ECONSTOR
Make Your Publications Visible.

A Service of

ZBW Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Bez, Charlotte; Steckel, Jan; Naumann, Lennard

Conference Paper

A Political Backlash to Job Losses in Coal? The Case of Colombia

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2024: Upcoming Labor Market Challenges

Provided in Cooperation with:
Verein für Socialpolitik / German Economic Association

Suggested Citation: Bez, Charlotte; Steckel, Jan; Naumann, Lennard (2024) : A Political Backlash to Job Losses in Coal? The Case of Colombia, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2024: Upcoming Labor Market Challenges, ZBW - Leibniz Information Centre for Economics, Kiel, Hamburg

This Version is available at:
https://hdl.handle.net/10419/302390

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

A Political Backlash to Job Losses in Coal? The Case of Colombia*

Charlotte Bez† Lennard Naumann‡ Jan C. Steckel§

February 1, 2024

Abstract

Voter backlash can pose an important political economy barrier to the public and political acceptability of phasing out fossil fuels. We investigate the case of Colombia, a country heavily dependent on coal exports, which recently announced a complete phasing out of fossil fuels. Using a novel and unique data set, we analyze how municipality-level changes in extracted coal and associated mining employment interact with voting outcomes, looking at presidential elections from 2014-2022. Applying a staggered Difference in Difference design with continuous treatment, we find that pro-mining and reformist parties are able to capitalize on changes in local coal labor markets. At the same time, we find less political support for parties that promote phasing out mining activities, pointing towards increasing political polarization.

Keywords: Political backlash, voting, job losses, extractivism, coal, just transition

*We would like to thank Maria Fernanda Vargas Cardozo from the Colombian Ministry of Health and Social Protection for facilitating the PILA data access and for their invaluable guidance on the use of the data. We also thank Pola Lehmann for providing us with the CMP data for the Colombian elections. Further, we are grateful to Rodimiro Rodrigo Flores, David Vargas, Sebastian Luckeneder, Florian Egli, Grace Quinceno, and Lina Maria Puerto Chaves for the insightful exchanges. Lastly, we want to thank Imán Missour-Benitez, Giacomo Raederscheidt and David Leoncio for their excellent research assistance. The authors have no competing interests to declare.

†Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany, Mercator Research Institute on Global Commons and Climate Change, Berlin, Germany, and Scuola Superiore Sant'Anna Pisa, Italy. E-mail address: charlotte.sophia.bez@pik-potsdam.de

‡WZB Berlin Social Science Center, Germany. E-mail address: lennard.naumann@wzb.eu

§Mercator Research Institute on Global Commons and Climate Change, Berlin, Germany, and Brandenburg University of Technology Cottbus–Senftenberg, Germany. E-mail address: steckel@mcc-berlin.net

1 Introduction

Phasing out coal is a pivotal part of the transition to an economy less dependent on fossil fuels, in line with the 1.5°C compatible mitigation pathway (Tong et al., 2019). While laudable from a climate perspective, potential socio-economic impacts of mine closures include loss of income and employment, out-migration and infrastructure erosion (Guriev and Papaioannou, 2022), especially if compensation or reskilling mechanisms are not in place, thus contributing to a "geography of discontent" (Lenzi and Perucca, 2021; Rodríguez-Pose, 2018).

Those socio-economic implications can be expected to have political spillovers. Hence, it is not surprising that phasing out coal has driven larger international debates on how to organize "just energy transitions" (see Wang and Lo, 2021, for a review of the academic literature), including on the level of the UNFCCC. While it is known that with political leadership and facilitating just transition agreements, local coal communities can be supportive of phasing out coal (Bolet et al., 2023), political difficulties have to be expected (Steckel and Jakob, 2022). Without careful political management, political backlash and political polarization might hinder a fast transition out of coal. Indeed, previous research has shown a populist and anti-environmental backlash resulting from coal mine closures in the US (Egli et al., 2022).

In this paper, we seek to understand whether there has been a political backlash following a decline in coal production and employment in Colombia. Colombian coal production represented 77.8% of Latin America's production, with the sector providing 11% of government revenues. Yet, the recently elected President, Gustavo Petro, has announced a strong anti-mining agenda. The Colombian political landscape poses a significant challenge to the proposed coal divestment agenda; the recent widespread protests against the government in Bogotá and other major cities in the Summer of 2023 underscore the importance of this approach.

We hypothesize, first, in line with Guriev and Papaioannou (2022), that a decline in coal mining triggers localized economic distress. In the absence of large-scale redistribution of the heterogeneously distributed burdens of economic shocks, such as employment losses, this will trigger a sense of political abandonment in affected communities. At the ballot box, this will lead to a political backlash against those who are leveraging an anti-coal narrative. Second, we argue that conservative political attitudes and beliefs about environmentalism are closely linked, as most pro-coal politicians are critical of climate change and opposed to environmentalism (see e.g. Böhmelt, 2021; Fiorino, 2022; Mendes Motta and Hauber, 2022).

To test our hypotheses, we regress municipal-level changes in coal employment on electoral outcomes using a staggered difference-in-difference approach to allow for multiple treatment periods following (Callaway and Sant'Anna, 2021). To do so, we create a novel data set that combines coal royalties and formal mining employment with electoral outcomes. Together, our data cover 1,104 municipalities over 2014-2022.

We find that job losses in coal mining cause political backlash by boosting support for conservative parties and decreasing support for socialist and environmentalist policy platforms. Importantly, we find causal evidence for mine closures leading to an increase in political polarization at the expense of centrist parties. To the best of our knowledge, our paper is the first that can show a causal effect of job losses in coal on voting outcomes in a low- and middle-income country. It can provide valuable insights that go beyond the specific case of Colombia.

The paper is structured as follows: Section 2 reviews the existing literature on the political economy of coal and political backlashes. Section 3 presents various data sources and Section 4 gives an outline of our empirical strategy, including coarsened exact matching and difference-in-difference. Section 5 presents the results and explains the limitations. Section 6 concludes and discusses the findings.

2 Literature

Several studies have noted the importance of regional economic decline and political alienation for the recent rise of populist and right-wing parties in Western Europe and North America (see, e.g., Rodríguez-Pose, 2018). This economic decline is usually attributed to a globalization shock, such as increased international trade, financial globalization, or migration. In fact, economic insecurity caused by trade, automation, and the 2008-2009 crisis has long been identified as a major driver of support for authoritarian populist parties in Europe and the United States (Guriev and Papaioannou, 2022). Broz et al. (2021) traces this mechanism for Europe and North America over the past three decades, noting that rural areas are particularly affected. Colantone and Stanig (2018) find that Chinese import competition significantly increased right-wing, authoritarian, and nationalist vote shares in Western European elections in 1988-2007. Similarly, Autor et al. (2020) find evidence of political polarization in U.S. electoral districts with high Chinese trade exposure. Related, Vona (2019) conceptualizes that negative economic shocks, such as job losses in the mining industry, reduce public support for environmentalist policies. He argues that because pollution and extractivist industries are spatially concentrated, and because such industries often already suffer from the adverse effects of globalization and automation, areas and groups of workers suffering from such multiple disadvantages tend to deter national and international policy implementation, i.e., create a collective action problem.

