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Dallaire-Fortier, Clara Lea

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CAUGHT IN TRANSITION: THE EMPLOYMENT LANDSCAPE FOLLOWING EMERALD MINE CLOSURE

Clara Lea Dallaire-Fortier

Supervisors: Lotta Takala-Greenish, University of Witwatersrand; Gary Dymski, Université Paris Sorbone Cité; and Gerald Friedman, University of Massachusetts Amherst.

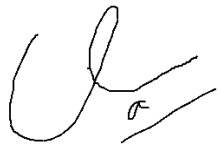
In partial fulfilment of the Master of Commerce, at the University of Witwatersrand and; of the Master in Economic Analysis and Policies, Paris Sorbonne Cité.

June 11th, 2018

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Declaration

I declare that this thesis is my own unaided work. It is submitted for the degree of Master of Commerce at the School of Economics and Business Sciences, Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or to any other university.



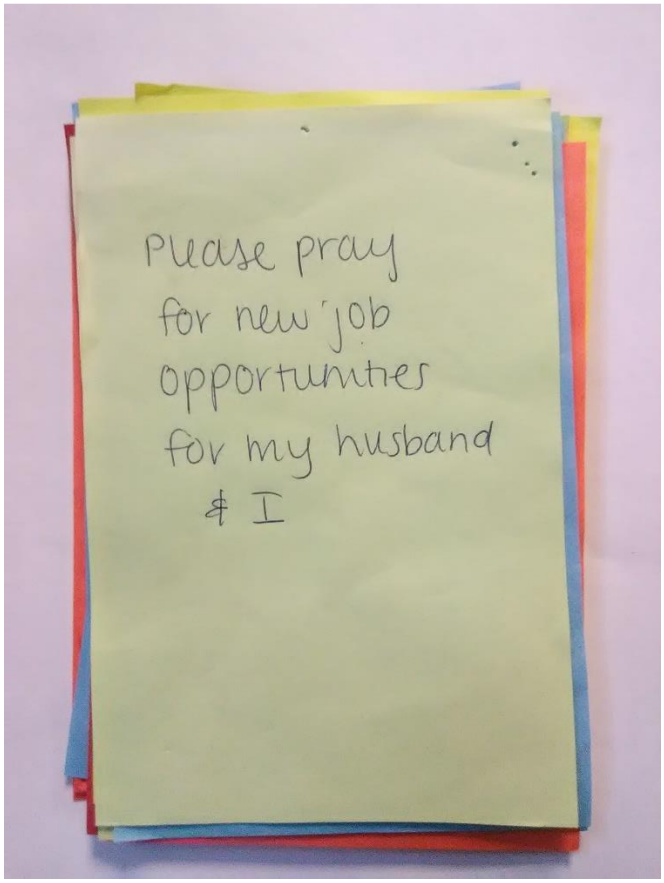
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Clara Lea Dallaire-Fortier

In July 31, 2014, a large group of UMWA workers (United Mine Workers of America) marches with posters raised high: ‘EPA rules destroy good jobs’, ‘EPA rules put seniors at risk’, ‘Our kids matter too’. They opposed environmental regulations put in place by the Obama administration through the Clean Power Plan of the Environmental Protection Agency (EPA), regulations which aimed to reduce, by 2030, by 30% in 2030 national carbon dioxide and other greenhouse gas emissions by 30%. At the margins of the march, environmental activists stand. The march is tense, emotionally charged. A coal miner insults an environmentalist, and the latter reaches to hit the miner. They are ready to fight. A woman stands to separate them. Follows an announcer who present their opposition as inevitable. It is an environment versus job dilemma. Such understanding of the coal deindustrialisation seems limited and the slogans seem like a better starting point to understand the complex economic structure that is sought through by the experience of coal decline. They communicate about the state of pensions and healthcare, about lack of employment opportunities in Appalachia and outlook for future generations.

Acknowledgements

For the purpose of this research, I visited Greene County in southwestern Pennsylvania. I meet with retrenched coal miners, and many other local actors. I wish to thank them for generously sharing their stories and knowledge about this place. I wish to thank them for their patience toward me and journalists who need explanations on the complexities of their situation, complexities that often remain absent from mainstream media coverage. I also wish to thank my supervisors for encouraging me to pursue interviews and for understanding the legitimacy of the process for economic research. Many thanks to my wonderful friends around the world. Et, merci la famille pour votre amour tendre, fou et joyeux.



Source: Coffee shop's public board of wishes,
Waynesburg, Greene County

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List of Abbreviations

ARC	Appalachian Regional Commission
BEA	U.S. Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
EIA	U.S. Energy Information Administration
EPA	Environmental Protection Agency
ILO	International Labour Organisation
IEA	International Energy Agency
MSHA	Mine Safety and Health Administration
PCA	The Pennsylvania Coal Alliance
UMWA	United Mine Workers of America
USA	United-States of America

SECTION 1. Introduction and research design

Introduction

As employment opportunities in Appalachia deteriorated in the last ten years, the American dream seems to have transmuted into despair. During the last three decades, socioeconomic crises increased in the Appalachian region, visible in illness, drug addition, poverty and unemployment. Like in the past, vulnerabilities have been connected to the decline of key industries in the region with the closure of windmills and coal mines.

Data about Appalachia aggregates the number of overdoses, of mine closure, or of individuals under the poverty line. But, the provision of such statistics by the media and the academia does not inform about the lived experience of the population, nor the structural causes for such situations. Aiming to complement the literature about mine closures, this research postulates that by linking statistics to the workers strategies following mine closure and complementing this with an analysis of the structures and institutions, it is possible to more accurately understand the dynamics of deindustrialisation in Appalachian coal communities. This approach also helps inform the development of new local economic activities.

The research addresses Emerald Mine closure in southwestern Pennsylvania through an exploration of the processes by which workers transition into new occupations. The broad research question is: what affects the job transition of retrenched coal workers from Emerald Mine after the closure in 2015? In order to identify the relevant factors, conditions, and influences, interviews were conducted with key stakeholders and informants (e.g. politicians, workers, union, members of the community etc.). These were analysed together with a review of the available empirical evidences. The triangulation of qualitative and quantitative evidences contributed to achieving a more nuanced and varied account of the economic realities and structures in the Appalachian county.

The research report begins by presenting the motivation, detailing the research approach and discussing the main trends in coal production for the United-States (USA) and the case study. The following section (section 2) explores the central conceptual framings behind the research. These draw from the concepts of deindustrialisation, coping strategy, natural resource economy and cumulative causation. Cumulative causation, introduced by Myrdal in 1958, presents the relation between independent variables as reinforcing each other into upward and downward cycles of economic development. According to the research, such cycles are influenced by external elements such as the decline in unionisation, the mono-industrial economic structure, the fluctuation in the energy sector, the employment-based welfare system and the precarisation of work, all detailed in section 3. Following the mine closure in Greene, many of the outcomes present a downward cycle impacting negatively on the population, wealth, other sectors of the economy, local government and services, and employment opportunities. These impacts are described in section 4. The report argues that by analysing the dynamics of the local labour market after the mine closure and through

the interviews of coal workers, three variables are important to influence the cycles. These variables are: worker's skill, local job demand and the households' security (income and welfare) as presented in section 5. The sections 3, 4 and 5 present the relations between these variables, the impacts of closure and the industry and employment structures. Section 6 follows from these and underlines that the three variables should be considered concurrently to understand and support transition into alternative employment for the workers. Section 6 argues that an analysis grounded in the structure of the regional economy helps to generate a better understanding of the dynamics of job transition in Greene and provides indications regarding potential solutions. Lastly, section 7 concludes, reviews the research hypotheses, and presents areas for future research.

Motivation

The deindustrialisation of the coal industry in the USA has received considerable political interest in recent years, both as a space for debate about the ecological transition, and with Donald Trump's promise to stimulate the industry. A diverse set of narratives revolves around coal in USA, which in turn induces misconceptions about its decline. It is essential to present these narratives, two of which are highlighted here, to illustrate the current conception of coal deindustrialisation. This research underlines biases to insure the realities of coal workers and their communities are properly voiced.

The first narrative is a dichotomy between employment and environment. It assumes that job creation cannot coexist with environmental protection[1]. Many journalists[2] remain eager to stage this dichotomy in USA to create tension between Republicans and Democrats, simplifying each position to a pro-job and a pro-ecology position respectively. According to many individuals in southwestern Pennsylvania, journalists following this narrative have published numerous pieces on the region and tend to simplify the vulnerabilities of the local economic structures to focus on federal politics. In addition to accentuating the tension between the two positions, many journalists tend to overlook the complexities, and focus their discourse on advocating for a transition toward green energy. This doesn't allow for a discussion on the structural tensions emerging in the coal community.

The second narrative is linked to generations-old stereotypes about the Appalachian population. In American fiction, Appalachians are often depicted as deprived and ignorant individuals (Mink, & O'Connor, 2004). This is accompanied by the conception that a culture of poverty would be at the root of poverty and vulnerabilities in Appalachia rather than corporate capitalism and the

[1] Nevertheless, an expanding body of literature detailing concepts such as the Just Transition breaks from this dichotomy with trade unions advocating for a low carbon economy. In 2015, the International Labor Organisation published the report, *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All*, where it is defined that "A just transition for all towards an environmentally sustainable economy needs to be well managed and contribute to the goals of decent work for all, social inclusion and the eradication of poverty." (p.5)

[2] A bias is also seen in the choice of research questions and approach in many academic works with, for example, costs-benefits analysis on green and brown economies at national level.

creation of economic dependence (Mink, & O'Connor, 2004). A "culture theory" on poverty points to individual characteristics like poor mental health as primary causes of poverty (Fryer, & Fagan, 2003). Even if such discourses have become less prevalent since the 1980s, parallels can be drawn today. For example, the justification of coal investments often refers to the 'helplessness of coal miners'. Such conceptions are often mentioned in political discourses, and there are few spaces for alternative approaches to the future of coalfields (Tickamyer, & Duncan, 1990). The weakness of such narrative encourages this research to question the reasons why individuals living in Greene have difficulties finding employment and thus, continue to live in poverty.

These biases imply that a better understanding of the outcomes of industry's actions on the labour market are important steps to move beyond stereotyping and misunderstanding the regional economy (Wallace, 2002). The prevalence of these narratives in current public debates combined with the need to address the vulnerabilities that cause mortality and poverty in the Appalachia constitutes a primary motivation for the research. This report proposes that the first step in designing effective policies in Appalachia is grounded in a more nuanced understanding of the region's economy.

Research question and hypotheses

The research question is: which factors affect the job transition of retrenched coal workers from Emerald Mine after the closure in 2015? Job transition identifies changes between prior and new employments. The question is raised in a context of larger scale transition away from a coal-dependent economy, but it focuses on the labour market in Greene County, and on the specifics of Emerald Mine. The dynamics of transition is seen at multiple levels i.e. micro, meso and macro. The focus of this research is primarily on the micro level, but these variables and tensions are situated and understood within a broader set of spheres of influence.

Three hypotheses are formulated:

> Hypothesis 1: Structural tension after the mine closure slows the process of transition and increase the vulnerability of the local labour market. This generates downward movement in the local economy.
>
> Hypothesis 2: Contextual elements influence the transition of workers into worse new occupations.
>
> Hypothesis 3: It is possible to identify a number of independent factors that create heterogeneity in workers capacity to transition into new occupations.

Contrary to the narratives described earlier, the three hypotheses shift away from the assumptions that particular 'Appalachian culture' or environmental concerns are the cause of vulnerabilities in Greene. Instead, the hypotheses seek to engage with a framework focused on the dynamics between economic structure and individual actions.

The study area

Emerald Mine is located in Greene County, in southwestern Pennsylvania. Pennsylvania is the fourth largest coal-producing state in USA after Wyoming, West Virginia, and Kentucky (Hodge, 2016). In 2015, Greene County had seven mines in operation, and was producing 28.5 million tons of coal, which represents more than half of Pennsylvanian production. Between 2012 and 2015, employment in the coal mining sector in Greene decreased from 3,045 to 2,569 (BLS, 2016). The year of the Emerald Mine closure, 2015, is also a significant point in time for the decline:

Table 1: Decline in coal production, 2015-2016

Coal-Producing State, Region and Mine Type	Number of Mining Operations[1]			Number of Employees[2]		
	2016	2015	Change (%)	2016	2015	Change (%)
USA	986	1,168	-15.6	51,795	65,971	-21.5
Appalachia	804	970	-17.1	27,292	37,576	-27.4
Pennsylvania	228	258	-11.6	5,202	6,633	-21.6
Underground Bituminous Mines in Pennsylvania[3]	41	53	-22.6	3,548	4,698	-24.5 (1150)

[1] Mining operations that consist of a mine and preparation plant or preparation plant processing both underground and surface coal are reported as two operations.
[2] Includes all employees engaged in production, processing, development, maintenance, repair shop, or yard work at mining operations, including office workers.
[3] Details are listed for underground bituminous mines in Pennsylvania, since Emerald Mine presents these characteristics.

Source: Department of Labour, Mine Safety and Health Administration, 2017

Over the last 20 to 30 years, many mines closed in Greene including Shannopin, Warwick, Gateway and Dilworth. Emerald Mine opened in 1977 and was owned by Alpha Natural Resources. Emerald is close to Greene's largest neighbouring town, Waynesburg, of a population of 36,770 individuals in 2017 (BEA, 2017).

Figure 2: Mines owned by Alpha Natural Resources in Greene

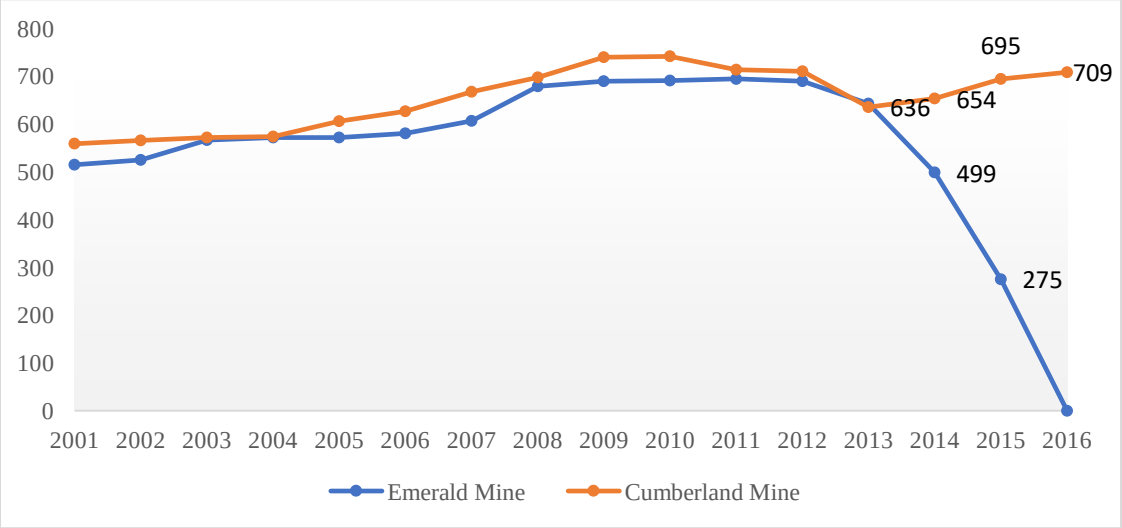


Source: Alpha Mine Co, 2008

In August 2014, Alpha Natural Resources announced the closure of Emerald Mine, scheduled for March 2015, and filed for bankruptcy under Chapter 11 (Gough, August 3, 2015). The official declaration addressed mentioned the layoff of 241 hourly, 49 salaried, 11 Pennsylvania Service

and 15 medical employees. 140 Emerald workers would have been transferred to the nearby Cumberland Mine between August 2014 and March 2015, and an additional 80 employees would have retired (Nieldbala, February 19, 2016). Workers were transferred between 2013 and 2017, and some, informed on the potential closure, started retiring as early as 2013. These amounts estimate to 536 employees the Emerald workforce in August 2014[3].

