot be defeated within existing political structures nor can it rationally deal with collective problems to the stability of the system such as climate change or financial risk. While Mizruchi ends his book with a plea for leadership from some sector of the corporate community this prospect appears no more likely than revolutionary social change to alter the politics of the US.

The simultaneous cooptation and marginalization within the EPPN of business and policy groups sympathetic to the dangers of climate change lends credence to the argument that it is with social movements aimed at the radical transformation of the social metabolism of capitalist society that the best hope for the future lies (Angus 2009; M. Engler and P. Engler 2013; Foster 2009; Salleh 2009). Even in the highly unlikely event of successful carbon capture and sequestration technological developments, coal power would still be based on unequal exchange with the sacrifice zones because of the trend towards surface mining to cut fuel costs. A just energy policy can only be pursued with the goal of human development and a measure of the qualitative and many-sided values in nature that capitalist cost-benefit accounting cannot hope to reckon. While such a reckoning would dispense with concern for accumulation and vested interests such as the fossil fuel industry, it would be much more concerned with the fate of those communities whose labor and health have been sacrificed under the current fossil fuel regime.

CHAPTER VI

STANDING ON A MOUNTAINTOP: MTR AS A NEXUS OF METABOLIC RIFTS

Introduction

Coal River Mountain (CRM) is located in Raleigh County, West Virginia. It is one of the last standing peaks in the Coal River Valley. The other missing peaks are among the over 500 mountains in the Appalachian region blasted apart and dumped into the nearby valleys through the process of mountaintop removal coal mining (MTR). CRM has been at the center of a conflict over two ways to produce electrical power from the mountain. One is to use MTR techniques to blast away the ridgeline and mine the coal seams beneath for burning in power plants. The other is for construction of a "farm" of wind turbines across the ridge. An economic study commissioned by a local community group and environmentalists found that the local benefits of the wind farm exceeded the surface mines' at every stage when including measures for so-called "externalities" of negative health and environmental effects on the surrounding community (Collins, E. Hansen, and Hendryx 2012; E. Hansen et al. 2008). The advantage of the wind farm for sustainable human development in the long term seems clear. The MTR mines would complete their energy and economic contributions after less than 20 years while the wind farm could operate indefinitely. The ecological costs of the MTR mines, including the loss of the mountain's wind power potential, would continue long after mining ends. The Federal and the West Virginia State governments have declined to intervene and mining preparation has begun on part of the ridge.

The apparent irrationality of the MTR mines appears even greater when considering coal's central place in larger ecological crises, particularly climate change. NASA climatologist James Hansen (2009b) wrote:

> [CRM] is the site of an absurdity… The issue… is whether the top of the mountain will be blown up, so that coal can be dredged out of it, or whether the mountain will be allowed to stand. It has been shown that more energy can be obtained from a proposed wind farm, if [CRM] continues to stand. More jobs... More tax revenue …would continue indefinitely. Clean water and the

> environment would be preserved. But if planned mountaintop removal proceeds, the mountain loses its potential… Someone needs to tell President Obama: [CRM] is a symbol of the promise and the hope and the possibilities for a brighter future.

This situation presents a conundrum for ecological modernization theories that focus on technological innovation and fuller accounting of ecological costs (or "natural capital") by placing front and center contradictory class interests. I examine the logic behind the "absurdity" on CRM using critical political economy's insights into capitalist rationality, the larger region's history of underdevelopment, and the economic and political power leveraged by the coal industry.

The forces thwarting what Hansen calls the "the hope and the possibilities for a brighter future," can be found deeply embedded in the structure and history of capitalist development. Marx's *Weltanschauung* included not only a class-economic critique of capitalist political economy but also a critique of capitalist robbery of the environment, i.e., the theory of metabolic rift. For Marx (developing on Liebig) industrial capitalism removed food and fiber from the soil and transported it hundreds and sometimes thousands of miles to the city, preventing its recirculation to the soil, and resulting in urban pollution. This notion of a metabolic rift—or as Marx (1990) put it—an "irreparable rift in the social metabolism," has been seen by sociologists as the key to Marx's conception of ecological sustainability. Moreover, there is a direct connection here to class analysis—since the metabolic relation to nature is for Marx the labor and production process itself, which is alienated under capitalist society (Foster 1999a; 2000). Weber raised similar concerns in his analysis of the system of *Raubbau* associated with industrial capitalism--a concept derived from Liebig and Marx (Foster and Holleman 2012).

Austin and Clark (2012) have demonstrated the utility of Marx's concept of metabolic rift in relation to MTR in Appalachia. This work responds to their call, echoed from McMichael (2010), to tackle the epistemic consequences of capitalism's metabolic rifts by employing multiple vantage points of analysis to problematize the different spatial and temporal boundaries involved.

Method

How should social scientists go about abstracting the process of MTR for analysis in such a way as to both present a broader critique of the system that produces it and inform political action?

Marx's method employs an ontology of "internal relations" that takes *relations,* and the *processes* they imply as the units of analysis (Ollman 2003; Paolucci 2007). Levins and Lewontin argue "What makes materialist science is that the process of abstraction is explicit and recognized as historically contingent within the science" (1985:149).[56] When engaging in relational analysis, a *vantage point* or perspective must be established. From there, the horizontal extension (or spatial scale) of the *relation* under analysis, as well as the temporal extension within which to trace its moments, is crafted (Lewontin and Levins 2007; Paolucci 2007). This brings certain dynamics into relief while abstracting out others that are, for the moment, treated as "constants." This multi-level conception of systems and causality emphasizes that the constraints of "broader" levels—of human societies in general for instance—shape but do not determine in mechanistic fashion the operation of systems at narrower levels of generality, e.g. that of class societies or capitalism. The potential also arises for chance occurrences at one level of causation forming path dependencies, i.e. structural constraints, at other levels. Therefore, an iterative process moving across levels of generality and between vantage points is required to elaborate the relation between the "whole" and its "parts." Such a dialectical approach has shown itself invaluable both in understanding natural history and human history (Gould 1977; Haila and Levins 1992; York and Clark 2011; York and Mancus 2009). Marx's method offers an encompassing perspective with which to integrate ecology and sociology while respecting the different forms in which social and material-ecological relations shape history (Foster and Clark 2008). Such conceptualization is vital for understanding the effects of contemporary environmental

[56] Ollman's emphasis on the dialectic of internal relations and Lewontin's on complex, interactive processes and contingencies constitute elements of a dialectical approach to understanding that goes against the more deterministic interpretations of structural Marxism (e.g. Althusser). On this see Ollman (Lewontin and Levins 2007; 2003 49-50; Thompson 1978).

problems, such as habitat destruction, on longer, broader issues like biodiversity and ecosystem resilience in the face of rapid climatic change.