However, the explanatory power of economic insecurity and decline is found to be insufficient to explain the magnitude of the empirical populist vote gains, and an additional theoretical mechanism is proposed that centers on threats to social identity (Margalit, 2019). Rapid economic and cultural change, also creates winners and losers in terms of cultural and political power, triggering a cultural and political backlash (Inglehart and Norris, 2017). Ballard-Rosa et al. (2022) find evidence for this mechanism in a representative survey of the United States, where individuals living in relatively diverse regions experiencing economic

decline increasingly adopt authoritarian values. Similarly, using European survey data, Gidron and Hall (2020) find a significant effect of lack of social integration on support for radical parties . Analyzing the 2016 US presidential election, Mutz (2018) finds evidence for the social identity mechanism, but not for the pure economic decline mechanism.

Thus, assuming the negative economic, environmental, and cultural impacts of job losses, we expect a local increase in populist and authoritarian votes for similar mechanisms as outlined above. To date, the only study that explicitly addresses this mechanism is that of Egli et al. (2022), which finds that coal mine closures in the United States significantly increased the Republican vote share in the 2012 and 2016 presidential elections in communities that were economically dependent on coal. The lack of research in this area, especially in the Global South, is striking and one of the main motivations for the present paper.

Furthermore, anti-environmentalism and right-wing policy platforms are closely linked in the political arena (Gemenis et al., 2012). Conservative and right-wing parties tend to take a strong stance against climate change (see, e.g., Brazil's ex-president Jair Bolsonaro, who is known for weakening environmental regulations, disregarding climate science, and serving the interests of fossil fuels). Indeed, the evidence that populism and anti-environmentalism are closely linked is overwhelming for the United States (Guber, 2013; Dunlap et al., 2016; Simon and Moltz, 2021; Fiorino, 2022) and Europe (Huber, 2020; Huber et al., 2021; Kulin et al., 2021; Böhmelt, 2021), with less empirical evidence for countries in the Global South. An exception is Mendes Motta and Hauber (2022), who confirm the existence of this link in the speeches of former Brazilian president Jair Bolsonaro. In the case of a political backlash against fossil fuel divestment, this relationship can be expected to be particularly pronounced: an anti-environmentalist backlash is an opposition to a perceived source of local economic crisis, namely environmentalist policies. This effect adds to the general (right-wing populist) backlash caused by the crisis and a general feeling of being politically left behind.

Drews and van den Bergh (2016) identify several other individual factors that have been shown to influence personal attitudes toward environmental issues and possibly moderate this general effect, including psychological factors, specific policy perceptions, and contextual factors from the social, cultural, political, and geographic domains. Bergquist et al. (2022) conduct a meta-analysis of observational and experimental evidence on perceptions of climate policy and find that policy perceptions such as fairness and perceived effectiveness are critical for individual support, while values, knowledge, beliefs about climate change, social trust, and ideology show weak effects.

3 Data

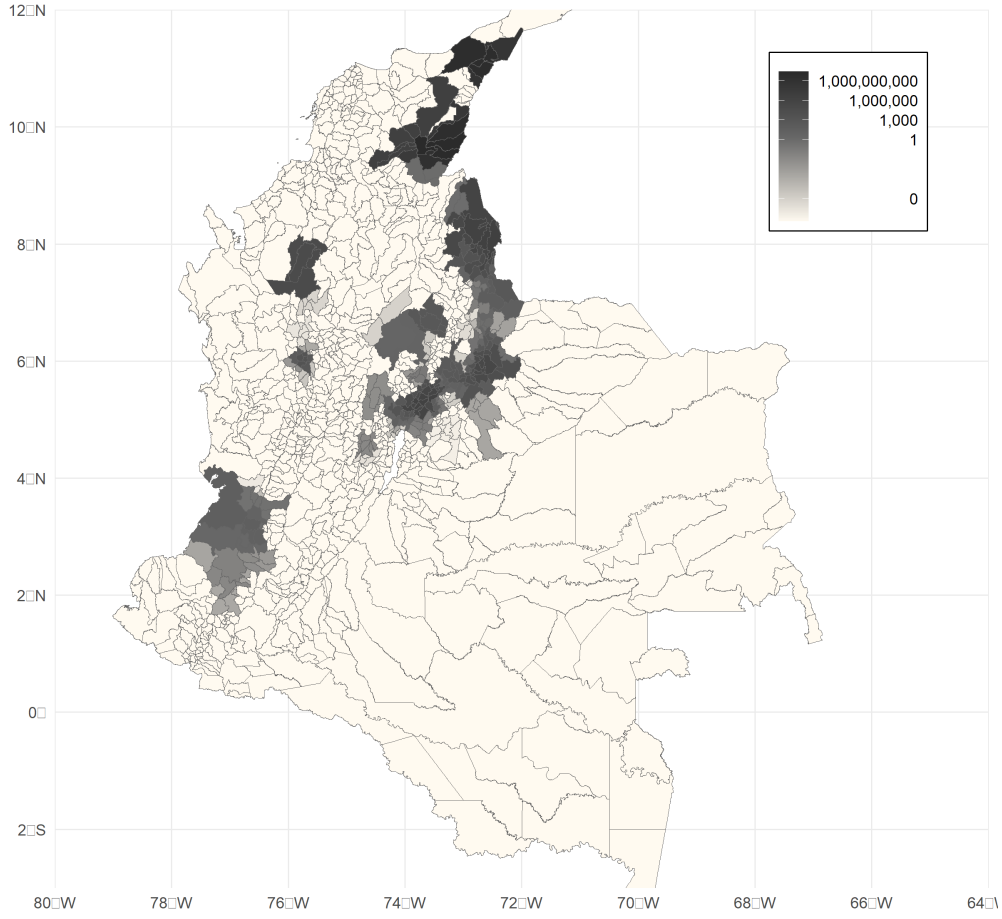
We construct a novel and unique dataset that combines the following data sources: information on coal mining activity obtained from the National Mining Agency, information on mining employment using social security data, information on election results obtained from the Electoral Observation Mission, and information on socio-economic indicators. We aggregate all data by municipality and year. Together, they cover 1,104 Colombian municipalities in the period 2014-2022.[1] Below is a step-by-step description of the data and the construction of the various indicators.

3.1 Mining data

We obtain data on mining activities from the National Mining Agency (ANM, from its Spanish name Agencia Nacional de Minería, 2022). It provides detailed information on the type and quantity of minerals mined in the national territory, linked to the economic value generated since 2012 at the municipal level.

[1] Being an outlier on several dimensions, the municipality of Bogotá is excluded from all analyses. We also restrict the analysis to the Colombian mainland, excluding the two municipalities of the archipelagic departments of San Andrés and Providencia.

Figure 1: Map of mining activity in Colombian municipalities



Notes: The black polygons depict the absolute value of coal extracted in a given municipality and its neighbors average over the three election years 2014, 2018, and 2022 in trillions of pesos, grey boundaries depict municipalities (n=1120). Source: Own elaboration based on data from the Agencia Nacional de Minería (2022).