Figure 1: Workforce of Cumberland and Emerald Mines, 2001-2016



Source: EIA, 2017

It is important to note that this mine closure presents certain specificities[4]. Nonetheless, Greene shares many characteristics with coal-dependant USA communities. The welfare system and mono-industrial economic structures are comparable, and similarly, the workforce is incentivized by the high wages provided by the industry. These characteristics are analysed in subsequent sections.

Methodology

The research method centers around a case study on the closure of the Emerald Mine. The data collection consisted in 10 in-person interviews and participant observation, and was accompanied by a review of relevant secondary sources (empirical evidence especially from governmental institutes, academic literature, legal documents, industry reports and media output). Findings are supported through triangulation across different types of data and evidence alongside the different profiles of the interviewees. The research argues that qualitative micro level data is useful in the identification of the transition processes. Furthermore, the research puts forward that the compilation of multiple sources produces alternative insights that reflect the diversity of outcomes more accurately (Hussein, 2009; Olsen, 2004).

[3] The mine administration refused to supply more precise numbers.
[4] Emerald Mine workers were unionized, which is not frequent in USA coal mines today, and over the last ten years the natural gas industry boom in Greene made up a portion of the economic activities in the area.

The interviews were semi-structured and aimed at developing in-depth accounts of the experience and perceptions of the workers after the closure of Emerald Mine. They also explored the potentials and limitations of future economic developments in the county. The questions (see Annex) are focused on the energy sectors, the coping strategies of workers, and the institutions of Greene.

Table 2: Profile of the interviewees

	Interviewees	**Titles and organisations**	**Locations**
1	David Baer	Clerk at PA CareerLink Greene County; UMWA representative; Ex-Emerald Miner	Waynesburg
2	Maresa Hungandy	Clerk at PA CareerLink Greene County; Spouse of a coal worker;	Waynesburg
3	Victoria Bruno	Business manager at Mikeys Men Store (retailer for the coal and the oil & gas industries)	Waynesburg
4	Pam Snyder	Pennsylvania State Representative 50th District (since 2013, Democrats)	Carmicheals
5	Robbie Matesic	Executive Director, Department of Economic Development for Greene	Waynesburg
6	Mary-Ann Lewis	Chief Assessor, Department of Finance and Administration for Greene	Waynesburg
7	Blair Zimmerman	Chairman, Greene Board of Commissioner; Ex-miner;	Waynesburg
8	Geoff Fisher	Clerk at American Nature journal; Youth adult from rural coalfield;	Bobtown and Mt Morris
9	Veronica Coptis	Executive Director at Center for Coal Justice	Washington
10	Dale Wildman	Clerk at PA Careerlink Fayette County; Ex-Emerald Miner	Lemont Furnace

From the ten interviews, perfect representativeness of Emerald's workforce was not achieved. The aim was rather to reach variety in the sample, and thereby access a diversity in the perceptions of the closure. Nevertheless, the interview sample presents some limitations. Firstly, the small number of individuals interviewed restricts the possibility of generalizing the results. Secondly, the mine administration refused to be interviewed, and there was a certain degree of control over the information. A third limitation results from intense media coverage of the county by national and international journalists following President Trump's promise to support the coal industry. Because of such coverage, many workers were reluctant to be interviewed or complained about how reporters modify their reality to fit with specific narratives. Due to the sample limitations, participant observations were used to access different layers and arguably a more representative account of the workers' experiences.

Table 3: Informal interviews and participant observation

Interviewees	**Titles, organisations or sources of information**

11	Anonymous	Ex-Emerald Miner (Electrical Engineer)
12	Ryan Gandelman	Young adult from Washington County
13	Coffee Shop	List of wishes/prayers for community collected since Sept. 2017
14	Nathan Blake	Primary school teacher
15	Welfare Office	Welfare Office (Staff and client)
16	Ed Yankovich	International District 2 Vice President, UMWA
17	Mike Jones and Bob Nieldbala	Journalists at Reporter-Observer
18	Kathy McClure, Librarian	Eva K Bowlby Public Library offers services and pamphlets to support families
19	Lauren Stauffer	Boutique owner and wife of retrenched coal miner

Participant observation and interviews were built over the span of two fieldtrips in the county. The first onsite visit aimed at collecting information on workers and community stakeholders, and established first contacts with the union representatives, clerks at the career centers and local journalists. It led to a better understanding of territorial, political and social specificities associated with the Emerald Mine closure. The second visit allowed for data collection through interviews and participant observation.

Figure 3: Timeline of the mine closure and fieldwork



Whereas resilience has been defined as changing through time (Moorhouse, & Caltabiano, 2007; Ungar, 2012), the timeline has implications for which conclusions can be drawn from the interviews. This case study was selected for its temporal proximity to the Emerald Mine closure. Such proximity suggests potential for detailed analysis of the short-term strategies used by workers.

SECTION 2. Literature review

The literature review sets the framework on deindustrialisation and presents how regions that are resource-dependant are vulnerable to deindustrialisation. Together, it provides empirical evidences and theories to predict the impacts of coal decline in Appalachia. Also, the literature on resilience and the welfare system establishes how workers are likely to address unemployment after mine closure.

2.1. Deindustrialisation and the process of transition

This section of the literature review provides theoretical background about deindustrialisation and its impacts on employment, investment and other sectors of the economy.

Following an extended phase of deindustrialisation in developed countries in the 1970s and 1980s, different theorisations of the concept emerged. One of the foundations is the work of Bluestone and Harrison, who defined deindustrialisation as "a widespread, systematic disinvestment in the nation's basic productive capacity" (1982, p.6). Fluctuations in investments are key determinants to the closing, opening and relocation of plants (Bluestone, & Harrison, 1982, p.28). Research by Campiglio *et al.* (2017) on the transition from a high-carbon to low-carbon economy assesses the effect of expectations and investments on the length of the transition. Building on Schumpeter and Perez, the research presents how apathetic expectations[5] constitute limitations to a rapid transition by limiting capital flows and investments. The period of the transition, then, impacts real and financial economy by increasing the amount of both physical and financial stranded assets[6]. To summarize, apathetic expectations increase the amount of stranded assets, which in turn increases the cost and pace of transition. This conclusion embeds the important political implication that late transition is more socially and economically costly. High probability for late transition is identified in Greene with the importance of expectations from Emerald workers and investors.

Concurrently, deindustrialisation can be defined as the "loss of competitiveness and disappearance of entire industrial sectors" (Camagni, 1991, p.141). Differing from widespread analysis of deindustrialisation based on unit of production per sector, Palma (2014) suggests an identification based on the scale and the speed of employment changes. He investigates the links between income per capita and employment in the manufacturing sector. His approach includes political elements like industrial policies or post-Fordist capitalism. Another facet of the literature is derived from a

[5] The importance of irrationality present in most heterodox schools of thought in economics (Marxist, post-Keynesian, institutional, etc.) contradicts the mainstream and an extension in our capacity as economists to develop a better assessment of economic realities. There are many spaces for limited rationality such as the behavioral bias in job seeking. For instance, individuals do not maximise their total or lifetime (but rather their short term) consumption and income level by choosing to work in the coal sector since the risk of unemployment is very high.

[6] Stranded assets in the cycle of innovation refer to assets which will considerably lose their value under low-carbon economy. Under transition, these are important starting points in identifying negative impacts and being able to prepare for them (Campiglio *et al.*, 2017).

Kaldorian model with for instance, Tregenna (2009) who defines deindustrialisation in term of changes in manufacturing output, labour intensity and the share of industry in GDP. She concludes that insufficient productivity growth, regardless of technological progress, is likely to lead to a decline in employment (Tregenna, 2009, p.435). The key components of the definition for this research regard investment and employment.

The impact of deindustrialisation is not even geographically (Bluestone, & Harrison, 1982), and Appalachia is disproportionately vulnerable to coal decline compared to other regions in the USA. Since sectors have different levels of concentration in different localities, it entails various velocities of deindustrialisation, absorptive capacities and importance in circuits of capital (Hudson, 2005). The limited mobility of capital and labour underscores that "the aggregate trend in employment is inadequate to prove or disprove deindustrialisation if inter-industry and interregional worker mobility is insufficient to clear labour markets. What counts in an economy where mobility is imperfect are the trends in specific industries and regions" (Bluestone, 1984, p.43).

The different effects reviewed indicate that Emerald workers live in a region that is outside of a dynamic economic base. Bluestone and Harrison conclude that "reindustrialisation does not compensate for the losses suffered as a result of prolonged disinvestment" (1982, p.95).

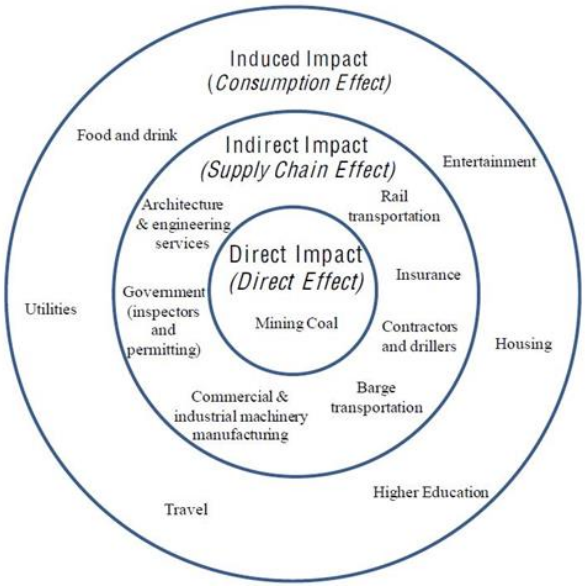
2.2. Resource-based economies

The literature on resource dependant economies provides good insights into particularities of the economic structure of coalfields. The paradox of plenty or the resource curse is the idea that resource-rich regions face poor long-term economic development. It is a contribution from political economy to understand the opportunities and shortcomings of resource-based industrialisation to sustain economic growth (Barma, 2012). The Staple Theory (Innis, 1927; 1940) and its revisions help to deconstruct the dichotomy between the characteristic of "curse" and "blessing" attributed to natural resource, and enhance the analysis by including social and institutional elements. The Staple Theory, initiated by Harold Innis, identifies a dynamic of dependency between primary resource producers and their buyers that constrains development. Additions to this theory suggest that constraints can be reduced if the staple is used as a driver of economic diversification through its export base (Watkins, 1963, p.144). This addition is connected to the concept of linkages[7], and studies the exchanges between sectors during

[7] A backward linkage is understood as "every non primary economic activity will induce attempts to supply through domestic production the inputs needed in that activity." (Hirschman, 1958, p.100). A forward linkage is understood as "every activity that does not by its nature cater exclusively to final demands, will induce attempts to utilize its outputs as inputs in some new activities" (Hirschman, 1958, p.100).A fiscal linkage is understood as "state levies taxes on […] incomes and channels the proceeds into productive investment, it is possible to speak of fiscal linkages of the staple to be contrasted with the, again, more direct physical (or production) linkages" (Hirschman, 1988, p.162). A final demand linkage is understood as "a measure of the inducement to invest in domestic industries producing consumer goods for factors in the export sector." (Watkins, 1963, p. 145).

production processes often using input-output matrices (quantified in terms of employment and value added). The matrices can be used to measure direct (coal mining), indirect (industries linked to the mine operations) and induced (industries linked to the consumption of the workers) impacts.

Figure 2: Spread effect on the coal industry

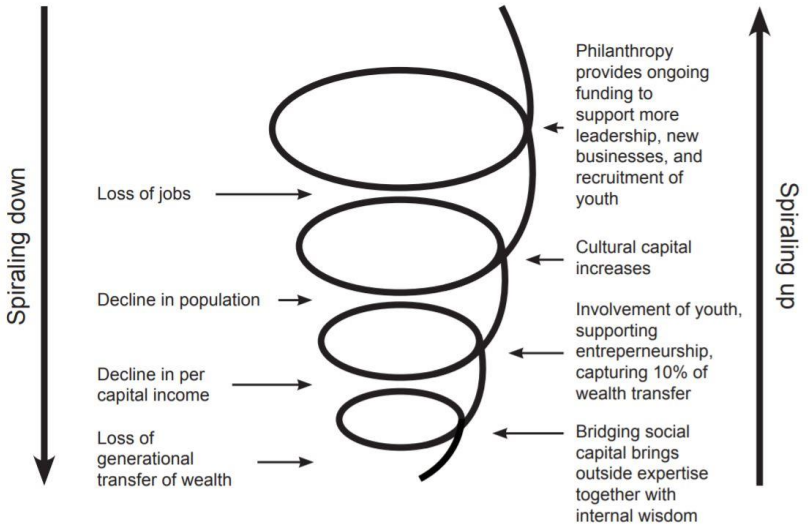


Source: Sissons, 2009

The different impacts show how a "loss of industry created profound local economic and social disruption" (Sadler, 1992). This profound and aggregated impact is referred to as the ripple effect. Black *et al.* (2005) look at the economic multiplier effect of the economic slowdown in Appalachian communities, and report a 1:4 ratio implying that when 100 coal jobs are destroyed an additional 25 indirect jobs will be. Yet, the induced impacts are very difficult to capture (Pollin *et al.*, 2017). Likewise, Bluestone and Harrison (1982, p.51) mention the difficulties in measuring social costs of mine closure: "the evidence on the social impact of capital mobility tends to be submerged in GDP accounts and disguised by poorly measured and impersonal unemployment figures."