Because capitalist development is inherently uneven in space and time, how we abstract these processes critically affects our understanding of their meaning for human societies and the natural world (Bunker 2007; Harvey 2006; Hornborg et al. 2007). CRM today is at the base of an energy commodity chain central to the US economy but also global in scope. West Virginia exports 79% of the coal it produces beyond its borders (Energy Information Agency 2010). The social choices made regarding CRM can be situated generally within the political economy of modern capitalism, but the particulars are determined by the history of the region as an *extractive periphery* (Bunker 2007; Dunaway 1996a; Walls 1978).

The threats to the local landscape and ecosystems in the lifetime of current residents and their children are simultaneously part of metabolic rifts that threaten the stability of the biosphere as a whole across a span of *geologic* time. I maintain that to understand the problem of MTR on CRM at least three vantage points must be employed in rotation: the perspective of ecology, of capital accumulation (political economy), and of human development (human "social" ecology); each at multiple levels of abstraction (e.g. of the community, the state/region, the nation, and the globe). A full analysis is beyond what can be attempted in this space. Instead, I will provide an overview, and then proceed with some examples in more detail.

The Social Metabolism of MTR and its Metabolic Rifts

The ecological disasters emanating from MTR are the result of the "social metabolism" of capitalism (Austin and Clark 2012; Meszáros 1995). The rational regulation of society's metabolic relationship to nature (the flow and exchange of materials and energy) is inhibited wherever it threatens the reproductive needs of capital's particular social metabolism (the flow and accumulation of surplus value). Capital typically responds to rifts in its social metabolism by shifting them elsewhere where they only reassert themselves at a vaster scale (Foster et al. 2010; Harvey 1981).

It is often claimed that simple substitution of green energy technologies will be sufficient to avert ecological disaster (Friedman 2008; Mol, Sonnenfeld, and Spaargaren 2009). Yet, on CRM such alternative technological possibilities are being destroyed along with the mountain itself, contrary to the expectations of ecological modernization theorists. However, that such an agenda is being pursued cannot be attributed to mere ignorance, or short-sightedness on the part of the capitalists. Indeed, it is a reflection of the formal rationality (substantive irrationality) depicted by Weber (Foster and Holleman 2012). The failure to substitute a wind farm for MTR mines at CRM is a product of capitalist modernity in extractive peripheries: high levels of absentee ownership, governmental capture by extractive capital, and the narrow time horizon of modern economic decision making (Austin and Clark 2012). CRM is a *specific concrete* case that reflects many *essential relations* of the crisis of our social and ecological systems in *general*.

What is irrational from a perspective of human development is rational from the profit-maximizing standpoint of capital. Capital's short-sightedness and indifference to quality of life was remarked upon by Marx from its earliest days:

> In every stock-jobbing swindle every one knows that some time or other the crash must come, but every one hopes that it may fall on the head of his neighbour, after he himself has caught the shower of gold ... *Après moi le déluge [After me, the flood!]* is the watchword of every capitalist and of every capitalist nation. Capital therefore takes no account of the health and length of life of the worker, unless society forces it to do so. (Marx 1990:381)

Marx's argument equally applies to ecological conditions as they relate to reproduction of the labor force and its quality of life. As Marx was aware, the phrase "*Après nous le déluge*" was used by German botanist Matthias Schlieden to describe the threat of regional climate change brought on by capitalist society (Foster 2011a). Principal to Marx's analysis is the conclusion that capitalist production is a process of exploitation of both the soil (earth) and the worker (Foster 2000). We should, therefore, not be surprised by reckless disregard for both the health of the worker and the health of the land, which are viewed as either "free gifts" or disposable commodities—factors of production to be exploited to their fullest.

From these general contradictions presented by the system, I proceed to the more specific historical contradictions of CRM—an analysis rooted in the metabolism of the region. The vantage point of capital brings into focus only those narrower aspects of the problem that impinge upon the accumulation process. As an internal periphery, Appalachia's people and resources have always been viewed by capital as expendable, and capital has never hesitated to liquidate them should it perceive doing so to be in its interests and power (Dunaway 1996a; Walls 1978). In contrast, the vantage point of ecology provides the basis for a broader materialist critique. After examining the ecological relations and capital's system of metabolic regulation, the challenges facing real human development for the people of Coal River can be soberly considered.

The Vantage of Point Ecology:

MTR coal mining in Central Appalachia is an instructive vantage point from which to elaborate the relationship of global crises to the localized operation of our political economic system. Austin and Clark posit, "The ecological degradation linked to [MTR] is simply a microcosm of the unsustainable dynamics of an economic system, driven by the ceaseless accumulation of capital that is creating an ecological rift in the planetary boundaries" (Austin and Clark 2012:16). MTR is connected at multiple points to at least six of the "planetary boundaries" of the biosphere identified by Rockström et al. (2009), whereby natural systems are approaching or experiencing catastrophic failure: climate change, ocean acidification, biodiversity loss, freshwater depletion, the nitrogen cycle, and massive changes in land use.

The life cycle of coal is full of quantitative (e.g., the amount of carbon in the atmosphere and oceans) and qualitative (e.g., toxic processing chemicals, species loss) problems suited to dialectical, metabolic analysis. Clark & York (2005) have analyzed climate-change as the result of a metabolic rift in the earth's carbon cycle. The following analysis reiterates that the climate crisis is part of a larger and still differentiating metabolic rift between capitalist society and natural systems that threatens their resilience. For a detailed description of Marx's theory of metabolic rift and its application to MTR see Austin and Clark (2012).

Air. The proposed MTR mines on CRM would eliminate the potential for future wind development in the area. The steep contours and elevation of the mountains are partially responsible for the potential to generate power at a viable rate (E. Hansen et al. 2008). It is also doubtful the new ridgeline constructed from the "reclaimed" rubble leftover from mining would be stable enough to anchor wind turbines.

Weekly, a Hiroshima bomb's equivalent of explosives is used in Appalachian MTR operations. This blasting, compounded by coal processing and transportation, spreads fine-grained particles of pulverized minerals and chemical residue. These are linked to respiratory problems in humans and presumably could be affecting wildlife as well (Aneja, Isherwood, and Morgan 2012; Epstein et al. 2011).

The mining itself is a significant source of greenhouse gas emissions that contribute to climate change and ocean acidification. The mining process, including the disruption of the soil and forest as well as fuel for extraction and transport, adds an estimated additional 7 to 17% to the CO2 emissions of the coal's actual consumption (J. F. Fox and Campbell 2010). Projections indicate that if mining trends continue the Southern Appalachian forests will switch from a net carbon sink to a carbon source between 2025 and 2033 (Elliott Campbell, J. F. Fox, and Acton 2012). Methane, a greenhouse gas with a shorter life span but 25 times higher potency than CO2, is also released during the mining process.

Finally, the combustion of coal itself creates, in addition to more CO2, nitrogen oxides (NOx) that contribute to corrosive ground level ozone. Ozone and particulates from coal plants are major contributors to respiratory disease (Epstein et al. 2011).