Figure 1 gives an overview of mining activity in Colombian municipalities. The black polygons represent the average value of coal mined in the election years 2014, 2018, and 2022 in trillions of pesos, adding up the mined coal of each municipality's neighborhood. Coal mining is widespread and concentrated, but mostly in the northern region of Guajira (Cerrejón mines). The mines are jointly owned by BHP (formerly BHP Billiton), Anglo American and Glencore, or through a subsidiary of this joint ownership. Other major mining

operations are located in the Department of Cesar, where the La Loma Mine, El Hatillo Mine, Calenturitas Mine and El Descanso Mine operate.

3.2 PILA data

To construct the third independent variable *Mining employment loss* and the control variable *Employment rate*, we rely on data from the Colombian Social Security Administrative Records (in Spanish, Planilla Integrada de Liquidación de Aportes, or PILA). It contains detailed information on all formal employment contributions to the social security system, including wages, location of employer and employee, economic sector, and days worked per registered contract. Due to the sensitivity of the data, access is difficult. After direct contact with the Colombian Ministry of Health and Social Security (Ministerio de Salud y Protección Social, 2023), we were allowed to register for an online training course, which is a prerequisite for handling the PILA data. The next step was to formally apply for a data access token, which we received about two weeks later.

With this token, we extract the total number of formally employed persons in the mining sector ($MiningEmpl$, in 1,000) and in total ($TotalEmpl$, in 1,000), per municipality and year:

$$\begin{aligned}(Mining\ employment\ loss)_{i,y} = -|-Mean(MiningEmpl_{i,y-2}, MiningEmpl_{i,y-3}) \\ + MiningEmpl_{i,y-1}|_-,\end{aligned} \tag{1}$$

where $MiningEmpl_{i,y}$ is the number of formal employees in the mining sector in year y in municipality i and $|.|_-$ is the positive part function. The aim of this variable is to capture the direct impact of a decline in mining on the electorate, as the loss of employment opportunities is a more direct channel through which individuals are affected. The variable indicates the total loss of jobs in the mining sector and not specifically in the coal mining sector due to data availability constraints. Even with this broader definition, the data are

rather sparse.[2]

In addition, PILA is used to extract the total number of employees in the formal sector. Together with data on *Population* from CEDE, we calculate the total municipality specific *Employment Rate* as $Empl.rate = log(TotalEmpl/Population)$. Here, the extreme values are limited to $log(0.0001)$ at the bottom and $log(1)$ at the top of the distribution. The right panel of Figure 2 depicts the k-density of mining employment loss across every election.

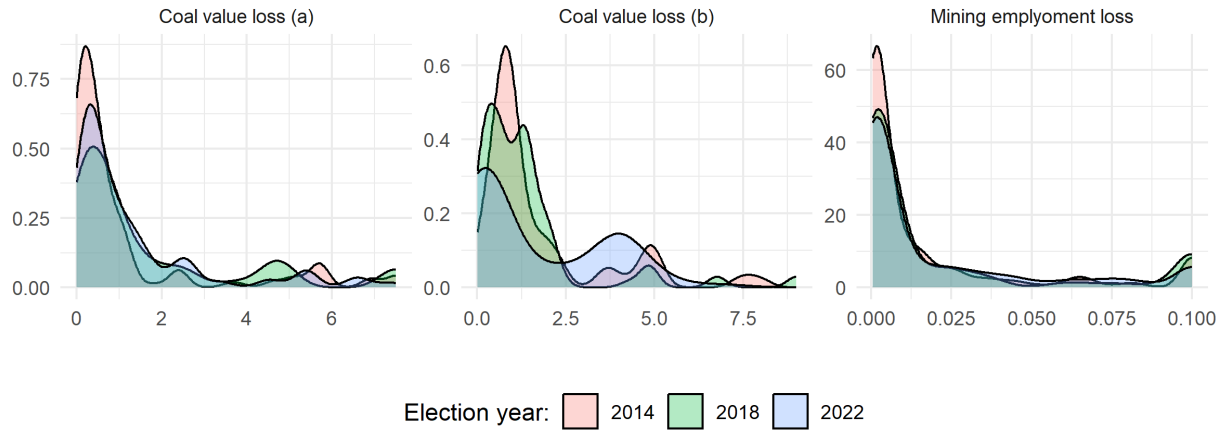


Figure 2: Densities of coal value loss and mining sector employment loss

3.3 Election data

To measure electoral outcomes, we collect original data on voting outcomes for Colombian elections from national sources. We use election data provided by the Electoral Observation Mission (in Spanish: Misión de Observación Electoral, 2019) and by Guerra (2023), both of which query the official databases of election results produced by the Colombian National Civil Registry (in Spanish: Registraduría Nacional del Estado Civil (2023), RNEC for short). Colombia holds presidential elections every four years, with the first round taking place in late May and the second round in mid-June.[3] The data cover

[2]As can be seen in the third panel of Figure 2, the *Mining employment loss* variable barely takes on values above 0.05, which corresponds to an absolute loss of 50 jobs. Hence, we cap the variable at 0.1 or 100 jobs lost.

[3]We focus our analysis on the first round of presidential elections, covering the period from 2014 to 2022, as it covers all parties, while the second round is the run-off of the two most successful candidates.

three elections and election results for 1,104 municipalities. The party considered in the analysis are listed in Table 1, by election and year.

Table 1: Overview of parties in the elections 2014-2022

Election year	Party name	Candidate name
2014		
	Polo Democrático	Clara López Obregón
	Unidad Nacional	Juan Manuel Santos
	Alianza Verde	Enrique Peñalosa
	Partido Conservador Colombiano	Marta Lucía Ramírez
	Centro Democrático	Óscar Iván Zuluaga
2018		
	Humane Colombia	Gustavo Petro
	Independent	Germán Vargas Lleras
	Democratic Center	Iván Duque
	Citizens' Compromise	Sergio Fajardo
	Colombian Liberal Party	Humberto De la Calle
	Somos Región Colombia	Viviane Morales Hoyos
	We Are All Colombia	Jorge Antonio Trujillo
2022		
	Humane Colombia	Gustavo Petro
	Rodolfo Hernández	Rodolfo Hernández
	Creemos Colombia	Federico Gutiérrez
	Alianza Social Independiente	Sergio Fajardo
	Movimiento de Salvación Nacional	Enrique Gómez
	Partido Verde Oxígeno	Íngrid Betancourt
	Colombia Justa Libres	John Milton Rodríguez
	Independent	Luis Pérez Gutiérrez

We code political party manifestos to identify the parties' positions regarding mining and extractivism. To categorize political parties, we followed a similar approach to that of Egli et al. (2023) and Carter et al. (2018) by coding relevant statements in the manifestos of political parties as pro-mining, reformist or contra-mining. This analysis covers three national elections from 2014–2022, requiring us to analyze the manifesto of each party listed in Table 1. As the Colombian political landscape changes from one election to the

other, the number of parties per election changes, and only a minority of parties compete repeatedly. This is why we opt for the approach of aggregating party vote shares based on their stances towards mining, as opposed to calculating individual party vote shares.

For the hand-coding exercise, we source the party manifestos in the original language from the Comparative Manifesto Project (CMP) database (Lehmann et al., 2023), and complement the missing manifestos from other sources[4][5].