Another way to frame the ripple effect is through the theory of cumulative causation as formulated by Myrdal (1957). For him, upward and downward series of development can be induced in an economy via cumulative causation. As such, it is possible to identify a number of independent variables that interact together in backwash (downward) and spread (upward) effects (Myrdal, 1996). Looking at an upward movement, assets gains attract new assets and investments in a spiraling upward movement where community livelihood increases through a self-reinforcing cycle (Gutierrez-Montes, 2005). Downward movements are often observed in deindustrialisation processes where outmigration reinforces the decline in investments, capital, and consumption.

Figure 3: Spiralling movements of assets



Source: Emery, & Flora, 2006.

For Watkins (1958), some staples are exported by leaving behind sole weak local economic benefits and the lack of the proper institutional framework makes economic transition harder. Similarly, for Bluestone and Harrison, the pace of transition and impact of deindustrialisation depends on the importance of the integration of the industry into the production chain (1982, p.72). Thus, regulations of the staple industries should target the creation of linkages perceiving the state is an agent capable of incentivizing investments in all linkage-types (Watkins, 1958). In North-Rhine Westphalia (German's coal region), brown (high carbon emission) job destruction was accompanied by green job creation via governmental investments and planification. Robbie Matesic, the Executive Director of Department of Economic Development in Greene County, underlines that her German analogues emphasised government's key role in shifting energy production processes. Walkins nevertheless would underline that ex-post policies have lower success rates.

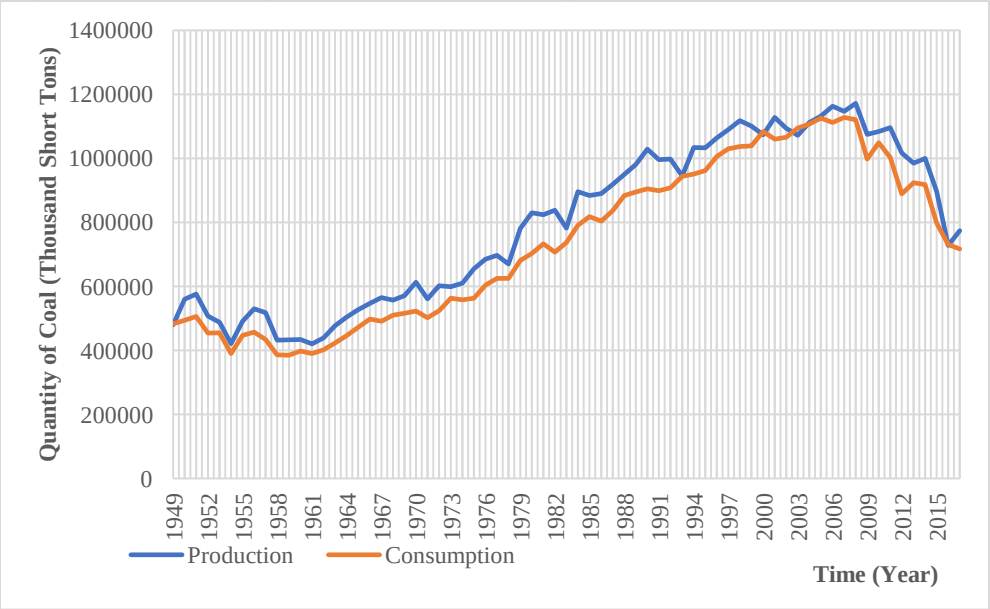
Another characteristic of the staple economies is the presence of market fluctuations. These fluctuations are not unique to the energy sector: "capitalism is inherently unstable because of the volatility of private investment. Private investment drives the capitalist economy; its volatility is therefore the root cause of fluctuations in aggregate demand and employment." (Dymski, & Pollin, 1992, p.29) Yet, natural resource prices are characterized for being particularly fluctuating. Additionally, fluctuations in the oil and gas sector are linked to fluctuations in the coal sector since they can be substituted and compete for market shares (IEA, 2011). Zamani (2016, p.803) notes that "policymakers attempt to compensate for oil supply declines by increasing coal demand". Still, sectors are not neutral nor are they perfectly substitutable. Reallocation of investments between industries has different labour implications (Gylfason, 2001). With natural resource economies that are highly dependent on price cycles, job destruction is one of first strategies by

corporations to save cost in the face of stagflation and intensifying global market competition (Bluestone, & Harrison, 1982, p.35).

2.3. The case of coal deindustrialisation

USA coal production and consumption has considerably declined since 2005, and similar trends have been observed worldwide. Between 1990 and 2016, a large share of the national production was displaced from Appalachia (48% in 1990 to 24% in 2016) to the Powder River Basin (20% to 44%) (EIA, 2017). This indicates that the deindustrialisation of coal will have a more significant impact in Appalachia (IEA, 2011, p.26). In addition, many authors identify "a continued path-dependent vulnerability [of the Appalachian communities] to the fortunes of the coal industry" (Ziliak, 2012, p.347).

Figure 4: USA coal production and consumption, 1945-2017



Source: EIA, April 2018 Monthly Energy Review

Different exogenous trends and causes help to identify the drivers of coal deindustrialisation. For example, analysis of post-Fordist capitalism denotes a shift from a manufacturing and resource-based economy to a service economy (Cahen-Fourot, & Durand, 2016). Another approach focuses on the major changes in the energy sector and associates them with policy changes or an ecological transition. Accelerated in part by President Obama's emissions reduction targets, the USA energy sector has shifted away from the traditional coal energy to natural gas and renewable energies (Boersma, 2017). The decline of Chinese demand for coal also impacted the international market where supply hardly met demand (IEA, 2011, p.28). Others, like Hodge (2016), investigate a reorganisation of the energy sector and conclude that, whereas in 2013 coal constituted 39% of USA energy generation, alternative sources of energy (natural gas 27%, renewables 13% and nuclear 19%) are expanding. Richardson (2017) produced statistics on this expansion:

Table 4: USA energy production by sources, 2010-2016

Source of Energy	Share of the Energy Production by Year (%)	
	2010	2016
Coal	45	30
Natural Gas	24	34
Others	31	36

Source: EIA, 2017

Looking at the future of the industry, a report from the Appalachian Regional Commission (ARC) summarizes: "Our forecast predicts a stabilisation of coal output in Appalachia. This results largely from the expectation of higher natural gas prices in coming years as infrastructure enhancements broaden markets for natural gas, as well as from an expectation that there will be no major regulatory changes that increase the cost of burning coal in coming years." (ARC, 2018, p.2)

Overall, coal employment has been declining for about a century. There were over a million miners in 1919, 500,000 workers in coal mining in 1950, and only hundred thousand by the 1970s. Employment declines were even greater in the Appalachian area and in underground mining. One main decline in the coal industry employment occurred in the 1970s and is attributed to the mechanisation of extraction processes (Sissons, 2009). The literature on coal mining identifies other prior causes for the change in employment, such as mechanisation of the sector in the 1920s and in the 1960s in Appalachia (Mink, & O'Connor, 2004), and natural resource price fluctuations resulting from changes in demand and deposit discovery (Lobao *et al.*, 2016; Partridge *et al.*, 2013).

2.4. Resilience, Safety Nets and Coping Mechanism

A broad array of case studies from the 1970s about the USA deindustrialisation presents that coping strategies depend on the isolation of the community, the level of diversification of the economy, individual characteristics of the workers and the lifespan of the mine (Neil *et al.*, 1992, p.18; Bluestone, & Harrison, 1982, p.53; p.90). The main coping strategies in cases of mine closure at the individual and household levels are:

(1) search for new employment,
(2) change in household consumption,
(3) denial and distress,
(4) emigration, and
(5) re-training (Neil *et al.*, 1992; Tickamyer, & Duncan, 1990; Yamatani *et al.*, 1989; Singh, & Bangs, 1988; Wilson, 1997; Gillette, 2003).

About the first point, individuals who are re-employed are more at risk of job insecurity. Other case studies underline the vulnerability of retrenched Emerald Mine workers. Evidences show that new positions are not guaranteed, and cannot be compared to long-term employment (Fryer, &

Fagan, 2003; Lobao *et al.*, 2016). The closure of a steel plant in Ohio illustrates a pattern following closure where 35% of the retrenched workers were forced into early retirement at less than ½ of their salary, 15% were still looking for a job 2 years later, 40% experienced an important wage cut and 10% were forced to move (Bluestone, & Harrison, 1982, p.49). In some instances, there might be a lack of willingness from the retrieved workers to work in alternative industries. For example, Bourdieu (1981) describes how childhood experience can create the disposition of young workers to identify with, and wish for, a work experience similar to that of their parents[8]. Through interviews, this trend was confirmed by agents of the career center.

On the second point, consumption is often dealt with at the household level and thus, influences spousal employment profile (mainly women in the case of mine workers). Indeed, workers do not experience nor plan occupational changes in isolation, and a gender perspective on mine closure is insightful. Furthermore, wives of unemployed men are particularly vulnerable in mining towns (Neil *et al.*, 1992). This research interviewed one spouse to better understand that perspective. Also, reduction of household consumption can lead to poorer nutrition and housing, which affects future employment capacities, and psychological and physical health (Bluestone, & Harrison, 1982, p.64).

Thirdly, resilience and unemployment are often linked to psychological distress. The International Labour Organisation (ILO) underlines that employment is "a source of dignity, self-fulfilment, identity and recognition" (ILO, 2003, p.1). Mine closures are connected the loss of social networks and a sense of identity that is brought about by working in the mine. Many plant closures left a legacy of "lost jobs, mortgage foreclosures, suicides, broken marriages and alcoholism" (Hoerr, 1988, p.11). Increases in suicide after job lost are observed with rates 30 times higher than expected[9] (Cobb, & Kasl, 1977). According to one of the interviewees, this distress applies to Emerald unemployed workers: "some of them are getting in fights and get divorce and turn to drug and alcohol. I am sure alcohol sell go up when these things happen for sure as a stress relief" (Zimmerman, March 7, 2018). For Neil *et al.* (1992), psychological distress arising after mine closure limits the ability to cope. Nevertheless, it is fallacious to consider ex-miners as sole victims of their environment, and this research will follow Burawoy (1985) by seeing workers as coercing and consenting to their position in production processes.

[8] "The dispositions inculcated by a childhood experience of the social world which, in certain historical conditions, can predispose young workers to accept and even wish for entry into a world of manual labour which they identify with the adult" (Bourdieu, 1981, p.314).

[9] Pennsylvania's mortality rate is 28% higher than non-Appalachian portions of each state and deaths of despair in Appalachia are over represented in the total USA population (Meit, 2017). The recently identified phenomena called death of despair presents the increase in mortality due to alcohol and drug overdose, suicide and liver disease linked to alcohol consumption (Case and Deaton, 2015). Since inabilities in the system to balance brain chemistry is often provoked by chronic stress like unemployment and the insecurities after mine closure. Some links have been made between system's inability to balance and addiction. (Koob & Le Moal, M., 2001).

Overall, the strategies depend on individual characteristics and predict heterogeneity of the coping processes. This is aligned with evidences that exposure to poverty in cases of industrial change is not homogenous (Lobao *et al*, 2016). These results gain robustness as they were confirmed by a sample of 4,000 men (Bluestone, & Harrison, 1982, p.53). From this heterogeneity, a question arises: which agents holds the higher risks after mine closure? Hacker (2006) presents how risks in economic activities has shifted from a more equal division between companies, the state and workers to increasingly being held by workers and their family., Hacker observes a decline in governmental protection, rise of inequality in the labour market, contracts and benefits proposed by companies and important fluctuations in employment. Consequently, individuals in USA are more at risk of living under poverty than before and compared to many of their OECD counterparts (Hacker, 2006, p.74). In the current neoliberal context, this rising insecurity is accompanied by indebtedness and financial bankruptcy of middle class families (Hacker, 2006, p.90).

2.5. Gap in the literature

The literature on the energy sector is mainly macro-level, and the coping strategies were mainly micro-level and presented in the fields of psychology, sociology or anthropology. The various macroeconomics trends, e.g. energy industry transformation, the rise of the service economy, fluctuation in energy prices, are often analysed in isolation from workers actions. Many links could be done between these literatures, and some were already presented like the connections between welfare system and individual risk. Yet, Bluestone and Harrison (1982, p.66) argued that there was hardly any holistic analysis done on the phenomena of mine closure, and this statement remains accurate. The subsequent sections draw on interviews and empirical evidences to understand the dynamics between workers' job transition and the context and structures in which they find themselves. Furthermore, reacting to theories on the resource curse, the report will try to identify anchor points where there is space to limit the negative impacts of transition and challenge the idea of the downward spiral being inevitable. It is largely based on Myrdal (1990) who discusses how the interaction of several variables is at the core of both upward and downward movements. In the discussion of policy implication presented in section 6, the potential for upward movement will be examined.

SECTION 3. Industry and employment structures

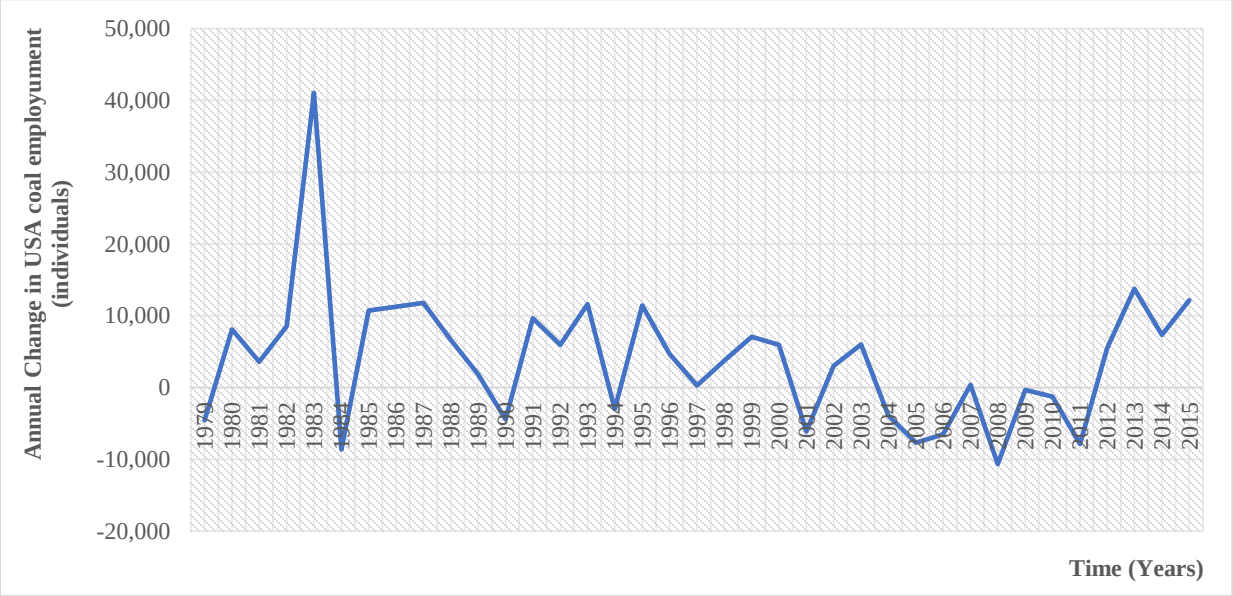
This section presents the conditions under which job transition is occurring in Greene. These elements discussed cover trends in the labour market (precarisation and decline in unionisation), in the energy sector (fluctuations) and elements about the structures of USA welfare and mono-industrial economies. These elements influence the intensity of the impacts of Emerald Mine closure and the capacities of workers to transition into new employment. Links between industry and employment structures and the impacts of mine closure are presented throughout sections 3 and 4.