Water. Changing the shape and surface of the mountains can alter rainfall patterns and the clearing of forest and filling of streams with debris is associated with increased flooding that can damage farms, homes, and businesses (Palmer et al. 2010). Given the disruptions of the hydraulic metabolism wrought by the coal industry in the Coal River Valley, the watchword of capital there has *quite literally* become *"Après moi le déluge!"* Beyond the quantitative flows of water, the quality of water bodies is negatively affected by changes in temperature, dissolved oxygen, sediment load, chemical composition, and

pH. Over one-tenth of the surface areas of numerous watersheds in WV have been disturbed by MTR (Palmer et al. 2010). Blasting can change water tables, damaging or drying up wells (Environmental Protection Agency 2004; Palmer et al. 2010).

Chemicals that were previously stabilized in geologic formations are exposed to air and water, becoming toxic pollution that affects aquatic life and human residents' drinking water (Environmental Protection Agency 2004; Palmer et al. 2010). The processing of coal after mining to remove certain chemicals and impurities to enhance its price has produced hundreds of billions of gallons of toxic coal slurry across the region that is stored in earthen dams or injected underground. The former pose the risk of failure and flooding in addition to water contamination, while the later has been associated with residents well water contamination and health impacts (Burns 2007; Epstein et al. 2011). West Virginia alone has 126 slurry impoundments with over 110 billion gallons of coal processing waste (Epstein et al. 2011). This pre-sale processing of coal is one example of modern "clean coal technology" whereby harmful environmental effects of the coal life cycle are diverted from the burning stage to extractive communities.

The effluent from mine sites is usually channelized into retention ponds requiring perpetual treatment to limit the outflow of the toxic heavy metals and acid drainage. The pollution containment efforts are widely ineffective and contaminants from surface mining in the Appalachian headwaters have been detected throughout the waters they feed, thus exacerbating the larger freshwater supply problem. The spread of water contamination will continue from many of these sites and raises question of who will pay for continued monitoring and treatment. Significant water degradation has been detected downstream two decades after MTR sites have been "reclaimed" (Lindberg et al. 2011). A wider temporal extension of the problem brings into focus climate change induced weather patterns as the range of precipitation levels exceeds that under which mine site reclamation has been engineered for "acceptable" risk levels. A trend toward greater high precipitation events has already been detected and many communities in the area have experienced flooding off of mountains with MTR and clear-cut operations (Burns 2007; Epstein et al. 2011; Palmer et al. 2010).

Further down the coal consumption process, coal plants produce large amounts of toxic coal ash that threaten water (Ruhl et al. 2010). One impoundment at the Kingston Fossil Plant in Tennessee ruptured in late 2008 flooding homes and the Emory River with 5.4 million cubic yards of coal ash slurry rich in toxic metals concentrated by the burning process (Dewan 2008). Coal ash impoundments (an additional "clean coal technology") are another case of the shifting around of the problem of pollution without solving the underlying rift.

Coal combustion is a significant contributor to the nitrogen rift (Mancus 2007), accounting for 20 % the total NOx emitted, of which some is later deposited into watersheds by precipitation (Environmental Protection Agency 2003; Rockström et al. 2009). Such air deposition accounts for greater than half, on average, of riverine nitrogen that contributes to eutrophication crises in coastal areas (Epstein et al. 2011).

Land Use, Habitat, and Biodiversity. Capitalism's metabolic rifts affect energy and nutrient cycles linking many species across multiple ecosystems in complex ways that make analysis challenging. While the three MTR mines permitted on CRM will disturb around 6,450 acres (10 square miles) and bury 9 miles of streams, their effects will reach further, undermining the already damaged resiliency of the species endemic to the mixed mesophytic forests of the region. As species population sizes and habitat ranges shrink their risk of extinction over time increases.

During mining, the area being blasted and or buried under rubble is, of course, no longer suitable for its previous inhabitants. According to the USGS, mining in the Central Appalachian region has been associated with 65% of all changes in land cover between 1973 and 2000, with 4.4% of the region's surface area transformed from forest to mining. During that period, the surface area consumed by mining at any given time accelerated two-fold (Sayler 2008). In that latter decade, research indicates approximately 1,200 miles of streams were damaged, over 700 miles buried completely, and at least another 535 miles were permitted to be damaged with 66 percent of those to be buried (Environmental Protection Agency 2004; Ward 2008). However, a recent study indicates there are 1,700 miles of impacted waters in southern West Virginia alone, suggesting the 1,200 mile regional figure is a serious underestimation (Bernhardt et al. 2012).

Current Federal policy regarding species conservation in the mining region is that by implementing surface mining permitting laws regulatory agencies automatically meet their obligations under the Endangered Species Act (ESA), without the necessity of actually surveying for any endangered species in mining areas. This makes data on species relatively scarce, but from what is known of Appalachian forest and stream ecology there are likely a significant number of endemic species as yet unidentified (Epstein et al. 2011). In 2010 the Center for Biological Diversity filed a petition for federal listing as threatened or endangered under the ESA 30 aquatic, riparian, or wetland species that "are specifically threatened by [MTR]" (Center for Biological Diversity 2010:19). Selenium levels are decimating fish populations downstream from MTR mines (Lindberg et al. 2011; Palmer et al. 2010). The mountains of Central Appalachia are not only the source of waters for the larger region; they are also habitat for species that traverse the continent. For example, the migration of bird species that make their home in the Appalachians in the spring to reproduce is disrupted by MTR. Detrivore insects consume leaf litter washed into headwater streams, cycling nutrients both into useable forms for aquatic organisms downstream and, later, during their adult stage, back into terrestrial forest ecosystems (e.g., as a food source for migratory birds) (McQuaid 2009). When headwater streams are mined through or buried this cycle is disrupted.

Biodiversity is thus negatively impacted by both outright habitat destruction and long-term degradation that extends beyond the immediate mine site via the disruption of wider food webs (Palmer et al. 2010). The loss of biodiversity weakens the resilience of the ecosystem over the medium to long term and makes it more vulnerable to catastrophic reorganization, for example, under pressure from climate change (Gunderson and Holling 2002). The ecological rifts at the long-term global scale could easily reinforce and exacerbate the local effects of MTR on CRM—again illustrating the importance of iterative multiple levels of analysis.

Events unfolding on CRM reveal that, paralleling the global ecological crisis, there is a tendency by the government toward reductionist or simplistic framing of the problem and biological issues involved. Palmer et al. summarize the failure of ecological modernization in MTR: "Current mitigation strategies are meant to compensate for lost

stream habitat and functions but do not… Mining permits are being issued despite the preponderance of scientific evidence that impacts are pervasive and irreversible and that mitigation cannot compensate for losses" (Palmer et al. 2010:149).

The broader metabolic relationships within the region and globe are threatened by capitalist development. Capitalism is, above all, a system of accumulation of capital. Hence, the economic mode of production of capitalism in general finds its specific forms in various phases of accumulation.

