Three Essays in Applied Microeconomics

by

Eric Adebayo

M.Sc., University of San Francisco, 2014
Master's in Environmental Law and Policy, Vermont Law School, 2012
B.Sc., University of Maryland, 2008

Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy

in the
Department of Economics
Faculty of Arts and Social Sciences

SIMON FRASER UNIVERSITY
Spring 2020

Approval

Name: **Eric Adebayo**

Degree: **Doctor of Philosophy (Economics)**

Title: **Three Essays in Applied Microeconomics**

Examining Committee: **Chair:** Alex Karaivanov
Professor

Hendrik Wolff
Senior Supervisor
Associate Professor

Eric Werker
Supervisor
Professor

Fernando Aragon
Internal Examiner
Associate Professor
Department of Economics

Lucija Muehlenbachs
External Examiner
Associate Professor
Department of Economics
University of Calgary

Date Defended: **April 2, 2020**

Ethics Statement

The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

a. human research ethics approval from the Simon Fraser University Office of Research Ethics

or

b. advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University

or has conducted the research

c. as a co-investigator, collaborator, or research assistant in a research project approved in advance.

A copy of the approval letter has been filed with the Theses Office of the University Library at the time of submission of this thesis or project.

The original application for approval and letter of approval are filed with the relevant offices. Inquiries may be directed to those authorities.

Simon Fraser University Library
Burnaby, British Columbia, Canada

Update Spring 2016

Abstract

In chapter one, Dr. Hendrik Wolff and I examine the effect of an Alabama immigration law on documented immigrants. Alabama's 2011 immigration law (H.B. 56) specifically targets, significantly limits the economic opportunities of, and intensifies the prosecution of undocumented immigrants. Using demographic and citizenship data we test whether the law has led to an unintended reduction of the documented immigrant population of the state. Our hypothesis is that documented immigrants will choose not to locate in Alabama, due to their connections with undocumented immigrants who choose not to live in Alabama because of HB.56. Using synthetic control on data from 2006-2017, we find a significant downward effect on the percentage of the population that is foreign-born non-citizens, and no effect of the law on immigrant citizens. Using data measuring new permanent residents we see no effect on new PRs after the passage of H.B 56. This suggests that the drop in Alabama's immigrant population is likely due to the intended effect of the law discouraging undocumented immigrants from living in Alabama, and that there does not seem to be a similar effect on documented immigrants.

In chapter two, Dr. Eric Werker and I estimate community benefits stemming from the signing of benefit sharing agreements associated with two mining projects. Benefit-sharing agreements determine how resource extraction companies and stakeholder communities share the economic rents created by extractive activities. Besides direct financial compensation, BSAs can include preferential access to contracting opportunities for local firms, guarantees of direct employment for local individuals, and other benefits that can be economically quantified. This paper seeks to demonstrate that BSAs can be quantitatively modeled by estimating the expected size of benefits from two BSAs: the Newmont Ahafo gold mine in Ghana, and the Baffinland iron mine in Nunavut, Canada. We compare the levels of expected BSA benefits to a counterfactual scenario in which we imagine the companies carry out their extractive activities in the absence of signing a BSA and estimate the relative contribution from each of financial transfers, jobs, and contracting opportunities. We find that in the Ahafo case the impacted community's discounted benefits from the BSA amount to 1.08% of the estimated life-of-mine revenue and 2.10% in the Mary River case, with the primary contributions coming from jobs and financial transfers respectively. Quan-

tifying potential BSA benefits can have practical value for future BSA negotiations and for monitoring the implementation of agreements.

In chapter three Dr. Eric Werker and I use a newly created dataset to test hypotheses about what determines the government "take" of gold mining operations worldwide. We define government take as the share of net revenue of a mine collected by the mine's host country government in taxes and other payments. We construct a theoretical model to predict the government take, and then use linear regression to test the agreement between theory and the data. Investment decision theory predicts that governments should decrease their tax rate on mining operations to compensate multinational corporate investors for increased local development costs and political risks. However, higher political risk, and local development requirements are actually associated with higher government take. We find that country-level political economy variables have more predictive power in explaining the patterns determining the government take than the basic investment theory model. We interpret this as evidence that the conventional wisdom surrounding mining investment decisions is incomplete, and that political economy channels may have a role to play in describing the underlying process of determining government take of mining projects.

Keywords: Immigration Policy, Synthetic Control, Benefit Sharing Agreements, Benefit Sharing, Mining, Taxation

Dedication

This dissertation is dedicated to my truly amazing wife April, who has unwaveringly supported me through everything, my dear, always encouraging mother, my father who taught me the value of hard work, my introspective brother Alan who's conversation is always invaluable, my machine of a brother Davey who inspires me to work harder, and all of my colleagues who have helped me along this journey.

Acknowledgements

I want to acknowledge the guidance and help provided to me by my supervisors Dr. Eric Werker and Dr. Hendrik Wolff, my colleagues Cheng Yuan, Thomas Vigié, Ricardo Meilman and so many others throughout the PhD. I truly could not have done it without you all.

Table of Contents

List of Tables

List of Figures

Chapter 1

Sweet Home Alabama: Migration Externalities of America's Toughest Immigration Law

1.1 Introduction

We examine the demographic effects of the passage of the 2011 Alabama law, HB.56. This legislation is designed to encourage self-deportation of undocumented immigrants from the state. We hypothesize that documented immigrants would also be discouraged from living in Alabama due to their undocumented family members avoiding the state. This paper is the first of its kind to use synthetic control to measure the effect, of an immigration policy which targets undocumented immigrants, on the decisions of documented immigrants about where to live.

Immigration policy directly and indirectly affects millions of people within the US. There were 41.3 million immigrants living in the US in 2013, and around 80 million people in the US were first or second generation residents and/or citizens (Zong and Batalova, 2015). Around a million people gained US legal permanent resident status each year from 2000 to 2013. Over half a million undocumented immigrants were apprehended each year during the same period, and an estimated 11.4 million undocumented persons resided in the US in 2011 (US Department of Homeland Securty, 2012, 2014). Asylum seekers can theoretically benefit from preferential status in immigrating. Once immigrants attain legal status in the US they may even have an incentive to "pull the ladder up behind themselves" and to push for more strict immigration standards aimed at reducing further immigration, and hence competition for employment.

Immigration has always played a huge role in shaping the society of the United States, and national immigration policy has shifted along the spectrum from open immigration, to completely closing borders for particular groups of people, both during peace and times of war (Rowen, 2016). Though not for the first time in US history, in recent years anti immigration sentiments have manifested themselves in government, endangering the prospects of those seeking to relocate to the US, and potentially mitigating immigration's effects on the society. Opposition to legal and illegal immigration from Central and South America is popular in some parts of the US population as well. It is crucial for the debate surrounding immigration policy to understand the mechanisms that underlie immigration/emigration decisions and to test whether immigration related policies have intended or unintended impacts. In order to analyze a mechanism by which immigrants choose to locate in the US, we use the toughest immigration law in the US. It is important to see how immigration policies can affect the connections between the millions of documented and undocumented immigrants in the US and how those policies can impact their social and economic lives, and the society and economy in general.

Bohn et al. (2014) analyze the Legal Arizona Workers Act (LAWA), using synthetic control to compare levels of likely undocumented workers between Arizona and synthetic Arizona. The state legislature passed LAWA in 2007, requiring all employers to verify new hires' authorization to work in the US using the E-Verify document verification system. This legal change created harsh penalties for employers who don't use E-Verify in their hiring procedures and also for those who hire undocumented immigrants, thus erecting significant barriers to undocumented persons acquiring work in Arizona. The authors find that the percentage of the population which is statistically more likely to be undocumented immigrants (working age, non-college-educated Hispanic males) saw a significant decline in the wake of LAWA's passage, suggesting self deportation from and/or reduced in-migration to the state of that segment of the population (Bohn et al., 2014).

Authors Hoekstra and Orozco-Aleman write in their 2017 paper about the effects of SB 1070, a piece of Arizona legislation similar to HB.56, on Mexican immigration to Arizona. Through using a novel dataset containing survey responses of US-bound Mexican migrants, they find compelling evidence suggesting that the passage of SB 1070 reduced the rate of undocumented workers moving to Arizona by 30 to 70 percent (Hoekstra and Orozco-Aleman, 2017). Their work, like ours, suggests a significant effect of state immigration policy on immigrants' decisions of where to live in the US. While these papers help to uncover evidence of an immigration policy's effects on *undocumented* immigrants, we are the first authors to measure the effects of tough immigration policy on the decisions of *documented* immigrants about where to live in the US.

Whereas these authors use survey and demographic data to examine the impacts of policy on undocumented immigrants, in our analysis we we use demographic, visa, and citizenship data to measure effects on documented immigrants.

We use the term "undocumented immigrants" to refer to individuals living in the US without proper authorization from the government, and "documented immigrants" refers to foreign-born individuals with US citizenship or permanent residency. A state's population of documented immigrants added to its population of undocumented immigrants equals the state's total immigrant population.

We use synthetic control estimation to test the idea that HB.56 has indirectly created an "immigrant deficit", the difference between Alabama's actual immigrant population and that of the counterfactual Alabama in which HB.56 was never instated. Our prediction is that while the law is intended to target undocumented immigrants, it would also put downward pressure on the population of documented immigrants in Alabama. We cannot reject the null hypothesis that the law has had no effect on the decisions of documented immigrants, but we do see an effect of the law on immigrant non-citizens (which includes undocumented immigrants).

Our first set of estimates using data on the foreign-born percentage of the population suggest that HB.56 has reduced the percentage of the Alabama population that is foreign-born non-citizens in treatment years over the period of study.

Unfortunately the data on foreign-born non-citizens doesn't distinguish between documented and undocumented immigrants. This prevents us from knowing whether the immigrant deficit comes from a reduction in the population of undocumented, documented, or both types of immigrants. In order to measure documented immigrants directly, we analyze U.S. Citizenship and Immigration Services (USCIS) data on new permanent residents (PRs) in each state-year. The PR data analysis shows that there is no effect of HB.56 on the number of new permanent residents in Alabama after 2011.

There is no effect on immigrant citizens and immigrant PRs, with a significant effect on immigrant non-citizens. This pattern suggests that the decrease we see in the percentage of the population that is foreign-born is due to HB.56 having the intended effect of discouraging undocumented immigrants from living in Alabama, without having a significant effect on documented immigrants.

These results contribute to the literature concerning immigration and immigration policy. Ours is the first paper to use synthetic control to test the link between anti undocumented immigrant policies and a reduction in the population of documented immigrants who would not be directly affected by such a policy. The results are important for policy debate concerning immigration. The contentious climate surrounding immigration policy in the US, particularly concerning immigration from Mexico and other south and central American countries highlights the importance of immigration policy and its externalities for policy makers and voters. These results are pertinent for the debate over what the effects on immigrants would be of increasing immigration enforcement.

1.2 Background Information

Anecdotally, many Hispanic Alabamans have reported experiencing increased suspicion and race-based discrimination since HB.56 was passed (Sarlin, 2013; Constable, 2012). Hispanic children have been victims of increased intimidation and bullying at school, leading to decreased attendance (Struckman, 2011; Weishar, 2011). There is also anecdotal evidence that this threatening atmosphere appears to have caused many documented immigrants to leave Alabama in order to work, live, and stay connected to undocumented friends and family members more directly affected by the law (National Immigration Law Center, 2012; Post, 2012).

Even before the passage of HB.56 or laws like it, life for both documented and undocumented immigrants could oftentimes be difficult and uncertain. The Southern Poverty Law Center writes that;

> *"They [Latinos in the South] are routinely cheated out of their earnings and denied basic health and safety precautions. They are regularly subjected to racial profiling and harassment by law enforcement. They are victimized by criminals who know they are reluctant to report attacks. And they are frequently forced to prove themselves innocent of immigration violations, regardless of their legal status." (Southern Poverty Law Center, 2009)*

1.3 HB.56 as the Topic of this Analysis

HB.56 is widely regarded as the "toughest" anti-illegal immigration law in the US. The legislation was introduced by Representative Micky Hammon on the first of March 2011, passed in June, and went into effect on September first of that year (National Conference of State Legislators, 2012). The rapidity with which the law was introduced and passed limits the possibility that individuals were able to anticipate its implementation and pre-adjust behaviors accordingly.

HB.56, or The Beason-Hammon Alabama Taxpayer and Citizen Protection Act mandates that:

1. Law enforcement personnel must make an effort to determine the legal status of anyone reasonably suspected of living in the US without authorization.

2. Undocumented immigrants are barred from receiving any public benefits at the state or local level.

3. Public schools must find out which students and parents are undocumented immigrants, and provide the information to the state.

4. Landlords aren't allowed to rent to known undocumented immigrants.

5. Employers aren't allowed to knowingly hire undocumented immigrants, and are required to use the E-Verify document verification system to screen all potential employees.

6. Any contracts entered into, between an undocumented immigrant and any party aware of their undocumented status, are null and void.

Subsequent legislation, H.B.658, which passed on May 18th of 2012, amended 13 of the 34 sections of HB.56. Among the changes to HB.56, the newer legislation left in place provisions 1-6 above, as well as creating a requirement that courts record and publish information about undocumented immigrants who have appeared before them (National Conference of State Legislators, 2012). Throughout its legislative life, HB.56 has been widely opposed by civil and immigrant rights proponents, as well as being challenged by the US departments of Homeland Security, Justice, State, and Education. The constitutionality of many provisions of the law were challenged in the case of United States v. Alabama and Governor Robert J. Bentley. The controversial nature of the law stems largely from the fear of significant negative effects on the lives of already-marginalized Alabama residents. The US Department of Justice explained in a letter to the state of Alabama that HB.56 has created a hostile climate at schools for Hispanic children as well as having caused large increases in absenteeism among the same population (Post, 2012).

The Center for Business and Economic Research at the University of Alabama performed an HB.56 cost-benefit analysis. They estimate that, instead of helping Alabama's fiscal situation and increasing statewide economic activity, HB.56 has had a significant negative impact on taxes collected, increased immigration enforcement costs, and reduced economic output and business prospects for Alabama (Addy, 2012). Many businesses reported labor shortages due to much of their labor forces leaving the state or being afraid to show up for work for fear of apprehension and deportation (Constable, 2012; Rawls, 2011). Even documented US immigrants, particularly Hispanic individuals, have reported feelings of being unwelcome in Alabama after HB.56 was passed (Rawls, 2011). Anecdotes further suggest that many documented immigrants have quit long-term careers and left Alabama to avoid being indirectly affected by HB.56 or in order to stay connected to friends and family who may be in the US illegally and who have been forced to leave the state (Constable, 2012).

1.4 Methodology

1.4.1 Data Source(s)

The first data used in our state-level analysis comes from the the American Community Survey (ACS), carried out by the United States Census Bureau (United States Census Bureau, 2015). This extensive data set is a representative random sample of the US population carried out in every state in the US, each year. The ACS doesn't differentiate between documented and undocumented individuals.

In the interest of brevity, we will use the placeholders FB, FBC, and FBN to refer to; the percentage of a state's population that is foreign-born, the percentage of a state's population made up of foreign-born US citizens, and the percentage of a state's population consisting of foreign-born non-citizens, respectively (FB = FBC+FBN).

The ACS data include overall population, employment levels, distribution of national origins, and immigration status, among other useful statistics. From these data, we get our variables of interest such as the FB, FBC, and FBN. The second dataset used is USCIS data on the number of new PRs in each state-year which comes from the yearly Yearbook of Immigration Statistics (United States. Department of Homeland Security, 2014). All of these data are freely accessible on the internet.

Our variables of interest for each state-year include FB, FBC, FBN, the total number of new PRs, and the ratio of the total number of new PRs to the population. Our independent variables which predict the outcomes include for each state-year are: state population, percent of the population that is hispanic, black, and white, foreign-born population, population density, the gini coefficient of economic inequality, the unemployment rate, the percentage of jobs that are "rural", the percentage of jobs that are in construction, the percent of the 25 and up population that has a high school diploma, the percent of the 25 and up population that has a bachelor's degree or higher, and the percent of the population below the poverty line.

1.4.2 Synthetic Control

Synthetic control is a useful technique for evaluating a change in one jurisdiction, when one has access to a group of control jurisdictions (such as regions within the same country) but none of the other regions are particularly well suited to being "the best" counterfactual or even a plausibly usable counterfactual. The synthetic control estimation technique was introduced by Abadie et al. in 2003. In that paper the authors examine the effect of Basque country nationalist terrorism (terrorist attacks is the treatment) on GDP growth in the Basque region of Spain. No plausible counterfactual exists for the Basque region of Spain. This theoretical counterfactual would essentially look just like the Basque region, except without having experienced the campaign of terrorist attacks that the real region did. In order to deal with the lack of a plausible comparison region, the authors use the data to construct a counterfactual of this nature (Abadie and Gardeazabal, 2003).

They accomplish this through creating a weighted average of the other provinces of Spain in a way that closely matches the actual Basque region's GDP/capita growth data and data on the predictors of GDP/capita during the pre-treatment period, before the Basque nationalist terrorist attacks. In this way they created a synthetic Basque Country region. This data-driven method of creating a counterfactual leaves the authors with a plausibly useful comparison "state" where pre-treatment parallel trends closely holds by construction between the real and synthetic Basque region. The post-treatment-year outcomes for the treated unit and the synthetic control unit are then compared graphically to determine if there appears to be any effect of the treatment.

Similar to the filtering process described in Abadie et al. (2015), we remove certain control states from our pool of states that can possibly end up with positive weights in the synthetic unit. The removed states are very different from Alabama, possibly affected by the policy change in question, or which have implemented immigration policies similar to HB.56 during or after 2005 and so are not acceptable control states in that regard (Abadie et al., 2015). Any states which border Alabama are removed from the control state pool, as they are more likely to be directly affected by this policy through migration from Alabama. Coastal states are removed as they are likely very dissimilar to Alabama culturally and economically. We also remove states with outcome variable levels more than double or less than half of 2011 Alabama's. This leaves us 17 control states to choose from when assigning the weights for synthetic Alabama's creation in the FB* analyses. We are left with 11 control states to choose from in the analysis of the data on new PRs. The weights assigned to control states which make up the synthetic control version of Alabama, for each of the five outcome variables of interest, are shown in tables 1.1 through 1.5.

Table 1.1: FB Control State Weights

	Weights	State
1	0.776	Louisiana
2	0.223	North Dakota

Weighting of control states to create synthetic Alabama.
Outcome variable is the percent of the population foreign born.

Table 1.2: FBC Control State Weights

	Weights	State
1	0.095	Idaho
2	0.672	Kentucky
3	0.233	North Dakota

Weighting of control states to create synthetic Alabama.
Outcome variable is the percent of the population that is foreign born citizens.

1.5 Estimation Results

We use synthetic control to examine the question of whether or not HB.56 had a negative effect on Alabama's FB, FBC, FBN, new PRs, and new PRs per person post-treatment. The results of these exercises are reported in figures 1.1 through 1.5.

We see in figures 1.1 and 1.3 that there is a significant divergence of FB and FBN respectively between synthetic Alabama and real Alabama after 2011. The gaps for immigrants overall and immigrant non-citizens pre-2011 are quite small, and widen significantly after 2011. We see in figure 1.2 that there appears to be no discernible effect of the law

Table 1.3: FBN Control State Weights

	Weights	State
1	0.003	Arkansas
2	0.074	Kansas
3	0.005	Kentucky
4	0.715	Louisiana
5	0.086	Michigan
6	0.066	Missouri
7	0.001	Nebraska
8	0.045	North Dakota
9	0.001	Ohio
10	0.002	Oklahoma

Weighting of control states to create synthetic Alabama.
Outcome variable is the percent of the population that is foreign born non citizens.

Table 1.4: New PRs Control State Weights

	Weights	State
1	0.294	Arkansas
2	0.320	Kentucky
3	0.386	New Mexico

Weighting of control states to create synthetic Alabama.
Outcome variable is the number of PRs.

Table 1.5: New PRs per Person Control State Weights

	Weights	State
1	0.116	Arkansas
2	0.001	Kansas
3	0.035	Kentucky
4	0.626	Louisiana
5	0.222	Missouri

Weighting of control states to create synthetic Alabama.
Outcome variable is the number of PRs per person.

on immigrant citizens, as the magnitude of the gaps in the case of immigrant citizens are similar pre- and post-2011. The action in the movement of the immigrant population is coming from an effect on the immigrant non-citizens.

By only using the ACS data we see an effect of HB.56 on the immigrant population. However, we do not know if this effect is on documented or undocumented immigrants or both. We would like to measure the impact of HB.56 specifically on documented immigrants and so use USCIS data on the number of new PRs, and the number of new PRs per person, per state-year. The results of these synthetic control analyses are displayed in figures 1.4 and 1.5. We can see clearly in figures 1.4 and 1.5 that the paths for Alabama and synthetic Alabama closely mirror one another both pre and post-treatment, suggesting that HB.56 has had no effect on the number of new PRs in Alabama. This result, along with the previous lack of impact on foreign-born citizens, we interpret to signify no effect of HB.56 on documented immigrants. It appears that what we are seeing is a drop in Alabama's population of undocumented immigrants showing up in the ACS data analysis, and a lack of an effect on documented immigrant citizens and new PRs.