3.1. Fluctuations in the energy sector

The workers from the energy sector are exposed to fluctuations in production. It impacts the job transition by rising the expectations for future increases in the demand for coal workers in time of drought, and by providing in Greene, some short-term employment in the oil and gas sector.

As discussed in the literature review, energy companies use job destruction to adjust to fluctuations. These are visualised in the significant annual changes in the coal sector's labour demand.

Figure 5: Annual changes coal employment in USA, 1997-2015



Source: Author's representation from MSAH, 2016a

Looking at the last century, it presents a decline in coal employment, but annual fluctuations matter to shape workers expectations. Fluctuations are observed at the national level, but also in county-level data for Greene. These fluctuations in the demand for workers manifests as multiple layoffs throughout the working life of individual coal workers in Appalachia. As such, these historical patterns generate expectations: "With the coal industry, it goes up and down. If you work in the

coal industry, you are expected to get layoff at some time, but you always thought that you would get called back." (Zimmerman, March 7, 2018) Notably, some of the retrenched workers from Emerald considered the mine closure as a temporary layoffs, and are expecting to work in a mine again. Even other industries are affected, a local retailer of clothes for the energy sector mentioned that "since closure [of Emerald Mine, her business] experienced a down and a boom" and that these fluctuations are common in the region (Bruno, March 6, 2018).

Figure 6: Annual change in coal employment in Greene, 2009-2015

Year	2009	2010	2011	2012	2013	2014	2015
Number of coal mine employees	2,432	2,446	2,597	2,781	2,749	2,623	2,478
Net annual change	--	14	151	184	-32	-126	-145

Source: Author's representation from MSHA, 2016b

For some, expectations were fueled by the wish to maintain these jobs, as the salaries are considerably higher than many of the alternatives in the region. Also, longwall mining is more competitive relative to other coal extraction processes. With that comparative advantage, local mines including the neighbouring Cumberland Mine are expecting to withstand market fluctuations more easily, and thus take on contracts from less competitive mines as they close (Snyder, March 6, 2018).

However, some workers consider that long-term prospects of the coal sector are weak. This links to the overall decline in the coal sector: "we went from a large coal industry to very small coal industry in Greene" (Coptis, March 7, 2018). There are local tensions arising between the divergent point of views. One perspective is found in the following quote: "you should see the writing on the wall if you are working in a coal mine right now and you are not preparing for a decline or uncertainty in the future" (Coptis, March 7, 2018).

National politics also influence fluctuations and expectations. During presidential campaign of 2015, the Republican Party with Trump promised to stimulate the USA coal sector by subsidizing for coal power plants and removing environmental regulations. As Hartfield (Greene County) and Michaels (the adjacent Washington County) powerplants closed in 2013, local demand declined. Since the presidential campaign and the mine closure are proximate in time, it implies that many of the workers have been expecting that the Trump administration might have a direct impact on their situations. In 2018, such improvements have not been observed in the region. Nevertheless, new developments are planned like the creation of a research and development center in Morgantown concern with alternative uses of coal or a project of metallurgical coal in Fayette County (Matesic, March 6, 2018).

Lastly, Greene County encountered a boom in its oil and gas sector initiated by the discovery of Marcellus Shale in 2007. For the oil and gas projects, many of the workers came from other USA

states with previous experiences in horizontal drilling. The boom reduces the scale, in the short-run, of induced impact on aggregate demand that follows the Emerald Mine closure.

Table 5: Fluctuations in the energy sector in Greene, 2007-2018

	2007	Introduction of horizontal drilling in Greene (Marcellus Shale)
	2013	Closure of Hatfield and Michaels Coal Power Plants (Washington and Greene Counties).
	2014	Downturn in the gas industry. Overproduction lead to cut back production.
		Announcement of Emerald Mine closure (April).
	2015	Alpha Natural Resource files for bankruptcy under Chapter 11 (08/03/2015).
		November. Closure of Emerald Mine (Alpha Natural Resource).
	2016	Presidential Election. Trump increases the expectations for the development of the coal sector.
		Obama Administration's POWER Initiative (March).
	2017	Opening of the metallurgical coal mine in Lafayette County.
		Bailey Mine in Greene (Consol Energy) temporarily layoffs approx. 200 workers (30% of its labour force).
	2018	March. Closure of Dana Mine, and increase in Cumberland's demand for coal workers.

Source: Author's representation from interviews and Nielbala, 2016 and 2018

3.2. Mono-industrial economic structure in Greene

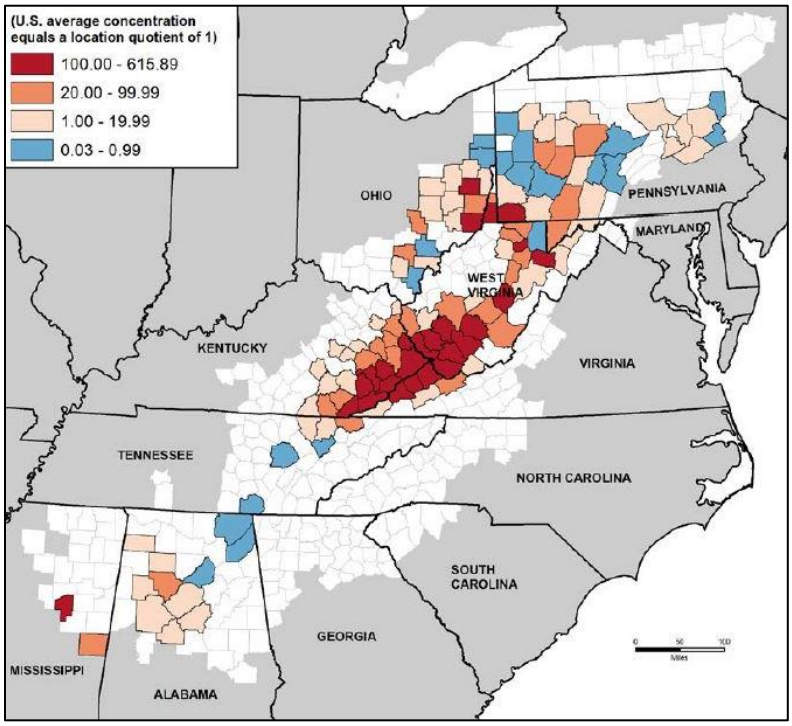
Appalachian coalfields often developed as mono-industries. Their economies are highly dependent on the changes in the coal market, and their politics strongly linked to the needs of the industries[10]. The relation between political and economic actors in Greene results from a strong and sustained presence of coal companies in the county. The coal companies hold a major share of capital and political power in the region (Coptis, March 7, 2018). A local activist stated: "the coal industry still has power (…) they control our capital in the state and they are only operating in 2 counties" (Coptis, March 7, 2018). For Myrdal (1990, p.162), further inequality in the distribution of the means of production is characteristic of mono-industrial developments. The concentration of power and economic activities creates vulnerabilities to the boom and bust of the industry. It considerably affects job opportunities in the region, as coal industry faces a decline in two main ways presented below.

Firstly, since the share of the coal sector on the local economic activities is high (in term of employment and value added), the coal decline implies that there is a large part of local

[10] For example, companies in Greene have been constraining environmental legislation and creating pressure against members of the population wishing for a better waste management by the companies. In Appalachia, this operates through institution with regulation and through threat from the company to individual or groups. For instance, in Bobtown, a town in Greene, a bar owner was threatened by the main company to see workers deserting his bar after he filled at the governmental administration for the protection of a stream on his land (Fisher, March 7, 2018).

employment that will be directly and indirectly affected. For mono-industries, the size of the core industries is generally defined as 30% or higher. For Greene in 2017 after Emerald Mine closure, coal represent 27% of direct employment for population living in Greene only (BLS, 2017). This imply that even after the decline of the coal sector and the increase of the oil and gas sector, the relative size remains high. The figure 7 for 2014 presents that compared to other Appalachian counties, Greene ranks among the counties with the highest concentration of there coal industries, data from 2017 also supports this result.

Figure 7: Coal mining industry concentration by county, 2014



Source: ARC, 2015

Thus, as the main job providers, corporations like Alpha Natural Resource have a lot of power over the local labour market. The population is highly dependent on these jobs. For instance, a local advocate at the Center for Coal Justice[11] mentioned: "every time, we would win [an environmental action], the company would do these temporary layoffs and so. They didn't have to but to make a political point they would lay people off for 2 days or 2 weeks" (Coptis, March 7, March 7, 2018). This illustrates low bargaining power of coal workers in Greene. Linked to job transition this is considerable, because it represents the status of dependence of the population to these positions in coal companies.

Secondly, the last point underlined the constraints of the concentration of power and economic activities on ex-ante actions to generate alternative employments. Like mentioned in the literature

[11] Center for Coal Justice involved in protecting environment and communities from the negative impact of fossil fuel extraction. See more https://www.coalfieldjustice.org/.

review, the dependence status is linked to the failure to create linkages and diversify. The tension between vulnerability and dependence on the fluctuations of the coal industry is well illustrated in a quote by Rep. Snyder (March 6, 2018): "we had coal being an integral part of our economy here for a long long time and they have taken a pretty heavy hit over the past few years. I think that right now it is stable. (…) we have to find some way to diversify our economy." Weak diversification is often conceived as a consequence of extractive industry control over the local development and their constraint on other industries. Indeed, the salaries of the natural-resource based industry are considerable higher than other industries, which creates a pressure on the latter to remain competitive in terms of wages (Gylfason, 2001). Many analysts also argue that the disinvestment in alternative industries has been controlled by mining companies to hold higher bargaining power over the labour force. To summarize, the planned disinvestment in alternative sectors in Appalachia allowed coal companies, historically, to maintain lower wages and greater control over their workforce.

Lastly, the decline of coal imposes changes on institutional configuration. Different regions have their specific institutional configurations, that influence the strategies of local planners and economics activities (Martin, 2000; Amin, 1999). This institutional configuration after the mine closures causes inertia in transition: "a region can become 'locked in' by outdated and outmoded institutions, as relics from the industrial past. Such outdated institutions then serve to become a structural weakness, holding back restructuring and integration into new circuits of growth" (Essletzbichler, & Rigby, 2007, p.9). Linked to job transition, this informs about the historical disinvestment in employment alternatives and about the relative inertia in political structures holds institutional roots. It is possible to hypothesise that this is one of the reasons why oil and gas development fitted easily in the pattern of development of the region. Indeed, politicians have been proactively working with oil and gas companies in the last years[12]. Nonetheless, this is in the awareness of the temporary nature of the oil and gas industry since many mentioned during interview the importance of diversification for more sustainable development in the region.

3.3. US employment-based welfare system

The structure of welfare influences workers during job transition by configurating how much risk they are exposed to. In addition to the analysis by Hacker (see section 2.4.), the risks held by the workers and their family depend on the welfare systems and the local organisations present in the county, both detailed below.

According to Esping-Andersen (1999), different welfare systems present different distributions of risk between state, market and family. This generates a spectrum of configuration, which is not predetermined and lead to disparities in citizens' protection. The sociologist proposes three *regime-types* of welfare state in developed countries based on a criterion of decommodification. A decommodified welfare state implies that "citizen can freely, and without potential loss of job,

[12] Creation of the tri-county oil and gas association that include public awareness programs, job fairs and events for small businesses to capture the economic benefit of the boom.

income, or general welfare, opt out of work when they themselves consider it necessary" (Esping-Andersen, 1990, p.23). Esping-Andersen classifies USA as a liberal welfare regime[13], which implies a residual nature[14] of its support and a high degree of commodification of citizens' work. Under residual welfare, state supports only exists in case of failures from market and family, and targets a narrowly defined and stigmatised population like household living under the poverty line (Esping-Andersen, 1990, p.20). In other words, liberal welfare regimes are based on market fundamentalism, and cash nexus[15]. A focus on poverty alleviation does not support emancipation of workers or decommodification (Esping-Andersen, 1993, p.46). USA liberal welfare regime has been pursuing an ideological project that aimed at minimising the state's role in economic management: "individualize risks, and promote market solutions" (Esping-Andersen, 1990, p.48). This leaves very little space to support the workers in the immediate period after mine closure. Evidences show that a large share of across family income inequality can be attributed to transitional shift rather than permanent differences (Hacker, 2006, p.24), and point to the need for welfare during transition periods. Moreover, the employment-based characteristic of USA welfare was underlined by Esping-Andersen (1990). Esping-Andersen describes the USA regime as job dependent with major market dependency of individuals. Hacker (2006) mentions that unemployment insurance is vital for upgrading and retraining workers. The relatively weak support offered to workers at time of unemployment and the increasing risks bared by them and their family affect the coping process.

Concretely, in Greene, the state and union were important channels of support to individuals who were unemployed following the closure of the mine. Personal networks of family and friends were also major channels. State support will be discussed, and the following subsection will address union support. Firstly, workers were eligible for unemployment benefits, which cover 26 weeks after unemployment. In Pennsylvania, these compensations are claimed bi-weekly, and constitutes approximatively 50% of previous average weekly wages up to a weekly maximum of $573. During this time, if the individual works part-time jobs, the unemployment benefits can be received but the amounts are lower (Barreiro *et al.*, 2015). Secondly, to support the transition into new employment, career guidance services and retraining subsidies are available. These are provided by the state funded career centers at the number of one per county. These centers (PACareer Link) support job seekers with career counseling, job search assistance, and workshops. They propose specific programs related to mine closures and focused on retraining into new industries. When training is demanded, agents of the centers assist in the application for financial support, and for testing when necessary (SAGE and TAPE). After, the agents also monitor the studies by receiving attendance sheets and grades (Hungandy, March 5, 2018). According to agents in Greene and Fayette counties, the majority of the coal workers receiving the diverse services were 45 and below, and the younger workers without children participated in longer programs (Baer, March 5,

[13] Other regimes are Corporatist-Statist (Germany) and Social Democratic (Norway).

[14] Esping-Andersen's categories of welfare state points to a differentiation of residual (or marginalist) versus institutional welfare (Titmuss, 1969).

