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Are We Missing Something When Measuring Citizens' Perceptions of the Extractive Industry?

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Are We Missing Something When Measuring Citizens' Perceptions of the Extractive Industry?*

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Abstract

We study individual preferences and public beliefs surrounding extractive industries in the Latin America and the Caribbean (LAC) region using a metaphor elicitation technique instead of standard stated self-reported questions. Combining qualitative one-on-one interviews in Guyana and Venezuela with national surveys in 12 LAC countries, we uncover deep metaphors and narratives shaping citizens' views. The findings reveal key narratives centered around environmental, economic, and social impacts, as well as governance and local participation. Sentiment analysis indicates polarized opinions on extractive industries. The study highlights the importance of considering emotional and unconscious mental models in shaping individual preferences, which is often overlooked in traditional survey-based methodologies. Our findings could contribute to more nuanced policy interventions and conflict resolution strategies in the extractive sector. Broadly, alternative tools to stated preference surveys are valuable for researchers and policymakers to understand public sentiment across various issues and contexts.

JEL codes: N56, D83, D91, Q30, Q50

Keywords: belief elicitation, survey bias, extractive industries, metaphors, sentiment analysis, GPT model.

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1 Introduction

The development of tools to elicit individual preferences is a central concern in social research, particularly in the behavioral sciences (Alberini, 2020; Adamowicz et al., 1994, 1997; Ishihara and Ida, 2022; Calfee et al., 2001). These efforts have benefited from a long-standing multidisciplinary debate over whether researchers can uncover meaningful information using survey data. Individuals responding to a survey can experience a variety of cognitive, moral, political, social, and contextual factors, which can affect their self-reported information (Bertrand and Mullainathan, 2001; Funk, 2016; de Koning et al., 2017). Hence, the inferences drawn from standard belief elicitation surveys ultimately may be distorted due to inaccurate survey data, compromising the quality of the resulting research and interventions (Danz et al., 2022; Azevedo et al., 2003; Zawojka and Czajkowski, 2017).

Along these lines, it is essential to recognize that humans understand the world through narratives, which can affect their (mis)understanding of causal relationships (Shiller, 2017; Collier, 2016; Eliaz and Spiegler, 2020). This phenomenon can be understood as a result of certain characteristics of the human mind, which is both rational and emotional (Damasio, 2005), as well as unconscious (Greenwald and Banaji, 1995; Damasio, 2005), bandwidth-constrained (Norretranders, 1999), visual rather than textual (Damasio, 2005), and metaphorical instead of literal (Haven, 2007; Lakoff and Johnson, 2008; Kövecses, 2005).¹ These characteristics frequently are at odds with survey-based research designs, increasing the likelihood of inaccurate observations.

This paper aims to implement a methodology that can improve the understanding of belief elicitation in the context of extractive industries in Latin America and the Caribbean (LAC)—a particularly relevant setting in which social conflicts are prevalent and violent (Andrews et al., 2017; Albrieu and Palazzo, 2020).² A review of the research in this area, predominantly focused on survey-based designs, raises a few key questions: Do previous studies adequately assess the principal dimensions that determine an individual’s opinion of these industries? Which narratives prevail when people think about the sector? Are survey incentives aligned with the aim of revealing preferences? Our study seeks to generate inputs for future research

¹See Bressette (2009) for a review on the importance of understanding the inner workings of the human mind and its implications for research. Methodologies are needed that can help uncover hidden mental processes and decision-making, and address misconceptions that can lead to sub-optimal approaches and outcomes. The review presents three different approaches for revealing the inner human along with case studies demonstrating their application.

²Over the past two decades, the Latin American Observatory of Mining Conflicts (OCMAL) has recorded 284 conflicts in LAC, as well as 112 threats, 43 crimes against women defending the environment, and 71 homicides/attacks.

and policy interventions that account for individual preferences and opinions using citizens’ conceptual frames to find common ground, improve conflict resolution, and achieve more peaceful and collaborative outcomes and solutions.

To this end, we employ the Zaltman Metaphor Elicitation Technique (ZMET) through qualitative one-on-one interviews in Guyana and Venezuela,³ and national surveys in 12 LAC countries: Argentina, Bolivia, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Guyana, Mexico, Peru, and Venezuela.⁴ ZMET is a metaphor measurement and elicitation technique that can be used to create a collective cognitive map for groups of individuals (Zaltman, 1997; Coulter et al., 2001; Zaltman, 2003; Zaltman and Zaltman, 2008; Christensen and Olson, 2002). In particular, our research focuses on revealing *deep metaphors*, which can be understood as the unconscious frames that shape individual experience and perception. When properly leveraged, these metaphors can exert an outsized influence on behavior; thus, understanding deep metaphors is essential for guiding effective policy-making that involves rationally and emotionally engaged subjects. We use a bottom-up, grassroots approach to delve deeply into citizens’ conscious and unconscious thoughts about the extractive sector. This methodology can capture conscious and unconscious mental models and associations that are not captured by current quantitative methodologies.

We find this novel approach reveals a rich set of deep metaphors that shape citizens’ views of extractive industries in LAC. The deep metaphors associated with extractive industries include notions of balance, transformation, journey, container, and connection. Through our analysis, we identify several key narratives that emerge from these deep metaphors, which relate to the extractive industry’s environmental, economic, and social impacts, as well as the role of governance and local participation in decision-making processes. Additionally, our sentiment analysis, performing a GPT model⁵, reveals polarized public opinion on extractive industries, with participants expressing strong positive and negative sentiments.

³Guyana and Venezuela are compelling case studies for examining public opinion on extractive industries in LAC due to their vast oil and gas resources and contrasting political contexts. Guyana’s recent oil discoveries have spurred rapid growth, while Venezuela’s long-established oil sector faces challenges from political and economic turmoil. Studying these countries allows us to explore how differing political landscapes and resource endowments influence public opinion on extractive industries and their policy implications.

⁴Olson Zaltman Associates developed SIMILE as a quantitative tool to implement ZMET in contexts in which statistical inference and representativeness are essential for the analysis. SIMILE preserves the richness of emotional depth needed to draft actionable policy recommendations from the ZMET one-on-one interviews.

⁵GPT stands for Generative Pre-trained Transformers, a set of large language models (LLM) that use neural networks.

The one-on-one interviews in Guyana and Venezuela reveal the specific concerns and aspirations of individuals who live near extractive projects. Participants express concerns about environmental degradation, water scarcity, and negative health impacts, as well as the distribution of economic benefits and the potential for increased social inequalities. However, they also recognize the potential for job creation, infrastructure development, and improved local economies. These interviews highlight the importance of transparent communication between communities, society, governments, and companies, as well as the need for active participation and consultation with local stakeholders.

Our findings underscore the importance of considering the multiple dimensions that shape individual opinions on extractive industries in LAC. In particular, they demonstrate the value of considering the emotional and unconscious mental models that drive individual preferences, which are not adequately captured by traditional survey-based methodologies. These insights can inform more nuanced policy interventions and conflict resolution strategies that take into account citizens' conceptual frames and strive to find common ground, ultimately contributing to more peaceful outcomes and solutions in the extractive sector.

The results of our study suggest that new methodologies like ZMET, which combines national surveys with one-on-one interviews, could effectively elicit narratives that shape public opinion on extractive industries in LAC. In doing so, this methodology could overcome many of the limitations associated with traditional survey-based approaches, which often fail to capture the full complexity of individual preferences and opinions. This innovative approach can be applied to other policy domains and contexts, providing a valuable tool for researchers and policymakers interested in understanding the factors that drive public sentiment.

This paper contributes to multiple debates in the literature, of which three are particularly relevant to our study. First, we add to work on the determinants of the acceptance of natural resource projects and the efficacy of different tools for executing extractive industry projects while considering citizens' concerns. Our findings highlight the importance of understanding individual preferences and opinions using citizens' conceptual frames to find common ground and develop more effective conflict-resolution strategies. Research in this area has focused on the concept of social license to operate (SLO) as a means to address the societal expectations of industries involved in natural resources extraction (Moffat et al., 2016; Balza et al., 2023; Gunningham et al., 2004; Prno and Slocombe, 2012). Our research contributes to this literature by identifying the factors that influence people's acceptance of industrial projects and exploring the role of governance in shaping public trust in the extractive sector.

Similarly, our results contribute to understanding the dynamics of social mobilization and contestation in the context of extractive industries. Research has shown that protests against extractive industries often are driven by underlying socio-environmental conflicts, frustration over wages, and a lack of economic opportunities for local communities (Vargas, 2019; Schilling-Vacaflor et al., 2018). Moreover, the State often depoliticizes the participation process, paving the way for an expansion of extractive frontiers by organizing exclusionary processes of participation, providing pro-extraction information, and identifying critical actors and discourses to weaken resistance against planned activities (Schilling-Vacaflor et al., 2018). However, local populations often contest these practices, frequently driven by previous negative experiences with extraction activities and the existence of local economic alternatives. Local contestation can be quite effective, leading to increased social investment in the affected areas, the withdrawal of extractive projects, and the adoption of laws on prior consultation, as occurred in Peru (Schilling-Vacaflor et al., 2018). Studies in this area, including Conde (2017); Urkidi (2010); Ocaklı et al. (2021); Orta-Martínez and Finer (2010); Latorre et al. (2015); Perez-Rincon et al. (2019); Fetzer and Kyburz (2022); and Berman et al. (2017), further explore the dynamics of resistance, social divisions, and identity politics in the context of extractive industries.

Second, we contribute to methodological discussions on the accuracy of surveyed preferences in the context of public policies and the ability of surveys to capture individuals' opinions and beliefs. Graham (2023) demonstrates that surveys often fail to identify firm, deep, steadfast, and confidently held beliefs, as even those who report high certainty in their beliefs exhibit substantial instability in their response over time. These findings challenge the existing evidence on the prevalence, predictors, correction, and consequences of misperceptions and misinformed beliefs. Funk (2016) investigates biases in surveyed preferences for a broad range of public policies using data from Swiss referenda and post-ballot surveys. The author finds that biases in surveyed preferences vary by policy area, with the largest biases occurring in policies on immigration, international integration, and votes involving liberal or conservative attitudes. The paper furthermore provides evidence of a tendency among citizens to respond in a manner that matches the majority view, further complicating the interpretation of survey data. These findings call for a cautious approach when using surveys to measure public sentiments and preferences in the context of extractive industries.

Finally, the literature on machine learning has important implications for the use of innovative tools in economic research, particularly for sentiment analysis. Athey and Imbens (2019) discuss the relevance of machine learning for economics, highlighting the importance of supervised and unsupervised learning methods and matrix completion methods. They

also emphasize the usefulness of newly developed techniques that combine machine learning and econometrics, particularly for causal inference, optimal policy estimation, and consumer choice models. Meanwhile, [Gilardi et al. \(2023\)](#) demonstrate the superior performance of a large language model, ChatGPT, in-text annotation tasks, including relevance, stance, topics, and frame detection. This finding has important implications for the efficiency and cost-effectiveness of data annotation in economic research. Furthermore, these kinds of machine learning tools provide opportunities to improve the quality of data analysis and enhance the accuracy of conclusions. Our use of a GPT model for sentiment analysis is in line with a new trend in research that uses text as a relevant source of information ([Gentzkow et al., 2019](#); [Dugoua et al., 2022](#); [Ferrario and Stantcheva, 2022](#); [Wilkerson and Casas, 2017](#)). By incorporating these innovative tools, our paper aims to contribute to the growing body of research that employs natural language processing in large language models and machine learning to extract insights from textual data.

The paper is organized as follows. The next section describes the methodology employed in the study, including further details on ZMET and how it was implemented in one-on-one interviews and national online surveys. The third section presents the results from both implementation methods and compares them with previous quantitative studies. This section includes findings from the deep metaphors elicited from participants, sentiment analysis, and factors that influence support for the extractive industry. The final section concludes and discusses the implications of the results for policymakers, citizens, and researchers.

2 Methodology and research design

We employ the Zaltman Metaphor Elicitation Technique (ZMET) through qualitative one-on-one interviews and national quantitative surveys – see e.g. [Zaltman \(1997\)](#); [Coulter et al. \(2001\)](#); [Zaltman \(2003\)](#); [Zaltman and Zaltman \(2008\)](#) for more details on the methodology. This method accesses the unconscious mind through metaphors to understand individuals and uncover their unspoken needs, drivers, and emotions. Images, used as metaphors, can help to express and uncover unconscious phenomena, revealing cognitive processes and emotions beyond literal language and how these phenomena influence or change perceptions and decision-making. The ultimate goal of our use of ZMET is to elicit the main *deep metaphors* prevalent in individuals’ narratives concerning extractive industries in LAC.

Deep metaphors: Before describing our research design, it is important to define what a *deep metaphor* is and its meaning in the extractive industry context. *Deep metaphors* are the primary outcome of both of our surveys. When properly leveraged, deep metaphors can exert an outsize influence on behavior. Therefore, a comprehensive view of metaphors related to the extractive industry could prove effective in guiding effective policy-making around emotionally involved subjects.

People understand and describe something new by comparing it to something familiar. Abstract concepts are understood and defined by contrasting them with something tangible. Indeed, describing an emotion without a metaphor is nearly impossible. Deep metaphors are the foundation of the human metaphorical system and are familiar to everyone because they are rooted in universal physical experiences. For example, consider the concept of balance. Virtually all of us learn to sit up, crawl, walk, and eventually run. Therefore, we understand what happens when we maintain our balance (which generally tends to be a good thing) and what happens when we fail to keep our balance (which generally tends to be a bad thing). We then use the fundamental concept of balance to understand and describe some of the more ethereal things we encounter. For example, we often use balance to frame concepts such as human relationships (e.g., “a good marriage is a give-and-take”), justice (e.g., the scales of justice, which are present in many courtrooms), and emotions (one person may be “level-headed” or “grounded” while another could be “off the wall” or “head over heels in love”).

As human beings, we undergo sensory and motor experiences that are identical in many key aspects. In total, nine key deep metaphors repeatedly appear in the human narrative: *balance, connection, container, control, force, ideal, journey, system, and transformation* (Zaltman and Zaltman, 2008).⁶ Subsequently, each deep metaphor has a set of *sub-metaphors* that capture the feelings expressed in more detail. A complete list of these sub-metaphors and a description of each deep metaphor is presented in Appendix Table A1. An example of how these metaphors can be understood in the context of extractive industries is shown below, and will be discussed in greater detail when presenting the results in Section 3.

⁶Nature can be understood as a metaphor as well, but individuals usually describe concepts related to nature more literally than metaphorically. We intentionally do not include nature as a metaphor given the environmental component of the extractive industries.

Example 1: An example of *deep metaphors* in narratives on the extractive industries.

In this study, we identified the metaphor of imbalance as relevant for the extractive industry, as participants often characterized their perception of the industry using terms like “tilted scales,” described certain figures as being positioned “high above” or being “large” relative to their peers, and framed the industry itself as a “predator” (of various kinds) preying on less fortunate communities or manipulating governments. An example is seen here:



“The State is represented by the puppet, which is manipulated by the private sector, and the one who really moves or modifies provisions and regulations for their benefit. The puppet is the State, which is manipulated or sold to benefit extractive companies.” (Mexico, female, 33 years old, oil and gas)

Equipped with this knowledge, we can identify communication frameworks and policies that will resonate with these unconscious frames. Imbalance, in this case, suggests that approaches speaking to the concept of improving equity and “leveling the playing field” will be the best received. Deep metaphors, such as balance, are especially powerful because they are largely unconscious, and also because they provide coherence in what can be seen, at a surface level, to be a disparate collection of thoughts and feelings.

2.1 One-on-one interviews

To elicit individual deep metaphors in the one-on-one ZMET interview, participants select images they view as relevant to ideas they wish to express and bring them to a session that lasts approximately one to two hours. During the interview, highly trained interviewers deeply explore what each picture means to participants. Interviewers use non-directive probing techniques to explore participants’ ideas, eliciting additional metaphors and thus uncovering deeper, even unconscious, meanings. By carefully analyzing the metaphors and other non-literal speech that individuals use in the process of describing their pictures, interviewers can identify deep emotional reactions and meanings that structure participants’ thoughts and feelings.

The ZMET protocol can employ several steps to bring participants’ key thoughts and feelings to the surface and further explore them. The use of multiple steps also increases the likelihood of uncovering an important idea that might be missed by more narrowly focused techniques. At the same time, each step validates ideas from other steps, a process known

as convergent validity (Russell, 1978). This redundancy provides greater confidence in the validity and importance of ideas being expressed. The central steps of the interview process are described below.