Our study of the PR data is limited in that we only observe the inflow of PRs, not the stock or the outflow, so we do not know what the net in or out flow is in each state. We are unable to definitively say that there was no impact on the population of PRs in Alabama, only that it that the inflow of new PRs does not appear to have been affected by HB.56. Our result for immigrant non-citizens could be driven by undocumented immigrants not leaving Alabama but simply being driven farther underground and becoming more hesitant to answer census questions.

In order to further ensure that we are seeing an effect on the foreign born non-citizens we perform two falsification tests. First we use the total state population as our outcome variable of interest, and then in another analysis we use the native born state population. There are no effects on either the total or native born population, as evidenced by figures 1.6 and 1.7. To test our ability to create a plausible counterfactual synthetic Alabama, we use data from 2006 to 2008 to predict 2009 and 2010. In figure 1.8 we see that we are able to predict post-2008 Alabama's FBN accurately using previous years' data.

1.5.1 Synthetic Control Inference

In order to reject the null hypothesis that there was no effect of HB.56 on Alabama's documented immigrant population one needs a way to show that the relevant observed outcomes are not the result of random chance. The standard technique used in the synthetic control literature is one that uses the results of placebo tests and compares that to the results of our analysis of the actual treated state outcomes (Abadie and Gardeazabal, 2003; Abadie et al., 2010, 2011, 2015). First, we perform a synthetic control analysis on each of the control states as if each were the treatment state instead of Alabama. Then the outcome variable of each state's synthetic version is compared to its actual outcomes and the difference (the

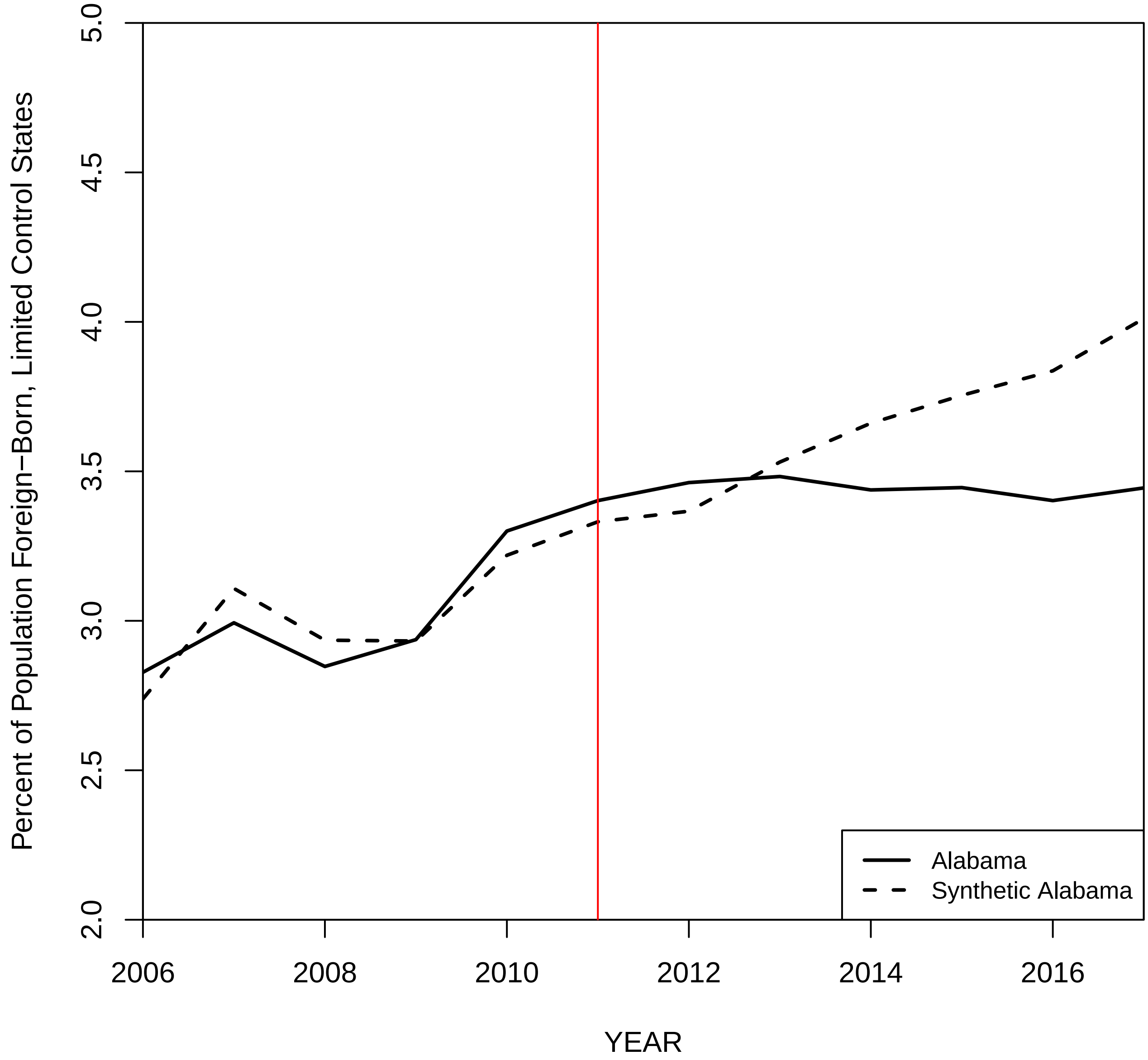


Figure 1.1: Alabama vs Synthetic Alabama, Percent of the Population Foreign-Born per State-Year

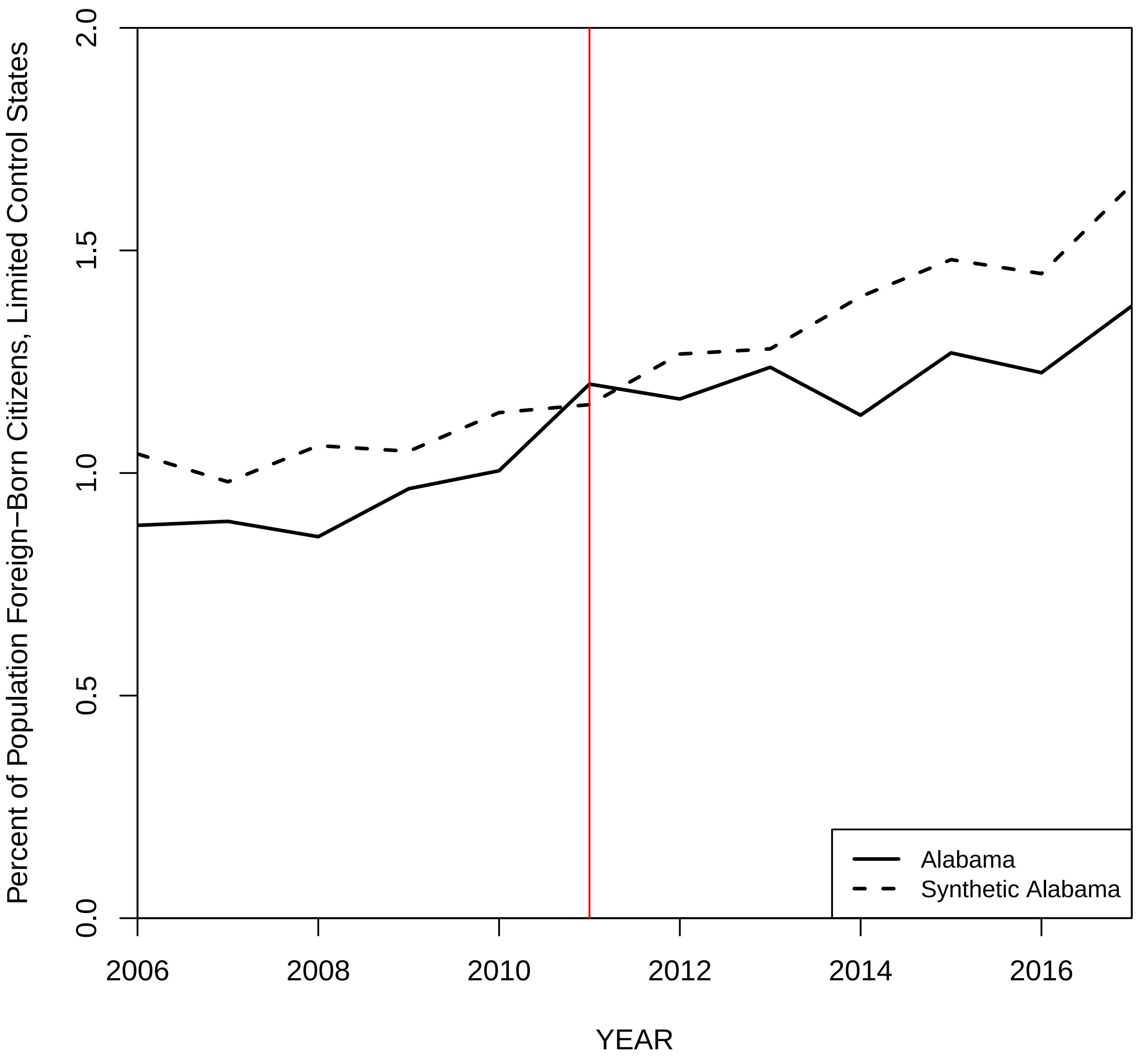


Figure 1.2: Alabama vs Synthetic Alabama, Percent of the Population Foreign-Born Citizens per State-Year

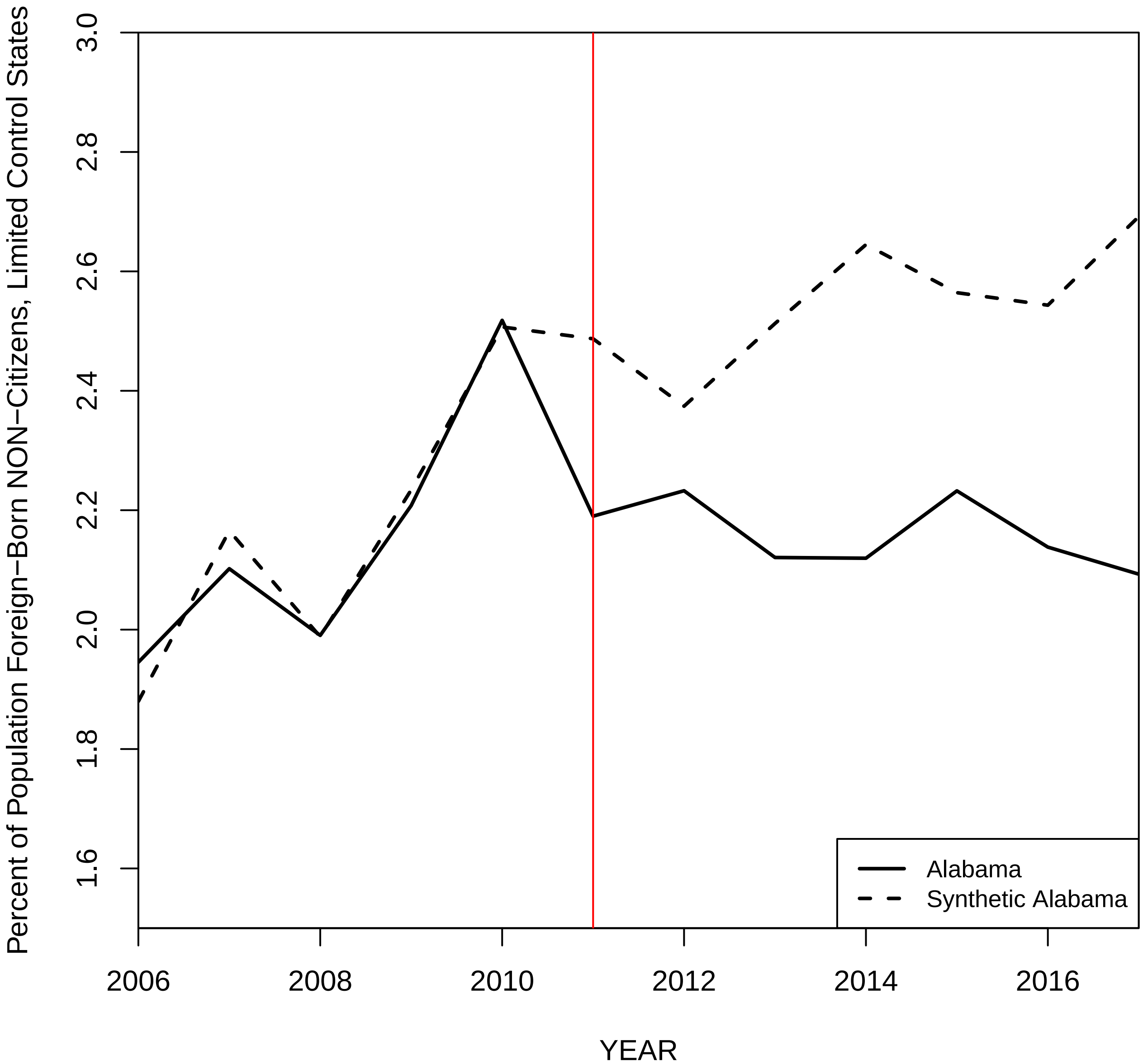


Figure 1.3: Alabama vs Synthetic Alabama, Percent of the Population Foreign-Born Non-Citizens per State-Year