The Vantage Point of Capital

> The exchange of commodities is the process in which the social metabolism, in other words the exchange of particular products of private individuals, simultaneously gives rise to definite social relations of production, into which individuals enter in the course of this metabolism. (Marx 1970:51-52)

Exchange value is the lifeblood of capital's social metabolism. But unlike economies of simple commodity production [C-M-C], simple circulation is insufficient for capital's metabolism—its circulatory system requires a constantly increasing supply of its lifeblood. Productivity and efficiency are defined in terms of the creation and appropriation of surplus value.

Most of the metabolic rift created by MTR is invisible from the vantage point of capital because it is external to its considerations and interests except where imposed by material necessity or struggle.

> [A] basic contradiction of the capitalist system of control is that it cannot separate 'advance' from *destruction*, nor 'progress' from *waste*—however catastrophic the results. The more it unlocks the powers of productivity, the more it must unleash the powers of destruction; and the more it extends the volume of production, the more it must bury everything under mountains of suffocating waste. (Meszáros 2010:91)

The suffocation of valley stream systems underneath the remains of mountains does not register within the vantage point of capital, but it unleashes greater production of coal and profits (Austin and Clark 2012; Burns 2007; J. Fox 1999). Researchers have tried to calculate the ecological and human costs accruing outside markets in price terms as "externalities." "Externalities" in general, and the case of MTR and CRM in particular,

reflect the conflict between the human metabolism with nature for use-values that must characterize *production in general* with the historically specific, and self-undermining, domination of production for exchange-value in the *capitalist mode of production* (Foster et al. 2010; Paolucci 2007). The dialectical identity-difference relation between use-value and exchange-value is crucial for avoiding reified conceptions of production by abstracting into focus class antagonisms (Burkett 1999a; 2006). Mainstream economic theory and policy derived from it universalize the interests and form of valuation important to capital. McMichael warns against analysis that does not both recognize and transcend such a vantage point: "[T]he metabolic rift is not only assuming greater significance in how we analyse the historical moment, but also both its material and epistemic consequences need to be overcome. Restoring the social/natural metabolism to promote ecological sustainability will only materialise when we transcend the value calculus through which capital rules the world" (2010:622).

The bold attempt by Hansen et al. (see also Collins et al. 2012; 2008) at a cost-benefit analysis of coal versus wind on CRM to sway policy makers presents an opportunity to examine how thoroughly ecological and human considerations do not factor into the logic of capital but rather are actively "externalized". On the benefit side of the ledger, Hansen et al. include increased jobs, earnings, and economic output. On the cost side, they quantified externalities arising from wind or MTR development in terms of "excess deaths and illness, and environmental damage" (E. Hansen et al. 2008). Because the mining operation would last only seventeen years, cumulative benefits diverge more sharply over time. They find that under conservative estimates about the extent of local manufacture for wind operations, cumulative earnings from wind will surpass surface mining after approximately 100 years. Cumulative county jobs from wind take about 80 years to rise above and neither wind's cumulative energy output or contribution to economic growth approach that of the surface mines scenario in the study period. The strength of the study's argument for wind, absent future investment in local wind manufacturing, rests largely on the inclusion of externalities whereby the MTR scenario generates large *negative* earnings for the county over its life of operation. Also, the time horizon for all capitalists is constrained, earnings are valued less the further into the future they are. After applying a standard "discount rate", the landowners receive a

net present value of $63 million in revenue from MTR and only $19 million from wind (E. Hansen et al. 2008:42).

The study was never meant to convince landowners, however, who had already sold the coal rights. Cost-benefit analysis, by its premises, obscures the unequal class (and often gendered and racial) division of who bears costs and who reaps benefits as well as the incommensurability of money, nature, and human life. Yet, it is the hegemonic form of discourse for the current government in questions of private property use and the public interest. Movement actors, therefore, face the difficult choice of employing, and perhaps unintentionally lending legitimacy to that form of political economic discourse that *reflects capital's vantage point*, in order to object to destructive development. Foster et al. remark that:

> Although such attempts are important in bringing out the irrationality of the system, they run into the harsh reality that the current system of … account[ing] *does* accurately reflect capitalist realities of the non-valuation/undervaluation of natural agents (including human labor power itself). To alter this, it is necessary to transcend the system (Foster et al. 2010:71).

The unevenness of capital's social metabolism, its unequal flows of use-values and exchange-value, has been keenly felt in Appalachia. Communities suffer from the degradation of their own ecosystems while gaining little of the use-values and exchange-value resulting from coal production and consumption. Regional economic "development," from the vantage point of capital, is concerned with capital accumulation and circulation in the form of wages and investments. For the absentee capital which dominates in mining, the concern is future profitability in general and with respect to their asset holdings specifically. The "sunk" nature of extractive investment makes political defense of these assets a higher priority than in other types of industry where companies can liquidate assets more easily (Barham and Coomes 2005). The dominance of the coal industry is a case typical of extractive peripheries where the dominant industry retards the growth of others and contributes to underdevelopment (Bunker 1984). While opportunities for continued accumulation for the owners of surface mined lands may be conceived in theory, only six percent of mine sites across the region, four percent in WV

have seen post mining business (Geredien 2009). Several projects such as a prison and big box stores that have been undertaken have seen their construction costs vastly increased due to the instability of the reclaimed land. Therefore many MTR sites fail the permitting requirement of leaving the terrain flattened for "higher and better use," even by capitalist standards.

As Bunker (1985; 2007) has argued, capitalist extractive activity is inherently self-undermining as resources are depleted. For capital all sources of value are equivalent—so such depletion is little issue, it can simply move on. For extractive *communities* with ties to place and particular forms of real wealth found in their environment this points to an inevitable decline—a source of suffering, resistance, and efforts for transformation (Montrie 2003; Pfleger et al. 2012; Puckett et al. 2012).

Without transcending the system, victories by social movements are still possible but the underlying ecological contradictions central to capitalism are not resolved away but simply shifted and displaced (Foster et al. 2010:73-87). These shifts occur both within and between capital's labor and ecological contradictions. Fox (1999) notes how regulatory attempts to reduce acid rain pollution from coal power plants (a market-based procedure celebrated by ecological modernization theorists) contributed to increased surface mining and ecological destruction in West Virginia, rendering it an "environmental sacrifice zone." Through decades of bitter struggle, coal miners' won improved wages and safety, putting upward pressure on labor costs. Mining capital's response, as in most industries (Schnaiberg 1980), has been to harness more powerful technologies to increase productivity. More powerful cutting and loading equipment used underground increased dust and health problems for miners even as they reduced the labor force and increased the power of management over the labor process (Couto 1993; Podobnik 2008). New struggles had to be fought for Black Lung benefits (Judkins 1993). The most incredible of these new productive strategies are surface mining in general and MTR in particular.

