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Stumbling Toward the Up Escalator: How Trends in International Trade, Investment, and Finance Have Complicated Latin America's Quest for Sustainable, Diversified Economic Development

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STUMBLING TOWARD THE UP ESCALATOR: HOW TRENDS IN INTERNATIONAL TRADE, INVESTMENT, AND FINANCE HAVE COMPLICATED LATIN AMERICA'S QUEST FOR SUSTAINABLE, DIVERSIFIED ECONOMIC DEVELOPMENT

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DEDICATION

For Robert G. Williams, my undergraduate advisor and mentor at Guilford College, who showed me that there was room within the field of economics for scholars like me, and for policy-relevant research on inclusion, sustainability, and conflict.

For my family — the Rays, Rosnick/Yaghoubians, and Marshall/Wolkens — whose encouragement made this work possible.

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ABSTRACT

STUMBLING TOWARD THE UP ESCALATOR: HOW TRENDS IN INTERNATIONAL TRADE, INVESTMENT, AND FINANCE HAVE COMPLICATED LATIN AMERICA'S QUEST FOR SUSTAINABLE, DIVERSIFIED ECONOMIC DEVELOPMENT

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This dissertation explores economic, environmental, and social aspects of Latin America and the Caribbean's (LAC's) halting steps away from commodity dependence (the "down escalator" envisioned by Hans Singer). It focuses on the most recent commodity boom (2003-2013), during which the region shifted back toward primary commodity production under a new policy framework aimed at limiting the environmental and social costs of this production while more broadly sharing its benefits through infrastructure, social spending, and closer oversight of foreign investors. This dissertation's three essays focus on three international flows: trade, development finance, and investment.

The first essay weighs the environmental impact of LAC's recent "China boom" in commodity exports. It finds that LAC primary commodity production is more

environmentally intensive – in net greenhouse gas emissions and water use and contamination – than manufacturing. Applying these findings to the "China boom," it finds that LAC-China exports are associated with significantly more carbon emissions and water use and contamination than other exports.

The second essay evaluates environmental and social protections covering development lending for infrastructure in the Andean nations of Columbia, Ecuador, Peru, and Bolivia, which have experienced an infrastructure boom concurrent with the end of the commodity boom. This essay measures the environmental impact (using geospatial imaging of tree cover change) associated with the 84 infrastructure projects financed by international development institutions between 2000 and 2015 in these four countries. It finds that projects undertaken under policy regimes including guarantees of prior consultation with affected indigenous communities were associated with significantly less tree cover loss, showing the importance of social protections for environmental outcomes in the Andean region.

The third essay examines recent environmental and social reforms in Ecuador's oil sector. It uses a mixed-methods approach to evaluate the extent to which new partnerships with Chinese state-owned oil investors gave Ecuador the needed policy space to implement this regulatory framework. It finds that while Chinese oil firms operating in Ecuador have avoided the environmental and social misconduct that typified some past oil FDI, the state has struggled to carry out its own social and environmental protections, endangering its new "high-road" approach to extraction.

TABLE OF CONTENTS

Page

ACKNOWLEDGEMENTS .... **v**

ABSTRACT .... **vii**

LIST OF TABLES .... **xiii**

LIST OF FIGURES .... **xv**

LIST OF ABBREVIATIONS .... **xvii**

CHAPTER

INTRODUCTION **1**

1. THE PANDA'S PAWPRINT: THE ENVIRONMENTAL IMPACT OF THE CHINA-LED RE-PRIMARIZATION IN LATIN AMERICA AND THE CARIBBEAN **22**

1.1 Introduction........ 22

1.2 Context: LAC's China-Led Re-Primarization and its Environmental Impacts 22

1.2.1 Re-primarization in LAC 23

1.2.2 China's Role in LAC's Re-Primarization 25

1.2.3 LAC as a "Pollution Haven:" an Imperfect Fit for the China Boom 28

1.2.4 Environmental Effects of Re-Primarization in Middle-Income Countries 29

1.3. Testing the Models: Should Middle-Income Countries Specialize in Primary Production?........ 31

1.3.1 Greenhouse Gas Emissions 32

1.3.2 Water Footprints 36

1.4. The China Effect on GHG and Water Intensities of LAC Exports........ 39

1.4.1 Greenhouse Gas Intensity of LAC Exports to China and Elsewhere........ 39

1.4.2 Water Intensity of LAC Exports to China and Elsewhere........ 41

1.4.3. Considering GHG and Water Together: Scale and Composition Effects 43

1.4.4 LAC-China Environmental Balance of Payments: Importing Carbon, Exporting Water ... 45

1.5 Discussion ... 48

1.6 Conclusion ... 50

2. SUSTAINABLE DEVELOPMENT *FOR* PEOPLE OR *WITH* PEOPLE? ENVIRONMENTAL AND SOCIAL SAFEGUARDS, INFRASTRUCTURE INVESTMENT, AND DEFORESTATION IN THE ANDEAN AMAZON, 2000-2015 ... 51

2.1 Introduction ... 51

2.2 Background ... 52

2.2.1 Infrastructure and Deforestation ... 52

2.2.2 A Brief History of International DFIs' and Countries' Environmental and Social Safeguards ... 54

2.2.2.1 ESS Reform Among International DFIs: Not from Within but from Without ... 55

2.2.2.2 ESS Reform among Andean Nations: Not from Above but from Below ... 59

2.3 Model of Analysis ... 63

2.3.1 Choice of Impact Studied: Deforestation ... 63

2.3.2 Choice of Method: Satellite Imagery ... 64

2.3.3 Choice of Location: Colombia, Ecuador, Peru, and Bolivia ... 65

2.3.4 Choice of Projects ... 66

2.4. Data Description ... 67

2.4.1 Tree Cover Change Near international DFI-Financed Infrastructure Projects ... 67

2.4.2 Safeguards ... 69

2.5. Results ... 73

2.5.1 Regression Analysis of ESS on Tree Cover Change ... 74

2.5.1.1 The Role of Initial Tree Cover ... 86

2.5.1.2 The Role of Site Selection ... 88

2.5.2 Country and Type ... 90

2.5.3 The Role of International DFIs ... 93

2.6. Discussion ... 98

2.6.1 Discussion of Findings 99
2.6.2 Policy Implications 100
2.6.3 Areas for Future Research 102
2.7. Conclusion 105

3. CROSSROADS IN THE EQUATORIAL FORESTS: CHINESE INVESTMENT AND "HIGH-ROAD EXTRACTIVISM" IN ECUADOR 107

3.1 Introduction 107
3.2 Ecuador: Oil as an Impediment to Sustainable Development 109
3.2.1 Terms of Trade Disadvantages 110
3.2.2 Employment, or the Lack Thereof 115
3.2.3 Environmentally and Socially Sensitive Territory 117
3.2.4 Relative Impunity of Foreign Investors 119
3.3 Ecuador's Moves Toward a New Paradigm 125
3.3.1 Challenging the Reliance on Oil 125
3.3.2 Enhancing the Regulatory Environment of Oil FDI 128
3.3.2.1 Regulation and Terms of Trade 129
3.3.2.2 Environmental Protection 132
3.3.2.3 Social Inclusion 133
3.3.3 Shifting away from Reliance on the US 136
3.3.3.1 China as a Source of Investment 138
3.3.3.2 China as an Export Market 141
3.3.3.3 China as a Source of Bilateral Credit 143
3.4. Case Study: CNPC and Sinopec in Ecuador 147
3.4.1 CNPC and Sinopec in Ecuador, to Date 148
3.4.1.1 Social Performance of Andes Petroleum and PetroOriental 150
3.4.1.2 Environmental Performance 153
3.4.1.3 Analysis 156
3.4.2 New Concessions in the Southeastern Ecuadorian Amazon 157
3.4.2.1 New Challenges in the Physical and Social Landscape of Blocks 79 and 83 157

3.4.2.2 (Mis)Management of New Challenges Posed by New Landscapes 161

3.4.2.3 Further Developments: Moving Forward After an Unsuccessful Consultation 165

3.5. Discussion 167

3.6. Conclusion 170

CONCLUSION **172**

APPENDICES

A. ADDITIONAL INFORMATION FOR CHAPER 1 .... **178**

B. ADDITIONAL INFORMATION FOR CHAPER 2 .... **198**

BIBLIOGRAPHY **203**

LIST OF TABLES

Table **Page**

I.1 LAC exports as a share of GDP, by technology level, 1990-2016 7

I.2 Top LAC export commodities during the boom share of exports, 1992-2002 8

I.3 Contributions to average annual GDP growth in 5-year periods, LAC, 1990-2015 ... 10

I.4 Direct employment per millions USD of economic activity, by sector...................... 13

I.5 Distribution of Environmental Conflicts by Triggering Sector 15

1.1 China's contribution to the re-primarization of LAC exports 27

1.2 China's role in the growth of LAC's export-based GHG emissions and water use ... 45

2.1 Adoption of ILO 169 and incorporation into national law, by country 60

2.2 Tree Cover loss within 10km of international DFI-financed infrastructure projects, 2000-2015 68

2.3 Required safeguard processes for infrastructure project planning 71

2.4 Prior consultation adoption for infrastructure projects, by country and DFI 72

2.5 Regression results: association with net tree cover change (N=81) 78

2.6 Tree cover loss associated with international DFI-financed infrastructure projects, 2000-2015 83

2.7 Regression results using site-specific radii: association with net tree cover change.. 86

2.8 Blinder-Oaxaca decomposition of the observed differences in Model 4 (Table 2.7) 90

2.9 Table 2.9: Regression results with country and type variables, using site-specific radii: association with net tree cover change... 92

2.10 Table 2.10: Regression results with EPI scores for countries and international DFIs at site-specific radii: association with net tree cover change........................... 93

2.11 Table 2.11: Regression results, disaggregated by DFI: association with net tree cover change 94

2.12 Table 2.12: Regression results, disaggregated by source of prior consultation requirement: country, DFI, or both: association with net tree cover change 95

2.13 Table 2.13: Regression results, disaggregated by source of prior consultation requirement, where initial tree cover >0: association with net tree cover change...... 97

2.14 F-tests for significance of differences in coefficients shown in Table 2.10............. 98

3.1 Price volatility (coefficient of variation) for commodities, 1960-2016....................114

3.2 Public oil revenue and fuel subsidies, Ecuador..130

3.3 Ecuadorian fuel subsidies by type, 2003-2013...131

3.4 Sources of oil FDI into Ecuador by type, 2003-2013 138

3.5 Greenfield and M&A FDI deals in Ecuador, by source and sector, 2003-2013 139

3.6 Oil-boom era loans to Ecuador from Chinese banks and SOEs..............................145

3.7 Calculation of average weighted tree cover change under Chinese concessions in Ecuador, 2000-2016..155

LIST OF FIGURES

Figure **Page**

I.1 Real GDP growth by sector, 1990-2016. 5

I.2 Average world prices, major LAC export commodities 9

I.3 LAC import, export, and terms of trade indices, 1990-2014 11

1.1 Real GDP growth for the LAC region, selected sectors, 1990-2016 25

1.2 China's share of LAC exports, by technology level 26

1.3 Net GHG emissions of exports by technology level and country income level, 2007 33

1.4 Net GHG emissions of export baskets by region and technology level, 2007 35

1.5 Water intensity of exports by tech. level in 2005, by country income level 37

1.6 Water intensity of exports by region and technology level in 2005 38

1.7 Average GHG intensity, LAC exports by destination 40

1.8 Average GHG intensity, exports to China and the R.o.W., by country and region 41

1.9 Average water intensity, LAC exports by destination 42

1.10 Average water intensity, exports to China and the R.o.W., by country and region 43

1.11 LAC-China "balance of payments" in net greenhouse gas emissions 47

1.12 LAC-China "balance of payments" in water 48

2.1 Completed international DFI-financed infrastructure projects in Amazon-basin countries, 2000-2015 66

2.2 Relative tree cover change within 10km of international DFI-financed infrastructure projects, 2000-2015 69

2.3 Relative tree cover change near international DFI-financed infrastructure with and without ESS 74

2.4 Examples of site-specific radii and their definitions (red=loss, blue=gain) 80

2.5 Relative tree cover change measured within site-specific radii of international DFI-financed infrastructure projects, 2000-2015 84

2.6 Distribution of relative tree cover change (measured within site-specific radii), by ESS, 2000-2015 85

2.7 Distribution of relative tree cover change (measured within site-specific radii) among projects with positive initial tree cover, by ESS, 2000-2015......................... 87

2.8 Absolute tree cover change and initial tree cover level, 2000-2015.......................... 88

2.9 Distribution of initial tree cover levels among projects with and without prior consultation safeguards (kernel density).. 89

2.10 Tree cover in 2000 at infrastructure project sites, by prior consultation protection type 96

3.1 Ecuador exports as a share of GDP, by commodity 109

3.2 Ecuador's terms of trade, 1960 - 2014 112

3.3 World oil prices, nominal and real, 1960-2015 113

3.4 Labor intensity of Ecuadorian exports, 2007-2012, by major sector.......................116

3.5 Sensitive territory and active oil blocks in Ecuador, 2003-2013.............................118

3.6 Ecuador central government revenue by source, 2003-2013 (percent of GDP)........127

3.7 Ecuador's net petroleum exports by type, 1994-2013 (percent of GDP).................129

3.8 China's share of Ecuadorian exports, by major sector..142

3.9 Ecuador's imports (top three sources, in percent of total) 143

3.10 Total Ecuadorian debt compared with debt to China (percent of GDP)................144

3.11 Map of Ecuador, with Andes Petroleum and PetroOriental holdings shaded.........149

3.12 Net tree cover loss in oil blocks active during the oil boom, 2000-2016, weighted by initial tree cover 154

3.14 Sensitive territory and Andes Petroleum's new oil blocks, Ecuador......................158

3.15 Basic service coverage, Ecuador and regions of Ecuador where Andes Petroleum (AP) and PetroOriental (PO) operate, 2013..160

LIST OF ABBREVIATIONS

ABC	Administración Boliviana de Carreteras
ADB	Asian Development Bank
ADBI	Asian Development Bank Institute
AP	Andes Petroleum
ARCH	Agencia de Regulación y Control Hidrocarburífero (Ecuador)
BCE	Banco Central del Ecuador
BNDES	Banco Nacional de Desenvolvimento Econômico e Social (Brazil)
BNF	Banco Nacional de Fomento (Ecuador)
CAF	Development Bank of Latin America
CAIC	Comisión para la Auditoría Integral del Crédito Público (Ecuador)
CBRC	China Banking Regulatory Commission
CDB	China Development Bank
CEPALStat	United Nations Economic Commission for Latin America and the Caribbean Statistical Database
CHEXIM	Export-Import Bank of China
CIESIN	Center for International Earth Science Information Network of Columbia University
CLACSO	Consejo Latinoamericano de Ciencias Sociales
CNPC	China National Petroleum Corporation
CNRA	California Natural Resources Agency
COMTRADE	United Nations Commodity Trade Statistics Database
CONAIE	Confederación de Nacionalidades Indígenas del Ecuador

CONFENIAE	Confederación de las Nacionalidades Indígenas de la Amazonía Ecuatoriana
CV	Coefficient of Variation
DFI	Development Finance Institution
ECA	Export Credit Agency
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
ECORAE	Ecodesarrollo Regional Amazónico (Ecuador)
EIA	Environmental Impact Assessment
EJAtlas	Environmental Justice Atlas
EPI	Environmental Performance Index
ESS	Environmental and Social Safeguard
FAO	Food and Agriculture Organization of the United Nations
FOBOMADE	Foro Boliviano Sobre el Medio Ambiente y Desarrollo
FPIC	Free, Prior, and Informed Consent
GAD	Gobierno Autónomo Decentralizado (Ecuador)
GDP	Gross Domestic Product
GEF	Global Environment Facility
GFDI	Greenfield Foreign Direct Investment
GHG	Greenhouse Gas
GM	Grievance Mechanism
GTAP	Global Trade Analysis Project
HS	Harmonized System
IAD	Inter-American Dialogue
IADB	Inter-American Development Bank

IBRD	International Bank for Reconstruction and Development
ICIM	Independent Consultation and Inspection Mechanism, Inter-American Development Bank
IDFC	International Development Finance Club
IFC	International Finance Corporation
IIC	Inter-American Investment Corporation
ILO	International Labour Organisation
IMF	International Monetary Fund
INEC	Instituto Nacional de Estadística y Censos (Ecuador)
ISI	Import Substitution Industrialization
ITT	Ishpingo-Tambococha-Tiputini oil fields (Ecuador)
LAC	Latin America and the Caribbean
LPG	Liquified Petroleum Gas
M&As	Mergers and Acquisitions
MDB	Multilateral Development Bank
MEER	Ministerio de Electricidad y Energía Renovable (Ecuador)
MMT	Millions of Metric Tons
MNC	Multi-National Corporation
MRNNR	Ministerio de Recursos Naturales No Renovables
NASE	Nación Sápara del Ecuador
NDB	National Development Bank
OCP	Oleoducto de Crudos Pesados
OSAL	Observatorio Nacional de América Latina
PO	PetroOriental

PWT	Penn World Table
RoW	Rest of the World
RdP	Refinería del Pacífico (Ecuador)
SDGs	Sustainable Development Goals
SENPLADES	Secretaría Nacional de Planificación y Desarrollo (Ecuador)
SHE	Secretaría de Hidrocarburos (Ecuador)
SITC	Standard International Trade Classification
SOE	State-Owned Enterprise
SOTE	Sistema Oleoducto Transecuatoriano (Ecuador)
TC	Tree Cover
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VIX	Volatility Index of the Chicago Board Options Exchange
WB	World Bank
WBG	World Bank Group

INTRODUCTION

I.1 Introduction

Over the last 50 years, Latin America and the Caribbean (LAC) has made several attempts to diversify its production base away from relying on exports of raw materials, with mixed results. Over the last business cycle, these perennial efforts were further complicated by 21st-century trends in current and capital account flows. As a result, rather than diversification, the region has experienced a period of re-primarization. This time was different from previous commodity booms, however, at least regarding the regulatory frameworks in place. Across Latin America and the Caribbean – and especially in South America – governments during the commodity boom enacted sweeping protections for workers, indigenous groups, and the environment, as well as instituting greater redistribution of rents through social and infrastructure spending. This dissertation attempts to examine this recent re-orientation toward “high-road” primary production in light of longstanding structural problems with reliance on primary commodity production and exports.

The present work is divided among three essays to cover three forms of international flows – trade, finance, and investment – at the regional, sub-regional, and national levels. Essay 1 explores the rise of China as a major trading partner for LAC, how China’s demand for raw materials has contributed to LAC’s re-primarization, and the environmental impacts of this “China boom.” Essay 2 explores the infrastructure boom financed by international development finance institutions (DFIs) in the Andean nations of Colombia, Ecuador, Peru, and Bolivia in light of new social and environmental standards, to measure whether the environmental profiles of these projects has improved concurrently with the enactment of these new protections. Finally, essay 3 focuses on Ecuador, a small country highly dependent on oil exports and foreign investment in its oil sector, to evaluate governmental attempts at re-defining the terms of investor-state relationships with new investors: Chinese oil SOEs.

I.2 The Resource Curse Globally and in Latin America and the Caribbean

Hans Singer famously stated that developing nations' attempts at reaching "sustained development and industrialization" are akin to "trying to run up a downward-moving escalator" (1949; 7). Structural transformation requires such a dramatic dedication of capital that it is all but impossible for countries to do so using domestic resources, which are already occupied addressing their immediate needs. (In other words, their efforts are currently being used to avoid going *down* the downward-moving escalator on which they find themselves).

Prebisch (1950; 5) elaborates further on this point by positing that Latin America's development challenge was to avoid "restrict[ing] the individual consumption of the bulk of the population, which, on the whole, is too low, [while] accumulat[ing] the capital required for industrialization and for the technical improvement of agriculture." In his view, the region faced two perennial obstacles in meeting this goal: countering short-term fluctuations in export prices (due to global business cycles) and finding long-term financing for investment. Thus, commodity-producing countries – and especially those in Latin America – needed to mobilize *international* resources for industrial development.

Ironically, though, attracting that international capital can be particularly difficult for commodity-producing countries, because of the unfavorable impacts of commodity exports on the stability of terms of trade and exchange rates. In perhaps their most famous legacy, Prebisch and Singer are both credited with developing the "Prebisch-Singer hypothesis" that raw materials will display a secular price decline relative to manufactured goods in the long term, leaving commodity-exporting countries with inevitably declining terms of trade. Tests of this hypothesis have largely validated it over varying commodity baskets and time periods (see for example Arezki et al., 2013; Cuddington, 1992; Grilli and Yang, 1988; and Harvey et al., 2010). Furthermore, Blattman et al (2007) finds a significant association between commodity exports and terms of trade *volatility*, which in turn is linked to exchange rate volatility, diminished FDI inflows, and lower long-term GDP growth (Aiyar et al., 2013; Eichengreen, 2008).

Prebisch expressed concern over "acute social antagonism" arising from the labor market fluctuations and, when monetary policy alone is used to address them, inflation, that are intrinsic in the boom-and-bust cycle of commodity exports (1950, 41). Indeed, one of the major areas in which scholars have studied the so-called "resource curse" is its relationship to labor markets, discussed in more detail in the LAC case below. Even during booms, export-oriented agricultural and extractive production tend to use capital-intensive methods and support few employees. For example, Lódola, Brigo, and Morra (2010) calculate the employment intensity of 31 common agricultural products in

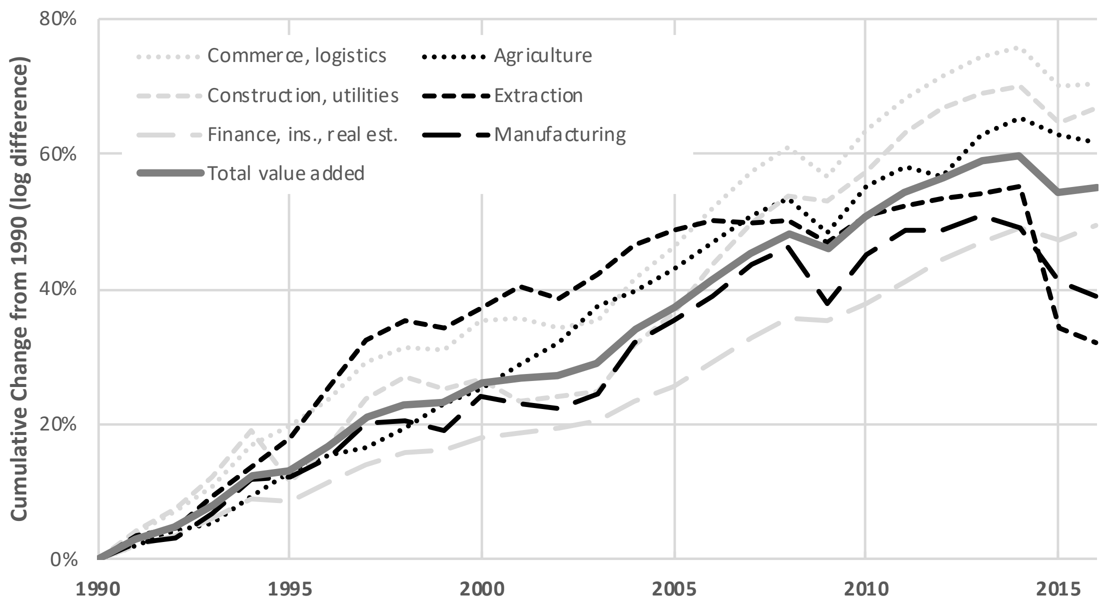
Argentina for the year 2007 and find that soy –which grew precipitously in price and production in the latest commodity cycle and drove Argentina's export agriculture boom – is among the crops that supports the fewest employees for a given value of output. Soy is tied with rice at 7 jobs per million pesos; only barley supported fewer (with 6 jobs per million pesos). For its part, the extractive sector is famously capital-intensive, as is further discussed below in the Latin American and Caribbean (LAC) case. Thus, the benefits of commodity booms do not automatically spread throughout local communities by way of labor markets. Furthermore, commodity booms can lead to currency over-valuation (the so-called "Dutch disease"), hurting the competitiveness of other, import-competing industries, which can itself have significant employment impacts (Buiter and Purvis, 1980; Ismail, 2010; Palma, 2014).

For all of these reasons (and many more that go beyond the scope of the present research), LAC has spent decades in halting steps toward diversifying away from reliance on exports of raw materials, with mixed results. The most recent commodity boom, from 2003 to 2013, represented a step backward toward re-primarization but under a new context of higher social and environmental protections to address the "acute social antagonism" flagged by Prebisch. This regional turn – and the reforms applied to it – are discussed in more detail below.

I.3 LAC: Commodities, Re-Primarization, and the Resource Curse

Latin America has famously struggled to diversify away from reliance on raw materials for decades. As Figure I.1 shows, real manufacturing growth has lagged behind overall real GDP growth in LAC since the mid-1990s. The two began to diverge further in the mid-2000s during the years of the most recent commodity boom, 2003-2013. In fact, of all goods-producing sectors (shown in black in Figure I.1), only agriculture has kept pace with total value added. Latin Americanists refer to this phenomenon as "re-primarization" (see for example Baumann, 2010; Burchardt and Dietz, 2014). As Figure I.1 also shows, the most recent downturn of 2015 brought slowdowns to all sectors, but extraction was particularly hard-hit and declined further in 2016. It is no exaggeration to say that the end of the commodity boom set extractive production back decades, as the last time it was at its 2016 level was roughly 20 years previously. Thus, though the bulk of this dissertation deals with the commodity *price* boom from 2003 to 2013, it is important to bear in mind that economic *activity* in these sectors is subject to rising and falling with prices and profitability.

Figure I.1: Real GDP growth by sector, 1990-2016.



Note: Commerce and logistics includes trade, hospitality, storage, and transportation.
Source: Author's calculation from ECLAC (n.d.) data.

The lagging of manufactured goods compared to non-manufactured goods is also visible in LAC exports. As Sinnot, Nash, and de la Torre (2010) note, LAC is disproportionately represented among world commodity exports – especially petroleum exports – relative to its share in world GDP. Table I.1 shows the LAC goods exports as a share of regional GDP, disaggregated by technology level, following the technology classification matrix of Lall (2000).[1] Raw materials and their refined derivatives occupied a place of prominence in the LAC export basket – close to or above 10 percent of regional GDP – from 2003 to 2013, shown in darker shades of grey. In contrast, manufactured goods hit their peak of importance in 2004 and began to decline thereafter.

[1] Here, "resource-based" exports are primary commodities that have undergone minimal transformation, such as refined metals, gasoline, and soybean oil.

Table I.1: LAC exports as a share of GDP, by technology level, 1990-2016

	Non-manufactured			Manufactured, by tech. level				GRAND TOTAL
	Primary	Resource-based	Total	Low	Medium	High	Total	
1990	3.9%	1.4%	5.3%	0.7%	1.4%	0.2%	2.3%	7.6%
1991	3.3%	1.9%	5.2%	0.9%	1.5%	0.3%	2.6%	7.8%
1992	3.6%	2.2%	5.8%	1.3%	2.2%	0.8%	4.2%	10.0%
1993	3.3%	2.1%	5.4%	1.4%	2.3%	0.8%	4.4%	9.8%
1994	3.4%	2.1%	5.5%	1.3%	2.3%	0.9%	4.6%	10.1%
1995	3.7%	2.5%	6.3%	1.4%	2.7%	1.0%	5.1%	11.4%
1996	4.0%	2.4%	6.4%	1.5%	2.8%	1.2%	5.5%	11.9%
1997	3.9%	2.3%	6.3%	1.6%	3.0%	1.4%	6.0%	12.2%
1998	3.2%	2.2%	5.5%	1.6%	3.2%	1.7%	6.5%	11.9%
1999	3.8%	2.6%	6.4%	1.8%	3.7%	2.3%	7.9%	14.3%
2000	4.4%	2.8%	7.1%	1.9%	4.0%	2.7%	8.6%	15.7%
2001	4.1%	2.8%	6.9%	1.9%	4.1%	2.7%	8.7%	15.6%
2002	4.9%	2.9%	7.9%	2.3%	4.7%	2.8%	9.9%	17.7%
2003	5.7%	3.4%	9.1%	2.4%	4.8%	2.8%	10.0%	19.1%
2004	6.1%	4.4%	10.4%	2.4%	5.1%	2.8%	10.2%	20.6%
2005	6.3%	4.6%	10.9%	2.3%	4.8%	2.5%	9.6%	20.6%
2006	7.2%	4.1%	11.4%	2.1%	4.8%	2.6%	9.4%	20.8%
2007	5.3%	4.1%	9.4%	1.8%	4.4%	2.2%	8.5%	17.8%
2008	6.9%	4.5%	11.3%	1.7%	4.2%	2.2%	8.2%	19.5%
2009	5.6%	3.9%	9.5%	1.4%	3.3%	2.1%	6.9%	16.4%
2010	5.7%	4.2%	9.8%	1.3%	3.6%	2.0%	6.9%	16.7%
2011	6.4%	4.1%	10.5%	1.2%	3.7%	1.8%	6.7%	17.2%
2012	6.5%	4.3%	10.8%	1.3%	4.0%	1.8%	7.1%	17.8%
2013	6.4%	4.0%	10.4%	1.3%	4.2%	1.8%	7.2%	17.6%
2014	5.1%	3.5%	8.6%	1.4%	4.3%	1.8%	7.5%	16.1%
2015	4.6%	3.4%	7.9%	1.5%	4.9%	2.0%	8.4%	16.3%
2016	4.4%	3.4%	7.8%	1.4%	5.0%	2.0%	8.4%	16.2%

Source: Author's calculations based on UN COMTRADE (n.d.) and IMF (2017) data.
Note: The commodity boom years of 2003-2013 are shown in darker shades of grey. Technology levels are defined using Lall (2000). "Resource-based" exports are primary commodities that have gone minimal transformation, including goods such as refined metals, gasoline, and soybean oil.

Within the primary and resource-based commodity categories, the most important exports for LAC were petroleum, copper, iron, and soybeans (in their refined and unrefined forms), as Table I.2 shows. Each of these products increased their share of total exports sharply during the commodity boom compared to the previous 11 years. Other major LAC export commodities – including animal feed, other fruits and nuts, sweeteners, and coffee – remained constant or fell as a share of total exports.

Table I.2: Top LAC export commodities during the boom: share of exports, 1992-2002

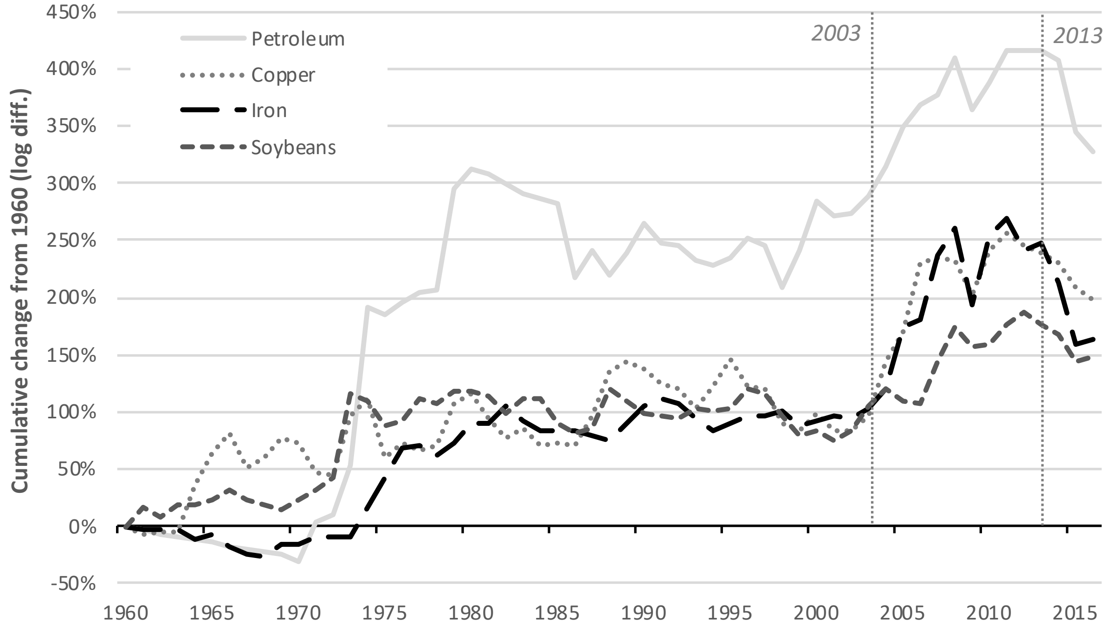
	1992-2002	2003-2013
Crude petroleum oil	10.3%	14.8%
Refined petroleum products	4.0%	4.3%
Copper	2.2%	3.1%
Unrefined iron	1.2%	2.5%
Unrefined copper	0.8%	2.3%
Soybeans and other oilseeds	1.2%	2.1%
Animal feed	2.1%	1.9%
Fruit and nuts (excluding oilseeds)	2.2%	1.6%
Sugars, honey, and molasses	1.4%	1.4%
Coffee and coffee substitutes	2.3%	1.2%

Source: Author's calculations from UN COMTRADE (n.d.) data.

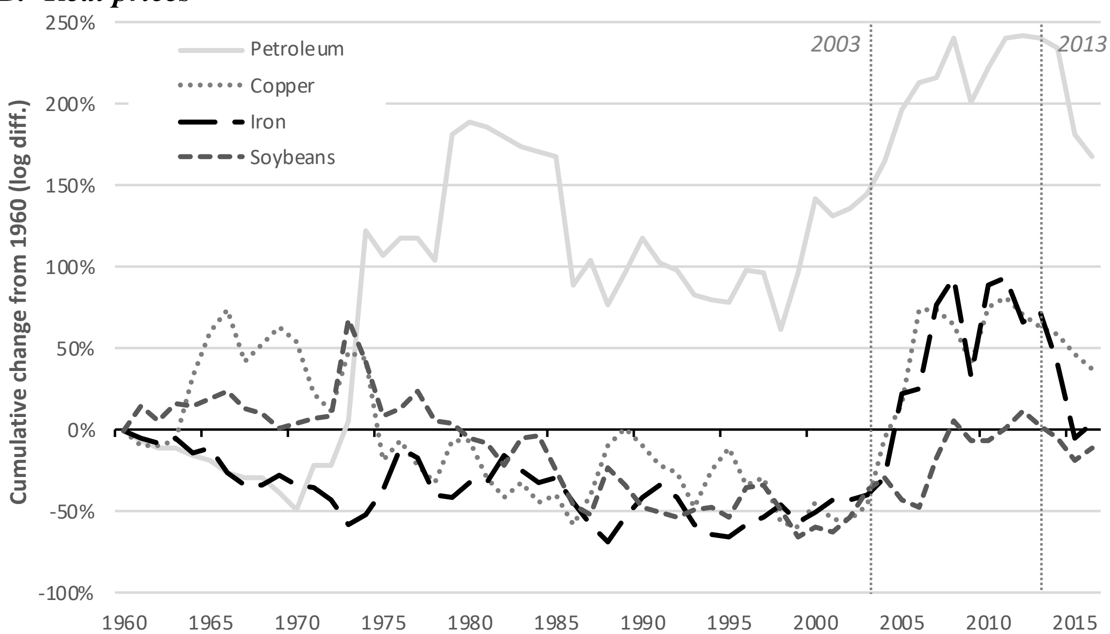
Figure I.2 shows average world prices for these four categories of regionally-dominant commodity exports: petroleum, copper, iron, and soybeans. Each of these four categories saw explosive growth in prices – in both nominal and real terms – between the years of 2003 and 2013, before declining again after 2013. For this reason, this collection of essays defines the commodity boom – as LAC experienced it – as occurring from 2003 to 2013.

Figure I.2: Average world prices, major LAC export commodities

A. Nominal prices



B. Real prices



Source: Author's calculations using World Bank (n.d.) data.

Despite the growing share of primary and resource-based products in LAC exports during the commodity boom, these sectors did not directly contribute much to real GDP. Table I.3 shows sectorial contribution to real GDP growth in the decade of the commodity boom compared to the prior decade. While all other segments grew in their contribution, agriculture and extraction each shrank in their contribution to just 0.1 percent annually each.

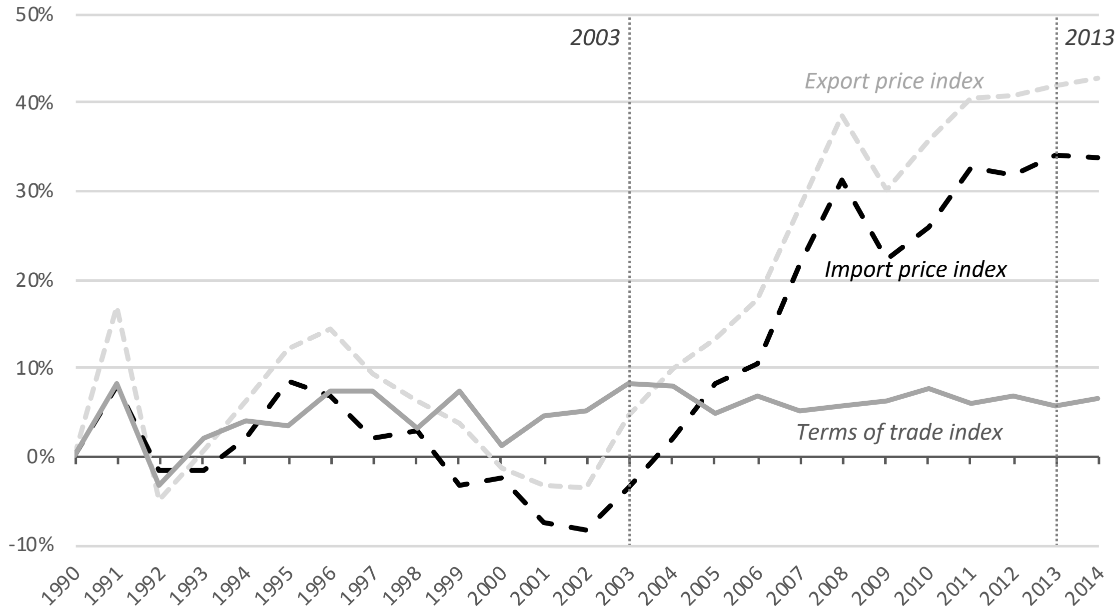
Table I.3: Contributions to average annual GDP growth in 5-year periods, LAC, 1990-2015

	1993-2003	2003-2013
Agriculture, hunting, fishing, forestry	0.2%	0.1%
Extraction	0.3%	0.1%
Manufacturing	0.3%	0.4%
Construction, utilities	0.1%	0.4%
Transport, storage, commerce, hospitality	0.5%	0.9%
Public administration	0.5%	0.7%
Finance, insurance, real estate	0.3%	0.5%
Total Value Added	2.1%	3.1%

Source: Author’s calculations from ECLAC (n.d.) and IMF (2017) data.