1. *Storytelling*: During this step, participants describe how each picture they brought to the interview expresses their thoughts and feelings about the research topic. As much of our knowledge and memory takes the form of stories, stories deliver excellent sources of metaphors and insights. These insights emerge when participants tell a story about the pictures, with probing by trained ZMET interviewers. Special probing techniques are used to explore why key ideas are relevant to the participant.
2. *Missing pictures*: Participants are asked if there were important ideas they wanted to express, but for which they were unable to find relevant images. When this happens, the interviewer asks about images that might represent those thoughts and feelings.
3. *Expand the frame*: A sequence of probes is used to explore selected visual images more deeply. First, participants are asked to widen the frame of one or more selected pictures and describe what else might enter the picture that reinforces the original idea. They also might be asked to imagine themselves in the picture and to discuss what might be taking place and what they are thinking and feeling. They may be asked to invite someone or something into the picture to help them with a paradox or dilemma and describe who or what it would be. Other follow-up questions help reveal the significance of this person or item. This step is customized to address the specific issues of concern.
4. *Sensory metaphors*: Participants also are asked to express their ideas using multiple sensory images. For instance, participants might be asked what color, taste, smell, touch, and sound the topic has (or does not have). Each answer is explored to uncover further dimensions of the person's thinking. This step also is customized to address specific framing needs.
5. *Vignette*: People engage in additional areas of their brain when they think about time sequences and motions than when they think about still pictures. For this reason, this step involves motion, time, and further storytelling by asking participants to create a movie or one-act play that expresses important ideas about the topic. The characters that are to appear in the movie are determined beforehand and specific to the participant. Like the "expand the frame" and "sensory metaphor" steps, the characters in the vignette can be customized to address specific issues. Participants are asked to

describe the setting; identify who, if anyone, is present, what else is happening, and so on. This step provides additional understanding of the participant's thoughts and feelings.

6. *Digital imaging*: Finally, at the end of the interview, each participant creates a summary collage in the form of a digital image. Digital images are based on a subset of pictures the participant initially brought to the interview (typically the most meaningful five to seven pictures). While the digital image summarizes many ideas expressed earlier in the interview, new ideas frequently emerge from this creative process as participants modify their pictures in terms of size, color, shape, etc., to fully convey their thoughts and feelings. When the image is finished, the participant gives a verbal summary, which serves as an interpretative tour through the collage.

The images are meant to be metaphorical and serve as a jumping-off point for a rich discussion in which participants' metaphoric language is elicited and explored. Interviewers use *laddering* techniques to probe deeper into participants' beliefs. Laddering, in a ZMET interview context, involves asking strategic questions to elicit a chain of consecutively deeper responses that provide insight into the participant's thoughts and experiences about the topic at hand. For this study, laddering questions move participants from a discussion about a feature of the extractive industry toward their own experience of the sector, all the way to the root motivational and emotional causes that fuel their interactions with the mining or oil and gas industries. Laddering elicits participants' views of the outcomes of extractive industries and their experience of the outcomes at the psychological, personal, and emotional levels.

Sample selection and framing questions: Participants in the one-on-one ZMET interviews were selected from a pool of interested individuals from Guyana and Venezuela recruited through social media.⁷ A screening survey was designed to identify people with different opinions about oil extraction and mining activities. Respondents were classified as being in favor or against each industry.⁸ Additionally, we collected demographic data, such as age, gender, education, geographical location, and occupation. We recruited 67 individuals from Guyana and 60 from Venezuela.

⁷Specifically, participants were selected from among those who responded to a screening survey posted on Facebook.

⁸The screening survey included 7 questions about individuals' perceptions of each industry, which were evaluated on a Likert scale from 1 to 10. See Supplemental Material [S.1](#) for the ZMET screening format.

From this pool of individuals, we invited sixteen from each country to participate in the interviews.⁹ Participants were contacted to verify demographics and opinions about the industry and to schedule the one-on-one interviews.¹⁰ We chose purposive sampling based upon two quotas for the final sample. First, half the analysis sample was to be in favor of the extractive industry and half against. Second, half the respondents were to be asked about mining, and the other half about oil extraction.¹¹ In terms of demographics, we invited individuals from different age groups, genders, education levels, and geographical locations but hard quotas were not assigned for these dimensions. Composition of the recruitment and the analysis sample is shown in Appendix Tables [A2](#) and [A3](#).

Participants were required to bring images to the interview representing their thoughts about the extractive industry. Many participants required additional guidance with this task, sometimes needing several examples to improve their understanding. The guidance provided for this task and an example of the images that individuals brought to the interview are shown in [Figure 1](#).

Interviews followed a standard ZMET protocol with an emphasis on aspects related to the purpose of this study –see [Supplemental Material S.2](#) for details. Interviewers were advised to probe critical topics and frame questions if they arose during the conversation. Interviewees were encouraged to reflect on the social, economic, and environmental impacts of extractive industries in a context where the actions of multiple stakeholders (e.g., individuals, communities, firms, and governments) are weighted differently for belief formation. Critical insights included those concerning justice, including distributive justice, following [Balza et al. \(2023\)](#).

2.2 National online surveys

The online survey offers quantification of deep metaphors that are conceptualized through focused questions and a comparison of multiple segments with greater scalability than the ZMET interviews. This enables a countrywide scope that is essential for providing a global view of the metaphorical landscape. The inherent tradeoff in the survey is that it does not

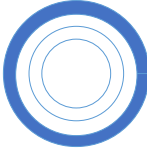
⁹Due to their rigor, ZMET interviews require a minimum of only seven participants to reach the maximum constructs for rich insights.

¹⁰During the scheduling process, interviewers prepared a script to explain the objectives of the interview and the homework process. Additionally, they had to assuage people’s fears by assuring them we were independent researchers, not representatives of the extractive industry or the government. The interviews took place between September 23rd, 2021, and October 19th, 2021.

¹¹We chose this approach to gain a more general understanding of people’s views about the extractive industries. Mining and oil extraction industries are heterogeneous in many aspects and perceptions towards each sub-sector may vary between individuals.

Figure 1: ZMET guidance to prepare individuals for one-on-one interviews

(a) ZMET guidance



PLEASE REFLECT

We are interested in your thoughts and feelings about the impact of the Mining industries in your community; please reflect on the role this industry has on your community, both the positive and negative aspects.

When you think about the **mining industry** what thoughts and feelings come to mind?
 ↳ What is your position with respect to this industry?

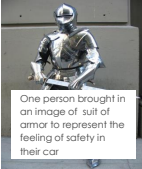
Find 6 images that best illustrate or express your thoughts and feelings about the impact of the mining industry on your community; & one image that personifies (a person or animal) what the mining industry is for you.

Your pictures can come from any source (magazines, newspapers, the Internet, photos, etc.). Be picky about your pictures and choose those that vividly express your thoughts and feelings.


Be creative! look for images that *metaphorically* capture your personal thoughts, feelings and emotions.

These images should represent your thoughts and feelings about the impact of the **mining industry** on your community. Your pictures do not have to make sense to anyone but you, so I encourage you to have fun and be creative!

For example, in an unrelated study about driving cars...



One person brought in an image of suit of armor to represent the feeling of safety in their car



Another person used an image of an open landscape to represent their feeling of being free in a car

Please email your images to your recruiter 48 hours before our time together

Your pictures will form the foundation for our discussion, and without them, I will be unable to talk with you or compensate you for your time.

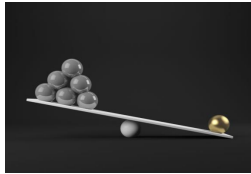





Checklist

- Do you have your 6 photos/images selected?
- Have the images been emailed to the recruiter before the interview?


(b) ZMET example outflows

Find 6 images that best illustrate or express your thoughts and feelings about the impact of the mining industry on your community;

• PLEASE STICK YOUR IMAGES HERE

One image that personifies (a person or animal) what the mining industry is for you.



Notes: This figure shows the guidance provided to the participants prior to the one-on-one ZMET interviews. Figure 1a describes the task, and Figure 1b illustrates an example of what individuals might bring to the interview.

allow for follow-up probing or additional impromptu questioning, meaning that the survey is a direct response to the questions posed to respondents. The ZMET interview data thus becomes a very valuable complement to the surveys, allowing deeper probing on individual topics – as well as tangentially related associations – and providing architecture to support a more sophisticated metaphorical framework.

The quantitative survey begins with the participant choosing two images from a proprietary database to express their thoughts and feelings about extractive industries. The database is carefully and expertly curated to ensure images reflect the most salient universal orientations and mental models. In total, respondents have access to 300 different images.¹²

After the image selection, participants are asked to describe their thoughts and feelings about the image and its relationship to the extractive industry. This step is particularly important because it highlights what participants view as meaningful about their image choice. The survey is designed to ensure that responses go beyond surface-level remarks. An expert analyst then reviews and codes all image and text responses into one of the metaphors.¹³

To code the responses, each deep metaphor has an associated set of images representing the thematic expression; however, selection of the most relevant deep metaphor hinges on the language used to describe the image. Generally speaking, the language “overrides” the database image’s default tag. For example, an image of a person walking on a high wire may be tagged with the deep metaphor of balance, but if the respondent says “*This high wire walker moving from one building to another symbolizes how I have changed over time*”, the analyst would code the metaphor not as balance but as transformation. The metaphorical images paired with their text descriptions were assessed and coded by a team of researchers trained in metaphor analysis.¹⁴

Responses can be coded to capture primary, secondary, and tertiary-level metaphors depending on the expression exhibited. Primary-level metaphors are the first response provided by each respondent. Secondary-level metaphors are the second response provided, if any, and tertiary-level metaphors are the third response provided. For the purposes of this study, the analysis is conducted at the primary level. Furthermore, sentiment is categorized as positive,

¹²For the purposes of this study, images associated with the deep metaphor of nature were removed, as these images tend to result in literal rather than metaphorical expression in studies where nature is a direct focus.

¹³The expert analyst is a staff member from Olson Zaltman Associates.

¹⁴In each country, the data were evaluated by a team of one to four coders to limit coding bias and also reviewed by a senior Olson Zaltman Associates metaphor researcher.

negative, or neutral (see Appendix for details about the sentiment analysis and systematic classification). The images do not contain metadata indicating sentiment, and so we evaluate this exclusively from the text. Similarly, deep metaphors assigned during coding do not contain inherent sentiment and any permutation between metaphors and sentiments is possible.

Sample selection and survey description The quantitative online survey offers the opportunity to explore perceptions about the extractive industry through a more comprehensive picture. Our sample is comprised of participants recruited from twelve LAC countries: Argentina, Bolivia, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Guyana, Mexico, Peru, and Venezuela.¹⁵ Respondents working for the extractive industries were excluded from the recruitment sample to avoid any type of bias.¹⁶ Depending on their country of residence, respondents were asked about either the mining industry, or the oil and gas industry. In Figure 2, we show the industry assignment for each country. Assignments were selected depending on which industry was more important for each country in terms of the industries’ rents as a percentage of GDP. Argentina and Colombia were the exceptions, with mining selected for both countries due to its considerable potential even though oil rents were larger for 2021.¹⁷

We set a goal in our recruitment efforts to obtain a nationally representative sample of 600 individuals from each country with complete responses.¹⁸ Online surveys, however, can suffer from sampling bias, which may restrict the analysis to a certain segment of the population

¹⁵The data collection period lasted from November 3rd, 2021 to February 17th, 2022.

¹⁶Participants directly connected to the extractive industries may have vested interests, personal experiences, or financial incentives that could influence their responses. This could lead to biased results that overemphasize the positive aspects of extractive industries, downplay potential negative consequences, or skew the overall perception of the sample.

¹⁷World Bank estimates of mineral and oil rents (% of GDP) for 2021 were 0.6 and 1.5 for Argentina; 5.9 and 1.3 for Bolivia; 4.5 and 2.6 for Brazil; 16.2 and 0.0 for Chile; 0.9 and 3.4 for Colombia; 2.0 and 0.0 for Dominican Republic; 0.0 and 6.4 for Ecuador; 1.1 and 0.1 for Guatemala; 9.4 and 22.1 for Guyana; 1.4 and 2.1 for Mexico; 12.1 and 0.2 for Peru; and 0.1 and 11.3 for Venezuela (year 2014). This data was retrieved from the [World Bank Open Data website](#).

¹⁸For this study, we recruited participants from a panel provider, except for Guyana and Venezuela, where recruitment took place via social media. The usability of responses was evaluated based on two criteria: whether were clear and relevant to the questions, and whether they used metaphorical or representational language to express thoughts and feelings. Responses that did not meet these criteria were discarded as either “unusable” (nonsensical or off-topic) or “missing metaphor.” In total, 771 responses were not included in the final sample.

Figure 2: Industry assignments for ZMET national surveys



■ Mining ■ Oil and gas ■ Not included

Notes: This figure illustrates the country assignments for the ZMET national surveys. We recruited participants from twelve LAC countries: Argentina, Bolivia, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Guyana, Mexico, Peru, and Venezuela. Perceptions and beliefs about mining were collected in Argentina, Bolivia, Brazil, Chile, Colombia, Dominican Republic, Guatemala, and Peru, while respondents from Ecuador, Guyana, Mexico, and Venezuela were asked about the oil and gas sector.

(Funk, 2016). To avoid this, sample quotas were specified to guarantee the presence of certain population groups in the analysis sample. The recruitment targets were defined independently by sex, age, and socioeconomic level.¹⁹

Across all countries, it was more difficult to recruit older, less affluent, and less educated segments. As a result, a slight deviation from the initial targets can be observed in the final recruited population relative to the initial quota. Nonetheless, we exhausted the recruitment

¹⁹We were interested in setting quotas by education, but there is a high correlation between socioeconomic levels and education groups. The socioeconomic level is a composite score that is calculated through a point-based system. Points are assigned based on two primary dimensions: 1) Educational attainment, which spans from no schooling to higher education, and 2) Household attributes. The latter encompasses access to public utilities such as piped water and paved streets, as well as ownership of specific items like bathrooms, personal computers, and automobiles. The cumulative points determine an individual's SEL classification, with specific point ranges corresponding to predefined socioeconomic tiers (e.g., 45-100 points classifying an individual in the 'A' tier). Detailed breakdowns of points and classifications can be provided upon request as the calculations are proprietary information of the panel providers.

sample in Guyana and decided to include the Dominican Republic to take advantage of the additional number of respondents that we could recruit. Statistics for the final analysis sample are shown in Table 1.

Table 1: Descriptive statistics of the ZMET national surveys

Variable	Country												Total
	ARG	BOL	BRA	CHL	COL	DMR	ECU	GUA	GUY	MEX	PER	VEN	
Panel A. Target variables													
<i>Age group</i>													
18-24	0.14	0.21	0.18	0.17	0.17	0.27	0.17	0.26	0.27	0.19	0.18	0.11	0.19
25-39	0.32	0.34	0.31	0.32	0.32	0.44	0.35	0.44	0.50	0.36	0.37	0.35	0.36
40 or more	0.54	0.45	0.52	0.51	0.51	0.29	0.47	0.30	0.23	0.46	0.45	0.54	0.46
<i>Sex group</i>													
Female	0.46	0.50	0.45	0.43	0.47	0.49	0.48	0.48	0.36	0.49	0.47	0.52	0.47
Male	0.54	0.50	0.55	0.57	0.53	0.51	0.52	0.52	0.64	0.51	0.53	0.48	0.53
<i>Socioeconomic level</i>													
Lower	0.41	0.49	0.43	0.40	0.47	0.38	0.48	0.41	0.58	0.44	0.46	0.52	0.45
Upper	0.59	0.51	0.57	0.60	0.53	0.62	0.52	0.59	0.42	0.56	0.54	0.48	0.55
Panel B. Additional sociodemographic variables													
<i>Civil status</i>													
Married	0.35	0.28	0.40	0.30	0.30	0.28	0.31	0.41	0.31	0.48	0.36	0.31	0.35
Single	0.37	0.47	0.37	0.44	0.40	0.45	0.41	0.43	0.41	0.32	0.39	0.38	0.40
Other	0.28	0.25	0.24	0.25	0.30	0.26	0.28	0.16	0.28	0.20	0.25	0.30	0.25
<i>Education group</i>													
Lower	0.33	0.23	0.36	0.31	0.36	0.25	0.41	0.45	0.66	0.43	0.17	0.27	0.34
Upper	0.67	0.77	0.64	0.69	0.64	0.75	0.59	0.55	0.34	0.58	0.83	0.73	0.66
<i>Urban/rural area</i>													
Urban	0.96	0.88	0.96	0.88	0.91	0.80	0.80	0.76	0.44	0.91	0.89	0.84	0.86
Rural	0.04	0.12	0.04	0.12	0.09	0.20	0.20	0.24	0.56	0.09	0.11	0.16	0.14
<i>Household role</i>													
Head	0.67	0.60	0.71	0.67	0.69	0.60	0.65	0.57	0.53	0.71	0.69	0.77	0.66
Other	0.33	0.40	0.29	0.33	0.31	0.40	0.35	0.43	0.47	0.29	0.31	0.23	0.34
<i>Occupation group</i>													
Employed	0.65	0.45	0.57	0.56	0.54	0.55	0.46	0.55	0.48	0.68	0.63	0.28	0.54
Unemployed	0.14	0.35	0.21	0.26	0.25	0.30	0.39	0.27	0.40	0.13	0.25	0.53	0.28
Inactive	0.05	0.04	0.06	0.06	0.06	0.02	0.04	0.05	0.02	0.06	0.04	0.03	0.05
Student	0.11	0.13	0.08	0.10	0.09	0.13	0.09	0.12	0.05	0.10	0.07	0.04	0.09
Retired	0.06	0.02	0.08	0.03	0.05	0.00	0.02	0.01	0.04	0.03	0.01	0.12	0.04
N	600	601	628	625	688	393	617	601	220	600	636	586	6795

Notes: This table presents descriptive statistics of the ZMET national surveys for the respondents across 12 countries: Argentina (ARG), Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Dominican Republic (DMR), Ecuador (ECU), Guatemala (GUA), Guyana (GUY), Mexico (MEX), Peru (PER), and Venezuela (VEN). The table is divided into two panels, Panel A and Panel B. Panel A showcases the target variables, which include age group, sex group, and socioeconomic level, and Panel B presents additional sociodemographic variables.