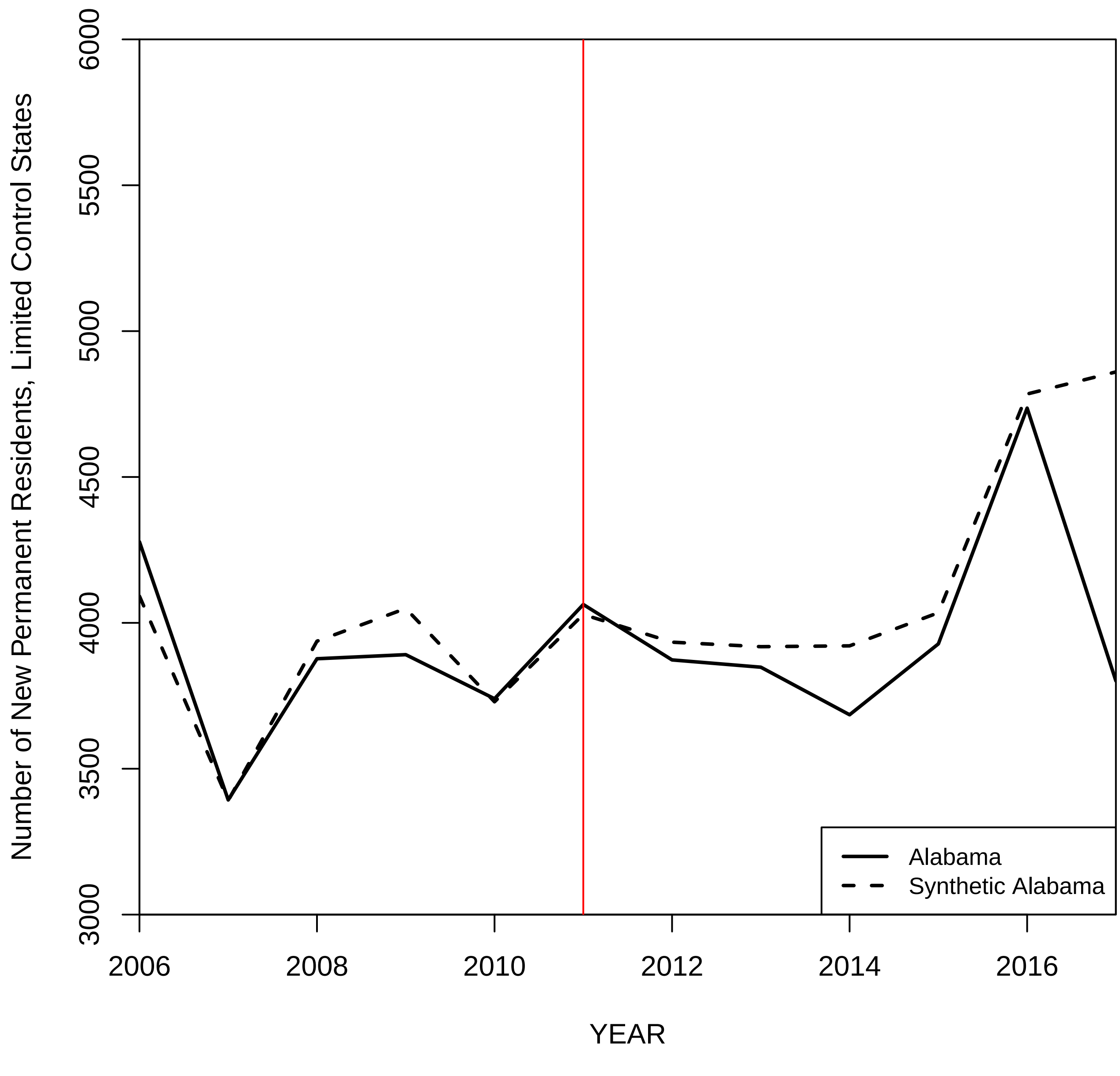


Figure 1.4: Alabama vs Sythetic Alabama, Total # of new PRs per State-Year

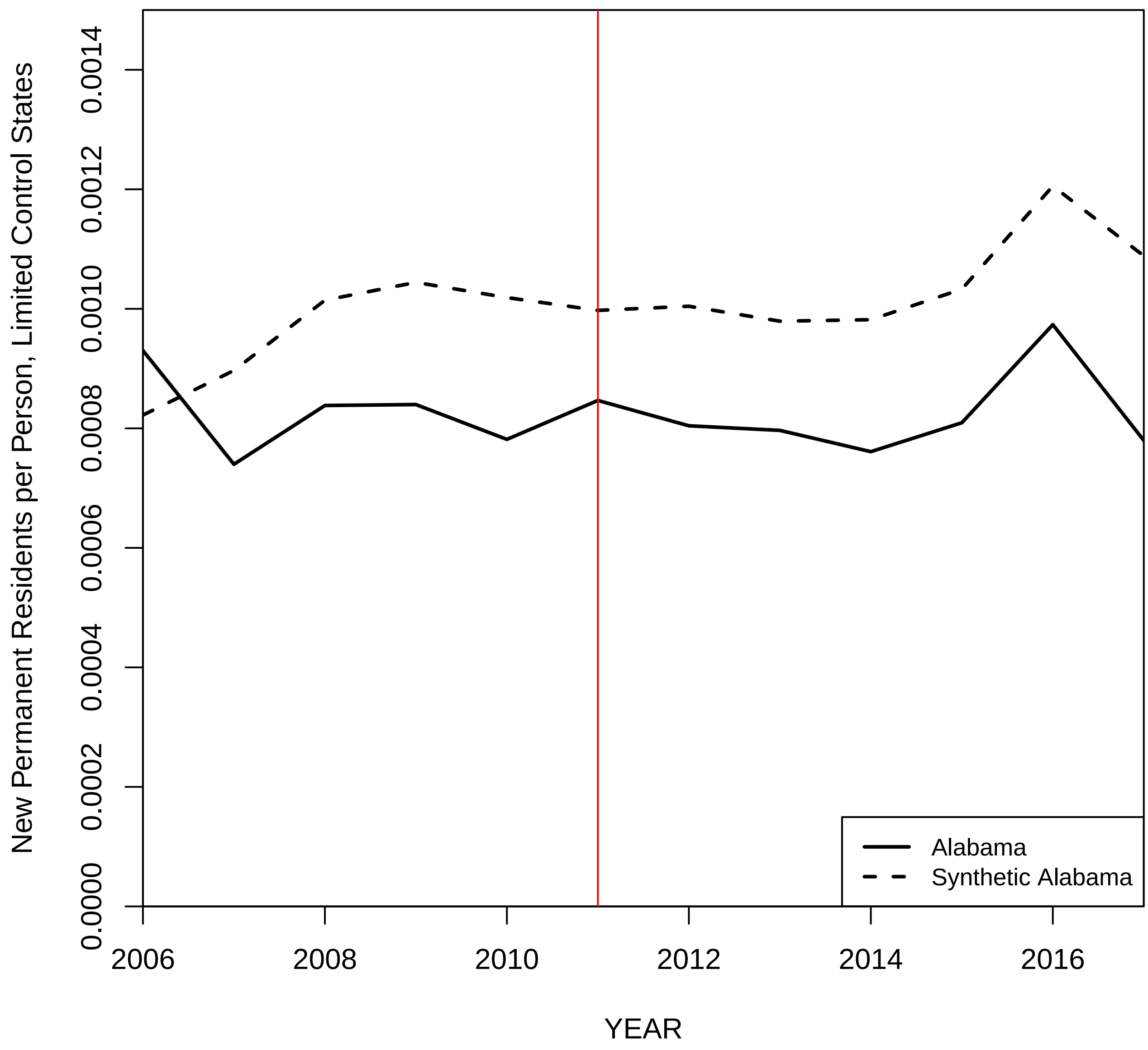


Figure 1.5: Alabama vs Sythetic Alabama, PRs per Person per State-Year

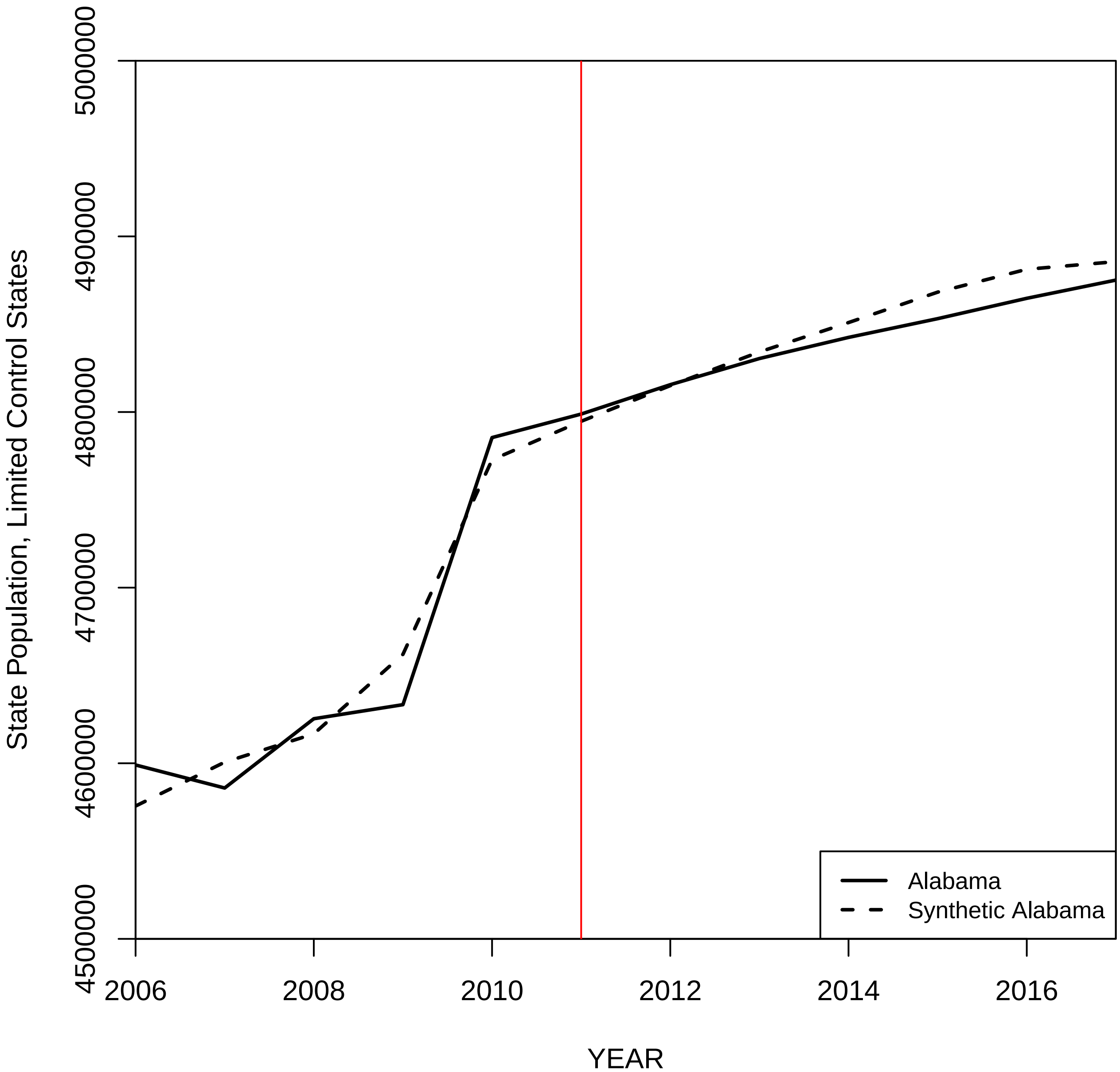


Figure 1.6: Alabama vs Sythetic Alabama, State Population per State-Year

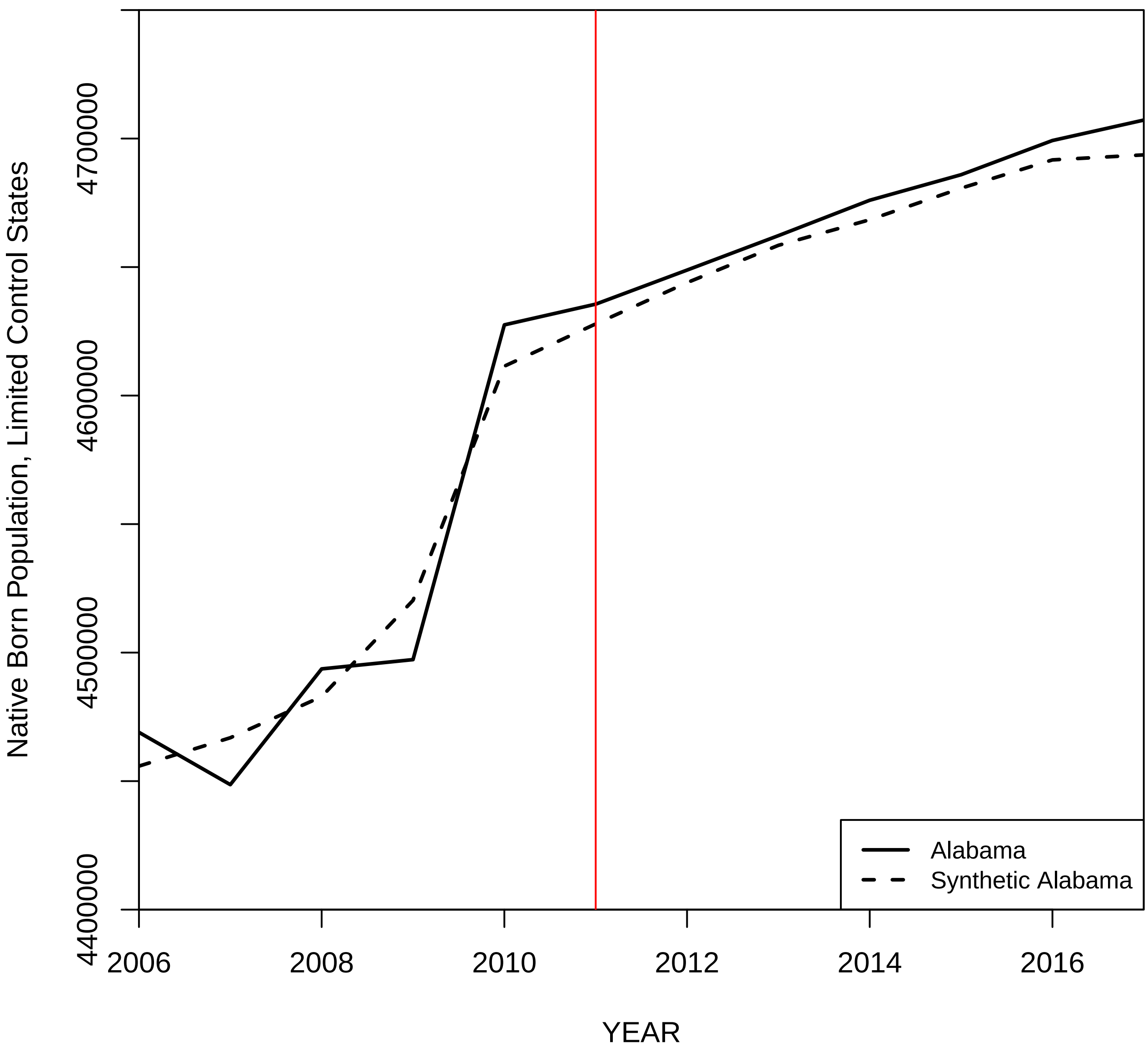


Figure 1.7: Alabama vs Sythetic Alabama, Native Born Population per State-Year

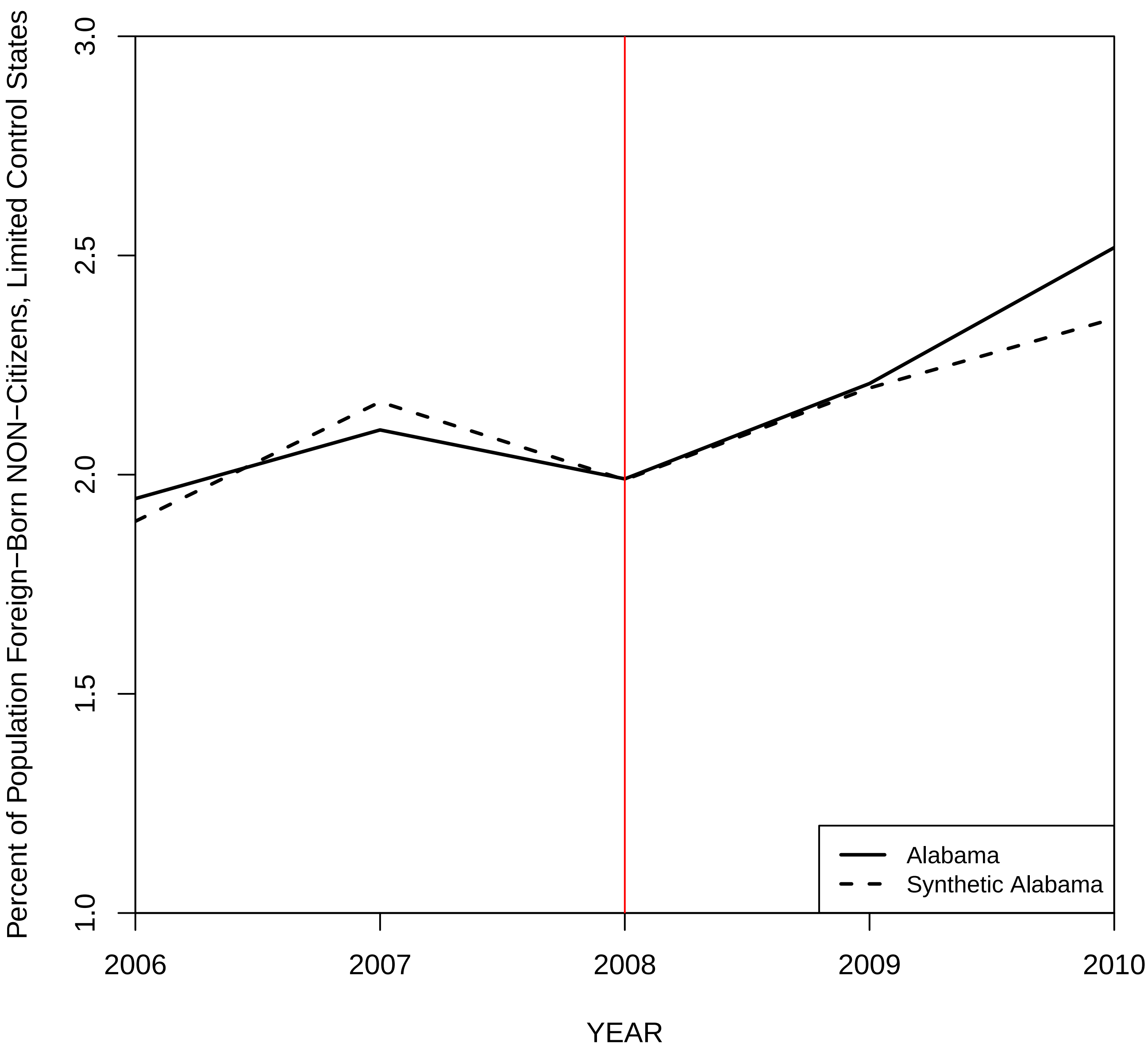


Figure 1.8: Alabama vs Sythetic Alabama, Percent of the Population Foreign-Born Non-Citizens per State-Year, Pre-Treatment Prediction Test

“gap”) is plotted over time. One can then overlay all of these gaps graphs to see whether or not the differences between synthetic and real Alabama are uncommonly large when compared to the differences between the real and synthetic versions of the control states. If the post-treatment gaps are significantly larger for Alabama than what is “normal” for the group, this would suggest that our outcome of interest is the result of the legal change in question and not spurious correlations in the data. The results of this exercise for the percentage of the population made up of foreign-born non-citizens is presented in figure 1.9.

The effect of HB.56 appears to be coming completely through its effect on foreign-born non-citizens. Therefore we focus on this result and try to determine its statistical significance. We limit our comparison to states for which the synthetic control procedure has created a relatively good pre-treatment synthetic version (the pre-treatment gaps between the real and synthetic version of a state are close to zero). As in the synthetic control literature, we first limit the comparison states to those which have a mean squared prediction error (MSPE) less than 10x that of Alabama. The MSPE measures the degree to which a synthetic state’s outcome mirrors its real version pre-treatment. We then further limit the comparison group to states which have pre-treatment gaps relatively close to zero, where the Alabama gaps generally sit. This unfortunately leaves us with only 4 comparison states. In the placebo states, there does not seem to be any upward or downward pattern in their gaps graphs. They all seem to hover around the same level before and after treatment. However, for our treatment state, we can see the gaps between synthetic and real Alabama are around zero pre-2011 and then clearly expand as time goes on after 2011. This pattern suggests to us an increased impact of the legislation over time.

The fact that the pre-treatment gaps for many of the placebo states are large, and so they were removed from the gaps graph, suggests to us that the synthetic control method is not able to generate synthetic versions of many placebo states that closely mirror their real counterparts pre-treatment. Among the states which are reasonably well approximated, the gaps for synthetic Alabama do appear significantly larger. We interpret the gaps graph, figure 1.9, as allowing us to reject the null hypothesis that HB.56 had no effect on the decisions of immigrants on where to live. HB.56 appears to have decreased the share of the population that is immigrant non-citizens, and not affected the level or share of new PRs in Alabama.

1.6 Conclusion

We use synthetic control to test the hypothesis that Alabama’s 2011 anti-undocumented immigrant law, HB.56, has had an unintended effect of dissuading documented immigrants from living in Alabama due to their connections with undocumented members of their community specifically targeted by the legislation. We use American Community Survey data about the percent of each state-year’s population that is foreign-born and U.S. Citizen-

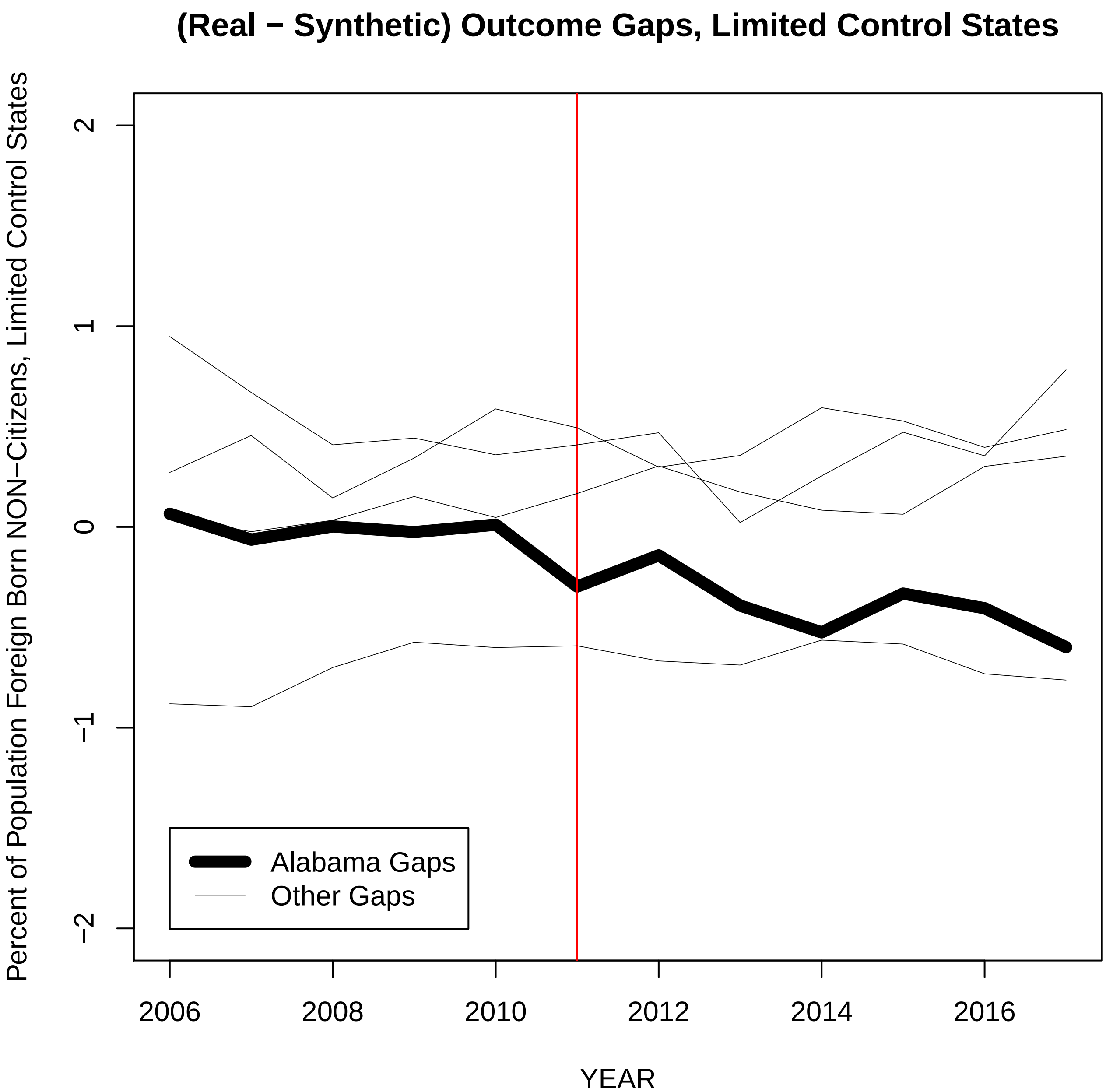


Figure 1.9: Synthetic Control Inference Graph

ship and Immigration Services data about the number of new permanent residents in each state-year to test our hypothesis. The results of our analysis of the two datasets leads us to reject the null hypothesis of no effect, for immigrant non-citizens. We do not see any effect of the law on immigrant citizens and new PRs. This suggests that the law had the intended effect of driving some portion of immigrant non-citizens,likely the undocumented, from the state without also driving out documented immigrants that they have connections with. It appears that connections between documented and undocumented immigrants are not strong enough to outweigh the other deciding factors, economic opportunities for example, on where documented immigrants decide to live. These results suggest that states which enact these types of legislation targeting undocumented immigrants would not also unwittingly dissuade documented immigrants from locating in the state.

Chapter 2

What do Communities Get From Mining Projects? Valuing Benefit-Sharing Agreements

2.1 Introduction

Conflicts surrounding mining projects have cost companies and communities human lives, significant time, energy, and money, as well as forgone potential benefits of resource extraction (Davis and Franks, 2014; Özkaynak et al., 2012; Slack, 2009; Weber-Fahr, 2002). To avoid these costs, mining companies have turned to signing contracts with mining-affected communities. These agreements, herein referred to as benefit-sharing agreements (BSAs), help to lay out the rights, responsibilities, and governance mechanisms of each of the corporate and community stakeholders of a mining operation. BSAs also determine how resource extraction companies and stakeholder communities share in the economic rents from extractive activities. Each host community, in negotiating a BSA, must make trade-offs between various potential benefit streams. These can include preferential access to sub-contracting opportunities for local firms, guarantees of direct employment for local individuals, and financial payments to the community.

Mining is a large industry with significant ties to countries all over the globe. The gold mining industry alone accounted for more than USD 171.6 billion of direct and indirect spending in the world economy in 2013. Over four million people worldwide were directly employed by or a subcontractor of the gold mining industry in the same year (World Gold Council, 2015). The often rural and relatively poor communities situated near mining projects potentially have much to gain by signing BSAs. This paper provides a place to start for communities to more meaningfully engage in BSA negotiations and extract concessions. A quantitative measurement of BSA-derived benefits can help mining-affected communities make concrete demands of mining companies in BSA negotiations. Knowing the size and types of benefits that communities have received in the past, and how small those benefits have been in some cases, can provide a benchmark for the minimum amount of benefits that a community should accept in terms of benefits from the mining company involved.

BSAs are a way for the corporate and community stakeholders (or rights holders, in some contexts) to plan for the mitigation of mining's negative effects and provide mining-affected communities with a share of its benefits (Otto, 2010; O'Faircheallaigh, 2013). They allow communities to supplement sometimes woefully inadequate legislation concerning mining activities and their potential negative externalities (Kamlongera, 2013). That being said, the success of communities in protecting their interests depends highly on the policy, institutional, and legal environment that they exist within (O'Faircheallaigh, 2006). The growing popularity of BSA negotiations in the mineral extraction sector comes partly from the idea that in order to proceed with mining operations, companies need a "social license to operate" in order to prevent protests and disruption of mining activities (Prno and Slocombe, 2012). In the mining sector, research has shown that the pursuit of corporate social responsibility in relation to improving community outcomes is often in response to pressure from civil society organizations, public and private regulations, pressure from financial markets, and changing community expectations (Mzembe and Meaton, 2014).

