Market Concentration and Natural Resource Development in Rural America

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Abstract

Natural resource development, both extractive (oil, gas, mining, timber) and non-extractive (tourism, real estate, outdoor recreation), has been found to negatively impact economic prosperity in rural America. One mechanism recently proposed for why this occurs is high levels of labor market concentration, or oligopsony. Oligopsony occurs when there are few employers within a labor market and can lead to suppressed wages and a power imbalance between employers and workers. In this paper, we test the moderating effect of labor market concentration on the relationship between natural resource development and per capita income and poverty in rural America from 2010 to 2016. By comparing results between extractive and non-extractive development, as well as manufacturing, we show that labor market power attenuates the beneficial relationship observed at low levels of specialization in natural resources—particularly for extractive forms of development. Further, by finding no significant relationship between manufacturing specialization and economic prosperity, nor any moderating effect of labor market concentration in the case of manufacturing, we demonstrate that natural resource development and labor market concentration have a unique relationship with rural American economic prosperity.

Keywords: Natural Resources, Oligopsony, Poverty, Market concentration, Dependence

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1. Introduction

Rural labor markets, particularly those grounded in natural resource development, are well-known for being vulnerable and prone to economic hardship (Freudenburg, 1992; Krannich et al., 2014; Lobao et al., 2016; Mueller, 2021a,b). In the United States, rural areas dependent on, or over-specialized in, natural resource development have been found to have elevated levels of poverty, lower incomes, and higher inequality (Douglas and Walker, 2017; Deller and Schreiber, 2012; Freudenburg and Wilson, 2002; Krannich et al., 2014; Lobao et al., 2016; Mueller, 2021a; Perdue and Pavela, 2012). Although prior work on natural resource dependence has mostly focused on extractive activities (e.g., oil, gas, mining, timber), there is an increasing awareness among scholars that non-extractive activities such as tourism, outdoor recreation, real estate, and other forms of natural amenity development can result in negative social and economic outcomes for rural people (Mueller, 2021b; Sherman, 2018; Ulrich-Schad, 2018; Winkler et al., 2012). In this paper, we build upon this growing understanding by evaluating the moderating role of labor market concentration in the relationship between extractive and non-extractive natural resource dependence and economic prosperity.

High levels of labor market concentration, meaning few employers within a given labor market, are detrimental to the economic prosperity of workers through wage suppression and decreased labor power (Azar et al., 2020b; Steinbaum, 2019). Although labor market concentration experienced a recent growth of research attention from economists working on labor markets in general, the topic has received scant attention from those focused specifically on rural people and places. Given that rural labor markets are often concentrated simply due to their size (Azar et al., 2020a), and are frequently dominated by a single large employer (Thiede et al., 2017), the negative impacts posed by oligopsony—meaning a labor market with few employers, and the employer power that goes with it—appear highly relevant to rural scholars, particularly those focused on natural resource development. In-step with this, Mueller (Forthcoming), in his integrative theoretical framework of natural resource dependence, termed dual dependency, argued a key mechanism of natural resource dependence is the local oligopsony formed by natural resource capitalists in the United States. In this paper, we test this conjecture from 2010 to 2016 at the county-level for extractive and non-extractive natural resource-related development. We do so by estimating the non-linear impact

of each form of development on per capita income and poverty, and then evaluate how that non-linear relationship changes across the range of market concentration. Further, by also testing these relationships for rural manufacturing, we show that the moderating effect of market concentration appears to be a unique effect for the natural resource sectors.

2. Background

2.1. Market Concentration and Monopsony

An important element of labor markets is how market structure relates to the relative power of employers versus workers. Paraphrasing Weber (1971, 180), power can be defined as the ability to realize one’s will “even against the resistance of others.” Power can be achieved by various qualitative and structural differences that grant one party an advantage over the other (Burt, 1997). In labor markets, market power is achieved by limiting other parties’ ability to “walk away” from an exchange, since the capacity to be selective is crucial to bargaining power (Bowie, 1988). One way employers enjoy market power over workers is to be the sole buyer (or one of few buyers) of labor, known as monopsony and oligopsony, respectively (Steinbaum, 2019; Steinbaum and Stucke, 2019).

Market concentration is achieved when a firm, through mergers, acquisitions, or internal growth, acquires a greater share of the market than other firms, thus the number of firms is reduced and the market is concentrated around those firms (Azar et al., 2020b; Glenna and Cahoy, 2009; Harrigan, 1984). Vertical integration describes when companies expand their control to multiple segments of the commodity chain (Harrigan, 1984). Meat packing industries, for example, vertically integrate by expanding into livestock production and product distribution, allowing companies to reduce risks and negotiate more advantageous contracts with farm laborers (Crabtree, 2016). Horizontal integration, what we examine in this paper, is defined as a single company or small group of companies “gaining greater market share of one segment of a commodity chain” (Glenna and Cahoy, 2009, 114). A rural example of horizontal integration is when larger hospitals purchase smaller hospitals in rural counties, turning them into branches of a single firm rather than independent competitors (Williams et al., 2020). Using vertical or horizontal integration is a common strategy for firms to increase their market share, and as sectors become globalized, firms face pressure to

gain market share in response to their competitors becoming vertically or horizontally integrated. The result is that firms either seek similar restructuring, or they risk being acquired themselves (Glenna and Cahoy, 2009; Hart and O’Connell, 2006; Herbert and Pritchard, 2004; Heaver et al., 2001; Kudelko et al., 2015). Importantly, we can examine market concentration at multiple scales depending on the question at hand. For instance, we can discuss market concentration in terms of a local labor market as we do in this paper, or in terms of an entire nation, as done elsewhere.

Market concentration is problematic in that it can reduce competition and grant employers asymmetrical control compared to labor (Hafiz, 2019; Steinbaum and Stucke, 2019). In America, horizontal concentration has become a “stylized fact” as there are fewer firms available to purchase labor, pushing local labor markets toward monopsony or oligopsony (Azar et al., 2020b, 13). These changes in America are in-part due to antitrust laws that overemphasize consumer welfare, or the view that price effects are the most meaningful outcome for consumers (Steinbaum and Stucke, 2019). This approach overlooks the fact that increased market concentration comes at a deficit to employees in the form of a lack of competition in the market and decreased bargaining power on the part of employees (Hafiz, 2019; Steinbaum and Stucke, 2019). It is important to note that some proponents of market concentration consider it an effective way to conduct business (Harrigan, 1984). Horizontal mergers and acquisitions may benefit firms, not necessarily employees, through both greater economies of scale and the ability to successfully compete against larger competitors that make similar decisions (Hart and O’Connell, 2006). Still, greater market concentration is generally associated with rising social inequality because as employers gain asymmetrical control, employees have less power to bargain for quality working conditions (Hafiz, 2019). Where there is a lack of employment alternatives, as is common in rural settings, asymmetrical control is associated with degraded labor conditions, as employers shift risks on to employees, curtail pay and benefits, and suppress wages as a means to reduce costs and increase efficiency (Kalleberg, 2011).