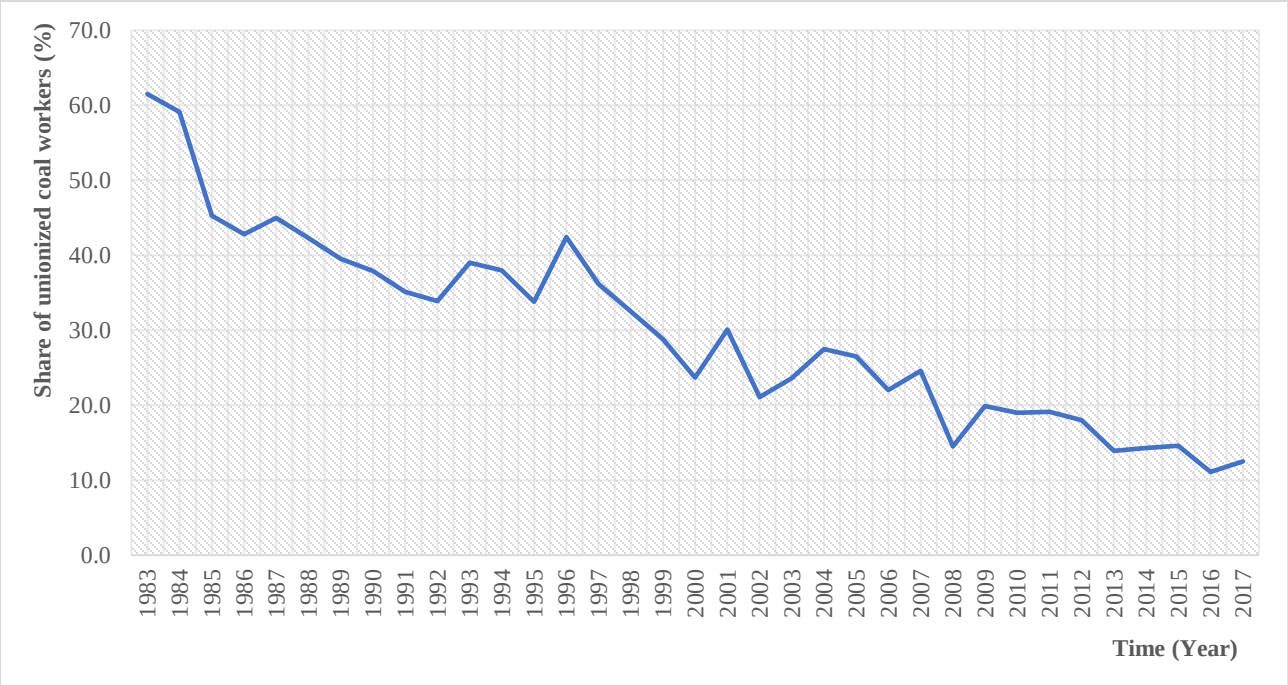
[15] In this context, the cash nexus refers to the reduction of welfare support in monetary transactions.

2018). These programs are managed by former coal workers. The programs also target workers' spouses, and unemployed workers from mining-related industries. Yet, only a few spouses participated. This might be because the program for spouse was put in place in August 2017 (2 years 5 months after the mine closure). Mining-related industries include industries providing mining equipment like tires, shafts or security equipment and subcontractors for welding, trucking or maintenance and approximately 100 community members participated at PACareerLink of Greene (Baer, March 5, 2018).

3.4. Decline of unionisation

Since 1970, union membership decisively decreased in USA, and worldwide. United Mine Workers of America (UMWA), which represents the majority of USA coal mine workers and the workers from Emerald Mine experienced such decline.

Table 6: Decline in union membership in the coal industry, 1983-2017



Sources: Author's representation from Hirsch, & Macpherson, 2003

In 2015, Emerald and Cumberland mines were both owned by Alpha Natural Resource, and were among the few unionised mines in USA. When Emerald closed, one fifth of the employees were transferred to Cumberland. After the closure of Emerald and the bankruptcy of Alpha Natural Resource, Cumberland employees remained unionised, and the UMWA coverage of retrenched Emerald workers including panel rights to Cumberland. Panel rights guarantee that hiring for new full-time positions in Cumberland must prioritise Emerald workers. Any new hiring prioritises according to seniority given the skills required for the position. Panel rights increase the chances that Emerald Mine workers can remain in the coal sector, and creates high expectation in workers (Snyder, March 6, 2018). The hopes of most workers were not met until very recently. The

situation changed as Cumberland Mine increased its production, partly as a result of new contracts won following the closure of Dana Mine[16]. Between the end of February to early March, 18 workers from Emerald were hired at Cumberland (Baer, March 5, 2018). Other support from UMWA include pensions and an extensive health insurance package[17] received by workers and their family (children under 26 years old) (UMWA, 2014)[18]. Overall, the union provides a sense of security[19] for the workers with pensions, healthcare and panel rights.

The importance of social services and welfare after unemployment is illustrated by the difference in the coping strategies of unionised and non-unionised coal workers. A comparison of Emerald and Dana (non-union) mines illustrates this fact. The closure of Dana Mine led to the loss of 370 jobs in March 2018 (Nieldbala, January 3, 2018). For the non-unionised workers of Dana, "it is a different mindset as the folks are non-unions, they are not making the same money and pension and everything that the UMWA miner had. So, they are transferring into lesser paying jobs way easier that the Emerald folks did" (Wildman, March 8, 2018). Also, the imperative for transition into another job is higher without panel rights. Indeed, there are no options to get called at an another mine based on their seniority: "for the non-union miners because they don't have panel right and they know that they will have to travel and relocate their family of find a new career" (Wildman, March 8, 2018).

However, the decline of UMWA membership had important consequences on their capacity to deliver these services. This is even more important than the decline in the industry since it implies that the nominal figure is significantly lower and the leverage on the industry felt even more. Unionised workers are more at risk to see their protection weaken due to the decline of the UMWA bargaining power and to the reduction of financial contributions collected through memberships: "Without new membership at UMWA or new mine opening up, it is impacting the pension and everything for the older generation. With no money coming in, there is no pension for these

[16] However, the net employment creation is negative.

[17] When the workers retire, they are covered by the same health insurance if they completed 20 years in the mine and if they are older than 55 years old. These provide very good coverage, but in the context of coal mining, with the fluctuation in the demand for workers, 20 years is difficult to accumulate. Some workers underline the difficulty of having 20 years in a single unionized coal mine. When they are retired and covered, the first health insurance they receive is Medicare or Medicaid, and if they are not covered, UMWA will act as a second insurance. This also apply to spouses and for many workers, the necessity to retire after 55 is influenced by the wish to insure their spouse.

[18] Workers are eligible for pensions if they have 20 years experience in the company or if they are older than 55 (UMWA, 2014). There are many variations in the type of pensions to which workers are eligible depending on the starting date of work and the years of experience, but average monthly benefit is $ 530 (Warrick & DePillis, 2016).

[19] For non-union mines, even if companies promise safety nets, these are not guaranteed especially when they file for bankruptcy. In an interview, Rep. Snyder mentioned: "I have watched people who worked for companies their whole life and retired with a promise to have health care and have the company come back and say: "well we cannot pay that anymore". They changed the game. If you a member of a union that is a lot harder to do." (Snyder, March 6, 2018) This was the case less than 10 years ago with Consol in Greene cancelling pensions and healthcare.

people" (Wildman, March 8, 2018). The decline of and bankruptcy in the coal industry have nearly depleted the UMWA pension fund. Currently, UMWA is involved in a campaign to preserve the pensions, which involves contentious position on whether federal government should provide financial support. If the campaign fails, more than a hundred thousand retired coal workers would be impacted. This insecurity forced many workers into later retirement (Baer, March 5, 2018).

3.5. Precarity of work

The labour market has significantly changed in the recent decades as a result of the increases in temporary work and rate of job turnover (Hacker, 2006). The rise of precarious work under neoliberalism has been attributed to the 're-regulation' of labour markets through outsourcing, subcontracting, and casualisation (Standing, 2014)[20]. These reduce the stability and security of work, and render quality of the work and family balance more difficult (Hungandy, March 5, 2018). Together with the mono-industrial economic structure and its few employment alternatives, the presence of precarious employment represents a significant pressure on the labour force in Greene County. Precarious employment is prevalent in the service sector (although not consistently), and in the service sector, it has been rising from 46% of USA employment in 1970 to 79% in 2010 (BLS, 2018). Discussing the situation in Waynesburg, an interviewee mentions: "Right now, people have to work two or three service-sector jobs to support their family or they are on one service job and have to get food stamps to survive" (Coptis, March 7, 2018). In recent years, important critics from trade unions and academia linked the degradation of welfare support to the increase of precarious positions. In April 2018, a Canadian organisation noted the mechanisms under which "benefit provision [were made] as inadequate and precarious as possible so as to create the desperation that can drive people into the expanding low wage sector" (Clarke, April 4, 2018). To summarise, employment available to retrenched workers and their families is increasingly characterised by low-wage and precarious positions.

[20] There is an extensive debate about the definition and nature of precarity around the work of Standing (2014). This research focuses on the manifestations, causes and dynamics of worker and social vulnerabilities and is thus connected to the precarity debates (see Scully, 2016). Nevertheless, contributions to the conceptual aspects of this debate remain outside the scope of this research.

SECTION 4. Impacts of the Emerald Mine closure

This section presents the main consequences of the closure of Emerald Mine on Greene's demographics, labour market and economic development. Since the dissertation focuses on job transition, the straightforward impact is the loss of employment, which involves a decline in income and in social security (healthcare) for Emerald workers. It should be noted that these implications affect the process of transition for the workers considerably. Additionally, a ripple effect is generated. To assess the size of this effect, this section draws from input-output matrices constructed from secondary data sources[21] to estimate the direct, indirect and induced impacts[22] (Harsdorff, & Phillips, 2013). The three-fold impact will be discussed alongside more consequences of the closure. Many links will be made between these impacts and the structural and contextual elements described previously.

It is important to note that the impact of mine closure cannot be isolated from other economic activities. In this case, its scale is reduced by the oil and gas sector's expansion. Indeed, it generated some well-paid employment in the short term, and maintained consumption at high levels, which enabled many businesses such as restaurants and hotels to continue their operations. Yet, as the oil and gas industry decreases, it is likely that the large-scale impact of the coal decline will be more apparent.

4.1. Unemployment: Impact on welfare and income

The closure of Emerald Mine led to a decline of employment in mine-related sectors. In 2015, Pennsylvania Coal Alliance (PCA) published an input-output analysis linked to the longwall coal mining of Greene and Washington counties. The analysis estimates 1,363 direct, 398 indirect and 578 induced jobs. Since Emerald Mine constituted 10% of such production, an approximation using Emerald 500 employees before closure would be 146 indirect and 212 induced jobs. These estimates, even if imprecise, suggest a scale for the job destruction in the region.

An input-output analysis produced at the state level provides insights about the distribution per industries of the employment impact (PCA, 2013). At the levels for 2013, Emerald Mine represent 4.6% of direct employment in the state. This second matrix provides estimates about the sectors also impacted by the mine closure (the sectors of indirect and induced unemployment).

[21] Since the accuracy of county level data present is limited, empirical evidences are used concurrently to interviews to build a general impression of ripple effect of the closure of Emerald Mine in 2015.
[22] Refer to the description in the literature review.

Table 7: Employment impact of PA coal industry with top 10 industries, 2013

Industries	Direct	Indirect	Induced	Total
Total top ten	13,886	5,064	3,824	22,774 (63%)
Mining coal	13,886	460	3	14,349 (40%)
Food services and drinking places	-	208	1,225	1,433
Architectural, engineering, and related services	-	1,060	42	1,102
Securities, commodity contracts, investments, and related activities	-	847	232	1,079
Wholesale trade businesses		655	89	744
Transport by truck	-	369	360	629
Real estate establishments	-	182	512	694
Management of companies and enterprises	-	635	58	693
Private hospitals	-	-	677	677
Support activities for other mining	-	648	-	648
Offices of physicians, dentist, and other health practitioners	-	-	626	626
Total all industries	13,886	10,689	11,612	36,187

Source: Pennsylvania Coal Alliance, 2014

The job loss has a number of implications. According to interviews, income drop and loss of social security benefits were the prime influence on workers' decision making. Unemployment benefits are available for 26 weeks and health coverage with UMWA is accessible for one year post mine closure. The wages of coal miners are considerably above national and regional averages. According to the Census Bureau in 2017, the average yearly wage is $86,013 for employment in Mining, Quarrying, and Oil & Gas Extraction. According to the interviews, the wage of Emerald Mine workers is higher due to overtimes and seniority. This points to an average and a median wage close to $95,000 for Emerald Mine workers. According to agents at PA CareerLink in Waynesburg, Emerald workers experienced a wage drop from $100,000 to $30,000 yearly salary. It affects their purchasing power, as an interviewee mentions: "12$/hour to $20 maybe where coal miners are up in the $30 and depending for how long they work. With $30 per hour, they cannot afford the high price of housing in the region currently" (Lewis, March 7, 2018). The level of consumption is barely supported by state welfare since food stamps, and housing assistance are scarcely available for transitional poverty. The latter is due to a system of assistance provision based on previous six months income. This also applies to the food stamp program (SNAP), which in 2018, required a maximum of $1,702 as monthly income for a family of three (CBPP, 2018).

Furthermore, after the closure, loans become a major burden on households. The provision of loans to Emerald Mine workers before the closure was above average: "you work 12-16 hours a day you are making good wages, you are living in a nice house, big mortgage. Too much credit is offered to people making that kind of money" (Wildman, March 8, 2018). Indeed, adding to their above average salary, "banks and other lending institutions generally accommodate and even

aggressively promote the growing demand for credit" (Dymski, & Pollin, 1992, p.40). Also, some workers maintain high levels of consumption commonly purchasing new vehicle every one or two years, for example (Baer, March 5, 2018). All this increases the need to transition into high wage employment. However, some workers saved and worked overtime before the closure and are better prepared for the diminution of income. This also leads to change in household dynamics with many spouses, primarily women, seeking new employment[23] (Wildman, March 8, 2018).

The levels of consumption and saving vary among the workers and are influenced by age. Some of the older workers had more time to repay their debt and mortgage than younger ones (Wildman, March 8, 2018). Also, with the fluctuating demand for coal workers, older workers "have been through rough times several times throughout their career. So, they have learned to save and to put money back and not live above their means. The younger generation has not experienced that yet" (Wildman, March 8, 2018). However, it has also been more difficult for the older workers to find reemployment due to age discrimination on the labour market and because the payoffs of retraining are lower. At Emerald Mine, many of the workers were between 45 and 55 years old, which is a crucial period for accumulating money: "you should be putting your money away when your kids are done with college and you are done with all that stuff like mortgage and everything. Now their salaries are being decreased and they don't have that ability to start soaking a wage or retire" (Wildman, March 8, 2018).