BSA negotiations can help to not only provide financial benefits to communities, but can also protect the cultural heritage of Indigenous groups when negotiations meaningfully address weaknesses in their bargaining power (O'Faircheallaigh, 2008). BSAs are potentially beneficial to mining firms in addition to mining-affected communities, as Henisz et al. find that increased stakeholder support leads to higher financial valuation of firms (Henisz et al., 2014). By examining stock market reactions to the signing of Canadian BSAs, Dorobantu and Odziemkowska similarly find that firms investing in extractive projects are more highly valued by shareholders when signing BSAs with communities that have strong property rights protections, experience with legal processes, and a history of protests. Such communities are more likely to be able to delay or completely disrupt mining projects, and so securing their consent is seen as more necessary and valuable to extractives firms (Dorobantu and Odziemkowska, 2017).

Even as BSAs have become widely prevalent based on their promise of benefit transfer, the actual levels of benefits inside them remain unknown and unmeasured. This paper estimates the expected size of benefits from two publicly available BSAs concerning two different mines: the Newmont Ahafo gold mine in Ghana, and the Baffinland Mary River iron mine in Nunavut, Canada. In Ahafo, Newmont signed three agreements with the surrounding communities that put forward a multi-stakeholder governing framework, set a minimum local employment target, and established a development foundation funded by contributions from the mine equal to 1% of net profits and $1/oz gold. In Mary River, Baffinland and the Qikiqtani Inuit Association (QIA) signed an Inuit Impact and Benefit Agreement (IIBA) that established a governance framework, agreed to a minimum Inuit employment goal, put forward bidding criteria that would favor Indigenous-owned businesses, set land and water use rates, and determined that 1.19% of net revenue be transferred to the QIA.

We posit that communities must make trade-offs between different types of benefits in BSA negotiations. However, the extent to which this happens may be limited to trade offs at the margins. O'Faircheallaigh finds that, in company-Indigenous community negotiated mining BSAs in Australia, agreements with strong provisions in one area tend to be strong in other areas. For instance, strong cultural heritage protections are paired with strong environmental protections, and the reverse is true for weak protections. It appears that the relative bargaining power of the parties, the organizational strength and negotiation experience of organizations that represent Indigenous interests, and the level of Indigenous legal protections determine the strength of all of a BSA's provisions together (O'Faircheallaigh, 2015).

Mineral development agreements (MDAs) perform similar functions to BSAs but are usually negotiated at the national level and perform the function of stabilizing the fiscal and legal environment surrounding mining projects. The corporate mining proponent and the relevant government decide on the rights and responsibilities of both parties, often covering things like environmental and socioeconomic issues resulting from mining, hiring of host country nationals, as well as royalty, tax, and other payments (Natural Resource Governance Institute, 2013). Best practice in negotiating MDAs includes the quantitative modeling of financial returns to mining companies and tax revenues to the host country, as has been the case for over 50 years (Smith and Wells, 1975). We seek to take these best practices and apply them to BSA negotiations, while moving beyond those best practices by also incorporating non-fiscal benefits. Using a modified discounted cash flow methodology, we model the expected returns to each host community [1] by estimating financial transfers, employment and wages, and contracting profits, taking into account the parameters of the mine and price expectations for the resource at the time of the signing of each BSA. When figures are unavailable, we use estimates from comparable projects or previous studies. We compare the levels of expected BSA benefits to plausible counterfactual, or business-as-usual (BAU), scenarios, which we define more precisely as mining without signing a BSA.

There are several goals of this exercise, each of which contributes to the literature on resource development and potentially influences the practice of mining companies and mine-hosting communities. One, we wish to demonstrate how BSAs can be quantitatively modeled by doing so in two very separate contexts, with information that could have been available to advisers at the time of negotiation. Two, we seek to estimate the actual share of rents that communities have successfully negotiated for. Three, we examine where the benefits

[1] Throughout this paper when referring to a relevant community, we mean to speak of those specifically targeted for receipt of benefits by a particular BSA; in these cases, we mean local residents of the towns in the Ahafo mine catchment area, and the Inuit people living in communities near the Mary River mine site.

lie in two particular BSAs—-are they largest in jobs, business opportunities, or in financial transfers? Four, we aim to put forward clear and simple methodologies for quantifying non-fiscal benefits like employment and contracting. This may have an impact beyond BSAs and extend to negotiations between resource companies and national governments.

Our work also contributes to the literature concerning community benefits from investment projects. The parameters of our financial model capture differences in projects that affect the community benefits captured. Through our model we are able to come up with predictions of negotiated outcomes, a procedure which could be recreated in other large scale investment settings.

We define the variables we will seek to estimate as well as the procedure for modeling the counterfactual scenarios. Our quantification of BSA-derived benefits includes only those measured in financial terms (excluded are things like improved communication or goodwill between parties to an agreement) and that are explicitly included in each BSA. We model the benefits flowing to each community from royalty payments, direct jobs with the mining company, local preference in subcontracting, and other payments, using a methodology that has not been used in this arena before. Our outcome variable of interest is the ratio of the net present value (NPV) of BSA benefits to the NPV of life-of-mine revenues. Ideally, we would use economic rents as the denominator, but getting an accurate measure of rents is beyond the scope of this work.

We find that in the Ahafo case the community's expected benefits derived from the BSA amount to 1.08% of the estimated life-of-mine revenue, which is split fairly evenly between employment benefits and financial contributions; contracting was not discussed in the BSA (though Newmont did initiate a "linkages" program with the support of the International Finance Corporation). We find that the same measure in the Mary River case amounts to 2.10% of total life-of-mine revenue, driven primarily by financial contributions followed by employment, with contracting being the smallest of the three benefit streams. Using sensitivity analysis, we compare how the values change with different output prices.

The rest of the paper proceeds as follows. Section two explains generally our methodology for estimating BSA-derived benefits. Section three details our analysis and results for the Ahafo mine, and section four does the same for the Mary River case. Section five contains discussion and conclusions.

2.2 Estimating Community Benefits from BSAs

We estimate the predicted benefits accruing to the affected communities, above an estimate of benefits under a reasonable BAU scenario where the mining proceeds in the absence of a BSA. For each mine we model expected revenues and costs and employment and contracting opportunities created through the expected life of the mine. We are not estimating the benefits of the mine net of environmental and economic impact. Because of data limitations, we do not consider multiplier effects; instead, we focus on the direct effects of the BSA.[2]

The ideal way to perform this exercise would be to obtain detailed mine production, hiring, and profitability predictions from a feasibility study (FS) of the mining asset. With this, one could anticipate a time path of the revenue and expenditures of the mine. These reports include geological information on mineral reserves, cost and revenue predictions, future world commodity price predictions, employment level predictions, along with other information that one would need in order to justify the investment (Pelaez, 2017).

We have access to the Mary River project FS, and so use the information contained therein, along with reasonable parameter estimates from relevant literature, to construct our estimates of community benefit derived from the Mary River BSA. Our research team was not given access to an Ahafo FS.[3] Due to these data limitations, in the Ahafo case we were required to create a model of mine profitability from the ground up based on reasonable parameter values and assumptions from mining-related academic literature and industry reports, and in consultation with mining professionals.

The calculations for each mine are based on information that would have been available to negotiators at the time of the relevant BSA's negotiations. We model benefits from the Ahafo mine in 2008 USD and Mary River in 2013 CAD. Benefits in future years are discounted at the rate of 3.5% (Boardman et al., 2010).

2.2.1 Calculation of Benefits Derived from Mining Activities

The total benefit $TOTAL$ is the discounted (at rate d) sum of the yearly expected benefit B_t from the year of BSA signing, $t = 0$, to the end of the mine's life, $t = T$.

$$TOTAL_B = \sum_{t=0}^{T} B_t/(1+d)^t \quad (2.1)$$

The expected yearly value of each benefit stream can be decomposed into a set of easily interpretable terms. The following equations, in which the time subscripts are suppressed, are meant to illustrate conceptually our calculations. Below we decompose the estimates

[2]BSAs may also lead to indirect benefits. A report on the Newmont Ahafo mine estimates the multiplier ratio of the mine to be 2, meaning that for every dollar spent by the mine, 2 dollars of economic activity is generated locally, for example through mine employees spending money on goods and services (Kim et al., 2013). Our benefit estimates for the BSA are likely lower bounds, due to the existence of multiplier effects increasing total local benefits. Local workers and contractors may be more likely to spend money on local goods and services and invest in local business. Financial payments can be used to construct infrastructure such as roads, which may have a high rate of economic return.

[3]Canadian mining companies are required to make their FS public for each project. They are usually readily available on the mining company's website and/or www.sedar.com. Despite multiple attempts to locate the Ahafo feasibility study, including writing the Vice President of Investor Relations directly, we were unable to access it.

of community benefits coming from jobs, royalty payments, and contracts, as these are the largest categories of benefits that we model in the examined BSAs. The equations defined below describe our estimates of the gross yearly level of economic benefits attributable to the relevant BSA.

Jobs estimates

Expectation of economic value from jobs = $E[J]$, Average increase in salary per mining job over non-mining job = w, Units of output = O, Total mining jobs = j, Mining jobs above BAU, going to relevant community = c, Total mining jobs per unit of output =j/O, Ratio of mining jobs going to local community to total mining jobs created = c/j.

$$E[J] = O \times j/O \times c/j \times w \iff E[J] = c \times w \tag{2.2}$$

In words, the expected benefit from jobs is the mine output, multiplied by the job intensity of the mining, times the additional share of jobs going to the community, times the wage premium. Increasing c or w would increase the benefit to employment from the BSA. We do not ascribe expenditures on training or capacity-building projects as a benefit to the community if the intention of those programs is to increase the local level of employment, since that would be double-counting benefits–that is, training programs can be seen as an intermediate input in the increased earnings that we do model. This modeling choice does not diminish the importance of capacity building to local workers or firms; indeed, such programs may be required to realize the benefits of the BSA.

Royalties estimates

Expectation of Royalties = $E[R]$, Royalty percentage of profit = p, Royalty percentage of sales rate = s, Royalty per unit of output = u, Revenue per unit of output = r , Production cost per unit of output = c, Profit per unit of output = $r - c$, Fixed payment = F.

$$E[R] = F + p \times O \times (r - c) + s \times O \times r + u \times O \tag{2.3}$$

In the case of Ahafo, the royalty is driven by p and u, or profit and volume of output, whereas at Mary River, the royalty is a hybrid of p and s, a royalty charged on a base that is partway between sales and profits, plus F or a fixed payment.

Contracting estimates

Expectation of total contracting economic value added (EVA) to the community = $E[S]$, Measure of total expenditures = TX, Total expenditures paid to relevant community firms above and beyond BAU = f, Percent of total expenditures going to local community of interest firms = f/TX, Average total value of a contract = k, Average Economic Value Added (Wages and Profits) of a contract = e, Average percent of contracts consisting of EVA = e/k, Average percent relevant community ownership and workforce participation of relevant community firms (i.e. % local Inuit ownership and workforce of 'local Inuit firms') = l. Opportunity cost of community firms = W.

$$E[S] = TX \times f/TX \times e/k \times l - W \iff E[S] = f \times e/k \times l - W \tag{2.4}$$

In words, the benefit to the community from its BSA is equal to the mine expense multiplied by the contracting share of expense, times the share of contract value that is economic value added, times the share of local participation in the contracts, adjusted for their level of business in a situation where mining proceeds in the absence of the BSA.

2.3 The Ahafo Mine Analysis

2.3.1 Ahafo Background and Context

The Ghanaian mine we analyze is located in the Brong-Ahafo region of Ghana. Based on the 2000 census, agriculture accounts for about 70% of all economic activity in the Ahafo mine districts (Ghana Statistical Service, 2005). The 10 communities identified as affected by the Ahafo mine project are called the "mine catchment area communities" (The Agreement Forum, 2008c). These ten towns together make up the community in the Ahafo BSA. The size of the community towns ranges from 1,600 to 11,000 individuals (Boakye et al., 2018). The Ahafo mine sits on a lease concession of about 137,000 acres located approximately 300 kilometers northwest of Ghana's capital, Accra. The operation consists of 3 open pits and an underground operation. We model the open pit part of the operation, as the underground portion was not developed in 2008. During 2016 the mine produced 349,000 ounces of gold, and the site reported 9.6 million ounces of reserves. The costs applicable to sales for the Ahafo project were on average \$655/oz for the first 6 months of 2016, and \$743/oz for the same period in 2017. The average all-in sustaining costs for the same two 6-month periods were \$888/oz and \$934/oz respectively, compared to an average gold price of \$1257/oz for 2017 (Newmont, 2017).

Ghanaian mineral rights and the legal framework surrounding mineral extraction are established by the Minerals and Mining Act 2006 (MMA). The MMA requires that 10% of all mining royalties paid to the central government be given to the communities affected by mining, irrespective of any BSA. It lays out the requirements for being eligible to acquire mineral rights, the governmental role in and procedures for granting such rights, as well as responsibilities of the government and any mineral extractors (Parliament of the Republic of Ghana, 2006). The Minerals and Mining regulations 2012 (MMR) further established requirements for mineral extraction, local recruitment, and local content in mining (Parliament of the Republic of Ghana, 2012).

Ghanaian law requires mining companies applying for leases to plan for the mitigation of environmental degradation, preferentially employ Ghanaians, and use Ghanaian intermediate products whenever possible. The Minerals Commission, an agency of the Ghanaian federal government, is in charge of enforcing the reporting requirements and implementation of the environmental, employment and procurement plans (Parliament of the Republic of Ghana, 2006, 2012; Columbia Center on Sustainable Investment, 2014).

In the Ghanaian context, the landowners and community leaders of the mine catchment area do not have veto power over potential projects. The central government's authority over land, particularly the power of eminent domain held by the president, is regularly used to approve mining projects that are seen as advantageous to the central government's finances through taxes and royalty payments, and which are often not tied to local mine community outcomes (Oxfam, 2015). The low level of development unrelated to mining, coupled with relatively low levels of literacy and experience with formal work has prevented many locals and local businesses from taking advantage of economic opportunities (World Business Council for Sustainable Development, 2011).

2.3.2 The Ahafo BSA Documents

We use the term "Ahafo BSA" to refer to three documents called the Ahafo Social Responsibility Forum Agreements. They outline the rights and responsibilities of, as well as the methods of communication and areas of cooperation between, Newmont and the "Chiefs and People of the Ahafo Mine Local Community" (The Agreement Forum, 2008c,b,a).

The Ahafo Social Responsibility Forum, a multi-stakeholder body created in 2006, signed the Ahafo BSA in 2008, creating the Newmont Ahafo Development Foundation (NADEF). The Forum is made up of 3 company representatives, 8 representatives from district and regional government, 20 representatives of the traditional chiefs, 18 representatives from community groups, and two representatives from local NGOs (The Agreement Forum, 2008c). In 2005 Newmont began discussion of mining and its impacts with the chiefs of the communities (Boakye et al., 2018). Through interviews we learned that the main focus of the community negotiators was on direct employment with Newmont. Some members of the community, particularly those in positions of power, were satisfied with the negotiation process. Newmont paid for the services of one lawyer to help all ten communities during negotiations. However, the lawyer is said to have only met one-on-one with the chiefs, and during negotiations mainly provided translation services, without providing advocacy (Boakye et al., 2018).

The Social Responsibility Agreement lays out the overall aims of the BSA as well as creating the institutions that administer the agreement. The employment agreement spells out how local communities should be a preferential source of mine labor, with 35% of all labor coming from the local communities being the initial goal, to be increased to 50% within ten years of the start of mine production (The Agreement Forum, 2008b).

The first two documents are agreements between Newmont and the local mine communities, and the third is between Newmont and NADEF. NADEF is managed by a board of trustees which includes a chairman nominated by the Forum on Newmont's recommendation, four members nominated by Newmont, and four members nominated by the community. In the third agreement, Newmont commits to NADEF 1% of net pre-tax income, as well as $1 USD per ounce of gold sold (The Agreement Forum, 2008a).

The Ahafo BSA does not require Newmont to use or support local contractors, although the company created a “linkages” program that incentivized the use of local contractors in mining operations and provided support for the development of the local subcontractors. According to the World Business Council for Sustainable Development, the linkages program did increase the level of local content used in Newmont’s operations (World Business Council for Sustainable Development, 2011).

2.3.3 Ahafo Modeling Assumptions

We assume a 20-year mine life, as that is what the International Finance Corporation, a financier, expected in 2006 (Engineering & Mining Journal, 2006). A production rate of 500,000 oz/year is used based on the site’s plant capacity and Newmont’s predictions (Mitchell and Jorgensen, 2007; Newmont, 2009). The level of employment is based on the 2005 ratio of production-to-employment for a similar operation: the Obuasi gold mine, approximately 150km southwest of the Ahafo mine (Roe and Samuel, 2007).

The $492/oz total production cost comes from Newmont’s 2007 annual report (Newmont, 2008b). The mine’s revenue is 500,000 oz/year multiplied by the expected world gold price. Since we model the future payments in real terms (2008 dollars), we do not adjust either the price or the cost up; our basic assumption is that the net profit will increase at the rate of inflation. As a reality check, gold price data from Bloomberg include a predicted price per ounce of gold for 2008-2011; the price’s average growth rate for this period (2.8%) is close enough to the inflation rate that we use a constant price assumption. The standard deviation of yearly gold prices for 30 years from 1978 to 2008 ($261.21 2008 USD) was calculated from World Gold Council data (World Gold Council, 2017). This is used to create a 2 standard deviation-wide band centered around our gold price predictions, providing us with low, medium and high gold price estimates for sensitivity analysis.

Each direct job with Newmont is assumed to provide $2400 per year, 3.5 times the official minimum wage, as this is the average ratio in lower-middle income countries for similar mining projects (World Business Council for Sustainable Development, 2011; Ghana Statistical Service, 2008; Roe and Samuel, 2007; World Gold Council, 2015). The outside option level of income is calculated as the 2005 mean of per capita income in the Brong-Ahafo region as reported by the Ghana Living Standards Survey, scaled up to its 2008 level by Ghana’s GDP per capita growth from 2005-2007; the 2008 figure comes to $466.75/year (Ghana Statistical Service, 2008; The World Bank, 2017). Each income level is assumed to increase by the average real World Bank GDP/capita growth rate for Ghana from 1997 to 2007.

The BAU proportion of Ahafo mining jobs going to local community members is assumed to be 25% based on a 2008 environmental impact statement for a Newmont Ahafo mine expansion (Newmont, 2008a). The percentage of jobs going to locals attributable to the BSA is set at 35% for 9 years after 2006, and increases to 50% in 2016 (The Agreement Forum, 2008b).

We model the potential size of local procurement to get an idea about how much a realistic provision could have increased the level of total community benefits. In general, detailed local content expenditure data are unavailable. Our industry contacts informed us that BSAs usually target expenditures on services, including energy purchases. This is due to the limited capacity of most mine host communities to provide other types of mining inputs.

According to one industry contact, in a developing country, services typically make up 20%-25% of a large mine's total expenditures, and the local content expenditure target is usually set at 5%-10% of the services expenditures. This leaves us with a proportion of total expenditures going to local sources ranging from 1% to 2.5%. These targets are typically set at 3 times the expected BAU level of local procurement. We use the range of BAU (.3%-.833% of total expenditures) and BSA-induced (1%-2.5% of total expenditures) local procurement estimates. The actual benefits are the level of profits and wages or "economic value added" (EVA) of contracts. We scale the estimates of contractor income by .536 based on the Ghana Industrial Census Brong-Ahafo manufacturing firm EVA (Ghana Statistical Service, 2006). We assume that local firms are 100% owned and staffed by locals, consistent with our interviews. We also scale the value of contracts by the ratio of the difference between BAU and BSA jobs income to the BSA jobs income to account for the opportunity cost of the contractors.

Mine profits are calculated as the 500,000 oz/year production multiplied by the predicted difference between the world gold price and the mine's cost per ounce. Royalty payments to NADEF are thus $500,000 plus 1% of estimated profits in each year.

2.3.4 Ahafo Results

Community benefits in the Ahafo case are reported in Table 2.1. The total discounted life-of-mine community BSA benefit is estimated to be between $59-$92 million, measured in 2008 USD. Total benefits from the jobs category amount to $42 million and payments to NADEF range from $17-$50 million, depending on the price of gold. Estimates of possible contracting benefits range from $12-$28m, depending on the level of local participation achieved. The benefits as a fraction of life-of-mine revenues is 1.08% and could rise to 1.44% when including local contracting at the highest estimated level, for the base gold price scenario. The table reports this percentage for each of the benefit flows, using the base gold price revenues as the denominator. The direction of the results aligns with expectations. Given that the NADEF payments are profit-based, the share going to the Ahafo communities rises with the price of gold. Yet the ratio of the NPV of total benefits to the NPV of total revenue, once jobs are included, falls with gold price since the community is getting employment irrespective of the profitability of the mine (assuming production levels are not changed).

Figure 2.1 graphically shows the discounted path of estimated benefits, based on base gold price predictions, as well as the range of reasonable estimates of potential benefits from contracting.