Although rural labor markets are often presumed to be fairly concentrated, the majority of the extant work on market concentration has little to say about rural areas. Azar et al. (2020b) show that rural areas experience especially high levels of horizontal integration, and that this is associated with lower wages. However, there is scant other research focused on rural contexts. For instance, Crabtree (2016); Glenna and Cahoy (2009); Hart and O’Connell (2006); and Steinbaum (2019) examine integration and monopsonies among specific sectors, but their analysis does not fo-

cus on spatial segmentation. In the same time frame that much vertical and horizontal integration practice has increased (from the 1970s and on), rural America has experience significant industrial and economic restructuring (Brown and Schafft, 2019). Given that rural areas have smaller populations and fewer firms compared to urban and suburban geographies, they are more likely to be concentrated by default. In this analysis, we aim to fill this gap in the literature by focusing directly on market concentration in rural America.

2.2. Natural Resource Development in Rural America

We center our analysis of rural American labor market concentration in the extant literature on natural resource development and the theoretical framework of dual dependency. Drawing on the work of Mueller (Forthcoming), we divide natural resource development into the categories of extractive (oil, gas, mining, timber) and non-extractive (tourism, outdoor recreation, real estate) development. These two sectors, particularly extraction, have been historically associated with natural resource dependence, or over-specialization in the natural resource sectors (English et al., 2000; Krannich et al., 2014; Mueller, 2021b). This over-specialization is characterized by an association between high levels of natural resource development and low levels of economic prosperity (Freudenburg, 1992; Krannich et al., 2014; Mueller, Forthcoming). Although variable by region and time, elevated levels of extraction in the United States have been associated with lower income, elevated unemployment, higher poverty, and heightened inequality (Freudenburg, 1992; Lobao et al., 2016; Nord and Luloff, 1993; Mueller, 2021a; Perdue and Pavela, 2012; Stedman et al., 2005). Further, although the literature is less-developed than it is for extraction and remains conflicted, high levels of non-extractive forms of natural resource development in rural America have been associated with negative returns to income, elevated poverty, unaffordable housing, and social conflict (English et al., 2000; Ghose, 2004; Hines, 2010; Nelson and Hines, 2018; Mueller, 2021a; Sherman, 2018; Ulrich-Schad, 2018; Ulrich-Schad and Qin, 2018). Although it should be noted that non-extractive activities have been advanced as a boon, or at least not a net harm, to rural communities in a number of papers grounded in economic growth models (Deller et al., 2001, 2008; Deller, 2010; Marcouiller et al., 2004).

Until recently, there was limited theoretical synthesis regarding the relationship between the outcomes from extractive and non-extractive forms of development. Although many theories had

been advanced for why extraction is especially harmful to rural economies (see Mueller (Forthcoming) for a full discussion), non-extractive natural resource activities in rural America have had far less theoretical discussion, with much of the theory grounded in basic economic growth models (Deller et al., 2001, 2008; Deller, 2010; Marcouiller et al., 2004). To remedy this lack of cohesion, Mueller (Forthcoming) developed the framework of dual dependency, which we test elements of in this paper. This integrative framework draws on critical theories of capitalism to posit that the root cause of natural resource dependence is the contradiction between the need for capital to be in motion and the spatially static nature of natural resources, termed the spatial contradiction. Due to this contradiction, capitalists in the natural resource sectors face greater friction when attempting to relocate investments than they would in other industries. This contradiction, combined with the ease of external investment in rural areas available to capitalists under American federalism, creates perverse incentives for natural resource capitalists and results in them doubling-down in the locality.

This doubling down is characterized by the natural resource capitalist intentionally inhibiting broad-based economic development and agglomeration, while trying to preserve the highest rate of profit possible (Mueller, Forthcoming). Importantly, both extractive and non-extractive capitalists experience this contradiction—as both are interested in generating profit off of a static resource base. Thus, it is expected that both extractive and non-extractive forms of natural resource development will have an inherently exploitative relationship with rural labor markets, pushing the labor markets into the formation of dual dependencies, the first upon the global capitalist system, and the second upon the resource rich local environment (Mueller, Forthcoming). Within the framework of dual dependency, it is expected that some level of specialization in the natural resource sectors is not inherently bad, and it is likely to result in positive outcomes. It is at high levels of specialization that we expect over-specialization effects (e.g., negative returns) to be more likely (Mueller, 2021a).

Within this framework, Mueller (2021b) identified eight mechanisms by which the spatial contradiction results in adverse economic outcomes. These include disinvestment in education, local elite power, gendered labor markets, low quality jobs, corporate capture of regulatory agencies, temporal variation in markets, low market diversity, and localized oligopsony (e.g., market concentration). The last, localized oligopsony, is our focus in this paper. As stated prior, rural areas have a tendency to face a higher degree of market concentration simply due to the size of the

population (Azar et al., 2020a). However, in the context of natural resource development, Mueller (2021b) argued this problem will be especially severe. The reason for this is that the economies of scale required to operate in these sectors, particularly extraction, are increasingly infeasible for smaller regional businesses. Due to this, it is easier for external companies to dominate the rural labor market, leading to oligopsony. From this, all of the other deleterious outcomes from elevated market concentration, including wage suppression and inadequate labor power (Azar et al., 2020b; Steinbaum, 2019), work in-concert with the other mechanisms identified to reduce economic prosperity.

Although high levels of labor market concentration are often viewed as being a characteristic only found in extraction (e.g., the company town), non-extractive natural resource capitalists are increasingly operating at large economies of scale which can dominate the labor market of an entire community (Mueller, 2021b). Examples of this include Vail Resorts, which is continuing to apply economies of scale to the ski industry, and Delaware North, which utilizes both horizontal and vertical integration to operate gifts shops and resorts in rural areas (Mueller, 2021b). Given the role of market concentration as a hypothesized mechanism of dual dependency, we expect that higher levels of market concentration will moderate the relationship between natural resource development and economic outcomes. This moderation is expected to result in the relationship between natural resource development and economic outcomes being less dynamic at higher levels of market concentration. This is because we do not expect to see the benefits hypothesized under dual dependency, and partially validated by (Mueller, 2021a), at low levels of development in the case of high market concentration due to wage suppression and diminished labor power.