Furthermore, the commodity boom did not help LAC’s terms of trade, shown in Figure I.3. The export and import price indices both rose by about the same amount during the boom and in 2013 LAC’s terms of trade index was 2.3 percent *below* its 2003 level. This lack of terms of trade benefit can be traced to one simple factor: a lack of diversification. When commodity prices rose, LAC countries, in general, had to import products that relied heavily on those commodities as inputs, including refined and manufactured goods using large shares of iron (such as steel products), copper (such as electronics), or petroleum (such as plastics). This is especially true for small commodity exporters such as Ecuador, whose exports are not only mostly limited to raw materials, but to a small number of raw materials.

Figure I.3: LAC import, export, and terms of trade indices, 1990-2014



Note: Regional price indices are calculated as the weighted average of country indices, with weights defined as each country's share of regional exports or imports in a given year. Where UN COMTRADE data are missing for a given country's *exports/imports* in a given year, they are imputed from rest-of-world *imports to/exports from* that country and year. Source: Author's calculation using Penn World Table 9.0 (Feenstra, Inkaar, and Timmer, 2015) and UN COMTRADE (n.d.) data.

I.4 Social and Environmental Impacts of LAC's Resource Curse

Any examination of the social and environmental aspects of the resource curse in LAC suffers from a paucity of existing literature measuring this subject, partly due to a widespread absence of official data collection among regional governments. All three essays in this dissertation aim to help address this gap, by more closely examining – and where possible, measuring – the environmental and social aspects of LAC's halting steps away from raw material dependence. In place of region-wide, quantitative work on the social and environmental costs and benefits of natural resource production in LAC, a deep literature of location-specific and sector-specific case studies has emerged from the fields of ecology, political ecology, and geography.

Ecological research, for example, shows that Brazilian Amazonian deforestation is significantly linked to beef and soy price trends. During commodity booms, the expansion of beef and soy production frontiers has driven deforestation in the Brazilian Amazon, showing that the responsiveness of agroindustry to world commodity demand trends has outstripped conservation attempts by the Brazilian government, resulting in a "boom and bust" cycle tying deforestation trends to world commodity price trends (Barbier 2004; Fearnside, Figueriedo, and Bonjour, 2013; Verburg et al., 2014). Dammert Bello (2015) shows similar findings for the expansion of the palm oil productive frontier in the Peruvian Amazon, with related impacts including both deforestation and community displacement.

Research from the fields of political ecology and geography shows that environmental and social problems arising from commodity production are inextricably intertwined. Bunker (1985) shows that extractive production in the Amazon not only suffers from the "enclave economy" characteristics of low employment intensity described above but also *amplifies* these problems by competing with local communities for the natural resources (including land, water, and sinks) necessary for traditional livelihoods such as fishing, hunting, gathering, and smallholder agriculture. Thus, these new sectors endanger traditional livelihoods without creating a substitute employment boom.

Employment estimates bear out these claims, especially for extractive activities of mining and drilling. Table I.4 uses household survey data to estimate direct employment per million USD of economic activity, by sector and country. These figures undoubtedly overstate employment in agriculture, because they include peasant agriculture, which is famously labor-intensive. Plantation-style agriculture for exports has a very different labor profile, but one that is impossible to differentiate with existing survey data. Nonetheless, Table I.4 clearly shows that extraction requires very little labor input. This lackluster employment impact, combined with competition for the resources necessary for traditional livelihoods, creates conditions in which conflict can proliferate.

Table I.4: Direct employment per millions USD of economic activity, by sector

	Sector			All Economic Activity	Data Year
	Agriculture	Extraction	Manufacturing		
LAC Overall	159.5	4.8	50.1	45.7	2014
Countries:					
Argentina	7.1	3.4	27.8	31.6	2014
Bolivia	472.4	24.9	167.2	151.7	2013
Brazil	134.4	0.0	52.1	42.4	2014
Chile	89.0	7.3	30.4	29.2	2013
Colombia	158.6	6.9	60.8	57.7	2014
Costa Rica	84.2	13.2	39.3	42.4	2014
Dominican Rep.	173.4	6.3	41.8	61.3	2014
Ecuador	194.9	5.2	58.9	72.1	2014
El Salvador	190.5	36.2	81.7	103.1	2014
Guatemala	348.5	0.0	81.8	113.0	2014
Honduras	487.5	52.1	128.5	172.3	2013
Mexico	187.0	3.0	38.4	40.8	2014
Panama	186.7	3.3	45.2	35.7	2014
Paraguay	118.0	0.0	104.0	99.0	2014
Peru	309.6	11.1	55.1	80.9	2014

Source: Author's calculations using World Bank WDI and UN ECLAC CEPALSTAT data.

Leff (2001) notes that this dual nature of environmental and economic concerns makes the US-based framework of environmental justice an apt one for analyzing conflicts that arise in this context. Bebbington and Bury (2013) show *how* these concerns unite – further complicated by a context of long-standing ethnic and economic inequality – in conflicts surrounding extractive sectors in Latin America, particularly in the sectors of mining, gas and oil in the Andean region. Sinnot, Nash, and de la Torre (2010) explore the differing conflict triggers for various commodity sectors: mining (water contamination, noise, and particulate air pollution), oil (water and land contamination), agriculture (chemical runoff and land tenure disputes), and fisheries (over-exploitation).

One way to estimate the social and environmental costs of commodity production in LAC is through the records of the Environmental Justice Atlas, or EJAtlas (Temper, del Bene, and Martinez-Alier, 2015). The EJAtlas complies information about environmental conflicts worldwide for the last several decades. This resource warrants a note of caution: it would be impossible for it to successfully capture and catalog every conflict with equal detail, though it is a remarkably rich source, with over 700 such conflicts reported for LAC. Furthermore, reporting is not perfectly comparable across geographic areas, as conflicts may be submitted to the database by civil society organizations, who do not all operate in similar political contexts – or with similar internet access – across nations or regions. Finally, it includes occasional duplicate reports of the same conflict or related conflicts. However, it still has value as a tool for overall estimates if used with caution. For example, even though it cannot capture differences across regions, it can still have value for illustrating the relative distribution of conflicts among sectors *within* particular geographic areas. Table I.5 shows the results of this comparison. It includes only those conflicts based on allegations of specific misconduct, and it attempts to exclude all instances of duplicate reporting. It shows conflicts listed by the sector accused of misconduct.

Table I.5: Distribution of environmental conflicts by triggering sector

	Caribbean	Mexico, Cent. Amer.	South Amer.	Total
Agriculture, food processing	12%	15%	15%	15%
Extraction and refining	42%	36%	56%	52%
Manufacturing	8%	2%	2%	3%
Tourism	8%	3%	1%	2%
Commerce	0%	1%	0%	0%
Infrastructure	23%	36%	21%	24%
Public land management	8%	7%	3%	4%
Multiple sectors	0%	0%	1%	1%
TOTAL	100%	100%	100%	100%

Note: "Public land management" includes public administration of land tenure and conservation projects.
Source: Author's calculations using EJAtlas (Temper, del Bene, and Martinez-Alier, 2015) data.

As Table I.5 shows, the sector most closely associated with environmental conflict across LAC is extraction and refining, followed by infrastructure projects. In Mexico and Central America, notably, these two sectors tie for the dubious honor of triggering the greatest number of environmental conflicts. Taken together, primary sectors account for over half of all conflicts in every sub-region in LAC. It is clear that these sectors are disproportionately represented in social conflict; even at their height during the commodity boom, primary activities reached a peak of just 12.3 percent of GDP, in 2008 (ECLAC, n.d.). In contrast, manufacturing accounts for less than 10 percent of environmental conflicts in each sub-region and only three percent for LAC as a whole, though it is a larger share of LAC GDP. The lowest level manufacturing reached as a share of GDP during the commodity boom was 12.6 percent, in 2014 – still quite a bit higher than its share of environmental conflicts. Thus, in LAC, primary production is much more environmentally *conflict-intensive* than manufacturing.

I.5 LAC's Halting Progress Toward Diversification

Both Prebisch and Singer wrote that some level of industrialization – to complement developing countries' current comparative advantage in raw materials – was a necessary step toward development. Singer referred to industrial capital accumulation as one of the "seeds" of development (with human development goals such as reduced malnutrition and poverty as the "fruits" thereof), while Prebisch saw industrial capital accumulation as a necessary precursor for improvements in productivity – and ultimately, in living standards. Notably, neither called for the elimination of commodity production (despite later characterizations of their work by others) but rather sought what would today be called "diversification" or "moving up the value chain" to include higher value-added production. Thus, the present work focuses on efforts to *diversify* production, rather than to shift entirely to industrial production.

Another reason for choosing diversification rather than industrialization as the framework for this work is the region's experience with import substitution industrialization (ISI), which failed to catapult LAC into the realm of developed countries. Reasons for the LAC's incomplete transition during ISI are myriad and go beyond the scope of the present work. However, a few points merit mentioning. Amsden (2001) shows that Latin American governments – particularly Argentina and Brazil – failed to implement "reciprocal control mechanisms" to discipline firms that did not meet state-directed goals such as innovation or employment. This problem touches on long-standing aspects of the political economy of Latin America, distinguished as the world's most unequal region in which well-connected executives are notoriously difficult to regulate (see for example Campos and Nugent, 1999; O'Donnell, 1998; and Schneider and Soskice, 2009).

Concurrent with, and partly due to, these institutional struggles with industrialization, Bértolo and Ocampo (2012) demonstrate that, counter to Prebisch's and Singer's urging to attract and mobilize international capital for development, most economic growth in LAC during the ISI era stemmed from increased domestic consumption rather than investment or exports. Furthermore, they explain that ISI policies largely relied upon the importation of capital goods for industrialization, which required more foreign exchange than these nascent sectors generated through exports. The resulting debts could not withstand the interest rate shock of 1980s, contributing to the Latin American debt crisis and the end of ISI (for more, see Thorp and Whitehead, 1987).

After the ISI period, LAC shifted back toward commodity production and exports in a process of "re-primarization." This shift began in the 1990s through a globalization-led shift back toward LAC's traditional sectors of comparative advantage. A second phase of re-primarization, beginning in the 2000s, can be attributed to the rise of China as a major trading partner (discussed further in Essay 1). This period of neo-extractivism is not exactly like the previous period, however. Groundswells of civil society organization (discussed more thoroughly in Essay 2 and 3) ushered in left-of-center governments across the region, most notably in South America, on promises of more broadly distributing the benefits – and limiting the costs – of mining, oil, gas, and agricultural production. These new governments – dubbed the "pink tide" by political scientists and commentators – brought a long series of reforms, varying among locations, including environmental regulation, labor protections, indigenous rights guarantees, and the use of natural resource rents (either through nationalization or taxation) from the most recent commodity boom to fund increases in infrastructure and social spending. It should be noted that this increase in social spending has not completely offset the impacts of re-primarization, which has resulted in weaker and less stable labor markets. As Bértolo and Ocampo (2012) note, "As a whole, social trends can … be summarized as involving increased social spending and coverage of social services accompanied by rising job precariousness and economic insecurity (248)." For more on the "pink tide," these reforms, and their limits, see Ballón et al (2017); Fritz and Lavinas (2015); Lavinas and Simões (2017); Lustig (2014); and Vakis, Rigolini, and Lucchetti (2016).

I.6 Structure of the Remainder of This Work

It is this last period – the "pink tide" concurrent with the most recent commodity boom – that this collection of essays examines through the framework of social, environmental, and economic sustainability. It explores how LAC reforms have interacted with trends in international flows – trade, development finance, and investment – to impact the region's long-standing goals of establishing a more diversified and sustainable economic paradigm. In two out of the three essays, it also considers the introduction of new or strengthened partnerships with China. As mentioned above, the re-primarization that has characterized the most recent commodity boom has been driven by demand for raw materials from China. However, Chinese investors and lenders have also shown themselves to be willing to adapt to local regulatory environments (Buckley et al.;

2007; Ramasamy, Yeung, and Laforet, 2012; Gallagher, Irwin, and Koleski, 2012). Between these two factors, then, the entrance of China as a major partner for the region has reinforced the region's re-primarization with social and environmental protections – referred to here as "high-road re-primarization" or "high-road extractivism."

In doing so, the present research attempts to update Prebisch and Singer's diagnosis. Rather than focusing on Singer's goal of "sustained development and industrialization," it broadens its view to include the United Nations Development Program (UNDP) Sustainable Development Goals (SDG) framework, which encompasses economic, social, and environmental sustainability (UNDP, 2016). Underlying Prebisch and Singer's analyses was a deep concern for avoiding crises. The UNDP SDGs address crisis avoidance on the economic and social levels envisioned by Prebisch and Singer, complemented with avoidance of *environmental* crises, which can no longer be isolated from social and economic stability, especially considering the confluence of social and environmental conflicts in LAC discussed above. Addressing each of the 17 SDGs independently would be beyond the scope of this work. Instead, it takes the "three pillars" approach to sustainability (encompassing economic, social, and environmental realms, as discussed by Littig and Griessler, 2005 and reflected in the UNDP SDGs) as an updated version of Prebisch and Singer's view.

This work applies the "three pillars" framework to LAC's interaction with each of the three global flows, at three different levels of detail:

- Essay 1 examines trends in *trade* for the entire LAC region.

- Essay 2 examines *development finance* for infrastructure for the western Andean nations of Colombia, Ecuador, Peru, and Bolivia.
- Essay 3 examines *foreign direct investment* in the oil sector in Ecuador.

The first essay weighs the environmental (and indirectly, due to the links discussed above, social) impacts of LAC re-primarization in its most recent, China-driven phase. It finds that, regardless of the region's attempts to improve the distribution of costs and benefits of with re-primarization, LAC natural resource production is intrinsically crisis-prone environmentally and socially. It generates more net carbon emissions, and uses or contaminates more water, per million dollars of exports than manufacturing does. Applying these findings to the so-called "China boom" of re-primarization from 2003 to 2013, it finds that LAC exports to China are associated with significantly more carbon emissions and over twice as much water use and contamination as other exports.

The second essay explores ways in which new environmental and social protections have altered the profile of development lending for infrastructure in the Andean nations of Columbia, Ecuador, Peru, and Bolivia, which have experienced an infrastructure boom concurrent with the commodity boom and which are home not only to the most biodiverse sections of the Amazon rainforest but also the highest concentration of uncontacted and voluntarily isolated indigenous communities on Earth. During this time, these countries – and some of the international development finance institutions (DFIs) that lend to them – developed regulatory protections to limit potential social and environmental costs, including environmental impact assessments (EIAs); prior consultations with affected indigenous communities and in some cases, free, prior, and informed *consent* (FPIC) of those communities; and grievance mechanisms (GM). This essay measures the environmental impact (using geospatial imaging of tree cover change) associated with the 84 infrastructure projects financed by international DFIs between 2000 and 2015 in these countries. It finds that those projects undertaken under policy regimes including prior consultation provisions were associated with significantly less tree cover loss. This finding reinforces the intertwined nature of environmental and social concerns in LAC and reinforces other scholars' work on the "environmentalism of the poor," that environmental impacts can be mitigated by empowering those most likely to be affected by them (see for example Martinez-Alier, 2002).

The third essay more closely examines the mechanisms of "high-road extractivism," characterized by ambitious environmental and social protections. It traces the development of a new regulatory regime overseeing oil production in Ecuador, the severing of relationships with oil investors with unsatisfactory environmental and social performance records, and the welcoming of new partners in the form of Chinese SOEs. It explores the extent to which these new partnerships gave Ecuador policy space to implement its new regulatory framework. It finds that the Chinese oil SOEs in Ecuador have avoided the environmental degradation and social conflicts that characterized US-based MNC oil investment in past commodity booms. However, Ecuador's model of "high-road extractivism" cannot be labelled a success. Legal research and key stakeholder interviews show that Ecuador is falling back into a pattern of conflict-ridden oil extraction, due in large part to the Ecuadorian government's inability to implement its own prior consultation protections before auctioning new oil concessions.

CHAPTER 1

THE PANDA'S PAWPRINT: THE ENVIRONMENTAL IMPACT OF THE CHINA-LED RE-PRIMARIZATION IN LATIN AMERICA AND THE CARIBBEAN

1.1 Introduction

In the last 10 years, China has grown into a major trade and investment partner for Latin America and the Caribbean (LAC). It is now South America's top export destination and the second-largest source of FDI inflows for the LAC region. However, it has also come to symbolize the trend of "re-primarization" in LAC: the shift away from state-led industrialization back toward LAC's traditionally competitive production of raw commodities. While much has been written about how this new relationship fits into the history of industrial policy in LAC, less has been written about its environmental impacts in LAC, one of the world's most biodiverse regions and home to most of the world's annual tropical deforestation. Several prominent scholars have hypothesized that primary production should be less environmentally intensive than manufacturing in middle-income countries like those in LAC. This chapter sets out to test that hypothesis against evidence from the last decade in LAC. It finds that primary production is *more* environmentally intensive than manufacturing in LAC (measured through net greenhouse gas emissions and water use), and LAC exports to China are significantly more environmentally intense than other LAC exports.

1.2 Context: LAC's China-Led Re-Primarization and its Environmental Impacts

Many scholars have discussed re-primarization in LAC and the importance of China in driving it. Other scholars have posited that LAC has a comparative advantage in inexpensive production of environmentally-intensive goods and serves as a "pollution haven," attracting investment in these sectors from countries with stronger environmental safeguards. Finally, the work of a third group of scholars, grounded in the environmental Kuznets curve, predicts that primary production should be environmentally less intensive than industrial production in middle-income countries such as those in LAC. This chapter aims to complement the existing literature by testing the differences in the environmental impact of production in LAC by the level of technology involved, and whether the China-driven trend of re-primarization in Latin America has, in fact, driven production into environmentally "cleaner" or "dirtier" sectors.

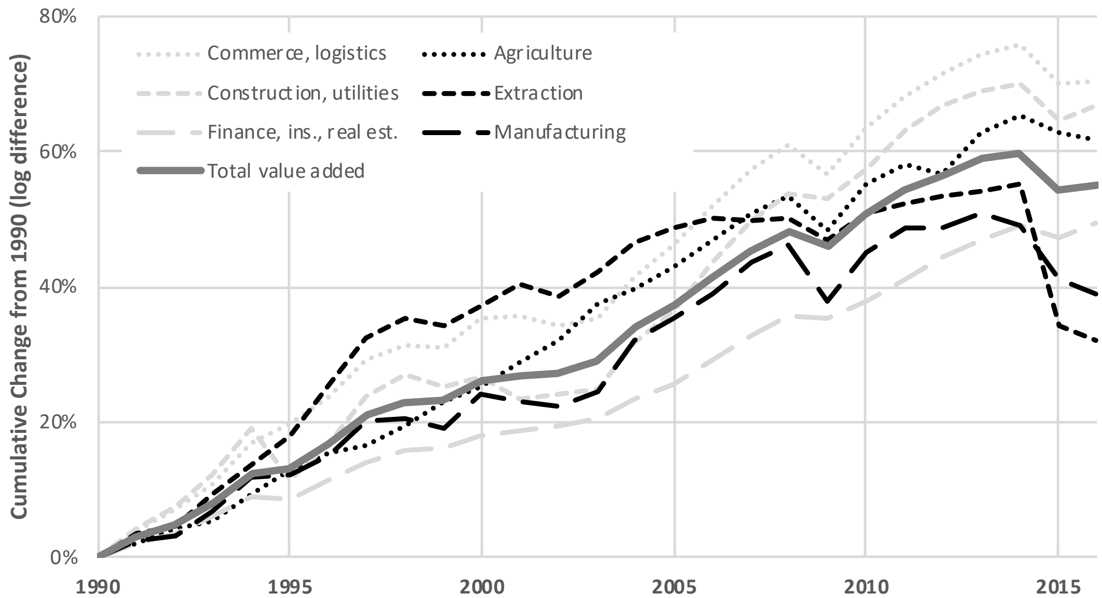
1.2.1 Re-primarization in LAC

Scholars and policy makers alike have noted the tendency of LAC production to shift back toward primary commodity production over the last few business cycles, dubbed "re-primarization." The seminal works by Amsden (2001) and Bértolo and Ocampo (2012) both draw a direct link between this trend and the broader switch in Latin American development strategy from one based on state-led industrialization through import substitution (ISI) toward one based on neoliberal macroeconomic policy and export orientation. Bértolo and Ocampo point out that the late ISI period was characterized by trade deficits, counter to its stated goals. Amsden resolves this seeming paradox by explaining that LAC continued to rely foreign capital goods in order to support domestic manufacturing. Bértolo and Ocampo show that only in the last decade, since 2004, has Latin America regained positive trade balances. However, these trade surpluses came at the cost of an erosion of the gross fixed capital formation, and a shift back toward the primary production that characterized the period before ISI.

It is important to resist overstating the extent of re-primarization. As Bértolo and Ocampo (226) note, much of this apparent shift is an artifact of rising commodity prices. Thus, to more accurately assess the timeline of re-primarization, it is important to measure it in real terms. Figure 1.1 shows real growth by sector over the last 20 years.

As Figure 1.1 shows, goods production of all types has slowed relative to overall GDP growth in the last decade, but this is especially true for manufacturing. In fact, of the three merchandise-producing sectors (agriculture, extraction, and manufacturing), only agriculture has largely kept up with overall value added in the LAC economy. (In the 2015 recession, all sectors suffered, but none so much as extraction, which was set back by decades. Its growth appears to be the most volatile of any sector shown here, but it is too early to tell when it will recuperate.) The manufacturing slowdown relative to overall real GDP growth began in the early 2000s, so the remainder of this chapter will look more closely at the last decade.

Figure 1.1: Real GDP growth for the LAC region, selected sectors, 1990-2016



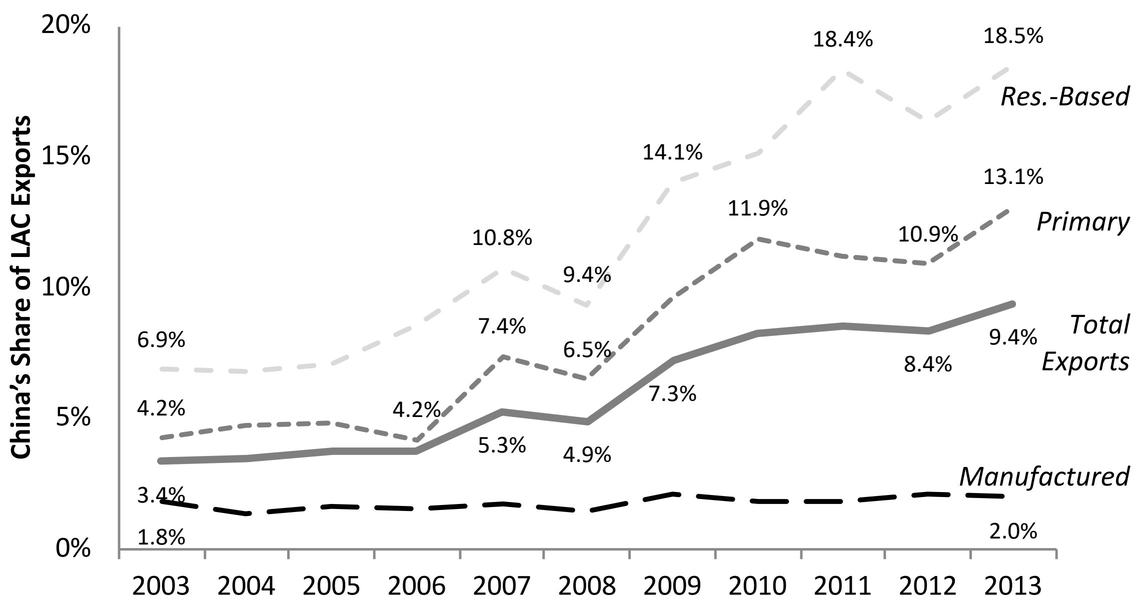
Source: ECLAC CEPALStat database.

1.2.2 China's Role in LAC's Re-Primarization

Scholars attribute LAC's re-primarization over the last decade to the rise of China as the world's largest economy and as a major trading partner for the LAC region. China has contributed to LAC's re-primarization in two ways: by raising global demand (and prices) for raw commodities and by intensifying competition in the production of inexpensive manufactured goods. The UN Economic Commission for Latin America and the Caribbean (ECLAC, 2015) and Myers and Jie (2015) expand on the former point, showing that Chinese investment and import demand have spurred LAC primary production. Gallagher and Porzecanski (2010) and Mesquita Moreira (2007) expand on the latter point, showing that China has out-competed LAC for market share in world manufacturing exports.

All of the authors listed above agree on one important point: China's demand for LAC exports has been overwhelmingly concentrated in low-technology goods. Figure 1.2 shows China's rising share of LAC merchandise exports during the 2003-2013 commodity boom, according to the Lall (2000) technology scale. Overall, China's share of LAC exports more than doubled, from 3.4 to 7.8 percent of the total. China is now the largest market for South American goods, and the second-largest market for goods exports from LAC overall. The fastest growth was seen among primary goods, in which China more than tripled its market share, growing from just 4.2 to 13.1 percent of the region's exports in a decade. However, this growth has left manufacturing behind at just two percent of the total.

Figure 1.2: China's share of LAC exports, by technology level



Source: Author's calculations using Lall (2000) and UN Comtrade data.
Note: Detailed information can be found in Appendices A.1 and A.2.

China's importance as an LAC export market jumped in 2009 because of the global downturn, which China survived relatively unscathed. Instead of falling back to its pre-recession levels, however, China's importance continued to grow. By 2013 its market share was about twice its level from a decade before for total exports and for resource-based goods, and over four times as large for primary exports.

As Table 1.1 shows, China drove the growth in non-manufactured exports from Latin America. China accounted for about 40 percent of the growth in the LAC region's primary and resource-based exports, compared to about 20 percent of total export growth and just four percent of the growth in manufactured exports, in real terms.[2]

Table 1.1: China's contribution to the re-primarization of LAC exports

	Sectors			Total
	Primary	Res.-based	Manuf.	
LAC Exports to China (billions of real USD)				
2003	3.6	7.9	3.3	14.8
2013	20.4	19.2	7.0	46.6
Growth	*466.7%*	*143.0%*	*112.1%*	*214.9%*
Total LAC Exports (billions of real USD)				
2003	111.8	104.0	217.4	437.7
2013	154.0	132.0	305.1	600.2
Growth	*37.7%*	*26.9%*	*40.4%*	*37.1%*
China's share of LAC exports				
2003	3.2%	7.6%	1.5%	3.4%
2013	13.3%	14.5%	2.3%	7.8%
Growth	*314.9%*	*91.3%*	*51.2%*	*129.4%*
China's contribution to LAC export growth	**40.0%**	**40.3%**	**4.2%**	**19.6%**

Source: Author's calculations using CEPALStat, FAO World Food Price Index, Lall (2000), UN Comtrade, and the World Bank GEM Commodity Database. Detailed information can be found in Appendices A.1 and A.2.

[2] See Appendix A.2 for details on the deflation methods used in this essay.

Interestingly, Table 1.1 also shows that LAC exports overall did not tilt dramatically away from manufactured goods: primary and manufactured goods both grew by about the same amount, and significantly more than resource-based goods. This implies that the re-primarization shown in Figure 1.1 may be due to switching from consuming domestically-produced to imported manufactured goods. Nonetheless, it remains clear from Table 1.1 that the effect of China's demand has been one of spurring primary production much more than it would be otherwise. Based on the information presented above, it is safe to conclude that China has pushed LAC exports toward primary and resource-based products. The sections below estimate the environmental impact of this re-primarizing pressure.

1.2.3 LAC as a "Pollution Haven:" an Imperfect Fit for the China Boom

Given LAC's new surge in investment and exports, the "pollution haven" framework is an intuitive fit for predicting the expected effect on of the China boom on the environmental intensity of LAC exports. This approach posits that developing countries attract pollution-intensive investment and specialize in those sectors under conditions of free trade. Stern (1998) expresses this as an extension of the Heckscher–Ohlin trade theory, in which developing countries have a comparative advantage in pollution-intensive production because of a dearth of costly regulation. In this line, Levinson and Taylor (2004) find a significant, positive impact of US environmental regulations on imports within that industry, implying that environmental protections discourage investment at home but encourage investment abroad instead. In contrast, Birdsall and Wheeler (1993) find that openness to trade among Latin American countries (with relatively weak environmental protection) was associated with *less* pollution-intensive growth in the 1960s through 1980s, and hypothesize that market forces such as the introduction of newer technology and shareholder pressure can account for the seeming paradox, in line with the "pollution halo" hypothesis. However, neither of these approaches can adequately address LAC's "China boom," because each of them assumes a North-South trade and investment relationship, where the importing country has higher environmental standards than the exporting country. So, LAC's "China boom" is fertile territory for new explorations of the environmental impact of South-South relationships.

1.2.4 Environmental Effects of Re-Primarization in Middle-Income Countries

A more apt framework must incorporate the relative environmental intensities of different sectors within developing countries. Grossman and Krueger (1995) and Antweiler, Copeland, and Taylor (2001) both allow for further exploration in this area. Grossman and Krueger describe a mechanism behind the observed "environmental Kuznets curve," in which in which middle-income countries have more environmentally-damaging production than either poor or rich countries. In their framework, developing countries' pollution intensity rises as those countries industrialize, and then falls again, in part due to an "induced policy response" demanded by the citizenry to curtail the environmental damages caused by industry. Antweiler, Copeland, and Taylor (2001) develop a model to measure the impact of trade liberalization on emissions in poorer and richer countries. Their model anticipates that under free trade, poor and middle-income countries will switch from industrial to primary production, following the Heckscher–Ohlin theory that countries will gravitate toward specialization in either capital- or labor-intensive production depending on the relative strengths of their endowments.[3] Primary commodity production is treated as intrinsically environmentally cleaner than manufacturing, as Antweiler, Copeland, and Taylor incorporate Grossman and Krueger's "induced policy response" by modeling an environmentally beneficial scenario of free trade in which rich countries (with more stringent environmental safeguards) specialize in capital-intensive industry, satisfying both their comparative advantage in capital-intensive industry and their ability to mitigate its pollution.

Both of these models suffer from limitations associated with data availability on emissions at the time of their publication. To operationalize their models, both studies rely on estimates of SO_2 emissions, which are strongly associated with industrial production. Thus, both of these papers assume that technology level and emissions are directly related, absent policy interventions controlling industrial emissions. The Antweiler, Copeland, and Taylor model assumes two kinds of production: one with low technology inputs and no emissions, and one with high technology inputs and high emissions. Grossman and Krueger envision three levels of production: clean primary production; emissions-intensive industrial production in middle-income, recently industrialized countries; and clean industrial production in wealthy countries with intensive environmental regulations. It is now possible to revisit their original approaches as they apply to the more politically pressing environmental impacts of the early 21st

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3 While both sides of the China-LAC trade relationship are middle-income countries, Antweiler, Copeland and Taylor's approach is still applicable here. As Gallagher and Porzecanski (2010) show in great detail, China's greater capital intensity (and relatedly, higher labor productivity) has allowed Chinese manufactured goods to displace Latin American manufactured goods not only within the LAC region but also in traditional LAC export markets such as the United States. Thus, China has taken the role of the richer trading partner in Antweiler, Copeland and Taylor's model.

century: greenhouse gas (GHG) emissions and water use and contamination. The former is now the subject of global negotiations, with active debates surrounding the proper role for developing countries in limiting global carbon emissions. The latter is the most frequent cause of environmentally-based social conflict in LAC, according to the case studies of Ray et al (2017). More recently published estimates of GHG intensity, technology levels, and trade data that have been published since those studies allow for such an exercise, detailed below.

1.3. Testing the Models: Should Middle-Income Countries Specialize in Primary Production?

Thanks to recently published, detailed estimates of the environmental impacts of specific commodities for most countries in the world, it is now possible to test the expectation that specializing in primary production is environmentally beneficial for developing countries, and for Latin America in particular. Specifically, this is possible for two forms of environmental impacts, one global (greenhouse gas emissions, GHG) and one local (water use). Each of these analyses is conducted separately in the sections below, drawing on the various methodologies to measure the embodied carbon and water in exports used by Peters (2011), Biewald et al (2014), and Sato (2014). They focus on exports rather than overall production, because export data is available disaggregated into highly specific categories through the UN Comtrade database.

For both GHG emissions and water use, environmental science literature has estimated the environmental footprints of most exports, disaggregated by the traded items and countries of origin. These disaggregated trade line items can be further classified into technology levels using the method developed by Sanjaya Lall (2000).[4] Lall's classification system has five main categories: primary products (unrefined agricultural and extractive products), resource-based products (processed agricultural and extractive products such as soybean oil and refined petroleum), low-technology manufactured goods (such as apparel and basic metal products), medium-technology manufactured goods (such as vehicles and chemical products), and high-technology manufactured goods (such as electronic and medicinal products). The resulting technology-based environmental footprints are explained in detail below.

1.3.1 Greenhouse Gas Emissions

Contrary to the expectation suggested by the environmental economics literature cited above, the most GHG-intensive products in poor and middle-income countries are not high-technology manufactured goods but primary goods, resource-based goods (such as soybean oil and refined petroleum), and lower-technology manufactured goods. Figure 1.3 shows the average carbon intensity (measured in kilograms of CO_2 equivalent per dollar) for exports in each of Lall's technology categories and each income level of countries.

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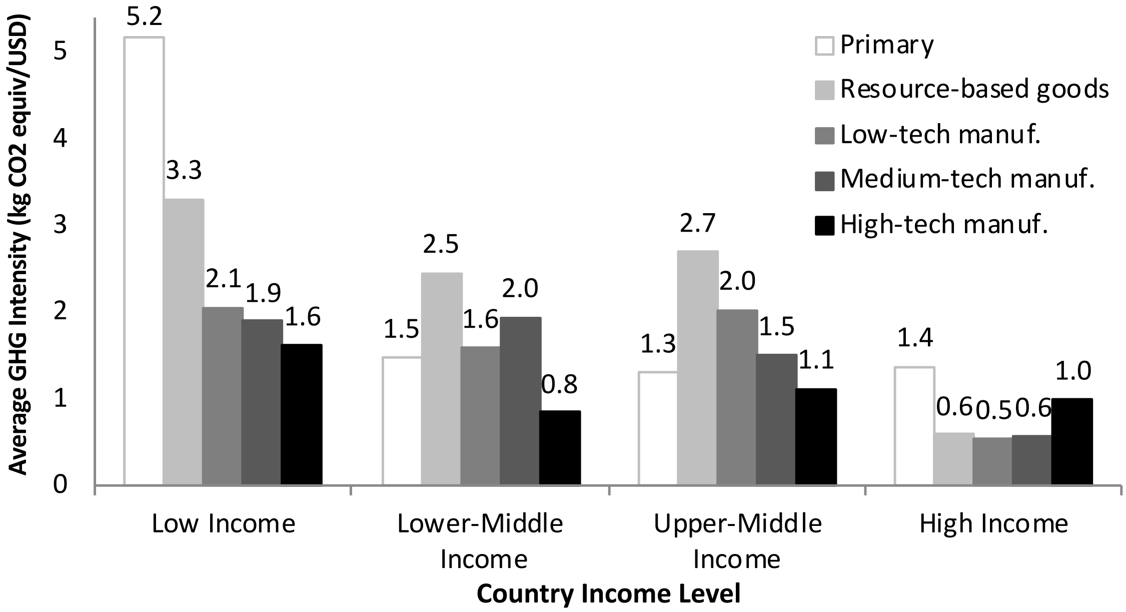
[4] Details for these calculations can be found in Appendix A.1.

Figure 1.3: Net GHG emissions of exports by technology level and country income level, 2007



Source: Author's calculation based on Lall (2000), Peters (2013), and UN Comtrade. Country income levels are defined using World Bank categories. Detailed information can be found in Appendix A.1.

These emissions calculations use GHG intensity data from a model developed by Peters (2011), which establish the net GHG embedded in each dollar of exports, by country of origin and GTAP category.[5] By applying these intensities to UN Comtrade export data for each country in the world and classifying that data into Lall's (2000) technology categories, it is possible to calculate average net GHG intensities of globally traded merchandise by technology level. Figure 1.3 shows the result for the year 2007, the most recent year of Peters' data.[6]

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[5] The Global Trade Analysis Project (GTAP) classifies trade into 57 categories of goods and services, with heavy disaggregation among agricultural products. Because they are much broader categories than the SITC categories used by the UN Comtrade database, it is simple to establish a corresponding GTAP category for each SITC category. More information on GTAP is available at https://www.gtap.agecon.purdue.edu/.

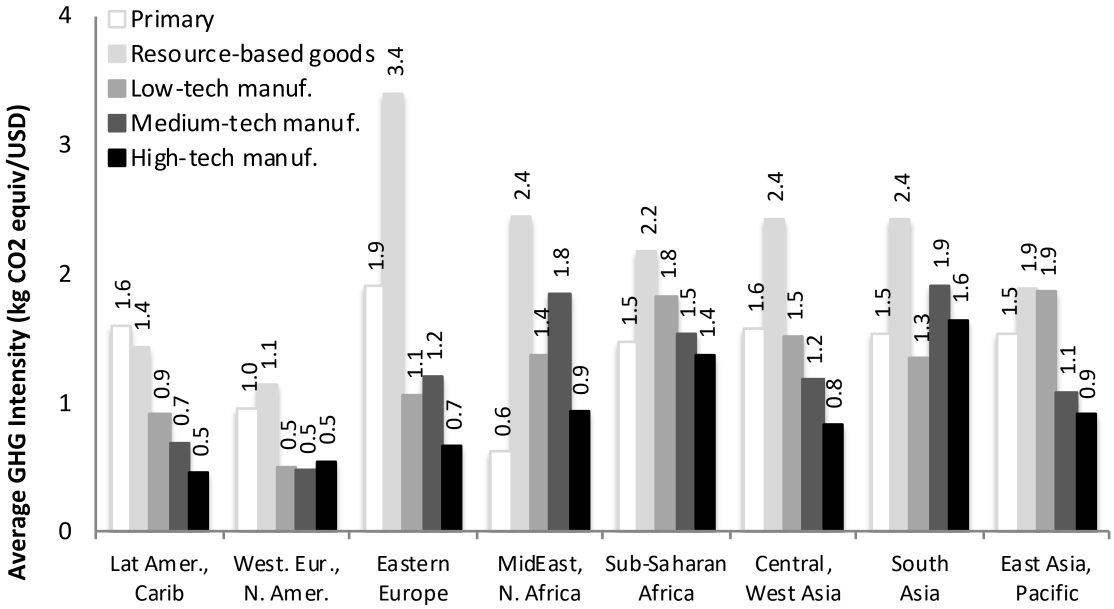
[6] For a detailed explanation of the calculations behind Figure 1.3, see Appendix A.1.