Table 2.1: NPV of Newmont Ahafo BSA Benefits in 2008 USD (% of Total Discounted Life of Mine Revenue)

Increase in local benefit due to:	
Jobs ($E[J]$)	
\$42 million (0.60%)	Based on 500,000 oz/year
Payments to NADEF ($E[R]$)	
\$17 million (0.34%)	LOW gold price
\$34 million (0.48%)	MED gold price
\$50 million (0.55%)	HIGH gold price
Total BSA Benefits ($E[J] + E[R]$)	
\$59 million (1.18%)	LOW gold price
\$76 million (1.08%)	MED gold price
\$92 million (1.02%)	HIGH gold price
Local Contracting ($E[S]$)	
\$12 million (0.15%)	1% of TX goes to local firms
\$28 million (0.36%)	2.5% of TX goes to local firms

2.3.5 What Has Happened in Ahafo?

The Ahafo BSA's local employment target, which started out at 35% and was supposed to increase to 50%, was never met. This was reflected when the Ahafo agreement was re-negotiated in 2014 and the target was lowered to 24% with the hope that it could be raised to 35% by 2016 (The Agreement Forum, 2014). This has led community members to express disappointment with the employment situation (Boakye et al., 2018). Our model predicts that NADEF would receive \$24m in royalty contributions from 2008 to 2016. This is only a slight over-estimation, as NADEF annual reports indicate \$23m in contributions over the same period, though the gold price that resulted was more than \$200 per once higher than forecast.[4] Our overestimation of royalties was driven by a higher realized cost per ounce to extract the gold. The opportunities for local firms to fulfill contracts are estimated to be quite significant, however we are unable to find reliable data on the actual amount of contracting which has gone to local firms. Anecdotally, we observed many local firms partic-

[4]We consulted NADEF annual reports from 2009 to 2016.

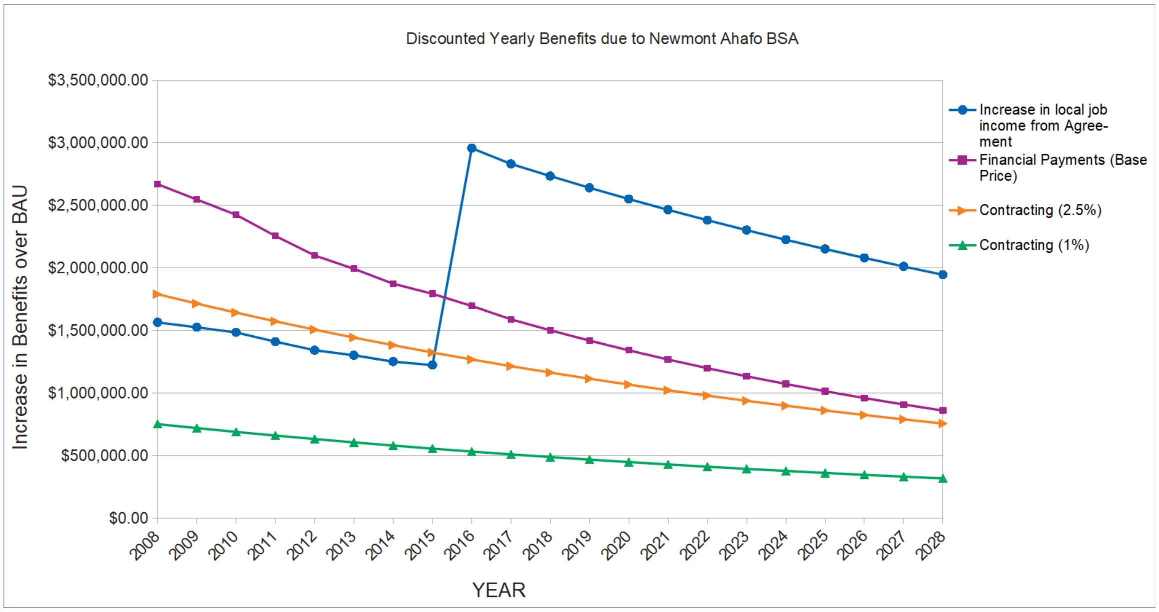


Figure 2.1: Yearly Ahafo BSA Benefits (2008 USD)

ipating in lower-end, labor-intensive parts of the value chain like land reclamation. Finally, conflict has not disappeared as a result of the signed BSA. In 2017, youth demonstrated against Newmont, citing a failure to deliver local jobs and contracts and to protect the environment (Boakye et al., 2018).

2.4 Mary River Mine Analysis

2.4.1 Mary River Background and Context

The second BSA case we analyze is the Inuit impact and benefit agreement (IIBA, in our nomenclature a type of BSA) pertaining to Baffinland Iron Mining Corporation's (BIMC) Mary River iron mine. The mine includes an open-pit, a port on Milne Inlet to the north and a Milne Inlet tote road connecting the mine to the port. Using this production chain, Baffinland mined 3.2 million tons of iron ore in 2016 (Baffinland Iron Mine Corporation, 2017a,b). The BSA was negotiated based on an earlier plan to build a railway from the mine site to a southern port, with an annual production rate of 18 million tons of ore (Qikiqtani Inuit Association and Baffinland Iron Mine Corporation, 2013). In this case we have access to much more detailed reports concerning the mine including a detailed feasibility study.

The Mary River project contains at least nine high-grade iron ore deposits, with mining currently taking place at deposit number one. The ore being removed from the currently producing pit is very high grade, averaging 67 percent iron content (Mining Technology, 2017). The mine is located in the remote Qikiqtani region of the Canadian province of Nunavut, on the northern part of Baffin Island. The island is traditionally used for harvesting wildlife including whales, walruses, seals, polar bears, ducks, and other birds (Indigenous and Northern Affairs Canada, 2012). Due to the remoteness and frigid temperatures, there are relatively few non-mining uses for the land. The entire population of the territory is around 39,000 people, with about 11,000 living on Baffin island, mostly in the capital, Iqaluit (Nunavut Bureau of Statistics, 2017). The unemployment rate in Nunavut is generally higher than in the rest of Canada at around 15% in 2017 (Statistics Canada, 2017a). The closest communities to the mine site are at least 100km away over rough and undeveloped terrain.

Canadian law explicitly requires consultation with Indigenous communities in a meaningful way before carrying out resource exploration or extraction on their lands. This has lead to the creation and implementation of hundreds of impact and benefit, socio-economic, exploration, participation, cooperation and other types of resource extraction agreements in place throughout the country between companies, Indigenous people groups, and the various levels of Canadian government (Natural Resources Canada, 2017, 2013). These BSA-type documents and their negotiations are almost always confidential (Gaul, 2012; Coppes, 2016).

Nunavut contains about 350,000 km^2 of Inuit-owned lands. In the case of Mary River, the land immediately adjacent to the mine site is Inuit owned (Kvaerner, 2008). The Nunavut Land Claims Agreement of 1993 mandates that any organization proposing a major development project on Inuit land must sign an IIBA with the relevant designated Inuit organization, which, for the Qikiqtani region, is the Qikiqtani Inuit Association (QIA). The organization represents almost 15,000 Inuit people spread throughout 13 communities in the Qikiqtani region (Qikiqtani Inuit Association, 2017b). Revenues from the mine provide an opportunity for advancing the development agendas of the QIA communities, which generally lag behind the rest of Canada in terms of indicators such as education rates and per capita income levels (Qikiqtani Inuit Association, 2017b).

2.4.2 Mary River BSA Document

The Mary River BSA sets minimum targets for Inuit employment and establishes preferential contracting practices with local Inuit-owned businesses. It also funds the QIA's implementation of the agreement, creates positions for those responsible for managing, monitoring, and implementing the agreement, and requires that some portion of mine profits be devoted to scholarship programs for youth. It suggests that improvements can be realized through shipping opportunities and employment, maintaining certain workplace conditions, Inuit engagement in the mining project, and monitoring/mitigation of environmental degradation (Qikiqtani Inuit Association and Baffinland Iron Mine Corporation, 2013). The agreement was signed by the two parties on September 6th, 2013.

The BSA creates an executive committee made up of 3 BIMC and 3 QIA representatives, which implements the agreement. The executive committee estimates yearly workforce requirements and Inuit availability to fill positions. It also establishes the minimum Inuit employment goal, a ratio of Inuit person-hours to total person-hours involved in the mining operation, and determines whether it has been met and how it will be met in the future. The agreement also establishes a management committee made up of 4 BIMC and 4 QIA representatives, which is in charge of monitoring the operation and managing the mining project in relation to implementing the BSA (Qikiqtani Inuit Association and Baffinland Iron Mine Corporation, 2013).

The most easily quantifiable benefits are royalty and other payments by Baffinland, Inuit preference for employment, and preference for hiring Inuit-owned firms as contractors. Baffinland is required to make advance payments in the pre-production phases and royalty payments on iron produced during the mine life (Qikiqtani Inuit Association and Baffinland Iron Mine Corporation, 2013). Royalties are 1.19% of the net sales revenue. The QIA is only responsible for the cost of BSA implementation in years where BIMC pays royalties. The maximum implementation costs that the QIA is responsible for is 10% of its yearly royalty payments.

The agreement provides for a category of payments we refer to as "other" financial payments, which includes:

- A business capacity and start-up fund into which BIMC pays $250,000 per year until commercial production begins,
- The Ilagiiktunut Nunalinnullu Pivalliajutisait Kiinaujat (community capacity building) Fund, for which BIMC matches QIA contributions up to $375,000 per year for the first six years that the BSA is in effect, with BIMC increasing its payments by 30% for the first three years to cover the fund's administrative costs,
- An education and training fund to which BIMC contributes $1,000,000 in each of the first two years of the agreement, and a minimum of $25,000 per year thereafter,
- A wildlife compensation fund with an initial contribution of $750,000 from BIMC which is optionally re-funded after its value dips below $50,000. (Qikiqtani Inuit Association and Baffinland Iron Mine Corporation, 2013)

In addition to the publicly-available BSA, three additional agreements were signed, covering land rental, sand and gravel fees, and water compensation respectively.

2.4.3 Mary River Modeling Assumptions

We have ready-made estimates of yearly output, costs, revenues, and profitability in the Mary River feasibility study (Kvaerner, 2008). The Mary River BSA was signed in 2013 and we assume production starts in 2016 to account for the feasibility study's 3-year lag until production.

The negotiators initially left the minimum Inuit employment goal out, to be negotiated separately. In QIA's 2015-2016 annual report, the goal is set at 25% (Qikiqtani Inuit Association, 2016a). We use this as our estimate of the BSA-induced Inuit employment level for Mary River, and assume that this figure represents three times the BAU level of Inuit employment (8.33%).

We assume that those employed by the mine would otherwise earn the median reported income in the five hamlets in North Baffin, Nunavut. The median of those five communities for 2013 is $21,864 per year, and we multiply it by real wage growth in Nunavut (1.12%), which we calculate by subtracting the Iqaluit consumer price index growth from the Nunavut average weekly earnings growth for 2004-2013 as accessed through the Nunavut Bureau of Statistics. The salary going to Inuit workers at the Mary River mine is assumed to be $71,936 per year, based on the average 2011 salary for Nunavut-based employees of the Agnico-Eagle mining company, scaled up by Nunavut's nominal wage growth from 2011 to 2013 (George, 2011; Nunavut Bureau of Statistics, 2017). The number of employees during the operating phase of the mine, 629, comes from the feasibility study (Kvaerner, 2008). For the more costly start-up stage, manpower is not directly specified. The feasibility study tells us the amount of labor expenditure and total expenditure, and we divide this to get a share of capital expenditure (CAPEX) that goes into labor. Then, for each year of capital expenses, we multiply that share by the estimated CAPEX, and divide by the average salary in the operating estimates to get a number of expected jobs. That estimate peaks the year before first production (which we assign to 2015) at 1696 workers. These numbers are not far from the reported 800 people working at the smaller, but expanding, mine in 2017 (Bell, 2017).

With respect to calculating the financial value of the 1.19% royalty, we subtract the operating, capital, and land lease costs from total revenue and multiply that by the royalty rate. Unlike in gold mining, transportation of the iron ore from the mine's port to the buyer is a fairly significant share of the costs. We also exclude shipping costs from the total revenue figure given that QIA did not have any authority over shipping. With respect to QIA's responsibility to contribute towards the implementation budget, we do not subtract out this cost from our benefit calculations but, to be conservative, nor do we add benefits from the reimbursed expenses even though it might be leading to public goods provision and additional salary payments.

We then add the other payments detailed in the previous section. While we do not know the terms of the rental and compensation agreements outside the BSA, the QIA's annual reports list the revenue from land leases, including an expected budget from the Mary River mine. In 2016-17 the estimate was $3.1 million (Qikiqtani Inuit Association, 2016a) and in 2017-18 the estimate was $3.2 million (Qikiqtani Inuit Association, 2017a), though the actual amount received that year was $3.4 million (Qikiqtani Inuit Association, 2018). We conservatively estimate that QIA will receive an annual lease payment of $3 million in 2013 dollars. According to the BSA, all advance and extension payments are calculated with the initial payment year 2013 as the base year, and each payment thereafter is adjusted annually for yearly inflation in the city of Iqaluit (Qikiqtani Inuit Association and Baffinland Iron Mine Corporation, 2013). For modeling purposes, we just keep them unadjusted in 2013 dollars.

We review literature concerning another northern Canadian mine that is party to a BSA, the Diavik diamond mine, to inform our estimates of the local content percentage that Inuit BSA negotiators could have realistically expected. We then use the 3-to-1 rule of thumb for BSA improvements to establish local procurement BAU levels. The Diavik average proportion of total expenditures (TX) going to Indigenous firms is 34% over the 11 year period, which is the figure we use in the Mary River benefit modeling (Rio Tinto, 2014). The Diavik BSA also gives us a categorical breakdown of the types of contracts and the proportion of spending devoted to each category. We assume that the Mary River procurement follows the same pattern when calculating the EVA attributable to procurement. To end up at an estimate of the procurement EVA we follow the calculation laid out in equation 2.4.

For the “outsourced labor” half of local Inuit procurement we assume that of contracts for laborers, 10% of the contract value is profits to local Inuit business owners and 90% is wages paid to employees (counted in our jobs estimates) so we assume that the outsourced labor contracts have a relevant EVA of 10%. For the remainder of the contract category types, we use the average Canadian manufacturing EVA of 35% (Statistics Canada, 2017b). We scale procurement EVA by 51%, based on the minimum level of Inuit ownership needed to qualify as an Inuit firm (Qikiqtani Inuit Association and Baffinland Iron Mine Corporation, 2013). This results in Inuit firm procurement equal to 3.9% of TX. Once again, we use the 3-to-1 rule for establishing a BAU scenario, giving us a counterfactual level of Inuit procurement of 1.3% of TX. As in Ahafo, we scale the value of contracts by the ratio of the mining jobs benefit (over the mining employee’s outside option) to the value of mining jobs in order to account for the opportunity cost of contractors.

2.4.4 Mary River Results

We report the Mary River results in Table 2.2. The discounted values of the jobs, royalties, other payments, and contracting categories are estimated to be \$122m, \$212m, \$56m, and \$32m respectively, using the base price estimate. This leaves us with total community benefits of \$422 million for the life of the mine. We estimate the ratio of total benefits to life-of-mine revenues, net of shipping costs, to be 2.10%. Given that the royalty is based on sales rather than profits, we do not see a significant change in the community’s share of revenues when prices rise or fall, however the overall share correlates inversely to ore prices given that employment and contract opportunities are not sensitive to prices or profits in our simplified model.

Figure 2.2 graphically shows our estimates of yearly discounted community benefits. There is a hump in the benefits from subcontracting and jobs that coincides with the capital expenditure stage, and an initial spike in royalties from the up-front payments guaranteed in the agreement.

Table 2.2: NPV of Baffinland Mary River BSA benefits in 2016 CAD (% of total discounted life-of-mine production revenue)

Increase in local benefit due to:	
Jobs ($E[J]$)	
\$122 million (0.61%)	
Royalty Payments to QIA ($E[R]$)	
\$119 million (1.06%)	LOW ore price
\$212 million (1.06%)	MED ore price
\$307 million (1.06%)	HIGH ore price
Other Financial Payments to QIA ($OTHER$)	
\$56 million (0.28%)	
Local Contracting ($E[S]$)	
\$32 million (0.16%)	3.9% of TX goes to local Inuit firms
Total BSA Benefits ($E[J] + E[R] + E[S] + OTHER$)	
\$329 million (2.93%)	LOW ore price
\$422 million (2.10%)	MED ore price
\$517 million (1.79%)	HIGH ore price

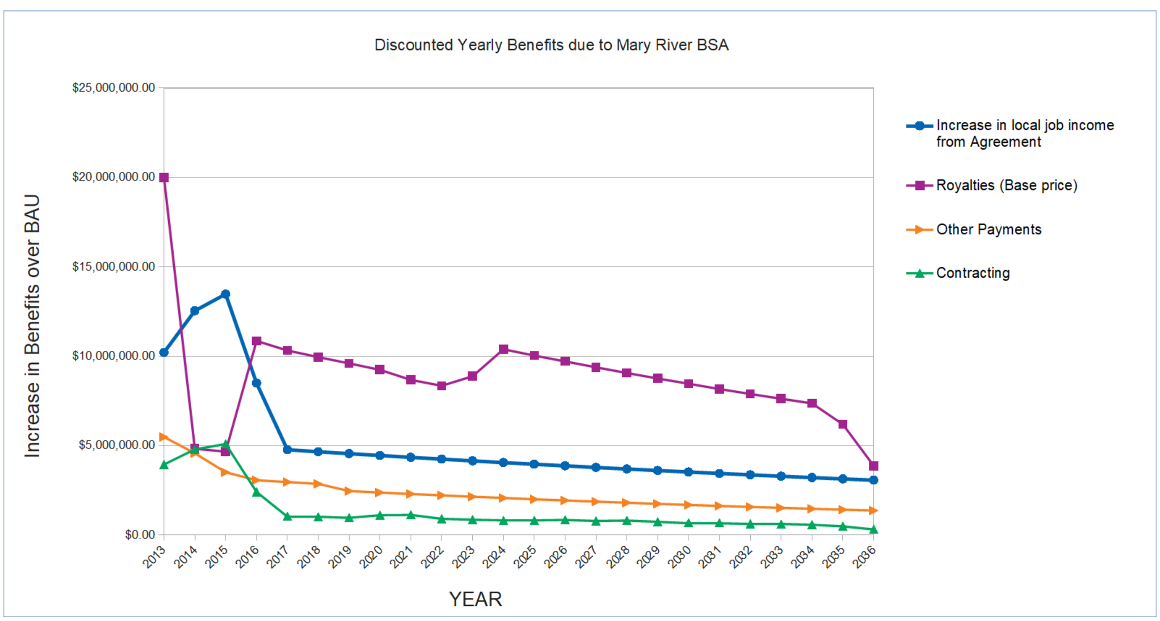


Figure 2.2: Yearly Mary River BSA Benefits (2016 CAD)

2.4.5 What Has Happened in Mary River?

Following the signing of the BSA in 2013, Baffinland went forward with a scaled-down plan to utilize the tote road through to the northern port, and mine just 3.2 million tons per year. Iron ore prices had fallen by more than half in the two years following the signing of the agreement, leading the company to choose a production plan that required less capital up front. Meanwhile, the QIA built up its capacity to manage the implementation of the BSA, including putting together a revenue management strategy that set up a "legacy fund" and a rule, intended to preserve the organization's revenue from exhaustible resources for future generations, that just 4% of the principal be spent on programs (Qikiqtani Inuit Association, 2016b). As of October 2018, the fund held $42 million (Edgar, 2018).

Baffinland and the contractors did not meet the employment target of 25%; by 2017 the proportion of employment going to Inuit workers was only 13% (Brown, 2018). In 2018, alongside a proposed expansion of the mine output to 6 million tons per year, the BSA was renegotiated. In the new agreement, Baffinland committed to certain levels of expenditures on its own side to meet the employment goals through Inuit training, work readiness programs, recruiting, and career planning (Brown, 2018).

2.5 Discussion and Conclusion

Using a net present value methodology, we quantify the derived benefits of two BSAs using the most reasonable parameter estimates available. In so doing, we attempt to bring a similar level of quantitative rigor that has characterized the fiscal modeling of mineral development agreements or production-sharing agreements signed between natural resource companies and national governments for many decades (Smith and Wells, 1975). Of course, it is unknown whether these two cases are representative of the confidential agreements that are more typical of BSAs, yet with the text of their agreements public, they nonetheless serve as a sort of benchmark to communities negotiating BSAs. The estimated total benefits from signing the Ahafo and Mary River BSAs are 1.08% and 2.10% of estimated life-of-mine revenues respectively. To our knowledge, these are the first attempts to quantify the level of benefits promised to a community through a BSA.

Through their comprehensive nature, modern BSAs promise a suite of benefits with differing yardsticks and tactics to ensure benefit delivery across each BSA. One valuable contribution of our analysis is insight into the fact that actual outcomes such as local community development or employment can differ substantially from the goals set out in the relevant BSA. This is important for BSA negotiators to keep in mind when setting relevant targets. By quantifying the expected benefits from each of financial transfers, jobs, and contracting, the exercise allows us to estimate the relative performance of each for the two mine sites. Using our base estimate for the price of gold, we find the largest benefit in the Ahafo case to be jobs for locals. In the Mary River case, the largest benefit in the base iron price scenario is estimated to be that from financial payments—mostly royalty and land rent—with the benefit from contracting falling behind jobs. The exercise has value to the wider ambition in mining and sustainability to begin to value non-fiscal benefits so that they can be understood alongside the more easily-quantified tax revenues (Woodroffe and Grice, 2019).