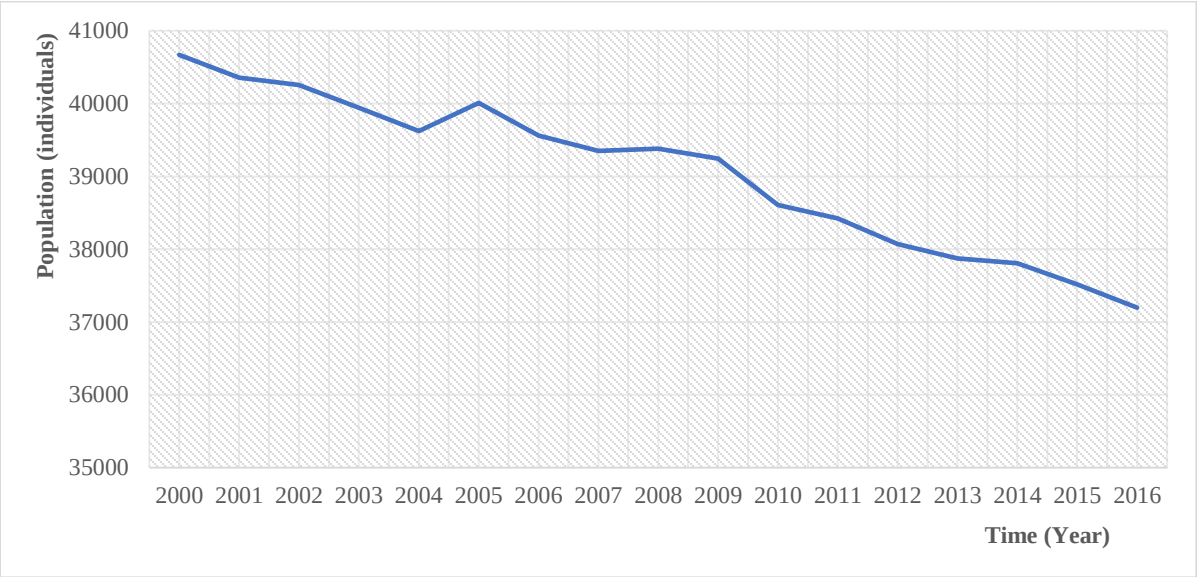
The wage drop not only has a considerable impact on the ability to take out and pay loans, but has a significant impact on health care coverage. Such healthcare is essential due to the physical intensity of the work underground in the mine. Many coal miners have diseases including black lung, and back problems. As a result, health insurance is a crucial incentive for workers seeking employment (Baer, March 5, 2018). Lastly, one interviewee mentioned the importance of friends and family to help her to cope with the anxiety, depression, and the financial difficulties that arouse directly after the mine closure (Baer, March 5, 2018). Considering the problems linked to mental health, very few infrastructures are built to support the workers' struggle (Coptis, March 7, 2018). To summarise, Emerald Mine workers are seeking for high wage employment and health insurance.

4.2. Impact on population and outmigration

One of the main concerns with the decline of the coal industry has been expressed in the interviews: "it is pretty much going to be a ghost town" (Wildman, March 8, 2018) The population of Greene County decreased by 10% with 40,668 in July 2000 and 36,770 in July 2017. In the interviews, politicians, development agent, and business owner underlined the difficulties linked to the absence of the workforce.

[23] Many spouses are already working in the region, that is often in banking and retailing professions.

Figure 8: Population decline in Greene, 2000-2016



Source: Census Bureau, 2017

Linked to industrial changes, there is a double movement with the inflow of workers linked to the oil and gas boom, and the outflow related to the coal decline. Indeed, the interviewed retrenched workers mentioned some of their colleagues leaving of the region. According to one interviewee, "younger people who want the new home and nice vehicle. They are the one who are more likely to move or try to get another job somewhere else" (Lewis, March 7, 2018). Also, Lewis (March 7, 2018), as many others interviewees, noted changes: "if you drive around the county, you will see a lot of cars from Texas and Oklahoma and stuff, they[, oil and gas companies,] bring a lot of their own people in".

However, there are some methodological issues with the interpretation of results. Firstly, since unemployment data do not account for mobility, the relocation of workers is difficult to monitor (Bluestone, & Harrison, 1982, p.55). Secondly, many workers of the energy sector (coal, oil and gas industries) are not Greene inhabitants: some retrenched Emerald workers drove up to 2 hours to go to work, and many oil and gas workers are transient. Lastly, the decline in the population can also be associated to aging population. More empirical evidences would be necessary to better understand population dynamics[24]. To summarise the impact on demography, although the estimations and causations are not certain, two unmistakable features are the decline in the population of the county and the presence of transient workers for oil and gas industry.

4.3. Impact on local government revenue

The closure of Emerald Mine pressures local government budget by reducing tax revenues and increasing the need for public expenditure and social assistance (Bluestone, & Harrison, 1982, p.75). In November 2015, Emerald Mine was paying more than $1.3 million in property tax

[24] Find more information in Annex B.

revenue to the Central Greene School District, which budget is about $34.0 million (Nieldbala, January 03, 2016). The reduction in Emerald Mine's contribution to the property tax revenue is only showing in the account for the year 2018 given the modes of calculation of the Assessment Office (Lewis, March 7, 2018; Matesic, March 6, 2018). The property income tax is not the sole asset in governmental budget for instance, there is the earned income tax to local government and school districts. Cumberland and Emerald Mines at the end of 2014 were together paying $11.9 million in federal, state and local taxes and were providing $241 million in wages and benefit to their 1,275 employees (Nieldbala, January 03, 2016). They also are important sponsors of big events in the community. For all longwall mines in Greene and Washington counties in 2013, the total of direct business taxes was higher than $81 million.

The revenue to the state from the coal industry is perceived through property tax and constitutes close to 30 to 40% of the budget and is crucial to the existence for some school districts (Lewis, March 7, 2018). Natural gas industry affects the county's budget differently. The latter is linked to the county budget through a fee on quantity of gas collected. It is compiled at the federal and state levels, and then distributed according to share of production per county. Greene is one of the largest beneficiaries in Pennsylvania. Subsequently, the money can be used according to 13 categories of spending following Act 13 (Lewis, March 7, 2018). Similarly, because of the delay rendered by the coal tax and the boom in oil and gas, the county budget benefited from a relative protection from the decline of the coal industry. However, the impact of mine closure on county's budget will be felt in the coming years.

One of the most likely impact is a spiralling down effect described (Coptis, March 7, 2018; Lewis, March 7, 2018) as follow:

(1) Mine closure generates outmigration and drop in tax revenue and local income;
(2) The tax base is reduced;
(3) The decrease in the quality of services provided through the school district and the township e.g. education is negatively affected (especially in more rural area where the cost of accessing services are higher due to less economies of scale and other factors);
(4) Further outmigration arises due to the deterioration of services;
(5) The remaining individual are likely to be more vulnerable group and will struggle.

With the decline of the coal industry in Greene, downscaling of community has been observed, and one indicator is the reduction of people graduating schools due to outmigration in communities like Howlbroak, Renridge, and Graceville in western Greene.

Elementary and secondary education promotes economic development as well as individual and family wellbeing. They are funded by revenue from federal, state and local governments. The latter is tied to the coal industry. In Appalachia, the average income is lower than the national average. This implies that taxation has a disproportionate impact on households, and that counties are even more dependent on coal property tax (ARC, 2018, p.13). The vulnerability of the tax structure – or it dependence on the energy sector – implies that in the process of transition limited fund will

be available to develop alternative economic activities and build human capacity (ARC, 2018, p.2). Thus, federal and state support will be necessary. An interviewee mentioned, that the burden of transition would have to be spread: "money from other tax and different areas without over burdening these communities the way it would over burden Greene County if you raise taxes." (Coptis, March 7, 2018)

4.4. Impact on other sectors

The sectors that are direct providers (input) and recipients (output) of the mine activities are considered as the prime industries affected by the closure. Looking at data for USA mining sector, it is observed, the manufacturing sector is the largest providers of mine inputs by constituting 59% of the whole input of the mining sector in monetary term. Concretely, this includes R. G. Johnson Company in Greene and Washington counties, a company that builds shafts for the mine, and had to downsized after the closure of Emerald Mine and lay off workers (Baer, March 5, 2018). The manufacturing sector is followed by private fixed investment (14,97%), utilities (6.91%), and exports of goods and services (6,85%) (BEA, 2016).

Figure 9: Input to the mining sector in USA, 2016



Source: BEA, 2016

Figure 10: Output of the mining sector in USA, 2016



Source: BEA, 2016

In terms of induced impact on other sector, the implications on governmental sector through the reduction of taxes and reduction of workers's consumption have important repercussions on local

dynamics. Interviewees underline that the period directly after closure was characterised by downsizing and cutbacks in other sectors and activities. Some examples include local businesses like a jewellery shops, the car dealerships, the grocery stores, and a clothes store: "a lot of places have closed and downsize tremendously because they didn't have the business they once had. The retail services they have all suffered" (Lewis, March 7, 2018; Zimmerman, March 7, 2018; Wildman, March 8, 2018).

Other sectors in Greene have been affected by a change in the global economy. Matched with the indirect and induced impacts of the mine closure, this generates further vulnerabilities. For instances, the traditional expression of the retail sector with small shops in the main streets faced the competition of large chains like Walmart and Target and the increase of online sales. This double pressure on their activities via globalisation of trade and deindustrialisation of the coal sector resulted in closures, downsizing and an important decrease of retail staff wages. A retrieved coal miner presented his experience with the retail sector. He worked in retailing before he joined Emerald workforce 10 years prior the closure. During the interview, he mentioned looking for position in retail after the closure and finding work opportunities of comparatively higher-level positions, but at lower wage (Wildman, March 8, 2018).

Looking at the indirect effect as described in the literature review, a study published in 2013 assessed the economic impact of longwall mining in Greene and Washington counties. This provides an estimate of the multiplier effect of Emerald Mine of 10% in term of output for 2013.

Table 8: Impact on core industries of Greene and Washington counties, 2014

Industries in Greene and Washington Counties	Total Value Added ($)	Direct Employees (individuals)
Coal Mining (longwall)	**1 944 092 608 (13.4%)**	**3 550**
Wholesale Trade	761 587 650 (5.3%)	5 211
Real Estate	582 986 513 (4.0%)	3 550
Construction of new power and communication structures	567 402 307 (3.9%)	1 235
Support activities for oil and gas operation	543 577 324 (3.8%)	2 909
Total all industries (including top five)	14 475 310 136	134 575

Source: Author's representation from PCA, 2014

Furthermore, with the decline in oil and gas activities in the county, job offered in the sector is limited to a small number of maintenance jobs (Wildman, March 8, 2018). This largely impacts some coal workers who became professional truck drivers for the oil and gas companies after the

closure of the mine. Indeed, these jobs constitute only a temporary solution implying for another phase of employment reconversion in the future.

To conclude, in a 2018 report, the Appalachian Regional Commission (ARC) ranks Appalachian counties according to their vulnerability to the coal decline. The classification focuses on: "the relationship and interdependence among coal mining, its supply chain linkages, transportation services, coal-fired power plants, and human capital resources." (ARC, 2018, p.7). It produces three core measures: dependence, impact, and risk that help to situate Greene in relation to other counties in Appalachia. With these measures, the report suggests that Greene status is low or below average in terms of Impact[25], which implied that the spreading effect on employment is low (ARC, 2018). However, as this indicator is constructed with data up to 2015, but does not take into account the closure of Emerald Mine in 2015. It is likely that the outcome of the coal decline in Greene would be more substantial. Greene is above the Appalachian average in terms of Dependence and Risk[26], implying that Greene's economic activities are strongly connected to the performance of its coal sector and that the county is likely to experience predicament in the future. To further understand the structural weaknesses, the next section examines how the labor market is affected by the impacts of the closure and by the characteristics of Greene's economic structure described in the two previous sections.

[25] Impact is defined as "the sum of the employment change-weighted 'coal industry ecosystem' scores as a share of total employment, where employment change is defined as the difference between 2005 and 2015 employment" (ARC, 2018).

[26] Dependence is defined as the "sum of coal-dependent employees divided by total employment in each county. This measure is presented for both 2005 and 2015" (ARC, 2018). Risk is defined as "the degree to which counties are at risk of experiencing additional economic hardship should the decline in the coal industry continue." (ARC, 2018)

SECTION 5. Tension in the labour market

The previous section built from interviews and empirical evidences to describe a set of features that influence workers in job transition. It was observed that the mine closure generated through the number of direct, indirect and induced impacts, a spiralling down movement of the economy. It is in this dynamic setting that the workers' transition into new employment occurs. This section argues that the downward effect creates an important tension between workers' needs and low labour demand in the region, and the section analyses this tension.

The decline of activities in coal and related sectors weakens the employment opportunities in ùGreene County. According to McDowell (2003), "the net result [of mine closure] for many localities has been less secure jobs and lower wages, as the growth of poorly paid entry-level jobs, particularly in the service sectors, has offered little chance of career progression for less educated workers, especially men". In Greene particularly after the mine closure, it is such expansion of various forms of precarious employment that is observed with low wages, part-time hours and temporary positions.

Yet, there is diversity in the quality of alternative employments for the workers. From the interviews with agents of the career center, the summary table below is constructed to map the different form of employment that Emerald workers opted for after the closure of the mine. Most of these jobs require less training time and do not correspond to their previous income levels.

Figure 11: Alternative employment for Emerald Mine workers

New employments	Frequency in the sample	Training time for entry level (months)	Wage
Commercial driver	highest	1	medium
Train operator	medium	few weeks	low
*Mobile crane operator	medium	few weeks	medium
*Heavy equipment operator	high	few weeks	low
*Diesel mechanic operator	high	10	medium
*Welder	high	18	high
Steel mill operator	medium	--	low
*Electrician	high	18	medium
Heating or air conditioner technician	medium	few weeks	low
Insurance agent	rare	--	medium
Business management	rare	--	medium
State employment	medium	0	medium
Nurse or Medical assistant	medium	12-24	high

The scaler for wage is low for wages below $ 50,000, medium for $ 50 to 75,000 and high went above $ 75,000, which correspond to the previous employment bracket of coal workers since overtime is frequent. It is important to note that overtime might also influence upward the indicators of the table.
* The employment corresponds with some to the mine workers' previous training.