Political investments in the form of political donations and propaganda are factored against returns in the form of subsidies, taxes, and regulation. The institutions of the state and local governments may have longer-term interests in conflict with capital,

but the time horizon of most elected officials is still quite short and the power structure is dominated by coal and other absentee capital (Bell and York 2010; J. Fox 1999; Veblen 1964). The power of the industry in West Virginia is well documented (Bell and York 2010; Burns 2007; J. Fox 1999; Shnayerson 2008). There is evidence to suggest that the coal industry is actually a net drain on the state budgets of Central Appalachian states, highlighting the relationship of the state and monopoly capital (undefined author and J. Bailey 2009; Boettner and McIlmoil 2010; McIlmoil and Boettner 2010; McIlmoil et al. 2010). Surface mining allows profitable extraction of thinner seams uneconomical for deep mining but also importantly allows for the fuller, more profitable, extraction of thicker seams that could be deep mined. Industry representatives claim: "the facts are that the disturbance is limited, and the type of mining is controlled by the geology" (McQuaid 2009:5). The profitability of mining hinges on the price of coal versus costs of regulatory compliance, labor costs, the tax/subsidy balance, alternative uses of the land for timber, development, tourism, securitization and speculation etc. These social factors interact with geology to determine not only how coal is mined but also whether it is mined at all. As the depletion of higher quality coal reserves continues, the importance of regulatory neglect and state subsidy to maintain profits grows.

Returning to the case of CRM shows the *Après moi le déluge* reign unfolding. Rowland Land Company, the major absentee owner of CRM, began speculating on coal and timber lands in the late 19th century and remains one of the county's largest propertied interests. The coal company awarded the permits to mine CRM, Massey Energy, became the largest coal company in West Virginia under the fiercely anti-union leadership of Don Blankenship. At Massy there was reportedly a saying "A man is like a tool. If it's bent or broke, get rid of it, and get you a new one" (Shnayerson 2008:29). A federal investigation into an explosion at one of Massey's mines that killed 29 workers confirmed this sentiment finding the "root cause" was "a pervasive culture that valued production over safety" (Mine Safety and Health Administration 2010:157). The company also became the most aggressive in applying MTR in the region.

> Once, every mine in the Coal River Valley was a union operation. Now, thanks to Blankenship, hardly a union mine remains… with more mountaintop mines than

> any other…Nearly all the sites in the Coal River Valley and its environs are Massey mines. (Shnayerson 2006)

Surface mining employs fewer workers and uses skills with earthmoving equipment that often are less specialized and regulated than those of underground miners making "replacement workers" easier to come by (Bell 2009; Burns 2007). The decrease in coal-related employment has spawned public relations campaigns to bind the cultural identities of residents to coal (Bell and York 2010). Massey Energy accumulated 60,000 days of violations of the Clean Water Act over a period of six years without any action from State regulators. When Federal authorities finally intervened in 2008, Massey paid less than one percent of an estimated $2.4 billion in penalties. In the year after the settlement, the company's number of violations appears to have *increased* (Ward 2010).

Struggles of environmentalists and community groups versus the coal industry have sometimes played out in the form of battles over whether primary regulatory jurisdiction over mining should reside at the State versus Federal level (Montrie 2003; Shover et al. 1986). However, explaining regulatory inaction at the federal level requires tracing the coal industry's power relations throughout the broader national context of directorate interlocks, federal advisory boards, and energy policy formation network (Crawford 2012; Domhoff 2010; Goodell 2007; Vietor 1980), a task only the first stages of which are completed in the previous chapter.

The Vantage Point of Sustainable Human Development

"Human development" has been fostered by social scientists as a concept distinguished from mere economic growth by focusing on quality of life relations such as freedom from poverty, and high levels of health, education, measures of "social capital," etc., (Bagchi 2005). In this sense, it is more closely related to the vantage point of ecology, taking into account externalized social costs (Kapp 1978), than the vantage point of capital. Social problems like poverty or lack of education are only problems for capital to the extent they limit effective demand, threaten reproduction of the labor force, or raise the cost of labor power by a shortage of workers with the minimum skills required. Burkett (Burkett 2005) has argued that Marx had his own concept of sustainable human development that shares common features with modern conceptions. It saw the labor

process itself, defined by Marx (Marx 1990:283-290) as the metabolic relation between human beings and nature, as structured to encourage the growth of human health, abilities, and self-expression—in accord with the rational regulation of the human-nature metabolism. Lebowitz (2010) proposes that the question of productivity for a socialist society must be concerned with the production of human beings—all commodities, productive processes, etc. must be optimized to that end. This is consistent with a fundamentally ecological point of view.

As Paul Baran presciently noted in his work on economic growth and underdevelopment, the "optimum" output of a rational and humane society is a matter of meeting finite human needs through appropriate ends—it is a qualitative and well as quantitative view of production:

> The meaning and contents of the "optimum" involved are essentially different from those attached to this notion in bourgeois economics. They do not reflect a configuration of production and consumption determined by profit considerations of individual firms, by the income distribution, tastes, and social pressures of a capitalist order; they represent a considered judgment of a socialist community guided by reason and science. …a scientific policy of conservation of human and natural resources, and the like.
>
> Nor does this "optimum" presuppose the maximization of output ... It may well be associated with… a voluntarily shortened labor day, of an increase in the amount of time devoted to education, or of conscious discarding of certain noxious types of production (coal mining for example). (Baran 1962:42-43)

Such "noxious types of production" have effects on the land that cannot be separated from their effects on the people. Studies are linking coal extraction and MTR to elevated birth defects (Ahern, Hendryx, et al. 2011a), lower birth weights (Ahern, Mullett, et al. 2011b), cancer mortality (Hendryx, Fedorko, and Anesetti-Rothermel 2010) and generally poorer physical, mental health (Zullig and Hendryx 2011). Although the exact mechanisms of these effects have not been isolated, declining water quality in streams is associated with cancer rates in humans (Hitt and Hendryx 2010). Experimental studies have also linked dust from MTR to cardiovascular disease (Knuckles et al. 2013). There is also evidence that educational progress in children is stunted in mining communities by some combination of social or ecological harms (Cain and Hendryx 2010). The basic

reproduction and healthy development of future generations is a foundational, rather than external, question from the vantage point of human development.

What constitutes "efficient" use of CRM is tied up in the *question: efficient to what end*? Hansen et al. (2008) note that on average wind energy has a higher energy return on energy invested (EROI) of 18 to 1, than coal with 8 to 1. Daly's (1991; 2007) concept of use-value oriented efficiency offers a four-part model that considers efficient use of both human artifacts and ecosystem stocks. This model, more useful from the vantage point of human development, considers both sustainability and equitability of the distribution of use-values. Piercing the veil of money, the choice of MTR over wind would constitute a gross inefficiency of both ecosystem maintenance efficiency and ecosystem service efficiency. Human development must take into account substantial ecological considerations and, given its open-ended historical development, may come to include a very broad cultural need/relation to nature depending on the path of history. We should not lose sight of the cultural ties to the land and life existing on it that many residents of the region have mourned as being lost to the process of MTR.