The dataset was then developed by iteratively going through the party manifestos to identify all relevant statements and adopting an inductive coding approach. We evaluated statements about the mining sector including environmental protection, corporate responsibility and its role in economic development. These statements must give a clear indication of whether a given party is pro-mining, reformist, or pushes for phasing out of extractivist activities. We categorize each party manifesto from five Spanish-speaking scholars, who do the categorization effort independently from each other, in order to avoid biases. The category that the majority of coders have opted for - a minimum of three out of five - is then chosen as the final category.

Examples of a pro-mining party include statements such as "*The mining-energy sector is the great ally in the eradication of poverty and Proposes an opening to investment* [...]" (the Social Party of National Unity, 2014, translated from Spanish into English by the authors). Examples of a reformist party include statements such as "*We will engage in a national dialogue with the mining-energy sector with the aim of overcoming the social conflict surrounding the sector, aiming at sustainable development that will help to overcome the social gaps in Colombia.*" (Alianza Social Independiente, 2022, translated from Spanish into English by the authors). Lastly, examples of a party against mining include statements such

[4]CMP has not coded the 2022 election yet.

[5]However, we are unable to recover four manifestos from the years 2014 and 2018. The four associated parties had national vote shares between 0,002 and 0,296, hence are predominantly small and two of the candidates have withdrawn from the election (Viviane Morales Hoyos and Jorge Antonio Trujillo). We adopt an alternative strategy for these four parties, using sources such as interviews and posts on social media to classify the candidate's opinions towards mining during the electoral campaign.

as "[...] *Abandoning dependence on oil, coal and all types of mining and illegal economies* [...]" (Humane Colombia, 2022, translated from Spanish into English by the authors). Most manifestos include many statements on the mining sector, given its important role in Colombia's economy, hence helping to consolidate and strengthen the coding decisions.

Given the fluctuation of parties in Colombia with a political landscape characterized by alliances, creation of new parties, closure of parties and candidate-based parties, the composition of party positions in the mining industry shows high variation over time, given heterogeneous vote shares and heterogenous stances regarding mining. The table below gives an overview of the distribution of party family vote shares by election year. The vote share of the "pro" party family is both the most important and most stable one, varying between 52,6 and 69,8% on average and reflecting the political reality of mining support, often considered as the backbone of economic development. The "reformist" and "contra' party families are relatively more fluctuating. For instance, in 2022, we code two parties as reformist, however, they only gained a few votes national, hence the "reformist" vote share of solely 2,5%. More compellingly, we did not code any 2018 party as "contra".

Table 2: Overview of party family vote shares

Election year	**Share pro**	**Share reformist**	**Share contra**	**No. of parties**
2014	0.698	0.129	0.035	5
2018	0.526	0.364	0.00	7
2022	0.610	0.025	0.350	8

Lastly, Figure 3 shows the densitie of party family vote shares by election, shown separately for pro-mining parties (left), reformist parties (center), contra-mining parties (right).

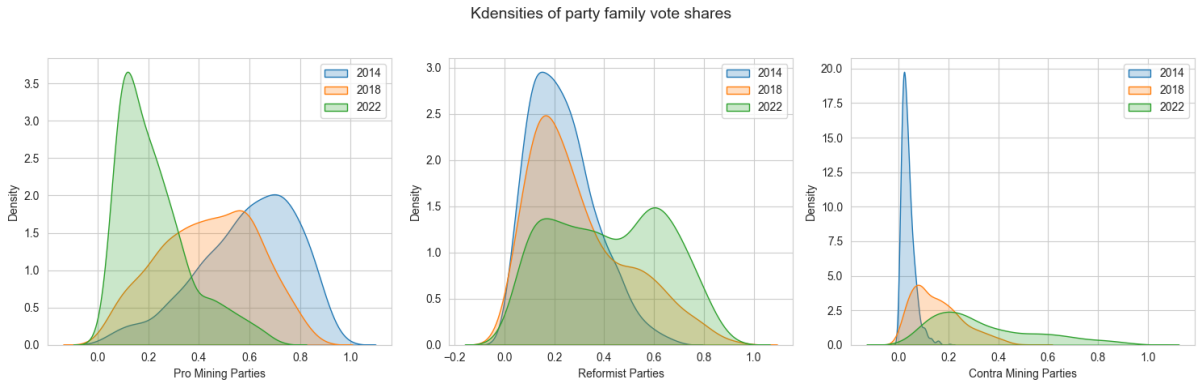


Figure 3: Density graphs of party family vote shares by election, shown separately for pro-mining parties (left), reformist parties (center), contra-mining parties (right)

3.4 CEDE data

Several other control variables are drawn from the Centro de Estudios sobre Desarrollo Económico (CEDE) (2021) at the Universidad de los Andes in Bogotá, which provides annual municipal-level panel data on several socioeconomic and political indicators from categories such as conflict and violence, agriculture, health, education, and public service provision.

For our main model specification, we use three control variables: *Population density* is used as an indicator of whether a municipality can be considered rural or urban. This is a well-established predictor in voting research across a number of political dimensions, in particular the fact that rural areas tend to vote more conservatively is well established (Scala and Johnson, 2017; Albrecht, 2022). Second, municipality *Area* (in $[km^2]$) is controlled for as a proxy for government reach and political participation (McDonnell, 2019; Górecki and Gendźwiłł, 2020). Finally, the *Population* variable is used to create an *Employment rate* to control for labor market effects on voting outcomes that are not directly related to the effect of coal mining decline.[6]

[6]The CEDE dataset offers several other variables that could serve as controls, including, for example, gross domestic product, student-teacher ratio, number of attacks on the civilian population, number of kidnappings, and number of displaced persons. These three variables were selected after careful consideration of the trade-off between capturing important theoretical confounders and statistical feasibility, particularly regarding autocorrelation among the independent variables.

4 Empirical strategy

4.1 Coarsened exact matching

Among the 1,104 municipalities in Colombia, there are a total of 848 municipalities with mining activities considering all years in the sample (according to ANM[7].). This subset of municipalities serves as control group (see Figure 4). We then identify the municipalities that are treated — that is, those that experienced a job loss in the mining sector in the year prior to a national election (N=119, see Figure 4). As a robustness check, we also employ specifications where we consider 6, 3, and 1 month(s).