3 Results

3.1 One-on-one interviews

One-on-one interviews are an effective research method, permitting an in-depth exploration of a participant's thoughts and experiences. The interviewer can probe and follow up on responses, leading to a more detailed and nuanced understanding of the topic. Similarly, the interviewer can control the pace and direction of the conversation, which helps keep it more structured and focused. In this section, we analyze attitudes towards the extractive industry in Guyana and Venezuela using the ZMET one-on-one interviews.

3.1.1 Guyana

In Guyana, those who are against the extractive industries tend to be vehemently opposed, whereas those in favor see both the pros and cons. The three primary deep metaphors expressed in connection with the negative effects of extractive industries are force, balance, and sacred/profane. Positive impressions of extractive industries, however, are related exclusively to the metaphor of transformation.

The deep metaphor of force emerges through language and imagery that references predatory images, scenes of catastrophe, and powerlessness. Guyanese respondents frame extractive industries as toxic, greedy, and resilient predators. Citizens believe that the industry does not care about the environment, the welfare of employees, or local communities. They also perceive the industry as a predator that always finds a way to survive, regardless of the economic conditions.

Guyanese culture is rooted in fishing, rich natural resources, and fauna diversity. Extractive industries could seriously affect all of these areas via collapsing pits, deforestation, pollution, human-induced natural disasters, and wildlife extinction. Some interviewees believe that the extractive industries have corrupted the government, which turns a blind eye to citizens' concerns and leaves them vulnerable and powerless.

Example 2: Force emerges through language and imagery that references predatory images.

“[The oil company] would be a tiger. They are a meat-eating animal that needs other animals to sustain itself. It is dangerous. It only eats flesh and blood.” (Female, 42 years old, oil and gas, against)



Additionally, the deep metaphor of balance includes references to justice and moral balance, in particular the concepts of proportionality and fairness. Imbalance is expressed as the opposite through imagery of injustice, feeling overwhelmed, and a lack of reciprocity.

During the interviews, Guyanese respondents mainly express imbalance in the sense of economic injustice. Executives and investors in the extractive industries are profiting at the expense of their front-line employees and lower-level managers. While the government has called Guyana “The Little Dubai”²⁰, citizens have seen little evidence of such a rise out of poverty. Imbalance can also be related to our thoughts and attitudes towards nature. Although the environment provides opportunities to profit from natural resources, some individuals perceive the industry as lacking reciprocity and not investing in the land and its people.

Example 3: Guyanese respondents express imbalance as they describe a sense of economic injustice.



“This is a picture of a fisherman deeply affected by an oil spill. He looks like his livelihood has been lost. It’s sad because Guyana really depends on fishing. If an oil spill happened, it would affect us all. Fish represents one of the main foods for Guyana. If you tell somebody about Guyana, you’re going to tell him about fish curry. It is our culture; it is part of us. It’s like beer is to Germany, vodka is to Russia, tacos are to Mexico.” (Male, 23 years old, oil and gas, against)

²⁰See references to the “Little Dubai” in this official report in a 2020 session held by [the Guyanese Parliament](#).

The last negative frame is the deep metaphor of sacred/profane, which includes references to the divine and spiritual, contrasting with the impure or the malevolent. Guyanese respondents often frame the extractive industries as an evil that poisons the environment, corrupts the government, and exploits citizens and local communities. Even those who support the extractive industries grow angry if the environmental impact is too great and if the benefits are not readily apparent and tangible.

Example 4: Sacred/profane emerges through language and imagery that references the devil.

“I think the mining industry would be the Devil. He would have two horns and the body of this devil would be made of natural resources. It would have a tattoo of a machine digging the earth to get resources. He would also have a scale, with natural resources on one end of it and people on the other one.”(Male, 30 years old, mining, against)



Turning to the positive frames, the metaphor of transformation deals with the change from one physical or emotional state to another, evolution, or growth. This frame is seldom mentioned by those opposed to extractive industries. However, supporters tend to see the industry through this transformative lens.

In Guyana, transformation is associated with a hope for future change through the economic benefits of the extractive industries. At an individual level, Guyanese respondents appreciate the fact that extractive industries can offer higher-paying jobs and greater employment opportunities, enabling them to provide better lives for themselves and their families. At a societal level, the economic benefits of extractive industries can lead to the modernization of infrastructure, improved housing and public services, improved health and educational systems, and increased foreign investment –including in tourism.

Although participants worry such changes will take too long, they nonetheless believe these improvements will create increased equality of opportunity and also a chance for the nation to rise and become, as one person put it, “one of the giants”. These changes would affect individuals as well, as the Guyanese people would feel empowered and liberated.

Example 5: Transformation relates to a hope for future change through the economic benefits of the extractive industries.



“The image of bread means I can feed a lot of people. Mining is a way to sustain one’s family when nothing else is working out. I am on the side of mining’s advantages. You can provide for a family and not only boost ourselves, but a community of people. If we put those resources to good use, we could do a lot better.” (Female, 42 years old, mining, in favor)

“[This image shows] a classroom, technology, a better education system. Oil and gas bring financial resources and that means we can do more. Parents can access educational facilities, they can go to private schools, they can pay for lessons... and the government can provide better resources from the financial resources we’ll be having from the oil and gas industries.” (Male, 43 years old, oil and gas, in favor)



Environmental and health concerns are shared among all age segments in Guyana. A noticeable difference exists, however, in how younger and older citizens view extractive industries. Younger Guyanese respondents tend to use more emotive and extreme language to describe these industries, often portraying them as “toxic” and “evil”. Older citizens tend to focus more on the lack of balance in terms of income distribution and equality of opportunity. This highlights a generational divide in the perception of extractive industries, with younger citizens being more critical and older citizens more pragmatic.

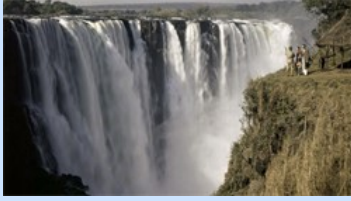
More specifically, an increasing awareness and concern for the negative impact of these industries on the environment and public health may influence the younger generation’s views on extractive industries. They may see these industries as a threat to the well-being of their communities and the planet. Meanwhile, older citizens may have more practical concerns, such as the impact of extractive industries on economic development and job opportunities in their communities. Additionally, older citizens may have more experience dealing with extractive industries and may have seen the positive and negative effects firsthand.

The extractive industry has been described as a powerful and unstoppable virus that leaves communities vulnerable to risks, disease, and natural disasters. Participants in our study compared the various stakeholders in the industry, often characterizing the government as an untrustworthy parent who prioritizes certain “real” children over others, similar to the story of Cinderella. Citizens, on the other hand, were portrayed as vulnerable, less fortunate, and mistreated, with a fear of expressing their objections and a sense of powerlessness. These perceptions highlight the need for a more equitable distribution of the benefits and risks associated with extractive industries and the need for governments to address the concerns and needs of marginalized communities. Establishing trust and transparency in the decision-making process is therefore crucial, as well as ensuring that citizens’ voices are heard and taken into account.

Mining: The mining industry is a topic of much debate in Guyana, and is associated with both positive and negative frames. On the one hand, the industry holds great promise for the country given its abundant natural resources and the potential for long-term economic growth. On the other hand, the industry is associated with concerns about the dangerous work conditions, lack of regulation, and negative environmental impacts of mining.

One positive frame associated with the mining industry is that it makes use of abundant resources. Guyana is rich in gold, bauxite, and diamonds, and the mining industry has the potential to be a lucrative sector for the nation’s economy for many years to come. Additionally, many Guyanese distinguish between large foreign mining companies, which are generally seen as having better safety protocols and improving the community, and small, illegal mining operations, plagued by accidents and seeking only short-term gains. As a 41-year-old participant states: “Legal mining is like a superhero, who is able to feed everyone, makes something for themselves and helps the community, helps the environment. Illegal mining is like a villain in a movie. They just see what they can get, then they disappear into the night.”

Example 6: Mining is not an industry that would ever collapse and it holds great promise.



“We know a waterfall never stops. This is like the mining industry because I have never heard about the resources diminishing. It’s not an industry that would ever collapse. Once it’s properly established, it will never disappear. The positive aspect would be the continuous flow of wealth for the families, the companies, and the country. The water in this picture would represent purity, something natural, a resource that can be extracted over and over.” (Female, 26 years old, mining, in favor)

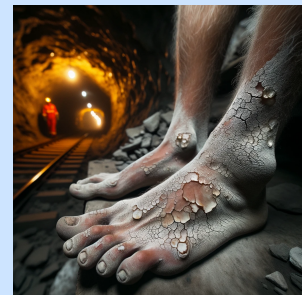
There are, however, also negative frames associated with the mining industry. A primary worry is the lack of regulation and dangerous conditions, which lead to many accidents and deaths. Additionally, the misuse of chemicals, particularly mercury, is a major concern as it poisons miners, waterways, and local wildlife. Miners also are exposed to diseases, such as malaria and dengue due to poor conditions and equipment, and do not receive adequate health care. Finally, there is a link between mining-related deforestation and the warming of the planet, which is also a concern for Guyanese respondents.

Example 7: The dark reality of mining includes death and danger.



“This dark, gloomy cemetery represents the amount of death in the mining industry. Too many people are dying. The crow represents more death to come, more incidents. It’s just lurking around, looking for something else, this is because there are not enough safety measures in the mining sector, and they are not enforced.” (Female, 26 years old, mining, against)

“This image is about the effects of mercury on a person’s feet. The conditions of workers in the mining industry are pretty subhuman. I believe one could ask: Is the paycheck really worth the long-term effects? It is a really intense job and they do it just to earn a paycheck” (Male, 40 years old, mining, against)



Overall, Guyanese respondents associate their country's mining industry with both positive and negative frames. While the potential for economic growth is undeniable, it is important to address the negative impacts of mining on the environment, public health, and safety, as well as ensure the industry is adequately regulated and sustainable.

Oil and gas: Guyana's oil and gas industry has been a source of hope and concern for its citizens. On the one hand, many Guyanese people believe the industry has the potential to bring about real change and development for the country. The promise of well-paying jobs and opportunities for growth in other business sectors has many people excited about the possibilities. Additionally, the industry may be able to stop the "brain drain" of young, talented Guyanese people leaving the country in search of better opportunities.

Example 8: The oil and gas sector creates jobs and increases the standard of living for citizens.



“The family represents the fact that oil extraction brings benefits to the country and eventually enables citizens to live a better life. It means new jobs will open up and people will be beneficially employed, they are going to earn a lot more money. The oil and gas industry is such a big player that there have to be hotels, you have to get food, water, all the kinds of things that the oil rig needs.”
(Female, 42 years old, oil and gas, in favor)

“They look Guyanese. The image relates to job creation from the oil extraction process. When they discovered oil in Guyana, few Guyanese were involved in the process. But now a few up-and-coming companies are looking for Guyanese recruits to fill those jobs. Guyana currently has a problem with brain drain. Most of the talent is migrating to other countries. But now those that are graduating can enter this sector, receive good salaries, feel appreciated, and would want to give back to the country rather than going overseas.” (Male, 19 years old, oil and gas, in favor)



Yet, negative frames also are associated with the oil and gas industry. A major concern is the potential for oil spills, which can devastate marine life and fishermen's livelihoods. Fishing is a central part of Guyana's multiracial identity and the potential for a significant oil spill threatens not only wildlife and jobs, but also the country's cultural heritage.

Another worry is the potential for air pollution caused by gas flaring. While Guyana has not yet experienced significant air pollution from oil and gas activities, the possibility remains an important hypothetical. Thus, while the industry presents opportunities, its potential effects on the country must be noted and considered.

Example 9: Our environment and our culture might be in danger with the oil and gas industry.



“When there is flaring, there is pollution and carbon dioxide. Little kids who are going to school are going to breathe the air. I haven’t seen air pollution with my own two eyes, but I have seen videos where there are particles flying around and into your eyes or nostrils.”
(Female, 42 years old, oil and gas, against)

3.1.2 Venezuela

Like respondents from Guyana, those surveyed in Venezuela use three deep metaphors when thinking about the negative effects of the mining and oil industries: force, balance, and sacred/profane.

The metaphor of force emerges through language and imagery that references predatory images, scenes of catastrophe, and powerlessness. The industry is perceived to have destroyed the environment, community health and safety, and vulnerable populations who have suffered from violence and labor exploitation. People cite the damage caused to the iconic Lake Maracaibo; the degradation of water quality; deleterious effects on the agriculture and fishing industries; threats to flora and fauna, and the increase in diseases such as malaria and yellow fever as evidence of the industry having turned a blind eye toward the well-being of the nation and its communities.

Example 10: The oil and gas industry represents danger.

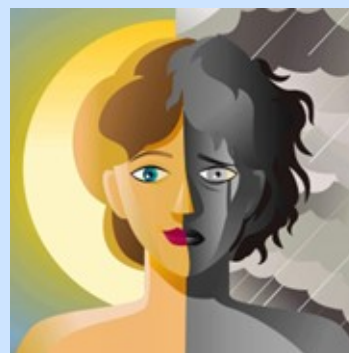


“The tiger represents danger. It looks at you constantly and if you are not careful it will hurt you. In the area where I live, there are gas leaks and those responsible do not carry out any investigations. We see the problem approaching and that the chances of greater damage are increasing, but we are passive. We don’t ask for an explanation or a solution.” (Male, 51 years old, oil and gas, against)

The metaphor of balance refers to stability, reciprocity, and states of emotional balance, such as calmness and peacefulness. The extractive industry has created feelings of extreme imbalance in the hearts of the Venezuelan respondents. They feel the wealth from the country’s natural resources has been distributed inequitably and that the industry has not repaid the nation and its people by improving conditions in local communities and protecting the environment. This leads to feelings of frustration, helplessness, anger, and sadness. They see no way to speak out or effectively push back against what they believe is a predatory industry protected by a corrupt government. They worry about what these developments mean for the future of a once-great country they still love.

Example 11: The oil and gas industry does not provide stability anymore.

“The mother gives stability to a family, love and protection. The oil industry for us has been that mother that gives us transportation, food and protection. That is the side that is in the sun. But unfortunately, in these times, we have changed and we are on the other side of the picture. A dark, sad picture, because I believe that is Venezuela today.” (Male, 41 years old, oil and gas, against)



Similarly, the metaphor of sacred/profane is a powerful one when Venezuelans discuss the negative effects of the mining and oil industries. This metaphor highlights the dichotomy between the reverence for nature and the perceived irreverence of the extractive industries in Venezuela. While the extractive industries have the potential to provide economic benefits, they also are seen as a threat to the sacredness of nature. The environmental destruction, damage to water quality, and negative effects on the agriculture and fishing industries are

viewed as profane actions that desecrate natural resources, which should be revered and protected. Furthermore, the lack of effective regulation and the failure to adopt technology that minimizes damage to the planet is seen as disregarding the sanctity of nature. As a result, many Venezuelans emphasize the importance of respecting nature and call for effective regulation and the development of technology that facilitates extractive activities while minimizing environmental damage.

Example 12: Mining harms culture.



“You have a bleak outlook, given that many indigenous people have died defending their lands. People die from mercury contamination, the morphology of the earth has changed, and the same plants no longer grow. 56,000 acres have been exploited and abandoned. I feel very depressed. But I love my country and I think this is going to come to an end. And when it happens, we will have to re-engineer many laws that are doing us a lot of harm.” (Female, 56 years old, mining, against)

Extractive industries have come to be positively associated with the deep metaphor of transformation, which has to do with the process of undergoing a change from one state to another, be it physical, emotional, or economic. In the case of Venezuela, participants express a nostalgic yearning for the days of the oil boom, when the country reaped the benefits of extractive industries in the form of growing communities, employment opportunities, and overall economic prosperity.

Despite the present economic challenges Venezuela faces, participants remain cognizant of the many advantages that the extractive industries can provide. To regain the prosperity of the past, it is imperative to make investments focused on establishing a more competent government and undertaking a strategic restructuring of the industry.

While the situation may appear bleak and hopeless, the Venezuelan citizens have not given up on their aspirations for a better future. They remain steadfast in their determination to overcome the obstacles ahead, with many recognizing that the potential for transformation lies within their collective hands.

Example 13: Positive frames are only seen in the future.