For Marx, and some ecological economists, human needs are historically developed. Therefore, we cannot definitively say today what future generations may decide their needs are. Yet, the economy on Coal River is geared to liquidating use-values in nature and the depopulation and scattering of communities. Whether or not the natural degradation of MTR has subverted local accumulation definitively, when MTR is coupled with an intentional depopulation of communities in the Coal River Valley (Bell 2010; Burns 2007), the possibility of human development there is lost with its people. It is an economy that supports an ever-smaller numbers of workers.

Because there is a contradiction between the value of money as the highest expression of exchange-value and natural forms of use-value, sustainable human development requires the application of reason and planning outside of markets. Planning is also required to account for proper valuation of forms of labor that are not involved in commodity production (e.g., reproductive or subsistence labor). Such "meta-industrial" labors form a crucial basis for the conditions of production and yet are commonly also treated as "external" (Salleh 2009).

Sustainable human development requires a process of production where the diverse use-values of the different parts of nature are accounted for and considered (e.g., EROI) and decided on collectively rather than remaining the narrow prerogative of the owning class who consider only their projected, *and discounted for the future*, profits. Indeed, such discounting raises fundamental problems of equity for future generations, exposing how deeply embedded capital's *après moi le deluge* maxim is.

Ultimately, human development in Appalachia does not seem suitable to the same intensity of systematic analysis as the other two vantage points because it is fundamentally dependent on communities as subjects of their own history. What can be shown is that capitalist development places structural constraints on the choices available to communities and must be superseded for sustainable human development. Analysis from the vantage point of human development raises the necessity of social control over the metabolic regulation of society's relation to nature.

Conclusion

While there are many campaigns to halt MTR, an essential aspect of the struggle over CRM is that it is not simply a fight to end king coal's reign but also to heal the rifts it has wrought and put forth in its place a sustainable human alternative. The alienated social metabolism of capital accumulation is fundamentally antagonistic to the requirements of a healthy and sustainable ecological metabolism. Although the wind proposal for CRM represents the promise of sustainable human development, the looming triumph of MTR within the current system—if not directly challenged on a thoroughgoing class-ecological basis—constitutes a concrete manifestation of what Mészáros (2008) calls the "destructive uncontrollability" of capitalist relations of production. It is a stark reminder that it is these very social relations must be confronted to heal the metabolic rift. "*Après moi le déluge!"* continues to be the watchword of the capitalist system—as shown by MTR and the destructive uncontrollability of fossil-fuel capitalism. Marx (1990:959), in contrast, defined socialism as a society in which "the associated producers govern the human metabolism of nature in a rational way…accomplishing it with the least expenditure of energy and in conditions most worthy and appropriate for their human nature." Above all, the concern should be one of

maintaining the earth for “the chain of human generations” (Marx 1990:754) From this material vantage point, MTR stands as a symbol of the ultimate destructiveness of capitalism, and of the dire need for a sustainable human alternative.

CHAPTER VII

CONCLUSION: TOWARD AN ENVIRONMENTAL SOCIOLOGY OF EXTRACTIVE ECONOMIES

This dissertation has examined the underdevelopment of the Central Appalachian region at multiple scales, from multiple vantage points, to demonstrate the political and economic relations that distinguish it as an extractive periphery shaped by successive modes of extraction. The concept of mode of extraction draws attention to the ways in which successive sociometabolic regimes have each developed out of the social and ecological consequences of the previous one. By analyzing the contestation of externalities and rentier behavior by elites as two different aspects of the same contradiction of capitalist valuation we can overcome reified conceptions of the "resource curse" in the development literature. While the productive relations involved in the social formations around extraction in Central Appalachia have varied, they have always been heavily reliant for their reproduction on the markets and dominant classes of capitalist productive regions. The features of a mode of extraction can be abstracted as operating within the general concrete of the capitalist world system. Comparison with the Amazon further underscores the range of diversity possible in the way productive relations are arranged within the social formations surrounding a mode of extraction. Regions dominated by modes of extraction have an external orientation that defines them as peripheral and the nature of value relations around extractive economies draw our attention to the transfer of surpluses. But beyond these conceptualizations of a mode of extraction as a specific abstract capitalist social formation, the details of particular regions are determined by the contingencies of their histories of the peoples and lands involved. Their continued peripheralization is not inevitable, but is the product of how class relations shape the sociometabolic regimes of extraction. Not only the dominance of extractive interests within the region but elites' political integration into larger political structures determines their ability to successfully reproduce their dominance in the face of challenge.

Chapters II and III demonstrate that despite some limited victories by local reform movements, coal's hegemony has been resilient in Central Appalachian counties and state

governments. The most serious progressive threats to the reproduction of the region's mode of extraction and its dominant classes have come when local movements linked with wider social movement organization bases to press for change, capitalizing on political opportunity structures at the national level. The first of these was posed by organized labor, which threatened the highly labor intensive sociometabolic regime built upon a system of profits by deduction and free appropriation of household reproductive/subsistence labor. The movement was beaten into abeyance in the heart of the region's coalfields after the First World War only to re-emerge with the rise of the CIO and federal labor protections won nationally by class struggle. The new sociometabolic regime built upon greater free appropriation of nature and externalization of costs that emerged afterward faced its most serious challenge from the local resistance by catalyzed a network of anti-poverty workers. This movement, when allied with national environmental groups, threatened the surface mining practices underpinning the new metabolism. But the movement for abolition of mining practices causing irreparable environmental damage was divided from organized labor and undercut by mainstream environmental compromises, with the result that it ultimately failed to achieve its goals. Social movements have mitigated, but never stopped, the flow of unequal exchange contributing to the region's underdevelopment.

Rather than acts of charity, federal projects and transfer payments to the region should be viewed as a return flow smaller than the large outflow of unequal exchange. Many of the federal projects implemented in the name of regional development, because they did not address the fundamental political economic foundations of the mode of extraction, were in large part appropriated by it. The Appalachian Regional Commission formed to reverse the region's underdevelopment was not able to alter the trajectory of the extraction dependent counties. State and local governments' spending priorities reflected the underlying power relations. The funding for anti-poverty organizers in the 1960s was successful, in spite of the planners' analysis of the nature of the region's problems, because so many of the volunteers, even if only indirectly, confronted the class relations in the region. The structural imperative for unlimited capital accumulation plays out at the national level of politics in favor of the extractive regime around fossil fuels. Elites dependent on the mode of extraction have been able to utilize the real or perceived

threat to economic growth posed by restricting the coal industry's ability to externalize costs. The evidence analyzed in chapter V, contrary to the prediction of ecological modernization theories, provides little hope that internal class divisions will provide sufficient political opportunity structures for the policy-planning network to produce legislation to seriously address the problems of fossil fuel use and extraction. However, exogenous developments in the fossil fuel market are creating a crisis for coal's dominance as an electrical energy source in the US.