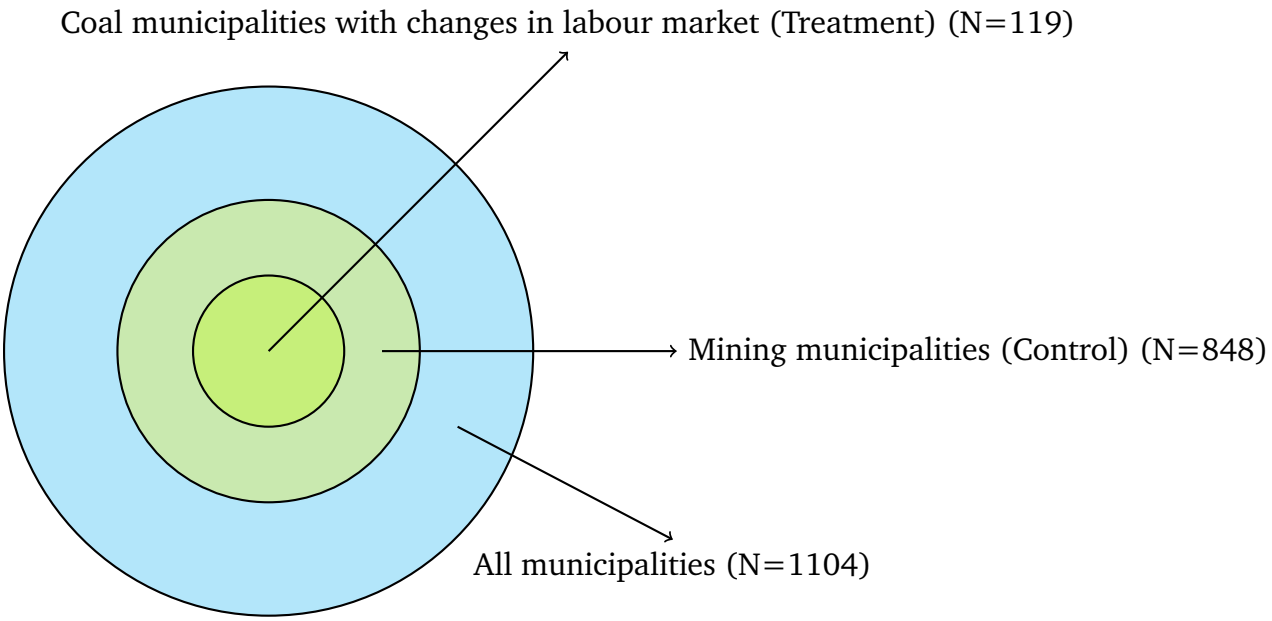


Figure 4: Schematic representation of identification strategy for treated and control units.

We correct for baseline differences between the treated and control municipalities using coarsened exact matching (CEM), a preprocessing, nonparametric method for correcting for imbalance on observable pretreatment characteristics between the treated and control units (Blackwell et al., 2009). The procedure matches each treated unit with a control unit

[7] See the Table of Abbreviations in Appendix A

that seeks balance on an ex ante-defined set of covariates (Iacus et al., 2012). We match the treated and control municipalities on four variables at pre-treatment levels.

The variables include the two socio-economic and two demographic variables, demonstrated by prior research to be important for mining activities: (1) GDP per capita (at current prices in billion pesos and taken from DANE "valor agregado por municipio"), (2) the number of people expelled due to displacement from the CEDE Panel of Conflict and Violence (3) the area (surface area of a municipality in km squared), and (4) the population density, self-calculated as population/area. All variables are matched at the municipality level. In other specifications, we match via an augmented set of covariates, including also *indrural*, a measure between 0 and 1 - percentage of population living in rural areas (from CEDE General Characteristics), *votpop* (population > 17 years), and *kidnappings* from the CEDE Panel of Conflict and Violence.

Table 3: Summary statistics of treated and control municipalities after matching, CEM weights applied

	Treated municipalities		*Control municipalities*	
	Obs.	Mean	Obs.	Mean
displaced	123	399	1.621	337
gdp_percap	151	0.018	2.043	0.015
area	151	1089	2.043	909
popdens	151	244	2.043	189

Notes: 2,194 out of 4,400 municipalities have been matched (50,14 per cent) using the CEM command. GDP per capita is GDP in billion pesos divided by population.

The post-matching summary statistics in Table 3 demonstrate that the matching strategy leads to a very good balance on the vote shares, while it only leads to a marginal loss of data due to pruning (loss of 2 treatment municipalities). In the Appendix, we also show summary statistics for the unmatched data, showing the unweighted economic and demographic characteristics of the municipalities based on treatment. The descriptive

statistics show considerable baseline differences in the treated and control municipalities, such that treated municipalities generally have more displaced people, a higher GDP per capita, are on average larger and more populated.

The matched sample is balanced considerably on observable characteristics, so we use the weights provided by CEM to estimate the models for a counterfactual framework. Using the matched sample, we estimate a series of difference-in-difference models using unit and time-fixed effects.

4.2 Difference-in-difference specification

We employ the staggered difference-in-differences approach with continuous treatment, building upon the framework developed by Callaway and Sant'Anna (2021). This methodology allows for the estimation of group-time average treatment effects, providing a nuanced understanding of how the treatment impacts different groups at various points in time. By estimating separate average treatment effects for each group affected by the treatment at different time intervals, the analysis captures variations in average treatment effects over the duration of exposure, similar to the two-way fixed effects estimator (Callaway and Sant'Anna, 2021, p. 208).

This model specification relaxes the classical 'parallel trend assumption' so that it is possible to assume its validity conditionally on municipality-level covariates. In this way, we are able to overcome two challenges. Firstly, it allows for changes in coal jobs to occur in different points in time - and hence different electoral periods -, and secondly, it accounts for the non randomness of coal municipalities, which are a function of coal reserves, geology, infrastructure and socio-economic characteristics which makes some municipalities more likely to be affected than others (selection bias). Other recent contributions on voting behavior with a staggered implementation of the treatment have argued similarly, see Isaksson and Gren (2024); Nyholt (2023).

As reported in Appendix 6, municipalities that were affected by changes in coal jobs

were, on average, significantly larger and less populous than those not affected. This difference could indicate that voters are different and that their support for anti- or pro-mining parties could follow different trends. To limit this potential bias of common trends, we carry out the matching process as described in Section 4.1.

The analysis focuses on three models to assess the effects on pro-coal, reformist, and contra-coal party family vote shares. We estimate three separate models, for each election between 2014-2022, and also report the group-time average treatment effects. We supplement the difference-in-difference design with matching on pre-treatment variables. Both unmatched and matched specifications are considered in the estimation process. Finally, we use a uniform confidence band and cluster bootstrapped standard errors at the municipality level to take account of serial within-municipality autocorrelation.

5 Results

Table 4 presents the regression results for *pro-mining party share*, *contra-mining share*, and *reformist party share*. We estimate the effect of changes in coal jobs in the support for those three party families in the election following the job changes. The regression table includes group-time average treatment effects as well as averages. Columns 1-3 report estimates the unmatched specification. Columns 4-6 report results controlling for population density, area, and employment rate, matched on pre-treatment levels, which slightly reduces the number of observations. We visualize the results with a coefficient plot, which is shown in the Appendix (Figure 6).

The effect of losses in coal jobs consistently drives up the vote share of *pro-mining* parties, both for the unmatched and the matched specification (columns 1 and 4). The models for *contra-mining* parties as stated in columns 2 and 5 indicate that coal job losses have a backlash on parties that promote an anti-mining agenda or even leverage a discourse towards phasing out fossil fuels. The fact that the effect is relatively large in both

specifications implies that direct electoral backlashes to parties that leverage anti-mining discourses are potentially more important than indirect crowding-out effects.