2.2.1. Hypotheses

Our hypotheses for this analysis build from the literature reviewed, the theory presented by (Mueller, Forthcoming), and recent empirical tests conducted by (Mueller, 2021a)—which illustrated important nuance initially lacking in the theoretical arguments by Mueller (Forthcoming). Modeling the relationships between natural resource development and economic outcomes as non-linear (i.e., quadratic) from 2000 to 2015, Mueller (2021a) found evidence of overspecialization, on average, at high levels of extraction—particularly in remote rural counties. In the case of non-extractive development, Mueller (2021a) did not find the expected relationship, which he hy-

pothesized would be similar to extraction. Instead, Mueller (2021a) found that non-extractive development generally resulted in negative economic outcomes across the range of development, with the returns variously improving or getting worse across the range of development dependent on outcome. Importantly, this unexpected finding did not disprove the arguments laid out in the framework of dual dependency, but rather provided important evidence that we cannot expect identical patterns of over-specialization between extractive and non-extractive development just because they share the spatial contradiction. Relying on the outlined literature, our formal hypotheses in this analysis are as follows:

Hypothesis 1: Extractive natural resource development will have a non-linear relationship with income and poverty, wherein the beneficial relationship at low levels of development diminish and ultimately become negative.

Hypothesis 1.1: As market concentration increases, the initial beneficial results of development at low levels of development will be reduced, resulting in a more consistent, and less beneficial, relationship.

Hypothesis 2: Non-extractive development will have a non-linear relationship with income and poverty, wherein the relationship, which may or may not be beneficial at low levels, will become less beneficial as the absolute level of development increases.

Hypothesis 2.1: As market concentration increases, the initial beneficial results of development at low levels of development will be reduced, resulting in a more consistent, and less beneficial, relationship.

2.3. Manufacturing and Comparison Hypothesis

Although the focus of our analysis, and guiding theoretical framework, is related to natural resource development, we also assess the relationship between manufacturing and economic outcomes in this study. This decision was made due to a limited amount of direct comparison between natural resource sectors and non-natural resource sectors in the literature on natural resource dependence. Thus, it remains an empirical question if the overspecialization we expect for natural resource-related industries is truly unique, or just a common pattern of overspecialization more often evaluated by natural resource scholars. Manufacturing is a valuable sector for this comparison

due to its rich history and presence in rural American labor markets (Brown and Schafft, 2019; Thiede and Slack, 2017). Manufacturing in rural America has ebbed and flowed over the past 50 years. In the 1970s and 1980s there was a boom in rural manufacturing which rejuvenated much of rural America as jobs in manufacturing exited urban areas for more desirable economic contexts in rural regions (Lovejoy and Krannich, 1982; Thiede and Slack, 2017). Unfortunately, the boom of the 1980s was more short-lived than many had hoped. As globalization proceeded, many manufacturing jobs which initially relocated from urban to rural America, ultimately relocated overseas. As evidenced by this migration of the capitalist investment, manufacturing represents a sector more detached from the spatial contradiction than the natural resource sectors. Instead of doubling down, we see the spatial fix described by Harvey (2018:1982) and Smith (1984)—wherein firms relocated to avoid crises of overaccumulation and labor market power (Smith, 1984, 2011)—operating as expected. From this history, we expect that over-specialization is unlikely in the manufacturing sector. This is because the perverse incentives which cause natural resource capitalists to double down in rural areas do not exist within the manufacturing sector. Thus, any manufacturing remaining in a rural area from 2010 to 2016 likely has a reason to do so and is expected to have a simply beneficial, and relatively stable, relationship with economic outcomes across the range of manufacturing development. The formal hypothesis for this comparative case is as follows:

Hypothesis 3: Manufacturing will have a steady positive relationship with economic outcomes, wherein growth in manufacturing is associated with positive returns to economic indicators.

Hypothesis 3.1: Although over-specialization is not expected, the benefits of manufacturing will still be reduced at higher levels of market concentration.

3. Methods

3.1. Data

Data for this study were collated from six different sources to make a county level dataset for the United States from 2010 to 2016. Demographic data and poverty rates were taken from the 2010 Census, as well as the American Community Survey (ACS) five-year estimates for each wave from 2008-2012 to 2014-2018. For each year of the data, five year estimates were centered on the mid-year

(e.g., 2010-2014 is treated as 2012). Census and ACS data, along with a corresponding shapefile were extracted from the National Historical Geographic Information System (NHGIS; Manson et al. (2020)). Data for per capita income and total county employees were extracted from the Bureau of Economic Analysis (BEA) Local Area Personal Income and Employment data (Bureau of Economic Analysis, 2020). Our data on county-level industry employment was extracted from the Imputed County Business Patterns Database developed by Eckert et al. (2020). Our county-level measures of labor market concentration were computed from the database of online job postings produced by Burning Glass Technologies (Burning Glass, 2020). Finally, we use USDA Economic Research Service Rural Urban Continuum Codes (RUCC) for our measure of rurality (Economic Research Service, 2020). Due to boundary changes and idiosyncrasies between the way each data source managed certain types of county-level units (e.g., the independent cities of Virginia), a number of counties were merged into time-consistent geographic units in both our quantitative database and our shape file. Further, with the exception of Hawaii—which is all islands—the three island counties within continental states were merged into their nearest inland neighbor to facilitate spatial econometrics. All county boundary changes are detailed in the appendix (Table A1). In our base models no data is missing, with the exception of a single 2016 observation of a New Mexico county where poverty data was not reported by the Census. In our market concentration models, a significant number of county-year observations were missing because their market concentration was unidentifiable. This is detailed further below.

3.2. Dependent Variables

In line with prior work in this area, to ensure our analysis captured an aggregate measure of income, as well as the distribution of that income, we assess two dependent variables: per capita income and poverty (Lobao et al., 2016; Mueller, 2021a). Per capita income, extracted from Bureau of Economic Analysis (2020), is adjusted for residence. This means that our dependent variable is not the per capita income of all income generated in a county, but is instead the per capita income which went to residents of the county. This decision was made so that our dependent variables reference the same population, while also more fully capturing the theory being tested—which emphasizes impacts to residents (Mueller, Forthcoming). Per capita income was calculated by dividing the total income to residents reported by the Bureau of Economic Analysis (2020)

in thousands by the census total population reported for the corresponding period. Poverty rate was calculated by dividing the population determined as being below the poverty line by the total population for whom poverty status was determined and multiplying by 100 as reported by NHGIS (Manson et al., 2020).

3.3. Independent Variables of Interest

3.3.1. Employment Share

We operationalize the level of development in a sector via employment share. Employment share was calculated for the three sectors outlined prior: Natural resource extraction, non-extractive natural resource activities, and manufacturing. To calculate employment shares in each sector, the total number of employees estimated in each sector by Eckert et al. (2020) was divided by the total number of workers within the county reported by the BEA for the equivalent year and multiplied by 100. Industries were determined by evaluating the relevant North American Industrial Classification System codes and selecting those appropriate to hypothesis testing. In-line with prior work Mueller (2021a,b), extraction was comprised of forestry and logging (NAICS=113); support activities for forestry (NAICS=114); fishing, hunting, and trapping (NAICS=1153); and mining, quarrying, and oil and gas (NAICS=21). Non-extractive activities included arts, entertainment, and recreation (NAICS=71); accommodation and food services (NAICS=72); scenic sightseeing and transportation; and real estate and rental and leasing (NAICS=531). Manufacturing was comprised of the general County Business Patterns manufacturing grouping (NAICS=31).