Figure 1.3 shows GHG intensity on a net basis, including the destruction of natural carbon sinks through deforestation and the clearing of grasslands. It also includes non-CO_2 sources of carbon emission, such as methane from agricultural production. Finally, it includes emissions from upstream inputs. For example, for electronic goods, these intensity estimates include emissions embedded in the entire supply chain, from the mining the metals involved through the manufacturing process itself.

According to Figure 1.3, for middle-income countries, net GHG emissions peak in resource-based goods before falling again as technology levels continue to rise. These falling emissions associated with higher-technology goods indicate that as technology levels increase, the value of these exports is rising more quickly than the emissions. For goods whose emissions are associated with the upstream inputs (for example, leather goods whose emissions are associated with cattle ranching), this means that the value of the primary inputs is falling as a share of the final value of the exports.

A *prima facie* analysis would support the hypothesis, associated with the environmental Kuznets curve, that if middle-income countries have more environmentally-intensive production, it is because they traditionally specialize in natural resource processing and lower-technology manufacturing. However, this inverted-U relationship between technology level of merchandise exports and net GHG emissions does not appear to hold for Latin America and the Caribbean, as Figure 1.4 shows. While in other regions, emissions are higher for natural resource refining and low-technology manufacturing, LAC shows the highest net GHG emissions from primary productions and falling emissions with each increase in technology.

Figure 1.4: Net GHG emissions of export baskets by region and technology level, 2007



Source: Author's calculation based on Lall (2000), Peters (2013), and UN Comtrade (n.d.). Detailed information can be found in Appendix A.1.

LAC is unique among world regions in the fact that the GHG emission intensity of exports falls with every increase in technology. Every other region shown in Figure 1.4 exhibits an inverted-U relationship between technology level of merchandise exports and their net GHG emissions.[7] This outsized GHG intensity for primary products in LAC is likely related to the importance of land-use change as a driver of GHG emissions in Latin America and the Caribbean. However, LAC is not totally unique among regions in the

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[7] A seeming paradox emerges between Figure 1.3, which shows a downward-sloping relationship for low-income countries (LIC), and Figure 1.4, which shows and inverted-U relationship for Sub-Saharan African (SSA). That paradox is resolved because of the importance of Nigeria and the Southern African Customs Union countries, which are not LIC but collectively accounted for over half of SSA exports in 2007. The technology-GHG relationship for these countries resembles that shown for SSA in Figure 1.4: an inverted U. In contrast, LAC is a mix of lower-middle, upper-middle, and high-income countries. The largest exporters in the region (Mexico and Brazil) comprise over half of all LAC exports and are both upper-middle income countries, but they are outliers for that income level, with a downward-slowing relationship between technology and GHG intensity. More country-specific disaggregation of LAC results can be found in Figure 1.10 and Appendix A.3.

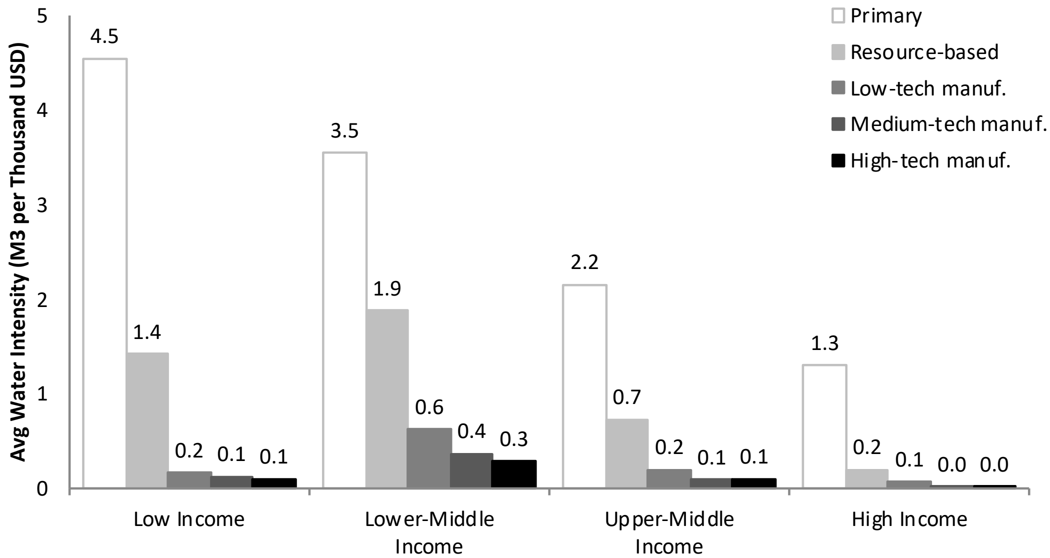
importance of land use change as a contribution to total net GHG emissions. WRI (2014) shows that in 2007 (the year shown in Figure 1.4), land use change and forestry accounted for 31 percent of net GHG emissions in LAC, a rate much higher than the world average (seven percent) but surpassed by the rate of Sub-Saharan Africa (47 percent). Thus, the results shown in Figure 1.4 should be interpreted as the total GHG impact of various sectors of economic activity for export, with the understanding that LAC is among the highest – but not the highest overall – among regions for the importance of land use change among drivers of GHG emissions. The use of net, rather than gross, emissions in this analysis is intentional, as the inclusion of land use change incorporates the social impacts of environmental damages (for more on this relationship in Latin America, see Chapter 2). Across the Amazon basin as a whole, ecologists have shown that agriculture, extraction, and most importantly, the access roads necessary to get those products to cities and ports, have been the major drivers of deforestation (see for example Cattaneo 2001, Fearnside 2006, and Swing 2011).

In sum, from a GHG perspective, it is unambiguously better for the LAC region to produce high-technology goods. This is especially true in an era of export-oriented growth, in which planners depend on export revenue for boosting GDP.

1.3.2 Water Footprints

Regarding water footprints (which incorporate both water use and water contamination), the trend is clearer: primary products are overwhelmingly more water intense. Figure 1.5 shows that this relationship holds globally, regardless of country income level.[8]

Figure 1.5: Water intensity of exports by tech. level in 2005, by country income level

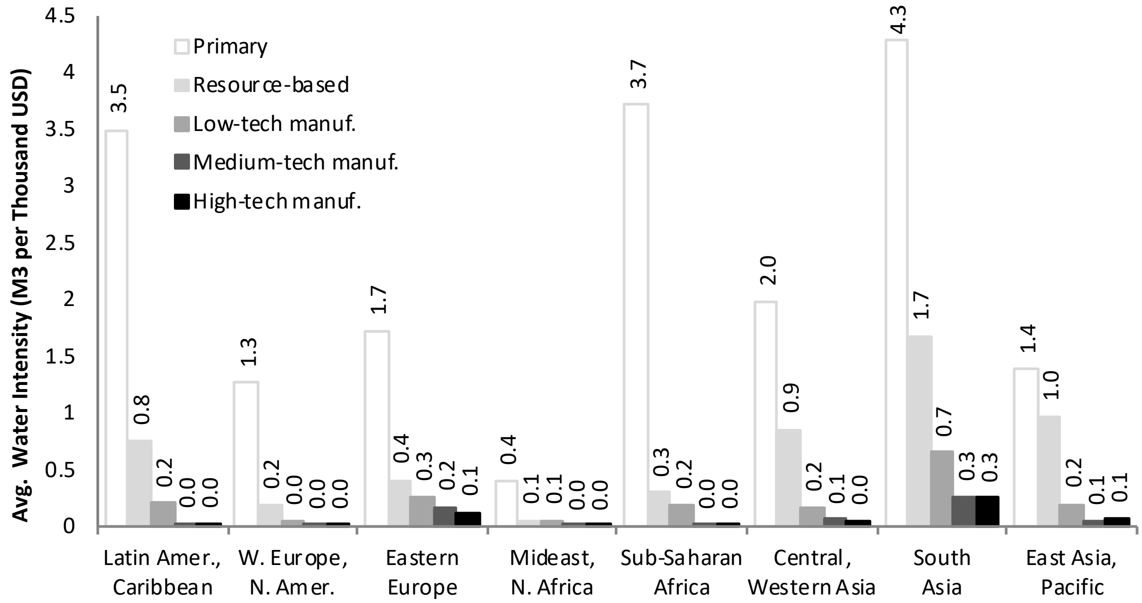


Source: Author's calculation based on Lall (2000), UN Comtrade (n.d.), and WaterStat (n.d.). Country income levels are defined by World Bank categories. Detailed information can be found in Appendix A.1.

All regions share this same basic profile, as Figure 1.6 shows. There is a stark difference between the primary and manufactured goods worldwide, and the LAC region is no different.

[8] The water footprints incorporated into this analysis include green, blue, and grey water footprints, defined as (respectively) the use of water by plant root uptake; surface/ground water uptake for domestic, industrial or irrigation uses; and the use of water to assimilate pollutants (ie, the creation of greywater). These three types of water footprints are collectively called "water use and contamination" in this chapter, though it is worth pointing out that the impacts of each are not interchangeable. Groundwater used for irrigation, for example, may in some circumstances be reused for other purposes. Nonetheless, this chapter aggregates the three types of water footprints both for the sake of simplicity and in order to take into account the various sources of water-based social conflict, as competition for clean water can arise from either the use or contamination of water sources.

Figure 1.6: Water intensity of exports by region and technology level in 2005



Source: Author's calculation based on Lall (2000), UN Comtrade (n.d.), and WaterStat (n.d.). Detailed information can be found in Appendix A.1.

The water footprint calculations included here rely on the Water Footprint Network's WaterStat database, developed by Mekonnen and Hoekstra (2011 a, b; 2012). Mekonnen and Hoekstra identify the water footprints (expressed as cubic meters of water per thousand USD) for each six-digit Harmonized System (HS) code of exports, averaged across the period 1996-2005. Figure 1.6 applies those average intensities to UN Comtrade export data for every country in the sample for the year 2005, the most recent year of Mekonnen and Hoekstra's calculations. (See Appendix A.1 for a full explanation of the calculations used here.)

In sum, it seems that from an environmental standpoint LAC would be wise to concentrate on manufacturing. In fact, the greater the technology used in production, the better the environmental impact of each dollar of exports will be.

1.4. The China Effect on GHG and Water Intensities of LAC Exports

The previous sections have established two key points. First, LAC market deregulation coincided with Chinese demand for raw materials to drive re-primarization of LAC exports. Second, primary commodity production is much more environmentally intensive than manufacturing in Latin America, as measured by GHG and water intensities. From these two points, it is reasonable to expect that LAC exports to China have been more environmentally intensive than other LAC exports. It is possible to test that expectation by repeating the analysis behind figures 1.3 through 1.6, dividing the LAC export basket by destination market.[9] The sections below do so, and find that LAC exports to China have indeed produced more net GHG emissions and used more water than other LAC exports.

1.4.1 Greenhouse Gas Intensity of LAC Exports to China and Elsewhere

The same method used to calculate relative GHG intensities of exports based on technology levels in Figures 1.3 through 1.6, above, can be used to compare the GHG intensities of LAC exports to China and other LAC exports. The results appear in Figure 1.7.[10]

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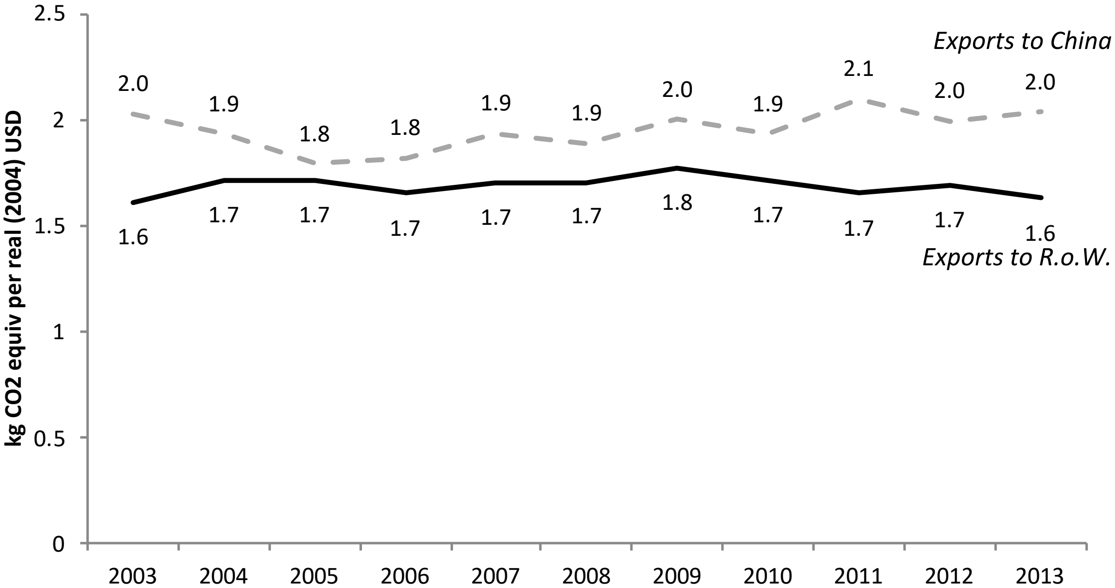
[9] These differences over time and between export market are due entirely to export basket composition. Differences in production technology are impossible to trace, because of opaque value chains from factory or farm to final destination country. Moreover, even if such granularity were available for one year, supply chains would be unlikely to remain constant between years, especially for highly-substitutable primary products.

[10] In order to trace the relative GHG intensities of exports over time, this section uses the same deflation technique as Table 1.1, above, described in Appendix A.2.

Figure 1.7: Average GHG intensity, LAC exports by destination

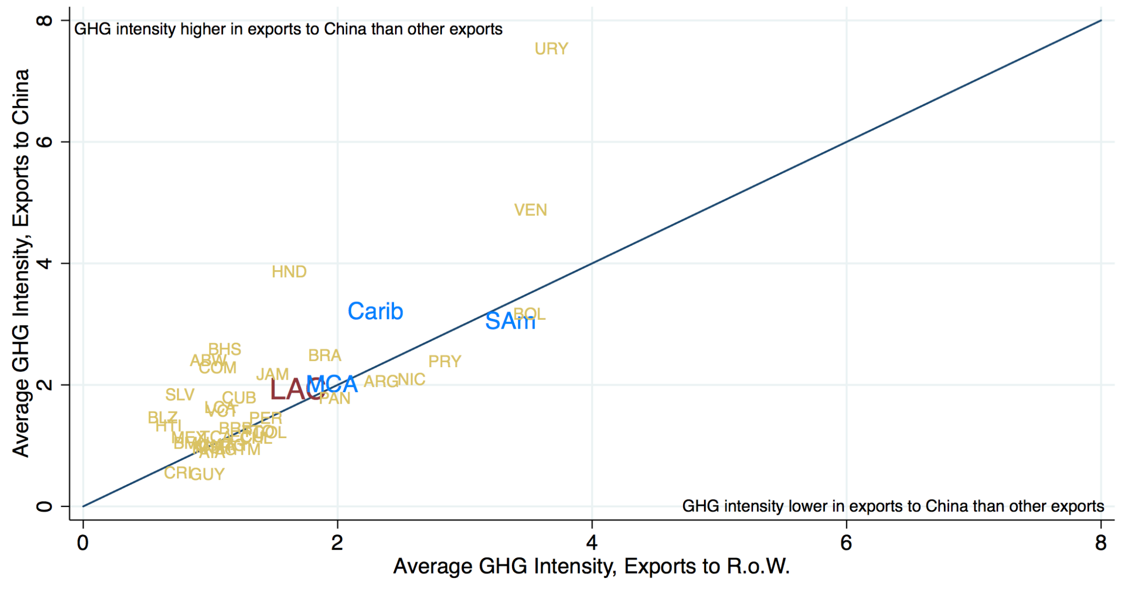


Source: Author's calculations using CEPALStat, FAO World Food Price Index, Peters (2013), UN Comtrade, and the World Bank GEM Commodity database. Information for the GHG intensity of overall economic activity is from World Resources Institute 2013. Detailed information can be found in Appendices A.1 and A.2.

From 2004 through 2013, LAC exports to China were about 16 percent higher in net greenhouse gas emissions per dollar than other exports. Regression analysis shows that this difference was highly statistically significant (t=6.1), as shown in Appendix A.3.

However, it should be noted that among individual countries, the "China effect" ranges widely. In Guatemala, for example, exports to China are only 81 percent as GHG-intensive as other exports, whereas in neighboring Honduras and El Salvador, exports to China are over twice as GHG-intensive as other exports (201 and 254 percent, respectively). Figure 1.8 compares the average GHG intensity of exports to China and other exports for each LAC country and sub-region in this study, as well as for the LAC region as a whole, from 2004-2013.

Figure 1.8: Average GHG intensity, exports to China and the R.o.W., by country and region



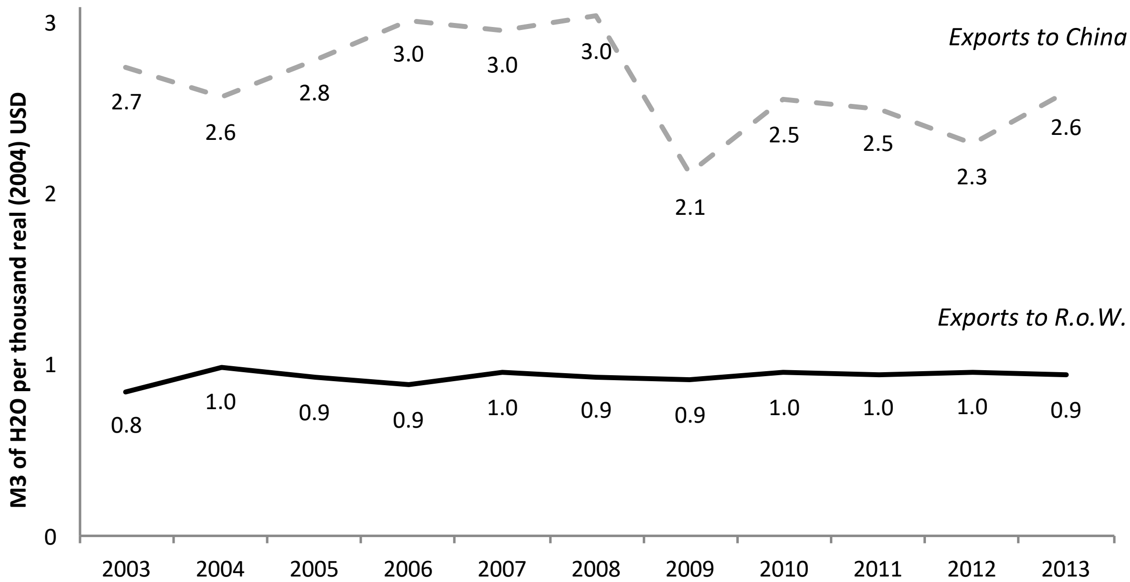
Note: GHG intensity is measured as kg of CO_2 equivalent in net emissions per real (2004) US dollar. Regions shown here include the Caribbean, Mexico and Central America, and South America.
Source: Author's calculations using CEPALStat, FAO World Food Price Index, Peters (2013), UN Comtrade, and the World Bank GEM Commodity database.

1.4.2 Water Intensity of LAC Exports to China and Elsewhere

By focusing the water analysis in Figures 1.5 and 1.6 on LAC exports and comparing the results by export basket, it is possible to determine how much LAC exports to China differ from other exports in their water footprint. As Figure 1.9 shows, LAC exports to China have used or contaminated two to three times as much water as other exports, per real dollar over the years of the most recent commodity boom.[11]

[11] As in the GHG analysis above, these differences over time and between export markets are due entirely to basket composition.

Figure 1.9: Average water intensity, LAC exports by destination



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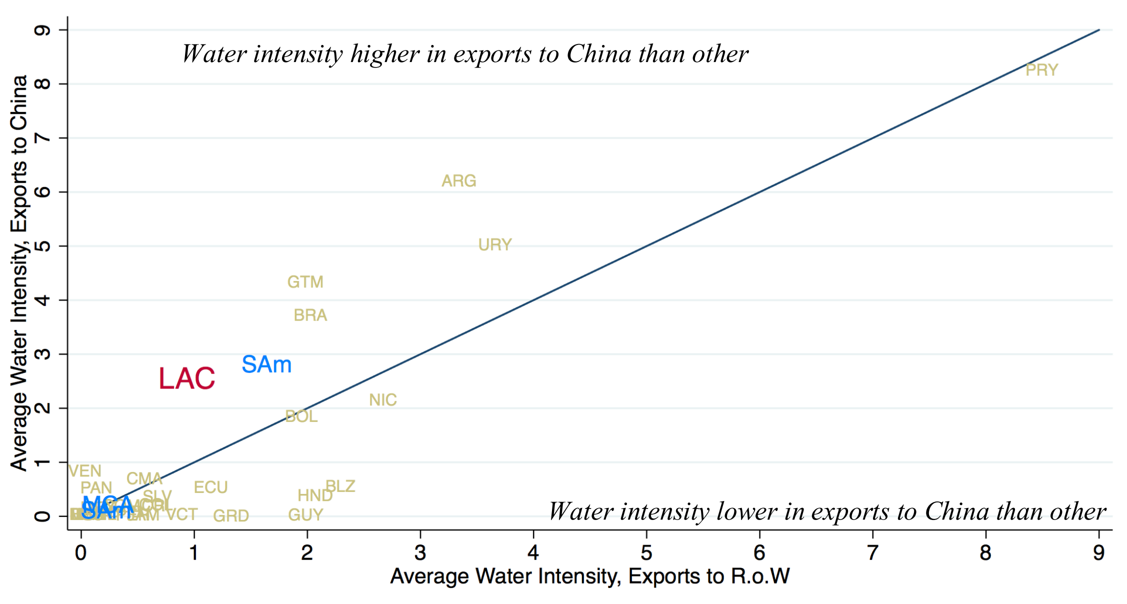
Source: Author's calculation using CEPALStat, FAO World Food Price Index, UN Comtrade, WaterStat, and the World Bank GEM Commodity database. Detailed information can be found in Appendices A.1 and A.2.

Regression analysis (detailed in Appendix A.4) shows that on average over the last decade, LAC exports to China used or contaminated 2.75 times as much water per dollar than other exports, and that this relationship is highly statistically significant (t=22.0). These differences are due entirely to basket composition differences, as LAC's exports to China are much more heavily concentrated in agricultural commodities than is the remainder of LAC exports. As with GHG emissions, LAC countries have had a wide variety of experiences, but in this case the largest exporters (Mexico, Brazil, and Argentina) all have much higher water footprints in their exports to China than in other exports. Figure 1.10 shows the average water intensities of LAC exports to China and to the rest of the world, for each country, sub-region, and for LAC overall, from 2004-2013.

Figure 1.10: Average water intensity, exports to China and the R.o.W., by country and region



Note: Water intensity is measured as cubic meters of water per real (2004) US dollar. Source: Author's calculation using CEPALStat, FAO World Food Price Index, UN Comtrade, WaterStat, and the World Bank GEM Commodity database.

1.4.3. Considering GHG and Water Together: Scale and Composition Effects

From 2003 to 2013, the real value of LAC exports rose by 37 percent, while the net GHG emissions from exports rose by 40 percent and the water used in exports rose by 59 percent. From this information alone, it is clear that the composition of LAC exports is shifting toward more environmentally intensive production.

How much of the rise in export-based GHG emissions and water use is due to the simple growth of exports, and how much is due to the shift in basket composition toward more environmentally-sensitive sectors? Following the example of Grossman and Krueger, it is possible to disaggregate the effect by scale and by composition. (It is not possible to distinguish an effect for technology changes, Grossman and Krueger's third category, because this analysis applies Peters' GHG intensity estimates for 2007 and WaterStat's estimates for 1996-2005 to the entire decade of trade data.)

From 2003 to 2013, net GHG emissions from LAC exports rose by 40 percent, from 709 to 996 megatons. If the carbon intensity of those exports had remained stable and only their volume changed, the emissions would have risen 37 percent, or 92 percent of the actual rise. So, between scale and composition effects, scale accounted for 92 percent of the increase in export-based GHG emissions and composition accounts for the remainder. Thus, if the total amount of LAC exports had remained at its 2003 level, but had still shifted toward China, net GHG emissions from exports would have risen by about eight percent.

Regarding water use, the total water footprint of LAC exports rose by 59 percent, from 383 to 608 billion cubic meters from 2003 to 2013. If the water intensity of exports had remained at its 2003 levels, the water used by those exports would have risen by just 37 percent, or about 62 percent of the actual rise in export-related water use. So, the basket composition of exports accounted for the other 38 percent of the rise in the water use associated with exports.

Of course, in reality, scale and composition interact. The growth in exports to China represents not only a shift in the trade basket toward China, but also an overall growth in exports, concentrated in primary sectors. Table 1.2 explores the share of growth in emissions and water use resulting from the rise of China's importance and the rise of exports in each technology level. It shows that China had an outsized influence on this increase. China accounted for 7.8 percent of the real volume of LAC exports in 2013 (using 2004 USD), but accounted for 19.6 percent of LAC's export growth over the previous decade, 22.7 percent of the increase in export-based GHG emissions, and 33.4 percent of the increase in export-based water usage.

The majority of LAC's growth in both export-based net GHG emissions and water use was due to a rise in primary goods. As Table 1.1 shows, above, China was responsible for about 40 percent of the growth in both primary and resource-based goods.

Table 1.2: China's role in the growth of LAC's export-based GHG emissions and water use

	Share of real exports		Share of total growth, 2003-2013		
	2003	2013	Volume of exports (real 2004 USD)	Export-based net GHG emissions	Export-based water use
By destination					
China	3.4%	7.8%	19.6%	22.7%	33.4%
Rest of World	96.6%	92.2%	80.4%	77.3%	66.6%
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*
By technology level					
Primary	25.5%	25.7%	30.3%	51.0%	96.6%
Resource-based	23.8%	22.0%	21.7%	26.3%	4.4%
Low-tech manuf.	9.9%	7.4%	-1.1%	0.4%	-1.6%
Med.-tech manuf.	28.7%	33.4%	39.2%	19.9%	0.4%
High-tech manuf.	11.0%	10.0%	7.7%	1.4%	0.1%
Other	1.0%	1.5%	2.2%	1.0%	0.0%
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

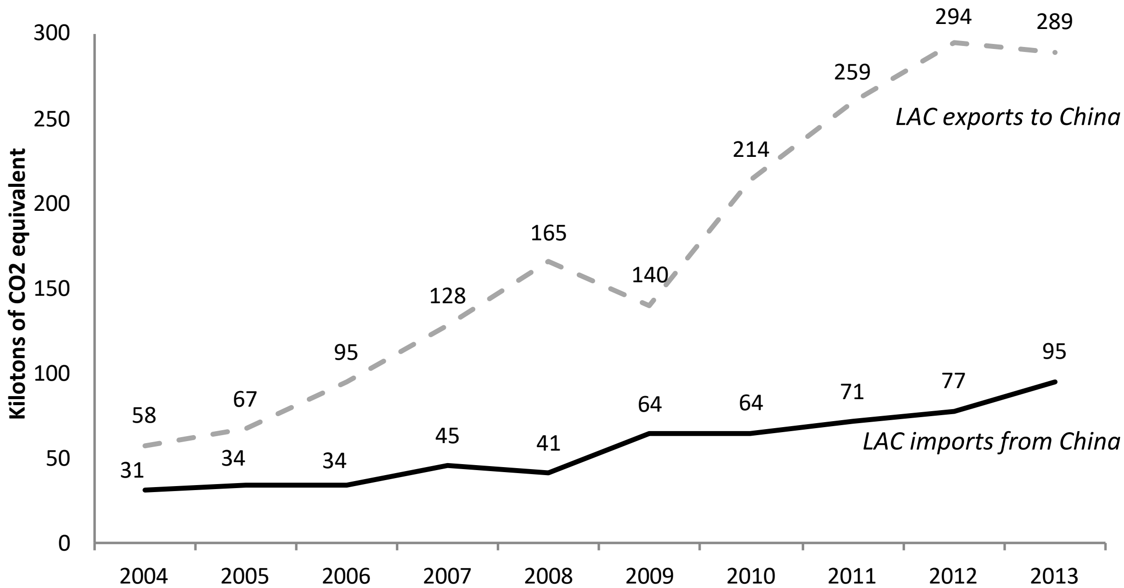
Source: Author's calculation using CEPALStat, FAO World Food Price Index, Peters (2013), UN Comtrade, WaterStat, and the World Bank GEM Commodity database. For detailed information, see Appendices A.1 and A.2.

1.4.4 LAC-China Environmental Balance of Payments: Importing Carbon, Exporting Water

The analysis above accounts only for one side of the LAC-China relationship: exports from Latin America to China. But LAC imports from China are not without their own environmental impact. For example, Peters (2011) shows that measuring the carbon emissions associated with a country's consumption – rather than production – changes the global emissions profile dramatically. For most countries, including trade with China (including the carbon in imports from China and excluding the carbon in exports to China) results in much higher carbon emissions than simply calculating the amount of emissions produced domestically. This effect is due to the high concentration of Chinese exports in light manufacturing, and the relatively weaker environmental standards in the country.

While Peters does not specifically address Latin America, the trend he notes appears to hold for the LAC region as a whole. Even though the region's exports to China are more GHG intensive than other exports, the region's imports from China are even more GHG intensive, in part due to differences in the energy matrix and differences in the composition of the trade basket. The GHG intensity of LAC imports from China ranged from 2.5 to 2.7 kg CO2 equivalent per USD between 2004 and 2013 – much higher than the intensities of 1.8 to 2.0 for LAC exports to China. As a result, LAC is a net importer of greenhouse gas emissions from China, of 289 kilotons in 2013. For reference, the World Resources Institute estimates that the LAC region produced a total of 4.6 gigatons of CO_2 equivalent in net GHG emissions in 2012.

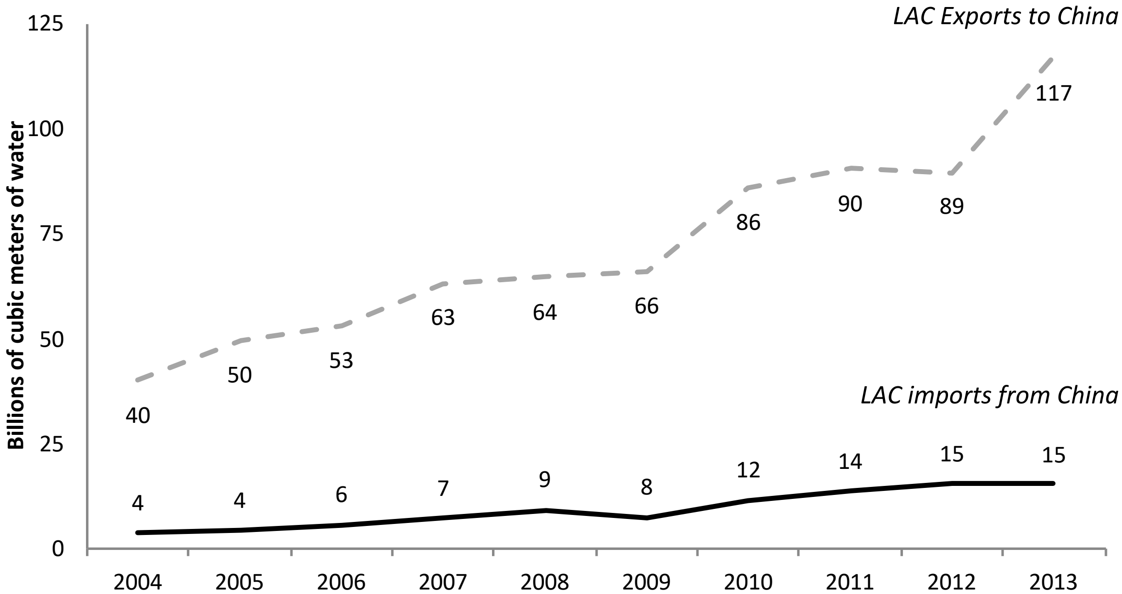
Figure 1.11: LAC-China "balance of payments" in net greenhouse gas emissions



Source: Author's calculations based on UN Comtrade (n.d.), Peters (2013), CEPALStat (n.d.), FAO World Food Price Index (n.d.), and the World Bank GEM Commodity Database (n.d.). For detailed information, see Appendices A.1 and A.2.

This relationship is reversed when it comes to water use, as Figure 1.12 shows. In 2013, LAC exported nearly 120 billion cubic meters of embedded water to China, or nearly eight times as much water as the amount embedded in its imports from China. For reference, Lake Nicaragua holds 108 billion cubic meters.

Figure 1.12: LAC-China “balance of payments” in water



Source: Author’s calculations based on UN Comtrade (n.d.), CEPALStat (n.d.), FAO World Food Price Index (n.d.), WaterStat (n.d.), and the World Bank GEM Commodity Database (n.d.). For detailed information, see Appendices A.1 and A.2.

Figures 1.11 and 1.12 show that LAC is, in effect, exporting water and importing carbon. Overall, LAC’s boom in exports to China has driven the region’s production into carbon- and water-intensive sectors. At the same time, LAC’s boom in imports from China has indirectly increased the region’s carbon footprint.

1.5 Discussion

The results shown here suggest a need for continued research in this area, on both theoretical and empirical fronts. Theoretically, there is room to bring together threads from environmental and structuralist economic literature in relation to the LAC region. Literature on structural transformation in developing economies, from Prebisch and Singer to Mazzucati (2013)’s theory of the “entrepreneurial state” is ripe for expansion to consider not only the impact of structural transformation on capital accumulation, terms of trade, and living standards, but also on environmental aspects of quality of life such as climate and natural resource management. For example, a relevant new theoretical framework might incorporate these aspects into the Prebisch-Singer hypothesis (that commodity exporters face secular, long-term declines in their terms of trade) or Bhagwati (1958)'s theory of immiserizing growth (in which economic growth associated with primary commodity booms can lead to deteriorating terms of trade and ultimately declining incomes). Likewise, the area of trade and the environment is ripe for expansion to include the impacts of commodity booms on countries' ability to meet their Paris Agreement commitments and the likelihood of natural resource-based social conflict.

Empirically, this line of research could benefit from an examination of *technological* differences in LAC's export basket to different markets. The analysis here relies on publicly-available trade data, and the changes in the scale and composition of trade baskets reflected therein. However, Grossman and Krueger (1995) famously disaggregate trade changes into *three* types: scale, composition, and technology. It may be possible to test for differences in technology between similar LAC merchandise exports to China and elsewhere. To do so, future research might benefit from identifying representative firms in LAC that exclusively or overwhelmingly produce for export to China and similar firms that produce for export elsewhere. If significant differences emerge in the labor or capital intensity of those firms' production methods, those findings may indicate that the environmental and social impacts of LAC's "China boom" go beyond the scale and composition changes examined here and include technology changes as well.

1.6 Conclusion

China's importance to the LAC economies is well established, as the largest export market for South American goods and the second-largest export market for LAC overall. But it is also well established that Chinese demand for raw materials and the competition from cheap Chinese manufactured goods have driven LAC away from manufacturing and back toward primary commodity production. Contrary to the hypothesis of the environmental Kuznets curve, primary production is more environmentally sensitive than manufacturing in LAC: it creates more net greenhouse gas emissions and uses or contaminates more water per million dollars. Thus, it is not surprising that LAC exports to China are more environmentally sensitive than other LAC exports. Given these risks associated with this important new economic relationship, LAC governments would be wise to approach it with reinforced emphasis on setting environmental safeguards that meet the needs of their development strategies.

CHAPTER 2

SUSTAINABLE DEVELOPMENT *FOR* PEOPLE OR *WITH* PEOPLE? ENVIRONMENTAL AND SOCIAL SAFEGUARDS, INFRASTRUCTURE INVESTMENT, AND DEFORESTATION IN THE ANDEAN AMAZON, 2000-2015

2.1 Introduction

Since the turn of the 21st century, South America's Andean nations have adopted some of the world's most ambitious environmental and social protections surrounding infrastructure investment, including most notably the right to prior consultation for affected indigenous communities. These reforms have been matched by the adoption of equally ambitious environmental and social safeguards (ESS) by the international development finance institutions (DFIs) who provide the projects' financing, including not only prior consultation but also the establishment of formal grievance mechanisms for affected communities.

These reforms could hardly have arisen at a more crucial time. Since the end of the recent commodities boom, Andean nations have undergone an infrastructure boom to take its place. For example, between 2008 and 2015, infrastructure investment rose from 3.6 to 8.4 percent of GDP in Bolivia, from 3.4 to 6.5 percent of GDP in Colombia, and from 3.3 to 6.9 percent of GDP in Peru (INFRALATAM, 2017). Given the extreme biodiversity of the Andean Amazon and the high concentration of indigenous territories there, appropriate regulatory frameworks may help prevent damage to marginalized communities and the forests where they live.

This essay specifically examines the role of these ESS in limiting the environmental impact of infrastructure projects in the Andean Amazonian countries of

Colombia, Ecuador, Peru, and Bolivia, since 2000. It finds that prior consultation, though it is often considered a *social* rather than *environmental* safeguard,[12] has a significant role in limiting infrastructure-related deforestation. Formal grievance mechanisms, however, are not found to have a significant deforestation impact, though they may prove crucial in limiting other risks such as social conflict or reputational damage for the development finance institution (DFI) involved.