Table 4: Regression results for unmatched and matched specifications

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	pro-mining share	contra-mining share	reformist share	pro-mining share	contra-mining share	reformist share
Average	0.041**	-0.107***	0.027**	0.035*	-0.103***	0.028**
	[0.020]	[0.015]	[0.013]	[0.020]	[0.015]	[0.013]
2014	0.012	-0.009	0.043***	0.008	-0.005	0.044***
	[0.017]	[0.021]	[0.013]	[0.017]	[0.021]	[0.013]
2018	0.155***	-0.142***	-0.022	0.147***	-0.138***	-0.020
	[0.038]	[0.027]	[0.026]	[0.038]	[0.027]	[0.026]
2022	-0.160***	-0.133***	0.108***	-0.161***	-0.132***	0.106***
	[0.006]	[0.004]	[0.003]	[0.007]	[0.004]	[0.003]
Observations	3,180	3,180	3,180	2,986	2,986	2,986
Type	Unmatched	Unmatched	Unmatched	Matched	Matched	Matched

Notes: Standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. Estimated effect of labour market changes on electoral support for different party families. The independent variable is number of jobs lost (in 1,000) in coal mining in the 12 months prior to a given election, compared to the level in the two prior years. 2014, 2018 and 2022 refer to the Average Treatment Effect of the Treated for each election period, across all periods. The matching is based on pre-treatment levels and includes the following controls: regional GDP (in logs), area in km2, population density, number of displaced people (at the municipality level).

Lastly, the vote share for *reformist* also increases after local job losses, similarly to the effect on the pro-mining share, but as expected, with a smaller magnitude. This result indicates a crowding out effect, whereby sceptical and pro-mining parties jointly profit from the votes that pro-mining parties have lost. The result on reformist parties is compelling, as ex-ante expectations on the direction of the effect have been unclear. As it seems, pro-mining and reformist parties jointly leverage voters, whether it is through conscious

alliances and bridges in narratives, or composite effects.

We carry out a number of robustness checks and extensions to the analysis. In particular, results are robust to: (1) applying different lags to calculate the changes in jobs, between 1 and 3 years (2) to match on pre-treatment characteristics including also rural density, population in voting age and number of kidnappings, (3) to express the changes in coal jobs in percentage - as opposed to absolute changes, (4) to restricting job changes to above the 75 and 25 percentiles (not shown).

A major limitation of this paper is the issue of informality. It is safe to say that both the mining sector in general and the Colombian economy, in particular, have high levels of informality and even illegality (Prieto et al., 2022). The data used in this paper to calculate mining losses are exclusively from official sources. However, it may still be missing important aspects and large parts of the Colombian mining sector. The only way to increase this representativeness is to improve data availability. These efforts should continue to be supported internationally.

Second, the models presented can also benefit from exploring further possibilities of control variables. For example, the CEDE data provide several variables on political violence and conflict, namely the number of attacks against the population, the number of kidnappings, and the number of displaced persons. Given that the Colombian peace process is partly financed by mining revenues and that rebel groups often finance themselves through the exploitation of natural resources, it is very likely that conflict affects both mining and voting behavior. The control variables in the models presented were chosen with a careful balance between capturing important theoretical mechanisms and statistical concerns, especially cross-correlation. The possibility of adding or substituting additional controls could further improve the quality of this work. In addition, the mining loss variables could be constructed using buffer zones (see, e.g., Wang et al. 2023) instead of the simple neighborhood approach used here to account for the fact that municipal boundaries are likely less relevant than distance for the spatial propagation of the coal loss effect.

Therefore, the results of this paper suggest the following steps for the future: To improve this work, a different set of control variables could be applied, and the loss variables could be refined by using the buffer zone approach. To further strengthen research on populist and anti-environmentalist voting, more research is needed, especially on non-Western economies, to investigate whether and how the mechanisms here differ from those already established for Europe and North America. For policymakers, the findings highlight the importance of designing a just transition from fossil fuels with a strong focus on affected local communities.

6 Discussion and Conclusion

We analyze whether changes in the coal jobs can trigger a political backlash and lead to increasing polarization. Pro-mining and reformist parties are able to capitalize on changes in labor market. At the same time, we find less political support for parties that want to phase out fossil fuels and the mining industry, pointing to an anti-environmentalist backlash. Taken together, these results provide novel support for the existence of a political backlash to the reduction of coal mining activity at the municipal level.

This has several implications for the Colombian case, for environmental politics in general, and for the existing literature on populist and anti-environmentalist voting behavior in particular. We will discuss each of these aspects below. For the Colombian political arena, a backlash at the ballot box poses a significant threat to the proposed coal divestment agenda. As a result, the current leftist government should be extremely cautious in designing concrete policies for divestment. This notion is underscored by the recent large-scale anti-government protests in Bogotá and other major cities that took place in mid-June 2023 (Lobo, 2023). The earlier pro-government protests show that support for the government's proposed policies, which include a large coal exit package, also has considerable popular support, at least in the cities where these protests were active. But this polarized situation

is a potential political powder keg for the Petro government. One possible solution to this situation is to design a fair, reasonable, and prudent policy that takes into account the need for a just transition. A redistributive mechanism, large-scale economic support packages for affected regions and communities, worker retraining initiatives, and the involvement of local populations in the transition process can help mitigate the potential political polarization and local economic hardship caused by the coal phase-out.

In this respect, Colombia can also be seen as a pilot case for international environmental policy. To stay within the 1.5°C target, fossil fuels, especially coal, must be phased out globally. This will affect many other countries whose economies depend on the extraction of these resources, both in the Global South and in the Global North. For the latter, it is already well known that this can lead to a political backlash. For the former, this paper provides at least tentative evidence that a similar mechanism may be at play. While more research is definitely needed on this topic, policymakers and academics should be prepared to find this mechanism, investigate it further, and take the necessary steps to mitigate this problem, as outlined above. An internationally funded mechanism to compensate local communities for their welfare losses and to finance a just transition is one possible step and should be in the interest of all countries, including the richer economies, since the adverse effects of CO_2 emissions affect the entire globe.

This paper adds to the existing literature on populist voting and political backlashes. The finding that a populist and anti-environmental backlash also exists for economic distress caused by coal mine closures has previously been shown only for the US by Egli et al. (2022). We provide tentative evidence that a similar mechanism may be at work in Colombia, suggesting that this effect may exist in other countries as well, both in Western industrialized countries and in low- and middle-income economies. This effect is far from as well studied as the determinants of populist voting outlined by Guriev and Papaioannou (2022), but further growth in the literature on this topic may have the potential to add an important determinant to the existing consensus.

References

Agencia Nacional de Minería (2022). Mineria - Materiales extraidos en Colombia 2012 a 2017. Retrievable online at https://www.datos.gov.co/Minas-y-Energ-a/Mineria-Materiales-extraidos-en-Colombia-2012-a-20/95e9-vx89. Accessed: 2022-12-15.

Albrecht, Don E. (2022). Rural/urban differences: Persistence or decline. *Rural Sociology 87*(4), 1137–1154.

Autor, David , David Dorn, Gordon Hanson, and Kaveh Majlesi (2020, October). Importing political polarization? The electoral consequences of rising trade exposure. *Am. Econ. Rev. 110*(10), 3139–3183.