“Wonder Woman represents strength, vigor, skills, and dexterity. There is still hope. When this government ends, there will be many people who will want to help Venezuela and invest in the oil industry to be able to lift it up.” (Female, 55 years old, oil and gas, in favor)

“We are hopeful that we can regain our environmental controls and hope that one day we will begin to punish those who have not complied with these standards. We hope this will start working how it should.” (Male, 51 years old, oil and gas, in favor)



“This image represents not only me but also my colleagues. We must put our feet on the ground, breathe in, and see what we can do for our country. We are each going to put in our grain of sand so that we can raise up our country. There is no evil that lasts 100 years. We still have strength and we can move on.” (Female, 57 years old, mining, against)

Mining: The mining industry in Venezuela is viewed through multiple lenses, with some perceiving it as a source of opportunity and progress while others see it as a threat to the environment and local communities. Those who view the industry positively often focus on its potential to provide employment and contribute to the economic stability of the country and local communities. This positive frame is based on the premise that Venezuela’s abundant natural resources can be utilized in a manner that is fair and beneficial to all parties involved, including workers, companies, and the government.

According to this view, the industry can offer well-paying jobs, stability, and professional growth for those who work in it. Venezuelans believe the industry has the potential to provide a good standard of living and a brighter future for them and their families. Similarly, it can provide stability for the country, forming the cornerstone of a robust and thriving economy and providing an outlet for investment, growth, and prosperity.

While it is important to acknowledge these potential benefits of the mining industry, people understand the sector needs to have certain characteristics to positively impact local communities while reducing environmental effects. To ensure the industry operates sustainably, it is crucial for workers, companies, and the government to work together to distribute the

benefits of the industry equitably and minimize its negative impacts. This can be achieved by developing effective regulations and implementing technologies that facilitate extractive activities while minimizing environmental damage.

Example 14: Mining can be a source of opportunity, development and progress taking advantage of the abundant natural resources in Venezuela.



“In 2021, I received my degree in petroleum and mining engineering. This image represents professional growth that started when I was a student and that I now want to continue as a professional” (Female, 31 years old, mining, in favor)

“The hands are protection. I want us to be protected economically, have security, have all our needs covered. And if there is progress thanks to mining, that can be accomplished. Then I can have security.” (Male, 43 years old, oil and gas, in favor)



Conversely, the mining industry has been criticized for its adverse impacts on labor conditions, the environment, and local communities. One primary concern is worker safety, as accidents such as landslides and mine collapses have become increasingly common in recent years. The lack of planning and disregard for employee safety has significantly harmed workers in the industry.

Another issue is the environmental destruction caused by mining operations. Both proponents and opponents of the industry agree that mining is synonymous with environmental degradation. Illegal mining by companies often goes unregulated and unchecked. The lack of environmental controls in gold extraction has caused irreversible damage to ecosystems and wildlife. Illegal mining also has contributed to an imbalance in the economy, as the actual value of the resources is not appropriately accounted for. The lack of control in resource-rich areas has created a “no man’s land” where companies exploit resources without paying their actual value.

Those opposed to the mining industry cite concerns related to the impact of population migration. The arrival of large groups of people into areas with mining activities has increased poverty and the abandonment of homes and businesses in the communities they leave behind. As the expansion of mining operations affects more communities, the cycle of poverty

and misery continues to grow. This highlights the need for the mining industry to take a more responsible approach to its operations and consider impacts on local communities and the environment.

Example 15: Mining has an impact on migration, and labor security



“The mining industry is the elephant. The little plant is the government, and I am the ant. The elephant, with its great capacity, convinces the little plant to get the most benefits and together, they will sow and harvest the profits.” (Female, 43 years old, mining, in favor)

“In the last two years, there have been more than 50 accidents in the eastern part of the country as a result of landslides and mines that have collapsed. There is no planning. Each one takes a portion of the cake, sucks out the profit, and if there is a disaster, they just leave it there and retire the mine.” (Male, 30 years old, mining, against)



“Due to migration that occurs from urban areas to mining areas, they produce more poverty every day, all the time. The more mining expands, the more communities are affected, the more businesses are abandoned. So, with each passing day there is more poverty and misery.” (Male, 45 years old, mining, against)

“This image represents economic growth, but right now incomes are not higher and there is no reinvestment. And there is illegal mining, and many people are exploiting these areas and causing irreversible damage. There is no control. It is a no man’s land. The true value is not being paid, which causes the economy to become imbalanced.” (Female, 43 years old, mining, against)



Oil and gas: Local individuals and communities view the Venezuelan oil industry positively for its role in improving quality of life and promoting development. One of the critical positive frames of the oil industry is its impact on quality of life. In the past, the oil industry provided well-paid sources of employment, allowing for a comfortable standard of living and access to essential goods and services. The industry was seen as a symbol of strength, solidity, and security.

In addition to its impact on quality of life, the oil industry also has significantly promoted development. In earlier times, it provided economic stability and access to health services, education, and infrastructure. Companies operating in the oil sector supported education, health, food, clothing, transportation, and roads, contributing to communities and country prosperity.

Despite the challenges the oil industry has faced in recent years, its positive impact on quality of life and development cannot be overlooked. The oil industry can be leveraged through responsible management and regulations to support economic stability and improve the quality of life for future generations.

Example 16: Oil and gas has a great potential for positive impact in communities and the country.



“The white tiger represents strength, solidity, firmness, security. A few years ago, this was oil for Venezuelans because we had well-paid sources of employment that allowed us a good quality of life. We could get everything in the supermarket and live comfortably. The one-of-a-kind white tiger [represents that] because we were unique at that time.” (Female, 55 years old, oil and gas, against)

“Before there were many companies around the oil industry providing education, health, food, clothing, transportation, and good roads. Now, many companies have gone bankrupt or closed, which has caused an end to this prosperity.” (Female, 60 years old, oil and gas, in favor)



The negative frames associated with the oil industry revolve around the close relationship between oil companies and the government, the detrimental impact of the industry on the environment, the lack of professional management, and migration, including the so-called brain drain.

First, the close ties between the government and oil companies have led to the government abdicating its responsibility to the people. This relationship furthermore raises concerns about the prioritization of oil companies’ interests over the needs and well-being of communities. Additionally, the lack of professional management in the oil industry has contributed to spills and their associated consequences.

Second, the environmental impact of the oil industry has been a source of concern for many. Oil companies have disregarded the effects of their activities on people and ecosystems. Poorly trained personnel and poorly maintained equipment have contributed to spills that have had far-reaching consequences for communities and the environment.

Lastly, the oil industry’s struggles have led to significant population migration in Venezuela. This has led to a “brain drain” as professionals, such as doctors, nurses, teachers, and university professors, have left the country due to the challenging economic situation. This migration has had far-reaching consequences for the country, leaving it abandoned and struggling despite being rich in oil and other natural resources.

Example 17: Negative impact, environmental consequences, and the exodus of professionals.



“The Tasmanian Devil represents the oil industry as a bad person who seeks solely his own benefits, who has no feelings. A person who takes everything in his path to satisfy his greed. It destroys everything.” (Female, 39 years old, oil and gas, against)

“The image is sad because you start to wonder if the extraction was worth it. What has impacted me the most has been the Maturín River spill. It could have been prevented with proper maintenance and if personnel had been trained. But the spill lasted for 10 days and they only realized it was happening because people were having symptoms of diarrhea, vomiting, and fever.” (Female, 37 years old, oil and gas, against)



“The image represents all those who have left Venezuela. Despite being a country rich in oil and gold, it is an abandoned country. The universities are abandoned, there are no professors. Almost all of them have emigrated, just like the doctors, the nurses, and the teachers.” (Female, 47 years old, oil and gas, in favor)

3.2 National online surveys

Extractive industries are a contentious issue in Guyana and Venezuela: while they offer the potential for economic growth and job opportunities, they raise concerns about their negative impacts on the environment and local communities. In Guyana, those who oppose these industries tend to view them as a toxic and destructive force, while those in favor see

the potential for growth and empowerment. Similarly, the adverse effects of these industries are a prevalent concern in Venezuela, but many still recognize the potential benefits and call for effective regulation to minimize damage.

While these findings highlight some of the challenges and opportunities related to extractive industries in Guyana and Venezuela, they provide a relatively narrow view of a complex issue. The experiences of other LAC countries may differ significantly from those of Guyana and Venezuela. Moreover, sub-populations within each country likely hold divergent views on the impact of extractive industries. To gain a more comprehensive understanding of the issue, ZMET can be adapted to the format of nationwide surveys that include a larger sample of respondents. Such surveys can allow for systematic analysis of the views of different groups, including those from different regions, socioeconomic backgrounds, and age cohorts. By adapting the methodology in this way, we could better understand the complexities of extractive industries and contribute to policymaking efforts that serve the needs and interests of all affected parties.

In Figure 3, we can observe the different metaphors associated with the mining and oil and gas industries throughout the entire region. The table reveals meaningful differences and similarities between countries and within each country. The data are presented as the percentage of individuals in the country who associate the extractive industry with each metaphor.

Figure 3: Distribution of main deep metaphors by country (% of country total)

	Mining								Oil and gas			
	ARG	BOL	BRA	CHL	COL	GTM	PER	DOM	ECU	GUY	MEX	VEN
Balance	20.67	20.47	23.09	18.40	21.22	25.62	24.21	18.58	27.88	24.09	18.50	15.19
Force	19.83	13.14	18.63	19.04	23.84	13.64	11.01	18.07	17.99	7.27	18.00	9.90
System	14.33	13.31	16.72	13.28	12.06	13.98	10.38	13.23	10.21	10.45	12.00	16.72
Transformation	11.00	13.98	17.36	9.28	12.94	14.64	13.21	4.33	14.75	29.09	9.50	12.80
Control	7.00	10.65	7.48	8.64	7.99	9.98	9.91	21.63	6.00	11.36	10.33	14.16
Ideal	12.83	7.49	6.37	12.80	10.47	9.65	11.79	7.38	9.24	6.36	12.67	9.22
Journey	6.83	12.15	5.25	9.60	5.09	6.82	8.49	13.74	5.83	6.82	11.33	10.92
Connection	4.67	5.32	2.87	5.60	4.94	3.00	7.55	1.53	3.73	3.18	4.50	8.53
Container	2.83	3.33	2.23	3.36	1.45	2.66	3.30	1.53	4.38	1.36	3.17	2.56

Notes: This figure shows how metaphors related to the mining and oil and gas industries are distributed across LAC countries. The data is expressed as a percentage of respondents who associate each industry with a given metaphor. Each column represents a specific industry and country combination, and the rows display the different metaphors: balance, connection, container, control, force, ideal, journey, system, and transformation. Percentages may not add up to exactly 100 due to rounding.

Comparing the metaphors across countries, we can see that the balance metaphor is the most prevalent, with the highest percentage observed in Ecuador (27.88%) and the lowest in Venezuela (15.19%). This suggests that people tend to view the industry as a delicate equilibrium between opposing forces or interests and may imply that respondents are aware of the need to balance economic growth, social well-being, and environmental protection when it comes to resource extraction.

The force metaphor also features prominently, with Colombia exhibiting the highest percentage (23.84%) and Guyana the lowest (7.27%). This could be indicative of people's awareness of the significant influence these industries have on various aspects of their lives, such as job creation, economic growth, and environmental degradation.

Conversely, the connection and container metaphors are the least prevalent across the countries with percentages rarely exceeding 5%. The lower prevalence of these metaphors implies that people might be less inclined to see these industries as interconnected systems or entities that hold or preserve resources. This could be due to a lack of understanding of the intricate relationships between different aspects of the industries or a focus on their more tangible and immediate effects rather than their broader implications.

Focusing on individual countries, we can observe some unique trends. For instance, the transformation metaphor is particularly high in Guyana (29.09%) compared to other countries, where it typically ranges between 9% and 17%. This suggests that respondents in Guyana perceive the extractive industry as more transformative than those in other countries. The control metaphor is notably high in the Dominican Republic (21.63%), while it falls between 7% and 15% in other countries.

Noticeable within-country differences also exist between metaphors. In Brazil, the journey metaphor is one of the least common (5.25%) compared to other countries, where it usually ranges between 6% and 13%. This might suggest that Brazilian respondents perceive the industry as less of a continuous process and more in terms of its immediate outcomes. Similarly, the ideal metaphor exhibits varying degrees of prevalence across countries, indicating differences in how respondents perceive the extractive industries' alignment with their values or aspirations.

Further explorations of the sentiment associated with each metaphor across countries can therefore provide valuable insights into the public's overall perception of extractive industries. To this end, Figure 4 delves into the sentiment analysis of the metaphors used by respondents

across different countries.²¹ This analysis enables us to determine whether the metaphors associated with extractive industries are predominantly perceived as positive, negative, or neutral, thus shedding light on the public’s nuanced understanding of the impact of these industries.

The data illustrates significant variation in sentiment across countries and metaphors. For instance, in Ecuador, the balance metaphor has a higher percentage of negative sentiment (67%) than positive sentiment (6%). This suggests that the Ecuadorian public might associate the need for balance in the extractive industry with negative consequences, such as environmental degradation or social inequality.

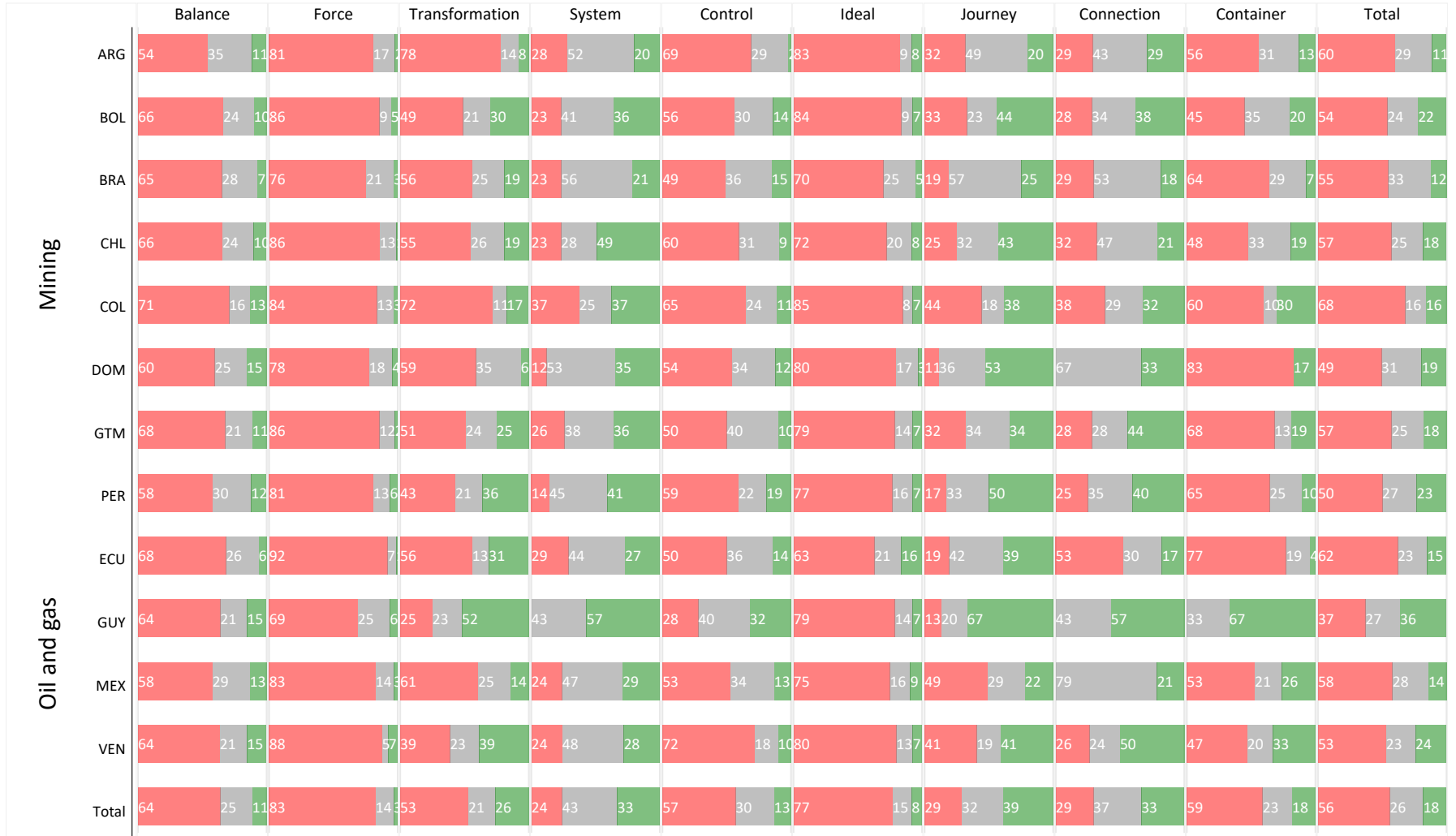
Another noteworthy finding is the high percentage of negative sentiment associated with the force metaphor across all countries, with values ranging from 69% in Guyana to 92% in Ecuador. This indicates that respondents in these countries predominantly perceive the influence of extractive industries as harmful, as it may lead to environmental, social, and economic problems. This widespread negative perception could inform policy discussions and public debates over how to manage and regulate these industries.