The summer of 2014 will mark the ten-year anniversary of the formation of the region wide anti-mountaintop removal organization Mountain Justice (Pfleger et al. 2012; T. Shapiro 2010). In those ten years the movement has steadily grown and in recent years the issuing of new permits has slowed, first due primarily to legal challenge and later from pressure on federal regulators. Coal production in the region is increasingly seen as having reached a point of permanent decline given the changes in the structure of the energy market. Today coal's sociometabolic regime in the region faces increasing exhaustion from depletion of prime reserves and increased competition from natural gas produced by the fracking revolution (Marley and S. Fox 2014). Because coal dependent elites cannot effectively influence the glut of natural gas or the declining quality of coal reserves the reproduction of the mode of extraction in Appalachia today is primarily concerned with defending its ability to externalize costs. Central Appalachian elites, from both political parties, loudly proclaim their besiegement by a "war on coal" waged by federal bureaucrats. State primacy of enforcement remains a pivotal issue. For example, in Kentucky in 2010, citizens' groups found through public records that dozens of mines owned by the state's two largest coal producers had, for years, consistently committed over 20,000 violations of the Clean Water Act by exceeding emissions, falsifying emissions reports (often by submitting old reports with the dates simply scratched out and written over). One day before the groups' lawsuit was to commence state regulators preempted the suit with a settlement for less than one percent of the maximum $740 million in fines and dismissed the criminal violations. Under public pressure, the state lost its legal fight to exclude the citizens' groups from the settlement process and in the end had to agree to third party monitoring of its own regulatory activities. Such regulatory capture in mining remains characteristic throughout the region. State

governments have also joined coal industry associations in lawsuits against the EPA over promulgation and enforcement of mining and air pollution regulations. States' federal legislators have proposed numerous, as of yet unsuccessful, bills to roll back federal authority and regulations around surface mining and successfully defeated new regulations to protect coal miner health and safety underground. The regime's survival, perhaps more than ever, hinges on the undermining of the two sources of real wealth, land and labor, through increasing their externalization costs and free appropriation of that wealth. Meanwhile, those areas with more internationally valuable metallurgical coal seek increased export capability to realize those rents waiting on the global market.[57] These behaviors are fully consistent with the value framework I have proposed as governing modes of extraction.

The ambiguity of my findings in chapter 4 on the influence of coal production within coal producing counties reflects, along with chapter 6, that recognizing the terms of unequal exchange as increasingly debilitating in the long run does not negate the devastating effects of economic exclusion when the extraction an area is dependent on falters or is exhausted. Already elites within the region are beginning to look to natural gas extraction as a replacement for lost coal revenues. In order for a social movement capable of bridging the need for healing metabolic rifts in the coalfields, as well as the global rift around climate, the ecological and social debt created by the history of unequal exchange between Central Appalachia and the nation's centers of development must be a central part of the discourse. The same issues arise in the timberlands of Oregon, on the Black Mesa Native Reservation, and other extractive peripheries as they face the economic dependency, underdevelopment, and governmental capture. The climate bill produced by the EPPN in 2009 sought to offer enough class fractions the prospect of rents and rationalization of accumulation within a political capitalism framework to win passage. That approach failed politically, but more importantly it failed to meet the needs of actually addressing climate change. Anticipating the limits to purely technological

[57] Western coal producers in the Powder River Basin also have some of the lowest production costs in the world due to their seam thickness. As demand has been undercut in the US, these producers face the classic case of economies of scale and diseconomies of space described by Bunker and Ciccantell (Bunker and Ciccantell 2005). As a result they are struggling to create new export capacity along the West Coast even as the climate movement struggles to stop them.

fixes for climate change acceptable to the ruling class, Gonzalez advises "those environmental groups and activists interested in protecting the environment…should withdraw from the polity and seek to mobilize the public on both local air quality and global warming issues…It appears that only through a confrontational social movement will the dominant position of local growth coalitions, industry, and the energy sector over land use, energy, and transportation policies be challenged" (2005:107).

For such a mobilization to be successful it will have to offer areas dependent on extractive economies a more promising future. An environmental sociology that hopes to contribute to such transformative project for Central Appalachia cannot come from the "new exemptionalism" within the discipline that abandons "other social criteria and goals, such as the scale of production, the capitalist mode of production, workers' influence, equal allocation of economic goods, gender criterion, and so on" (Mol 1996:309-10) in favor of a "foot in the door" in the elite environmental policy planning process (Foster 2012). The movements inspired by ecological modernization can offer extractive peripheries only new ways to sacrifice and, like the power elite whose favor they court, ask them to put their faith new technologies of fracking, carbon capture, and a nuclear renaissance instead of social change (e.g. Trembath et al. 2013). They propose new national sacrifice zones for the health of fracking communities (and gamble on the levels of their fugitive emissions) as a way to phase out coal while avoiding addressing the social relations upon which the current system is based. In a similar way, at every major point of historical challenge, the coal industry has promised that new technology has already rendered the social and environmental costs motivating the drive for regulation moot. But the problems of the coalfields lie not simply in the technology of mining, but in the larger sociometabolic regime of the underlying class relations.

Appalachian studies scholar Ronald Eller has pointed to new mobilizations of regional and local groups linked to the climate justice movement targeting financial institutions supporting mountaintop removal as symbolizing

> an important change in the way America understood Appalachia . . . the region now had become a symbol of the larger dilemma of people's relationship to the land and responsibilities to each other. . . . The Appalachian experience reflected the social, environmental, and cultural consequences of unrestrained growth, and

> it echoed the voices of powerless people struggling to survive in a changing world. Saving Appalachia now meant confronting the larger structures of global injustice as well as challenging local power brokers, corporate greed, and government apathy. (Eller 2008:258-9)

While coalfield elites are dismissive of science, the national policy-planning network even when it accepts science, eschews, and indeed sometimes attacks directly, the very conception of climate justice. As Brooking Institute Senior Fellow Chris Foreman wrote for the Breakthrough Institute:

> climate justice activism will likely enjoy one overriding success: the sheer generation of often misguided discourse…'justice' activism has … proven to be a distraction from more effective efforts. Rather than moralize about climate debt and reparations, those who truly care about poverty and the climate should focus instead on the kind of disciplined and pragmatic forms of advocacy it will take to build a prosperous and equitable future for the poor. (Foreman 2014)

Such analyses dismiss the realities of unequal exchange and associated debts as, at best, irrelevant to projects for a more equitable and sustainable future and more often counterproductive to "pragmatic" progressive politics. An analysis of underdevelopment and ecological crisis through modes of extraction provides not only a framework for evaluating the extent of unequal exchange and ecological debt but also the internal pathologies of the class structure and ideology that dominate the region. So-called "pragmatic" policies that do not address these local and national issues of power are most likely to simply reproduce them upon new bases, as they always have. In perhaps one of the earliest books in environmental sociology Charles Anderson identified the irrationality of the current technological priorities and the importance of addressing ecological debt in developing future applications. "A rationally ordered economic system could put science and technology to use in an environmentally constructive manner and reduce the ecological debt while simultaneously raising life quality" (C. H. Anderson 1976:143). Any environmental sociology that discards examination of the types of rationality determining technological development, *capitalist rationality,* in its analysis of extractive economies and sustainability generally can only represent a regressive research program (Lakatos 1989). "The fact is that environmental degradation and social inequality are interrelated in numerous ways and neither can be reversed without fundamentally altering the course of the other" (C. H. Anderson 1976:139).