3.3.2. Market Concentration

Market concentration was computed using the Herfindahl-Hirschmann Index (HHI) (Azar et al., 2020b). This index, scaled from 0 to 1, where 0 means no market concentration and 1 means complete market concentration, indicates the level of concentration found within an industry in a labor market. For any given market, the HHI is computed as

$$HHI = \sum_i^N s_i^2 \quad (1)$$

where s_i is the market share of firm i , and those shares are squared and summed across all active firms. Similar to Azar et al. (2020a), we calculate HHI using online job vacancy data from

Burning Glass, a market research firm that tracks online job announcements, and who posts those announcements, across the country.

For our purposes of this analysis, the geographic labor market used to estimate HHI is the county. Although labor markets may extend beyond county boundaries (Fowler and Jensen, 2020), the likelihood of workers applying to a given job diminishes strongly in distance. According to one estimate, 50% of all job applications are made to employers located in the county where the applicant lives (Marinescu and Rathelot, 2018). Further, our use of spatial econometrics, detailed below, captures the spillover effects of concentration occurring across county boundaries.

For the industry dimension of market concentration, we use three “super-industries”: natural resource extraction, non-extractive economic development (e.g., tourism), and manufacturing. For each super-industry, we collapse all job postings from each NAICS sector within that super-industry.¹ From these pooled groups of vacancies, we then estimated an upper and lower-bound HHI for each super-industry. The bounds refer to the assignment of vacancies whose employer is not identified: either individually to separate firms (corresponding to lower-bound HHI), or all to the same firm (upper-bound HHI). We use the lower bound in our analysis.

Given this approach, job openings had to be posted for a market concentration to be calculated. If no job openings were posted in a given county-super industry-year, then the market concentration is not defined. We only include defined observations in all models. Due to this, we only include 11,522 county-year observations in our market concentration model of income and 11,521 in our model of poverty. It is important to acknowledge that the greatest percentage of missing observations was for the most rural counties. A total of 70.24% of metropolitan county-year observations had identified HHIs for all three sectors, compared to 47.65% of non-metropolitan metro-adjacent and 37.73% non-metropolitan remote counties. Although this means we are not capturing all of rural America in these models, it is the best data on the topic known to us at this time. Given the importance of understanding market concentration in rural America and the fact that our fixed

¹For the extractive super-industry, the NAICS codes are 113, 114, 1153, and 21. For the non-extractive, the NAICS codes are 72, 71, 531, and 487. For manufacturing, they are 31, 32, and 33. These are larger industries than has been typical in the literature on labor market concentration that uses industry-based market definitions, yielding lower (more conservative) estimates of concentration that likely over-estimate the degree to which workers in a sector can or typically do cross or consider crossing market boundaries (Benmelech et al., 2020).

effects model specification attenuates some of the bias this imposes, we believe using this data, while acknowledging its weaknesses, is better than not asking the question at all.

3.3.3. Time-Variant Control Variables

Although our use of time and period fixed effects removes bias imposed by time-invariant confounders, it does not account for those confounding factors which vary over time. To account for this, we employ the same control variables used by (Mueller, 2021a). These factors are expected to influence both our economic outcome variables and our independent variables of interest and include total population—expected to lead to lower levels of extraction and greater economic prosperity (Johnson and Lichter, 2019); percent of the population over the age of 65—which can either decrease extractive natural resource development and economic prosperity through aging in place (Thiede et al., 2017), or increase non-extractive development and economic prosperity through amenity migration (Poudyal et al., 2008); and percent of the population which is white, Black, and Latino/a—expected to capture the confounding effects of ethnoracial concentration which can impact the form and level of development and economic prosperity due to deep-seated racism (Duncan, 2014; Harvey, 2017), labor market discrimination, and linked migration patterns between Latino/a immigrants and amenity migrants (Nelson et al., 2009).

3.3.4. Rural Indicator

The interest of our analysis is rural counties. However, rurality is not a simple dichotomy. In reality, rurality is a continuum which is notoriously difficult to capture (Isserman, 2005; Schroeder et al., 2019). To ensure we both capture some degree of this continuum, while still providing an interpretable analysis, we use a three-category rural indicator. This indicator, generated via the RUCC codes (Economic Research Service, 2020), classifies counties as either Metropolitan, Non-Metropolitan Metro-Adjacent, or Non-Metropolitan Remote (e.g., not adjacent to a metropolitan area).

3.4. Analytic Approach

We evaluate our hypotheses using Spatial lag of X (SLX) models with both period and unit fixed effects with cluster-robust standard errors (Cameron and Miller, 2015; Vega and Elhorst, 2015). It was necessary to use a spatial econometric model due to the permeable nature of county boundaries

and the spatial clustering of social factors in the United States (Brooks, 2019; Chi and Zhu, 2019; Lobao et al., 2007a,b; Thiede et al., 2018). We use the SLX model, which is a local spillover specification including spatial lags of all independent variables, due to the recommendations of Vega and Elhorst (2015). This model is desirable because it can be estimated via conventional OLS regression techniques, can handle the non-linear effects we model, and is easily interpretable (Gibbons and Overman, 2012; Vega and Elhorst, 2015). Unlike more complicated spatial models, in an SLX model, the direct relationship is simply β and the indirect relationship is simply θ (Vega and Elhorst, 2015).

To estimate the effects of interest, a series of quadratic terms and interactions were included in our models. For each outcome, we first estimate a base model which evaluates the non-linear within-county relationship between each form of development and the outcome of interest. The non-linear effect is specified as quadratic due to the underlying hypothesis of over-specialization—wherein the effects of development is expected to diminish at higher levels (Mueller, Forthcoming, 2021a). Although we do not expect manufacturing to have similar over-specialization effects as natural resources, we model it in the same way to explicitly test this conjecture.

We isolate the effect for non-metropolitan metro-adjacent and non-metropolitan remote counties by interacting our three-category variable with the independent variables of interest, resulting in a simple spatial-regime approach (Chi and Zhu, 2019). This approach allows us to extract the direct effect of each form of development for each of the three types of counties. Although metropolitan effects are estimated, we do not report them in the results due to their irrelevance to study hypotheses.