2.2 Background

This section reviews the established connection between infrastructure projects and environmental degradation, and the history of DFIs' and nations' reforms to lessen that degradation. While infrastructure projects – especially roads and dams with reservoirs – have a long history of association with environmental problems, Andean nations and the international DFIs have established an ambitious array of protections to buffer these impacts.

2.2.1 Infrastructure and Deforestation

Scholars have long noted the connection between Amazonian deforestation and new infrastructure projects. Most of the resulting literature focuses on two types of infrastructure projects specifically: roads (especially paved roads) and dams (especially those with reservoirs).

The use of satellite imagery to trace deforestation around roads is a decades-old practice with an established track record. For example, Malingreau and Tucker (1988) use satellite imagery to trace deforestation in three states of the Brazilian Amazon, and

[12] For example, CAF (2016) lists prior consultation under "Consultation and Community Relations" in its 2016 ESS framework, and the IADB (2006b) lists it as a crucial part of "support for indigenous peoples governance."

find strong visual evidence linking new roads in this area with nearby deforestation. Pfaff (1997), also using satellite imagery, develops a statistical model and finds that *paved* roads – and the arrival of the first settlers to use those roads to establish new settlements – are both strong predictors of Amazonian deforestation. Furthermore, Pfaff also finds that this impact can be observed not only in the same county were the roads occurred, but in nearby counties as well. Laurance, Goosem, and Laurance (2009) perform a meta-analysis to compile additional mechanisms for the connection between roads and deforestation, and find causes including the "edge effect" of drastic changes in temperature and sunlight from within the forest canopy to the roadside, which impacts animal and plant life near new roads, periodic flooding of nearby forests due to poorly-maintained culverts, and disrupted paths for animal migration and plant pollination.

The environmental impact of dams is somewhat more complex than that of roads. While it is true that the electricity produced by hydroelectric dams can be considered "renewable," it is not necessarily ecologically sound. Beyond initial forest clearing for reservoir installation, they can also become what Fearnside (2004) calls "virtual methane factories," converting biodegrading organic material on the reservoir floor to methane instead of the much less greenhouse-potent carbon dioxide (which would be the product of such biodegradation on a forest floor). The International Development Finance Club, a global umbrella organization which includes all of the DFIs studied here, considers hydroelectric dams to be "sustainable" only when they can demonstrate a net reduction in carbon emissions (IDFC 2015). The Kyoto Protocol's Clean Development Mechanism considers dams to have net reductions in carbon emissions only when they have a power density ratio (the ratio of the dam's potential output in megawatts divided by the surface area of its reservoir, measured in square kilometers) of no less than four.

While the present analysis focuses solely on deforestation and not carbon emissions, abundant evidence links new dams – especially those with reservoirs – to forest loss. Finer and Jenkins (2012) find that dams contribute to deforestation both directly, at the site of their construction or by the flooding necessary for reservoirs, and indirectly, along the paths of the power transmissions lines and roads that connect the dams to nearby cities and power markets.

2.2.2 A Brief History of International DFIs' and Countries' Environmental and Social Safeguards

This chapter focuses on projects financed by international DFIs – which includes multilateral development banks (MDBs) as well as national development banks (NDBs) and national export credit agencies (ECAs) operating abroad – because of their unique governance structure. For MDBs as well as NDBs and ECAs operating abroad, project governance and responsibility is shared between national governments and external DFIs. This dual structure may lead to mutually reinforcing networks of governance: affected communities may be able to look to one institution for recourse when the other does not adequately mitigate their risks.

Major ESS reforms have taken place in DFIs and among Latin American governments since 2000. This section reviews the development of ESS among those DFIs that have seen major reforms since 2000 (the World Bank, the Inter-American

Development Bank, the Development Bank of Latin America, and the Export-Import Bank of China) and the nations of Colombia, Ecuador, Peru, and Bolivia.[13]

2.2.2.1 ESS Reform Among International DFIs: Not from Within but from Without

Of the international DFIs studied here, four institutions have undergone major ESS reform: The World Bank, the Inter-American Development Bank (IADB), the Development Bank of Latin America (CAF, for its original Spanish acronym), and the Export-Import Bank of China (CHEXIM). In each case, ESS reform arose not simply out of enlightened management or even far-sighted risk mitigation on the parts of international DFIs. Rather, ESS arose in large part thanks to external pressure from a variety of sources. Mikesell and Williams (1992) cite three main external avenues for pressure on international DFIs' environmental performance: public opinion in the country where the DFI is based, NGOs in affected countries, and international organizations such as arms of the United Nations. In the cases of Washington, DC-based World Bank Group (WBG) and Inter-American Development Bank (IADB), civil society in both affected and headquarter countries cooperated to improve lending governance. In the case of CAF, reform has come through changing incentives thanks to action on the part of international organizations.

Plater (1998), examining the reform process within the World Bank, points to alliances between organizations of affected people in developing countries and partners

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[13] The World Bank Group (WBG) and the Inter-American Development Bank each have multiple lending arms, which financed different types of projects. The statistical analysis below considers four of these windows separately: the World Bank's International Bank for Reconstruction and Development (which provides sovereign loans to middle-income countries) and International Finance Corporation (which lends to private sector projects), and the Inter-American Development Bank's main IADB (sovereign) lending window as well as its private-sector lending arm, the International Investment Corporation (IIC). Where the phrase "World Bank" occurs, the intention is to indicate the WBG institution rather than a particular lending arm. For the IADB, context should be sufficient to distinguish institution from lender.

in wealthy countries, coalescing around so-called “glocal” conflicts, in which *global* civil society organized around *local* environmental problems caused in turn by *global* capital flows. Anguelovski and Martinez (2014) highlight the importance of organizing that continued after Plater published his work, including the gathering of 200 NGOs in Kyoto in 1997.

This history is especially important here, given the catalytic function that (Brazilian) Amazonian deforestation played in spurring international DFI ESS reform, as Rich (1994) and Blanton (2007) explain. Between 1981 and 1983, the World Bank lent $443.4 million to Brazil for projects related to Polonoroeste, Brazil’s Amazonian highway and agricultural expansion program. Showing the importance of this case in catalyzing future reforms, Blanton (2007, 254) refers to it as the “paradigm case of controversial World Bank projects and effective NGO opposition.” Unfortunately, although World Bank involvement was conditioned on government commitments to respect established indigenous territories and nature reserves, the ensuing rapid migration of a half-million settlers into the newly-accessible forest outpaced legal protections, leading to widespread deforestation and displacement of traditional communities. In 1984, US Congressional Rep. James Sheuer invited Brazilian ecologist and future Minister of the Environment José Lutzenberger to testify before the House Committee on Science and Technology’s Subcommittee on Natural Resources, Agricultural Research and Environment (Eckholm 1984). Sheuer later wrote to the U.S. Treasury Secretary, urging Treasury to pressure the World Bank to tighten its oversight of Polonoroeste loans, while 32 NGOs from 11 countries jointly wrote their own letter to the World Bank itself with similar demands (Rich 1994, 122). In May 1985, the World Bank announced in a meeting with environmental groups that it had halted all Polonoroeste disbursements two months earlier.

Also in 1985, the US abstained when a Polonoroeste-related project came up for a vote in front of the IADB, prompting a moratorium on disbursement until Brazil established a project plan to limit environmental degradation and impacts on indigenous lands. In October of that same year, 120 Amazonian rubber-tappers met with representative of the Environmental Defense Fund, Brazil's Institute for Amazonian Studies, and Oxfam. These organizations lobbied the U.S. Treasury Department, who in turn forwarded a report by them to the World Bank and the IADB. In the face of the public perception of moral authority of international environmental groups – and the dominant political power of the U.S. Treasury Department on these MDB boards – the World Bank and the IADB both began to reformulate their approaches to projects in sensitive social and environmental territories.

Within a few years, these efforts bore fruit in significant reforms to loan governance at the World Bank and the IADB. In 1989, U.S. Congressional Rep. Nancy Pelosi sponsored an amendment (later known simply as the "Pelosi Amendment") to the Oil Pollution Act (which would be passed in 1990 as H.R. 1465), requiring US representative to MDB boards to abstain or oppose MDB project proposals that did not give board members adequate environmental impact assessments (EIAs) at least 120 days before the board vote (Sanford, 1998). That same year, the World Bank formalized its commitment to conducting EIAs with Operational Directive 4.00, Annex A on Environmental Assessment (reprinted in WB 1999). In 1991 it expanded this oversight to including prior consultation with affected indigenous communities, with Operational

Directive 4.20 on Indigenous Peoples (WB 1991). In 1990, the IADB followed suit and published its "Strategies and Procedures on Sociocultural Issues as Related to the Environment," enshrining "the principle of community consultation and participation throughout project design and implementation" (IADB 1990, 6). This principle was codified in 1996, with a requirement that all IADB proposals "contain a chapter and/or annex approved by the CESI [Committee on Environment and Social Impact]" (IADB 1996, 9).

While Brazilian civil society was mobilizing around issues of deforestation and community displacement due to the Polonoroeste highway program, NGOs in India were mobilizing over the similarly-problematic Narmada Dam in Gujarat, India, which resulted in the displacement of approximately 120,000 people. The World Bank responded with the establishment of a panel of outside experts (headed by Bradford Morse, United Nations Development Programme officer) to review Bank policy and performance in the Narmada case. The resulting "Morse Commission" report, published in 1992, called for a greater role for civil society in monitoring project outcomes and envisioned the establishment a formal grievance mechanism ("Accountability," 2009). Meanwhile, during the 1994 IDA replenishment, the US pressured the World Bank to create such a mechanism. Within months, the World Bank established their Inspection Panel and the IADB established their Independent Investigation Mechanism, the predecessor to today's ICIM (Independent Consultation and Investigation Mechanism).

As mentioned above, CAF's history of ESS reform came after its financial incentives changed, thanks to trends among international organizations. In 1992, the Global Environment Facility was established in the preparations for the Rio Summit, to support qualifying “green” development projects. In 2009, the Green Climate Fund was established at the United Nations Climate Change Conference in Copenhagen, with a similar mission. In order to quality for accreditation by these two organizations, CAF had to establish its own formal ESS out of the general principles that had guided its lending beforehand (CAF 2010). In 2015, CAF published formal safeguards to govern its joint projects with GEF (CAF 2015) and received GEF accreditation (GEF 2015). In 2016, CAF published overall ESS and received accreditation with the GCF (CAF 2016, GCF 2016).

Unlike the MDBs listed above, the Export-Import Bank of China (CHEXIM) introduced reforms after pressure from its own national government rather than from civil society or international organizations. The China Banking Regulatory Commission (CBRC), together with China’s Ministry of Environmental Protection, published a new “Green Credit Policy” in 2007, calling on banks to take responsibility over the environmental impact of their lending projects (Aizawa and Yang 2010). Five years thereafter, the CBRC issued another decree, the “Green Credit Guidelines,” encouraging banks to create their own criteria for environmentally-responsible lending (CBRC 2012). In 2016, CHEXIM complied by publishing its “White Paper on Green Finance,” which makes specific commitments to “foreground” and mitigate social and environmental risks in its loans.

2.2.2.2 ESS Reform among Andean Nations: Not from Above but from Below

For the most part, the nations studied here adopted ESS related to new development projects more recently than did the DFIs discussed above. These ESS arose mostly out of ongoing struggles between indigenous communities and foreign extractive (oil, gas, and mining) investors. These struggles have been well-documented elsewhere (see for example Bebbington and Bury, 2013; Fontaine, 2003; and Ray et al, 2017). Because of the ethnic and economic nature of these conflicts, the primary outcome has been the right of indigenous communities to be consulted in conjunction with development projects that affect them.

All four countries studied here signed on to the International Labour Organisation's Convention 169 on Indigenous and Tribal Peoples within a decade of its introduction (ILO 1989). Furthermore, all four have enshrined ILO 169 in their national legal standards, as Table 2.1 shows. As Baluarte (2004) and Larsen (2016) note, the ratification of ILO 169 brought a seismic shift in how governments and communities approached resource disputes.[14]

Table 2.1: Adoption of ILO 169 and incorporation into national law, by country

Country	ILO 169 Ratification Year	National Legislation	
		Year	Mechanism
Bolivia	1991	2009	Nueva Constitución Política del Estado
Colombia	1991	1997	Supreme Court Decision SU039/1997
Ecuador	1998	2010	Ley Orgánica de Participación Ciudadana
Peru	1994	2011	Ley de Consulta Previa

Sources: Asamblea Constituyente de Bolivia (2009), Asamblea Nacional del Ecuador (2010a), Congreso de la República (2011), ILO (1989), Ocampo and Agudelo (2014).

The mechanism by which ILO 169 is reflected in national legal protections varies widely across these four countries, discussed below. Colombia was the first country in which national legal protections were established. These emerged out of conflict, similar

[14] ILO 169 is a revision and replacement of the 1957 ILO Convention 107, which protected indigenous peoples from labor exploitation in European overseas colonies. In 1986, an ILO Committee of Experts concluded that ILO 107 was written for the benefit of indigenous peoples but without sufficient allowances for self-determination for the indigenous communities themselves. ILO 169 explicitly addresses the rights of indigenous communities to decide if, when, and how they are to integrate with surrounding cultures. In effect, the transition from ILO 107 to ILO 169 represents a concerted effort to move from a model of development *for* people to one of development *with* people (ILO, n.d.)

to the World Bank and IADB ESS discussed above. Colombia's 1991 constitution dictates that indigenous territories are to be governed by indigenous councils, including in matters of resource use and distribution and the preservation of natural resources ("Constitución Política de Colombia", 1991, Art. 330). Nonetheless, in 1992, Occidental Petroleum signed a contract with the Colombian oil company Ecopetrol for seismic exploration of the Samoré Block in the territory of the U'wa indigenous community. The U'wa sued Occidental in 1995 and won in court, only to have the Supreme Court overturn the decision. However, in 1997, the national ombudsman's office (*Defensoría del Pueblo*) challenged this ruling to the Constitutional Court on behalf of the U'Wa people, and won. This ruling, SU039/1997, set the stage for future rulings, as Haller, et al (2007) note. For example, Decree 1320 of 1998 was established to provide a framework for indigenous consultation but was struck down itself for having been enacted without the indigenous consultation required by SU039/1997 (Ocampo and Agudelo, 2014).

The other countries shown here (Bolivia, Ecuador, and Peru) enacted legal protection to codify ILO 169 in a less combative context. In each of these three countries, leftist (in the cases of Bolivia and Ecuador) and center-left (in the case of Peru) governments were elected in the early-to-mid 2000s thanks to coalitions built among indigenous, labor, and environmentalist organizations. Intrinsic to these victories were promises to enact major legal reforms to enshrine the causes dear to these groups.

Both Bolivia (2009) and Ecuador (2008) established new constitutions as part of this process. Bolivia's constitution was the stronger in this regard, guaranteeing that rural indigenous communities should have the right to prior and informed consultation over any use of natural resources found in their territories (Asamblea Constituyente de Bolivia

2009, Article 403). Ecuador's new constitution did not explicitly enshrine the right to indigenous consultation but did give Mother Nature (*Pachamama*) her own legal rights, specifying that anyone would be legally allowed to sue public authorities to force them to defend these rights. In practice, this meant that communities need not prove that their private property is damaged in order to use the courts to stop and mitigate the damage (Asamblea Nacional del Ecuador 2008, Art. 71), a move especially favorable to NGOs, indigenous communities with uncertain land tenure, and the poor. Tanasescu (2013) notes that in its first enforcement, a municipal was made to pay for restoration of a river whose path it had modified to make room for a new road, thanks to a lawsuit on behalf of nature by local citizens.

Both Ecuador and Peru have enacted laws to directly address the right to prior consultation for indigenous communities. Ecuador's 2010 Citizen Participation Law states that the national government must consult with indigenous, Afro-Ecuadorian, and coastal Montubio communities regarding all decisions that might affect their environment (Asamblea Nacional del Ecuador 2010a, Art. 83). Peru's 2011 "Law of Prior Consultation" codifies these rights in much more detail, recognizing the rights of communities' elected officials to negotiate on their behalf and laying out a seven-step process for the consultations (Congreso de la República 2011). For more on these electoral changes and the resulting legal protections in Bolivia, Ecuador, and Peru, see Ray and Chimienti (2017), Sanborn and Chonn (2017), and Saravia López and Rua Quiroga (2017).

2.3 Model of Analysis

This chapter aims to further the literature on infrastructure, development banks, and the environment, by testing the association between major ESS reforms and the environmental performance of infrastructure projects financed thereafter. This section explains the choices of environmental impact studied (deforestation), method (tree cover change as measured by satellite imagery) and location (the nations of Colombia, Ecuador, Peru, and Bolivia).

2.3.1 Choice of Impact Studied: Deforestation

The analysis below examines only one of many possible environmental impacts: deforestation. Many other important social and environmental aspects of infrastructure expansion exist, of course, including water quality, air quality, access to ancestral lands, and the cultural politics surrounding the popular conceptualizations of natural resources as spiritual, community, or economic entities are all important aspects of the social and environmental impacts of the expansion of infrastructure projects in Latin America (see for example Carruthers 2008, Wickstrom 2008).

Nonetheless, as the history section above mentions, NGO mobilization regarding DFI-backed projects in these countries centered on the preservation of forests for the sake of communities therein. Thus, this chapter chooses deforestation as its primary impact variable in order to measure whether civil society participation requirements improved an outcome demonstrated to be highly important to civil society. Furthermore, deforestation is an attractive choice of environmental impact to study, as the preservation of the Amazon rainforest unites the concerns of international DFIs concerned with their climate impacts and the local concerns embodied in what Martinez-Alier (2014) calls “the environmentalism of the poor.”

2.3.2 Choice of Method: Satellite Imagery

As mentioned above, the use of satellite data to measure tree cover change is well-established. This chapter uses the “Global Forest Change” database managed by the University of Maryland in conjunction with Hansen et al (2013). At the time of this writing, the Hansen et al data included data for tree cover change between 2000 and 2015. It is compiled based on USGS LANDSAT imagery with 30m resolution. As Chen et al (2015) note, this resolution is fine enough to show deforestation, though it is too coarse to show forest degradation. However, it cannot distinguish between forest cover and plantation-based tree cover. For that reason, this analysis mostly uses the term “tree cover loss” instead of “deforestation,” unless it clear from the satellite images that no plantations are involved.

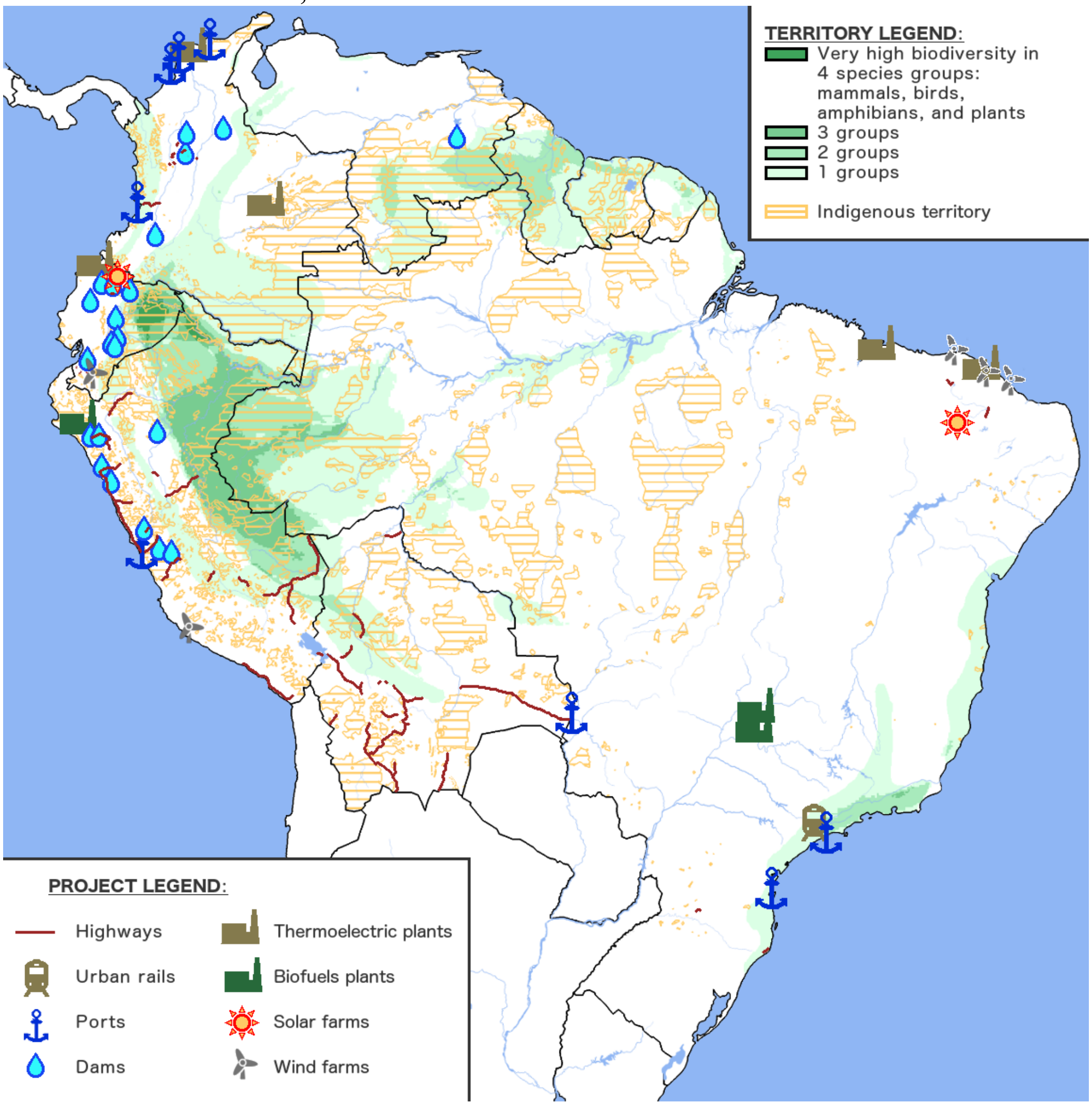
Methodologically, this chapter expands on the work of Buchanan et al (2013) at William and Mary’s AidData Research Lab. These authors use the Hansen database to investigate the relative tree cover change rates within 10km of World Bank projects globally. Instead of seeking differences among lenders, the present analysis investigates the impacts of ESS reforms, regardless of DFI or national government involved. It also relaxes the traditional use of 10km radii around projects, and instead uses site-specific radii established using a common set of rules across projects, discussed in more detail below.

2.3.3 Choice of Location: Colombia, Ecuador, Peru, and Bolivia

This chapter takes as its geographic focus the western Amazon, home to some of the most sensitive territory, both socially and environmentally, in the Western Hemisphere. Figure 2.1 shows all of the international DFI-financed infrastructure projects in Amazonian countries from 2000 to 2015, together with indigenous territory and varying levels of biodiversity. The richest biodiversity in South America is found along the western periphery of the Amazon basin, especially in eastern Ecuador and northern Peru. Among the indigenous territories shown here, arguably the most sensitive are those in the "Uncontacted Frontier" of the border region between Peru, Brazil, and northwestern Bolivia: home to the highest concentration of uncontacted and voluntarily isolated indigenous communities in the world (Survival international, n.d.).

Of the 100 projects shown in Figure 2.1, 84 are in the western Andean countries of Colombia, Ecuador, Peru, and Bolivia. Nearly all of the projects shown to be in areas that are both highly-biodiverse and home to indigenous communities are in a few sections of these four countries: The Pacific coast of Colombia, central Ecuador, inland Peru, and western Bolivia. Venezuela is home to just three projects, Suriname has one, and Brazil has 17 – but none in areas that are both highly biodiverse and indigenous territory. Because of this geographic distribution of international DFI-financed infrastructure projects, this chapter specifically focuses on the history and performance of projects in the four countries of Colombia, Ecuador, Peru, and Bolivia.

Figure 2.1: Completed international DFI-financed infrastructure projects in Amazon-basin countries, 2000-2015



Note: Individual projects considered here are listed in Appendix B.1. Source: DFI annual reports, Bass et al. (2010), LandMark (n.d.), Red Amazónica de Información Socioambiental Georreferencial (n.d.).

2.3.4 Choice of Projects

For the purposes of this analysis, infrastructure projects are defined as all "hard" infrastructure projects (energy and transportation) that contribute to an increase in a country's fixed capital stock. Thus, while roads form a crucial element of this dataset, not all roads are included. Specifically, roads are included when they entail paving previously-unpaved roads or rehabilitating paved roads, but they are *excluded* in the following cases:

- Repairing roads after natural disasters,
- Re-grading of unpaved roads, which must occur repeatedly in order to maintain usability,
- Periodic maintenance of paved roads
- All work regarding neighborhood (as opposed to inter-municipal) roads

However, major rehabilitations of paved roads, which make the difference between a road being passable by truck year-round or otherwise, are included.

2.4. Data Description

As mentioned, this chapter examines the tree cover change surrounding 84 infrastructure projects financed by international DFIs from 2000 to 2015. The following sections describe the characteristics of these projects, tree cover change around them, and the ESS that applied to them, either from DFI or national authorities.

2.4.1 Tree Cover Change Near international DFI-Financed Infrastructure Projects

Between 2000 and 2015, the 84 projects studied here were associated with the loss of 5,663 km^2 in tree cover within 10km of the projects, or 14.2 percent of the total nearby tree cover. As Table 2.2 shows, this rate of tree cover loss is much higher than the overall rate of deforestation in those four countries over this time period, which was just 3.9 percent. This level of tree cover loss is equivalent to 25.4 kilotons of new CO^2 emissions, or about seven percent of the total loss in carbon sequestration from deforestation in these countries over this time period.

Table 2.2: Tree Cover loss within 10km of international DFI-financed infrastructure projects, 2000-2015

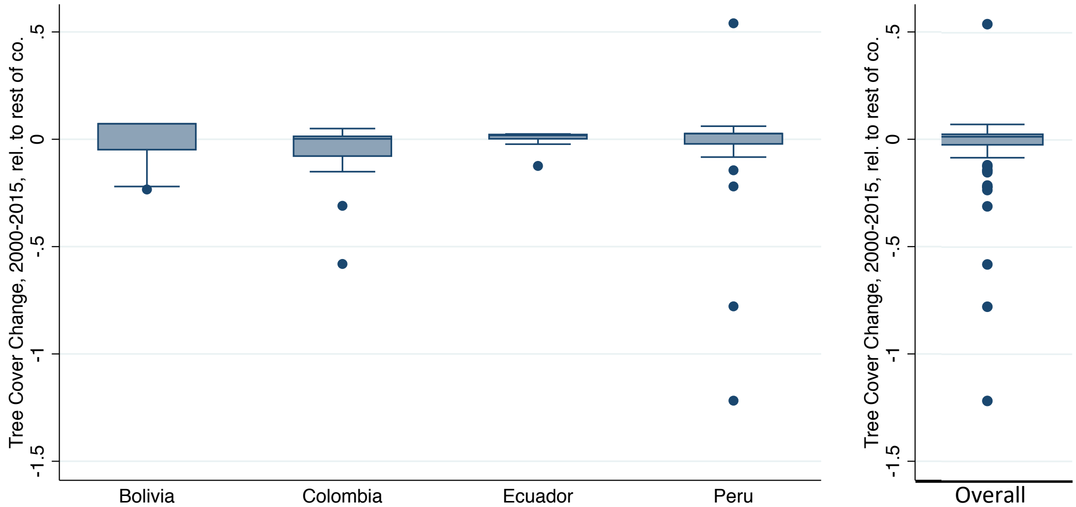
	Country				Total
	Bolivia	Colombia	Ecuador	Peru	
Within 10km of projects:					
Total tree cover change (km^2)	-2,937.9	-156.7	-45.0	-2,523.5	-5,663.1
Total initial tree cover (km^2)	14,730.8	4,219.2	2,570.7	18,400.0	39,920.7
Tree cover change (%)	-19.9%	-3.7%	-1.7%	-13.7%	-14.2%
Emissions equiv. (MMT CO_2)	97.0	7.9	2.5	146.2	253.5
Remaining territory:					
Total tree cover change (km^2)	-35,138.1	-21,917.2	-3,631.6	-18,487.8	-79,174.6
Total initial tree cover (km^2)	503,812.0	675,512.3	147,430.1	711,338.2	2,038,092.6
Tree cover change (%)	-7.0%	-3.2%	-2.5%	-2.6%	-3.9%
Emissions equiv. (MMT CO_2)	1,159.6	1,109.0	198.4	1,071.1	3,538.0

Note: Emissions are calculated using the average carbon intensity per km^2 of forest in each country, using median estimates in Saatchi et al (2011): 9.0 kT/km^2 in Bolivia, 13.8 in Colombia, 14.9 in Ecuador, and 15.8 in Peru.

However, as Table 2.2 also shows, the rate of tree cover loss associated with DFI projects varied widely among the four countries studied here. The highest rate was seen in Bolivia, where nearly 20 percent of tree cover within 10km of DFI projects was lost between 2000 and 2015. On the other extreme, the projects in Ecuador were associated with a loss of just 1.7 percent of tree cover within 10km, a *lower* rate than in the rest of the country.

Figure 2.2 explores this variation across individual projects, by country. "Relative tree cover change" is defined here as the log difference between tree cover change within 10km of the project and tree cover change in parts of the country *not* within 10km of an international DFI-financed infrastructure project, in order to take into account different national contexts. As the figure clearly shows, great variation exists, with some projects exhibiting much less tree cover loss than the rest of the countries where they occurred (shown as *positive* relative tree cover change), and others exhibiting much more, especially among projects in Peru.

Figure 2.2: Relative tree cover change within 10km of international DFI-financed infrastructure projects, 2000-2015



	Bolivia	Colombia	Ecuador	Peru	Overall
N	18	20	14	29	81
Mean	+0.4%	-5.8%	+0.2%	-5.4%	-3.3%
Median	+7.2%	-0.2%	+1.8%	+2.6%	+1.5%
St. Dev.	11.2pp	15.1pp	3.9pp	29.2pp	19.8pp

Note: The total number of projects is only 81 instead of 84, because this model results in three observations' elimination from the dataset. This problem is resolved in the following section. Relative tree cover change is measured as the log difference between local and national treed cover change percent rates: ln(1+Δ local TC) – ln(1+Δ nation TC excluding areas near projects).

The areas within 10km of international DFI-financed infrastructure projects had a median tree cover loss that was 1.5 percent better than the remainder of the nations where they were built. They had a mean level of 3.3 percent *worse* tree cover loss, but that was driven primarily by a few extreme outliers, so that level is not statistically significantly different from zero, as Figure 2.2 shows.

2.4.2 Safeguards

The high variance shown in Figure 2.2 raises the question of what DFIs and governments can do, in the face of such divergent outcomes, to limit the possibility of their projects experiencing the tree cover loss of the highly-negative outliers. This chapter attempts to answer this question by seeking relationships between DFIs' ESS processes and the tree cover change in the areas surrounding their infrastructure projects.

Table 2.2 shows the most common ESS among the DFIs most active in financing infrastructure projects in the Western Andean countries studied here.

CAF's approach to safeguards has been unique and bears explanation. CAF established formal ESS in 2016, after the time period studied here. Before that point, its lending was governed by its 2010 "Environmental Strategy," which states that CAF "makes sure operations have complied with the participation process demanded by the country's legal system and, where it sees a need, calls for additional step of public consultation" (CAF 2010, 18). This principle is certainly laudable in its intent, but its ambiguity makes it impossible to label as having across-the-board requirements beyond respect for national laws. Thus, for the sake of accuracy, Table 2.3 shows CAF requiring prior consultation (as it currently does), but the case-by-case analysis below recognizes that it did not have a formal prior consultation requirement from 2000-2015.

All eight of the DFIs shown in Table 2.3 require the completion of EIAs and compliance with host-country environmental standards. Six require consultation with affected communities, while only four MDBs – the World Bank, and IADB, and their private-sector lending arms – have (or require the establishment of) formal grievance mechanisms to address problems that arise. Due to DFIs' unanimity regarding EIAs and host-country standards, this chapter examines the association between the other commonly-accepted safeguards – prior consultation and formal grievance mechanisms – and tree cover loss near project sites. The recent enactment of stronger versions of these policies – free, prior, informed *consent* of affected communities (known as FPIC) and *project-level* grievance mechanisms – are crucial developments, but unfortunately too few projects in this dataset have those protections for this chapter to analyze the impacts of these reforms. Finally, it is important to note that Table 2.3 shows only prior consultation provisions that have incorporated formal processes of engagement, using the approach of Kvam (2017). While many more DFIs have statements broadly supporting the principle of public information or consultation, only the World Bank and IADB had standardized processes with space for affected communities to impact project design.

Table 2.3: Required safeguard processes for infrastructure project planning

	MDBs					NDBs Operating Abroad		
	IBRD	**IFC**	**IADB**	**IIC**	**CAF**	**CDB**	**CHEXIM**	**BNDES**
Environmental impact assessments (EIAs)	X	X	X	X	X	X	X	X
Compliance with host-country env. standards	X	X	X	X	X	X	X	X
Assistance with host-country standards					X			
Consultation with affected communities	X	X	X	X	X		X	
Consent of affected communities (FPIC)		X	X					
Formal grievance mechanisms	X	X	X	X				
Project-level grievance mechanisms	X	X						

Note: CAF and CHEXIM established their community consultation safeguards in 2016, after the time period studied here. Thus, while those slots are marked here, the analysis below takes into account the absence of those protections before 2016. The IADB requires consent of affected communities only in cases of involuntary resettlement.
Sources: Baker (2013), CAF (2016), CHEXIM (2016), Goodland (2004), Himberg (2015), IADB (1990, 2006a, 2006b), IFC (1998, 2006a, 2006b), IIC (2013), ILO (1989), IR (2007), Kennedy (1999), Ocampo and Agudelo (2014), Rivasplata et al (2014), WB (no date), Yuan and Gallagher (2017).

The distribution of which institutions guarantee prior consultation and access to grievance mechanisms is more complicated than Table 2.3 suggests, because international DFIs have gradually adopted these ESS over the last few years. Prior to the adoption of formal prior consultation processes, many DFIs had principles or guidelines related to consultation, but most have adopted standardized prior consultation more recently. Thus, for example, not every CAF project examined here required prior consultation, and not every IFC project had a formal grievance process.

Countries also have their own history of the adopting safeguards that apply to the projects studied here, as mentioned in the previous section. All four countries examined here are signatories to the International Labour Organisation's Convention 169 (ILO 1989) and have enacted their own legislation recognizing the right to prior consultation for indigenous communities affected by new development projects.

Combining the evolution of DFI prior consultation safeguards and national legislation yields the matrix of DFI and country consultation standards shown in Table 2.4. Projects in a given country, financed by a given DFI, have prior consultation guarantees if they were approved after the prior consultation enactment date shown in the table.

Table 2.4: Prior consultation adoption for infrastructure projects, by country and DFI

	Bolivia	Colombia	Ecuador	Peru
MDBs				
IBRD	1992	1992	1992	1992
IFC	2006	1998	2006	2006
IADB	1996	1996	1996	1996
IIC	1990	1990	1990	1990
CAF	2009	1998	2010	2011
NDBs Operating Abroad				
BNDES	2009	1998	2010	2011
CDB	2009	1998	2010	2011
CHEXIM	2008	1998	2008	2008

Sources: Asamblea Constituyente de Bolivia (2009), Asamblea Nacional del Ecuador (2010a), Baker (2013), CAF (2016), CHEXIM (2016), Congreso de la República (2011), Deruyttere (2004), Goodland (2004), Himberg (2015), IADB (1990, 2006a, 2006b), IFC (1998, 2006a, 2006b), IIC (2013), ILO (1989), IR (2007), MacKay (2005), Ocampo and Agudelo (2014), WB (no date), WB (1992), WB (2003).

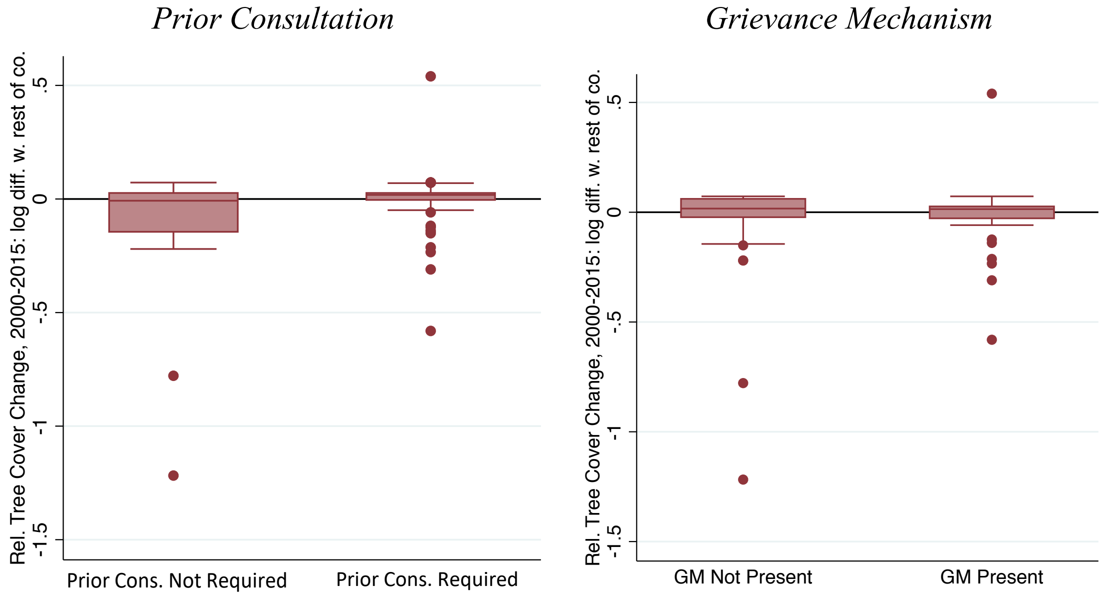
The adoption of formal grievance mechanisms by WBG and IADB lending offices evolved over time in a similar way to prior consultation safeguards, with the IBRD and IADB adopting them in 1994 (with the IADB further reforming theirs in 2010), followed by the IIC in 2002 and the IFC in 2006 (Bradlow, 2005; Brown et al, 2013; Cordonier Segger and Weramantry, 2017; Himberg 2015; IADB, 2009; IFC, 2009;

IIC, 2009). There is no equivalent evolution in grievance mechanisms in national legislation, because such complaints are handled through national judicial systems.