Comparing across the two mines, we note that the share of benefits coming from the financial contributions in Ahafo are increasing in the price of the commodity, whereas in Mary River, they are constant. The profit-based royalty in Ahafo means the community shares more in the upside, whereas the revenue-based royalty in Mary River combined with up-front payments and land rental means that the community is more protected if the project does not progress, or if prices are low.

One way to view these estimates is that they represent the level of benefits that the mining company must share in order to prevent the community from fighting the mine. The larger share of total revenue that we find going towards the Mary River communities may be due to the relatively higher bargaining power of the Nunavut communities, stemming from the mining company's duty to consult the Inuit and their own comprehensive land claim agreement. Indeed, at one point when the QIA felt that Baffinland was not honoring the agreement they took the company to arbitration and won a $7.3 million award (Strong, 2017). Since the impact of the Ahafo mine is likely to be more immediately felt by the surrounding communities than the more remote Mary River mine, it would appear from this comparative study that, at first glance, property rights trump mine impacts in determining a community's ability to win benefits.

We note that this modeling exercise has a number of important limitations. One, it has only quantified three of the benefit streams (financial payments, jobs created, and contracting opportunities) and none of the impact mitigation measures. This could unintentionally elevate their importance, whereas perhaps for a community the most important benefit is environmental or cultural protection. Our view is that some harder-to-quantify benefit streams (or impact mitigation measures) might be more meaningfully considered outside of a formal quantification. Two, the exercise is based on the relative value of the BSA to no BSA, but does not tackle the value of a project going forward relative to not going forward. This is a subtle difference, and community leaders and negotiators need to pay attention to both concepts (to the extent they have control over the latter) while being clear what the exercise can and cannot do. Three, it is based on forward projections which by definition can only be estimated. Whereas investment decisions are disciplined by the threat of financial loss, negotiation outcomes in a BSA might face less accountability, particularly if the agreement is confidential. Thus if this exercise is done in a practical situation, it would need appropriate oversight and informed debate, lest benefits be overstated for political purposes. Four, we do not model the different costs to the firm of providing each BSA-mandated benefit stream, which can make it seem like they are all equivalently costly for firms. However, one can imagine that it might be less costly for firms to provide benefits from direct employment to local communities than paying the equivalent directly to the community. As described by Gunton, modeling costs would be a necessary exercise for a firm intent on performing an informed cost-benefit analysis of signing a potential BSA (Gunton, 2020). Another obvious limitation is that different market conditions and implementation efforts may result in wildly different realizations of benefits. This limitation can be mitigated with scenario analysis and monitoring, which we discuss below.

Another limitation of our research is that we do not model any costs of signing a BSA. There could be time costs as well as governance and administration costs associated with abiding by a BSA, as well as the potential cost of reducing the ability of communities to try to stop the project. Another set of costs we have not analyzed are those associated with mine closure and environmental remediation as they are not contained in either BSA. Further, we are unable to determine the distribution of BSA benefits, particularly ex ante. However, we are able to measure the shares going to workers, contractors, governments, and development funds.

With figures running into the tens and hundreds of millions, the total life-of-mine benefits numbers may appear substantial, however we wish to put them in perspective. In the Ahafo case, the population of the 10 mine catchment towns according to the 2010 census, 48,504 people, would receive a total life of mine benefit of about $1,500 USD per capita in net present value (Ghana Statistical Service, 2014a,b). In the Mary River case, the 15,000 Inuit represented by the QIA would only see about $28,000 CAD per capita (Statistics Canada, 2017c). While these figures are significant, they are hardly transformational absent a broader economic and political awakening.

This exercise has policy implications for negotiations, monitoring, and implementation. On the negotiation side, communities may not end up with their full wish list, particularly on marginal projects or those occurring during weak periods in the commodity price cycle. Reasonable estimates of the value of BSA provisions will allow negotiators to make informed decisions about fighting for certain provisions over others. For monitoring, the explicit breakdown of our valuation calculation equations in section two can provide community leaders an idea of which parameters in their BSAs to pay attention to. Having numerical expectations to reference would also make the process of monitoring BSA performance more straightforward as the benefits observed could be compared to the community's expectations. Regarding implementation, having estimates of the level of benefits each year can help to shape reasonable expectations of BSA and company performance. This could lead to lower levels of conflict between the parties to a BSA.

Acknowledgments

We are grateful to the Qikiqtani Inuit Association for sharing their time and insights with us. We thank the community members and other stakeholders of the Ahafo mine area for spending the time to speak with us on related research. Stephen Williamson Bathory, Ben Bradshaw, Sam Szoke Burke, Andy Hira, Sean Markey, Mark Moore, Lisa Sachs, and Aidan Vining provided helpful feedback on earlier drafts, and we thank seminar participants at the Columbia Center for Sustainable Investment, Simon Fraser University's Faculty of the Environment, and the Sustainable Development in the Minerals Industry conference for helpful comments and suggestions. All remaining errors are ours alone. Werker thanks the Social Sciences and Humanities Research Council of Canada for generous funding.

Chapter 3

Is the Conventional Wisdom about Resource Taxation Correct? Some Surprising Results from Transparency Reporting.

3.1 Introduction

Multinational resource extraction companies search the world for natural resources to exploit for profit. Resource extraction such as that pertaining to gold mining, which we focus on in this paper, is different from most other investments because it is highly location-dependent. One has to go where the resource wealth is in order to exploit it. Along with deciding where to invest based on the geography of resources, companies take into account the other costs of doing business, such as the reliability of host country governments to commit to fiscal and legislative terms for resource extraction, and the ease of negotiating with local communities.

Gold mining is a large industry taking place in countries all over the world. The industry can provide direct jobs for individuals, contracting opportunities for local companies, funds to power development projects in developing countries, and a host of other potential benefits. The presence of mining can also have deleterious effects on the local environment and economy. For example, the livelihoods of farmers and fishermen can be destroyed by pollution or appropriation of useful land, and societal problems can manifest themselves due to the economic and social changes that gold mining can bring to a community (Hill, 2016). These forces interact in different ways depending on the local natural, economic, social, fiscal, and regulatory environments. Decisions of where to engage in gold mining have economic and environmental implications for communities, mine host country government revenues, and economic development trajectories of poor countries. It is crucial to understand the characteristics of mining operations worldwide to attempt to predict mining outcomes in the future. With millions potentially affected by mining, the implications of this analysis are significant to many. In this paper, we seek to measure how certain characteristics of gold mining operations, and country level variables, affect the the ratio of total payments from a mining company to a mine-host country government to the net revenue generated by that mining project. We refer to this ratio as the government's "take."

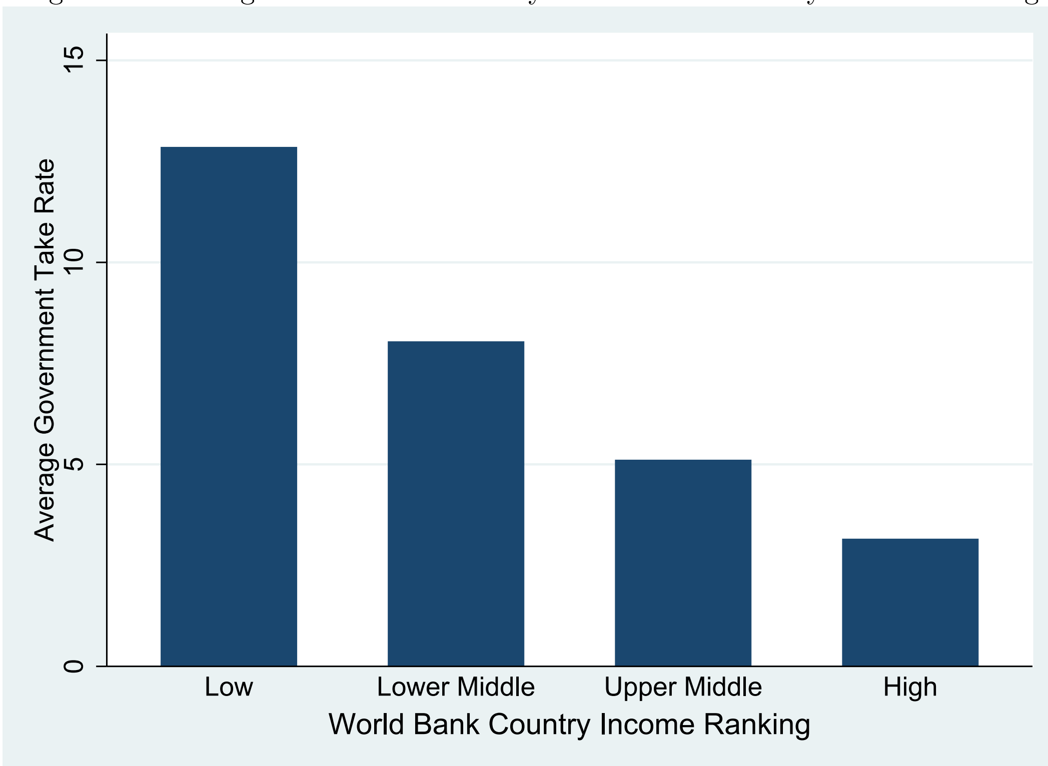
Bell et al. (2008) find, in an empirical analysis of gold mines around the world, that the sale price of gold mining operations, a measure of their perceived profitability, is increasing in the size and grade of reserves, while decreasing in the likely capital and operating costs and country risk (Bell, 2008). The likelihood that a government will change its policies and have a negative impact on foreign investors is referred to as political risk (Beers, 2019). This, along with the societal appetite for and perceptions of resource extraction, as well as the country and mine-specific costs of extraction helps determine whether or not a company decides to invest in a particular project. Based on standard investment theory, the more risky an international investment is to potential investors, the higher the potential return must be in order to attract interest in the investment.

In many countries the government requires the public disclosure of extractives payments between companies and the government by law. This can come through mandatory corporate disclosure documents from mining companies traded on stock exchanges, such as those in the EU, UK, Norway, or Canada, or through voluntary disclosure documents inspired by international organizations like the The Extractive Industries Transparency Initiative (EITI) and Publish What You Pay (PWYP) (Hubert, 2016). There is significant reporting on extractives operations due to legal requirements and voluntary disclosures encouraged and required by these types of organizations. The Natural Resources Governance Institute (NRGI) digitally scrapes all types of the disclosure documents for payment data and aggregates the data on their website for use by researchers (Natural Resource Governance Institute, 2019).

We match these payment data to descriptive data on gold mining projects from a Thompson Reuters Eikon data terminal, normally used by financial market investors in many sectors including mining. This allows us to calculate the government's take of each mining project and to control for features of each mining asset in our data analysis.

An initial look at the data reveals a surprising pattern. In contrast to the conventional wisdom that riskier (and usually poorer) countries must compensate investors with lower take rates, countries which have the lowest World Bank country income rating have the highest government take on average, shown in figure 3.1. The average take decreases as the World Bank income rating increases, with the highest income countries having the lowest average government take. Of course, this may simply be due to the fact that the mining projects active in the developing world are geologically superior, thus justifying the higher takes.

Figure 3.1: Average Government Take by World Bank Country Income Ranking



Notes: This figure shows the average government take rate of mining operations by World Bank country income ranking in our sample.

In an attempt to explain the surprising results, we generate a simple theoretical model to help structure our analysis and provide predictions of the effects of theoretically informed variables of interest on the government take. Our model is a constrained optimization problem: a representative firm maximizes profits of its mine, and a representative mine-host country government maximizes tax revenue by setting the government take. The initial basic model incorporates variables that come from standard investment theory. This basic model does not incorporate ideas such as the effects that political economy could have on the take. In order to analyze those relationships we extend the model to include political economy variables as potential determinants of the government take.

We use OLS regression analysis to test the model's predictions, using the government payment and gold mining datasets, supplemented with standard cross-country data. While mine-level variables on the richness of the deposit align with the model's predictions, the regression coefficients on country risk premium and local development requirements in fact go in the opposite direction. That is, riskier countries and those where there is a greater responsibility to compensate local communities have higher government take. This disagreement led us to seek better explanations for the patterns we see in the data, and to extend the model.

Our model extension incorporates political economy surrounding mining and how that affects government take. A persistent and pervasive difficulty faced by poor but natural resource-rich nations is the looting of their natural resource wealth through corporations legally and illegally avoiding paying taxes, as well as outright theft. Corruption in the mining sector often includes “grease payments,” payments to government officials in order to facilitate them performing their legal duties, as well as outright bribes of such officials (Marshall, 2001). In Africa alone, unpaid taxes amount to about $61 billion USD a year, in addition to the theft of around $29 billion USD per year in mineral wealth (Dearden, 2017). Stories like that of the former president of the Democratic Republic of Congo are all too common. President Kabila oversaw the transfer of $5 billion USD in state assets to private firms, and was being given at least $4 million USD in cash each week from mining companies in the country (Thomas, 2015).

Another force acting on and influencing governments is the power of lobbying such as that coming from citizens, and more importantly coming from the mining sector. In mining-heavy countries such as Canada and Australia, the mining sector is often heavily engaged in lobbying. In Queensland, Australia, mining lobbyists accounted for the largest share of lobbyists making contact with the state government from 2013 to 2018 (Knaus, 2019). A Canadian Centre for Policy Alternatives report finds that throughout both a conservative and liberal government’s terms, extractives industry lobbyists were effective in driving federal policy in line with the desires of the industry (Graham et al., 2019). Staple Theory is the idea that Canada’s economy has developed based on exporting “staple” natural resources, usually in their unrefined state, and that staple industries can capture the government through lobbying influence and financial contributions (Gunton, 2014).

The model extension incorporates four variables that measure the government’s appetite for unofficial side payments vis-a-vis the official taxes and fees. The regression coefficient on mineral rent dependence matches our theoretical model’s positive prediction and the lobbying influence coefficient matches the model’s negative prediction. Corruption has a surprising positive coefficient and goes in the opposite direction as the theoretical model, until we control for government effectiveness, which flips the sign on corruption to be in line with our theoretical prediction. These results suggests that countries with higher levels of dependence on mineral rents have higher takes, and that countries where lobbyists have more influence and countries which are more corrupt (when controlling for government effectiveness) have lower official government take rates. The regression coefficient on government effectiveness (a measure of a government’s ability to effectively generate and spend government revenues) surprisingly does not match our theoretical prediction and suggests that less effective governments on average generate higher levels of government take. The results of our two sets of regressions (basic core model, and the extended model) suggests to us that the political economy of countries could be more important than the underlying economics of mineral assets for predicting the government take of gold mines.

The rest of this paper is structured as follows: section two lays out our theoretical model of the determinants of government take. Section three describes our data in detail and how the variables enter our model. Section four contains our regression specifications, the results of our regressions, and robustness checks. Section five includes a discussion of our results and our conclusions.

3.2 Modeling Government Take

We have created a basic theoretical model and an extension that allow us to predict the relationships between our variables of interest and the government take. Our model is based on the theory of the firm which states that firms maximize profits through minimizing costs and maximizing revenues (Murphy, 2019).

3.2.1 Basic Investment Theory Model

The basic model includes one country government and one mining company. It incorporates the per unit revenue (R_t) and costs (C_t), the quantity of gold units produced (Q_t), and the life-span of a mine (T). The risk-free interest rate (r) and the country risk premium (δ) are used in discounting. The required return on investment in order for it to be undertaken is represented by $\gamma(\cdot)$. The government's take is τ. The net present value to a mining company of a mine is expressed as:

$$V(\cdot) = \sum_{t=0}^{T} \frac{(R_t - C_t)Q_t}{(1 + r + \delta)^t}$$

Discounted expected lifetime firm profits are defined as:

$$\pi = (1 - \tau) * V(\cdot)$$

$$\pi = \sum_{t=0}^{T} \frac{(1 - \tau)(R_t - C_t)Q_t}{(1 + r + \delta)^t} \tag{3.1}$$

The government maximizes tax revenues while leaving the company enough profit to make the investment worthwhile.

$$\max_{\tau}[\tau V(\cdot)] \tag{3.2}$$

Subject to:

$$\pi \geq \gamma(\cdot)$$

$$(1-\tau) * V(\cdot) \geq \gamma(\cdot) > 0$$

The government will set τ as high as possible, while just meeting the firm's participation constraint.

$$(1-\tau) * V(\cdot) = \gamma(\cdot)$$

Rearranging the constraint to isolate τ gives us:

$$\tau^* = 1 - \frac{\gamma(\cdot)}{V(\cdot)} \tag{3.3}$$

We use the constraint, equation 3.3, to perform comparative statics and give us predictions of the direction of the effect on τ^* of each independent variable of interest.

Our basic model based on investment theory assumes the government is a passive actor. However, governments have objectives other than simply maximizing the take. In order to analyze political economy effects on the optimal take, we extend the basic investment theory model.

3.2.2 Political Economy-Enhanced Model

We want to be able to analyze the impact of the underlying atmosphere around, or preferences for, unofficial side-payments between mining companies and governments. In our model extension, the government's utility function now includes official payments as well as side payments, and different governments will have differing preferences for side payments. Side payments can include illicit corruption payments, as well as political contributions, which may be more common in more corrupt or heavily lobbied countries. On the other hand, some governments may be especially wary of non-official payments. Governments which depend heavily on resource revenues to finance their spending, as well as those with especially effective public sectors, may have an especially high preference for receiving payments through official channels.

The government maximizes a utility function which includes official payments and side payments (political contributions, bribes, etc.), with ϕ being a measure of the preference for a lump sum side payment $S(\phi)$. We assume that $S(\phi)$ is increasing in ϕ.

$$\max_{\tau} [\tau V(\cdot) + S(\phi)] \tag{3.4}$$

The constraint in this extension takes the form:

$$(1-\tau)V(\cdot) - S(\phi) \geq \gamma(\cdot) > 0$$

Setting the two sides equal to one another and rearranging to isolate τ^* as before gives us:

$$\tau^* = 1 - \frac{\gamma(\cdot) + S(\phi)}{V(\cdot)} \tag{3.5}$$

Taking the derivative of τ^* with respect to our variables of interest gives us predictions of the direction of the effects of variables on the government take. Our independent variables are explicitly included in the function $V(\cdot)$, and/or assumed to be arguments of the functions $\gamma(\cdot)$ and $S(\phi)$.

3.3 Data Used and Regression Specifications

We have created a unique dataset covering gold mines around the world and the government take from each mine by combining two key mining-centered datasets that have never been combined before: payment data between mining companies and host governments, and mine asset characteristics. Our dataset does not include all of the variables that characterize our theoretical model. However, it does include a number of variables that serve as strong proxies for the theoretical variables and concepts in the model. Each observation represents a distinct mining operation in a given year. Our observations include data from 2015 to 2017, and in our sample we have many firms working in multiple countries.

We use three different types of data in our analysis: data on payments between mining companies and country governments; data describing the characteristics of the gold mines; and country-level data taken from the World Bank and other sources.

3.3.1 Payments Between Mining Companies and Host Governments

The payment data used is relatively new data from the NRGI on royalty, tax and other payments between mining companies and national governments. This data is made publicly available through the NRGI's ResourceProjects.org website (Natural Resource Governance Institute, 2019). Transparency in taxation systems is desirable so the government and the public can know that they are getting a fair share of the wealth generated by extractive industries (Dobbs et al., 2013). Evidence of the importance of transparency and good governance surrounding these industries comes in the form of the creation of organizations such as the EITI and PWYP, and their mandating/encouragement of the disclosure of extractives sector payment information publicly. The EITI works in 52 resource producing countries around the world with the objective of promoting the "open and accountable management of oil, gas and mineral resources." The standard requires that signatory countries publicly disclose information about the total value chain of their extractives industries and so are required to disclose, in official EITI reports, payments between the government and the mining companies working within their borders (EITI International Secretariat, 2019). PWYP is a UK-based charity that has successfully encouraged greater transparency in extractives payment reporting around the world. The organization complements the EITI and works in more than 50 resource-producing countries encouraging payment disclosures for each extractives project within their borders. In more than 30 countries PWYP has contributed to legislation having been passed requiring the public disclosure of extractives payments (Publish What You Pay, 2020). These initiatives in large part are designed to reduce the possibility for corruption and the clandestine expropriation of mining revenues through bribes and side-payments (Aaronson, 2011). It is due to the payment reporting spurred on in each country that we have access to the rich extractives industry payment data. The NRGI dataset includes payments in the form of taxes, royalties, fees, dividends, bonuses, infrastructure payments, production entitlements, and 'other' payments made (in USD) between mining companies and mine-host country governments (Natural Resource Governance Institute, 2019).

3.3.2 Gold Mining Projects

Our mine characteristics dataset is rich data on 275 gold mining projects around the world gathered from a Thompson Reuters Eikon data terminal. The data describe most major gold mining operations around the world. This data includes the richness of each mining asset, the reserves in the ground, and the net revenue of the mine, among other characteristics (Thompson Reuters Eikon, 2019). We log the measure of mine richness (grams of recoverable gold per tonne of dirt moved) and mine reserves (kilotons of gold in the ground) in our analysis. As some of the mines in our sample produce copper, lead, and zinc in addition to gold, we use the price ratios between gold and the other metals to come up with the gold-equivalence between each other metal and gold. We add the gold equivalence of all produced metals together for each mine-year to come up with an overall measure of a mine's richness. Our dependent variable is the ratio of all payments made to the mine-host country to the mining rents (gross revenue minus production costs) generated by a mine[1] (Natural Resource Governance Institute, 2019). This gold mining data, despite its small number of observations, presents a rich empirical setting to test our model, as it includes the underlying mine and financial data to calculate mining rents and measure the quality of mine site assets.