This analysis also highlights some interesting patterns in the distribution of neutral and positive sentiments. In Guyana, the transformation metaphor is associated with the highest percentage of positive sentiment (52%) for this metaphor across all countries. This finding could be related to the Guyanese public’s perception of the industry’s transformative potential through job creation and economic development. Conversely, in Brazil, the journey metaphor has a higher percentage of neutral sentiment (55%) than it does in other countries, suggesting that the Brazilian public has a more ambivalent view of the extractive industries as an ongoing process.

The last row and column in Figure 4 provide the total percentages across countries and metaphors of positive, negative, and neutral sentiments. The total sentiment percentages, in the bottom-right of the table, allow us to make general observations about the overall sentiment associated with extractive industries across all countries and metaphors. The public appears to have a poor opinion of extractive industries across the region, with negative sentiment accounting for 56% of all metaphor responses, higher than either positive (18%) or neutral sentiment (26%).

²¹Natural Language Processing (NLP) techniques are used to categorize the text provided by participants into one of three categories: negative, neutral, and positive. More details are available in the sentiment analysis section of the Appendix.

Figure 4: Distribution of sentiment by country-metaphor (% of country-metaphor respondents)



■ Negative
 ■ Neutral
 ■ Positive

Notes: This table presents the sentiment analysis of the metaphors related to extractive industries used by respondents across different countries. The table breaks down the percentage of respondents who associate each metaphor with a negative, neutral, or positive sentiment. Each row represents a specific industry and country combination, and the columns display the different metaphors: balance, connection, container, control, force, ideal, journey, system, and transformation. Percentages may not add up to exactly 100 due to rounding.

Building upon the previous analysis, Figure A1 extends our understanding of the sentiment associated with each metaphor in each country by further segmenting the sample into those respondents who were asked about mining and those who were asked about oil and gas. This reminds us to explore potential differences in public opinion on the extractive industry based upon the specific sector being assessed.

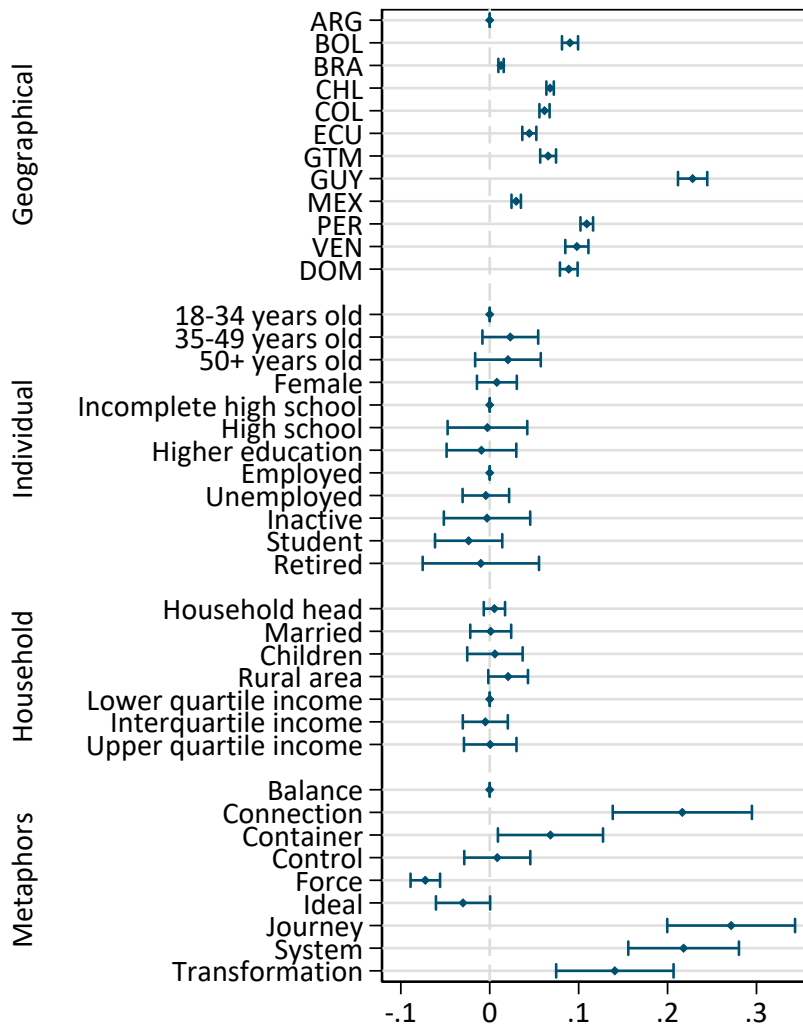
To further explain the relationship between the sentiment associated with different metaphors and respondents' support for the extractive industry, we introduce some estimates from a linear probability model and then move to some extensions. All details about the econometric methodologies implemented for the quantitative analyses are available in the Appendix, including the linear probability specification and the random forest estimations. In all cases, the dependent variable is a dummy variable that assumes a value of one if the respondent perceives the extractive industry positively, and zero if the perception is neutral or negative. The independent variables are potential determinants of support, categorized as geographical, individual, and household determinants, as well as the metaphors themselves.

To begin, the analysis in Figure 5 allows us to gain a deeper understanding of the factors that contribute to a respondent's support for the extractive industry using a linear probability model. By breaking down the determinants into distinct categories, we can identify patterns and associations that may help explain the motivations underlying a respondent's support or lack thereof.

Geographical determinants, represented by the country-level data, show statistically significant positive coefficients for all countries when compared to Argentina. This implies that respondents from the countries with significant positive coefficients are more likely to support the extractive industry relative to respondents from Argentina. Guyana exhibits the highest level of support for the extractive industry, with a substantially larger positive coefficient than other countries in the model. Conversely, Argentina, Brazil, and Mexico demonstrate the lowest levels of support, as indicated by their comparatively smaller positive coefficients.

Individual determinants such as age, sex, education, and occupation reveal a mixed pattern. No clear relationship is found between age and support for the industry when compared to the 18-34 year-old base group, while being female is associated with slightly higher support, albeit statistically insignificant. Education and occupation variables do not exhibit a consistent association with support for the extractive industry when compared to their respective base levels.

Figure 5: Expressing positive sentiment toward extractive industries: linear probability model



Notes: This figure presents the marginal effects from a linear probability model. The dependent variable is a dummy variable that assumes a value of one if the respondent perceives the extractive industry positively and zero if their perception is neutral or negative. The independent variables are categorized as geographical, individual, and household determinants, as well as the metaphors themselves. The base level for categorical variables is the first category listed in the Figure, i.e., Argentina, 18-34 years old, incomplete high school, employed, lower quartile, and balance are excluded from the regression to be used as base levels for their respective group of categorical variables. This figure illustrates the results in Appendix Table A4, column (8).

Household determinants, such as marital status, household head status, and the presence of children, show no significant associations with support for the extractive industry. Interestingly, respondents living in rural areas are more likely to support extractive industries, as

indicated by the statistically significant positive coefficient. The association between income and support is inconclusive, with no clear patterns emerging when various income groups are compared to the lower quartile income base level.

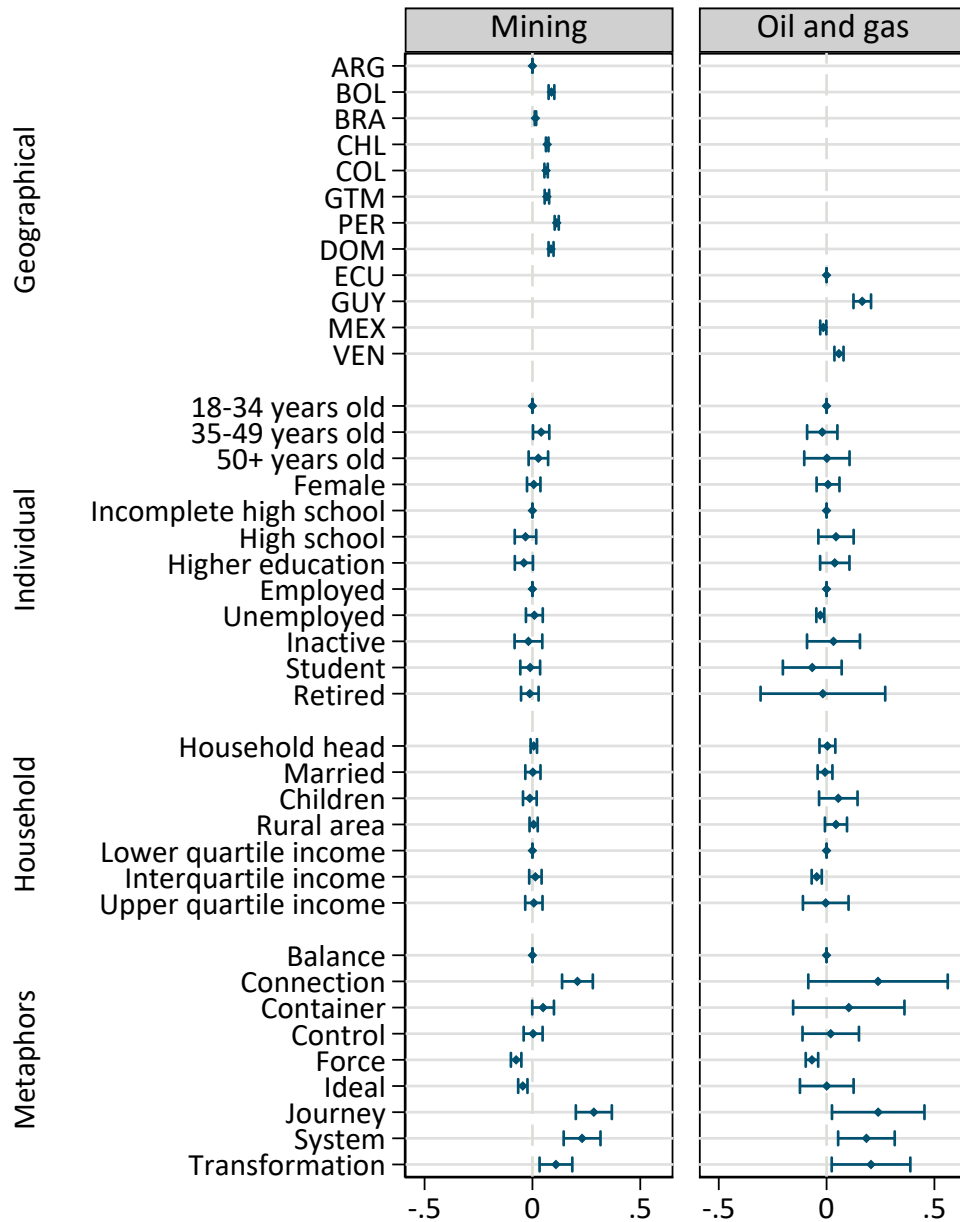
Furthermore, the metaphor dummies reveal varied effects on support for the extractive industry compared to the balance metaphor base level. The connection, container, journey, system, and transformation metaphors are associated with a higher likelihood of support, while the force and ideal metaphors are negatively associated with support.

To expand the analysis, we demonstrate in Figure 6 a similar exercise, but with subsamples defined by the subsector. Regarding mining, we observe that the coefficients for the geographical determinants remain statistically significant, with similar patterns to those found in Figure 5. For instance, respondents in Bolivia are 8.8 percentage points more likely to support mining compared to those in Argentina, holding other factors constant. This suggests that geography continues to play a crucial role in shaping the sentiment toward the extractive industry, even when focusing on mining alone. Interestingly, age seems to have a stronger influence on support for mining, with the group 35-49 age group showing a positive and statistically significant coefficient. This finding suggests that middle-aged individuals are 4 percentage points more likely to support mining than their younger counterparts.

With respect to the metaphors, the results remain largely consistent with the previous analysis, with connection, journey, system, and transformation showing positive and significant coefficients. For example, respondents who used the connection metaphor are 20.9 percentage points more likely to support mining than those who used the balance metaphor. On the other hand, force and ideal exhibit negative and significant coefficients, with respondents using the force metaphor being 7.5 percentage points less likely to support mining compared with the base level. These findings reinforce the notion that metaphors play an essential role in shaping public sentiment toward the extractive industry, particularly within the mining context.

The situation is different for oil and gas. Although the number of countries in this subsample is smaller – which explains the larger confidence intervals – we can observe some distinct patterns. The sentiment associated with oil and gas appears to also be influenced by geographical determinants, with Guyana and Venezuela exhibiting larger support. In Guyana, for instance, respondents are 16.5 percentage points more likely to support oil and gas than those in Ecuador, holding other factors constant. In this subsample, the rural area variable

Figure 6: Expressing positive sentiment towards the extractive industries by sub-sector



Notes: This figure presents the marginal effects from two linear probability models, one for mining and one for oil and gas. The dependent variable is a dummy variable that assumes a value of one if the respondent perceives the extractive industry positively and zero if their perception is neutral or negative. The independent variables are categorized as geographical, individual, and household determinants, as well as metaphors themselves. The base level for categorical variables is the first category listed in the Figure, i.e., Argentina (for mining), Ecuador (for oil and gas), 18-34 years old, incomplete high school, employed, lower income quartile, and balance are excluded from the regression to be used as base levels for their respective group of categorical variables. This figure illustrates the results in Appendix Table A4, columns (6) and (7).

becomes more prominent, with a positive and significant coefficient of 0.044, suggesting that respondents living in rural areas are 4.4 percentage points more likely to support the oil and gas industry.

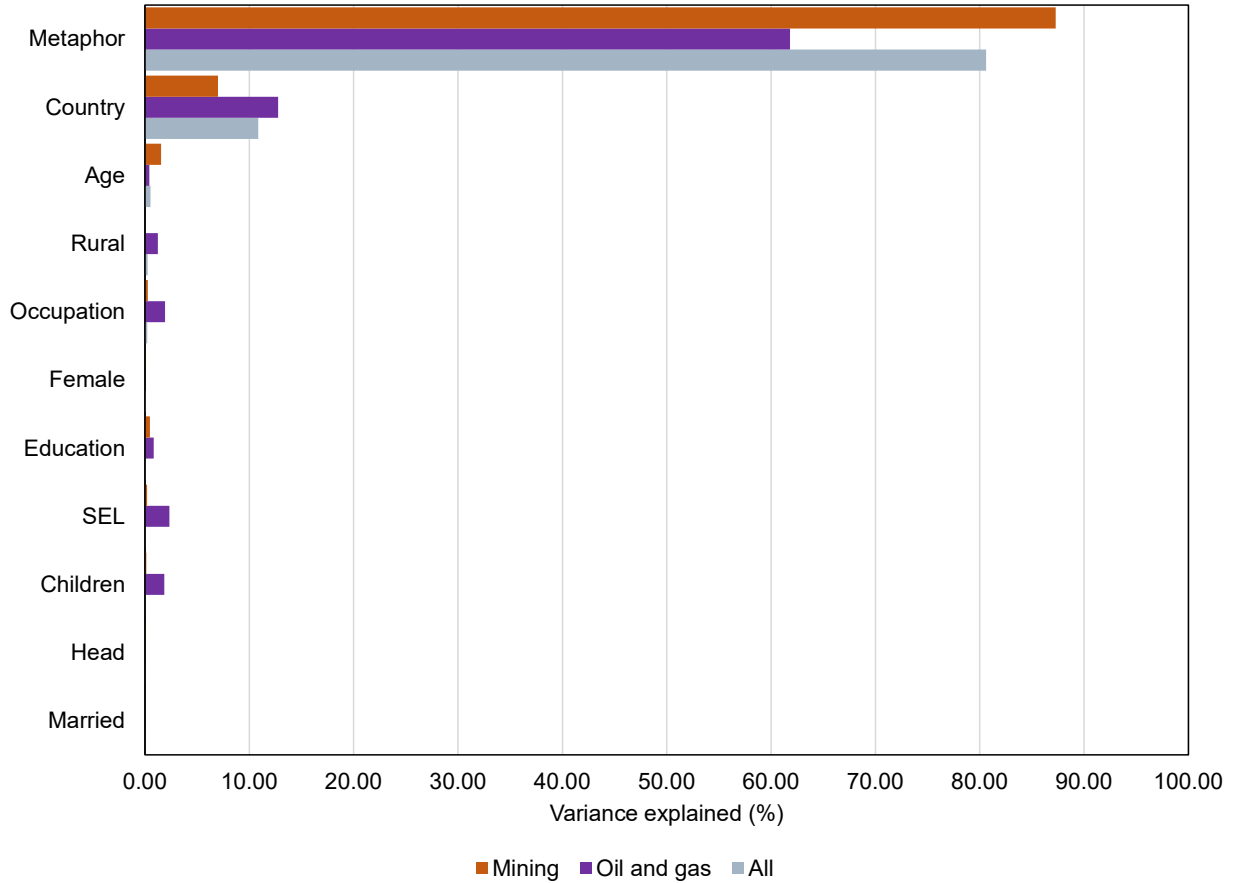
The metaphors associated with oil and gas exhibit some similarities and differences compared to the mining subsample. Journey, system, and transformation maintain their positive and significant coefficients, albeit with slightly different magnitudes. Respondents using the journey metaphor in the oil and gas context are 23.9 percentage points more likely to support the industry compared to those using the base category metaphor. Force retains its negative and significant coefficient, but ideal loses its statistical significance. These observations indicate that while some metaphors consistently shape public sentiment across both extractive industries, others may have a more nuanced effect depending on the specific industry context.