2.5. Results

Figure 2.3 shows the distribution of relative tree cover change among projects that do and do not have prior consultation and formal grievance mechanisms. The presence of prior consultation mechanisms appears to be associated with a sizeable reduction in tree cover loss. Having a prior consultation mechanism appears to raise the average relative tree cover change from a median level of -0.8 percent +1.8 percent and from a mean of -12.3 percent to -0.5 percent, compared to the remainder of the territory in the nations where the projects occurred. However, these differences are not conclusive, as the extremely high standard deviations mean that the means are not statistically significantly different from zero. However, the results seem more ambiguous for formal grievance mechanisms. Projects with these mechanisms in place had a higher *mean* relative tree cover change, but a lower *median* than the surrounding territory.

Figure 2.3: Relative tree cover change near international DFI-financed infrastructure with and without ESS



N	19	62	***N***	38	43
Mean	-12.3%	-0.5%	***Mean***	-5.3%	-1.4%
Median	-0.8%	+1.8%	***Median***	+1.7%	+1.4%
St. Dev.	32.9pp	12.6pp	***St. Dev.***	24.4pp	14.6pp

Note: Relative tree cover change is measured as the log difference between local and national treed cover change percent rates: ln(1+Δ local TC) – ln(1+Δ nation TC excluding areas near projects).

2.5.1 Regression Analysis of ESS on Tree Cover Change

To more closely examine the impacts of the two safeguards requires a formal difference-in-difference model, using the form

$$Rel\Delta TC_i = \alpha + \delta_1 PC_i + \delta_2 GM_i + \beta_1 \Delta Pop_i + \beta_2 Year_i + \delta_3 ITC0_i$$

where:

$Rel\Delta TC_i$ is the relative tree cover change with 10km of a project, measured as the log difference of the local tree cover change and the tree cover change in all parts of the country *not* within 10km of such a project.

PC_i is a binary variable expressing the presence or absence of a prior consultation mechanism.

GM_i is a binary variable expressing the presence or absence of a formal grievance mechanism.

ΔPop_i is the annual rate of population growth in the state (or department) of the project, in the five years prior to the project.

$Year_i$ is the year in which the project was approved.

$ITC0_i$ is a binary variable indicating countries with zero initial tree cover within 10km in 2000.

Relative tree cover change is expressed as

$$Rel\Delta TC_i = ln\left(\frac{TC_{P,2015}}{TC_{P,2000}}\right) - ln\left(\frac{TC_{\sim P,2015}}{TC_{\sim P,2000}}\right) = ln\left(\frac{TC_{P,2015}/TC_{P,2000}}{TC_{\sim P,2015}/TC_{\sim P,2000}}\right)$$

$$= ln\left(\frac{TC_{P,2015}}{TC_{\sim P,2015}}\right) - ln\left(\frac{TC_{P,2000}}{TC_{\sim P,2000}}\right)$$

where P indicates areas within 10km of an international DFI-financed infrastructure project and ~P indicates all national territory *not* within 10km of such a project. Using log differences rather than simple ratios allows for a more straightforward interpretation of results, as coefficients are expressed in positive or negative percent for tree cover change that is more positive or negative than what was experienced in the surrounding area. The second line of the expression above shows that defining $Rel\Delta TC$ as the log difference of tree cover change rates is arithmetically identical to defining it as a more classic difference-in-difference model form: the change in the ratio of tree cover levels between areas near projects and other areas.

Local population growth prior to project approval is included in order to differentiate whether tree cover loss is due to an area growing in population *regardless* of the project, from the change related to the project itself. It is measured as the annual rate of population increase at the state (or department) level during the five years prior to the project's approval. Project approval year is included because this model relies on end-point estimates of tree cover, in 2000 and 2015, so it is important to distinguish projects approved in 2000 (which show 15 years of tree cover change in this sample) from those approved in 2014 (which show only 1 year), for example. The model also differentiates projects with zero tree cover nearby in 2000, because these projects cannot possibly experience tree cover loss, only gain.

Table 2.5 shows the results of this model for each safeguard considered separately and for both together. While the presence of a prior consultation mechanism is significantly associated with 13.5 percent less tree cover loss (the coefficient on prior consultation in Model 1), there is no significant result for the presence of formal grievance mechanisms.[15] Furthermore, an F-test for over-specification shows that including grievance mechanisms does not explain observed variation any better than considering prior consultation mechanisms alone. Thus, for analytic purposes, Model 1 should be considered the primary model.

The significant correlation between prior consultation provisions and more positive (less negative) relative tree cover change is not unexpected, given the history of scholars in other contexts finding the importance of knowledge as a common-pool asset (see for example Ostrom and Hess 2007), and the significant impact that information

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15 These findings reinforce those of Buntaine (2016, 133-136), who finds that having a World Bank Inspection Panel case lowers the environmental risk of a country's future World Bank loan portfolio only for countries that predominantly borrow from the Bank's IDA concessional window – which applies to none of the countries studied here.

disclosure ("right to know") requirements have had on firm behavior (see for example Bennear and Olmstead 2007; Foulon, Lanoie, and Laplant 2002; Konar and Cohen 1995; and Wolf 1996). It is worth noting that the *lack* of significant results for grievance mechanisms may be misleading, because of possible survivor bias. If a filed grievance results in the cancellation of funding for a project, that project will no longer be included in the present dataset. For example, in 2011 the Bolivian environmental NGO *Foro Boliviano Sobre el Medio Ambiente y Desarrollo* (FOBOMADE) filed a complaint with the IADB's Independent Consultation and Investigation Mechanisms (ICIM), the bank's formal grievance office, about allegedly inadequate EIA and prior consultation processes in the construction of a bridge over the Bení river, connecting the towns of San Buenaventura and Rurrenabaque (IADB 2014, Molina Carpio 2014). Before the complaint could be adjudicated, the government of Bolivia shifted the IADB funds from that loan to another project. Thus, that project no longer appears in the present data. Furthermore, Buntaine (2016) finds that MDBs are less likely to approve projects in countries where grievances have been filed in the prior five years. Thus, formal grievance mechanisms may impact outcomes through the *exclusion* of problematic projects from the present dataset in one of two ways: projects may be cancelled, and future projects may be denied in countries where complaints have been filed.

Table 2.5: Regression results: association with net tree cover change (N=81)

	Prior Consultation (Model 1)		Grievance Mech. (Model 2)		Both (Model 3)	
	Coef-ficient	**St. Error**	**Coeff-icient**	**St. Error**	**Coef-ficient**	**St. Error**
Safeguards:						
Prior Consultation	**0.135****	0.051			**0.157***	0.065
Grievance Mech.			0.057	0.049	-0.033	0.060
Controls:						
Prior local Δ pop.	-1.026	2.477	-0.402	2.569	-0.896	2.500
Year	-0.002	0.007	0.003	0.007	-0.005	0.008
Zero initial TC	**0.107***	0.052	0.101	0.054	**0.108***	0.052
Intercept	4.732	13.699	9.023	15.879	9.023	15.879
R^2	0.1262		0.0627		0.1296	
F-Statistics:						
This model	F (4,76) = **2.74***		F (4,76) = 1.27		F (5,75) = 2.23	
Compared to Model 1					F (1,75) = 0.29	

Note: * indicates P≤0.05 Standard errors are shown in italics. Model 1 is shaded because it explains the observed variation best, based on the F-tests shown here.

The results discussed follow the pattern of Buchanan et al (2013) of measuring tree cover change within 10km of infrastructure projects. However, that method is not without its drawbacks. Most importantly, the choice of 10km is an arbitrary one, which in some cases may include impacts from extraneous sources while in other cases it may not encompass all of the source-related tree cover change. Thus, the resulting tree cover change rates include substantial variation in tree cover change that cannot be explained by any of the variables considered here, leading to low R^2 values and mostly statistically insignificant model F-statistics shown in Table 2.5.

This section explores a possible improvement over the traditional use of 10km radii, by measuring tree cover change at site-specific radii, based on each project's surroundings. Site-specific radii apply the same rules for radius selection to each project, to allow flexibility for variations in individual projects' surroundings, without sacrificing comparability among projects. These radii are defined as the point where the local source-based tree cover change fades into the background rate of the change of surrounding area. It takes into account as much as possible of the source-based tree cover change, while including as little as possible of the tree cover change from other, unrelated, nearby sources.

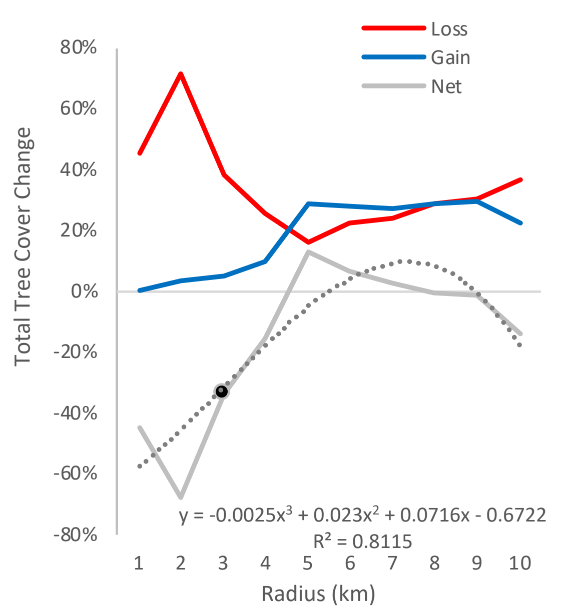
Mathematically, a site-specific radius is defined using a third-degree polynomial trend line for tree cover change as a function of an expanding radius, as measured at 1km, 2km and so on. The second derivative of this trend line yields an inflection point, after which the tree cover change ceases to be dominated by source-related tree cover change and begins to be dominated by the background rate of change. For most projects, the tree cover change trend line reaches an inflection point at or before 10 km; in those cases, there is no need to measure tree cover change beyond 10km. However, in cases where no inflection point is forthcoming within 10km, further measurements are taken until an inflection point emerges.

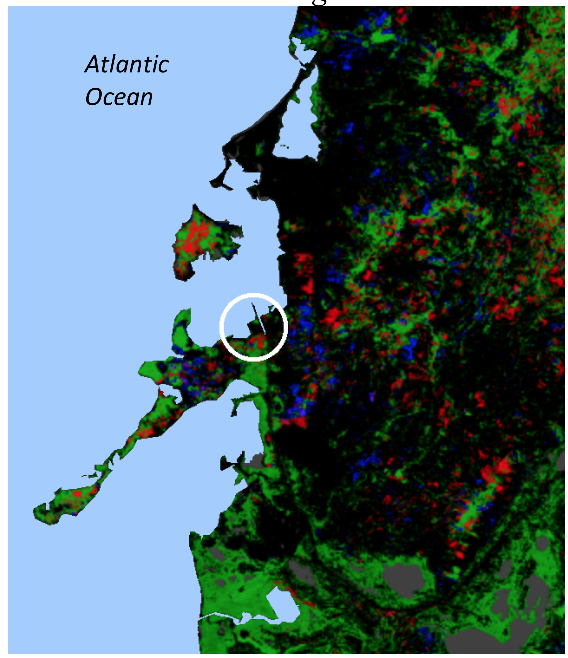
A few exceptions exist to this process. First, for projects with zero tree cover change in the area immediately surrounding a project (which is only the case for very small projects), then the site-specific radius is the largest radius with zero tree cover change, before unrelated tree cover changes can be taken into account. Similarly, where there is an obvious introduction of a new source of unrelated tree cover change, the site-specific radius must be small enough to avoid taking it into account.

Figure 2.4: Examples of site-specific radii and their definitions (red=loss, blue=gain)

2.4A: Puerto Bahía, Colombia

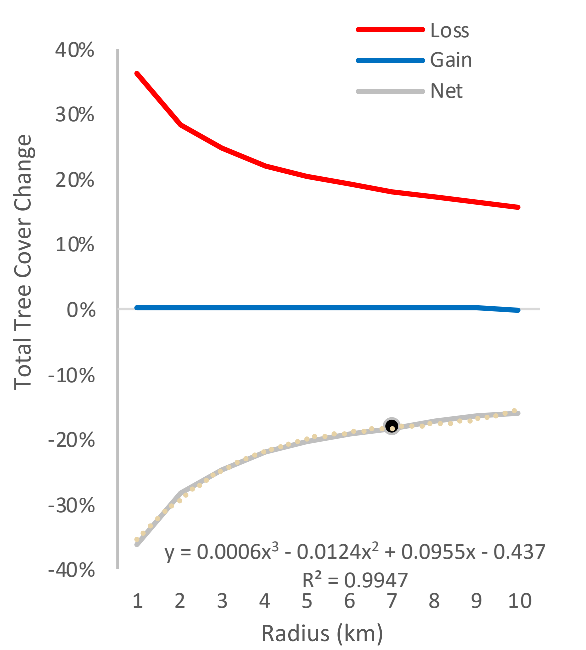
Tree Cover Change, Trendline, and Infl. Point. *Resulting radius: 3km*

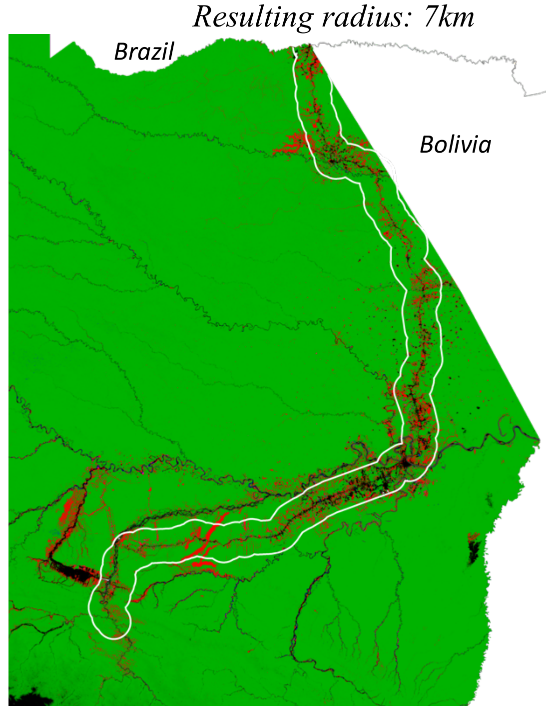




2.4B: Corredor Vial Interoceánico Sur, Route 3, Peru

Tree Cover Change, Trendline, and Infl. Point. *Resulting radius: 7km*





Note: Maps are not to scale relative to each other, to preserve visibility given Puerto Bahía's much smaller size.

Figure 2.4 illustrates the process of choosing site-specific radii using two examples: Puerto Bahía near Cartagena, Colombia, and Route 3 of the *Corredor Vial*

Interoceánico Sur in southern Peru. As the included tree cover change maps show, the choice of site-specific radii allows for the exclusion of extraneous tree cover change in smaller projects, while still encompassing applicable tree cover change for larger projects. It is useful in situations with extremely volatile tree cover changes within 10km (like Puerto Bahía) as well as projects where the tree cover change simply slowly fades out as the radius increases (as in Route 3).

Using site-specific radii has another important advantage compared to using 10km radii, beyond measuring project-related tree cover change more accurately. It also allows the inclusion of three projects for which tree cover change cannot be measured at 10km. These observations all had zero tree cover near the projects sites in 2000, and extremely low tree cover (less than 0.01 percent each) within 10km of the project sites. Nevertheless, in each case, the few trees in the area disappeared by 2015, yielding -100 percent tree cover changes, making it impossible to measure tree cover change in the form ln(1+Δ local TC) – ln(1+Δ nation TC excluding areas near projects). These three observations are as follows.

- Bolivia's Tiquina-Copacabana road, on the desert shores of Lake Titicaca, had zero tree cover within 3km of the road. However, the entire area within 10km of it had a tree cover rate of 0.002 percent in 2000, which fell to zero by 2015, yielding a tree cover change of -100 percent.
- Bolivia's Rio Seco-Huarina road had zero tree cover within 4km of the road in 2000. However, the entire 10km area had 0.002 percent tree cover in 2000, which fell to zero by 2015. Thus, using the 10km measure yields a tree cover change rate of -100 percent.

- Peru's Cerro Mulato micro-dam is surrounded by farmland (outside of the town of Chongoyape), and so had zero tree cover within several kilometers in 2000. Nonetheless, the entire area within 10km of the dam had 0.009 percent tree cover in 2000, which fell to zero by 2015, yielding a tree cover change of -100 percent.

In each of these cases, small unrelated changes in tree cover within 10km of the project sites yield extreme tree cover change *percentages*. Nonetheless, this factor alone does not warrant excluding them entirely from the analysis, as they are otherwise unremarkable projects. Using site-specific radii addresses the outlier problem without removing them from the analysis.

Table 2.6 shows the tree cover change associated with projects when measured with site-specific radii. As explained above and demonstrated statistically below, this method is more accurate as it includes only tree cover change that is demonstrably associated with the project sites. When measured with this higher standard, the tree cover change associated with international DFI-financed projects is actually greater than when it is measured conventionally within a 10km radius: 15.9 percent, four times the 3.9 percent rate in the remaining territories.

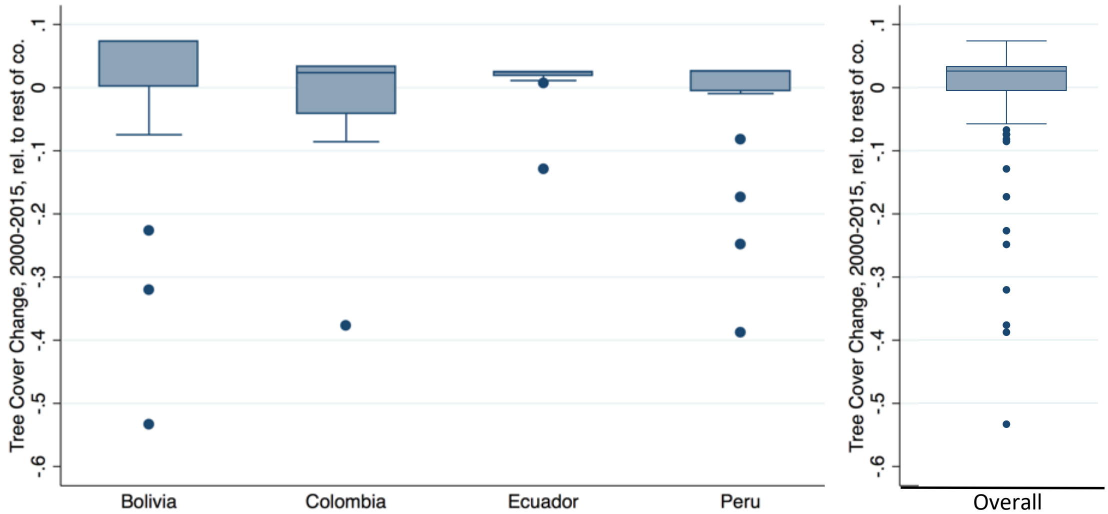
Table 2.6: Tree cover loss associated with international DFI-financed infrastructure projects, 2000-2015

	Country				Total
	Bolivia	Colombia	Ecuador	Peru	
Associated with projects:					
Total tree cover change (km^2)	-1,788.5	-63.5	-11.1	-2,587.4	-4,450.5
Total initial tree cover (km^2)	8,387.1	2,116.3	670.7	16,898.5	28,072.6
Tree cover change (%)	-21.3%	-3.0%	-1.7%	-15.3%	-15.9%
Emissions equiv. (MMT CO_2)	59.0	3.2	0.6	149.9	212.7
Remaining territory:					
Total tree cover change (km^2)	511,702.2	676,909.7	149,459.5	713,360.7	2,051,432.1
Total initial tree cover (km^2)	-36,331.4	-21,985.5	-3,666.0	-18,409.2	-80,392.1
Tree cover change (%)	-7.1%	-3.2%	-2.5%	-2.6%	-3.9%
Emissions equiv. (MMT CO_2)	1,198.9	1,112.5	200.3	1,066.5	3,578.2

Note: Emissions are calculated using the average carbon intensity per km^2 of forest in each country, using median estimates in Saatchi et al (2011): 9.0 kT/km^2 in Bolivia, 13.8 in Colombia, 14.9 in Ecuador, and 15.8 in Peru.

Figure 2.5 shows the distribution of relative tree cover change, when measured at site-specific radii, by country. The outliers that dominate Figure 2.2 have been curtailed, with the range of observations here stretching only from -60 percent to +10 percent, rather than the -150 percent to +50 percent shown above. However, the standard deviations are still strong enough to prevent the means from being statistically significantly different from zero.

Figure 2.5: Relative tree cover change measured within site-specific radii of international DFI-financed infrastructure projects, 2000-2015

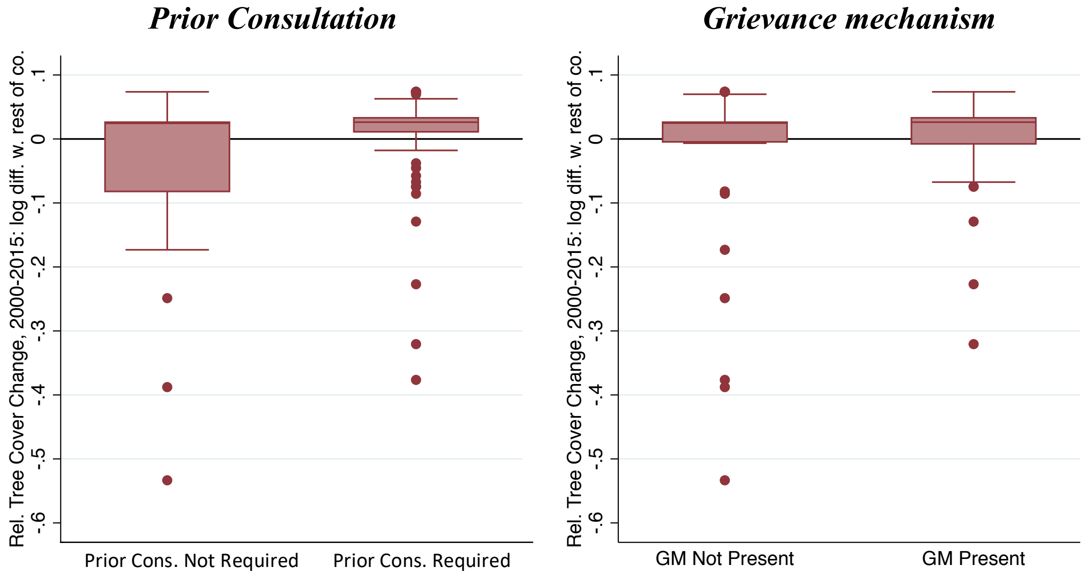


	Bolivia	Colombia	Ecuador	Peru	Overall
N	20	20	14	30	84
Mean	-0.6%	-1.7%	+1.1%	-1.3%	-0.8%
Median	+7.4%	+2.4%	+2.5%	+2.6%	+2.6%
St. Dev.	16.6pp	9.4pp	4.1pp	9.4pp	10.9pp

Note: Relative tree cover change is measured as the log difference between local and national treed cover change percent rates, as explained in the following section.

Figure 2.6 shows the distribution of relative tree cover change rates over the two safeguards examined here, when measured at site-specific radii (as Figure 2.3 does for tree cover change measured within 10km). As in Figure 2.3, above, prior consultation appears to be associated with less tree cover loss: having a prior consultation requirement raises the average relative tree cover change from -5.2 percent to +0.4 percent. However, these means are dominated by outliers; the standard deviations (while much smaller than those in Figure 2.3) are still quite large, and the means are not significantly different from zero. Also as above, grievance mechanisms show an ambiguous – at best – relationship with tree cover change.

Figure 2.6: Distribution of relative tree cover change (measured within site-specific radii), by ESS, 2000-2015



	Prior Cons. Not Required	Prior Cons. Required		GM Not Present	GM Present
N	19	65	***N***	38	46
Mean	-5.2%	+0.4%	***Mean***	-2.2%	+0.3%
Median	+2.4%	+2.6%	***Median***	+2.5%	+2.6%
St. Dev.	16.8pp	8.2pp	***St. Dev.***	14.0pp	7.4pp

Table 2.7 shows the results of repeating regression Models 1 through 3 with tree cover change measured at site-specific radii. Considered jointly, these models nearly double the R^2 values of Table 2.5 without losing degrees of freedom (or observations, as noted above). Furthermore, they have highly-significant model F-statistics. Thus, these models explain the variation in relative tree cover change among projects much better than those shown above.

As above, prior consultation mechanisms are significantly related to tree cover loss: projects with a prior consultation requirement have 5.6 percent less tree cover loss than other projects, relative to the surrounding territory. Also as above, formal grievance mechanisms are not significantly related to tree cover change, and including this variable fails an F-test for over-specification, so it should be omitted. Thus, Model 4 is preferable to Model 6. Finally, whether a project has zero initial tree cover is the *most* significant factor in relative tree cover change, which is to be expected given the impossibility of tree cover loss at these sites.

Table 2.7: Regression results using site-specific radii: association with net tree cover change

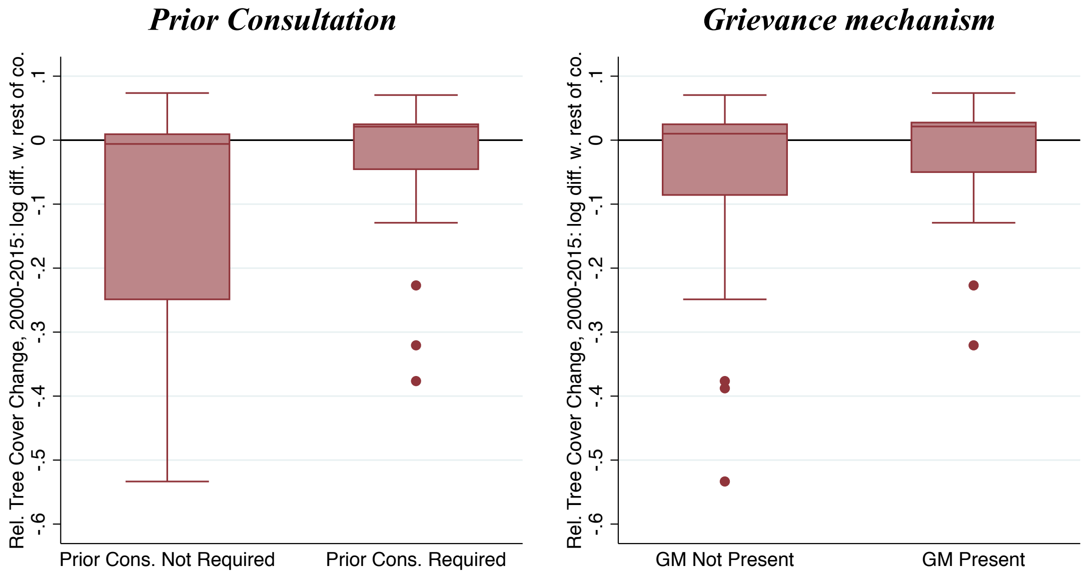
	Prior Consultation (Model 4)		**Grievance Mech. (Model 5)**		**Both (Model 6)**	
	Coef-ficient	**St. Error**	**Coef-ficient**	**St. Error**	**Coef-ficient**	**St. Error**
Safeguards:						
Prior Consultation	**0.056***	0.026			0.060	0.034
Grievance Mech.			0.028	0.025	-0.007	0.032
Controls:						
Prior local Δ pop.	0.529	1.361	0.758	1.396	0.570	1.381
Year	0.001	0.003	0.003	0.004	-0.000	0.004
Zero initial TC	**0.092*****	0.024	**0.092*****	0.025	**0.093*****	0.024
Intercept	-1.359	6.833	-6.251	7.358	-0.455	7.952
R^2	0.2100		0.1783		0.2105	
F-Statistics:						
This model	F (4,79) = **5.25*****		F (4,79) = **4.29****		F (5,78) = **4.16****	
Compared to Model 4					F (1,78) = 0.05	

Note: N=84. * indicates P≤0.05; *** indicates P≤0.001. Model 4 is highlighted because it offers the most explanatory power of these three, based on the F-test shown.

2.5.1.1 The Role of Initial Tree Cover

It is worth exploring the impact of including projects with zero initial tree cover on the results of the analysis. Among the 84 projects included in Table 2.7, only 49 had non-zero tree cover in 2000. Theoretically, there is reason to include the projects with zero initial tree cover. While the literature cited above has established a significant relationship between road construction and tree cover loss in forested areas, at the time of this writing no literature known to the author rules out the possibility of a relationship between road construction in non-forested areas and tree cover gain, either through reforestation or agro-forestry activities. Empirically, however, none of the observations studied here with zero initial tree cover experienced any change in in that tree cover level between 2000 and 2015. Figure 2.7 shows the relationship between tree cover change and project ESS just among projects with non-zero levels of tree cover in 2000; the resulting relationships are essentially unchanged, though the resulting distributions are broader as the universe of observations is smaller.

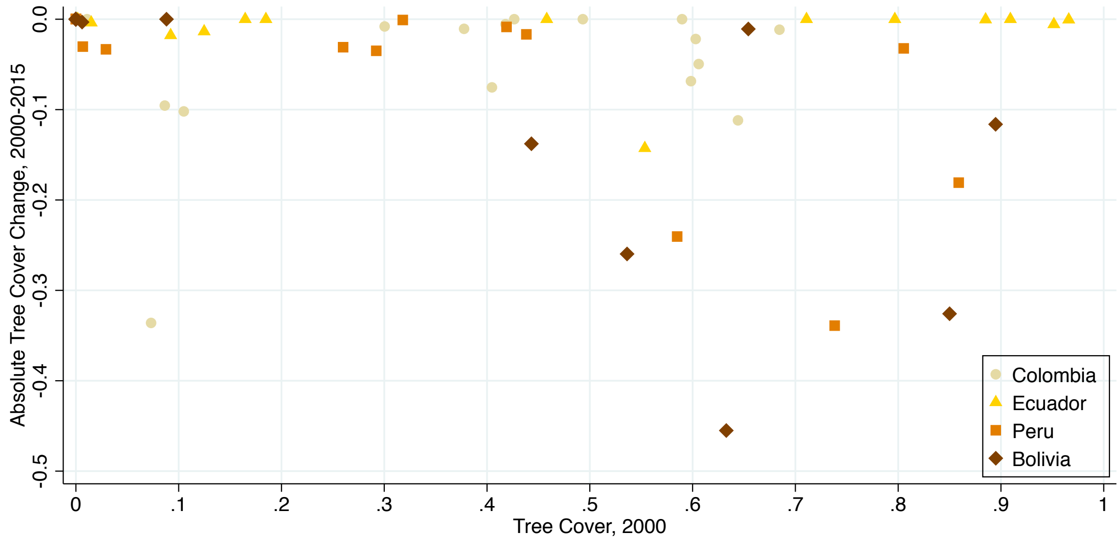
Figure 2.7: Distribution of relative tree cover change (measured within site-specific radii) among projects with positive initial tree cover, by ESS, 2000-2015



	Prior Cons. Not Required	Prior Cons. Required		GM Not Present	GM Present
N	10	39	***N***	22	27
Mean	-12.5%	-2.2%	***Mean***	-6.9%	-2.1%
Median	-0.6%	+2.1%	***Median***	+1.0%	+2.1%
St. Dev.	20.4pp	9.5pp	***St. Dev.***	16.6pp	8.8pp

Furthermore, among projects with positive levels of initial tree cover, no obvious relationship exists between the initial *level* of tree cover and subsequent tree cover loss, as Figure 2.8 shows. The projects with the most severe tree cover loss between 2000 and 2015 had initial tree cover levels of 63.3, 73.8, 7.3, 85.0, and 53.6 percent, respectively. Areas with low, mid-level, and heavy forestation rates are all represented in those five observations. On the other end of the spectrum, observations with zero tree cover change during the time period studied here have an initial tree cover levels ranging from zero to 90.9 percent – only five projects had higher initial tree cover rates than that level. For this reason, the model shown in Table 2.7 does not include any references to differences among non-zero levels of initial tree cover.

Figure 2.8: Absolute tree cover change and initial tree cover level, 2000-2015

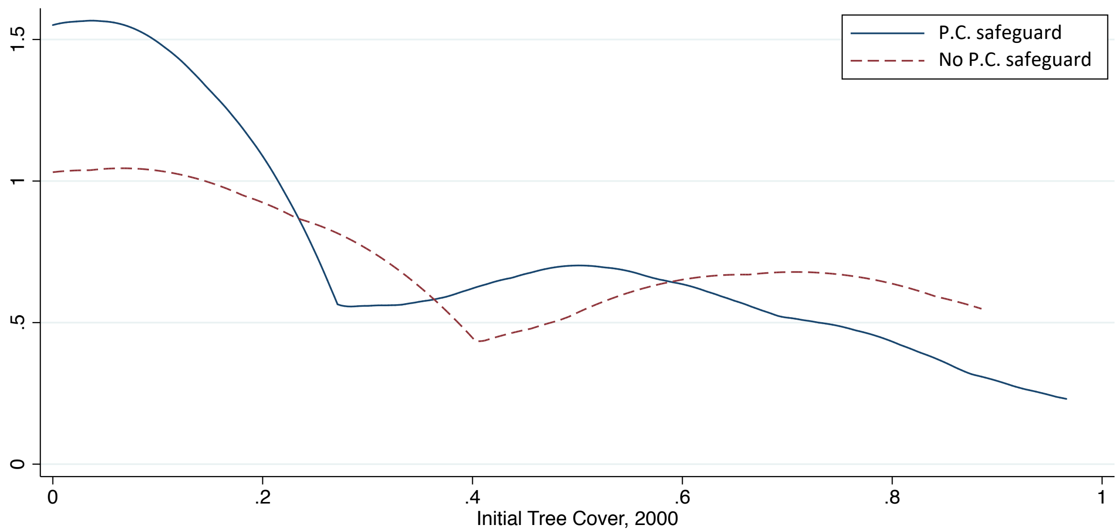


2.5.1.2 The Role of Site Selection

In all of the models shown thus far, the one variable with consistently significant results has been whether a project site had zero local tree cover in 2000. Thus, it is important to distinguish whether projects with prior consultation mechanisms perform better relative to tree cover change because of their *initial* conditions. In other words, this raises the question of whether prior consultation requirements simply add a bureaucratic hurdle that encourages countries to avoid using international DFIs with those requirements for projects in heavily forested areas. Such a finding would be consistent with the work of Buntaine (2016, 82), who interviewed 54 individual staff members at four Washington, DC-based MDBs and found that it was common for World Bank staff to report avoiding certain projects because of the added “hassle factor” of pursuing safeguards in environmentally or socially risky loans. Furthermore, the World Bank’s own Independent Evaluations Group reported in 2010 that most Latin American and Caribbean team leaders “had encountered clients who wanted to avoid all or part of a project because of safeguard policies” (46). If the results seen in Table 2.7 are simply a restatement of these observed tendencies, then they do not speak to the usefulness of prior consultation in preventing deforestation so much as its impact on sending risky projects to DFIs with looser safeguards – surely not the intention of safeguard designers.

Figure 2.9 shows the distribution of initial tree cover levels among projects with and without prior consultation requirements. Projects with prior consultation safeguards do appear to be more heavily concentrated in areas with zero or very low tree cover. (The bi-modal distribution shown here is not unexpected, as the region is characterized by dense tropical forest and open desert).

Figure 2.9: Distribution of initial tree cover levels among projects with and without prior consultation safeguards (kernel density)



	N	Mean ITC	Median ITC	St. Dev., ITC	% with zero ITC
With P.C.	65	25.8%	8.7%	31.1pp	40.0%
Without P.C.	19	31.6%	8.8%	36.1pp	42.1%
Total	84	27.1%	8.7%	32.2pp	40.5%

Based on Figure 2.9, it does appear to be the case that DFIs with stricter safeguards are likely to choose less risky projects. However, this tendency alone does not explain all of the difference seen in Table 2.7. A Blinder-Oaxaca decomposition, shown in Table 2.8, can more explicitly differentiate the importance of prior consultation safeguards in Model 4. The results show that almost all of the observed difference in performance between projects with and without prior consultation requirements is due to the coefficients, rather than the endowments. In other words, the difference is related to how well projects with prior consultation safeguards performed *given the initial characteristics* of the project, and not those characteristics themselves.

Table 2.8: Blinder-Oaxaca decomposition of the observed differences in Model 4 (Table 2.7)

	Absolute Difference	Share of total
Endowments	-0.002	4.0%
Coefficients	-0.059	105.8%
Interaction	0.005	-9.8%
Total difference in observed means	0.056	100.0%

2.5.2 Country and Type

Table 2.9 shows the result of including country and project type variables, both individually and together. Even without including an explicit country control, the model implicitly includes differences in national tree cover changes (in that the dependent variable's calculation includes national tree cover in 2000 near projects and elsewhere, nationally). However, it is worth exploring whether the differences in the national institutions that oversee project implementation have their own impact. This is especially true given that, in the cases of Ecuador, Peru, and Bolivia, prior consultation requirements were enacted by regimes that had come to power with the support of indigenous and environmentalist groups, as mentioned above, and might be expected to have important institution-specific mechanisms for improved performance under prior consultation-requiring regimes.

It is also worthwhile to seek out any differences among project type, given the extensive literature linking certain types of infrastructure projects (especially paved roads and dams with reservoirs) to deforestation in the Amazon basin, as mentioned above. When differentiating by type, this model divides projects into seven categories: biofuel, dams (divided into those with and without reservoirs), fossil fuel power plants, ports, roads, and unconventional renewable energy (including solar and wind farms).

Table 2.9 shows the results of including country and project type controls into the basic model. Every variation fails an F-test for over-specification when compared to Model 4 in Table 2.7. Thus, even though Model 7 shows a significant result for Ecuador, this result should be disregarded, as an extraneous artifact of over-specification. The lack of significant differences among project type is a particularly striking given the existing literature linking certain types of infrastructure projects (especially paved roads and larger dams) with deforestation.