[1] In table 3.1, we see that the minimum government take in our sample is negative. This outlier mine is the Grasberg gold and copper mine in Indonesia, one of the largest gold and copper mines in the world. The popular attitude that local communities have not been receiving a fair share of the benefits, along with a rise in resource nationalism in general, led the Indonesian government to acquire a majority equity share in the mine in 2018 (Wexler, 2018; Otto and Sentana, 2018).

3.3.3 Country-Year Level Variables

We use the variable "government effectiveness" from the World Bank's Worldwide Governance Indicators (WGI) dataset which includes estimates of the strength of different aspects of governance (Kaufmann and Kraay, 2019). Government effectiveness takes values from -2.5 to 2.5, with larger values corresponding to better governance (normally associated with more developed countries) (Kaufmann and Kraay, 2019). Government effectiveness co-varies closely with other WGI measures of government capacity such as voice and accountability, political stability and absence of violence, regulatory quality, rule of law, and control of corruption (Kaufmann and Kraay, 2019). We use government effectiveness as a measure of overall government capacity to tax and spend effectively. [2]

As the measure of each country's dependence on mineral rents, we use the percentage of GDP made up of mineral rents, taken from the World Bank's World Development Indicators dataset (World Bank, 2019).

We use an NYU Stern Business School measure of country risk premium, a percentage point increase in the risk-free interest rate, as a measure of the relative investment risks of mining in each country (Damodaran, 2019).

We use data from a Dupuy 2014 paper to make a dummy variable for whether a country's mining laws include a requirement for local economic development of the communities affected by mining operations (Dupuy, 2014). It is a common perception that mining firms pay attention to the financial, bureaucratic, and time costs of abiding by local development requirements in order to minimize costs and maximize profits. Mining firms operating in the 21st century seek to attain a "social license" to operate that is facilitated by abiding by local development laws (Grice, 2018). This idea is buttressed by evidence showing that mining companies are valued more by investors when the mining company commits to providing benefits to mine-host communities (Henisz et al., 2014). Benefits flowing from mining operations to the mine-host communities can be substantial, with previous research finding that the benefits can amount to up to two percent of total life-of-mine revenues (Adebayo and Werker, Forthcoming).

We construct a proxy for the lobbying influence that the mining sector may have on a host country's government by calculating the percent of the 2017 market capitalization of the world's 50 largest mining companies that is headquartered in each country (Els, 2017).

We use Transparency International's yearly corruption perceptions index (CPI), a survey-based measure of perceived corruption within each country, as a measure of corruption facing potential mining investors (Transparency International, 2018). The CPI takes values from zero to 100, with corruption decreasing as the CPI increases. We subtract each CPI value

[2] Government effectiveness also measures the government's ability to credibly keep order within the mine-host country, protect projects from expropriation by government officials and criminals, as well as from protests and work stoppages caused by civil unrest.

from 100 so that an increase in the variable corresponds to increased corruption, for ease of interpreting our results.

3.3.4 Linking the Dataset to the Theoretical Model

We choose variables from the dataset to correspond to the variables incorporated in our theoretical model. We show summary statistics of the variables of interest we use in our analysis in table 3.1, as well as correlations between our empirical variables in table A.1 in appendix A.1.

Basic Model Variables

The richness of a mine is negatively correlated with per-unit costs C_t, and positively correlated with the quantity of gold produced Q_t, both of which increase the value of a mine, $V(\cdot)$. Taking the derivative of equation 3.3 with respect to richness, our theoretical model predicts an increase in the tax rate τ^* due to an increase in the richness of a mine.

In our model the level of reserves, kilotons of gold at a certain mine site, is assumed to increase the quantity of gold produced in each year Q_t. Greater reserves should also increase the life of the mine T, which decreases the per-unit cost of mining C_t, as capital expenditures can be spread out over more years of operation. These effects increase, ceteris paribus, the relative net present value of a mine $V(\cdot)$, predicting that the tax rate, τ^*, increases with the mine's level of reserves.

Increased political risk in a mine-host country shows up as an increase in δ in our model, thus decreasing the net present value of a mine $V(\cdot)$ (Damodaran, 2019). The increased risk, based on standard investment theory, should cause a potential investor to require a higher minimum return on investment, $\gamma(\cdot)$, in order to go through with opening the mine (Palmer, 1980). The model predicts that the government take decreases as the country risk premium rises, which is in line with basic investment theory.

Local development requirements are predicted to cause an increase in the cost of mining C_t, reducing the value $V(\cdot)$. The local development requirement also creates more red tape for the mining company to deal with, and so should increase the required return, $\gamma(\cdot)$. Our model predicts a negative effect of local development requirements on government take.

Extended Model Variables

Government capacity increasing is associated with lower country risk δ, and so increased mine value, $V(\cdot)$. Increased government effectiveness should be associated with a decrease in $\gamma(\cdot)$, as the decreased risk lowers the required return to investors (Palmer, 1980). We assume that side payments, $S(\phi)$, are negatively related to government effectiveness through the decreased preference for such payments, ϕ. Using the model extension, it predicts that the government take will increase with government effectiveness.

We expect that governments more reliant upon mineral rents for revenues will have a reduced preference ϕ for side payments in order to “not kill the golden goose” through expropriation of mining rents. The model extension predicts that an increase in mineral rent dependence will be associated with an increased government take.

The presence of large mining companies lobbying a country’s government is predicted to have the effect of increasing the supply of political contributions $S(\phi)$ to government officials. We predict also that the presence of more mining company employees voting on mining policy would put downward pressure on the government take. The model predicts unsurprisingly that increased lobbying power in the mining sector will have a downward effect on the government take.

Increased corruption[3] is expected to increase side payments $S(\phi)$. Our model extension predicts that the take rate, τ^*, decreases in the host country government’s level of corruption.

3.4 Results

We use OLS linear regressions to empirically test the predictions of our model. Y_{fit} is our outcome variable, the government take. Each observation is at the firm f, project i, year t level. β_1 is our coefficient on the variable of interest (VOI). In each of our main specifications, the control variables included are mine age, mine age squared, and year fixed effects (FE_t). In a robustness check we include firm fixed effects, and in another we limit the observations to those with government take between zero and 25 percent. We interpret our regression results as correlational rather than causal, as there are likely omitted variables which could not be included, and the limited number of data points limits the power of the regressions. All of our main regressions take the form:

$$Y_{fit} = \beta_0 + \beta_1(VOI)_{fit} + \beta_2(Mine\,Age)_{fit} + \beta_3(Mine\,Age\,Squared)_{fit} + FE_t + \epsilon_{fit} \quad (3.6)$$

Regressions one through four, and seven through ten include only one variable of interest at a time. Regression five in table 3.2 includes the log of reserves, country risk premium, and local development requirement variables. We exclude log of richness due to that variable having limited observations in our dataset. We are left with only 122 of our 194 observations

[3] Our corruption variable is positively correlated with country risk δ, and so the effect of both on the government take will be in the same direction. So, we can use corruption as our variable of interest without including political risk in our analysis. Corruption is associated with an increase in expected costs C_t due to potential work stoppages due to mine-host communities’ perceptions of a lack of fairness in the distribution of mining-derived benefits. The required return on investment, $\gamma(\cdot)$ is also positively related to the CPI because of the increased risk of investing in a country with a more corrupt government. An increase of either C_t or δ has a negative effect on mine value $V(\cdot)$.

in the log of richness regression number one. Regression six in table 3.2 includes all four of our basic model covariates at once. Regression 11 includes government effectiveness, lobbying influence, and corruption. Finally, regression 12 in table 3.3 includes all four of our extended model variables.

Table 3.1: Summary Statistics

Variable	Max	Min	Mean	Standard Deviation
Government Take	26.302	-0.430	5.455	5.611
Mine Age	113	0	18.108	21.315
Mine Age Squared	12769	0	779.902	2195.773
Log Richness (Grams of gold per ton of earth)	6.928	0.662	2.398	0.999
Log Reserves (Kilotons of gold)	14.619	2.463	9.977	2.228
Country Risk Premium	10.410	0	2.994	3.225
Community Development Requirement	1	0	0.392	0.489
Government Effectiveness	1.937	-1.006	0.507	0.910
Mineral Rents/ GDP	24.002	0.074	3.196	5.124
Market Cap of 50 Largest Mining Companies	23.4	0	5.249	5.352
Corruption Perceptions Index	74	11	48.701	21.510
N	194			

The results of our basic model regressions are reported in table 3.2. The coefficient on the richness variable is positive and statistically significant at the 5% level. An increase in richness of one percent is associated with a 1.369 percentage point increase in government take. This seems to suggest that governments with richer assets under their control are better at generating official government revenues. The coefficient on the reserves variable is positive, as expected, but not statistically significant.

Surprisingly, the coefficient on the country risk premium variable is positive and significant at the 1% level. An increase of one percentage point in country risk premium is associated with a .830 percentage point increase in government take. This suggests that in riskier countries, usually located in the developing world, the governments are actually better at generating government revenue from gold mining.[4] The coefficient on the local development requirement variable is positive but not statistically significant.

[4]In unreported regressions, we replace the country risk premium variable with country GDP per capita in table 3.2, and see negative coefficients (higher GDP per capita being correlated with lower take rates on average), which is in line with figure 3.1, and our coefficients on country risk premium.

Table 3.2: Core Model Regression Results

	1	2	3	4	5	6
Log Richness	1.369**					0.995
	(0.648)					(0.716)
Log Reserves		0.326			-0.0230	-0.153
		(0.315)			(0.228)	(0.360)
Country Risk Premium			0.830***		0.889***	0.637**
			(0.230)		(0.242)	(0.238)
Local Devel. Required				0.782	0.178	0.0793
				(2.202)	(1.322)	(1.703)
Observations	122	168	181	183	166	114
Adjusted R^2	0.178	0.074	0.256	0.061	0.297	0.282

Standard errors in parentheses
The control variables suppressed include mine age,
mine age squared, and year dummies.
Standard errors are clustered at the country level.
* $p < 0.10$, ** $p < 0.05$, *** $p < .01$

Regression five in table 3.2 includes the reserves, country risk premium, and local development requirement variables. The coefficient on country risk premium remains of a similar magnitude and statistically significant at the 1% level. When we include all four basic model variables we lose 80 of our observations and none of the coefficients are statistically significant except the coefficient for country risk premium, which remains positive and statistically significant at the 5% level.

While the coefficients on richness and reserves lend support to the applicability of standard investment theory in describing the government take, the coefficients on the other two basic model variables (country risk premium, and local development requirement) do not provide this support, and suggests that there might be a better explanation for the patterns in the data. Standard investment theory would predict that in countries where there is more political risk, or in countries where mining companies are required to provide benefits to local communities, projects should have lower average take rates to incentivize investment. These surprising results align with the results from figure 3.1 in the introduction, and provide evidence that the higher average government take rate observed in riskier jurisdictions is not driven solely by the quality of the underlying mineral asset.

In table 3.3 we test the additional hypotheses suggested by the extended model. Our coefficient on government effectiveness is negative and significant at the 1% level. It shows that for an increase in government effectiveness, we can expect a lower take rate. The data unexpectedly imply that more effective governments generate lower levels of useful revenues from gold mining.

The coefficient on mineral rents as a percent of GDP, a measure of a country's mineral rent dependence, is positive and statistically significant at the 5% level. The coefficient implies that for a one percentage point increase in mineral rents as a percent of GDP, we expect to see a half percentage point increase in the government take, lending support to the hypothesis that governments more dependent on mineral rents may do a better job of generating official government revenues from mining.

The coefficient on the share of the market cap of the largest 50 mining companies headquartered within a country, a measure of the lobbying influence the mining sector has on the government, is negative and significant at the 10% level. A one percentage point increase in our measure of lobbying influence is associated with a .3 percentage point decrease in government take. Governments that likely experience more lobbying from the extractives sector, it appears, generate lower levels of mining-related government revenues.

In regression ten, the coefficient on the corruption perceptions index, an estimate of governmental corruption, is positive and statistically significant at the 10% level. This surprising result suggests that increased levels of corruption is associated with higher levels of government take, despite the possibility of increased side payments. This implies that governments which are more corrupt are actually better at generating useful revenues than less corrupt governments, until we control for government effectiveness, at which time the coefficient on corruption flips to negative, suggesting that less-corrupt governments generate higher levels of government take on average. In regression 12 in table 3.3, we include all four of our extended model variables at once. The coefficients on government effectiveness, lobbying influence, and corruption are negative. The coefficient on mineral rent dependence is positive. All of the coefficients are of the same sign as in the regressions where they enter alone, except for the coefficient on corruption which flips its sign from regression 10 to regressions 11 and 12.

The coefficients on mineral rent dependence and lobbying influence match with our theoretical predictions, while the coefficients on government effectiveness and corruption are the opposite of what our theoretical model predicts, until we control for government effectiveness which flips the sign on corruption to be in line with our theoretical prediction. The agreement between three out of four of the signs of our political economy regression coefficients and their theoretical model counterparts, as well as the fact that the minimum R-squared is higher in our extended model results, leads us to question the ability of the basic investment-theory-based model to fully explain government take, and to suggest that the political economy model extension brings additional insight.

Table 3.3: Extended Model Regression Results

	7	8	9	10	11	12
Gov Effectiveness	-2.204***				-6.146**	-4.786
	(0.722)				(2.492)	(3.380)
Mineral Rents, Percent of GDP		0.503**				0.299
		(0.191)				(0.266)
Lobbying Intensity			-0.300*		-0.0421	-0.0459
			(0.155)		(0.175)	(0.118)
Corruption Perceptions Index				0.0687*	-0.185**	-0.111
				(0.0376)	(0.0822)	(0.117)
Observations	183	109	183	183	183	109
Adjusted R^2	0.171	0.251	0.139	0.119	0.212	0.342

Standard errors in parentheses
The control variables suppressed include mine age, mine age squared, and year dummies.
Standard errors are clustered at the country level.
* $p < 0.10$, ** $p < 0.05$, *** $p < .01$

3.4.1 Robustness

In order to test the robustness of our regression results, we perform the same regression analysis with some changes. We may worry that the results are driven by the selection of firms operating in developed versus developing countries. In the first robustness check we include firm fixed effects in addition to year fixed effects and cluster at the firm level instead of the country level to control for that possibility. The results are similar, with the coefficient on reserves (regression two) and lobbying influence (regressions 11 and 12) switching sign but staying statistically insignificant, and a general reduction in statistical significance. These results are reported in tables A.2 and A.3 in appendix A.2.

A second concern is that the results may be driven by a handful of mines with relatively extreme values for government take. Our second robustness check involves keeping only observations that have a government take rate greater than zero and less than 25 percent, in order to remove the influence of outliers. The results of this robustness check shows that all of the signs of our coefficients do not change, and the magnitudes of the coefficients are very similar to those in the main regression tables. The second robustness check regression results are shown in tables A.4 and A.5 in appendix A.3.

3.5 Discussion and Conclusion

This work is a first step to match data on extractives sector payments with data on mine characteristics, and to ground the analysis of government take from resource projects in economic theory. We create a theoretical model of the determinants of government take from gold mines around the world, and test its predictions using OLS regression analysis. Based on our analysis we find that a standard investment theory model does a poor job explaining government take, and that a clearer picture begins to emerge with a political economy model related to governmental preferences for side payments.

The coefficients describing the physical characteristics of a mine in the basic model match our theoretical predictions, that increased reserves and richness would lead to higher government takes, with the coefficient on reserves not being statistically significant. However the coefficients on country risk premium and local development requirements do not match our predictions. The regression coefficient for country political risk is the opposite of its theoretical prediction, and the coefficient on local development provision is not statistically significant. The discourse around mining investment suggests that we should expect mines in countries with fewer local community obligations and less political risk to have higher take rates. Our predictions of how the red tape of dealing with local communities and political risk of government should affect the take are not borne out in our analysis, suggesting there might be a better way to explain the data.

We do see factors that influence government incentives having a predictive role in explaining our data. Our coefficient on government effectiveness is surprisingly negative, and the coefficient on corruption is surprisingly positive, both different from our theoretical predictions. However, the sign on corruption flips to be negative and statistically significant, in line with our prediction, once we control for government effectiveness. The coefficients on mineral rent dependence and lobbying influence of mining companies match our theoretical predictions and are statistically significant, giving us confidence that our political economy model extension does help in explaining the data.

Taken at face value, these results question the conventional wisdom that poorer, less-developed country governments have lower capacity to, and do a worse job of collecting, government revenue than do those in developed nations. It appears from our first look at the data in figure 3.1 and is borne out in our regression analysis that less developed countries, countries with higher dependence on mineral rents, those with lower shares of top 50 mining companies headquartered in country, and those with lower levels of corruption are actually getting larger shares of mine rents.

This could be the result of developing nations effectively implementing policy guidance that they have absorbed from international organizations like the International Monetary Fund, the World Bank, and the NRGI. It could be possible that, by focusing on government revenue generation and transparency, developing nations have outpaced developed nations in generating fair amounts of government revenue from mining, and we will perhaps see government take in developed nations "catching up" to developing countries in the future. It is also possible that we are witnessing "pockets of effectiveness," where good outcomes only require a small number of bureaucrats who are committed to and effective at public good provision in contexts where effective public goods provision is not the norm, particularly in the developing world (Hickey and Mohan, 2013). This paper adds to the growing number of examples of developing country governments exhibiting high capacity in spite of a commonly held belief of venality and ineffectiveness e.g., (Spray and Werker, 2019).

Most mining in the world is carried out by mining companies based in developed western nations such as Australia, Canada, and the United States. While there are generally legal protections put in place to protect the social, economic, and environmental health of Indigenous people domestically, these protections often do not exist in the other, often developing, countries where mining firms from the western world are extracting resources. Activists have shone a light on the destruction of Indigenous lives and livelihoods, forced displacement, and environmental destruction often wrought by western extractive firms operating abroad (Engler, 2019). Scholars studying the impacts of extractives operations throughout the global south make the point that the developmental goals of communities are regularly not met through increased extractive operation intensity. These projects are also often associated with widespread dissatisfaction with related outcomes (Canel et al., 2010). These negative experiences have led to substantial criticism of the mining sector's corporate behavior. Activists claim that there is a double standard for mining companies, in that they are held to higher standards in developed nations in terms of protecting local populations from the potential downsides of mining and sharing in its benefits. This could help explain why take rates are lower in developed nations, as mining firms must do more for local communities there in a way that is not captured in the simple dummy variable we use to proxy for community development costs.

Take rates are generally low in the mining sector all around the world, when compared to the world average of corporate income tax rates which sits at around 25 percent (Asen, 2019). It may be that the reason for our unexpected findings is that government take does not have a large enough effect on profitability to matter much. That is, government taxes on mining may not be high enough to materially affect the investment decisions of mining companies around the world. Instead, higher costs (labor, capital, etc.) in developed economies not captured in the mine-level data might lead to lower take in developed countries.

Having more voluminous and detailed resource project data would allow future researchers to perform a more rigorous analysis of the determinants of government take in mining. This could also allow for the further testing of the hypotheses in this paper and whether or not these surprising results stand up to further scrutiny with better data. And should these results be found in new datasets, future researchers will need to generate novel theoretical explanations to better understand the relationship between economic development, political risk, and government take from resource projects.

Bibliography

Aaronson, S. A., 2011. Limited partnership: Business, government, civil society, and the public in the extractive industries transparency initiative (eiti). Public Administration and Development 31 (1), 50–63.

Abadie, A., Diamond, A., Hainmueller, J., 2010. Synthetic control methods for comparative case studies: Estimating the effect of california's tobacco control program. Journal of the American statistical Association 105 (490), 493–505.

Abadie, A., Diamond, A., Hainmueller, J., 2011. Synth: An r package for synthetic control methods in comparative case studies.

Abadie, A., Diamond, A., Hainmueller, J., 2015. Comparative politics and the synthetic control method. American Journal of Political Science 59 (2), 495–510.

Abadie, A., Gardeazabal, J., 2003. The economic costs of conflict: A case study of the basque country. The American Economic Review 93 (1), 113–132.

Addy, S., 2012. A cost-benefit analysis of the new alabama immigration law.
URL `http://cber.cba.ua.edu/New%20AL%20Immigration%20Law%20-%20Costs%20and%20Benefits.pdf`

Adebayo, E., Werker, E., Forthcoming. What do communities get from mining projects? valuing benefit-sharing agreements. TBD.

Asen, E., 2019. Corporate tax rates around the world, 2019.
URL `https://taxfoundation.org/publications/corporate-tax-rates-around-the-world/`

Baffinland Iron Mine Corporation, 2017a. Baffinland iron mines 2016 annual report to the Nunavut impact review board.

Baffinland Iron Mine Corporation, 2017b. Baffinland iron mines corporation Mary River project 2016 Qikiqtani inut association (qia) and Nunavut water board (nwb) annual report for operations.