Source: Authors' representation from interviews

Since 80% of Emerald workers were 'general labour' in the mine, their skill profile is not in demand in the Greene labour market (Baer, March 5, 2018). Interviews indicated the transition of Emerald workers with specific trade skills like electricians or mechanical jobs might be relatively easier. The ARC notes that with the decline of coal employment in Appalachia, "the number of equivalent occupations in other sectors is limited in supply." (ARC, 2018, p.19) If the demand for labour is limited in the region, this is especially true for high wage employment, and the need of high wages is coherent with Emerald workers' high level of consumption and loans.

Some workers transitioned into oil and gas jobs: "with the gas and industry coming in this area, it saved a lot of them, you know because they are doing a decent wage" (Wildman, March 8, 2018) and some benefited from oil and gas companies (Marcella and Unica) paying gas rights for the use of their land, which consists in high monetary gains. One of the most popular alternative jobs is to be a truck driver. Workers with the support of the career center passed their commercial driving license as the demand for drivers was increasing with the oil and gas boom. Many of these positions are directly or indirectly linked to the oil and gas sector. Indeed, the demand for these workers is likely to be temporary, and the market for this skill might be saturated. Thus, these workers are still vulnerable to the fluctuations in the energy sector. Retrieved workers with their license have longer-term prospect with positions linked to internet sales and postal services, but the availability of these positions is limited.

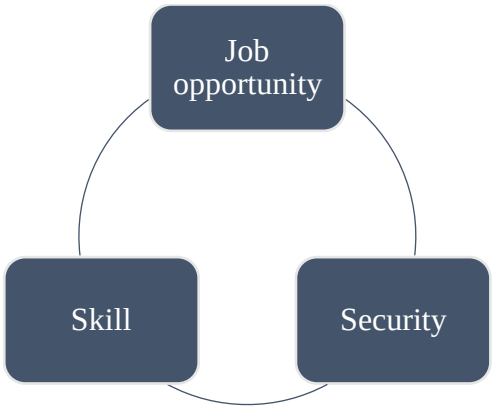
Due to limited availability of high wage employment, other strategies are adopted to maintain a certain income level. Some of the strategies intended by Emerald workers include requesting their unemployment benefits, changing the work of their spouse, selling their house or vehicles, taking side jobs when working full time at a lower paying job and moving away (Zimmerman, March 7, 2018). It also resulted in many workers accepting employment with lower wages, but working longer hours and some were planning later retirement. (Baer, March 5, 2018). Other strategies to remain employed in the coal sector saw some workers from Emerald drive up to 2 hours to go work in other mines, doing long shifts (12-16 hours), and driving back home (Baer, March 5, 2018). The desire for a certain income level in the short term also implies that very few of the workers or their spouses participated in programs that require long re-training, and many workers tried to stay in the coal industry. To summarize, the need to sustain a certain income level and the limited high wage employment in Greene lead worker to under invest in their careers by maximizing short run employment, later retirements holding multiple jobs, working overtime and shifting to short term work in the oil and gas sector instead of investing in education.

These strategies to quickly insure a certain level of household income also emerge because of the USA employment-based welfare system. The need to find employment is linked to the need to receive health coverage and/or be able to afford its cost. Health insurance are difficult to access when unemployed, but even for civilian workers from whom 70% were covered by healthcare benefits in 2017. Certain interviewees indicated that the need for health insurance plays a non-negligible role in accepting lower waged employment. For example, David Baer, an Emerald coal miner who was employed by PACareerLink to support his colleagues in transition: "I like my job here. I got a good boss, good people to work with. I can say it is not a 100,000$/year but it is nice. (…) I was going to retire, but I would have had no medical. So, I took the job for the medical." (March 5, 2018). Moreover, the need for high wage is linked to the fact that even when partly covered by the employers, the costs can be high. In March 2017, non-union workers assumed 21% of the healthcare premium for single coverage and 45% for family coverage. M. Baer does not have children, and hypothetically, this might have influenced his choice. Hence, USA welfare's constraints on decommodification decrease the chance to transition into high wage alternatives because, workers prioritize short run consumption and healthcare coverage rather than training and longer run security.

Furthermore, workers have heterogeneous expectations about the potential of new employment in the coal industry. This is for instance illustrated by a diversity in how the new generation is advised to work in the sector, and how they are encouraged to study or looking for new areas of work: "the guys use to think that they will always get called back and I think that some of that mentality still exist but in a lot of cases they don't" (Zimmerman, March 7, 2018). Three main elements influence their expectations: (1) historical fluctuations in the demand for coal workers, (2) political promises by Republicans to stimulate the coal sector, and (3) their membership in the union. These three elements have shaped the way workers planned their transition, it also reduced their investment in retraining maximizing short-term employment and encouraging them to find positions where they receive health coverage. Since the market has been historically fluctuating, some workers assume future increases in coal employment. Concerning the union, the panel rights provide a certain security to workers. Interviewees noted that the non-unionised workers transition more quickly into new jobs, indicating that not all types of union support are oriented toward job conversion and transition. Union support worked efficiently for many workers in the context of temporary layoff from the coal industry, but overall the union support and the state welfare seem ill-adapted to support the transition process of workers.

To summarize, the workers strategies after the mine closure is the materialization of a tension in the local labour market. According to Myrdal (1957; 1996), it is possible to identify key variables at the heart of upward and downward movements in economic development. For the case study, job opportunity, household-level security for retrenched workers and the skill level of workers all play a key role in job transition following Emerald closure.

Figure 12: Three key variables for job transition



Firstly, many factors have been provided about why workers are looking for security in the short run through high wage positions and health coverage. As described above, their need is generated by the employment-based welfare coverage with short periods of unemployment benefits, healthcare coverage, and obligations linked to consumption and loans. In other words, workers after the mine closure need to secure consumption needs, meet financial obligations and provide healthcare for them and their families. With more security, they can in turn influence positively the two other elements: invest more in retraining or consume more locally and stimulate the overall economic activities in the region through induced effect.

Secondly, workers with higher level of education are better able to transition into other high paying employment (for example, electricians or engineers at the mine). Capacity to participate in training programs and the education background of workers must be considered. According to interviewees, the capacity to retrain depends on workers' savings, availability of retraining programs, household consumption levels varying with age, and household dynamics (child, spouse work). The absence of high wage job opportunities prevents individuals to be able to invest in training. On the contrary, for some workers who save or those with relevant training, more opportunities are available, and they are better able to answer their need for high wages and health coverage. Skills and training have been mentioned throughout but will also be detailed in the subsequent section.

In a recent report (ARC, 2017), a number of Strategic Investment Goals are identified to support the transition away from coal economies in Appalachia. One of these goal presents what is essentialized in the variables 'security' and 'skill'. The goal proposes to "increase the education, knowledge, skills, and health of residents to work and succeed in Appalachia." (ARC, 2017)

Thirdly, job opportunities are central to the job transition. A prevalent theory on labour market is Say's law, according to which, labour supply creates its own demand. At the level of Greene, this is not observed. Instead, workers are forced into moving out of Greene or driving long hours. With few options, workers must accept lower paying jobs, overtime or late retirement as described above, which increases their vulnerability to poverty and drug addiction (Case and Deaton, 2015).

Say's assumes away labour demand stimulated through government intervention, and focuses of a supply side response (Sissons, 2017, p.35). However, that is observed is the presence of structural weakness of the labour market in Greene, which is linked to industrial structure, change in the quality of employment (precarisation) or lack of investments for diversification from political and economic actors. These observations in Greene question the idea of automatic stabilization from Say's law. Without job opportunities, it is likely that the downward cycle in Greene will continue. Also, linking to the other variables, new employment opportunities reduce willingness to invest in education and all further reduce their potential to receive high wages and healthcare like they did before.

The heterogeneity in workers experience of mine closure seems to be influenced by the three variables: certain skill profile advantages the workers (electrician and welder), and the workers who saved, who have lower consumption levels (e.g. no children) or the ones who have spouse making high salaries (more security) seem to cope better with the job loss. This provides elements of answer for hypothesis 3[27]. The identification of these variables as well as the tension in the labor market present a space for intervention and the possibility for an upward movement. This follows Myrdal (1996) who argues that those variables need to be simultaneously pushed; a 'big push', to generate an upward movement. The next section will attempt to define the relations between the three variables and improve understanding of the tensions through the evaluation of the solutions often proposed by organisations of economic development or by governmental agencies.

[27] It is possible to identify a number of independent factors that create heterogeneity in workers capacity to transition into new occupations.

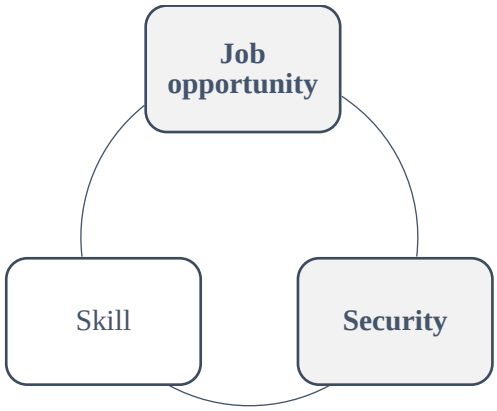
SECTION 6. Policy implications

This section will aim to evaluate the efficiency of certain policies. In a recent report (ARC, 2017), the ARC identifies needs linked to the process of economic transition away from coal, and list strategic investment goals, including (1) Ready Workforce: Increase the education, knowledge, skills, and health of residents to work and succeed in Appalachia; and (2) Critical Infrastructure; Invest in critical infrastructure—especially broadband; transportation, including the Appalachian Development Highway System; and water/wastewater systems. These two policy-orientations, alongside with policies aiming to attract manufacturing in the region will be analysed. These three orientations are discussed in relation to the three variables and are selected for being so present in the policy environment of coalfields today. By looking at the three variables, the research aims to guide informed intervention and to underlay the differences between structural and residuals actions.

6.1. Manufacturing: Job opportunities

Many community stakeholders in Greene advocate for manufacturing in the region. This solution is proposed to bring job opportunities in the region. Nevertheless, the wages from manufacturing are generally lower and likely not to be sufficient to answer to the need for security by the workers.

Figure 13: Manufacturing and structural tension



In Pennsylvania and throughout Appalachia, a discussion around high-wage manufacturing jobs is growing in popularity. Many individuals are skeptical, but projects are put in place through collaboration of think tanks, politicians and trade unions[28]. Nevertheless, currently, this is not achieved and another dimension of the 'security' variable comes into play: healthcare provision. Veronica Coptis from the Center of Coal Justice (March 7, 2018) warns of the risk for these manufacturing positions not being unionised, imposing limits on workers chances to be covered by healthcare. It is likely that these jobs will not be attractive to retrenched Emerald workers and

[28] See the High Wage America Project by the Century Foundation: https://tcf.org/content/event/fighting-high-wage-america/

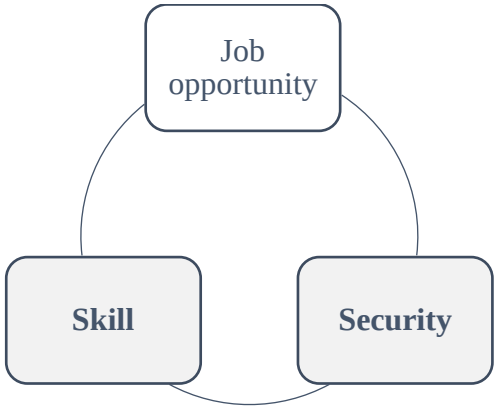
might rather be taken by the workers indirectly influenced by the mine closure or non-unionised coal workers. This might be an interesting solution for these members of the community. However, since this potential solution does not currently stop the outmigration, the low availability of the workforce restricts the willingness of the manufacturers to invest. Additionally, the number of available housing units is also low, which considerably diminishes the attractivity of Greene for many types of large industries (Lewis, March 7, 2018). Rep. Pam Snyder mentions: "Nothing will make me happier than to see a manufacturing plant come to the 58th district. We need that but here again, it is about a trained workforce and having the people that need the job and that are able to fill those jobs." (March 6, 2018) Thus, the outmigration, one of the presented impacts of the closure, is a limitation for renewed economic development in the region. The closeness between impacts of deindustrialization and constraints on development is a clear example of structural vulnerability and downward cycle. Nevertheless, there are a lot of space in this tension to think about attracting investment, diversifying, expending businesses' current activities, creating suitable mix of supply and demand-side interventions (Beatty et al, 2005, p.32) and the potential role of government in incentivizing these.

6.2. Education: A ready workforce

The level of education in Appalachia is below the USA average. 23.2% of Appalachian adults (25 years and more) holds bachelor's degree compare to a national average of 30.3%. A retrenched coal worker mentioned during interview: "a lot of them don't have college degree, so to transition into an upper level job, you know so they have the skills a lot of them are very bright they can be welders, electricians, heavy equipment operator" (Zimmerman, March 7, 2018). Data have shown that on average, less educated American men face more income volatility, twice higher than workers with degree above high school level (Hacker, 2006, p.27). Retraining of the workforce is one of the most popular policy-orientations in cases of plant closure. Nevertheless, it does not remove the need for structural investment and labour opportunities in Greene. This conclusion was observable during fieldwork.

An agent in charge of a recent closure in an adjacent county mentions that the first thing he will advise to prioritize training and start it quickly after layoff to beneficiate from unemployment benefits and healthcare coverage, which was extended for close to one year after the mine closure (Wildman, March 8, 2018). Also, new types of employment are more technology intensive, which implies that job transition required the acquisition of new skills (Bluestone, & Harrison, 1982, p.94). Lastly, the higher paying and longer-term jobs in Greene like nursing and electricians require training that are longer than 2 years (Wildman, March 8, 2018). The agents in the career center underline that many workers are incapable of studying without receiving wages due to the immediate consumption need described previously. This applies especially if retrieved workers are single parent, if their spouse does not receive a wage or if retraining happens after the period of unemployment benefits. This presents high opportunity cost for training: "How will you go to school and pay your bills at the same time? You can't do it." (Baer, March 5, 2018)

Figure 14: Education and structural tension



Shortly after closure, different stakeholders in Greene (local politician Pam Snyder, UMWA workers, the Department of Labour and others) tried to extend the period of unemployment benefits following mine closure. The initiative succeeded at various policy levels, but failed at the Federal level. Another attempt to address these problems by the career center was to try to develop a program that would propose part time work and schooling scheme, but its implementation was limited. Furthermore, according to Matesic (March 6, 2018), the Executive Director at Department of Economic Development of Greene County, on-the-job training should be prioritized and training should be better designed to fit and interact with the existing needs and characteristics of the region.