Table 2.9: Regression results with country and type variables, using site-specific radii: association with net tree cover change

	Country (Model 7)		Type (Model 8)		Both (Model 9)	
	Coef-ficient	St. Error	Coef-ficient	St. Error	Coef-ficient	St. Error
Prior Consultation	0.039	0.029	0.050	0.029	0.044	0.033
Controls:						
Prior local Δ pop.	0.135	1.358	0.440	1.422	-0.033	1.469
Year	-0.001	0.004	-0.002	0.004	-0.002	0.004
Zero Initial TC	**0.118*****	0.027	**0.105*****	0.025	**0.125*****	0.029
Country:						
Colombia	0.029	0.035			0.042	0.039
Ecuador	**0.085***	0.040			0.078	0.057
Peru	0.003	0.030			0.011	0.034
Type:						
Dam: R.o.R.			0.088	0.105	0.058	0.110
Dam: w/ res.			0.007	0.106	0.002	0.107
Fossil fuel power			0.034	0.116	0.005	0.121
Port			0.004	0.108	-0.003	0.112
Road			0.026	0.102	0.036	0.105
Unconv. R.E.			0.073	0.117	0.046	0.121
Intercept	2.730	7.126	3.261	7.644	4.590	8.082
R^2	0.2616		0.2612		0.2840	
F-statistics:						
This model	F (7,76) = **3.85****		F (10,73) = **2.58****		F (13,70) = **2.14***	
Compared to Model 4	F (3, 76) = 1.77		F (6, 73) = 0.84		F (9, 70) = 0.80	
Compared to Model 7					F (6, 70) = 0.36	
Compared to Model 8					F (3,70) = 0.74	

Note: N = 84. * indicates P≤0.05; ** indicates P≤0.01; *** indicates P≤0.001. R.o.R. indicates "run of the river" dams, without reservoirs.

Finally, even if *institutional* differences between countries are not significant, differences in the institutional *will and capacity* across countries – and DFIs – may be relevant. Table 2.10 shows the results of including considerations for the environmental performance of the institutions related to each project, measured as the Environmental Performance Index for each project's international DFI and nation.[16] As Table 2.10 shows, however, EPI scores do not help explain variations in tree cover. Not only are

[16] The methodology for calculating country and international DFI EPI scores for each project is discussed in Appendix B.2.

their impacts insignificant, but F-tests show that these models have less explanatory power than Model 4, which excludes EPI scores.

Table 2.10: Regression results with EPI scores for countries and international DFIs at site-specific radii: association with net tree cover change

	Country (Model 10)		Type (Model 11)		Both (Model 12)	
	Coef-ficient	**St. Error**	**Coef-ficient**	**St. Error**	**Coef-ficient**	**St. Error**
Prior Consultation	0.046	0.030	0.053	0.027	0.041	0.031
Controls:						
Prior local Δ pop.	0.581	1.369	0.366	1.404	0.374	1.407
Year	-0.002	0.006	0.001	0.004	-0.002	0.006
Zero Initial TC	**0.094*** **	0.024	**0.094*** **	0.024	**0.097*** **	0.025
EPI:						
Borrower	0.002	0.003			0.002	0.003
DFI			-0.102	0.197	-0.137	0.202
Intercept	4.472	11.264	-2.114	7.018	4.837	11.316
R^2	0.2143		0.2127		0.2190	
F-statistics:						
This model	**4.26** **		**4.22** **		**3.60** **	
Compared to Model 4	0.41		0.25		0.43	
Compared to Model 10					0.46	
Compared to Model 11					0.62	

Note: N = 84. * indicates P≤0.05; ** indicates P≤0.01; *** indicates P≤0.001. The methodology for calculating environmental performance index (EPI) scores is discussed in Appendix B.1.

2.5.3 The Role of International DFIs

Beyond the enactment of prior consultation provisions, the *implementation* of these requirements is a crucial element in project impacts. This is an intrinsically institutional topic. This section explores the role of international DFIs by examining the comparative performance of the different DFIs, the importance of international DFIs prior consultation requirements compared to *national* prior consultation standards, and the importance of DFI involvement with the prior consultation process.

Table 2.11 shows the results of comparing DFIs to each other within Model 4. The DFIs shown in Table 2.11 are not mutually exclusive. Since projects are often co-financed (and some road segments are financed under multiple different loans from different DFIs operating separately), this is a test of the *participation* of particular DFIs in particular projects.

Table 2.11: Regression results, disaggregated by DFI: association with net tree cover change

	Simple (Model 13)		With Countries (Model 14)	
	Coefficient	**St. Error**	**Coefficient**	**St. Error**
Prior Consultation	0.051	0.035	0.032	0.045
DFI:				
IBRD	-0.024	0.043	-0.012	0.051
IFC	-0.064	0.039	-0.068	0.042
IADB	-0.056	0.041	-0.048	0.044
IIC	0.050	0.053	0.039	0.055
CAF	-0.055	0.039	-0.053	0.039
BNDES	0.041	0.080	0.003	0.089
CDB	0.013	0.073	-0.012	0.079
CHEXIM	0.005	0.084	-0.017	0.090
Controls:				
Prior Local Population Growth	0.630	1.485	0.329	1.516
Approval Year	0.001	0.005	0.001	0.005
Zero initial Tree Cover	**0.110*** **	0.026	**0.126*** **	0.029
Country:				
Colombia			0.036	0.040
Ecuador			0.060	0.050
Peru			0.005	0.034
Intercept	-2.135	9.449	-1.565	10.780
Model:				
R^2	0.3036		0.3211	
F-statistics:				
This model	F (12, 71) = **2.58** **		F (15, 68) = **2.14***	
Compared to Model 4	F (8, 71) = 0.53		F (11,68) = 0.54	
Compared to Model 13			F (3, 68) = 0.58	

Note: N = 84. * indicates P≤0.05; ** indicates P≤0.01; *** indicates P≤0.001.

None of the DFIs significantly out-perform any other and including them yields an F-statistic that indicates over-specification when compared to Model 4. This is a useful result because it indicates that the difference shown above is due to policy, rather than other institutional aspects of the DFIs that have adopted them (mostly northern-based MDBs).

Another relevant question is the importance of whether the DFI or the national government provides the prior consultation protection. After all, as established above, in many cases the DFIs here established their ESS only after civil society groups in affected countries complained of not being taken into account by the relevant authorities in their national governments. With this in mind, it is worthwhile to disaggregate Model 4 by the type of institution that requires prior consultation: the DFI, the host country, or both.

Table 2.12 shows the results of this analysis. It also includes country controls, because of the institutional nature of the question asked in this section: *Given an active or passive DFI,* do any countries perform better than others? While prior consultation continues to show significant results, neither DFI leadership nor any particular country makes a significant difference.

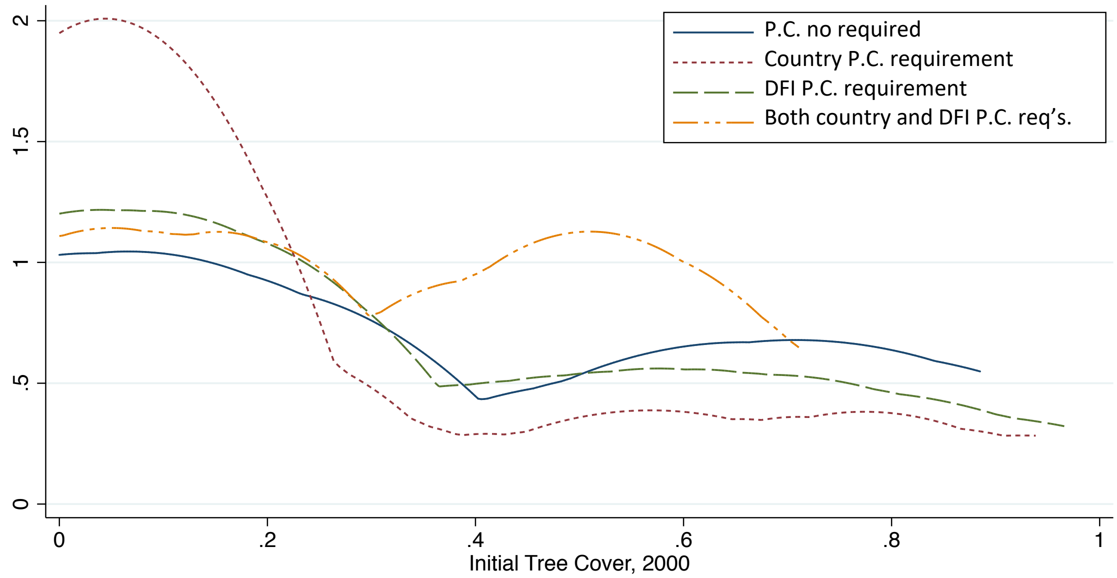
Table 2.12: Regression results, disaggregated by source of prior consultation requirement: country, DFI, or both: association with net tree cover change

	Simple (Model 15)		**With Countries (Model 16)**	
	Coefficient	**St. Error**	**Coefficient**	**St. Error**
Safeguards:				
Country-only P.C.	**0.085***	0.036	**0.097***	0.048
DFI-only P.C.	0.028	0.032	0.019	0.031
Both	**0.076***	0.034	**0.150***	0.060
Controls:				
Prior local population growth	0.065	1.415	-0.960	1.443
Approval year	-0.004	0.004	-0.009	0.005
Zero initial tree cover	**0.097*****	0.024	**0.102*****	0.028
Country:				
Colombia			-0.056	0.054
Ecuador			0.070	0.040
Peru			0.022	0.033
Intercept	7.611	8.946	17.346	10.701
Model:				
R^2	0.2355		0.3040	
F-statistics:				
This model	F (6,77) = **3.95****		F (9,74) = **3.59*****	
Compared to Model 15			F (3, 74) = 2.46	

Note: N = 84. * indicates P≤0.05; ** indicates P≤0.01; *** indicates P≤0.001.

However, as above, before drawing conclusions from Table 2.12, it is important to disaggregate the role of site selection from the role of policy. As Figure 2.10 shows, projects with country prior consultation protections but without DFI prior consultation protections are much likelier than other projects to be located in areas with low initial tree cover. The mean initial tree cover level for these projects is 21.1 percent, compared to other groups with means between 27.0 percent and 31.6 percent.

Figure 2.10: Tree cover in 2000 at infrastructure project sites, by prior consultation protection type



	N	Mean ITC	Median ITC	St. Dev., ITC	Pct. with zero ITC
No P.C.	19	31.6%	8.8%	36.1pp	42.1%
Country-only P.C.	20	21.1%	4.4%	31.6pp	35.0%
DFI-only P.C.	25	27.0%	0.0%	34.4pp	52.0%
Co. & DFI P.C.	20	29.1%	33.9%	26.9pp	30.0%
Total	84	27.1%	8.7%	27.1pp	40.5%

Since the *type* of prior consultation enforcement is a categorical variable, to test the importance of ITC as an interaction variable, a Blinder-Oaxaca decomposition is not useful in this case. Thus, to eliminate the interference of differences in site selection, Table 2.13 limits Models 12 and 13 to those observations with non-zero initial tree cover, yielding Models 17 and 18. Of the resulting two models, only Model 18 (including country controls) has a significant F-statistic (and also shows that adding country controls significantly helps explain the variation in tree cover change). Model 18 shows that the lack of significant impact of DFI prior consultation requirements seen in Table 2.12 is a mere artifact caused by the "zero initial tree cover" variable. It also shows that projects in countries with national prior consultation requirements are expected to have 30.4 percent better tree cover change around infrastructure projects, relative to the rest of the country, than projects with no prior consultation protections. In cases with no national prior consultation policy, a project's related relative tree cover change can still improve by 10.6 percent from the associated DFI's prior consultation policy. This rate rises to 32.4 percent if country and the DFI both have prior consultation policies.

Table 2.13: Regression results, disaggregated by source of prior consultation requirement, where initial tree cover >0: association with net tree cover change

	Simple (Model 17)		With Countries (Model 18)	
	Coefficient	**St. Error**	**Coefficient**	**St. Error**
Safeguards:				
Country P.C.	**0.122***	0.060	**0.304****	0.096
DFI P.C.	0.063	0.053	**0.106***	0.051
Both	**0.129***	0.056	**0.424*****	0.116
Controls:				
Prior local population growth	-0.430	2.018	-2.890	1.978
Approval year	-0.004	0.007	**-0.021***	0.008
Country:				
Colombia			-0.144	0.092
Ecuador			0.080	0.061
Peru			**0.169***	0.064
Intercept	7.178	14.657	**41.749***	16.623
Model:				
R^2	0.2484		0.3593	
F-statistics:				
This model	F (5,43) = 1.390		F (8, 40) = **2.87***	
Compared to Model 17			F (3, 40) = **7.29*****	

Note: N = 49. * indicates P≤0.05; ** indicates P≤0.01; *** indicates P≤0.001.

Table 2.14 tests the difference in strength of the associations shown in Table 2.13. The only non-significant difference is between country-only prior consultation requirements and double-source prior consultation requirements. In other words, while the introduction of a prior consultation requirement into a context that previously did not have one is significant, regardless of the source of this new safeguard, an *additional* DFI requirement – in a context where the host government already requires prior consultation – is useful mostly in that it prevents future projects from losing all prior consultation protections if the host country drops its protection. In this way, DFI and country systems act in a form of *productive redundancy*. They serve as insurance policies that even if partner institutions back out of their commitments, the vulnerable populations affected by infrastructure projects will still have a place at the planning table.

Table 2.14: F-tests for significance of differences in coefficients shown in Table 2.10

	Source of Prior Consultation Requirements		
	Country only	DFI only	Country and DFI
No P.C. Requirement	**9.96****	**4.21***	**13.41*****
Country-only P.C. Req.		**5.42***	3.11
Bank-only P.C. Req.			**8.98****

Note: All F-tests here are F (1,41).

Based on the results of Model 18, DFI safeguards appear to act as a form of productive redundancy, or insurance against the possibility of countries rolling back their protections. As row 1 shows, country and bank safeguards are associated with significant improvements in outcomes compared to no safeguards at all. As row 2 shows, bank safeguards are not associated with significant improvements *in addition to* country safeguards but serve as an insurance policy against countries rescinding their protections. Finally, as row 3 shows, country safeguards *are* associated with significant improvements *in addition to* bank safeguards. These results suggest that in countries outside of this region, which may not have similar legal protections, bank safeguards may fill the void left by national governments in the protection of their most vulnerable communities.

2.6. Discussion

This chapter shows that within a limited scope of analysis, prior consultation protections can have significant impact on deforestation related to infrastructure projects, while the existence of development bank grievance mechanisms do not. The sections below discuss these findings in more detail, extrapolate them to relevant policy discussions and lays out a research agenda for continuing this work.

2.6.1 Discussion of Findings

This analysis shows a significant relationship between reduced tree cover loss during international DFI-financed infrastructure projects and prior consultation safeguards, while it finds no such relationship for DFI grievance mechanisms. These results may seem surprising, but likely simply reflect the difference in purpose and design of the different safeguards. By definition, prior consultation safeguards slow down project planning until the environmental and social risks posed by land use change to vulnerable ethnic minority groups have been discussed thoroughly. Grievance mechanisms, in contrast, are akin to other mediation or arbitration processes in that they are post-hoc tools to halt or mitigate social or environmental damage that has already occurred or compensate populations that have suffered from that damage. Stakeholders may seek relief through grievance mechanisms for many different kinds of damages, ranging from the type of environmental impacts studied here to unrelated impacts such as labor disputes, gender or racial disparities in the distribution of project costs and benefits, or inadequate progress on promised social compensation measures. Seen from this perspective, then, grievance mechanisms may have significant but diffuse impacts across many different aspects of project implications. For this reason, section 2.6.3 below suggests that future work seek out possible impacts of grievance mechanisms on social conflict surrounding projects, regardless of the type of perceived harm triggering such conflict.

Another possible explanation for the significant relationship shown here between prior consultation safeguards and reduced tree cover loss may be some institutional characteristics not captured here. For example, DFIs and national governments may be more committed to project oversight in general after instituting safeguard reform, because of the pressure from civil society that brought about those safeguards. However, the lack of a significant result for grievance mechanisms makes this explanation unlikely. Similar groundswells of civil society activity spurred both of these reforms, in rather rapid succession, and yet only one shows a significant relationship with tree cover change. It is more likely that the results shown here are attributable to the reforms themselves.

2.6.2 Policy Implications

Prior consultation is a relatively new protection in the countries studied here, but unfortunately it is already under attack. Ballón and Molina (2017) document a significant rollback in national prior consultation protections since the end of the commodities super-cycle in Colombia, Peru, and Bolivia, as governments have prioritized expanding extractive production quickly given falling prices.

Moreover, even before the end of the super-cycle, indigenous communities in these countries have not always been ensured adequate inclusion in prior consultation processes. Sanborn, Hurtado, and Ramírez (2016) and Pozo (2012) explain that prior consultation has been unevenly applied in Perú, because the military government of the 1970s relabeled many indigenous communities as "peasant" communities as a rhetorical push to unite disadvantaged groups around their shared economic challenges. These "peasant" groups – many of whom speak Quechua and self-identify as such – have not always been included in the prior consultation processes. Ray and Chimienti (2017) show that, while that Ecuador's 2010 Citizen Participation Law allows the government to push forward with planned development projects in the face of majority opposition by local communities *only* if higher environmental and employment standards are applied, the prior consultation process has not always kept a record of what percent of consulted communities expressed favor or opposition, in order to determine which set of standards applies.

Maintaining political will for the importance of prior consultation safeguards at the national level, then, is a crucial area for policy implications of this work. As Humphrey (2015) states, without the buy-in of governments seeking financing for particular projects, they may avoid the “hassle factor” associated with international DFI ESS and simply take their proposals to banks with fewer requirements. Humphrey and Machaelowa (2013) show that MDB lending patterns in Latin America suggest that borrower demand is an important factor in which projects receive financing from which banks, so a situation with bank ESS but without country commitment to the process could simply result in countries taking their proposals to less-strict banks.

Another possibility is for countries to self-finance projects that have failed international DFI ESS processes. For example, in the example cited above in which Bolivia shifted funding away from a project that had been challenged through the IADB’s MICI grievance mechanism, the Bolivian government has continued to pursue that project with its own financing. In 2014, the Bolivia Highway Administration (*Administradora Boliviana de Carreteras,* or ABC) announced that it would self-finance the bridge, having signed a contract with Chinese contractor Sinopec (Escóbar 2014).

Given the ability of governments to “shop around” for the most favorable terms for an infrastructure loan, or even self-finance these projects, it is crucial for international DFIs to maintain their commitments to prior consultation processes. After all, most bank safeguards were enacted absent national standards. Furthermore, banks that have not yet adopted prior consultation protections, such as BNDES and the CDB when they operate outside of their home countries, would be well-served to consider incorporating them. Though these requirements are often conceptualized as *social* safeguards, this chapter shows that they have significant *environmental* impacts.

2.6.3 Areas for Future Research

This chapter serves as an initial inquiry into the environmental impacts of ESS reform. Nevertheless, it is important to interpret the results discussed above with a healthy level of caution, as the total number of projects carried out in the region and time period studied here is modest. Thus, ample space remains for this work to be continued with added breadth and/or depth.

This line of research would be well served to be continued with greater breadth of types of infrastructure projects and types of impacts. Other forms of hard infrastructure undoubtedly contribute to countries' fixed capital stock, including telecommunications, water, sewer, and power distribution networks as well as oil and gas pipelines. Unfortunately, however, it is not possible to trace the precise locations of every kilometer of new power or phone lines, or water and sewer pipes, with the same level of detail as for roads, dams, and power plants. However, they might reasonably be expected to have a significant relationship with tree cover change, by opening up rural areas for new housing developments and encourage in-migration from other areas, in addition to their stated purposes of increasing local living standards and competitiveness. Furthermore, as Finer and Jenkins (2012) find, some of the deforestation associated with dams happens not at the site of dams, but along the associated power transmission lines. If precise information about the locations of these networks and pipelines becomes publicly available in the future, it would be worthwhile to repeat the present analysis with these inclusions.

The breadth of the current study could be constructively expanded by including infrastructure-related tree cover change in other tropical deforestation hotspots such as Indonesia and the Philippines, as well as Brazil. Doing so may allow the model's degrees of freedom to expand sufficiently to support other contributing factors, such as the prices of the major commodity exports supported by new roads and ports (metals, hydrocarbons, soy, coffee, and palm oil) as well as exchange rate fluctuations (which might make primary commodity exports more profitable). Many researchers have found significant relationships between prices, exchange rates, and tropical deforestation (see for example Fearnside, 2008; Gaveau et al, 2009; Richards et al, 2012; and Swensen et al, 2011); such an expansion of the current model would allow for the incorporation of these impacts. Furthermore, it may allow for the incorporation of variables identifying differences in the social, economic and governance contexts, which are quite similar among the Andean nations studied here but differ broadly across regions.

As crucial as deforestation may be as a social and environmental impact, it is hardly the only one worth considering. For example, the line of research cited here would be well served to incorporate environmentally-motivated social conflict. This is especially true given the lack of significant relationship between international DFIs' formal grievance mechanisms and deforestation shown here. It may be that the impact of those mechanisms is better observed in preventing and mediating conflict rather than preventing deforestation. CLACSO (2000-2012) list every social conflict and protest in Latin America from 2000-2012. It would be highly useful for future research to pair individual protests listed in the CLACSO database with development projects to measure projects' tendency to inspire conflict, and the ability of national governments and development banks to resolve these conflicts.

This essay examined projects before and after the enactment of free, prior, informed consultation protections for indigenous communities. A further wave of reform enshrined free, prior, informed *consent* of those communities for projects overseen by the World Bank and IFC. As of year-end 2015, only two infrastructure projects in the Andean region have incorporated this protection: the Callao Muelle Norte port in Lima, Peru, and the Puerto Bahía port outside Cartagena, Colombia. Thus, FPI-consent could not be incorporated into the present analysis. Nonetheless, if consultation mechanisms are associated with better environmental outcomes, as the results of this essay suggest, further benefits may be visible once sufficient projects have been approved with FPI consent have been completed. It would be helpful to revisit the present analysis after this practice has garnered a larger presence in the global infrastructure finance portfolio, to test the potential environmental impact of this ambitious social protection.

There is also a significant need for future research of a deeper nature than this study can provide. This analysis is limited to the *de jure* presence or absence of social and environmental protections. It does not take into account the institutional factors behind how – or how well – these are *implemented*. For example, it would be worthwhile to examine whether banks without their own prior consultation requirements have better environmental performance when they co-finance projects with banks that *do* have such requirements. Unfortunately, this dataset is not large enough to explore these questions, as it contains just 10 projects that were co-financed by banks that do and do not oversee prior consultation processes, and just 16 projects with co-financing of any type.

Finally, having a prior consultation requirement is not equivalent to ensuring adequate community participation. For example, the universe size examined here does not allow for the consideration of prior *consent* (FPIC), only consultation. A broader array of projects may expand the dataset sufficiently to probe the impacts of full FPIC rather that simple prior *consultation* shown here. Furthermore, institutions vary in their ability and willingness to ensure that communities have truly been incorporated into prior consultation processes. Laurance et al (2015) note that the level of compliance with ESS can vary greatly. They urge, *inter alia*, a deeper commitment to stakeholder engagement, one that goes beyond what they call "superficial box-ticking" (260) to true stakeholder engagement. Unfortunately, while the differences in outcomes according to the thoroughness of safeguard application continues to be an important area for future exploration, it is well beyond the capabilities of the present work.

2.7. Conclusion

Though prior consultation is often conceptualized as a *social* safeguard, this chapter shows that it can have significant *environmental* impact. Furthermore, its impact is consistently positive, regardless of whether it is imposed by the national governments that propose the projects or by the transnational development banks that finance them. In this sense, governments and banks form a system of *productive redundancy*, in which each serves as an insurance policy for affected communities, so that if one institution rolls back its protections, prior consultation guarantees will be preserved. The same impact was not observed for the other major new ESS reform, the establishment of formal avenues for communities to pursue grievances against projects in case of damages. However, as these are traditionally considered social safeguards, it is likely that this protection's impact is felt in other avenues, such as the prevention of social conflict or reputational damage.

CHAPTER 3

CROSSROADS IN THE EQUATORIAL FORESTS: CHINESE INVESTMENT AND "HIGH-ROAD EXTRACTIVISM" IN ECUADOR

3.1 Introduction

Ecuador has been a predominantly oil-driven economy since crude was first discovered in the country in the middle of the 20th century. However, instead of bringing the country wealth and development, Ecuador's time as an oil producer has been plagued by economic instability, social conflicts, and environmental degradation. During the most recent oil boom, Ecuador enacted a sweeping series of reforms aimed at mitigating the worst aspects of the sector while ensuring that its benefits were shared broadly. Simultaneously, it sought to limit its dependence on oil (through supporting non-traditional sectors and through seeking payment for environmental services) while welcoming non-traditional oil investment partners, from China. Thus, Ecuador represents an "all of the above" strategy to repairing the damage from commodity dependence, by seeking to incorporate new industries, a new regulatory environment for oil production, and new partners within a short period of time.

In this regard, Ecuador presents a uniquely apt test case for whether Latin American commodity-dependent nations can successfully pursue an alternative to the problems of commodity dependence, in what this essay will refer to as a "high-road extractivism" model. Elements of this model include shifting away from reliance on the United States and U.S.-based investors in favor of new partners, ones whose identity as Chinese state-owned enterprises gives them incentives to cultivate long-term relationships with the government of Ecuador rather than seeking short-term profits. The model also involves establishing a comprehensive regulatory framework – encompassing new environmental protections, labor rights, human rights guarantees, and taxation and devolution schema to ensure that the revenue from oil production benefits impacted communities.

The oil boom from 2003 to 2013[17] provided an opportunity to evaluate the viability of this new rubric of investment governance. A new investment partner, a new regulatory environment, and oil exploration in new geographic areas gave Ecuador the opportunity to restart and redefine the terms of its reliance on oil investment. This essay explores the extent to which this re-initiation of Ecuador's oil economy with new partners enabled it to re-establish its identity as an oil economy on its own terms and pursue "high-road extractivism."

This essay is structured as follows. The first section reviews the various ways in which reliance on oil production and export has hampered Ecuador's ability to pursue sustained and sustainable economic development, through terms of trade volatility, anemic employment opportunities, environmental damage, and the history of relative impunity with which traditional (U.S.-based) oil firms have operated in Ecuador. The second section explores Ecuador's institutional attempts to change the paradigm that has governed its relationship with foreign petroleum investors: working towards less dependence on the oil sector, building a regulatory framework to govern investors' environmental and social performance in Ecuador, and seeking out new investment partners in China. The third section examines the extent to which these efforts have lived

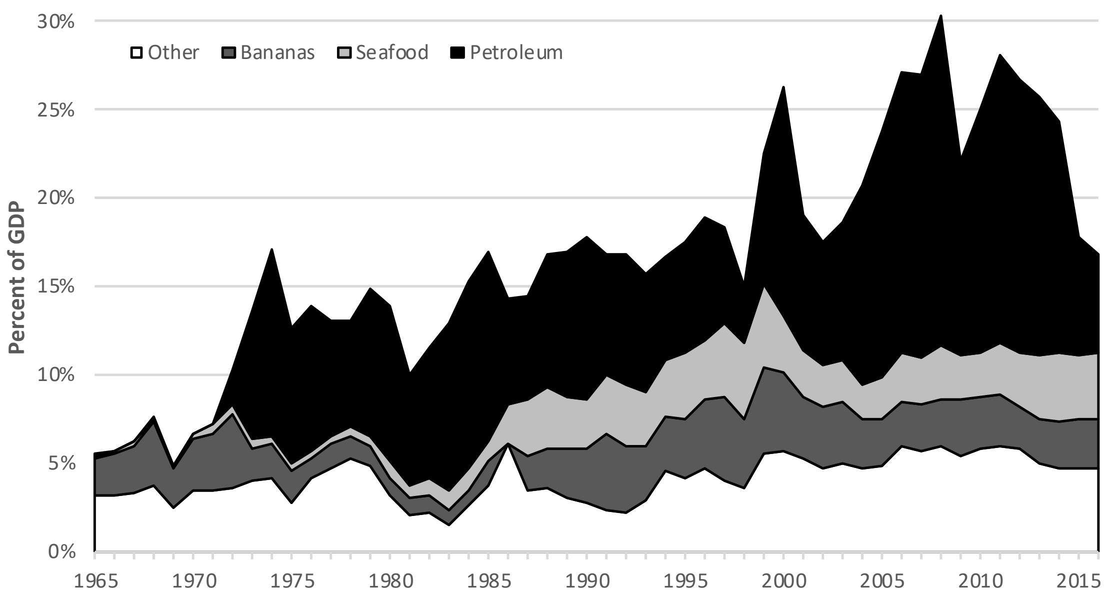
[17] For the purposes of the present analysis, the most recent global oil boom is defined as lasting between the years of 2003 and 2013 based on world oil prices, which tripled in real terms and more than tripled in nominal terms over that decade, as shown in Figure 3.3 below.

up to their potential, by evaluating the social and environmental performance of Chinese oil companies' operations in Ecuador as well as the Ecuadorian state's performance in overseeing new oil operations. Finally, a discussion section brings together the results from the previous sections, inquires into institutional explanations for the observed outcomes, and draws lessons for other Latin American countries seeking to improve the economic, social, and environmental sustainability of their extractive sectors.

3.2 Ecuador: Oil as an Impediment to Sustainable Development

Oil has been paramount in Ecuador's economy since its discovery in the 1970s. It quickly displaced bananas as the country's most important export, as Figure 3.1 shows, and has dominated exports ever since. At their highest level, in 2008, oil exports reached 61.7 percent of all Ecuadorian exports, and 18.7 percent of national GDP.

Figure 3.1: Ecuador exports as a share of GDP, by commodity



Source: Author's analysis based on COMTRADE (SITC Rev.1). Note: seafood includes fish and crustaceans; petroleum includes crude petroleum and petroleum products.

The government of Ecuador has recognized that basing the economy on petroleum is not sustainable environmentally, socially, or economically, and it has made diversification a major long-term policy priority. The 2013 National Development Plan states that "the existence of oil fields brings opportunities to generate income … However, the socio-environmental impacts of this extraction are very high, such as settling protected lands, deforestation, and the resulting habitat degradation, loss of biodiversity, contamination of soils and water sources, and others" (SENPLADES 2013, 460-461, author's translation).

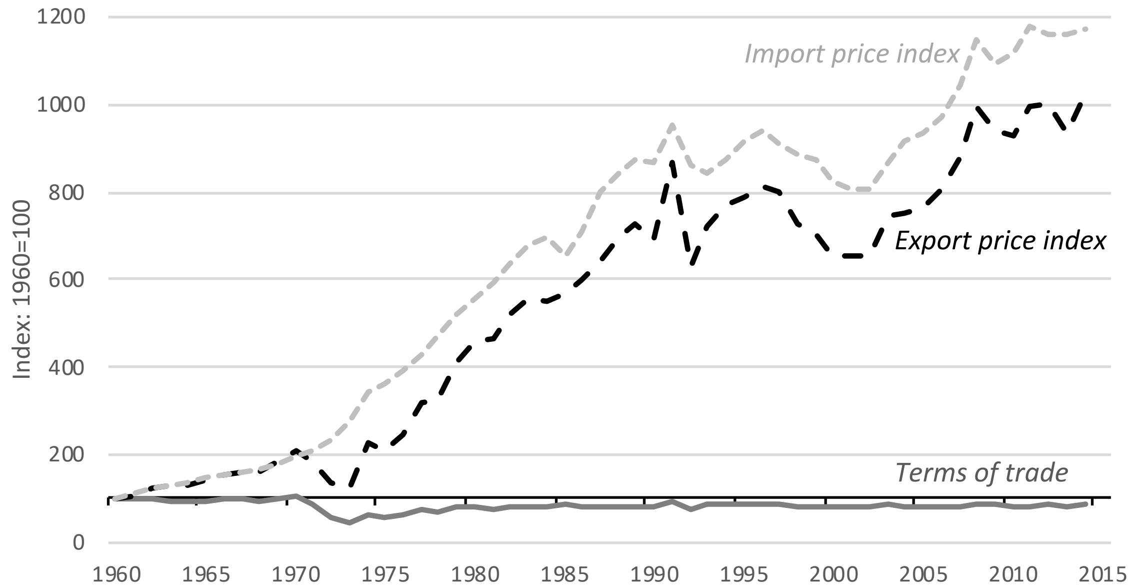
Specifically, the dominance of the oil industry hampers Ecuador's prospects for sustainable economic development in four ways. First, the price of petroleum is highly volatile globally, leading to volatile terms of trade and potentially dampening inbound FDI. Second, it supports few jobs per $1 million in exports, either directly or indirectly, so an oil boom does not necessarily benefit many Ecuadorians. Third, the oil reserves themselves are located in some of the most sensitive territory in the country: the Amazon rainforest, often under traditional indigenous territory. Finally, oil production in Ecuador has traditionally been carried out by large multinational corporations that have operated with lower social and environmental performance than they utilized elsewhere, and done so with relative impunity given Ecuador's relatively weak institutional capacity for setting and enforcing environmental standards.

3.2.1 Terms of Trade Disadvantages

The tendency of raw materials prices to fall relative to other prices in the long term has been the basis of much writing over the last half-century, since Raúl Prebisch (1950) and Hans Singer (1949) famously posited that countries relying on commodity exports would suffer a long-term decline in their terms of trade. Attempts to test the Prebisch-Singer hypothesis include Cuddington (1992), Harvey et al (2010) and Arezki et al (2013), which all use long-term price indices to determine which commodities fit the Prebisch-Singer hypothesis. Cuddingon and Arezki et al find a significant negative downward trend in the price of oil, while Harvey et al find no significant long-term oil price trend. These results suggest that while no consensus exists as to whether oil producing countries are bound inexorably to declining terms of trade, neither will oil help these countries catch up to countries that export manufactured goods.

Ecuador is an interesting test case for terms of trade trends in oil-exporting countries because it began exporting in the 1970s, so trade statistics are readily available for its entire oil-exporting period as well as the decade beforehand. Ecuador's oil export sector took off in earnest in the early 1970s, rising from just 38.8 metric tons and 0.0 percent of GDP in 1970, to 9,276.1 metric tons and 7.3 percent of GDP in 1973. So, it is particularly noteworthy that Ecuador's export price index experienced a *decline* during those years, as Figure 3.2 shows. Its export price index recovered with 1974's global petroleum price spike, but the nation had already lost ground relative to its import price index. This gap has persisted in the decades since, and Ecuador's terms of trade have never recovered to their pre-oil levels. The latest data available (2014) show that Ecuador's terms of trade index is still 17.3 percent below its 1970 level.

Figure 3.2: Ecuador's terms of trade, 1960 - 2014

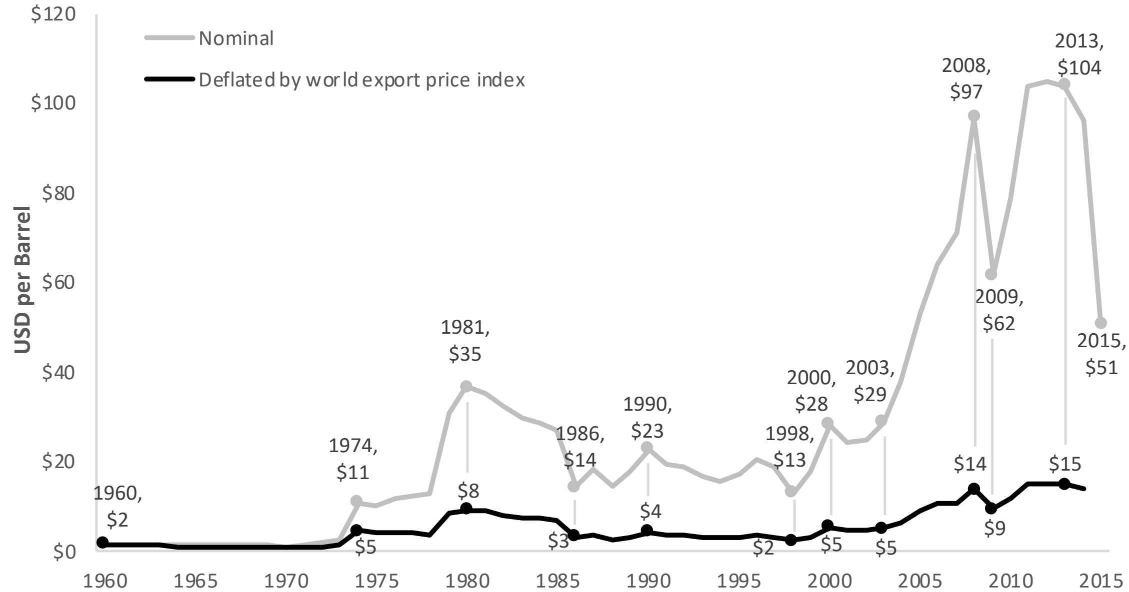


Source: Author's analysis of Penn World Table 9.0 data (Feenstra, Inkaar, and Timmer, 2015).

Beyond the importance of the declining terms of trade, terms of trade *volatility* is another important link between the importance of oil in Ecuador's economy and its middle-income trap. Blattman et al (2007) find in their study of long-term trends in terms of trade and GDP growth in periphery countries that terms of trade volatility was a significant determinant of economic growth, while terms of trade *growth* was not.

Figure 3.3 shows the average world price of oil since 1960 in two ways: nominally and deflated by the world export price deflator. The volatility is clear from a *prima facie* visual analysis. During the oil boom of 2003 to 2013, its price tripled in real terms and more than tripled in nominal terms, but since its peak it has lost nearly all of that ground.

Figure 3.3: World oil prices, nominal and real, 1960-2015



Note: As of this writing, export price indices are not yet available for 2015. The world export price deflator is estimated as the weighted average of national export price deflators, with weights defined as share of world exports. Source: author's calculation using world average prices, as listed in the World Bank GEM Commodities database, and Penn World Table 9.0 data (Feenstra, Inkaar, and Timmer, 2015).

Moreover, oil price volatility is extreme even among raw commodities. Table 3.1 shows the volatility (measured as coefficient of variation) in prices for 50 commodities with publicly available world price data between 1960 and 2016. In each case, crude oil stands out as particularly volatile, occupying second and third places (depending on its origin) for nominal prices, and first and second places for real prices.[18]

[18] The ranking of goods changes significantly depending on whether commodity prices are measured in nominal or real terms. The difference is related to whether a particular commodity's prices tend to move with other prices or not, which determines to what extent price volatility is dampened when deflated by the overall prices index.