In parallel, what percentage of the variation in support for the extractive industry is explained by the included variables in these models? The R-squared value in these exercises indicates that less than 13% –i.e., see Appendix Table A4. The coefficients from the linear probability models suggest that geographical and metaphor-related determinants are the most salient factors influencing support for the extractive industry. By performing an analysis of variance (ANOVA) to the specifications in Figures 5 and 6, we can obtain a deeper understanding of the variance in the models by determining the contribution of each set of variables to the explained variance.

In Figure 7, we show that metaphors account for most of the explained variance in the model. This is consistent with the previous analysis, which indicated that the metaphor-related determinants are highly influential in shaping support for the extractive industry. Geographical determinants, represented by country variables, also contribute to the explained variance in the models, although their impact is less pronounced than that of the metaphor variables. The other variables, including individual, household, and economic determinants, make a negligible contribution to the explained variance in the models, indicating their weaker association with support for the extractive industry.

Similarly, our results are robust when applying a random forest model to further dissect the intricate relationships in our data –see Appendix for additional details about how this model is implemented in this context. The findings are presented in Figure 8. The metaphor-related determinants, as previously distinguished, play an influential role in shaping public sentiment. Interestingly, the journey metaphor emerges with a salient prominence, register-

Figure 7: ANOVA results for main models



Notes: This figure presents an analysis of variance (ANOVA) for linear probability models of expressed positive sentiment towards the extractive industries. Different colors indicate results for mining, oil and gas, and the aggregate. This figure illustrates the ANOVA for models in Appendix Table A4, columns (6), (7), and (8). Additional details are available in Appendix Table A5.

ing the highest importance score across both the full sample and the mining subsample.²² This underscores the perception of the extractive industry as an ongoing process, resonating particularly with sentiments of exploration, evolution, and progression. Conversely, the force metaphor, which was previously associated with a largely negative sentiment, continues to hold significance, particularly within the oil and gas context. This is suggestive of a pre-

²²In a random forest model, the variable importance metric quantifies the significance of each predictor in accurately forecasting the target outcome. Specifically, for each tree in the forest, the decrease in prediction accuracy (often measured as the increase in mean squared error for regression) caused by permuting a predictor variable is recorded. This degradation in performance, averaged across all trees, provides the importance score for that variable. A higher score indicates that a variable is more crucial for the prediction, while a score close to zero suggests the variable might be irrelevant.

vailing sentiment that views the extractive industry, especially oil and gas, as an influential yet potentially harmful force. Geographical determinants also play a significant role, with Guyana exhibiting heightened importance in the context of oil and gas.

These findings highlight the complexities of public sentiment towards extractive industries in Latin America and the Caribbean. The analysis of metaphors reveals that the balance and force metaphors are the most prevalent across the region, reflecting a widespread recognition of the need to find an equilibrium between economic growth, social well-being, and environmental protection, and these industries’ significant influence on various aspects of life. The sentiment analysis shows that negative sentiment generally dominates across all countries, and focuses on the potential adverse effects of extractive industries on the environment, society, and economy. Interestingly, the findings for Guyana reveal a notably high prevalence of the transformation metaphor, suggesting that respondents perceive the oil and gas industry as more transformative, potentially associated with positive outcomes, such as job creation and economic development. This result confirms our findings from the one-on-one interviews in Section 3.1, and highlights the relevance of the sentiment about the industry in Guyana when compared with other countries in the region. We show that geographical determinants and metaphors are the most influential factors shaping support for the extractive industry, with notable variations between countries and industry sectors, even when controlling for individual and household characteristics.

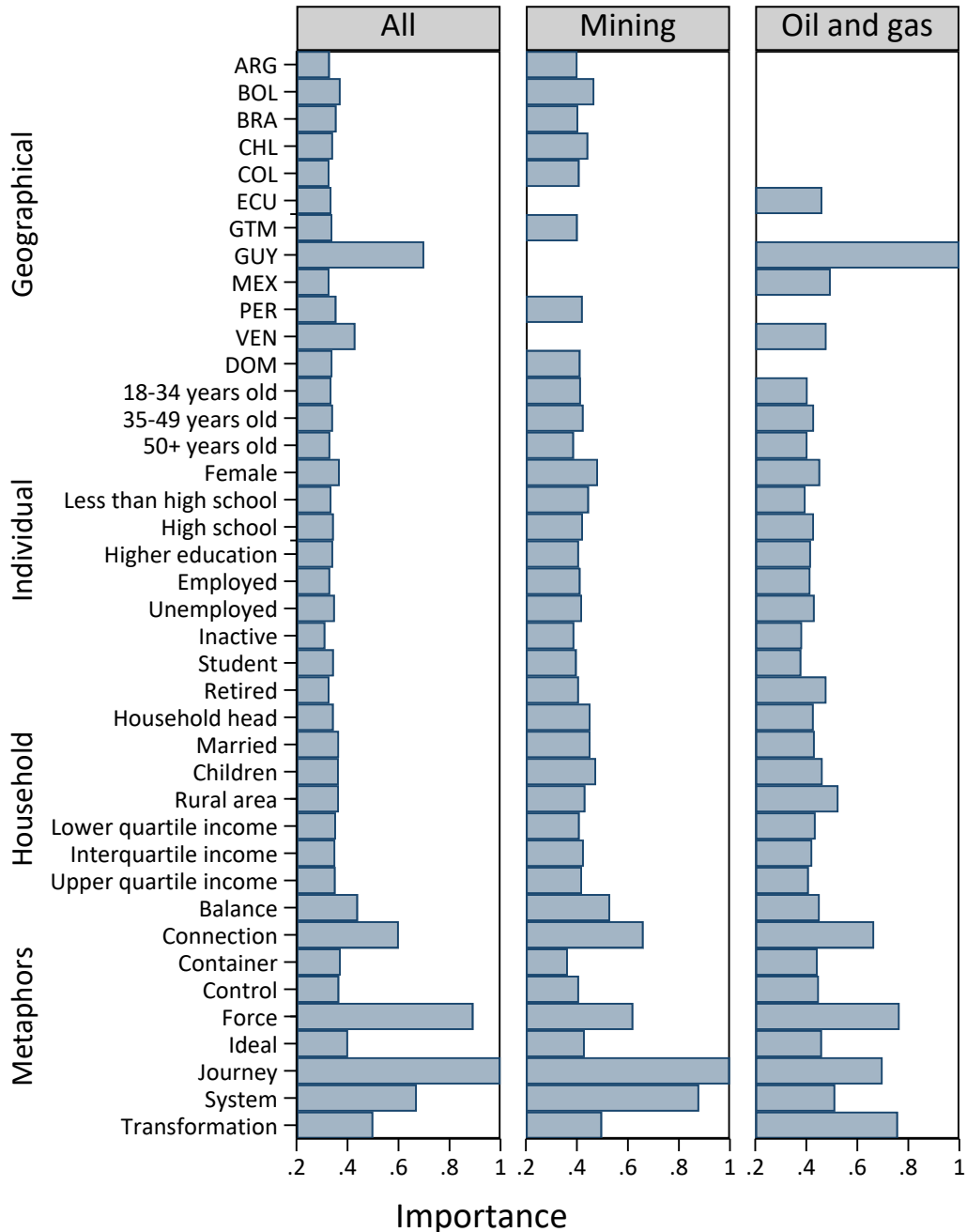
3.3 ZMET and stated preferences

The ZMET methodology provides a distinctive approach to analyzing public sentiment towards extractive industries, offering a valuable complement to quantitative studies like Brújula Minera (“Mining Compass”) and Balza et al. (2023). By incorporating qualitative data through the use of metaphors and images, this method makes it possible to explore latent opinions and emotions that participants may not explicitly express in more traditional survey-based approaches. This section compares our results from the national online surveys with those of Brújula Minera as well as the survey Balza et al. (2023) conducted.

Brújula Minera is a tool designed to support multiple stakeholders in the mining sector by providing information on various aspects of the industry, including market trends, regulatory frameworks, and other relevant factors.²³ Notably, the study has tracked citizens’ perceptions of the mining industry over the past seven years, although its coverage was limited to Colombia. In 2021 and 2022, the project expanded to include smaller samples in seven other

²³For more information, see their webpage [\[link\]](#).

Figure 8: Importance in predicting positive sentiment towards the extractive industry: a random forest analysis



Notes: This figure presents the relative importance of predictors in three random forest models for determining positive sentiment towards the extractive industry. Importance is quantified by the decrease in prediction accuracy (increase in mean squared error) when a predictor variable is permuted. A higher score indicates that a variable is more crucial for the prediction. The analysis is performed for the full sample, as well as for mining and oil and gas subsamples separately.

Latin American countries for the first time, with at least 600 individuals surveyed in each country (except for Colombia, which had over 2,400 respondents). The data were collected online and through phone calls in Mexico, Colombia, Peru, Ecuador, Bolivia, Brazil, Chile, and Argentina.

In a similar vein, [Balza et al. \(2023\)](#) conducted a survey to capture the general perception of extractive industries in five Latin American countries: Bolivia, Colombia, Ecuador, Peru, and Venezuela. At least 1,200 individuals were surveyed in each country, with data collected through cellphone calls in 2021 from citizens aged 18 years and older. The total sample size was 5,312 individuals, after removing incomplete data from the analysis.²⁴ The survey included seven questions designed to assess public views on extractive industries. Of particular interest to this study, respondents were asked “Do you consider that mining/oil and gas is...for the country?”. Respondents rated their views on a Likert scale ranging from very negative to very positive.

ZMET differs from these standard quantitative studies in its focus, approach, sample size, and data analysis methods. While ZMET collects qualitative data through the use of metaphors, quantitative studies gather numerical data through surveys and experiments. The national online surveys conducted in this paper, however, allow us to draw some comparisons with other quantitative methods while retaining the advantages of using metaphors and images to obtain information that survey participants may not explicitly state.

We can compare the views about the extractive industries in our dataset with *Brújula Minera* and [Balza et al. \(2023\)](#) in two main ways. First, the sentiment analysis of the image descriptions in Section 3.2 is a valuable tool that can be used to elicit feelings related to extractive industries. Second, participants in the ZMET survey were directly asked to rate their views on the extractive industry on a Likert scale, categorizing their perceptions as negative, neutral, or positive.²⁵

Several factors should be considered when comparing the results of the ZMET methodology with those of the other studies. First, the research may have been conducted at different times, which could impact public sentiment due to evolving political, economic, or social contexts. Second, disparities in sample sizes and demographics exist between the studies. ZMET is restricted to individuals who are not involved in the extractive industries and

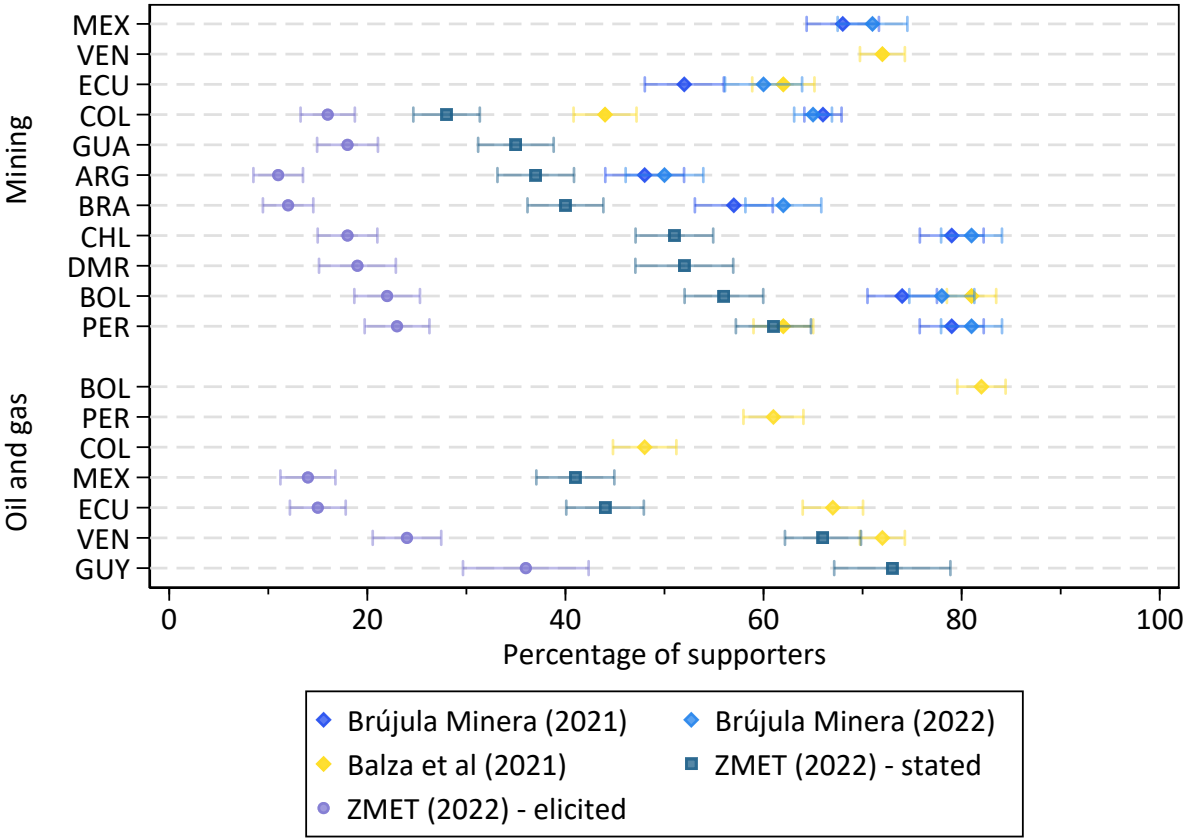
²⁴The sample data are representative at the national level in terms of gender, age, educational attainment, and region for Bolivia, Colombia, Ecuador, and Peru. For Venezuela, they are representative at the national level for all of the above variables except for educational attainment.

²⁵It should be noted that at this stage of the survey, individuals had already completed the metaphorical exercise, which may have influenced or framed their response when asked directly.

may not have the same representativeness as the other studies. Lastly, ZMET involves the use of images and metaphors which could frame the participants' responses and lead to potential differences when compared to traditional surveys. Still, we find systematic differences between datasets.

Figure 9 presents the proportion of the population that holds positive views about the extractive industries by country, industry, and study. It includes estimates from Brújula Minera (2021 and 2022), Balza et al. (2023) (for mining, and oil and gas), and the ZMET study (direct questions and sentiment analysis for the full sample and both industries as well).

Figure 9: Comparison between ZMET and other databases



Notes: This figure presents the proportion of the population with positive views on extractive industries by country, industry, and study. Year refers to the year of data collection, regardless of the year of the publication. 95% confidence intervals were calculated using the normal approximation to the binomial calculation of confidence intervals for proportions.

A comparative analysis of the results from Figure 9 reveals commonalities and discrepancies across the studies, both between and within countries. The sentiment analysis outcomes (i.e., ZMET-elicited) generally reveal a lower degree of positive sentiment towards the extractive industries than all other estimates. Interestingly, the sentiment analysis also shows a less positive sentiment even when it is compared with the direct question responses within the ZMET study. This suggests that the differences between the sentiment analysis and traditional survey questions do not stem solely from sample or time differences; but rather that the same sample responds differently to these methodologies.

The main takeaways from the comparison are that public sentiment towards extractive industries varies across countries and studies. Integrating the results from different approaches can help achieve a more comprehensive understanding of public views on extractive industries in LAC. The observed dispersion of the results across these studies prompts a deeper discussion about how support and discontent within the extractive industry can be measured. Traditional survey methods might be subject to social desirability bias (Hicken et al., 2015, 2018), in which respondents provide answers they believe are socially acceptable rather than expressing their true opinions. Meanwhile, the use of emotions and metaphors in the ZMET methodology allows for a more nuanced exploration of latent opinions and emotions, which could potentially provide deeper insights into topics where conflict may arise.

Incorporating qualitative data through metaphors and images might also help to identify new ways of asking people about their views on the extractive industries. By delving into the emotional and symbolic aspects of people’s perceptions, it becomes possible to design more targeted questions to better capture the complexity of public sentiment. Emotions and metaphors, as demonstrated by the ZMET methodology, can be powerful tools for understanding the underlying attitudes and concerns of the population on contentious issues, such as extractive industries.

4 Conclusion

This paper presents an innovative approach to understanding individual preferences and public beliefs surrounding extractive industries in the Latin America and the Caribbean (LAC) region. Rather than a standard survey-based approach, we use qualitative one-on-one interviews in Guyana and Venezuela, combined with national surveys in 12 LAC countries, to uncover the deep metaphors and narratives that shape citizens’ views on extractive industries. The findings reveal key narratives centered around environmental, economic, and

social impacts and the importance of governance and local participation in decision-making processes. Our sentiment analysis indicates that public opinions on extractive industries are polarized, with participants expressing strong positive and negative sentiments.