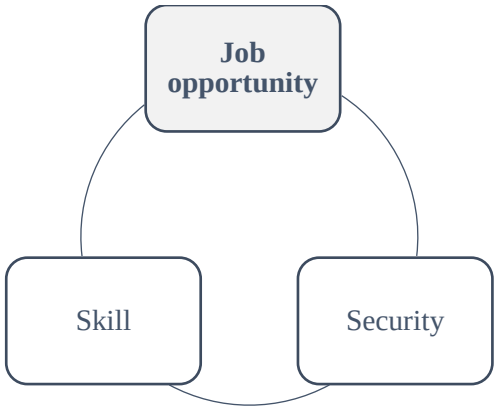
The recent retraining programs in the county were aimed at addressing the closure of two major power plants in the region in 2013 (Hatfield and Michaels coal power plants in Washington and Greene counties). Federal and State governments sent money for a retraining program for the workers of the plants. This money subsidised training but did not address the short-term consumption problem or the variable of security. The program attained a low participation rate and most of the money was returned. It indicates that, for a training program to succeed, it is essential to provide financial security to the workers.

Some additional points are worth mentioning about the policy oriented toward education. First, in Greene, mine closure is likely to led to underinvestment in education for the future generation as retrenched workers are less likely to be able to afford the college tuition fees for their children. Second, there is also less money available for the local elementary and secondary schools (see 4.3. Impact on government revenue). Third, there is also a relationship between skill and job opportunities. As the local representative Snyder says: “the Federal government and the State government can say here is money to retrain all of these coal miners because we are closing all of the coal mines. What good is to retrain the coal miners if I don’t have jobs to put them in.” (March 6, 2018) This is a good example of big push where policy needs to target simultaneously security, skill and job opportunity. Finally, there is also an important need to invest in local training facilities in Greene, a fact that was stressed during interviews and should be further investigated.

6.3. Critical infrastructure and diversification

As a result of mono-industrial development, the economic and political spheres in Greene are vulnerable to the decline in the coal industry. There are many questions about the division of power that have not been explored and that would significantly influence the job opportunities of retrenched coal workers. Although all cannot be covered, it is possible to point to certain elements that construct a more nuanced understanding of what drives the job opportunities in the region. The predominance of the coal industry in Greene and concentration of capital around coal activities generated specific limitations for job opportunities. One key limitation is the weakness of infrastructure like broadband coverage.

Figure 15: Labour demand and structural tension



The electricity infrastructure is very developed in the region as a result of investment by the coal companies. In contrast, road and broadband infrastructures are very weak. The Executive Director for Greene at the Department of Economic Development mentions: “there is a lot of change going on and the ones who are going to succeed they are the one who will utilize the technology. We have to get the broadband here or they won’t be able too.” (Matesic, March 6, 2018) Road are also identified: “We need an infrastructure program, the president talks about it, but we don’t get anything done. We need roads, we need highways and those are good jobs.” (Matesic, 2018)

To really understand these questions, it would be essential to collect more information about capital flows and ownership to be able to better map the investments made in Greene to enable economic development and job creation. The limited availability of such data constrains the capacity to discuss power and diversification in greater detail; raising this question would complement the research.

SECTION 7. Conclusions

The closure of Emerald Mine generated a downward cycle affecting job transition in Greene County. The impacts of the closure are being reinforced by external elements like the fluctuation in the energy sector, the employment-based welfare system, the monopolistic concentration of economic activities in the coal sector, the rise of precarious work, and the decline of union membership. Many connections were made between these contextual elements and the working conditions of retrenched workers (late retirement, overtime, long driving to work and multiple part-time employments), and this proves hypothesis 2[29]. The impacts are diverse and include the spread of unemployment, the decline of other sectors, outmigration, and a decrease of government revenue. Together, these evidences prove hypothesis 1[30]. An illustration of such vulnerability is found in the tension that emerges in the labour market with low employment opportunities. This has been a hallmark of mono-industrial economies, and follows what was predicted by the staple theory. For job opportunities to be created and lasting, it is necessary to develop other sectors and invest in infrastructures.

The results are aligned with the cumulative causation theory proposed by Myrdal (1957). Following the theory, the core variables for upward and downward job transition in Greene are job opportunities, skills and security. Strategic planning for transition should stimulate these variables simultaneously. Not to be tautological, such planning would allow for a quicker transition process and a decline of the vulnerabilities of the workers. Concretely, the proposed framework has a number of policy implications: (1) labour demand should be stimulated, (2) training programs should be accompanied through transitional security (income or/and healthcare), and (3) manufacturing does not seem to provide sufficient security.

Overall, the research underlines the co-dependency of certain variables in the coalfielda and their relation to structural vulnerabilities. Reflecting on the methodology and on future research, it would be pertinent to incorporate power dynamics and investments flows in the analysis. Furthermore, the interview sample could be extended to workers who moved outside Greene or to more members of the communities, and further potential policies may be scrutinize in the light of the three variables. Compared to the case studies presented in the literature review, Emerald is characterized for being one of the rare unionised mines, and for experiencing an oil and gas boom. These elements both limited the negative impact of mine closure on Greene retrenched workers. It would be necessary to use more cases as counterfactuals to these specificities. There is also an important study to do to quantify the influence of expectation on individual strategies and on the broader dynamics of transition. All these suggestions underline the vastness of what remains to be explored to properly voice Appalachian coal workers.

[29] Contextual elements influence the transition of workers into worst new occupations.
[30] Structural tension after mine closure slows the process of transition and increase the vulnerability of the local labour market. This generate downward movement in the local economy.

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SECTION 9. Annexes

Annex A: Questionnaires

Questionnaire 1: Interview of Community Stakeholders

Baseline information			
Name:	_____		
	Last	*First*	*M.I.*
Phone:	( ) _____		

Are you born in Greene County?

□ Yes □ No Where did you live previously? _____

When did you move to Greene? _____

Current and past position(s) and period of employment _____

_____

When did you find out about the mine closure?

How long was it between finding out and being retrenched?

Did you decide to leave or change the job before the exact date of closure in March 2015?

Action by Stakeholders/Services for the Workers

Alpha Natural Resource made the announcement to the workers more than one year before the closure. How could you describe the series of decisions and actions taken by the mine/union/government after the announcement and after the closure in Greene?

What did the workers face since the closure of Emerald Mine? What are the biggest difficulties faced by workers?

Can the skills of the miners be easily invested in other employment? What are their limits? What can be done?

Do you have examples of successful programmes to support workers after the closure of a mine (work, training or more)?

Have some of the union or private programs or of the government supports disappeared in the last decades? Have you observed change with the financial crisis of 2008 or with recent politics in the type of support that is received overall by the workers (not only miners) of the region and in United States?

Whom do you consider should give support to the coping process? The local government, union, company or the national government? Or none? Are people aware of the existence of any govt programmes or schemes? Are there any?

Politician	How successful were such programmes in the past? Is the current decline in coal employment different from the previous waves of declines since the 70s? Have your views changed or evolved? Over what time period? What caused them to change?
Mine management	How many workers were transferred to Cumberland Mine? How were they selected? Why was Emerald selected for closure and not its neighbour mine, Cumberland? Will Cumberland also face closure in the next 10 years?
Union	What is similar and different in the current decline in employment with previous labour struggles in coal UWMA was involved in? UWMA was involved in the health retirement plans for workers. What is the health impact on the workers after the coal mines close? Will they be covered if issues stemming from mining arise in the years following the closure of the mine?

Factors that influence the coping

What have been done by the mine to help the workers cope with the closure before and after March 2015? What was the most helpful to the workers?

Do you think worker know about services?

How did the closure of Emerald impact the community? Do you feel many businesses have closed? And what about the social clubs or other community spaces like church? If they haven't close, have they changes in their nature?

Which factors impact their capacity to react to the closure?

Which factors are the more important according to you? Can you rank them in order of importance?

What could be done by the workers, themselves?

Are there other industries or sectors that have been affected by the closure?

Have you worked well with the union/mine administration/politicians to put those in place and organise the closure?

What could have been done differently? What were the biggest barriers to the work being done in the best manner possible?

What would the best solutions for the community? And personally, what would help you now the more to deal with the closure of Emerald Mine?

If I create a fictive scenario: every worker would have reduced the number of hours worked, but everyone would have continued working a little bit longer at the end of Emerald's operation? And with the extra time, people would have received a training. Do you think it is could have worked?

Questionnaire 2: Interview for Workers and Families

Baseline information

Name: _____
Last *First* *M.I.*

Phone: ( ) _____

Are you born in Greene County?

□ Yes □ No Where did you live previously? _____

When did you move to Greene? _____

Previous position(s) at the mine: _____

Did your employment type or content change? _____

What was the period of employment at the mine? _____

Did your employment type or content change? _____

Was it? □ full time □ part time

□ permanent □contractual

Training/Education: Before _____

During _____

After _____

Do you have a pension? □ Yes □ No

Do you have a health insurance? □ Yes □ No

Did your parents work in the mine? _____

How many siblings do you have, and did they work in mine? _____

Who do you live with? Have you been living with them for a long time? _____

Background about the mine closure

When did you find out about the mine closure?

Who told you (word of mouth, rumour, union, manager, etc.)?

How long was it between finding out and being retrenched?

Did you decide to leave or change the job before the exact date of closure in March 2015?

Coping

What did you do when the mine closed to find your new occupation? (Timeline, steps)

Unemployed What are the barriers to find new employment? And motivations?

Employed When did this start, what are you doing now, is this temporary, permanent, part time, full time etc.?

Retired	If you would have had the option to continue to work at Emerald, would you have continued working in the mine? If yes, why? Do you receive the pension benefits you though you would receive?

What was the hardest change for you at the closure?

What are your spouse and children doing? Are they also working in coal? Did the employment of your spouse changed since before and after the mine closure? If yes, how and why?

Have you considered moving outside Greene? What would be the pro & cons for you of moving from Greene? Do you believe Greene can prosper without the mine? Was there job opportunity outside Greene that interested to you?

Would you get new training to find another job? In what? Where? Do you think it changes your chances of being re-employed?

Did you feel change in community after the closure of Emerald Mine? And what about the social clubs or other community spaces like church? Have you kept touch with other miners? How did these changes?

Did other sectors and business closed? Have they changed?

Do you want to continue working in the coal sector? Why? Why not?

Services and Factors that influence the coping

What are the forms of support you received since the closure of the mine (financial, psychological, training)?

What are the sources of support you received since the closure of the mine?

□ union	□ friends	□ local government	□ charity/voluntary group
□ your spouse	□ savings	□ family	□ national policy
□ other(s) _____			

Did it help? Which were the most helpful?

What are the forms of support you received since the closure of the mine (financial, psychological, training)?

Which one is the most needed?

Do you know which governmental programmes or support services exist? Have you used them? What do you think about them?

Since the closure of the mine, how have you been able to pay for your bills? Did you sell your home? Have you had to take a loan (or borrow on credit card)?

Since the closure did services or support available changed?

Are there some programs that you could not qualify to or which duration or requirement were preventing you to participate in?

Looking back, what are the other resources you could have used? Things you could have done differently?

What would the best solutions for the community?

And personally, what would help you now the more to deal with the closure of Emerald Mine?

If I create a fictive scenario: every worker would have reduced the number of hours worked, but everyone would have continued working a little bit longer at the end of Emerald's operation? And with the extra time, people would have received a training. Do you think it is could have worked?

Annex B: Population changes

Trying to assess change in population linked to the energy sector, Census Bureau division of American States data on the migration flow between 2010 and 2015 can be used[31]. The main one is within Pennsylvania. Considering migration between states, the flow between Greene and counties in South region are the most significant. Yet, the net migration between 2010 and 2015 is not that significant with only - 81 individuals. Empirical evidences contradict the information from the interviews according to which oil and gas workers from Texas and Alabama would be now establishing themselves in the county. The estimate indicates an inflow of 5 individuals from Texas. However, these estimates do not account for temporary stay, which could be the case of many oil and gas workers.

Table 9: Estimates of migration flows between counties in USA, 2010-2015

Regions	Migration Flow to Greene	Counterflow out of Greene	Net Migration to Greene
West	**14**	**102**	**-88**
Midwest	**188**	**197**	**-9**
Northeast	**1647**	**936**	**711**
Northeast without Pennsylvania	45	29	16
Pennsylvania	1602	907	695
Adjacent Counties to Greene in Pennsylvania (Fayette and Washington)	51	13	38
South	**579**	**660**	**-81**
South without West Virginia	231	273	-42
West Virginia	348	387	-39
Adjacent Counties to Greene in West Virginia (Marshall, Monongalia and Wetzel)	265	352	-87

Source: Author's representation from Census Bureau, 2016.

However, any workers from the coal, and the oil & gas industries are not registered as Greene inhabitants. Many workers of the coal sector drive to go to work. Thus, availabilities of housing will be used to further estimate demographic changes. It underlines the temporality of the size of the population: "There is a lot of transient workers that come with the gas industry no question. When the industry is booming our hotels are full, you cannot find a nock or a cranny to rent but you know whenever they are on the down side" (Snyder, March 6, 2018). The housing market also presents the limitations in trying to access mobility since for the companies (coal and gas), the cost of the property is lower than the cost of repairing especially after fracking. According to the Chief

[31] This time period is used to track the workers who moved outside Greene when they learned about the closure, before the official closure in March 2015. Also, there are some limitations in data availability to consider more recent period.

of the Assessment Office in Waynesburg, the oil and gas boom increase the high costs for renting and buying housing and such cost have been maintained higher than what the county experienced in the past. Monthly cost for renting apartment have increased from $ 400 to 1000 according to estimates of the Chief Assessor who adds: “I don’t look for it to ever go back to that $300 to 500 but it has leveled off over the last 2 years to where it is more affordable for the local people who are here and have been here” (Lewis, March 7, 2018).

Linking back to the methodological limitations presented in section 4.2, this encourages for more data to be collected about the different type of immigration, to age distribution and to transient workers. These would allow to better estimate the size of the impact of mine closures in Greene.

Annex C: Ethical clearance

Faculty of Commerce, Law and Management
University of the Witwatersrand, Johannesburg

School of Economic and Business Sciences
Private Bag X3, WITS, 2050, South Africa ▪ Telephone: +27 11 717 8004 ▪
email: Siyabonga.Molaba@wits.ac.za

CLEARANCE CERTIFICATE **PROTOCOL NUMBER: CECON/1100**

PROJECT: **EXPLORING THE IMPACT OF THE CLOSURE OF EMERALD MINE ON RETRENCHED WORKERS**

INVESTIGATOR: Clara Lea Dallaire-Fortier

STUDENT NUMBER: **1756629**

SCHOOL: SEBS

DATE CONSIDERED: 27 November 2017

DECISION OF THE ETHICS COMMITTEE: Approved

NOTE

Unless otherwise specified this ethics clearance is valid for 1 year and may be renewed upon application. Please remember to include the protocol number above to your participation letter.

DATE: 01/12/2017 **CHAIRPERSON: Jean-Marie Bancilhon**

cc: Supervisor:

Lotta Takala-Greenish

SCHOOL OF ECONOMIC & BUSINESS SCIENCES