Table 3.1: Price volatility (coefficient of variation) for commodities, 1960-2016

A. Nominal Prices

Good	CV	Good	CV	Good	CV
1. Phosphate	1.08	18. Zinc	0.67	35. Soybean oil	0.50
2. Crude oil, Dubai	**1.07**	19. Barley	0.64	36. Maize	0.49
3. Crude oil, world	**1.03**	20. Sugar, world	0.63	37. Sorghum	0.49
4. Potassium chloride	1.01	21. Oranges	0.62	38. Sugar, EU	0.48
5. Iron	1.00	22. Logs	0.60	39. Palm oil	0.47
6. Gold	0.98	23. Bananas	0.59	40. Wheat	0.47
7. Silver	0.95	24. Meat, chicken	0.57	41. Rice	0.46
8. Natural gas, US	0.94	25. Timber	0.56	42. Soybeans	0.46
9. Natural gas, Europe	0.89	26. Coffee, Robusto	0.55	43. Aluminum	0.46
10. Platinum	0.87	27. Sawnwood	0.55	44. Meat, beef	0.45
11. Nickel	0.86	28. Groundnut oil	0.55	45. Sugar, US	0.43
12. TSP	0.84	29. Copra	0.54	46. Tobacco	0.40
13. Lead	0.83	30. Cocoa	0.53	47. Tea, world	0.39
14. Copper	0.81	31. Tea, Colombo	0.53	48. Cotton	0.38
15. Rubber	0.75	32. Coconut	0.53	49. Tea, Mombasa	0.36
16. Urea	0.74	33. Coffee, Arabica	0.51	50. Tea, Kokata	0.34
17. Tin	0.68	34. Soybean meal	0.51		

B. Real Prices

Good	CV	Good	CV	Good	CV
1. Crude oil, Dubai	**0.79**	18. Lead	0.45	35. Soybeans	0.30
2. Crude oil, world	**0.77**	19. Rice	0.44	36. Tobacco	0.30
3. Natural gas, US	0.76	20. Coconut	0.43	37. Sorghum	0.30
4. Sugar, world	0.70	21. Tin	0.43	38. Groundnut oil	0.30
5. Gold	0.66	22. Rubber	0.42	39. Wheat	0.29
6. Phosphate	0.66	23. Copra	0.42	40. Sugar, US	0.29
7. Silver	0.61	24. Coffee, Arabica	0.40	41. Meat, beef	0.28
8. Potassium chloride	0.60	25. Tea, Mombasa	0.38	42. Barley	0.26
9. Natural gas, Europe	0.58	26. Palm oil	0.37	43. Oranges	0.25
10. Coffee, Robusto	0.57	27. Zinc	0.37	44. Logs	0.24
11. Iron	0.56	28. Soybean oil	0.37	45. Bananas	0.21
12. TSP	0.52	29. Tea, Kokata	0.35	46. Aluminum	0.20
13. Urea	0.52	30. Soybean meal	0.34	47. Meat, chicken	0.19
14. Platinum	0.49	31. Tea, Colombo	0.34	48. Sugar, EU	0.18
15. Nickel	0.49	32. Cotton	0.34	49. Sawnwood	0.17
16. Cocoa	0.47	33. Tea, world	0.34	50. Timber	0.16
17. Copper	0.45	34. Maize	0.32		

Source: Author's analysis of World Bank GEM Commodities database data.

Given the extreme uncertainty presented by the volatility of oil prices, and the long-term decline in Ecuador's terms of trade, it is no surprise that since 1970, per the Penn World Table, Ecuador's terms of trade volatility has been above average, ranking in place 60 out of 156 countries for which terms of trade information is available. The fact that it does not rank higher may be due to the fact that its exports are concentrated in three relatively-uncorrelated categories of bananas, seafood, and petroleum, as Figure 3.1 shows.

Blattman et al (2007) find a mechanism for the connection between slow long-term growth and terms of trade volatility: a significant, negative relationship between terms of trade volatility and capital inflows, suggesting that price uncertainty dampens foreign investment. These findings echo Eichengreen (2008) who argues that terms of trade volatility brings exchange rate volatility to periphery countries: another investment disincentive as well as a source of financial market instability. Aiyar et al. (2013) find similar results, using a probit model to show that sudden stops in capital inflows are a strong predictor of growth slowdowns that can lead to countries succumbing to the middle-income trap.[19] Domínguez and Caria (2016) point to these connections when they cite Ecuador's "imperfect structural transformation" away from raw commodities dependence as a key element in Ecuador's experience with the middle-income trap.

Given these connections between terms of trade shocks, capital inflow shocks, and long-term growth slowdowns, it comes as no surprise that scholars such as Wade (2016) and Paus (2012) recommend that commodity-reliant countries employ strategic uses of industrial policy as a path out of the middle-income trap, following the examples of those successful "latecomers" chronicled by Amsden (2001).

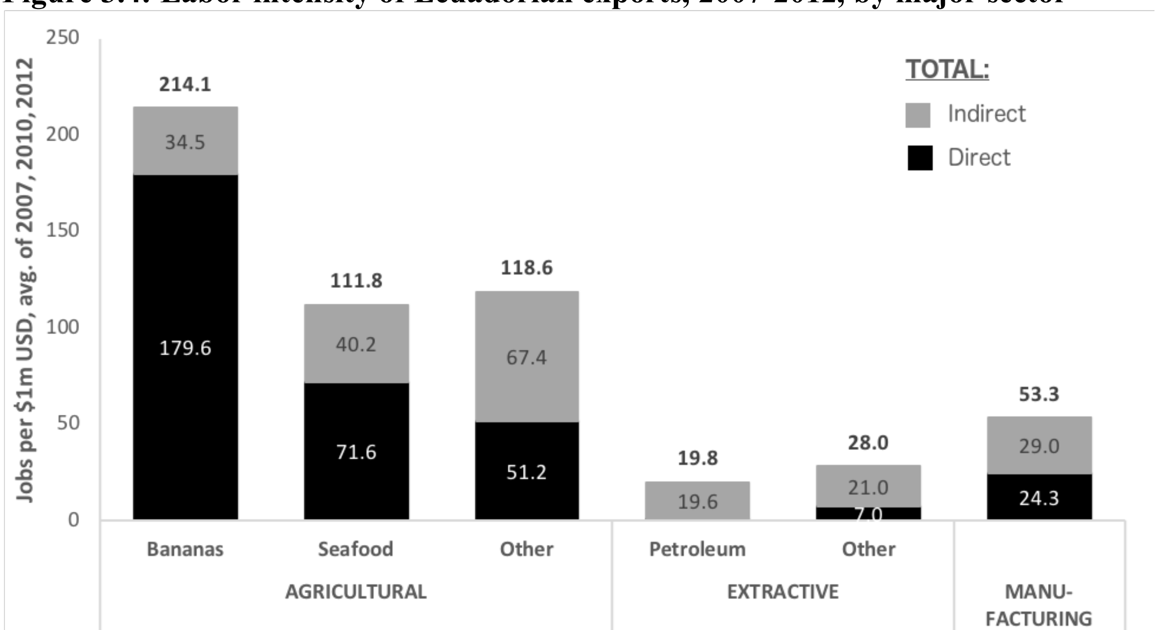
3.2.2 Employment, or the Lack Thereof

Petroleum is significantly less labor-intensive than other tradable sectors, so every $1 million in extractive exports supports far fewer jobs than the same amount of

[19] The phrase "middle-income trap" is here used to indicate scenarios in which countries fail to transition from middle to high-income status because of lagging export competitiveness, following Griffith (2011).

agricultural or manufacturing exports. Figure 3.4 compares the labor intensity of Ecuador's exports, by major sector. Based on the Central Bank's three input-output tables from the oil-boom decade (2007, 2010, and 2012), it shows the average direct and indirect employment (in upstream industries) supported by each $1 million in exports across these years. Petroleum stands out as supporting by far the least number of jobs per $1 million of exports of any major sector shown here: less than one direct job and fewer than 20 indirect jobs.

Figure 3.4: Labor intensity of Ecuadorian exports, 2007-2012, by major sector



Source: Author's analysis based on BCE and UN COMTRADE data. Note: Direct jobs are within a given sector, and indirect jobs are in upstream sectors.

The government recognized the difficulty that this employment differential creates for the national job market in the 2009-2013 *Plan Nacional.* Since petroleum creates so few jobs, employment has to come from other sectors, and the *Plan* states that, "slow growth in non-petroleum exports shows the scarcity of options for the creation of good jobs, which has contributed to the deterioration of standards of living, via unemployment, underemployment, precarious employment, and falling real wages

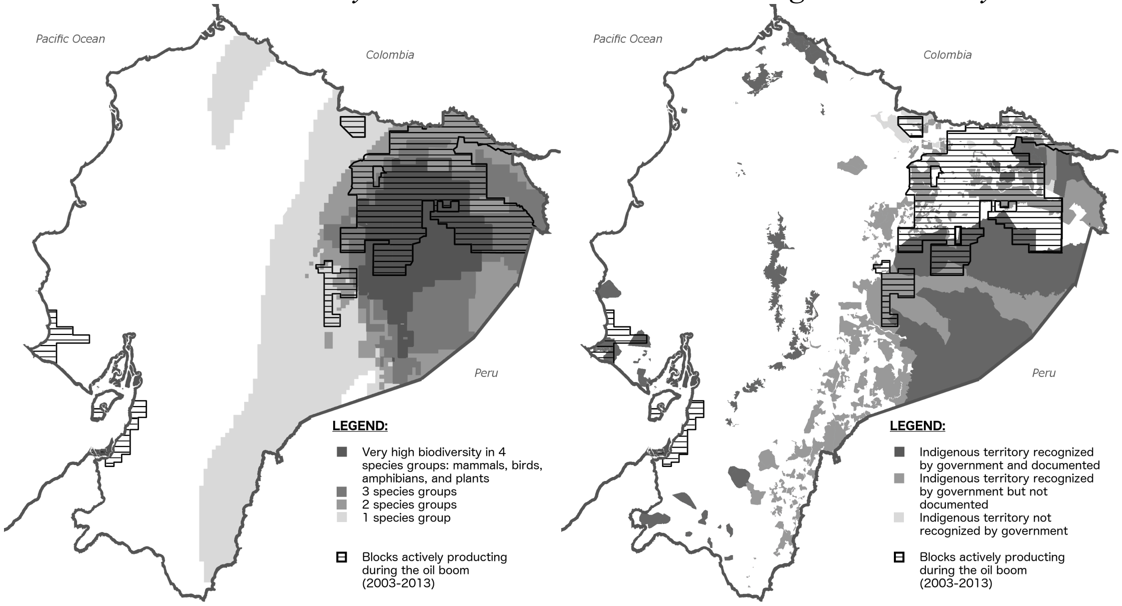
(SENPLADES 2009, 76, author's translation)." It specifically calls for diversifying national production away from oil, by developing local value chains in other sectors such as renewable energy, biotechnology, pharmaceuticals, vehicles, transportation, and others (Ibid. 393).

3.2.3 Environmentally and Socially Sensitive Territory

A final important obstacle to sustainable oil production in Ecuador is the location of most oil deposits, shown in Figure 3.5: in the Amazon rainforest, and often under traditional indigenous land. The Ecuadorian Amazon is one of the world's most biodiverse areas (more on this below), but the oil boom brought intensified threats. From 2005 to 2010, Ecuador's forest cover shrank by 1.9 percent per year, the fastest rate of deforestation in South America and the 12th highest rate worldwide. This represents an acceleration of its previous deforestation rates: 1.7 percent per year from 2000 to 2005 and just 1.5 percent per year from 1990 to 2000 (FAO, 2010). Not all of the deforestation has been due exclusively to oil fields, but ecological research by Fearnside et Al. (2013) and Lovejoy (2014) have concluded that the construction of access roads and railways for these extraction projects are among the most important causes of deforestation. These road and rail projects interrupt animal migration patterns and open the forest to human settlement, large-scale agriculture, and logging.

Figure 3.5: Sensitive territory and active oil blocks in Ecuador, 2003-2013

Biodiversity *Indigenous territory*



Note: Very high biodiversity is defined as being within the highest 6.4 percent of all South American land. Source: Compiled from Bass et Al. (2010), LandMark (no date), ARCH (2011-2013, 2017), Ministerio de Hidrocarburos (2014), and MRNNR (2012).

While the environmental impacts of Amazonian oil production are well known, the *social* impact on Amazonian communities is equally severe. According to the 2009 *Plan Nacional*, indigenous communities comprise a large share of the population in the Amazonian provinces, including half of all children in those provinces (SENPLADES 2009, 143). Oil drilling threatens their access to their traditional hunting, fishing, and gathering grounds (usually village-adjacent forests, which are not deeded to them and therefore open to exploration). Moreover, contamination from oil spills can make these traditional livelihoods unsafe, poisoning aquifers and downstream waterways. The consequences can be dire even for the oil companies themselves, which have often faced large-scale protests. The case study below explores these issues in more detail. As the *Plan Nacional* states, "the growing problems from environmental degradation – the accelerated loss of natural spaces, constant occupation of indigenous land, and the unequal distribution of the benefits of economic development – have been accompanied by socio-environmental conflicts since the 1970s" (221).

3.2.4 Relative Impunity of Foreign Investors

Over the course of the most recent few business cycles, scholars have noted that foreign investments have not necessarily contributed to long-term growth, domestic investment, or human development in their host countries, particularly among developing nations. This phenomenon is particularly acute among extractive industries in ecologically and socially sensitive territory such as oil investment in Ecuador.

Rodrik (1998) shows no relationship between capital account liberalization in developing countries and GDP growth or domestic investment. Mody and Murshid (2005) examine capital flows into 60 developing countries over 20 years (from 1979 to 1999) and discover that over this time period, inflows were dominated by portfolio investment or FDI "with characteristics of portfolio capital" – in other words, highly-liquid FDI that was not associated with appreciable domestic investment. They attribute their findings to the incentives driving FDI: investors are seeking diversification in their own portfolios, not responding to long-term unmet needs in host countries. These findings are reinforced by later work showing that FDI responds strongly to changing conditions in developed-economy markets. For example, Blanchard and Acalin (2016) show that FDI inflows to emerging markets rise during times of low US interest rates. These findings imply that FDI investors are motivated by the same incentives usually associated with portfolio investment: an interest rate differential between source and target markets. Rey (2015) finds that FDI inflows into LAC are positively correlated with the VIX (an index of US financial-market volatility), while portfolio investment is *negatively* correlated with the VIX. She concludes that FDI should not be considered separately from portfolio investment, but that together, these correlations form one cycle of global capital flows, all "dancing to the same tune." It is noteworthy that, while the FDI-VIX correlations she finds are positive for every region of the world, they are stronger by far in LAC (0.35) than for any other region (ranging from 0.06 in Western Europe to 0.16 in Asia).

Given these well-documented incentives of foreign investors in developing countries to portfolio diversification and shorter-term returns over long-term production goals, the environmental and social performance of foreign oil investors in Ecuador should not be surprising. Rather than investing in long-term prospects, they have frequently endangered their ability to continue operating in the country through poorly-managed environmental and social risk management. Most notable are the records of the largest two US-based multinational corporations (MNCs) to develop Ecuadorian oil: Texaco (now part of Chevron) and Occidental Petroleum.

As mentioned above, Ecuador's oil production and exports began in the early 1970s, while Ecuador was ruled under dictatorship. Thus, the conditions under which early oil development occurred were not subject to democratic approval or popular oversight. The 1978 Hydrocarbons Law set the terms for exploration contracts, but significant flexibility remained in the details of specific contracts into the 1980s. Institutional capacity for oversight and enforcement of environmental, human rights, and labor law continued to be developed through the most recent oil boom, as ministries worked to catch up to a booming sector. As a result, a few large multinational corporations (MNCs) were able to operate with relative impunity.

Two landmark examples stand out as examples of the extent of impunity, involving the US-based oil MNCs Occidental Petroleum and Texaco (now owned by Chevron). Texaco's case has become known as "trial of the century" (ECLAC, 2004; Valdivia, 2007) for the world-famous lawsuit brought by multiple groups seeking economic redress for environmental damages. Though less infamous, Occidental's case involves specifying in its contract with the Ecuadorian state a lower level of environmental standards than would be applicable elsewhere.

Texaco was the first oil MNC to discover, produce, and export Ecuadorian oil. It began operations in Ecuador in 1967, and produced oil there from 1972 to 1990, when it handed operations over to Ecuadorian SOE PetroEcuador, leaving the country completely in 1992. In 1993, a group of 30,000 indigenous filed a class-action suit against Texaco in New York, claiming it had failed to sufficiently remediate the environmental damage it had caused before leaving ("Indians sue Texaco," 1993).

Texaco was a minority partner in its Ecuadorian operations, but responsible for technology and oversaw daily operations with "complete autonomy," according to Gen. René Vargas Pazzos, PetroEcuador executive during the 1970s (Schemo, 1998). Texaco spent $40 million on remediation before leaving Ecuador, including cleaning out 268 waste lagoons. However, 400 similar lagoons remain were not covered under its remediation agreement with the government before leaving. Paola Carrera, Undersecretary for Environmental Quality at the Ministry of Environment, claimed in an interview that the exclusion of these waste pools from the initial agreement was due to Texaco's intentionally hiding them by covering them with organic debris so they would not be found during the audit that established the agreement's parameters (Carrera, 2013).

According to Carrera, these pools continue to be discovered by PetroEcuador during its operations in the same oil blocks. For its part, Texaco maintains that the Ecuadorian government bears responsibility for its institutional inability to set and enforce its own environmental standards, as the alleged actions were not explicitly prohibited by Ecuadorian law before 1990 (Brooke, 1994; Schemo, 1998). Nonetheless, Texaco's environmental performance in Ecuador was well below that permitted in its home country. A 1994 independent water analysis by the Center for Economic and Social Rights found polycyclic aromatic hydrocarbon concentrations between 28 and 2,793 nanograms per liter in drinking and bathing water of affected communities; at that time the U.S. Environmental Protection Agency had set a maximum recommended level of zero (Brooke, 1994). Though the case was originally brought by private citizens, President Rafael Correa weighed in publicly, stating that "the techniques they used here were against the law in their own country. They weren't interested in the human beings who lived in the Amazon region." (North, 2015).

Though the lawsuit was filed in 1993, it played out throughout the most recent oil boom. The plaintiffs filed their original lawsuit in New York because of perceived corruption and bias toward oil MNCs in the Ecuadorian judiciary as well as the lack of a class-action lawsuit option ("Agunida v. Texaco," 2002). Nonetheless, Texaco (by then having merged with Chevron to become ChevronTexaco, later known simply as "Chevron") successfully argued for a dismissal of the case, claiming that Ecuador was the appropriate venue given the fact that several cases against MNCs were currently ongoing in the Ecuadorian courts (Strong, 2013). Though the plaintiffs appealed, the U.S. Second Circuit Court of Appeals upheld the ruling in 2002, moving the forum to Ecuador

(Whytock, 2013). The plaintiffs filed suit in Ecuador in 2003, and a judgement was finally declared in 2011, ordering Chevron to pay $18 billion toward remediation. However, that award would not be forthcoming. Chevron sought relief via arbitration, through the US-Ecuador bilateral investment treaty, and won a 2012 injunction against enforcement of the Ecuador judgment (Erichson, 2013). Chevron then sued the original plaintiffs, alleging racketeering and corruption during the Ecuadorian phase of the trial, and in 2014 a US district court ruled that corruption did in fact take place (Krauss, 2014). Finally, in 2017, citing the 2014 ruling, a U.S. federal court voided the award, freeing Chevron from the obligation (Hurley, 2017).

Chevron’s gamble on the Ecuadorian courts, which all parties seem to agree was nearly universally plagued with corruption in the 1990s and 2000s, may seem brilliant in retrospect. Any judgment not in their favor could effectively be voided, as occurred. However, the case also had the effect of souring the relationship between the Ecuadorian government and US-based oil MNCs. In a 2011 speech, President Correa noted this by stating that Ecuadorian shipments of oil to the U.S. had traditionally been sent with “nothing in return” – signifying that this relationship yielded only private gains for oil MNCs instead of spurring development in Ecuador (“Presidente Destaca”, 2011). As is discussed in detail below, this interpretation of the Ecuador-U.S. relationship created an incentive for Ecuador to seek out new investment partners to develop its oil reserves under new conditions.

The other major US-based oil MNC active in Ecuador, Occidental Petroleum, signed its exploration and development contract with Ecuador in 1985 and renewed it in 1999. This contract established that its environmental performance would be based on the methods with widespread use across the global petroleum industry, rather than accepted best practices (Kimerling, 2001). This omission importantly opened the door to effective self-regulation in Occidental's operations. In subsequent years Occidental was associated with several instances of social and environmental misconduct, which gained national notoriety.

Occidental's main conflict during its operations was with the Secoya people, who resisted acculturate and settlement well into the 20th century. Occidental signed an agreement with the Secoya people in 1996, permitting unspecified oil activities in exchange for a package of compensation including outboard motors, water pumps, metal tanks, cooking stoves, and medicines (Fontaine, 2003). The agreement led to several months of intra-Secoya conflict, after which Occidental agreed to a series of re-negotiations, which led to a final agreement in 1998 in which Occidental agreed to postpone operations until the completion of a social and environmental impact assessment. Notably, the latter of these requirements (an environmental impact assessment) had long since been required for its operations in the United States and particularly so in its home state of California, under the National Environmental Policy Act California Environmental Quality Act, both enacted in 1969 (Ibid; CNRA, 2016; Code of Federal Regulations, 2011).

Occidental also came into conflict with members of the Kichwa people a few years later regarding careless environmental management.[20] In 2000, Occidental built a

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[20] The Kichwa people and language are also commonly referred to as "Quichua," following traditional Spanish grammar rules. However, the Kichwa people have chosen the name "Kichwa" for themselves (Limerick, 2014). Furthermore, their choice has been recognized by Ecuador's Ministry of Education, which offers officially-sanctioned "Kichwa" language courses (Ministerio de Educación, 2016). For those reasons, this essay refers to them as such.

road into the buffer zone on the periphery of the Yasuní National Park, spurring a legal complaint in which local Kichwa community members noted 12 examples of Occidental's alleged contamination of their territory but did not receive compensation or recognition of wrongdoing (Finer and Huta, 2005). While Occidental successfully argued that the road was not illegal because it was not an access road but an in-road between production facilities (and therefore unlikely to contribute to deforestation), subsequent GIS-based research has revealed that these facilities are *also* within the buffer zone, leading to a total of 60 hectares of illegal deforestation (Pappalardo and De Marchi, 2009).

3.3 Ecuador's Moves Toward a New Paradigm

During the most recent oil boom, and especially during the tenure of President Rafael Correa (who took office in early 2007), Ecuador took several important steps to move away from the model of oil-based economic development that left the country vulnerable to misconduct by U.S.-based oil MNCs. Three possible approaches exist to challenge that scenario: moving away from reliance on oil, reforming the regulatory environment in which oil-based FDI occurs, and moving away from reliance on the US as a partner for investment. Ecuador has pursued all three paths, with varying degrees of success. Each is discussed in turn below.

3.3.1 Challenging the Reliance on Oil

Ecuador's attempts at diversification away from reliance on petroleum exports have proven difficult for several reasons. First, Ecuador's use of the US dollar as its national currency means that in practice, its currency faces long-term pressure to become overvalued.[21] As a result, Ecuador's exports are more expensive on the world market than they would otherwise be, which hurts the competitiveness of non-petroleum industries. The *Plan Nacional* (66) calls the deterioration of competitiveness the "Achilles Heel" of dollarization. Compounding this problem is the "Dutch disease" phenomenon: nations that primarily export raw commodities tend to have overvalued currencies because their exports' prices are determined by the world market rather than by manufacturing costs. The resulting fall in competitiveness in other industries makes it difficult to escape dependence on those commodities, creating a vicious cycle. As the 2009 *Plan Nacional* states, in an economy "based on … extraction and export of commodities, long-term economic growth revolves around external market dynamics, especially the price of oil, and neglects internal demand … to the detriment of national production and employment" (SENPLADES 2009, 331, author's translation). Any effort Ecuador makes to spur investment in non-petroleum sectors is at a significant disadvantage because of this context.

Divestment efforts to date have included microloans with preferential terms, with special attention to the non-petroleum sectors that the government committed to boosting in the Development Plan. From 2007 to 2012, the National Development Bank and the Ministry of Economic and Social Inclusion issued more than a million small loans totaling nearly $3 billion (about 0.4 percent of GDP) to individuals and small businesses. (BNF 2010-2012). Furthermore, the infrastructure and education projects mentioned

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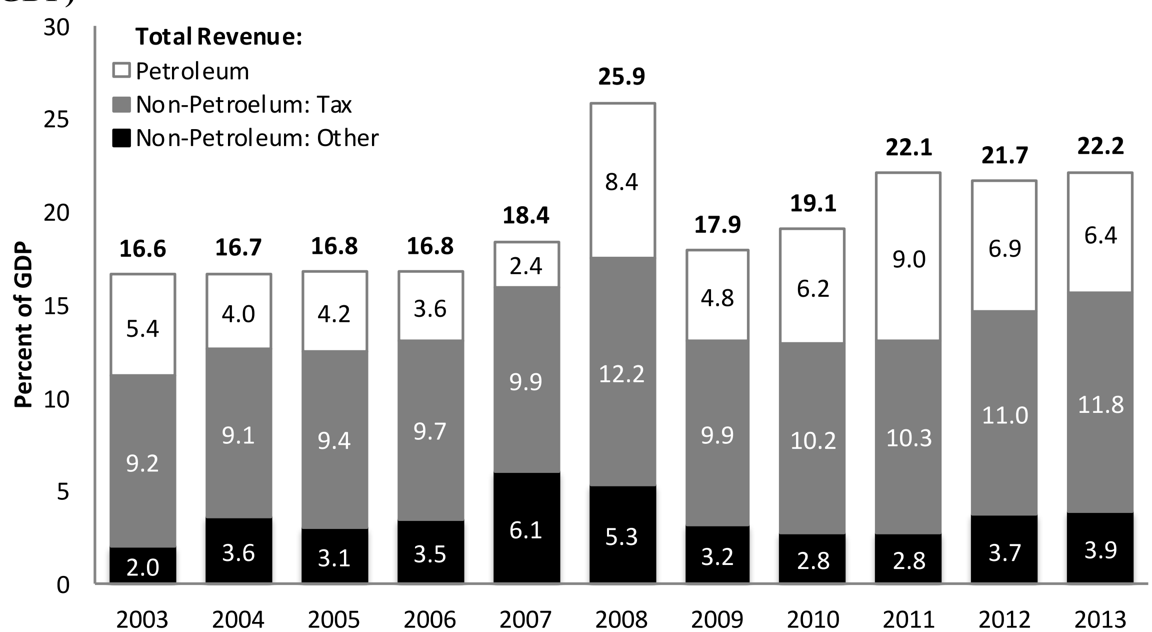
[21] Dollarization raises the risk of an overvalued exchange rate because the value of the US dollar is based on the US economy, not the Ecuadorian economy. Currency overvaluation, in turn, can undermine the manufacturing sector and prevent growth or recovery, as had occurred in the US in the 2000s and Japan in the 1990s. For more on dollarization and an overvalued exchange rate, see Vernengo and Bradbury 2011. For more on the effects of an overvalued currency on the manufacturing sector, see Palley 2003.

above provide support for businesses of all sectors and can help support competitiveness in non-traditional industries. As beneficial as these programs may prove to be in the long term, however, they have not proven to be a sufficiently large push to reduce Ecuador's dependence on oil.

Another obstacle to diversification is that oil represents a significant portion of public revenue. As Figure 3.6 shows, petroleum revenues have represented approximately 30 percent of central government revenues for most of the past decade. One major attempt to diminish this public dependence on oil revenue, the so-called Yasuní ITT initiative, is discussed in detail below.

Figure 3.6: Ecuador central government revenue by source, 2003-2013 (percent of GDP)



Source: BCE (2014).

Shortly after his election, President Correa sought to mitigate the Ecuadorian state's dependence on oil production for revenue through the 2007 Yasuní Ishpingo-Tambococha-Tiputini (ITT) Initiative. The ITT oil deposits lie within or bordering Ecuador's Yasuní National Park, one of the most biodiverse sections of the entire

Amazon basin but could add substantially to Ecuador's oil horizon. Estimates of the size of the deposit range from 412 to 960 million barrels of oil, or between 10 and 25 percent of the nation's proven oil reserves (Álvarez, 2013; Bass et al., 2010; Finer, Moncel, and Jenkins, 2010; OEM, 2018; OPEC, 2017). Correa launched the Yasuní ITT Initiative at the 2007 United Nations General Assembly, offering to commit to never extracting that oil if world governments pledged to donate $360 million per year for 10 years to Ecuador in exchange. This value represents approximately half of the opportunity cost of leaving that oil block untouched, and about 60 percent of Correa's estimate of the cost of purchasing carbon credits for the amount of carbon emissions that oil would be expected to produce (Larrea and Warnars, 2009; Rival, 2010).

In proposing the Yasuní ITT initiative, Correa initiated a shift in the international dialog surrounding payments for environmental services, in which wealthy, industrialized countries that benefit from mitigating climate change pay developing countries to preserve the forests that are key to climate change mitigation (Rival, 2010). Whereas traditionally payments for environmental services had been initiated by multilateral groups, this proposal set a precedent for the way in which it was unilaterally proposed by a developing country (Pellegrini et al, 2014). Whether despite – or because– of this new approach to negotiations, less than 10 percent of the proposed amount was raised, and the proposal was scrapped (Pellegrini et al, 2014). In 2016, Ecuadorian oil SOE Petroamazonas began production in the ITT oil block (ARCH, 2017).

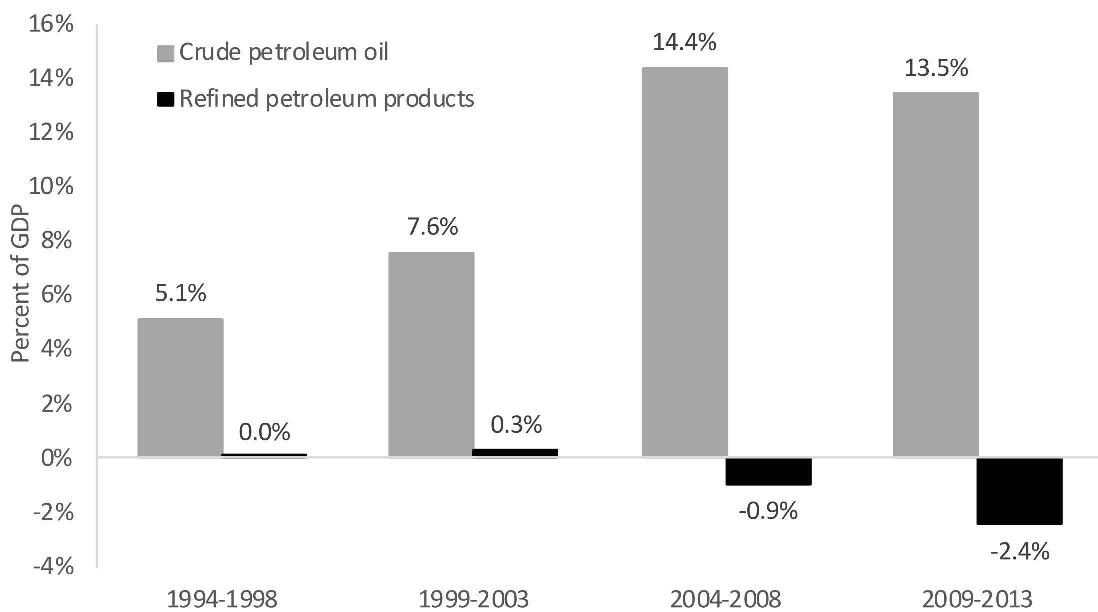
3.3.2 Enhancing the Regulatory Environment of Oil FDI

In addition to Ecuador's – admittedly limited – movements away from oil reliance discussed above, it has also enacted several important reforms to mitigate damages from particularly unstainable aspects of the sector. These reforms fall into three categories: those aimed at taming the impacts of volatile prices, those aimed at broadening social inclusion, and those aimed at limiting environmental degradation. In doing so, Ecuador adopted what may be termed a "high-road extractivism" approach to an oil-driven economy, aimed at limiting the social and environmental cost of oil production while ensuring that its benefits were shared as broadly as possible.

3.3.2.1 Regulation and Terms of Trade

As Figure 3.2 shows, above, periods of rising oil prices have not necessarily improved Ecuador's terms of trade. In part, this is due to the fact that oil prices impact both exports and imports for Ecuador. A lack of local refining capacity means that Ecuador exports crude oil and imports refined petroleum products such as gasoline, as Figure 3.7 shows. This imbalance grew during the most recent oil boom, partially due to fuel subsidies, discussed below.

Figure 3.7: Ecuador's net petroleum exports by type, 1994-2013 (percent of GDP)



Source: Author's analysis of UN COMTRADE and IMF WEO data.

The Ecuadorian government uses some of its petroleum revenue to subsidize the consumer price of gasoline, diesel, and liquefied petroleum gas (LPG), to cushion the impacts of price volatility on final consumers. In general, oil revenue and subsidy expenditure should rise and fall with the price of petroleum, acting as an automatic stabilizer of sorts. Table 3.2 shows the relationship between public oil revenue and public fuel subsidies between 2006 and 2013. The relationship varies, with subsidies representing between 4.8 and 30.2 percent of public oil revenues, because some public oil revenue is constant, as is explained below.

Table 3.2: Public oil revenue and fuel subsidies, Ecuador

	Public Oil Revenue (share of GDP)	Public Fuel Subsidies	
		Share of GDP	Share of Public Oil Revenue
2003	16.6%	0.8%	4.8%
2004	16.7%	2.1%	12.3%
2005	16.8%	4.1%	24.2%
2006	16.8%	4.4%	26.4%
2007	18.4%	4.9%	26.6%
2008	25.9%	5.9%	22.9%
2009	17.9%	3.3%	18.4%
2010	19.1%	4.4%	22.9%
2011	22.1%	6.6%	29.8%
2012	21.7%	6.6%	30.2%
2013	22.2%	5.9%	26.8%

Source: Author's calculations using Espinoza Echeverría and Guayanlema (2017) and BCE (2014) data.

Nonetheless, these subsidy programs shielded Ecuadorian consumers and producers from the fuel price impacts of the oil boom. Espinoza Echeverría and Guayanlema (2017) find that most of the benefit of the LPG subsidy benefitted the residential sector, while most of the gasoline and diesel subsidies unsurprisingly benefitted the transport sector.

Table 3.3: Ecuadorian fuel subsidies by type, 2003-2013

	LPG			Gasoline			Diesel		
	Consumer Price	Import Price	Discount (%)	Consumer Price	Import Price	Discount (%)	Consumer Price	Import Price	Discount (%)
2003	$0.09	$0.36	75%	$1.12	$1.03	-9%	$0.78	$0.91	14%
2004	$0.09	$0.44	80%	$1.15	$1.31	12%	$0.79	$1.27	38%
2005	$0.09	$0.53	83%	$1.15	$1.78	35%	$0.79	$1.90	58%
2006	$0.09	$0.65	86%	$1.15	$2.02	43%	$0.79	$2.00	61%
2007	$0.09	$0.74	88%	$1.15	$2.19	47%	$0.79	$2.18	64%
2008	$0.09	$0.82	89%	$1.15	$2.59	56%	$0.79	$3.00	74%
2009	$0.09	$0.51	82%	$1.15	$1.91	40%	$0.79	$1.87	58%
2010	$0.09	$0.63	86%	$1.15	$2.34	51%	$0.79	$2.30	66%
2011	$0.09	$0.90	90%	$1.15	$3.14	63%	$0.79	$3.11	75%
2012	$0.09	$0.81	89%	$1.15	$3.43	66%	$0.79	$3.24	76%
2013	$0.09	$0.78	88%	$1.15	$3.14	63%	$0.79	$3.14	75%

Source: Author's calculation using Espinoza Echeverría and Guayanlema (2017).

Additional reforms during the oil boom were oriented toward increasing the government share of private oil company profits, helping to support the subsidies discussed above as well as the social spending discussed below. Ecuador's 1978 Hydrocarbons Law, dating to the years of military rule, established that private oil companies could explore marginal oil fields (those where production yielded less than one percent of the national total, and where production costs were expected to be higher than average) through contracts with the Ecuadorian state (or – after their creation – Ecuadorian state-owned oil companies), setting a fixed price per barrel of oil produced (Dirección Nacional, 1978). These fixed prices were to be set above market rates, in such a way as to incentivize exploration in fields not already in production, taking into account "greater investment levels to be realized in the area, guaranteed minimum production levels, and production costs" (Ibid., Art. 2, author's translation). In 2006, as oil prices began to rise rapidly, President Alfredo Palacio signed an executive decree instituting a 99 percent windfall tax on the difference between the market prices and the world prices anticipated in these exploration contracts (Palacio, 2006).

The 2010 Hydrocarbons Reform Law extended this arrangement to all oil producers in the country other than Ecuadorian state-owned firms, in order to establish that "the entirety of production within the contracted area of is property of the State" (Asamblea Nacional del Ecuador 2010b, Art. 8, author's translation). However, it also determined that these producers should pay at least a 25 percent tax on their income from these sales, and at least a 44 percent tax on resulting profits (Ibid, Introduction). Taken together, the reforms of 2006 and 2010 gave the Ecuadorian state greater control over, predictability regarding, and revenue from its oil resources in the face of volatile international oil prices.

Another approach to addressing the terms of trade problem is downstream refinery investment. The Refinería del Pacífico (RdP), a major refinery project near the Port of Manta, promises to be the largest infrastructure undertaking in the country's history. This project was originally planned as a joint project between Ecuador and Venezuela's oil SOE PDVSA. It gained new life after PDVSA sold 30 percent of its stake to China's CNPC in 2013 (DeaLogic, n.d.) but has languished again since oil prices fell in 2014. The extent to which domestic refining can be increased enough to offset volatile costs of imported refined petroleum products remains to be seen and may have to wait until prices rise again.