Ballard-Rosa, Cameron , Amalie Sofie Jensen, and Kenneth F. Scheve (2022). Economic decline, social identity, and authoritarian values in the united states. *International Studies Quarterly 66*(1), 1–14.

Bergquist, Magnus , Andreas Nilsson, Niklas Harring, and Sverker C. Jagers (2022). Meta-analyses of fifteen determinants of public opinion about climate change taxes and laws. *Nature Climate Change 12*(3), 235–240.

Blackwell, Matthew , Stefano Iacus, Gary King, and Giuseppe Porro (2009). cem: Coarsened exact matching in stata. *The Stata Journal 9*(4), 524–546.

Böhmelt, Tobias (2021). Populism and environmental performance. *Global Environmental Politics 21*(3), 97–123.

Bolet, Diane , Fergus Green, and Mikel Gonzalez-Eguino (2023). How to get coal country to vote for climate policy: The effect of a “just transition agreement” on spanish election results. *American Political Science Review*, 1–16.

Broz, J Lawrence , Jeffry Frieden, and Stephen Weymouth (2021). Populism in place: The economic geography of the globalization backlash. *Int. Organ. 75*(2), 464–494.

Callaway, Brantly and Pedro HC Sant'Anna (2021). Difference-in-differences with multiple time periods. *Journal of econometrics 225*(2), 200–230.

Carter, Neil , Robert Ladrech, Conor Little, and Vasiliki Tsagkroni (2018). Political parties and climate policy: A new approach to measuring parties' climate policy preferences. *Party politics 24*(6), 731–742.

Centro de Estudios sobre Desarrollo Económico (CEDE) (2021). Panel municipal del CEDE. Retrievable online at https://datoscede.uniandes.edu.co/es/catalogo-de-microdata. Accessed: 2023-02-09.

Colantone, Italo and Piero Stanig (2018, October). The trade origins of economic nationalism: Import competition and voting behavior in western europe. *Am. J. Pol. Sci. 62*(4), 936–953.

Drews, Stefan and Jeroen C.J.M. van den Bergh (2016). What explains public support for climate policies? a review of empirical and experimental studies. *Climate Policy 16*(7), 855–876.

Dunlap, Riley E. , Aaron M. McCright, and Jerrod H. Yarosh (2016). The Political Divide on Climate Change: Partisan Polarization Widens in the U.S. *Environment: Science and Policy for Sustainable Development 58*(5), 4–23.

Egli, Florian , Nielja Knecht, Fride Sigurdsson, and Sebastian Sewerin (2023). The politics of phasing out fossil fuels: party positions and voter reactions in norway. *Climate Policy*, 1–14.

Egli, Florian , Nicolas Schmid, and Tobias Sebastian Schmidt (2022). Backlash to fossil fuel phaseouts: the case of coal mining in US presidential elections. *Environmental Research Letters 17*(9), 94002.

Fiorino, Daniel J. (2022). Climate change and right-wing populism in the United States. *Environmental Politics 31*(5), 801–819.

Gemenis, Kostas , Alexia Katsanidou, and Sofia Vasilopoulou (2012). The politics of anti-environmentalism: positional issue framing by the European radical right. In *MPSA Annual Conference 2012*, pp. 12–15.

Gidron, Noam and Peter A. Hall (2020). Populism as a problem of social integration. *Comparative Political Studies 53*(7), 1027–1059.

Górecki, Maciej A. and Adam Gendźwiłł (2020). Polity size and voter turnout revisited: micro-level evidence from 14 countries of Central and Eastern Europe. *Local Government Studies 47*(1), 31–53.

Guber, Deborah Lynn (2013). A Cooling Climate for Change? Party Polarization and the Politics of Global Warming. *American Behavioral Scientist 57*(1), 115–93.

Guerra, John (2023). Resultados Primera Vuelta Colombia 2022. Retrievable online at https://johnguerra.co/viz/resultadosPrimeraVuelta2022/. Accessed: 2023-06-23.

Guriev, Sergei and Elias Papaioannou (2022). The political economy of populism. *Journal of Economic Literature 60*(3), 753–832.

Huber, Robert Alexander (2020). The role of populist attitudes in explaining climate change skepticism and support for environmental protection. *Environmental Politics 29*(6), 959–982.

Huber, Robert A. , Tomas Maltby, Kacper Szulecki, and Stefan Ćetković (2021). Is populism a challenge to european energy and climate policy? empirical evidence across varieties of populism. *Journal of European Public Policy 28*, 998–1017.

Iacus, Stefano M , Gary King, and Giuseppe Porro (2012). Causal inference without balance checking: Coarsened exact matching. *Political analysis 20*(1), 1–24.

Inglehart, Ronald and Pippa Norris (2017). Trump and the populist authoritarian parties: The silent revolution in reverse. *Perspectives on Politics 15*(2), 443–454.

Isaksson, Zeth and Simon Gren (2024). Political expectations and electoral responses to wind farm development in sweden. *Energy Policy 186*, 113984.

Kulin, Joakim , Ingemar Johansson Sevä, and Riley E. Dunlap (2021). Nationalist ideology, rightwing populism, and public views about climate change in Europe. *Environmental Politics 30*(7), 1111–1134.

Lehmann, Pola , Simon Franzmann, Tobias Burst, Sven Regel, Felicia Riethmüller, Andrea Volkens, Bernhard Weßels, and Lisa Zehnter (2023). The Manifesto Data Collection. Manifesto Project (MRG/CMP/MARPOR). Version 2023a.

Lenzi, Camilla and Giovanni Perucca (2021). People or places that don't matter? individual and contextual determinants of the geography of discontent. *Economic Geography 97*(5), 415–445.

Lobo, Andrea (2023). Colombia's President Petro warns of "soft coup" attempt. *WSWS*. June 15, 2023. Retrievable online at https://www.wsws.org/en/articles/2023/06/15/gwoa-j15.html. Accessed: 2023-06-23.

Margalit, Yotam (2019). Economic insecurity and the causes of populism, reconsidered. *J. Econ. Perspect. 33*(4), 152–170.

McDonnell, Joshua (2019). Municipality size, political efficacy and political participation: a systematic review. *Local Government Studies 46*(3), 331–350.

Mendes Motta, Filipe and Gabriella Hauber (2022). Anti-environmentalism and proto-authoritarian populism in brazil: Bolsonaro and the defence of global agri-business. *Environmental Politics 32*(4), 642–662.

Ministerio de Salud y Protección Social (2023). Planilla integrada de liquidación de aportes. Retrievable online at https://minsalud.gov.co/proteccionsocial/paginas/pila.aspx. Accessed: 2023-04-28.

Misión de Observación Electoral (2019). Datos y resultados electorales. Retrievable online at https://www.datoselectorales.org/datos-y-resultados-electorales/. Accessed: 2023-01-19.

Mutz, Diana C (2018, May). Status threat, not economic hardship, explains the 2016 presidential vote. *Proc. Natl. Acad. Sci. U. S. A. 115*(19), E4330–E4339.

Nyholt, Niels (2023). Left behind: Voters' reactions to local school and hospital closures. *European Journal of Political Research*.