The full base model is presented in Equation 2, where y_{it} is the outcome of interest for county i at time t , $metro$ is the three-category indicator of metropolitan status, ex_{it} is the employment share in extraction, nx_{it} is the employment share in non-extractive natural resource activities, man_{it} is the employment share in manufacturing, X is a vector of time variant controls, W is a first-order queen’s contiguity spatial weights matrix, β is the direct relationship between an independent variable and the outcome, θ is the indirect relationship between an independent variable and the outcome, and u_{it} represent the error in model captured by the unit fixed effect, μ_i , the period fixed effect c_t , and stochastic error, ϵ_{it} .

$$\begin{aligned}
y_{it} = & metro * [\beta_1 ex_{it} + \beta_2 ex_{it}^2] \\
& + metro * [\beta_3 nx_{it} + \beta_4 nx_{it}^2] \\
& + metro * [\beta_5 man_{it} + \beta_6 man_{it}^2] \\
& + W\theta_1 ex_{it} + W\theta_2 ex_{it}^2 \\
& + W\theta_3 nx_{it} + W\theta_4 nx_{it}^2 \\
& + W\theta_5 man_{it} + W\theta_6 man_{it}^2 \\
& + \beta_7 X_{it} + W\theta_7 X_{it} + u_{it} \\
u_{it} = & \mu_i + c_t + \epsilon_{it}
\end{aligned} \tag{2}$$

After estimating the base model, we estimate our full models by introducing market concentration in the form of HHI. As seen in Equation 3, the super-industry-specific HHI, C is interacted with the relevant employment share terms to test our hypotheses regarding the detrimental effect of market concentration.

$$\begin{aligned}
y_{it} = & metro * [(\beta_1 ex_{it} + \beta_2 ex_{it}^2) * C_{ex}] \\
& + metro * [(\beta_3 nx_{it} + \beta_4 nx_{it}^2) * C_{nx}] \\
& + metro * [(\beta_5 man_{it} + \beta_6 man_{it}^2) * C_{man}] \\
& + (W\theta_1 ex_{it} + W\theta_2 ex_{it}^2) * C_{ex} \\
& + (W\theta_3 nx_{it} + W\theta_4 nx_{it}^2) * C_{nx} \\
& + (W\theta_5 man_{it} + W\theta_6 man_{it}^2) * C_{man} \\
& + \beta_7 X_{it} + W\theta_7 X_{it} + u_{it} \\
u_{it} = & \mu_i + c_t + \epsilon_{it}
\end{aligned} \tag{3}$$

Due to the difficulties in interpretation posed by our models due to non-linear effects and three-way interactions, we present our results visually via estimates of the marginal direct relationships between independent variables of interest and outcomes. Thus, full tables of regression output are not included in this manuscript, but are available in the online supplement (Table A3). We

estimate our base marginal effects across a constrained range of employment shares for all three forms of development. Effects are estimated across a range which contains the vast majority of observations for all three forms—all integers from 0 to 30 (Mueller, 2021a). Finally, to evaluate the impact of HHI, we re-estimate our base marginal effect with HHI held at 0.25, 0.5, 0.75, and 1. From this, hypotheses are evaluated by assessing the changing values of the direct relationships, and the overlap of the 95% confidence intervals of estimates with zero.

4. Results

4.1. Descriptive Results

For the sake of brevity, we only present summary statistics for non-metropolitan counties here. Summary statistics for metropolitan counties and all counties combined are available in the online supplement. As seen in Table 1, manufacturing had a greater average employment share over the study period from 2010 to 2016 than either form of natural resource development. Further, non-extractive natural resource-related development played a much more significant role in both forms of non-metropolitan counties than extraction, on average. When considering market concentration, the most heavily concentrated form of development, on average, was extraction. This was then followed by manufacturing and non-extractive activities.

4.2. Base Models

Here we will first present both base models, and then present the results for market concentration models. Results from our base models are shown in Figures 1 and 2. Increases in extraction were initially associated with increases in income and decreases in poverty, but these relationships diminished as employment share grew. In-line with prior work, these effects were more visible in remote non-metropolitan counties than those that were metro-adjacent (Mueller, 2021a). Non-extractive development had a less significant relationship than expected. Although the trends of non-linearity were similar to those found by Mueller (2021a), the relationship was only consistently significantly different than zero in the case of per capita income in remote counties. Finally, manufacturing countered expectations of beneficial relationships by displaying stable relationships not significantly different than zero in all but the case of per capita income and remote counties, where over-specialization effects were visible.

Table 1: Summary Statistics for Model Variables

	Mean	SD	Min	Max
Nonmetropolitan Remote (N = 941)				
Per Capita Income to Residents (thousands)	22.81	9.95	6.69	101.14
Poverty Rate	16.82	7.19	1.51	55.10
Extractive Employment Share	1.78	3.79	0.00	60.48
Non-extractive Employment Share	5.80	4.78	0.00	55.61
Manufacturing Employment Share	6.52	7.91	0.00	86.63
HHI - Extraction	0.78	0.29	0.05	1.00
HHI - Non-extractive	0.41	0.31	0.01	1.00
HHI - Manufacturing	0.55	0.32	0.03	1.00
Population (thousands)	16.75	17.80	0.07	197.66
Percent Over 65	18.82	4.96	3.79	39.16
Percent white	86.30	17.16	3.11	100.00
Percent Black	5.59	12.93	0.00	77.46
Percent Latino/a	8.88	14.73	0.00	95.54
Non-metropolitan Metro-Adjacent (N = 1,020)				
Per Capita Income to Residents (thousands)	19.79	5.95	1.27	127.41
Poverty Rate	17.95	6.42	0.00	53.95
Extractive Employment Share	1.27	2.89	0.00	36.33
Non-extractive Employment Share	6.20	4.09	0.00	68.87
Manufacturing Employment Share	9.85	7.91	0.00	74.28
HHI - Extraction	0.81	0.27	0.04	1.00
HHI - Non-extractive	0.34	0.27	0.00	1.00
HHI - Manufacturing	0.48	0.30	0.01	1.00
Population (thousands)	29.79	23.78	0.60	189.28
Percent Over 65	17.96	3.73	4.58	38.82
Percent white	84.01	17.38	3.55	100.00
Percent Black	9.77	16.17	0.00	87.41
Percent Latino/a	8.05	13.59	0.00	99.18

Figure 1: Base model results for per capita income. Predicted marginal direct relationships for per capita income across constrained ranged of employment share. Other variables held constant at means. Vertical bars represent 95% CI.

Figure 2: Base model results for poverty. Predicted marginal direct relationships for poverty across constrained ranged of employment share. Other variables held constant at means. Vertical bars represent 95% CI.

4.3. Market Concentration Models

4.3.1. Extraction

Results for our market concentration models of extraction are presented in Figures 3 through 6. Across both the income and poverty models, results generally support the market concentration specific hypothesis for extractive development. In three of the four figures we can see that the initially beneficial relationship between development and economic outcomes observed at low absolute levels of development diminished, and the overall relationship became more constant, as HHI rose. This effect was not observed for the relationship between extraction and income in metro-adjacent counties.