There was a hope at the founding of environmental sociology that it would not remain a sub-discipline but would rather transform the discipline as a whole. While this has not come to pass, the most promising developments have been those in the Marxist metabolic analysis tradition that as a recent review of the field concluded, "connects current research to classical theory and links sociology with an interdisciplinary array of scientific literatures focused on ecosystem dynamics" (Pellow and Nyseth Brehm 2013:233). Moving this research tradition forward will require increasingly explicit application of the process of abstraction in dealing the sociometabolic processes, as there is always the danger of losing the dialectical roots that set it apart. The case of Central Appalachia's history shows the integral relation of the political, economic, and ecological moments of extractive regions' development and its future prospects. Clarity about the historical limits and possibilities of extractive economies and the political economic dynamics at multiple scales is crucial for peripheries around the world hoping to capture resource rents for development strategies (Veltmeyer 2013). Future research must better connect the ecological forms of unequal exchange and free appropriation of non-human natural wealth with that of households' gendered reproductive relations. The role of household reproduction within modes of extraction must be better theorized if it is to continue to grow in usefulness as an important tool for environmental sociology moving forward in its larger integrative goal. Those involved in the struggles against the degradation of extractive communities are already forming linkages between their systemic problems, from the coalfields of Kentucky to those in Colombia (Bennett 2009; Chomsky and Striffler 2014). It is the duty of environmental sociology to pursue an analysis of extractive economies' that facilitates the inclusion of those economies historical victims into a new historic bloc capable of challenging the larger irrationality of the system that threatens us all.

APPENDIX

ADDITIONAL ITEMS

Table A.1. Variable Correlation Matrix

	Poverty	Unemployment	Education	Income	Surface Mining	Tot. Production	Urban	Manufacturing	Service	Pop. Change
Unemployment	0.7364	1								
Education	0.7743	0.6206	1							
Income	-0.6791	-0.6996	-0.8127	1						
Surface Mining	0.2801	0.0857	0.2712	-0.229	1					
Tot. Production	0.1134	0.1446	-0.0347	0.0792	-0.3769	1				
Urban	-0.57	-0.4553	-0.6937	0.5325	-0.1547	-0.0022	1			
Manufacturing	-0.25	-0.3973	0.0774	-0.0445	0.2816	-0.553	-0.0008	1		
Service	-0.128	-0.1718	-0.566	0.6058	-0.1765	0.3003	0.3647	-0.5473	1	
Pop. Change	-0.0662	-0.3238	-0.049	0.2059	0.3204	-0.2863	-0.1071	0.3857	0.0241	1
Tot. Population	-0.4746	-0.3031	-0.4937	0.3907	-0.3605	0.2330	0.7147	-0.2193	0.2348	-0.2936

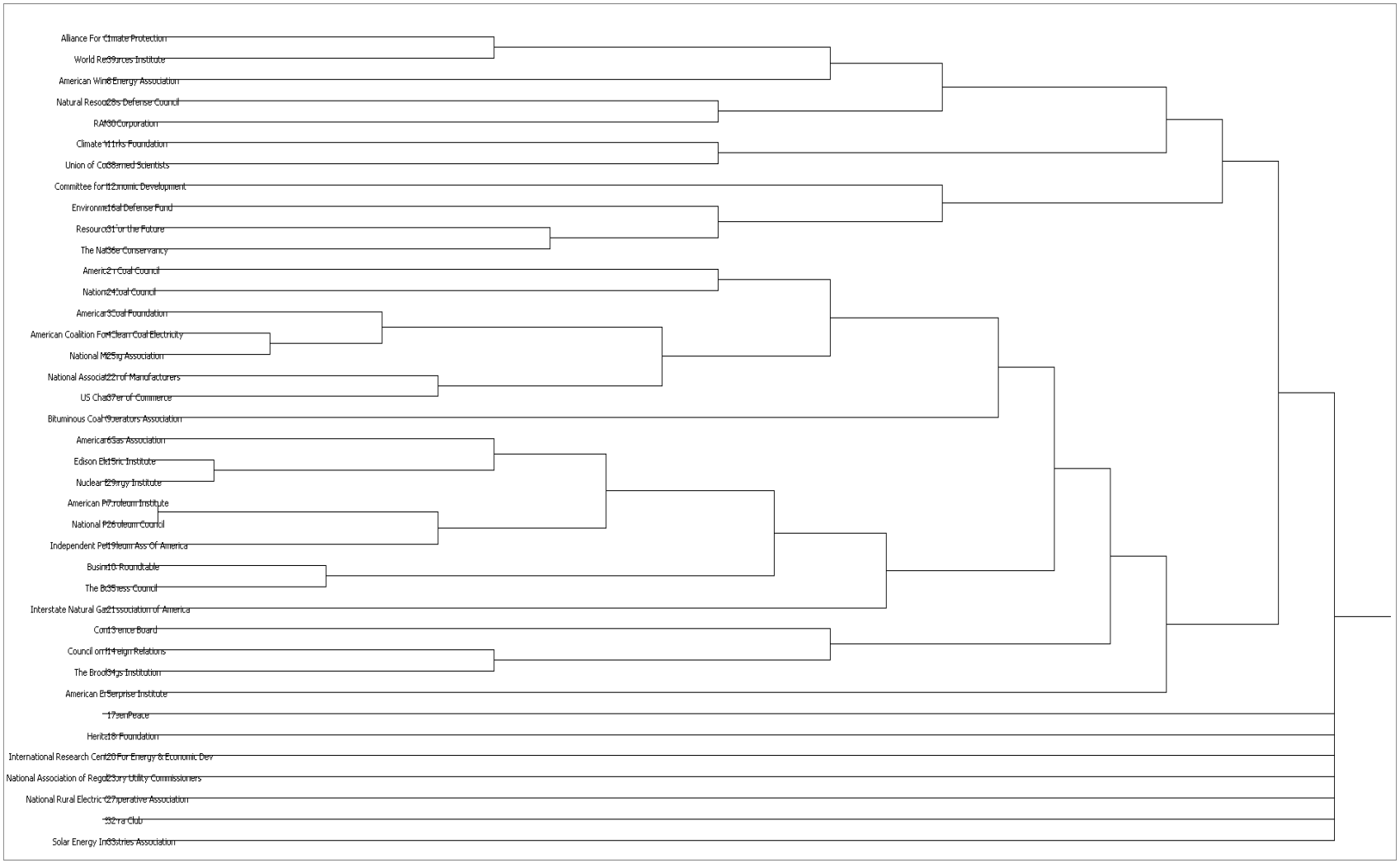

Figure A.1. EPPN Cluster Dendogram

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