Our study highlights the importance of considering emotional and unconscious mental models in shaping individual preferences, an aspect that is often overlooked in traditional survey-based methodologies. By delving into the deep metaphors that underpin public sentiment, we provide insights that can inform more nuanced policy interventions and conflict resolution strategies in the extractive sector in LAC. Specifically, understanding the complex narratives and emotions surrounding extractive industries can help policymakers identify common ground and work towards more peaceful and effective solutions.

Additionally, alternative methodologies offer a valuable tool for researchers and policymakers to understand more accurately understand public sentiment across various issues and contexts. By effectively eliciting deep metaphors and narratives that shape public opinion, we try to overcome many of the limitations associated with traditional survey-based approaches, which often fail to capture the full complexity of individual preferences and opinions. This innovative approach can be applied to other policy domains and contexts, providing a valuable tool for researchers and policymakers interested in understanding the factors that drive public sentiment and support for various issues. We contribute to various debates in the literature, including the accuracy of surveyed public policy preferences, the dynamics of social mobilization and contestation in the context of extractive industries, and the use of machine learning tools such as GPT models in sentiment analysis.

In conclusion, our study demonstrates the potential of innovative tools to uncover the narratives that shape public opinion on extractive industries in the LAC region. Future research might build on this approach to explore other policy domains and contexts, further enhancing our understanding of public sentiment and its implications for effective policymaking.

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Appendix

Econometric models

This section describes the econometric models used to analyze the ZMET national surveys. These models are essential for understanding the relationships between variables and identifying key factors that influence ZMET responses. We begin by providing an overview of the different types of models that we used, including the linear regression models (OLS) and the random forest estimations. These models incorporate the sentiment analysis used to create the dependent variable for these analyses.

Sentiment analysis: In the sentiment analysis section, our primary objective is to extract the underlying sentiment associated with participants' descriptions of images they selected to represent extractive industries. This data is collected for each respondent in the national survey, allowing us to investigate how these sentiments interact with the metaphors elicited through the ZMET methodology.

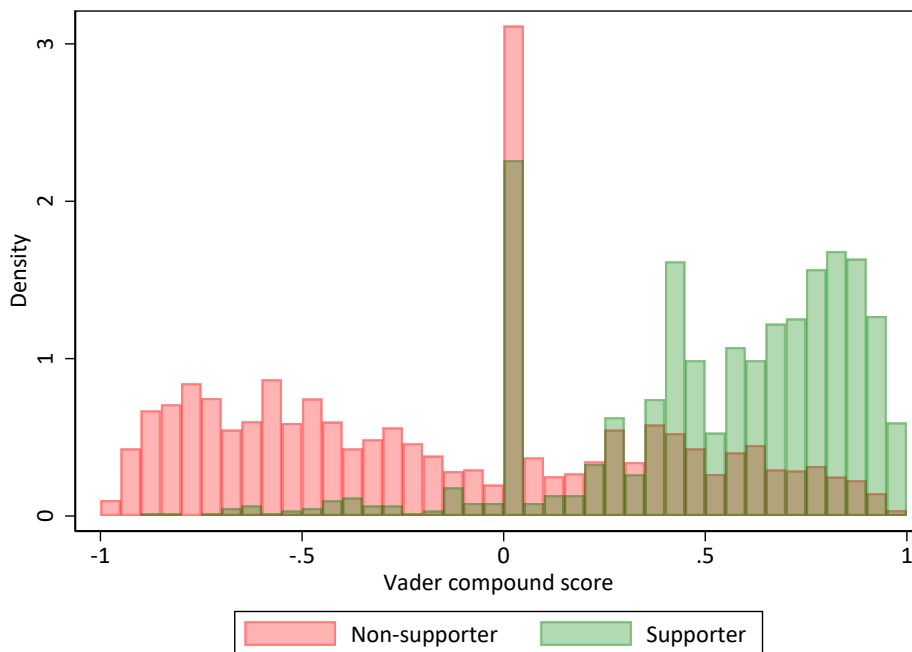
We aim to translate these sentiments into a quantifiable variable that enables comparison with previous research. Specifically, we strive to match the sentiment categorization from previous studies, where each individual's view towards the extractive industries is categorized as negative, neutral, or positive. This categorization is based on their response to the direct question, "Do you consider that mining/oil and gas is...for the country?" with responses given on a Likert scale ranging from very negative to very positive.

To accurately capture these sentiments, we deploy text analysis to discern the sentiment of individual responses. We employ two contrasting methods to ensure the stability and robustness of our findings.

First, we use the Valence Aware Dictionary for Sentiment Reasoning (VADER) as our initial approach for the sentiment analysis model. This tool is designed for text sentiment analysis and measures both the polarity (positive/negative) and intensity (strength) of expressed emotions. VADER incorporates a human-centric approach by amalgamating qualitative analysis with empirical validation, leveraging human raters' scores to construct sentiment ratings. In our image descriptions, each word is matched to a score from VADER, and we calculate the compound score, which reflects how negative/positive a sentence is – see [Hutto and Gilbert \(2014\)](#) for additional details about the advantages and limitations of this methodology.

Secondly, we leverage recent advancements in large language models (LLMs) to implement a more contextual sentiment analysis. Given the abstract nature of how individuals describe their sentiment towards the extractive industry, the LLMs such as the GPT-3.5 models, implemented via the OpenAI API in R, offer more accuracy by considering the context of the sentiment expressed. The categorization of individual descriptions of the extractive industry is completed using a specially designed prompt that accounts for this context.²⁶

Figure M1: Comparison of sentiment analysis methods: VADER vs. LLM contextual analysis



Notes: This figure illustrates the distribution of VADER compound scores, segregated by the supporter and non-supporter categorization as determined through contextual sentiment analysis. The x-axis represents the VADER compound scores, which measure sentiment polarity and intensity, while the y-axis shows the frequency of respondents. The supporters are those with a positive sentiment towards the extractive industry, while non-supporters have neutral or negative sentiments.

The resulting sentiment analysis used with the econometric models was taken from the LLM application. Given the framework of the analysis, we prefer to use a more contextual tool for analyzing metaphors. However, as shown in Figure M1, we create a binary variable

²⁶The prompt was: “For this task, I need you to think out of the box. You cannot tell me that you cannot classify the sentence. The following sentence metaphorically describes a personal image of the extractive industries. I need you to classify the sentiment of the full sentence. Sentiments could be NEGATIVE, NEUTRAL, or POSITIVE. Pick one and your response MUST be just your sentiment classification, without an explanation. Just random letters and words with non-sensical sentences can be classified as ILLOGICAL but try to avoid this classification as much as possible. The sentence is the following (try to fix any grammatical errors and translate it when needed, figure it out):”. Prompts were kept independent to prevent the algorithm from learning from previous responses. During this research, we tried multiple prompts before settling on this final version.

that becomes the dependent variable in our estimations that is highly correlated with the VADER compound score. The binary variable indicates whether a participant is a supporter (if their sentiment towards the extractive industry is positive) or not (if their sentiment is negative or neutral), as defined in the contextual sentiment analysis.

Linear probability estimations: The Ordinary Least Squares (OLS) approach is adopted to analyze the effect of independent variables on the sentiment toward the extractive industry. As mentioned before, the dependent variable, sentiment, is binary, where each individual is categorized as a supporter (1) if they have a positive sentiment towards the extractive industry, and 0 otherwise.

The model specification is as follows:

$$Sentiment_i = \beta_0 + \beta_1 Metaphor_i + \beta_2 X_i + \varepsilon_i$$

where $Sentiment_i$ is the dependent variable representing the sentiment of individual i towards an extractive industry, β_0 is the constant term, $Metaphor_i$ is the metaphor that individual i associates with the extractive industry, and X_i is a vector of additional covariates for individual i . The covariates in X_i include geographical, individual, and household determinants.²⁷ The term ε_i is the error term for individual i .

The standard errors are clustered by country to account for the potential correlation of the error terms within the same country. This OLS model provides estimates of the correlation between the metaphors and the additional covariate on the sentiment towards the extractive industry, in particular, for the oil and gas, and the mining sectors.

Random forest: In our analysis, we further incorporate the use of the random forest model as a robust machine-learning technique to assess and interpret the relationships in our data. The random forest model is a meta-estimator that fits several decision tree classifiers on various sub-samples of the dataset and uses averaging to improve the predictive accuracy and control over-fitting. It can handle a large amount of features, and it is great for dealing with categorical variables with many levels, like in our case. Random forests are also beneficial because they can easily handle interaction effects between variables and do not require assumption testing as in traditional OLS regression.

²⁷These variables are included as dummy variables, with the base level being the first category listed in their respective group, such as Argentina (for mining estimations), Ecuador (for oil and gas), 18-34 years old, incomplete high school, employed, and lower income quartile.

Our random forest model follows an iterative process. We focus on three different groups for this analysis: the total sample, the subgroup of individuals who expressed sentiments related to the oil and gas sector, and the individuals answering about mining. The variable of interest is the binary sentiment variable, where we categorize each individual as a supporter if their sentiment towards the extractive industry is positive and 0 otherwise.



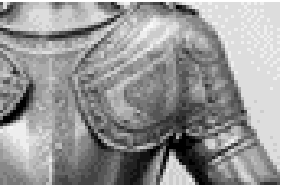
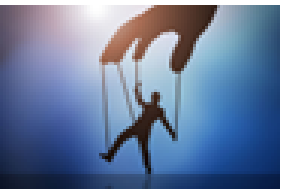
In the first step of our process, we create a random forest for each number of iterations ranging from 10 to 500, increasing in steps of 5, while maintaining the number of variables considered at each split at one. We predict the sentiment variable using a host of independent variables including the metaphor associated with each individual's view of the extractive industry, demographic and socio-economic factors, and the metaphors obtained from ZMET.

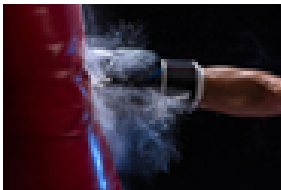




For each model, we capture the out-of-bag (OOB) error and the root mean square error (RMSE) of the validation set and define the minimum number of iterations needed to achieve convergence of these metrics. Next, we create a similar set of random forest models but this time varying the number of variables considered at each split from 1 to 40 for the total sample, 1 to 32 for the oil and gas sample, and 1 to 36 for the mining sample, while keeping the number of iterations at 500. Again, we capture each model's OOB error and RMSE to define the number of variables that minimize the OOB and the RMSE.

The RMSE and OOB error across different iterations and varying number of variables considered at each split are then visualized in scatter plots. These plots provide insights into the optimal number of iterations and variables that should be considered in the final model. The final random forest model is then generated based on these findings. The model's variable importance is analyzed to identify the most influential variables in determining the sentiment towards the extractive industry.

Tables

Table A1: Classification of deep metaphors and sub-metaphors

Deep metaphors	References	Sub-metaphors	Sample image
Balance	<ul style="list-style-type: none"> • Balance is the state of physical, psychological or social equilibrium. • References to equilibrium, stability, equalize or compensate. • Images of scales, teeter-totter, balance beam. • References to reciprocity—give and take. • References to “stable” emotional states such as calm, relaxed, serene. • Feeling “right” with the world. 	<ul style="list-style-type: none"> • Physical balance/imbalance. • Mental balance/imbalance. • Social and moral balance/imbalance. 	
Connection	<ul style="list-style-type: none"> • References to connecting to things or people. • Making an association. • References to linking or attaching. • To be a part of/to not be isolated from. • Liking or loving someone or something. • References to getting in touch with yourself. • Find your true self. 	<ul style="list-style-type: none"> • Connection to self/others. • Disconnection to self/others. • Ambiguous. 	
Container	<ul style="list-style-type: none"> • Keeping things in - or keeping things out. • References to being in (or out) of a place (house, room). • References to keeping or storing. • References to “in” and “out”. • Keeping things out as well as in. • Being wrapped up, or out in open. 	<ul style="list-style-type: none"> • Open/Closed. • Ambiguous. • Exposed/Protected Container. 	
Control	<ul style="list-style-type: none"> • Our unconscious motivation to control our minds, bodies and the situations we encounter. • References to a sense of mastery. • Having or lacking willpower. • Gaining or losing power. • Inferior or superior positions. • Personal empowerment and confidence. • References to success. 	<ul style="list-style-type: none"> • Mental in/out of control. • Physical in/out of control. • General in/out of control. 	

Deep metaphors	References	Sub-metaphors	Sample image
Force	<ul style="list-style-type: none"> • Force manifests itself as a powerful source of energy. • References to power, a powerful presence, or a source of energy. • References to the consequences of force (getting hit, slammed, or impacted). • References to war, fights, battle, attacks, and aggression. 	<ul style="list-style-type: none"> • Physical force. • War force. • Environmental force. 	
Ideal	<ul style="list-style-type: none"> • Ideal is the expression of the perfect, ideal object, situation or feeling. • References to the ideal object, situation, feeling. Statements about one's ideal self. • References to perfection, the perfect one. 	<ul style="list-style-type: none"> • Pristine/perfection. • Polluted/imperfect. 	
Journey	<ul style="list-style-type: none"> • Journey is rooted in our awareness of time, evolution, progress and maturation. • References to taking a trip. • Following a path, choosing a direction. • Getting there. • The journey of life. 	<ul style="list-style-type: none"> • Forward/backward. • Known/unknown. • Fast/slow. • Smooth/obstacle journey. 	
System	<ul style="list-style-type: none"> • System manifests itself as order and structure. • References to machine metaphors (wheels and gears, well-oiled machine). • Constructed process or approach for solving a problem. • A set of rules or procedures to accomplish a task. 	<ul style="list-style-type: none"> • Ritual/mechanical. • Cause/effect system. 	
Transformation	<ul style="list-style-type: none"> • Transformation involves a change from one state to another. • References to changing from one state to another—physical or emotional. • Becoming something or someone else. • References to evolving, maturing, growing. 	<ul style="list-style-type: none"> • Physical transformation. • Mental transformation. 	

Notes: This table provides an overview of the deep metaphors identified using the ZMET methodology. Each metaphor is accompanied by a set of references that describe its conceptual underpinnings. These references are further categorized into specific sub-metaphors. Sample images associated with each metaphor provide a visual representation of its essence. Olson Zaltman Associates provided the content of this figure.

Table A2: Descriptive of statistics of the recruitment sample in Guyana

Variable	N	Mean	Std. dev.	Min	Max
Region					
Barima-Waini	66	0.02	0.12	0.00	1.00
Demerara-Mahaica	66	0.56	0.50	0.00	1.00
East Berbice-Corentyne	66	0.08	0.27	0.00	1.00
Essequibo Islands-West Demerara	66	0.20	0.40	0.00	1.00
Mahaica-Berbice	66	0.09	0.29	0.00	1.00
Upper Demerara	66	0.06	0.24	0.00	1.00
Sex					
Female	66	0.55	0.50	0.00	1.00
Male	66	0.45	0.50	0.00	1.00
Industry					
Mining	66	0.45	0.50	0.00	1.00
Oil and gas	66	0.55	0.50	0.00	1.00
Education					
Primary	66	0.02	0.12	0.00	1.00
Secondary	66	0.32	0.47	0.00	1.00
Technical	66	0.26	0.44	0.00	1.00
University	66	0.36	0.48	0.00	1.00
Post-graduate	66	0.05	0.21	0.00	1.00
Industry perception					
In favor	66	0.79	0.41	0.00	1.00
Against	66	0.21	0.41	0.00	1.00
Age					
18-24	66	0.29	0.46	0.00	1.00
25-29	66	0.09	0.29	0.00	1.00
30-34	66	0.21	0.41	0.00	1.00
35-39	66	0.17	0.38	0.00	1.00
40-44	66	0.14	0.35	0.00	1.00
45-49	66	0.02	0.12	0.00	1.00
50-54	66	0.08	0.27	0.00	1.00
55-60	66	0.02	0.12	0.00	1.00

Notes: This table provides descriptive statistics for the recruitment sample used in the one-on-one ZMET interviews. Participants were selected based on their opinions about oil extraction and mining activities. Demographic details, including region, sex, industry affiliation, educational background, perception of the industry, and age group, are presented.

Table A3: Descriptive of statistics of the recruitment sample in Venezuela

Variable	N	Mean	Std. dev.	Min	Max
Region					
Anzoátegui	60	0.23	0.43	0.00	1.00
Apure	60	0.02	0.13	0.00	1.00
Capericual Anzoátegui, Carrasquero Zulia	60	0.03	0.18	0.00	1.00
Falcón	60	0.12	0.32	0.00	1.00
Guayana Bolívar	60	0.03	0.18	0.00	1.00
Río Cachimí Zulia	60	0.02	0.13	0.00	1.00
Tachira	60	0.02	0.13	1.00	2.00
Zulia	60	0.53	0.5	2.00	3.00
Sex					
Female	60	0.5	0.5	0.00	1.00
Male	60	0.5	0.5	0.00	1.00
Industry					
Mining	60	0.5	0.5	0.00	1.00
Oil and gas	60	0.5	0.5	0.00	1.00
Education					
Secondary	60	0.08	0.28	0.00	1.00
University	60	0.13	0.34	0.00	1.00
Post-graduate	60	0.78	0.42	0.00	1.00
Industry perception					
In favor	60	0.5	0.5	0.00	1.00
Against	60	0.5	0.5	0.00	1.00
Age					
18-24	60	0.02	0.13	0.00	1.00
25-29	60	0.05	0.22	0.00	1.00
30-34	60	0.22	0.42	0.00	1.00
35-39	60	0.08	0.28	0.00	1.00
40-44	60	0.17	0.38	0.00	1.00
45-49	60	0.18	0.39	0.00	1.00
50-54	60	0.2	0.4	0.00	1.00
55-60	60	0.07	0.25	0.00	1.00

Notes: This table provides descriptive statistics for the recruitment sample used in the one-on-one ZMET interviews. Participants were selected based on their opinions about oil extraction and mining activities. Demographic details, including region, sex, industry affiliation, educational background, perception of the industry, and age group, are presented.