Figure 3: Predicted marginal direct relationships for per capita income across constrained ranged of extractive employment share in remote counties. Other variables held constant at means. Vertical bars represent 95% CI.

Extractive Development and Income - Metro Adjacent

Figure 4: Predicted marginal direct relationships for per capita income across constrained ranged of extractive employment share in metro-adjacent counties. Other variables held constant at means. Vertical bars represent 95% CI.

Extractive Development and Poverty - Remote

Figure 5: Predicted marginal direct relationships for poverty across constrained ranged of extractive employment share in remote counties. Other variables held constant at means. Vertical bars represent 95% CI.

Extractive Development and Poverty - Metro Adjacent

Figure 6: Predicted marginal direct relationships for poverty across constrained range of extractive employment share in metro-adjacent counties. Other variables held constant at means. Vertical bars represent 95% CI.

4.3.2. Non-extractive Natural Resource Development

When looking at non-extractive natural-resource related development (Figures 7 to 10), we do see some curves flatten, supporting our hypothesis, which argued the relationship between non-extractive development and economic outcomes would become more stable over the range of development as HHI increased due the relationship being more negative at all levels of development. This moderating effect was visible in the case of per capita income in metro-adjacent counties and poverty in remote counties, but not the other two scenarios. Although we do see some evidence of moderation, the relationships were generally not significantly different than zero, indicating limited support of hypotheses.

Figure 7: Predicted marginal direct relationships for per capita income across constrained ranged of non-extractive employment share in remote counties. Other variables held constant at means. Vertical bars represent 95% CI.

Figure 8: Predicted marginal direct relationships for per capita income across constrained ranged of non-extractive employment share in metro-adjacent counties. Other variables held constant at means. Vertical bars represent 95% CI.

Figure 9: Predicted marginal direct relationships for poverty across constrained ranged of non-extractive employment share in remote counties. Other variables held constant at means. Vertical bars represent 95% CI.

Figure 10: Predicted marginal direct relationships for poverty across constrained ranged of non-extractive employment share in metro-adjacent counties. Other variables held constant at means. Vertical bars represent 95% CI.

4.3.3. Manufacturing

Continuing to counter hypotheses, manufacturing had a generally non-significant relationship with economic outcomes and this effect was quite stable across all levels of HHI (Figures 11 to 14). These results suggest HHI has limited impact on the relationship between manufacturing employment share and economic outcomes in non-metropolitan counties.

Figure 11: Predicted marginal direct relationships for per capita income across constrained ranged of manufacturing employment share in remote counties. Other variables held constant at means. Vertical bars represent 95% CI.

Manufacturing Development and Income - Metro Adjacent

Figure 12: Predicted marginal direct relationships for per capita income across constrained ranged of non-extractive employment share in metro-adjacent counties. Other variables held constant at means. Vertical bars represent 95% CI.

Manufacturing Development and Poverty - Remote

Figure 13: Predicted marginal direct relationships for poverty across constrained ranged of manufacturing employment share in remote counties. Other variables held constant at means. Vertical bars represent 95% CI.

Manufacturing Development and Poverty - Metro Adjacent

Figure 14: Predicted marginal direct relationships for poverty across constrained range of manufacturing employment share in metro-adjacent counties. Other variables held constant at means. Vertical bars represent 95% CI.

5. Discussion

In this paper, we tested a key mechanism of natural resource dependence advanced by Mueller (Forthcoming)—market concentration. Looking at the county level, we found market concentration does interact with the non-linear relationship between both forms of natural resource development and economic outcomes, although there was far more evidence for the case of extraction. Although variable between remote and adjacent counties, higher levels of market concentration were associated with fewer initial benefits of specialization and a more steady relationship between the level of specialization and economic outcomes. Importantly, when looking at our figures, we also find that the drop off of benefits at high levels of specialization (e.g., over-specialization) was lower in high HHI contexts, indicating a flatter relationship across the range of development in highly concentrated markets. The reason for this lack of a drop off at high levels of specialization in high HHI contexts may be due to the ability of firms to exert control over a concentrated market—but future research is required to determine if this is the case. Further, although our models are robust and theory-derived, the inability to define market concentration where we observe no job vacancies posted in the relevant sectors with a county means that we could not include all counties in our

models that include concentration. It will be important for future work to find a way to generate more complete measures of market concentration so that our results may be validated.

Our base models in this study find similar results to Mueller (2021a) in the case of extraction, but non-extractive development was more dissimilar than similar with the relationship only being consistently different than zero in one of the four scenarios. Unlike Mueller (2021a)—where non-extractive development generally had negative associations with outcomes at low levels of specialization, which either persisted or diminished at high levels—in three of four scenarios we find no relationship between specialization in non-extractive development and economic outcomes. The trends in changing coefficients were similar, but the standard errors consistently crossed zero. To be clear, this does not provide evidence that specialization in non-extractive development is good for rural economies; specialization does not appear to have reduced poverty or increased incomes. However, the difference between the results requires future research attention. This study utilized a different study period and employment share dataset than Mueller (2021a), so continued research is needed to establish a consensus on the relationship between non-extractive natural resource development and economic outcomes. Important first steps in this will be the separate consideration of real estate development and tourism, as well as the estimation of region-specific models.

Regardless of the reason, from this study we can confirm that Mueller (2021a)’s initial hypothesis that extractive and non-extractive development should have similar curves of over-specialization was overly simplistic. Although both forms of development may be inherently exploitative of rural labor markets, share the spatial contradiction, and thus share similar mechanisms, we should not expect their specialization curves to be identical. This difference between the two forms of development stems from the fact that although these sectors share many factors, they have important differences; key among these is the poor nature of the jobs available in the non-extractive versus the extractive sector (Green, 2017). It appears clear that future research should do as we have done here, and hypothesize a clear curve of over-specialization for extraction, and a more nuanced, yet still non-linear, relationship for non-extractive natural resource development.

It should be noted we find no notable effect of market concentration on the impact of manufacturing specialization in any of our scenarios. Manufacturing, which had generally non-significant associations with economic outcomes in our base models, also had limited effect in our models of market concentration. This finding supports the notion that natural-resource related forms of

economic development, particularly extraction, have a relationship with rural labor markets unique from other sectors, such as manufacturing. This finding supports arguments made by Mueller (2021b) regarding both the role of market concentration in natural resource dependency, as well as the argument that both extractive and non-extractive forms of development have shared mechanisms by which they impact rural economic prosperity.