Beers, B., 2019. Top risks for international businesses.
URL `https://www.investopedia.com/ask/answers/06/internationalfinancerisks.asp`

Bell, J., 2017. QIA to push hard for Inuit employment at Mary River.
URL `http://www.nunatsiaqonline.ca/stories/article/65674qia_to_push_hard_on_inuit_employment_at_mary_river/`

Bell, Guj, S., 2008. What are in-situ gold resources worth? an empirical study.

Boakye, B., Szoke-Burke, S., Kuschminder, J., Werker, E., 2018. Implementing the Ahafo benefit agreements: Seeking meaningful community participation at Newmont's Ahafo gold mine in Ghana.

Boardman, A. E., Moore, M. A., Vining, A. R., 2010. The social discount rate for canada based on future growth in consumption. Canadian Public Policy 36 (3), 325–343.

Bohn, S., Lofstrom, M., Raphael, S., 2014. Did the 2007 legal arizona workers act reduce the state's unauthorized immigrant population? Review of Economics and Statistics 96 (2), 258–269.

Brown, B., 2018. Improved Mary River benefits deal will deliver more to Inuit, QIA says. Nunatsiaq News.

Canel, E., Idemudia, U., North, L., 2010. Rethinking extractive industry: Regulation, dispossession, and emerging claims. Canadian Journal of Development Studies/Revue canadienne d'études du développement 30 (1-2), 5–25.

Columbia Center on Sustainable Investment, 2014. Local content, Ghana-mining.
URL http://ccsi.columbia.edu/files/2013/07/Local-Content-Ghana-mining-CCSI-June-2014.pdf

Constable, P., June 2012. Alabama law drives out illegal immigrants but also has unexpected consequences.
URL https://www.washingtonpost.com/local/alabama-law-drives-out-illegal-immigrants-but-also-has-unexpected-consequences/2012/06/17/gJQA3Rm0jV_story.html

Coppes, M., 2016. Inuit impact and benefit agreements (part i): What are they?
URL http://polarconnection.org/inuit-impact-benefits-agreementsi/

Damodaran, A., 2019. Country default spreads and risk premiums.
URL http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

Davis, R., Franks, D. M., 2014. Costs of company-community conflict in the extractive sector. Corporate Social Responsibility Initiative Report. Harvard Kennedy School, Cambridge, USA.

Dearden, N., 2017. Africa is not poor, we are stealing its wealth: It's time to change the way we talk and think about africa. AlJazeera.com 24.

Dobbs, R., Oppenheim, J., Kendall, A., Thompson, F., Bratt, M., van der Marel, F., 2013. Reverse the curse: Maximizing the potential of resource-driven economies. McKinsey Global Institute.

Dorobantu, S., Odziemkowska, K., 2017. Valuing stakeholder governance: Property rights, community mobilization, and firm value. Strategic Management Journal 38 (13), 2682–2703.

Dupuy, K. E., 2014. Community development requirements in mining laws. The Extractive Industries and Society 1 (2), 200–215.

Edgar, C., 2018. QIA's coffers awash in mining revenues. Nunatsiaq News.

EITI International Secretariat, 2019. The eiti standard. the global standard for the good governance of oil, gas and mineral resources.
URL https://eiti.org/standard/overview

Els, F., 2017. Top 50 biggest mining companies.
URL https://www.mining.com/top-50-biggest-mining-companies/

Engineering & Mining Journal, 2006. IFC approves newmont ahafo financing. Engineering & Mining Journal (00958948) 207 (2), 16.
URL http://proxy.lib.sfu.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=20093185&site=bsi-live&scope=site

Engler, Y., 2019. The canadian extractive industry in context.
URL https://stoptheinstitute.ca/concerns/the-canadian-extractive-industry-in-context/

Gaul, A., 2012. What is an iiba? (and why is it confidential?).
URL http://www.isuma.tv/fr/ashleigh-gaul/what-is-an-iiba-and-why-is-it-confidential

George, J., 2011. Agnico-eagle mines aims to increase inuit workforce.
URL http://www.nunatsiaqonline.ca/stories/article/65674agnico-eagle_mining_aims_to_up_Inuit_workforce/

Ghana Statistical Service, 2005. 2000 population and housing census data analysis report volume 1. Tech. rep.

Ghana Statistical Service, 2006. 2003 national industrial census report. Tech. rep.

Ghana Statistical Service, 2008. Ghana living standards survey report of the fifth round (glss 5). Tech. rep.

Ghana Statistical Service, 2014a. 2010 Population and Housing Census. District Analytical Report: Asutifi North District.
URL http://www.statsghana.gov.gh/docfiles/2010_District_Report/Brong%20Ahafo/Asutifi_North.pdf

Ghana Statistical Service, 2014b. Ghana Statistical Service, 2010 Population and Housing Census. District Analytical Report: Tano North District.
URL http://www.statsghana.gov.gh/docfiles/2010_District_Report/Brong%20Ahafo/Tano%20North.pdf

Graham, N., Carroll, W., Chen, D., 2019. Big oil's political reach.

Grice, T., 2018. Local content policies in the mining sector: Stimulating direct local employment.

Gunton, T., 2014. Staple theory and the new staple boom. The Staple Theory@ 50, 43.

Gunton, T., 2020. Fiscal Terms in CBAs TBD. TBD.

Henisz, W. J., Dorobantu, S., Nartey, L. J., 2014. Spinning gold: The financial returns to stakeholder engagement. Strategic Management Journal 35 (12), 1727–1748.

Hickey, S., Mohan, G., 2013. Pockets of effectiveness – overview.
URL http://www.effective-states.org/research/pockets-of-effectiveness/

Hill, D., 2016. Gold-mining in peru: Forests razed, millions lost, virgins auctioned [web page]. The Guardian. Available at: https://www. theguardian. com/environment/andes-to-the-amazon/2016/may/01/gold-mining-in-peru-forests-razed-millions-lost-virgins-auctioned. Accessed on February 19, 2018.

Hoekstra, M., Orozco-Aleman, S., 2017. Illegal immigration, state law, and deterrence. American Economic Journal: Economic Policy 9 (2), 228–52.

Hubert, D., 2016. Finding the missing millions.
URL https://www.globalwitness.org/en/campaigns/oil-gas-and-mining/finding-missing-millions/#chapter-0/section-1

Indigenous and Northern Affairs Canada, 2012. Traditional harvesting.
URL https://www.aadnc-aandc.gc.ca/eng/1315677967159/1315678088470

Kamlongera, P. J., 2013. The mining boom in Malawi: implications for community development. Community Development Journal 48 (3), 377–390.

Kaufmann, D., Kraay, A., 2019. Worldwide governance indicators.
URL http://info.worldbank.org/governance/wgi/index.aspx#home

Kim, R., van Moorsel, T., Kapstein, E., 2013. The national and regional socio-economic impact of Newmont Ghana's Ahafo mine.

Knaus, C., 2019. Mining lobbyists access queensland government 214 times in six years.
URL https://www.theguardian.com/australia-news/2019/aug/23/mining-lobbyists-access-queensland-government-214-times-in-six-years

Kvaerner, A., 2008. Definitive feasibility study report, Mary River iron ore project. Tech. rep.

Marshall, I. E., 2001. A survey of corruption issues in the mining and mineral sector. International Institute for Environment and Development 15, 3–52.

Mining Technology, 2017. Mary River iron ore mine, northern Baffin Island.
URL https://www.mining-technology.com/projects/mary-river-iron-ore/

Mitchell, J., Jorgensen, M., 2007. Newmont's Ahafo mine - gold mining in west Africa. Mining Engineering.

Murphy, J. C. . C. B., 2019. Theory of the firm.
URL https://www.investopedia.com/terms/t/theory-firm.asp

Mzembe, A. N., Meaton, J., 2014. Driving corporate social responsibility in the Malawian mining industry: a stakeholder perspective. Corporate Social Responsibility and Environmental Management 21 (4), 189–201.

National Conference of State Legislators, August 2012. National conference of state legislators: State omnibus immigration legislation and legal challenges.

National Immigration Law Center, 2012. Racial profiling after hb 56.
URL www.nilc.org/document.html?id=800

Natural Resource Governance Institute, 2013. Mining Contracts: How to Read and Understand Them. NRGI.
URL https://eiti.org/sites/default/files/documents/mining-contracts-how-to-read-and-understand-them.pdf

Natural Resource Governance Institute, 2019. Project payments.
URL https://resourceprojects.org/projects?tab=0&

Natural Resources Canada, 2013. Agreements between mining companies and aboriginal communities or governments.

Natural Resources Canada, 2017. The atlas of Canada - indigenous mining agreements.
URL http://atlas.gc.ca/imaema/en/

Newmont, 2008a. Akyem gold mining project final environmental impact study.

Newmont, 2008b. Annual report 2007.
URL http://www.annualreports.com/HostedData/AnnualReportArchive/n/NYSE_NEM_2007.pdf

Newmont, February 2009. Annual report pursuant to section 13 or 15(d) of the securities exchange act of 1934.

Newmont, 2017. Regional operating statistics.

Nunavut Bureau of Statistics, 2017. Nunavut Quick Facts .
URL http://www.stats.gov.nu.ca/en/home.aspx

O'Faircheallaigh, C., 2006. Aborigines, mining companies and the state in contemporary Australia: A new political economy or 'business as usual'? Australian Journal of Political Science 41 (1), 1–22.

O'Faircheallaigh, C., 2008. Negotiating cultural heritage? Aboriginal–mining company agreements in Australia. Development and Change 39 (1), 25–51.

O'Faircheallaigh, C., 2013. Community development agreements in the mining industry: An emerging global phenomenon. Community Development 44 (2), 222–238.

O'Faircheallaigh, C., 2015. Negotiations in the indigenous world: Aboriginal peoples and the extractive industry in Australia and Canada. Routledge.

Otto, Sentana, 2018. Indonesia wrests control of freeport's grasberg mine, ending long battle.
URL https://www.wsj.com/articles/indonesia-wrests-control-of-freeports-grasberg-mine-ending-long-battle-11545396193

Otto, J., 2010. Community Development Agreements: Model regulations and example guidelines.

Oxfam, 2015. The right to decide: Free prior informed consent in Ghana.

Özkaynak, B., Rodríguez-Labajos, B., Arsel, M., Avci, D., Carbonell, M. H., Chareyron, B., Chicaiza, G., Conde, M., Demaria, F., Finamore, R., 2012. Mining conflicts around the world: common grounds from an environmental justice perspective.

Palmer, K. F., 1980. Mineral taxation policies in developing countries: an application of resource rent tax. Staff Papers 27 (3), 517–542.

Parliament of the Republic of Ghana, 2006. The minerals and mining act, 2006.
URL `https://resourcegovernance.org/sites/default/files/Minerals%20and%20Mining%20Act%20703%20Ghana.pdf`

Parliament of the Republic of Ghana, 2012. The minerals and mining regulations 2012.
URL `https://www.a-mla.org/images/acts/MineralsandMining(General)Regulations2012(LI2173)-1.pdf`

Pelaez, J., 2017. Starting a mine: Pre-feasibility and feasibility studies.
URL `https://www.geologyforinvestors.com/starting-a-mine/`

Post, H., June 2012. Alabama immigration law will have 'continuing and lasting' effects on hispanic students, feds say.

Prno, J., Slocombe, D. S., 2012. Exploring the origins of 'social license to operate' in the mining sector: Perspectives from governance and sustainability theories. Resources policy 37 (3), 346–357.

Publish What You Pay, 2020. Our highlights.
URL `https://www.pwyp.org/about/`

Qikiqtani Inuit Association, 2016a. 2015-2016 Annual report celebrating the advancement of Inuit rights and values.

Qikiqtani Inuit Association, 2016b. QIA Revenue Policy.

Qikiqtani Inuit Association, 2017a. 2016-2017 annual report protecting and promoting Inuit rights and values.

Qikiqtani Inuit Association, 2017b. About Us.
URL `http://qia.ca/about-us/`

Qikiqtani Inuit Association, 2018. 2017-2018 annual report protecting and promoting Inuit rights and values.

Qikiqtani Inuit Association and Baffinland Iron Mine Corporation, 2013. The Mary River project Inuit impact and benefit agreement between: Qikiqtani Inuit Association and Baffinland Iron Mine Corporation.

Rawls, P., October 2011. Many legal immigrants leaving alabama behind.
URL `http://www.spokesman.com/stories/2011/oct/06/many-legal-immigrants-leaving-alabama-behind/`

Rio Tinto, 2014. Diavik diamond mine 2013 sustainable development report.

Roe, A., Samuel, J., 2007. Ghana country case study the challenge of mineral wealth: Using resource endowments to foster sustainable developmenty.

Rowen, B., 2016. A detailed look at immigration legislation from the colonial period to the present.
URL http://www.infoplease.com/us/immigration/legislation-timeline.html

Sarlin, B., December 2013. How america's harshest immigration law failed.
URL http://www.msnbc.com/msnbc/undocumented-workers-immigration-alabama

Slack, K., 2009. Mining conflicts in Peru: Condition critical.

Smith, D. N., Wells, L. T., 1975. Mineral agreements in developing countries: structures and substance. American Journal of International Law 69 (3), 560–590.

Southern Poverty Law Center, May 2009. Under siege: Life for low-income latinos in the south.
URL https://www.splcenter.org/20090401/under-siege-life-low-income-latinos-south

Spray, J., Werker, E., 2019. Price controls in liberia. Economic Development and Cultural Change 67 (3), 461–491.

Statistics Canada, 2017a. Labour force characteristics, unadjusted, by territory (3 month moving average).
URL http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/lfss06-eng.htm

Statistics Canada, 2017b. Manufacturing - Canadian industry statistics.
URL https://www.ic.gc.ca/app/scr/app/cis/manufacturing-fabrication/31-33

Statistics Canada, 2017c. Nunavut [territory] and Canada [country] (table). census profile. 2016 census. Statistics Canada catalogue no. 98-316-x2016001.
URL https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E(accessedJanuary18,2019).

Strong, W., July 2017. Arbitration panel rules Baffinland owes QIA 7.3m in missed royalty payments.
URL http://www.cbc.ca/news/canada/north/qia-wins-mary-river-arbitration-1.4193977

Struckman, R., Novermber 2011. Fear of anti-immigration law leaves empty classrooms, idle farms.
URL http://www.aflcio.org/Blog/In-The-States/Fear-of-Anti-Immigration-Law-Leaves-Empty-Classrooms-Idle-Farms

The Agreement Forum, 2008a. Agreement between Newmont Ahafo Development Foundation and Newmont Ghana Gold Limited.

The Agreement Forum, 2008b. Agreement between Newmont Ghana Gold Limited and the Ahafo mine local community on local employment.

The Agreement Forum, 2008c. Ahafo social responsibility agreement between the Ahafo mine local community and Newmont Ghana Gold Limited.

The Agreement Forum, 2014. Agreement between Newmont Ghana Gold Limited and the Ahafo mine local community on local employment.

The World Bank, 2017. GDP per capita growth (annual %).
URL https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=GH

Thomas, T., 2015. The looting machine: Warlords, tycoons, smugglers and the systematic theft of africa's wealth.

Thompson Reuters Eikon, 2019. [Mine Project Information, 2015-2017].
URL https://eikon.thomsonreuters.com/index.html

Transparency International, 2018. Corruption perceptions index 2018.
URL https://www.transparency.org/cpi2018

United States Census Bureau, 2015. American fact finder.

United States. Department of Homeland Security, 2014. Yearbook of immigration statistics: 2013.

US Department of Homeland Securty, 2012. Estimates of the Unauthorized Immigrant Population Residing in the United States: January 2012. Washington, D.C.

US Department of Homeland Securty, 2014. Yearbook of Immigration Statistics: 2013. Washington, D.C.: U.S.

Weber-Fahr, M., 2002. Treasure or trouble? mining in developing countries.

Weishar, S., October 2011. Injustice unleashed: Hb 56 takes hold in alabama.
URL http://www.loyno.edu/jsri/injustice-unleashed-hb-56-takes-hold-alabama

Wexler, R. H. . A., 2018. Countries push to extract more cash from big mining companies.
URL https://www.wsj.com/articles/countries-push-to-extract-more-cash-from-big-mining-companies-1542568635

Woodroffe, N., Grice, T., 2019. Beyond revenues: Measuring and valuing environmental and social impacts in extractive sector governance. Natural Resource Governance Institute.

World Bank, 2019. World development indicators.
URL https://databank.worldbank.org/data/source/world-development-indicators#

World Business Council for Sustainable Development, 2011. Newmont supporting local economic growth in ghana.
URL http://wbcsdpublications.org/wp-content/uploads/2016/02/NewmontIFCcaseStudy.pdf

World Gold Council, 2015. The social and economic impacts of gold mining.

World Gold Council, 2017. Download the Gold Price in a Range of Currencies Since December 1978.
URL `https://www.gold.org/research/download-the-gold-price-since-1978`

Zong, J., Batalova, J., February 2015. Frequently requested statistics on immigrants and immigration in the united states.
URL `http://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states`

Appendix A

Chapter 3 Appendix

A.1 Correlations Between Variables of Interest

Table A.1: Correlations Between Variables of Interest

Variables	Log of Richness	Log of Reserves	Country Risk Premium	Local Development Requirement	Government Effectiveness	Mineral Rents Dependence	Market Cap of 50 Largest Mining Companies
Log of Richness	1						
Log of Reserves	0.0457	1					
Country Risk Premium	0.118	0.0731	1				
Local Development Requirement	0.434***	0.232	0.370**	1			
Government Effectiveness	-0.143	0.119	-0.738***	-0.141	1		
Mineral Rents Dependence	0.124	0.301*	0.658***	0.430***	-0.365**	1	
Market Cap of 50 Largest Mining Companies	0.0311	-0.233	-0.715***	-0.215	0.683***	-0.514***	1
Corruption Perceptions Index	0.0777	-0.149	0.521***	-0.0262	-0.923***	0.16	-0.550***
* p<0.05, ** p<0.01, *** p<0.001							

A.2 Regression Results, Firm Fixed Effects

Table A.2: Core Model Regression Results, Firm Fixed Effects

	1	2	3	4	5	6
Log Richness	1.317					1.296
	(0.915)					(0.820)
Log Reserves		-0.0154			-0.153	-1.004
		(0.412)			(0.359)	(0.706)
Country Risk Premium			0.650^{**}		0.625^{**}	0.640^{*}
			(0.262)		(0.276)	(0.330)
Local Devel. Required				0.464	0.500	-1.630
				(1.356)	(1.175)	(1.538)
Observations	122	168	181	183	166	114
Adjusted R^2	0.466	0.404	0.401	0.346	0.447	0.519

Standard errors in parentheses
The control variables suppressed include mine age, mine age squared, firm and year dummies.
Standard errors are clustered at the firm level.
* $p < 0.10$, ** $p < 0.05$, *** $p < .01$

Table A.3: Extended Model Regression Results, Firm Fixed Effects

	7	8	9	10	11	12
Gov Effectiveness	-1.533				-6.283	-5.091
	(0.940)				(4.473)	(4.364)
Mineral Rents, Percent of GDP		0.421				0.336
		(0.316)				(0.357)
Lobbying Intensity			-0.160		0.105	0.206
			(0.165)		(0.190)	(0.246)
Corruption Perceptions Index				0.0489	-0.179	-0.130
				(0.0341)	(0.149)	(0.138)
Observations	183	109	183	183	183	109
Adjusted R^2	0.380	0.472	0.357	0.367	0.390	0.476

Standard errors in parentheses
The control variables suppressed include mine age, mine age squared, firm and year dummies.
Standard errors are clustered at the firm level.
* $p < 0.10$, ** $p < 0.05$, *** $p < .01$

A.3 Regression Results, Errors Clustered at the Country Level, Government Take above 25% and below 0% dropped.

Table A.4: Core Model Regression Results, Outliers Dropped

	1	2	3	4	5	6
Log Richness	1.294**					0.925
	(0.614)					(0.735)
Log Reserves		0.314			-0.0139	-0.218
		(0.269)			(0.203)	(0.345)
Country Risk Premium			0.806***		0.863***	0.621**
			(0.220)		(0.235)	(0.239)
Local Devel. Required				0.690	0.225	0.0876
				(2.190)	(1.283)	(1.767)
Observations	118	164	177	179	162	110
Adjusted R^2	0.127	0.039	0.232	0.031	0.273	0.238

Standard errors in parentheses
The control variables suppressed include mine age, mine age squared, and year dummies.
Standard errors are clustered at the country level.
* $p < 0.10$, ** $p < 0.05$, *** $p < .01$

Table A.5: Extended Model Regression Results, Outliers Dropped

	7	8	9	10	11	12
Gov Effectiveness	-2.297***				-5.658**	-4.683
	(0.709)				(2.562)	(3.670)
Mineral Rents, Percent of GDP		0.448**				0.220
		(0.174)				(0.255)
Lobbying Intensity			-0.308*		-0.0408	-0.0773
			(0.155)		(0.173)	(0.115)
Corruption Perceptions Index				0.0752*	-0.159*	-0.0963
				(0.0367)	(0.0830)	(0.129)
Observations	179	105	179	179	179	105
Adjusted R^2	0.163	0.185	0.120	0.108	0.193	0.328

Standard errors in parentheses
The control variables suppressed include mine age, mine age squared, and year dummies.
Standard errors are clustered at the country level.
* $p < 0.10$, ** $p < 0.05$, *** $p < .01$