Prieto, Amanda Vargas , Javier García-Estévez, and John Fredy Ariza (2022). On the relationship between mining and rural poverty: Evidence for Colombia. *Resources Policy 75*, 102443.

Registraduría Nacional del Estado Civil (2023). Histórico de resultados electorales. Retrievable online at https://registraduria.gov.co/-Historico-de-resultados-electorales-. Accessed: 2023-06-16.

Rodríguez-Pose, Andrés (2018). The revenge of the places that don't matter (and what to do about it). *Cambridge journal of regions, economy and society 11*(1), 189–209.

Scala, Dante J. and Kenneth M. Johnson (2017). Political Polarization along the Rural-Urban Continuum? The Geography of the Presidential Vote, 2000–2016. *The Annals of the American Academy of Political and Social Science 672*, 162–184.

Simon, Christopher A. and Michael C. Moltz (2021). Conflicted by conservatism? Exploring authoritarian values, climate politics, and alternative energy funding public opinion in the United States. *Energy research and social science 73*, 101944.

Steckel, Jan C and Michael Jakob (2022). To end coal, adapt to regional realities. *Nature 607*(7917), 29–31.

Tong, Dan , Qiang Zhang, Yixuan Zheng, Ken Caldeira, Christine Shearer, Chaopeng Hong, Yue Qin, and Steven J Davis (2019). Committed emissions from existing energy infrastructure jeopardize 1.5 c climate target. *Nature 572*(7769), 373–377.

Vona, Francesco (2019). Job losses and political acceptability of climate policies: why the 'job-killing'argument is so persistent and how to overturn it. *Climate Policy 19*(4), 524–532.

Wang, Xinxin and Kevin Lo (2021). Just transition: A conceptual review. *Energy Research & Social Science 82*, 102291.

Wang, Xiaoling , Chang Lu, Ying Cao, Lili Chen, and Mohammad Zoynul Abedin (2023). Decomposition, decoupling, and future trends of environmental effects in the Beijing-Tianjin-Hebei region: A regional heterogeneity-based analysis. *Journal of Environmental Management 331*, 117124.

Appendix

A Abbreviations

ANM *Agencía Nacional de Mineria* (National Mining Agency)

CMP Comparative Manifesto Project

CEDE *Centro de Estudios sobre Desarrollo Económico* (Center for Economic Development Studies)

COP Colombian Peso

DANE *Departamento Administrativo Nacional de Estadística* (National Administrative Department of Statistics)

PILA *Planilla Integrada de Liquidación de Aportes* (Integrated Contribution Settlement Form for the Colombian social security system)

RNEC *Registraduría Nacional del Estado Civil* (National Civil Registry)

B Balance on vote shares

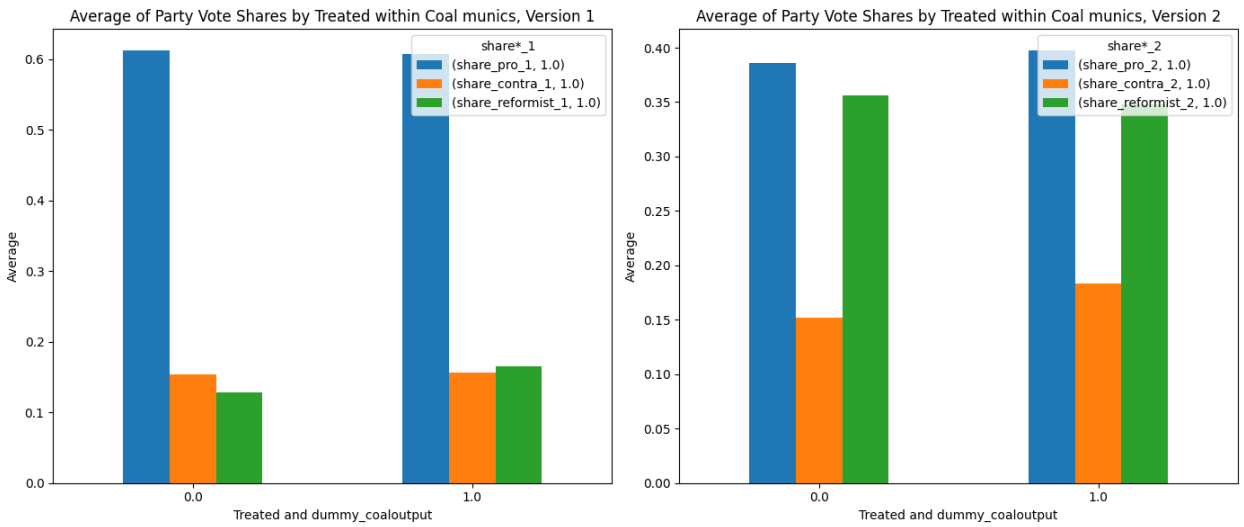


Figure 5: Balance on vote shares comparing treated and control municipalities

C Visualization of results

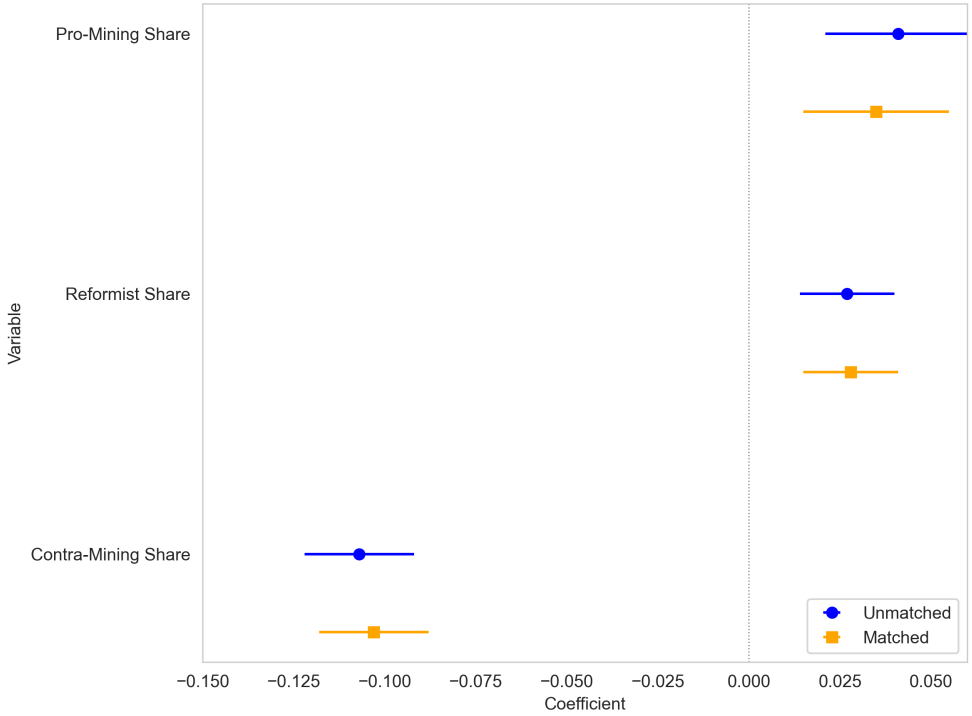


Figure 6: Coefficient plot comparing unmatched with matched sample