In sum, we have shown that market concentration plays a unique role in the relationship between natural resources and economic prosperity that we do not see for manufacturing. By using robust analytic techniques and accounting for spatial spillovers, we have confirmed some of the earlier findings of Mueller (2021a), while also finding support for prior arguments suggesting market concentration was a major factor in natural resource dependence. Market concentration is an under-explored issue across all research, but it is particularly lacking among rural scholars. It is important that those focused on the rural United States account for this phenomenon in their theory and research.

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6. Appendix

Table A1: Counties Collapsed to Ensure Time-Consistent Geographic Units

State	Counties
Alaska	Ketchikan Gateway Borough (2130) + Prince of Wales-Outer Ketchikan Census Area (2201)
	Kusilvak Census Area (2158) + Wade Hampton Census Area (2270)
	Petersburg Census Bureau (2195) + Hoonah-Angoon Census Area (2105) + Prince of Wales-Hyder Census Area (2198) + Skagway Municipality (2230) + Skagway-Hoonah-Angoon Census Area (2232) + Wrangell-Petersburg Census Area (2280)
	Maui and Kalawao combined (15901) + Maui (15005) + Kalawao (15009)
South Dakota	Oglala (46102) + Shannon (46113)
Virginia	Albermarle (51003) + Charlottesville City (51540)
	Alleghany (51005) + Covington City (51580)
	Augusta (51015) + Staunton City (51790) + Waynesboro City (51820)
	Bedford (51019) + Bedford City (51515)
	Campbell (51031) + Lynchburg City (51680)
	Carroll (51035) + Galax City (51640)
	Dinwiddie (51053) + Colonial Heights City (51570) + Petersburg (51730)
	Fairfax (51059) + Fairfax City (51600) + Falls Church (51610)
	Frederick (51069) + Winchester City (51840)
	Greensville (51081) + Emporia City (51595)
	Henry (51089) + Martinsville City (51690)
	James City (51095) + Williamsburg City (51830)
	Montgomery (51121) + Radford City (51750)
	Pittsylvania (51143) + Danville City (51590)
	Prince George (51149) + Hopewell City (51670)
	Prince William (51153) + Manassas City (51683) + Manassas Park City (51685)
	Roanoke (51161) + Salem (51775)
	Rockbridge (51163) + Buena Vista City (51530) + Lexington City (51678)
	Rockingham (51165) + Harrisonburg (51660)
	Southampton (51175) + Franklin City (51620)
Islands	Spotsylvania (51177) + Fredericksburg City (51630)
	Washington (51191) + Bristol City (51520)
	Wise (51195) + Norton City (51720)
	York (51199) + Poquoson (51735)
	Barnstable (25001) + Dukes (25007) + Nantucket (25019)
	Skagit (53057) + San Juan (53055)

Table A2a: Summary Statistics for Model Variables

	Mean	SD	Min	Max
Metro				
Per Capita Income to Residents (thousands)	25.64	8.57	9.44	100.63
Poverty Rate	14.56	5.46	2.43	44.81
Extractive Employment Share	0.62	1.90	0.00	44.37
Non-extractive Employment Share	7.75	4.22	0.00	77.17
Manufacturing Employment Share	7.46	5.75	0.00	46.70
HHI - Extraction	0.63	0.32	0.01	1.00
HHI - Non-extractive	0.19	0.22	0.00	1.00
HHI - Manufacturing	0.28	0.28	0.01	1.00
Population (thousands)	235.70	505.57	0.71	10105.72
Percent Over 65	15.11	3.87	3.28	55.60
Percent white	81.08	15.14	12.62	99.80
Percent Black	10.96	13.49	0.00	78.51
Percent Latino/a	9.45	12.46	0.00	95.60
<i>N</i>	1,146			
Nonmetro Metro-Adjacent				
Per Capita Income to Residents (thousands)	19.79	5.95	1.27	127.41
Poverty Rate	17.95	6.42	0.00	53.95
Extractive Employment Share	1.27	2.89	0.00	36.33
Non-extractive Employment Share	6.20	4.09	0.00	68.87
Manufacturing Employment Share	9.85	7.91	0.00	74.28
HHI - Extraction	0.81	0.27	0.04	1.00
HHI - Non-extractive	0.34	0.27	0.00	1.00
HHI - Manufacturing	0.48	0.30	0.01	1.00
Population (thousands)	29.79	23.78	0.60	189.28
Percent Over 65	17.96	3.73	4.58	38.82
Percent white	84.01	17.38	3.55	100.00
Percent Black	9.77	16.17	0.00	87.41
Percent Latino/a	8.05	13.59	0.00	99.18
<i>N</i>	1,020			

Table A2b: Summary Statistics for Model Variables

	Mean	SD	Min	Max
Nonmetro Remote				
Per Capita Income to Residents (thousands)	22.81	9.95	6.69	101.14
Poverty Rate	16.82	7.19	1.51	55.10
Extractive Employment Share	1.78	3.79	0.00	60.48
Non-extractive Employment Share	5.80	4.78	0.00	55.61
Manufacturing Employment Share	6.52	7.91	0.00	86.63
HHI - Extraction	0.78	0.29	0.05	1.00
HHI - Non-extractive	0.41	0.31	0.01	1.00
HHI - Manufacturing	0.55	0.32	0.03	1.00
Population (thousands)	16.75	17.80	0.07	197.66
Percent Over 65	18.82	4.96	3.79	39.16
Percent white	86.30	17.16	3.11	100.00
Percent Black	5.59	12.93	0.00	77.46
Percent Latino/a	8.88	14.73	0.00	95.54
<i>N</i>	941			
Total				
Per Capita Income to Residents (thousands)	22.86	8.64	1.27	127.41
Poverty Rate	16.36	6.50	0.00	55.10
Extractive Employment Share	1.18	2.94	0.00	60.48
Non-extractive Employment Share	6.65	4.44	0.00	77.17
Manufacturing Employment Share	7.96	7.32	0.00	86.63
HHI - Extraction	0.72	0.31	0.01	1.00
HHI - Non-extractive	0.30	0.28	0.00	1.00
HHI - Manufacturing	0.41	0.32	0.01	1.00
Population (thousands)	101.79	324.13	0.07	10105.72
Percent Over 65	17.17	4.49	3.28	55.60
Percent white	83.62	16.66	3.11	100.00
Percent Black	8.94	14.45	0.00	87.41
Percent Latino/a	8.82	13.57	0.00	99.18
<i>N</i>	3,107			

Table A3a: Models of Economic Prosperity, Specialization, and Market Concentration from 2010 to 2016 in Rural America