Table A4: Linear probability model for the sentiment towards extractive industries

Dependent variable	1[Positive sentiment towards extractive industries]						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ARG	0.000 (.)				0.000 (.)		0.000 (.)
BOL	0.111*** (0.000)				0.090*** (0.004)		0.088*** (0.006)
BRA	0.019*** (0.000)				0.013*** (0.001)		0.014*** (0.001)
CHL	0.074*** (0.000)				0.068*** (0.002)		0.069*** (0.003)
COL	0.052*** (0.000)				0.062*** (0.003)		0.063*** (0.003)
ECU	0.041*** (0.000)				0.045*** (0.004)	0.000 (.)	
GTM	0.070*** (0.000)				0.066*** (0.004)		0.067*** (0.004)
GUY	0.258*** (0.000)				0.228*** (0.007)	0.165*** (0.013)	
MEX	0.036*** (0.000)				0.030*** (0.002)	-0.015** (0.004)	
PER	0.122*** (0.000)				0.109*** (0.003)		0.113*** (0.004)
VEN	0.136*** (0.000)				0.098*** (0.006)	0.057*** (0.007)	
DOM	0.088*** (0.000)				0.089*** (0.005)		0.086*** (0.005)
18-34 years old		0.000 (.)			0.000 (.)	0.000 (.)	0.000 (.)
35-49 years old		0.018 (0.015)			0.023 (0.014)	-0.020 (0.022)	0.040** (0.016)
50+ years old		0.008 (0.019)			0.020 (0.017)	0.001 (0.033)	0.028 (0.019)
Female		-0.000 (0.011)			0.008 (0.010)	0.007 (0.017)	0.006 (0.013)
Incomplete high school		0.000 (.)			0.000 (.)	0.000 (.)	0.000 (.)
High school		-0.004 (0.022)			-0.003 (0.020)	0.044 (0.026)	-0.032 (0.021)
Higher education		-0.009 (0.024)			-0.009 (0.018)	0.038 (0.021)	-0.040* (0.018)
Employed		0.000 (.)			0.000 (.)	0.000 (.)	0.000 (.)
Unemployed		0.012 (0.012)			-0.004 (0.012)	-0.029** (0.006)	0.009 (0.017)
Inactive		-0.018 (0.026)			-0.003 (0.022)	0.032 (0.039)	-0.018 (0.027)
Student		-0.037 (0.023)			-0.024 (0.017)	-0.066 (0.043)	-0.010 (0.019)
Retired		0.004 (0.033)			-0.010 (0.030)	-0.017 (0.091)	-0.012 (0.017)
Household head			0.010*		0.005	0.004	0.006

Dependent variable	1[Positive sentiment towards extractive industries]						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			(0.005)		(0.005)	(0.012)	(0.006)
Married			0.002		0.001	-0.007	0.002
			(0.010)		(0.010)	(0.011)	(0.015)
Children			0.022		0.006	0.054	-0.012
			(0.014)		(0.014)	(0.028)	(0.013)
Rural area			0.058*		0.021*	0.044*	0.006
			(0.028)		(0.010)	(0.016)	(0.008)
Lower quartile income			0.000		0.000	0.000	0.000
			(.)		(.)	(.)	(.)
Interquartile income			-0.001		-0.005	-0.046***	0.014
			(0.011)		(0.011)	(0.007)	(0.012)
Upper quartile income			0.010		0.001	-0.004	0.007
			(0.014)		(0.013)	(0.033)	(0.017)
Balance				0.000	0.000	0.000	0.000
				(.)	(.)	(.)	(.)
Connection				0.222***	0.217***	0.239	0.209***
				(0.037)	(0.036)	(0.102)	(0.030)
Container				0.067**	0.068**	0.103	0.050*
				(0.025)	(0.027)	(0.081)	(0.021)
Control				0.017	0.008	0.019	0.003
				(0.016)	(0.017)	(0.041)	(0.019)
Force				-0.079***	-0.072***	-0.068***	-0.075***
				(0.008)	(0.008)	(0.009)	(0.010)
Ideal				-0.031*	-0.030*	0.001	-0.044***
				(0.014)	(0.014)	(0.039)	(0.009)
Journey				0.278***	0.272***	0.239**	0.285***
				(0.034)	(0.033)	(0.067)	(0.035)
System				0.218***	0.218***	0.185**	0.230***
				(0.027)	(0.028)	(0.041)	(0.036)
Transformation				0.150***	0.141***	0.206**	0.109**
				(0.034)	(0.030)	(0.057)	(0.032)
R2-squared	0.019	0.002	0.004	0.098	0.114	0.127	0.117
N	6760	6760	6760	6760	6760	2013	4747
Countries	12	12	12	12	12	4	8

Notes: This figure presents the results of a linear probability model. The dependent variable is a dummy variable that assumes a value of one if the respondent perceives the extractive industry positively and zero if their perception is neutral or negative. The independent variables are categorized as geographical, individual, and household determinants, as well as the metaphors themselves. The base level for categorical variables is the first category listed in the Figure, i.e., Argentina, 18-34 years old, incomplete high school, employed, lower quartile, and balance are excluded from the regression to be used as base levels for their respective group of categorical variables.

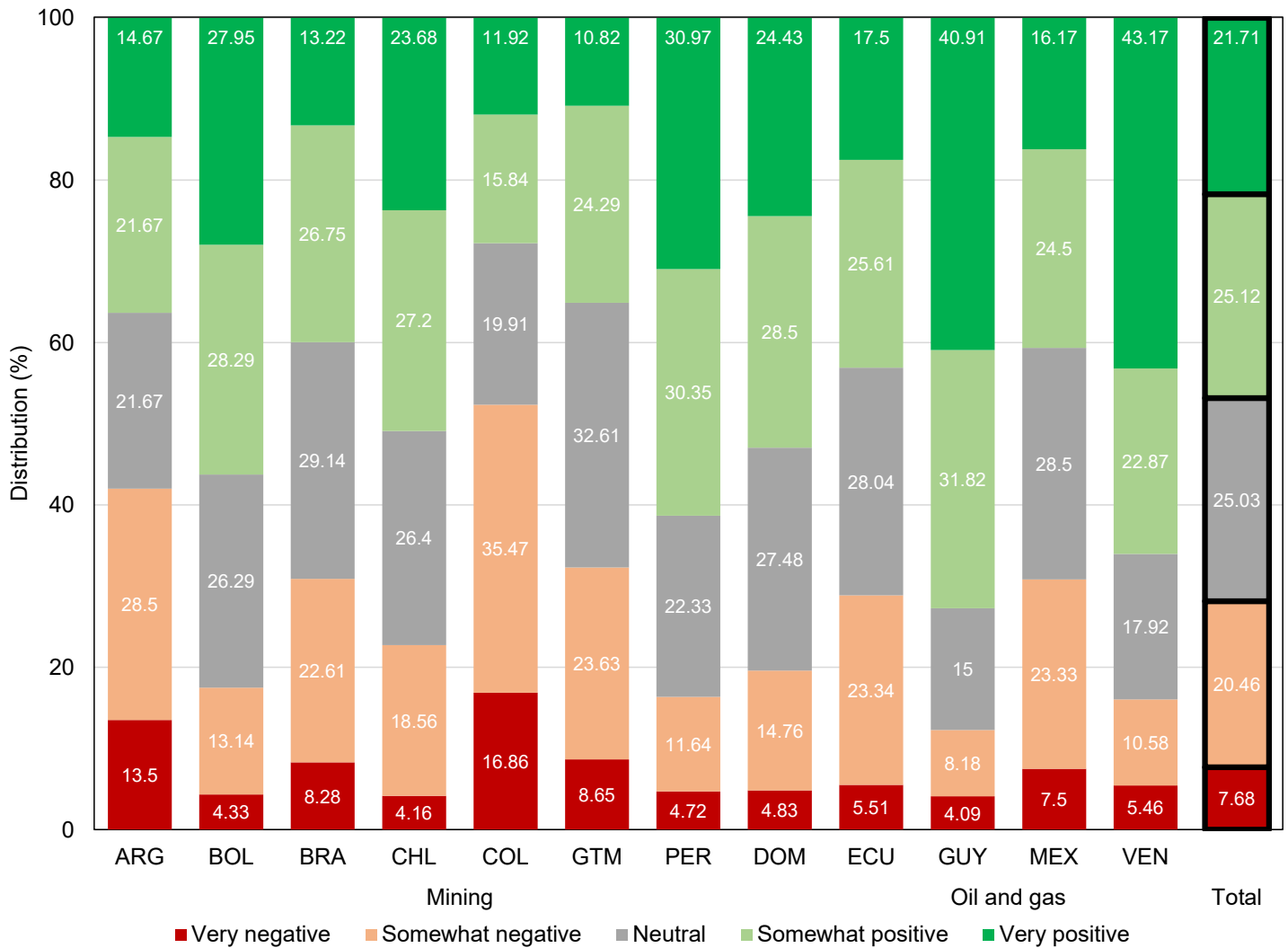
Table A5: ANOVA results for main models

Source	All				Oil and gas				Mining			
	SS	df	F	Prob>F	SS	df	F	Prob>F	SS	df	F	Prob>F
Model	113.66	34	25.52	0.00	40.49	26	11.14	0.00	78.97	30	20.80	0.00
Country	12.35	11	8.57	0.00	5.16	3	12.32	0.00	5.53	7	6.24	0.00
Age	0.60	2	2.28	0.10	0.16	2	0.59	0.56	1.22	2	4.82	0.01
Female	0.10	1	0.74	0.39	0.02	1	0.14	0.71	0.04	1	0.31	0.58
Education	0.07	2	0.26	0.77	0.34	2	1.21	0.30	0.38	2	1.51	0.22
Occupation	0.25	4	0.47	0.76	0.78	4	1.39	0.24	0.23	4	0.45	0.77
Head	0.03	1	0.22	0.64	0.00	1	0.03	0.85	0.03	1	0.24	0.62
Married	0.00	1	0.01	0.91	0.02	1	0.13	0.72	0.00	1	0.03	0.86
Children	0.03	1	0.25	0.61	0.75	1	5.37	0.02	0.10	1	0.81	0.37
Rural	0.30	1	2.32	0.13	0.51	1	3.63	0.06	0.01	1	0.10	0.75
SEL	0.05	2	0.17	0.84	0.94	2	3.38	0.03	0.15	2	0.60	0.55
Metaphor	91.62	8	87.42	0.00	25.03	8	22.38	0.00	68.91	8	68.07	0.00
Residual	881.04	6725			277.61	1986			596.77	4716		
Total	994.70	6759			318.10	2012			675.73	4746		

Notes: This figure presents the results of an analysis of variance (ANOVA) for the linear probability models presented in Appendix Table A4, columns (6), (7), and (8). The dependent variable is a dummy variable that assumes a value of one if the respondent perceives the extractive industry positively and zero if their perception is neutral or negative. The independent variables are categorized as geographical, individual, and household determinants, as well as the metaphors themselves. *df* stands for degrees of freedom, and *SS* for partial sum-of-squares.

Figures

Figure A1: Stated sentiment toward the extractive industry by country



Notes: This figure shows the stated sentiment in LAC using a traditional survey question, like the one used by [Balza et al. \(2023\)](#). Each column represents a country, and segments in each column represent the percentage of the population that selects one option among a) very positive, b) somewhat positive, c) neither positive nor negative (neutral in the figure), d) somewhat negative, or e) very negative to the following question: “Do you consider that [mining/oil extraction] is [...] for the country?”.

Supplemental material

S.1 ZMET one-on-one interviews screening

1. What country do you live in?
2. What area do you live in?
3. What is your gender?
4. How old are you?
5. What is your level of education?
6. On a scale from 1 to 10, where 1 is strongly disagree and 10 is strongly agree, how much do you agree with the following mining-related [Oil and gas extraction related] issues?
 - Mining [Oil extraction] activities in the area where I live have a negative impact on the environment.
 - Mining [Oil extraction] activities in the area where I live contribute to the economy.
 - Mining [Oil extraction] activities in the area where I live generate social unrest and conflict.
 - Mining [Oil extraction] activities in the area where I live provide jobs for people.
 - Mining [Oil extraction] activities in the area contribute to our economic development.
 - My community or the area where I live is affected by mining [Oil extraction] activities.
 - I have opinions about the Mining [Oil extraction] Industry that I would like to share with others.
7. Do you have a computer or mobile device with internet access to make a video conference call?
8. Are you interested in participating in an interview to discuss some of these matters?
9. After the interview you will be compensated for your time.
10. Please write down your name so we may contact you
11. Please provide us with your mobile number
12. Please write down your email

S.2 ZMET one-on-one interviews protocol

Interviewers followed the guidelines explained in section 2 to conduct one-on-one ZMET interviews. They were also instructed to pay special attention to the following topics of interest for our research:

- Explore the impact on their community and country.
- Role of people and their personal role in this community (How do they see themselves? Do they share the point of view of the community, or is it different from others?).
- Understand if their perspectives on the extractive industries have changed over time. What caused that change?
- Understand their thoughts on the environmental impact.
- Understand how they view the social impact on their community and country.
- What are their perceptions of the economic benefits and their distribution?
- Inquire about domestic vs. foreign companies (position/opinion).
- Explore thoughts around types of extractive industries (artisanal vs. large scale – is there a difference?).
- Ask about sources of information: Which are credible and why? Which aren't? (Other people, news, social media, tv, etc.).
- Understand the role of the government.
- If they mention it, inquire about “justice” or “doing justice”.

S.3 ZMET questionnaire for national surveys (SIMILE)

S.3.1 Screener:

1. Please indicate your gender.
2. What is your age?
3. In what country do you reside?
4. In what state or province do you currently live?
5. Are you the head of the household? Consider the head of household to be the person making the greatest contribution to the household income.
6. What level of education have you attained? [If head of the household]
7. What level of education has the head of household attained? [If not head of the household]
8. What level of education have you personally attained? [If not head of the household]
9. How many of each of the following items or services do you have in your household?
 - Bathrooms, restrooms, and/or powder rooms
 - Domestic employee services, including those who work at least five days a week
 - Passenger cars exclusively for personal use (not professional use)
 - Personal computers, including desktop computers, laptops, notebooks, and netbooks (excluding tablets, palmtops, and smartphones)
 - Dishwashers
 - Refrigerators
 - Stand-alone freezers or freezers in two-door refrigerators
 - Washing machines, excluding tub washing machines
 - DVD players, including any device that plays DVDs (excluding car DVD players)
 - Microwave ovens
 - Motorcycles exclusively for personal use (not professional use)
 - Clothes dryers, including washers-and-dryers
10. Where does the water used in your household come from?
11. Considering the stretch of street where your house is located, would you say your street is...
12. In what type of area is your current residency located? (urban/rural)
13. Do you, or does anyone in your household, work in any of the following?
 - Oil and gas industry
 - Mining industry
 - Market research/advertising company or department
 - Public relations firm
 - Any media company (print, radio, TV, internet)
 - Government / regulatory agency
 - Manufacturer, distributor, or seller of pharmaceutical drugs/devices
 - Manufacturer, distributor, or seller of automobiles
 - Manufacturer, distributor, or seller of consumer package goods
 - None of the above

S.3.2 Questionnaire:

For the rest of the survey, we'd like you to think about the oil and gas industry in your country.

We are interested in your thoughts and feelings about the impact of the oil extraction [mining] industry in your country; please reflect on the role this industry has in your country, either positive or negative. When you think about the oil extraction [mining] industry, what thoughts and feelings come to mind? What is your position concerning this industry?

Now, imagine you had to express these thoughts and feelings without words, and only through images...

- **[Image choice:]** Below you will see a grid of images. Please scroll through this grid and select two images that you feel best represent your thoughts and feelings about the impact of the oil extraction [mining] industry in your country.
- **[Literal image description:]** Please describe this image as if you were describing it to someone who cannot see the image. At this point, only describe what you see.
- **[Metaphorical elaboration prompt:]** How does this image represent your thoughts and feelings about the impact of the [mining/oil extraction] industry in your country? Please tell us your thoughts and emotions with as much detail as possible.
- Do you consider that oil and gas [mining] is _____ for the country?
 - Very positive
 - Somewhat positive
 - Neither positive nor negative
 - Somewhat negative
 - Very negative
- How would you describe your current employment situation?
- Which of the following categories most closely describes the economic sector your job belongs to? [If employed]
- What is your marital status?
- How many children do you have?