Direct Effects	Per Capita Income		Poverty Rate	
	Base	HHI	Base	HHI
Metropolitan				
Extractive Employment Share	0.0600	0.0746	0.0289	0.0597
Extractive Employment Squared	0.0017	0.0012	-0.0027*	0.0011
Non-extractive Employment Share	0.0483	0.0480	-0.0259	0.0613
Non-extractive Employment Squared	0.0002	0.0011	0.0011	0.0020
Manufacturing Employment Share	-0.0215	0.0453	-0.0271	0.0414
Manufacturing Employment Squared	0.0023	0.0014	-0.0000	0.0010
HHI Extraction		0.0029	0.0031	-0.0000
		0.5040***		0.0267
HHI Extraction * Extractive Emp. Share		-0.2316*		-0.0230
HHI Extraction * Extractive Emp. Share Squared		0.0047		-0.0018
HHI Non-extractive		2.2054**		0.5577
HHI Non-extractive * Non-Extractive Emp. Share		-0.4799**		-0.1488
HHI Non-extractive * Non-Extractive Emp. Share Squared		0.0210***		0.0054
HHI Manufacturing		-0.8678		-0.2750
HHI Manufacturing * Manufacturing Emp. Share		0.0888		0.0770
HHI Manufacturing * Manufacturing Emp. Share Squared		-0.0020		-0.0022
Non-Metropolitan Metro-Adjacent				
Extractive Employment Share	0.0172	0.1351	-0.1762	0.1095
Extractive Employment Squared	-0.0003	0.0105	0.0061	0.0055
Non-extractive Employment Share	0.0055	0.0746	0.1073	0.0832
Non-extractive Employment Squared	-0.0016	0.0014	-0.0029	0.0021
Manufacturing Employment Share	0.0578	0.0558	0.0161	0.0566
Manufacturing Employment Squared	-0.0026	0.0015	0.0001	0.0012
HHI Extraction				
HHI Extraction * Extractive Emp. Share				
HHI Extraction * Extractive Emp. Share Squared				
HHI Non-extractive				
HHI Non-extractive * Non-Extractive Emp. Share				
HHI Non-extractive * Non-Extractive Emp. Share Squared				
HHI Manufacturing				
HHI Manufacturing * Manufacturing Emp. Share				
HHI Manufacturing * Manufacturing Emp. Share Squared				
Extractive Employment Share	0.0172	0.1351	-0.1762	0.1095
Extractive Employment Squared	-0.0003	0.0105	0.0061	0.0055
Non-extractive Employment Share	0.0055	0.0746	0.1073	0.0832
Non-extractive Employment Squared	-0.0016	0.0014	-0.0029	0.0021
Manufacturing Employment Share	0.0578	0.0558	0.0161	0.0566
Manufacturing Employment Squared	-0.0026	0.0015	0.0001	0.0012
HHI Extraction				
HHI Extraction * Extractive Emp. Share				
HHI Extraction * Extractive Emp. Share Squared				
HHI Non-extractive				
HHI Non-extractive * Non-Extractive Emp. Share				
HHI Non-extractive * Non-Extractive Emp. Share Squared				
HHI Manufacturing				
HHI Manufacturing * Manufacturing Emp. Share				
HHI Manufacturing * Manufacturing Emp. Share Squared				

Standard errors in second column

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A3b: Models of Economic Prosperity, Specialization, and Market Concentration from 2010 to 2016 in Rural America ctd.

Direct Effects	Per Capita Income		Poverty Rate	
	Base	HHI	Base	HHI
Non-Metropolitan Remote				
Extractive Employment Share	0.4167***	0.1216	0.5551	0.3412
Extractive Employment Squared	-0.0099***	0.0025	-0.0216	0.0122
Non-extractive Employment Share	-0.2298*	0.1033	-0.4281	0.2494
Non-extractive Employment Squared	0.0009	0.0021	0.0062	0.0076
Manufacturing Employment Share	0.0895	0.0846	-0.0954	0.1674
Manufacturing Employment Squared	-0.0055**	0.0020	-0.0006	0.0048
HHI Extraction			0.1431	0.3684
HHI Extraction * Extractive Emp. Share			-0.4646	0.2559
HHI Extraction * Extractive Emp. Share Squared			0.0153	0.0110
HHI Non-extractive			-2.9716*	1.2395
HHI Non-extractive * Non-Extractive Emp. Share			0.5976*	0.2425
HHI Non-extractive * Non-Extractive Emp. Share Squared			-0.0220*	0.0099
HHI Manufacturing			0.7583	0.8064
HHI Manufacturing * Manufacturing Emp. Share			-0.0978	0.1315
HHI Manufacturing * Manufacturing Emp. Share Squared			0.0028	0.0045
Population (thousands)	0.0000**	0.0000	0.0000**	0.0000
Percent White	-0.0210	0.0267	-0.0332	0.0334
Percent Black	-0.0329	0.0576	0.0156	0.0675
Percent Latino/a	-0.0631	0.0624	-0.2851**	0.0969
Percent Over 65	0.1470	0.0753	-0.1222	0.0865
Year				
2010 [Reference]	0.0000		0.0000	
2011	1.4468***	0.0592	1.0626***	0.0670
2012	1.9667***	0.0960	1.9024***	0.1220
2013	2.6339***	0.1479	2.3406***	0.1649
2014	2.7182***	0.1961	3.0065***	0.2166
2015	2.7428***	0.2391	3.4083***	0.2565
2016	2.3448***	0.2735	3.5242***	0.3005

Standard errors in second column

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A3c: Models of Economic Prosperity, Specialization, and Market Concentration from 2010 to 2016 in Rural America ctd.

Indirect Effects	Per Capita Income			Poverty Rate		
	Base	HHI	Base	Base	HHI	HHI
Extractive Employment Share	0.4284***	0.1040	0.4661***	0.1028	-0.1904*	0.0898
Extractive Employment Squared	0.0003	0.0064	-0.0074	0.0056	0.0019	0.0067
Non-extractive Employment Share	-0.7061***	0.2056	-0.5486**	0.1868	0.0222	0.1076
Non-extractive Employment Squared	0.0252***	0.0073	0.0187*	0.0075	-0.0035	0.0038
Manufacturing Employment Share	-0.3318*	0.1445	-0.0971	0.1033	0.0681	0.0771
Manufacturing Employment Squared	0.0179***	0.0051	0.0084*	0.0037	-0.0074*	0.0030
Population (thousands)	0.0000***	0.0000	0.0000***	0.0000	-0.0000	0.0000
Percent White	-0.0864*	0.0431	-0.1005	0.0617	0.0930	0.0497
Percent Black	-0.1416	0.1055	0.0043	0.1189	0.0922	0.0922
Percent Latino/a	-0.0040	0.1070	0.0203	0.1109	0.0310	0.0872
Percent Over 65	0.1378	0.0970	0.0395	0.0914	-0.0015	0.0670
Constant	25.2665***	4.4040	30.7995***	5.5543	14.2150**	4.6995
N County-years	21749		11522		21748	11521

Standard errors in second column

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$