3.3.2.2 Environmental Protection

Ecuador's most ambitious environmental protection reform has come through its 2008 Constitution, which recognizes the rights of Mother Nature (Pachamama) herself (Asamblea Nacional del Ecuador 2008, Arts. 71-74). Article 71 explicitly states that "any person, community, town, or nationality" may bring legal action on behalf of Pacha

Mama against anyone suspected of causing environmental damage. In practice, this reform has the potential to be a powerful tool for environmental justice, in that plaintiffs do not need to prove that their private property was damaged by the alleged action. Furthermore, Article 72 states that Pacha Mama has a right to restoration: judges may order not only an end to specific acts of environmental damage but also remedial action.

The application of this reform has been tentative, but not without successes. For example, the first judgement using the rights of nature did not occur until March 2011. In that case, *Wheeler v Director de la Procuraduría General del Estado de Loja*, the judge ordered a municipality to pay for restoration of a river whose path it had modified for a new road (Daly, 2012). The next year, a group brought a case against the municipal government of Santa Cruz, Galápagos, regarding a road construction project that had not gone through the necessary environmental licensing or public information processes (Bedón Garzón, 2017). Finally, in a more recent case, communities along the Chiquita River brought a complaint against the Los Andes and Palesma palm oil plantations citing waste dumping into the river. After six years of trial, the 2017 judgement ordered the plantations to plant an eight-meter bamboo periphery buffer between their plantations and the river, to help mitigate runoff (Hazelwood et al 2017). This case presents a possible precedent for oil companies, in that it is the first time the rights of nature have been applied to productive investors rather than local government agencies.

3.3.2.3 Social Inclusion

During the oil boom, Ecuador enacted reforms aimed at broadening the social inclusion of the economic benefits of oil, while limiting its social cost. These reforms centered on three thematic areas: labor protections, public revenue devolution to local governments, and prior consultation for indigenous communities.

Labor conflict is common in Latin America's extractive sectors, as chronicled by the "Observatorio Social de América Latina" (OSAL) initiative (CLACSO, 2000-2012). A common trigger of this conflict is the use of subcontracted workers to evade national labor standards.[22] President Correa addressed this issue in 2008, with an executive decree limiting subcontracting to "complementary" work such as janitorial and security services (Correa, 2008). Furthermore, Ecuadorian employers must now engage in profit-sharing with all employees, including subcontractors. Employers must distribute 10 percent of their profits to all workers equally and must distribute an additional 5 percent of profits to workers based on their family dependents (Congreso Nacional, 2005).

Another touchstone for labor conflict in the Latin American extractive sector is the use of foreign workers by foreign investors. Ecuador has largely eliminated this trigger, through the Hydrocarbon Reform of 2010, which requires petroleum companies to hire Ecuadorian staff for 95 percent of unskilled positions and 90 percent of administrative and technical positions (Asamblea Nacional del Ecuador, 2010b). This standard can be quite powerful in preventing social conflict: Zach Chen, commercial attaché for the Chinese embassy in Quito, expressed in an interview that meeting these staffing goals has been key to the ability of Chinese oil companies to prevent labor disputes in their oil fields (Chen, 2014).

[22] For more on the role of subcontracting in extractive industry labor disputes in Latin America, see Cook and Bazler (2013); González Serna, Canstañeda Gómez, and Giraldo Ramírez (2017); Marshall (2000); Pont Vidal (2008); and Sanborn and Chonn Ching (2017).

These labor reforms may have helped ensure that oil workers shared in the benefits of oil boom, but as mentioned above, the oil sector employs very few workers per million dollars of output. To broaden the group who benefit from oil profits beyond those employed by the sector, Ecuador has enacted a series of devolution reforms. These policies channel public oil revenue to sub-national governments, the Gobiernos Autónomos Decentralizados (GADs) at the province, canton, and parish level. In 2003, the Fondo para el Ecodesarrollo was established, which dedicates $1 per barrel of oil for public investment in the Amazon, under the care of the GADs and the Instituto para el Ecodesarrollo Regional Amazónico (ECORAE). From 2003 to 2013, Ecuador produced nearly 2 billion barrels of oil, distributing the resulting funds to municipalities (58 percent), provinces (28 percent), parishes (5 percent), and the ECORAE (9 percent). The funds come with restrictions: at least 80 percent must be spent on conservation and transportation projects, and the rest is to be spent on public investments approved by the Secretary of Hydrocarbons. More recently, the 2010 oil reform law re-directed 12 percent of oil profits (which previously went to the central government) to the GADs in the regions where the drilling takes place, to be used for health and education projects as approved by the appropriate ministry (Asemblea Nacional del Ecuador 2010b, Art. 94).

Finally, Ecuador has recognized the right of indigenous communities to have a meaningful voice in oil exploration plans in their traditional territory. In 1998, it ratified the International Labour Organisation Convention 169 on Indigenous and Tribal Peoples, enshrining the rights of indigenous communities to determine the extent to which they assimilate into the society around them, and requiring their consultation for any projects that might impact their lands, water, air, or livelihoods (ILO 1989).

In 2010, Ecuador enacted national legislation to formalize the commitments it made through ILO 169. The 2010 Citizen Participation Law requires the government to seek communities' free, prior, and informed consent (FPIC) before allowing new oil and mining projects. Projects are not completely prohibited if they do not win local community approval, but in the case of majority opposition, they must meet higher environmental and social standards, including offering employment to affected indigenous communities (Asamblea Nacional del Ecuador, 2010a).

These reforms are perhaps the most ambitious in scope of all "high-road extractivism" efforts listed here. Rather than simply setting the terms of oil investment, they have the potential to determine if projects will happen at all. If adequately enforced, they could successfully address the intrinsic conflict of oil reserves below indigenous territory and ensure that exploration and drilling happen in a way that respects indigenous communities and shares benefits with them. However, these FPIC protections are also the most difficult to enforce, because they pit contradictory governmental incentives and even ministries against one another, setting up a conflict between the goals of expediting FDI and protecting human rights. Section four of the chapter looks more closely at this institutional conflict and its results in the application of FPIC protections.

3.3.3 Shifting away from Reliance on the US

Since his election in 2007, President Rafael Correa has facilitated a new type of international engagement for the country. Throughout its history, Ecuador's economy was primarily dependent on the United States as a source of exports and imports, as well as a primary destination for migrants whose remittances made up a significant portion of

GDP. After assuming power, Correa employed several strategies to buffer Ecuador against the volatility of depending on one external partner.

Part of Correa's strategy has involved moving his country away from the US and toward China. The Ecuadorian leader explained the shift in a speech delivered in 2011 about the two nations' complementarity: "In 2006, 75 percent of our oil was going to the United States …this year, 50 percent has been committed to China, in exchange for billions of dollars" ("Presidente Destaca," 2011, author's translation). In another example, when Correa's government refused to extend the controversial lease of an Ecuadorian Air Force base to the US military, it turned to China as a potential partner for re-developing the site. The government made attempts, which ultimately proved unsuccessful, to lease the base to a Chinese firm and to revamp a series of projects related to a transport corridor from Manta to the Brazilian Amazonas capital city of Manaus, with Chinese financing (Narins, 2012). In light of that project's ultimate infeasibility, Chinese interests became more focused in the oil and mining sectors (Bonilla, 2010). In addition, Correa's administration signed three major treaties with China, including:

- Treaty on Economic and Technological Cooperation, including a RMB 20 million (about $3 million USD) in Chinese aid to Ecuador,
- Executive Plan of Cooperation in Science and Technology;
- Cooperation document on oil trade finance between PRC Export-Import Bank and PetroEcuador.

(For more on these deals, see ADB, IADB, and ADBI, 2012).

In many ways, China has become an invaluable economic ally for Ecuador. Ecuador's burgeoning relationship with China has guaranteed it access to financial markets, an investor willing to develop oil fields in a way that benefits Ecuador as well as China, and a partner in generating value added through the Pacífico Refinery.

3.3.3.1 China as a Source of Investment

China's involvement in Ecuador's oil sector has been largely led by investment, which in turn has driven exports to China. From 2013 to 2013, China was Ecuador's most important source of oil investment, for both greenfield investment (GFDI) and mergers and acquisitions (M&A) deals, as Table 3.4 shows.

Table 3.4: Sources of oil FDI into Ecuador by type, 2003-2013

Source	Greenfield FDI		Mergers and Acquisitions	
Country	Millions of USD	Share of Total	Millions of USD	Share of Total
Brazil	316.0	26.4%		
Canada	337.0	28.1%	141.7	6.2%
China	408.2	34.1%	1,905.0	84.0%
Other	136.4	11.4%	222.0	9.8%
Total	1,197.6	100.0%	2,268.7	100.0%

Source: Author's analysis of DeaLogic and FDIMarkets data.

China's importance in the Ecuadorian oil sector came through three large deals carried out by China's largest two state-owned oil companies: the China National Petroleum Corporation (CNPC) and Sinopec. First, in 2003, CNPC acquired the oil interests of Block 11 on the northwestern border with Colombia. While Block 11 has never been shown to have significant oil reserves, it is conveniently located on Ecuador's main oil pipeline, the Sistema Oleoducto Transecuatoriano (Trans-Ecuadorian Pipeline System, or SOTE) so any oil discovered there would be easily transported (Chi, 2016).

China's biggest investment came in 2006 with the $1.42 billion purchase of the Ecuadorian oil interests of the Canadian firm Encana, including production in three important oil blocks (14, 17, and 62) For this deal, CNPC and Sinopec created two joint ventures. CNPC owns a majority stake (55 percent) in each of the resulting firms, Andes Petroleum and PetroOriental, with Sinopec owning the remaining 45 percent in each.

Andes Petroleum took over production in the northwestern block 62 while PetroOriental took operations in blocks 14 and 17, further south. Separately, PetroOriental bought a 36 percent stake in Ecuador's second major pipeline, the Oleoducto de Crudos Pesados (Heavy Crude Pipeline, or OCP) for $385 million.

These oil investments are a major part of China's overall relationship with Ecuador. As Table 3.5 shows, the oil and gas sector comprised 41.5 percent of all Chinese GFDI and 98.4 percent of Chinese M&As in Ecuador between 2003 and 2013. This heavy concentration stands in stark contrast to other FDI in Ecuador, in which the oil and gas sector represented only 11.8 percent and 9.2 percent, respectively.

Table 3.5: Greenfield and M&A FDI deals in Ecuador, by source and sector, 2003-2013

	Greenfield FDI				Mergers & Acquisitions			
	From China ($0.9b)		From R.o.W. ($6.4b)		From China ($1.9b)		From R.o.W. ($2.4b)	
	USD	Pct.	USD	Pct.	USD	Pct.	USD	Pct.
Agr., food, bev.	0.0	0.0%	102.5	1.5%	0.0	0.0%	823.2	34.2%
Oil & gas	408.2	41.5%	789.4	11.8%	1,905.0	98.4%	222.0	9.2%
Mining & metals	0.0	0.0%	1,668.5	25.0%	28.0	1.4%	160.1	6.6%
Other mfg.	4.3	0.4%	1,392.6	20.9%	0.0	0.0%	14.0	0.6%
Communications	20.0	2.0%	732.9	11.0%	0.0	0.0%	833.0	34.6%
Transp., storage	523.0	53.2%	233.7	3.5%	0.0	0.0%	210.0	8.7%
Other services	28.3	2.9%	1,758.1	26.3%	2.8	0.1%	146.6	6.1%
TOTAL	983.8	100.0%	6,677.7	100.0%	1,935.8	100.0%	2,408.8	100.0%

Source: Author's analysis of FDIMarkets and DeaLogic data.

Notably, both Andes Petroleum and PetroOriental are SOEs and as such, may be expected to display different firm behavior than that of private MNCs. For example, DeWenter and Malesta (2001) shows that SOEs tend to operate longer-term decision horizons than private firms: that over longer-term time spans of 20 years, the commonly-accepted SOE efficiency disadvantage disappears. This is particularly so in China, where policy strategies are famously determined along the lines of five-year plans. Putterman and Dong (2000) show that firm behavior by Chinese SOEs has largely followed Chinese government policy prescriptions as they shifted from employment creation (during the Mao period) to efficiency (in the reform period). Thereafter, beginning with in 1999, China's "going global" policy promoted outbound FDI in strategic sectors and through strategic partnerships. Buckley et al. (2007) and Ramasamy, Yeung, and Laforet (2012) examine the determinants of Chinese SOEs' outbound FDI and conclude that, *inter alia*, institutional factors are crucial in explaining investment decisions. For example, Chinese SOEs established their presence overseas through an investment pattern that was simultaneously more geographically diversified (including countries seen as politically risky) and more sectorally concentrated (especially in raw materials) than would be predicted by traditional theories of MNC behavior. Given these differing incentives for Chinese SOEs and western MNC investors in Ecuador, it should not be surprising that these new partners have acted in such a way as to protect their long-term relationship with Ecuador to a greater than the MNCs profiled above.

China has differed from most other sources of oil investment in two important ways. First, Chinese petroleum companies have remained in the country through major oil reforms in 2007 and 2010, each of which increased the state's revenue from oil production. After each round of reforms several other foreign oil companies left the country, including the Brazilian firm Petrobras, the French firm Perenco, and City Oriente, which was registered in Panama. Zach Chen, Chinese Embassy Attaché, attributes the perseverance of the Chinese oil companies to a long-term company strategy. The Chinese oil companies in Ecuador, CNPC and Sinopec, are both state-owned enterprises (SOEs), and serve the Chinese government's diplomatic as well as financial interests. Diplomatic relationships take time to build and must be stronger than short-term profit motives (Chen, 2014).

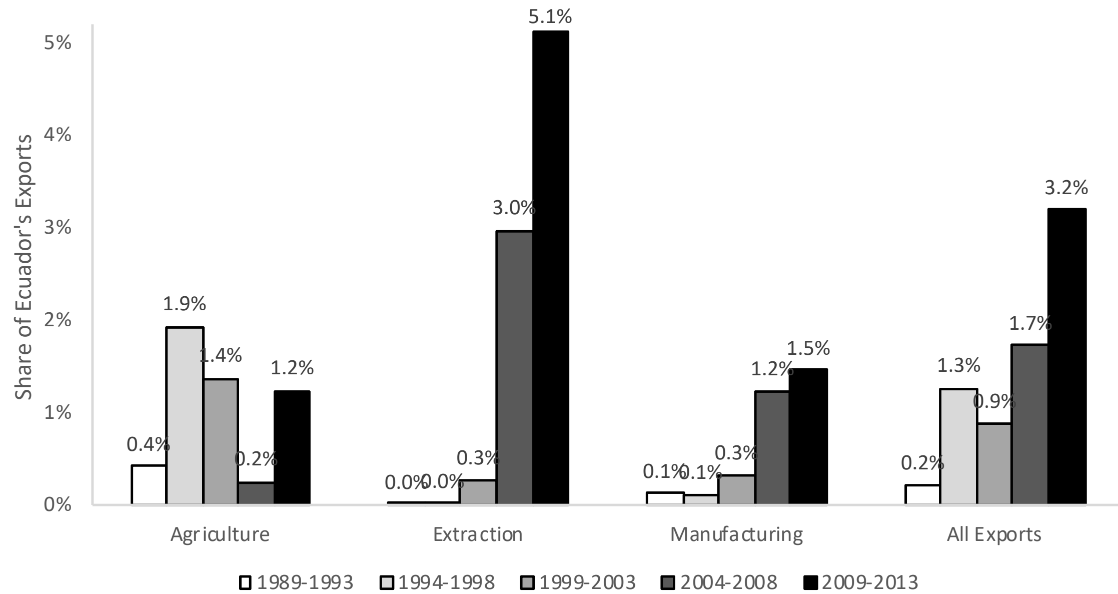
China has also distinguished itself as an investment partner in its willingness to support downstream industry linkages in Ecuador, rather than solely producing crude petroleum and refining it once it reaches China. As mentioned above, it is now a major partner in the Refinería del Pacífico project, though progress is stalled as of this writing. The RdP project also shows the limits of China's goodwill in meeting

The RdP project is an example of how Chinese investment and finance are interwoven in Ecuador. When CNPC joined as an RdP partner, it brought access to Chinese financing, as well as an expectation of the use of Chinese labor and equipment. This situation stands in contrast with Chinese oil *production* in Ecuador, which has used local labor following the Ecuadorian labor laws mentioned above. Thus, although China's SOEs have shown themselves capable and willing to take steps to prevent labor disputes when required by law, they have not done so on their own accord.

3.3.3.2 China as an Export Market

Following the oil investments described above, China's importance as a market for Ecuadorian oil also rose dramatically. The importance of China for Ecuadorian oil is understated in trade data because of the use of refineries in intermediary countries. Public records do not exist connecting oil fields in originating countries, through refineries in second countries, and on to consumers in third countries. Even so, as Figure 3.8 shows, China's market share of Ecuadorian exports rose quickly Ecuador throughout the oil boom period, especially in the extractive sector. China's share of petroleum exports themselves peaked at 10.9 percent of Ecuador's exports in 2009.

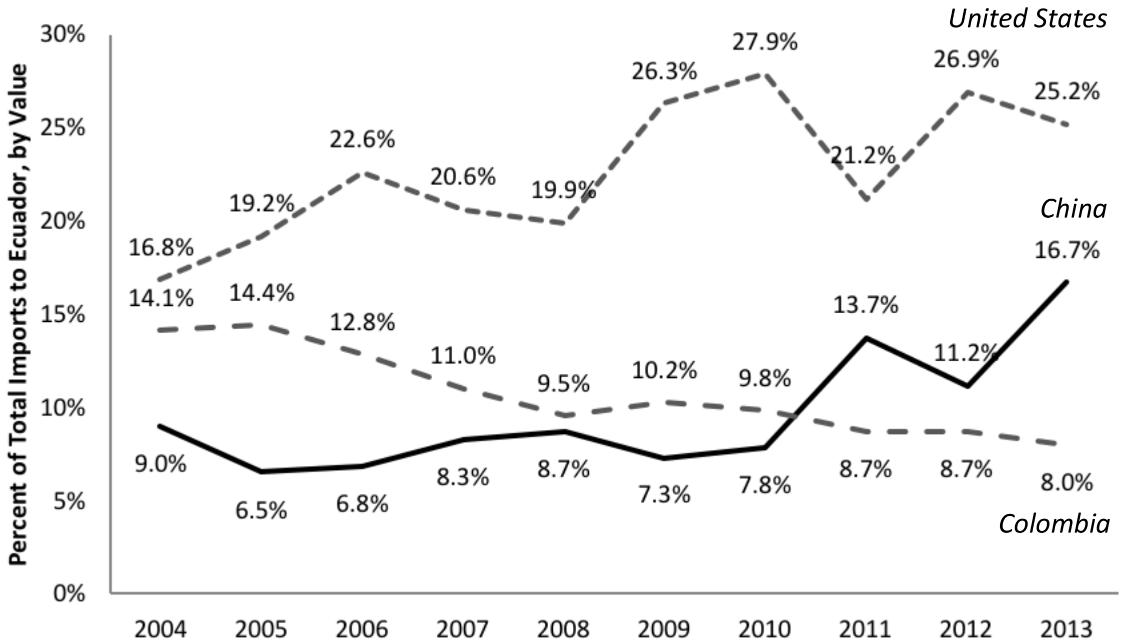
Figure 3.8: China's share of Ecuadorian exports, by major sector



Source: Author's analysis using COMTRADE data.

Concerning imports, Figure 3.9 shows that by the end of the oil boom, the United States still led in shipments to Ecuador—25.2 percent in 2013—but China was the second most important source of imports, at 16.7 percent. Notably, China's gains in the Ecuadorian market do not appear to have taken market share from the US but from smaller, regional partners like Colombia. China unseated Colombia as the second most important import source, while the US continued to grow in importance.

Figure 3.9: Ecuador's imports (top three sources, in percent of total)



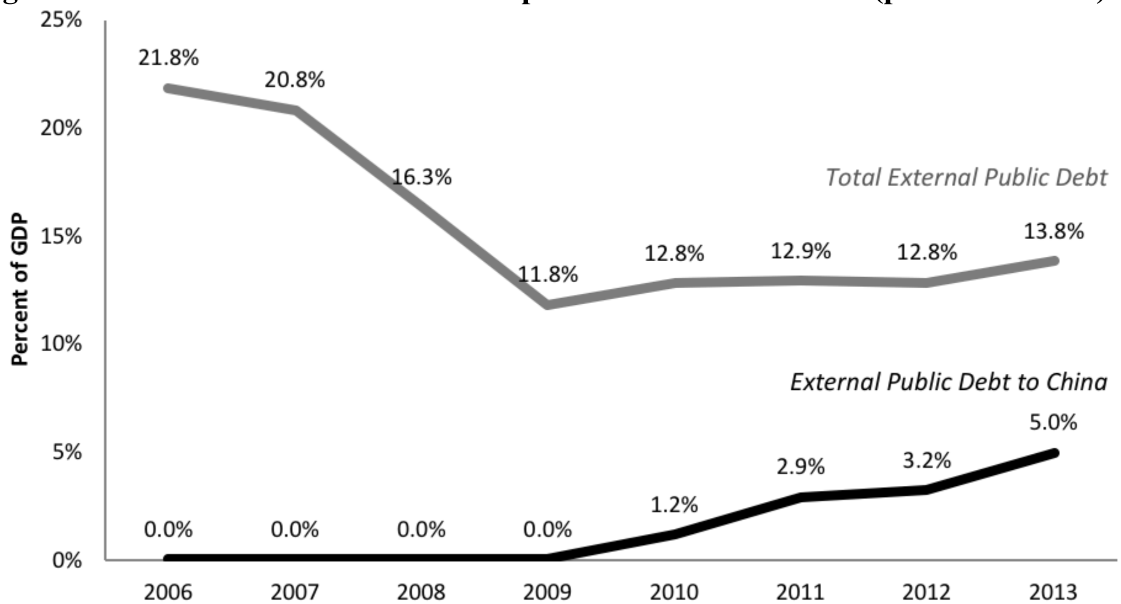
Source: Author's analysis of UN COMTRADE data.

3.3.3.3 China as a Source of Bilateral Credit

In 2008, after reviewing all of its international debt, Ecuador declared two bonds (totalling $3.2 billion) to be odious debt and defaulted on them. These bonds were singled out due to irregularities in their initial contracts: one was issued under a dictatorship and the other lacked a competitive bidding process in selecting investment-banking (CAIC, 2008). Both situations make embezzlement, corruption, and capital flight more likely, although the funds themselves were not definitively shown to have been misappropriated.

These two bonds amounted to less than half of all national public debt, and only about five percent of GDP (IMF, 2014). Nonetheless, the default was unusual in the government did not cite financial hardship but irregularities in the debt itself. Many international analysts and pundits vociferously opposed it, and Ecuador subsequently lost access to its traditional Western creditors (Porzecanski, 2010). This signalled an opportunity for Chinese leaders and investors to diversify their economy's sources of primary commodities through the oil loans described below. Ecuador, for its part, became unable to seek funding elsewhere; China's innovative arrangements involving pre-sales of crude oil provided much-needed immediate funds.

Figure 3.10: Total Ecuadorian debt compared with debt to China (percent of GDP)



Source: Author's analysis of Banco Central del Ecuador (n.d.) and IMF World Economic Outlook (April 2014) data.

As Figure 3.10 shows, China became Ecuador's most important creditor during these years (accounting for over one-third of the nation's total public debt in 2013). From 2009 to 2013, external public debt to China rose by five percent of GDP while total external public debt rose by just two percent of GDP: in other words, non-China debt fell during these years. Gallagher, et al. (2012) explain that China's loans to Ecuador (about 8.5 percent of Chinese loans to LAC from 2005-2011), constitute a disproportional amount based on Ecuador's population (2.5 percent of LAC in 2011) and GDP (1.3 percent of the region). Moreover, during this time China signed a series of oil deals with Ecuador in which it prepaid for oil shipments, giving both parties predictability in their trade and providing Ecuador with frontloaded income (Benítez, 2014).

Most loans from China during this time were directed at the extraction and hydroelectric sectors, as Table 3.6 shows. Ecuador did not receive significant Chinese finance until 2009, after the default. Thereafter, China backed both the Coca-Codo Sinclair Dam and the Sopladora Dam. These loans boosted the government's goal of producing some 93.5 percent of its energy needs by the year 2021 via hydroelectric sources (see MEER, n.d., 1, 2 for more), but they also carried conditions to use Chinese equipment and contractors.[23] The loans for the hydroelectric projects have the added benefit of providing power for the large-scale Chinese extraction projects in Ecuador.

Table 3.6: Oil-boom era loans to Ecuador from Chinese banks and SOEs

Year	**Lender**	**Partner**	**Quantity (USD, b)**	**Purpose**
Oil-Backed:				
2010	China Dev't Bank	PetroEcuador	1.0	80% discretionary, 20% oil-backed
2011	China Dev't. Bank	Government	2.0	70% discretionary, 30% oil-backed
2011	PetroChina	PetroEcuador	1.0	Pre-payment for oil purchase
Other:				
2010	China Ex-Im Bank	Government	1.7	Coca-Codo Sinclair hydroelectric dam
2010	China Ex-Im Bank	Government	0.6	Sopladora hydroelectric dam
2012	China Dev't Bank	Government	2.0	Financed budget deficit
2013	China Ex-Im Bank	Government	0.3	Minas-San Francisco hydro. dam
2013	China Ex-Im Bank	Government	0.1	Highway construction
TOTAL			*8.7*	

Source: IAD (2017).

Loans for oil involve Chinese public banks, Ecuador, and Chinese oil companies. When the loans are made by the China Development Bank (CDB), they proceeded as follows: the CDB lent money to Ecuador, which in return shipped a prescribed amount of oil to Chinese oil companies. Those companies paid for the oil at current market rates; part of the payment goes to CDB account to repay the loan, and the remained was paid to Ecuador (Gallagher et Al, 2012; Sanderson and Forsyth, 2013).

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[23] As Gallagher, Irwin, and Koleski (2012) have highlighted, most of China's loans to Ecuador do not have policy conditions but do have conditions on using the funds to purchase Chinese goods or services.

These loans' complicated structure makes them difficult to compare to traditional loans. However, given Ecuador's constraints during those years, they posed an important advantage in terms of risk management for both China and Ecuador. Most international loans depend on the borrower's continued access to the lender's currency for repayment, which can trigger complications for countries with "soft" currencies or with no currency of their own at all, like Ecuador. In this case China and Ecuador avoid that risk, but face two others: the possibility of an unexpected drop in the world oil price (meaning that more barrels of oil would be required to repay the loan) or an unexpected drop in Ecuador's oil output. The short-term nature of these arrangements (usually fewer than 8 years, according to Bräutigam and Gallagher, 2014) reduced the risk of a drop in world oil prices (Ecuavisa, 2013). However, the oil boom itself ended after 2013, so it is likely that the 2010 and 2011 arrangements remained on Ecuador's books much longer than originally anticipated.

It is worth noting that seven years after Ecuador's default, it re-entered international bond markets. By early 2017, international sovereign bonds had regained their position as Ecuador's most important source of credit. By year-end 2017, Ecuador's total external debt stood at 31.6 percent of GDP: 13.5 percent in sovereign bonds, 8.4 percent in multilaterals loans, 7.5 percent in bilateral loans from China, and 2.2 percent in other bilateral debt (Ministry of Finance, 2018). Thus, China effectively saw Ecuador through a particularly difficult seven-year period without access to traditional credit market. For a small country such as Ecuador, with very few exports (most of which are subject to wide global price swings) and no currency of its own, such assistance was economically crucial to avoid a ballooning debt crisis, and laid the groundwork for a strategic relationship between the two countries.

3.4. Case Study: CNPC and Sinopec in Ecuador

The 2003-2013 oil boom provided a test case for Ecuador's new model of "high-road extractivism," in two phases: in 2006 and again in 2014, in the form of the arrival and expansion of Chinese oil investment. This new relationship gave Ecuador the opportunity to begin an investment partnership under its new framework. The Chinese oil companies mentioned above, Andes Petroleum and PetroOriental, entered Ecuador in 2006 by acquiring concessions in oil blocks already in operations. In 2014, Andes Petroleum acquired two new oil blocks, in a section of the Amazon where oil production has never occurred before.

This section examines the social and environmental performance of Andes Petroleum and PetroOriental in their existing blocks, as well as the regulatory performance of the Ecuadorian state in overseeing the expansion of their operations into new territory. It seeks to determine the extent to which this new diplomatic and investment relationship allowed Ecuador to pursue its new approach to "high-road extractivism." It addresses this question through a mixed-methods approach, utilizing both quantitative and qualitative measures. Section 3.1 *quantitatively* evaluates the performance of these Chinese oil companies in their existing concessions on the basis of social conflict (measured as the relative frequency and intensity of protests and other mobilizations targeting Andes Petroleum and PetroOriental operations compared to other oil companies in Ecuador) and environmental degradation (measured as relative deforestation in Andes Petroleum and PetroOriental oil blocks compared to other oil blocks in Ecuador). Section 3.2 *qualitatively* evaluates Ecuador's oversight of Andes Petroleum's new concession, the first such expansion under the new regulatory regime for oil investors. This latter evaluation uses legal research and targeted, semi-structured interviews with key stakeholders and experts. Those sources, and their titles at the time of the new concession awards, are as follows:

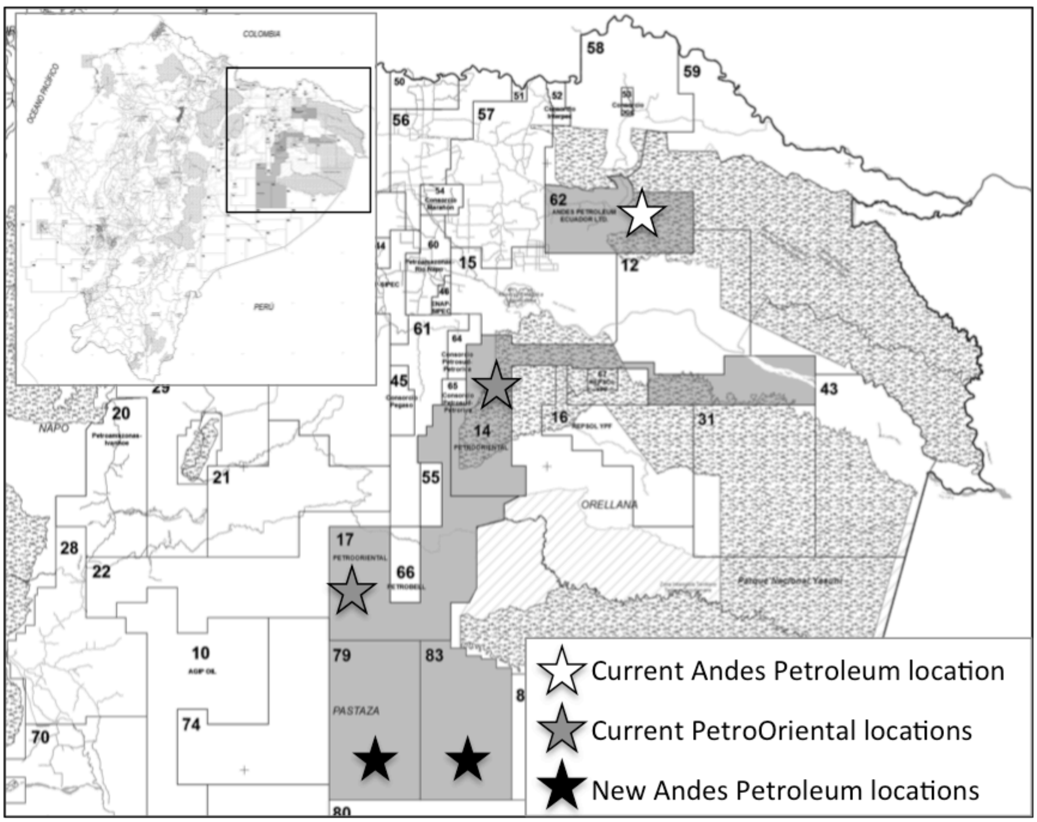
- Kléver Ruiz, President of the Sápara Nation of Ecuador
- Gloria Ushigua, President of the Association of Sápara Women
- Paola Carrera, Undersecretary for Environmental Quality, Ecuadorian Ministry of Environment
- Anonymous representative of the Ecuadorian Ministry for the Coordination of Strategic Sectors
- Kelly Swing, director of the Boston University Tiputini Biodiversity Station within the Yasuní National Park and renown expert on the Ecuadorian Amazon

In addition to these five sources, the evaluation draws from a site visit to an oil well operated first by Texaco and now by PetroEcuador, and an accompanying presentation by Michel Boufadel, director of the Center for Natural Resources Development and Protection at the New Jersey Institute of Technology and expert on oil spill effects and remediation.

3.4.1 CNPC and Sinopec in Ecuador, to Date

As mentioned above, in 2006 CNPC and Sinopec jointly purchased the Ecuadorian assets of Canadian firm Encana, including three oil concessions in the country's eastern provinces of Sucumbios, Pastaza and Orellana, as well as a lead stake (32.3 percent) of the Heavy Crude Pipeline (Oleoducto de Crudos Pesados, or OCP) project, which was built in 2003 and operated by several MNCs, including Repsol, Perenco and Petrobras. CNPC and Sinopec formed Andes Petroleum to manage Block 62 in the northeastern province of Sucumbíos, and PetroOriental to manage Blocks 14 and 17 in Orellana and Pastaza, further to the south. Figure 3.11 shows the locations of these blocks, along with Andes Petroleum's new concessions (discussed below).

Figure 3.11: Map of Ecuador, with Andes Petroleum and PetroOriental holdings shaded



Note: Solid blocks indicate Andes Petroleum and PetroOriental concessions. Mottling indicates parks, and hash marks indicate the off-limits "zona intangible." Source: Adapted from Secretaría de Hidrocarburos.

Andes Petroleum and PetroOriental are among the most important oil producers in Ecuador. At the peak of the oil boom, they collectively accounted for about one-fourth of Ecuador's total production (ARCH, 2011-2013). Andes alone produced more than any other external producer except for Repsol and including PetroOriental raises the level even higher than Repsol's.

3.4.1.1 Social Performance of Andes Petroleum and PetroOriental

When CNPC and Sinopec arrived in Ecuador, they inherited Encana's uneasy relationship with community leaders and environmentalists, mostly centered on the OCP pipeline. According to the Paola Carrera, Undersecretary for Environmental Quality at the Ministry of Environment, the government does not keep databases of firms' environmental or labor performance, but it is possible to track the instances that were severe enough to spur public protest, though CLACSO's "Observatorio Social de América Latina" (OSAL) initiative (Carrera, 2014; CLACSO, 2000-2012). OSAL has documented at least four large-scale strikes during the OCP's construction in 2001 and 2002: two by environmental activists seeking to block the project entirely, one by workers seeking better pay, and one by community leaders seeking local jobs and a fund for projects to offset the economic effects of expected environmental damages.

Since arriving in Ecuador, Andes and PetroOriental have maintained more positive relationships with the government and civil society than Encana had. In fact, despite the large scale of their operations, OSAL archives show that these two oil companies have maintained better community relations than any of their major competitors, including Ecuadorian SOEs. OSAL archives contain zero records of environmental protests that specifically targeted Andes or PetroOriental. In contrast, Repsol was targeted by a weeklong road blockade in 2006 over environmental concerns, and PetroEcuador was the target of large-scale environmental protests in 2006, 2007, 2008, and 2010.

The comparatively peaceful company-community relationship enjoyed by the Chinese oil firms may be partially due to the fact that Andes Petroleum (which produces about three times as much oil as PetroOriental) is located in Sucumbíos, which has been home to large scale agricultural and oil development for decades, including Texaco's original oil fields. Interviews with Undersecretary Carrera and remediation expert Michel Boufadel made it clear that the local aquifer is still so heavily polluted from the remaining Texaco pits that fishing and small-scale agriculture are no longer healthy options for local communities. In a site visit to Texaco's nearby Aquarico 4 well, Boufadel explained that the most toxic components of oil spills are compounds like benzene, which are invisible and quick to dissolve in water and spread throughout the aquifer and downstream waterways. Thus, even after remediation efforts have removed some of the visible effects of these decades-old oil spills, the water used by surrounding communities can still carry powerful toxins, making traditional livelihoods unsafe. New spills are unlikely to pose a significant marginal impact on communities that have been unable to hunt, fish, or farm for decades.

However, Andes and PetroOriental have had their share of labor disputes. Early in their presence, they both faced community conflict over local job opportunities. In November 2006, 300 local residents entered, occupied, and stopped production for Andes, demanding 400 local jobs. In July 2007 community members, transit workers, and municipal staff from the nearby town of Nueva Loja blocked a major road to demand more local jobs and other local investment. More serious conflicts involved PetroOriental, in the parish of Dayuma, Orellana. Dayuma crosses several oil blocks, including two major ones: Block 14, operated by PetroOriental, and Block 61, operated by Ecuadorian SOE PetroEcuador. Most of the protests focused on PetroEcuador (CLACSO documents 15 different protests, strikes, and blockades against PetroEcuador in 2006 and 2007), but PetroOriental also received some attention. In the summer of 2006 and again in 2007, local residents blockaded the road into the PetroOriental facilities twice, demanding more local jobs and the patronage of local transportation providers. After extensive negotiations, an agreement was reached on the provision of a Social Fund tasked with local job creation and credit programs.

Furthermore, Chinese Embassy Attaché Zach Chen states that Andes and PetroOriental have established English as the primary working language in their Ecuadorian facilities, and only hire workers who speak it fluently. This requirement dramatically limits the pool of potential workers, raising their salaries, reducing turnover and improving morale. However, this policy also has a strong downside: it limits hires from the immediate vicinity, where schools are not able to teach students sufficient English. So, while this problem has been addressed at the national level, it may continue to cause friction with local communities in the future.

Another area of labor relations continued to plague Andes and PetroOriental until recently: profit sharing with subcontract workers. As mentioned above, subcontracting is strictly limited in Ecuador and subcontracted employees must be included in profit sharing. Andes Petroleum and PetroOriental participated in the 15 percent profit sharing as required but neglected to include subcontracted employees in the distribution of those profits. At issue was not the companies' willingness to pay – they had originally distributed the correct amount of their profits – but the fact that the original amount was shared among too few workers. As a result, the companies were required to pay an additional $16 million to the originally excluded workers (CLACSO, n.d.; "Ex Trabajadores" 2009). Since the oil companies did not benefit financially from skirting the law initially, and since they suffered extensive financial costs to address the problem later, it is unlikely that their oversight was intentional or that the problem will occur again.

3.4.1.2 Environmental Performance

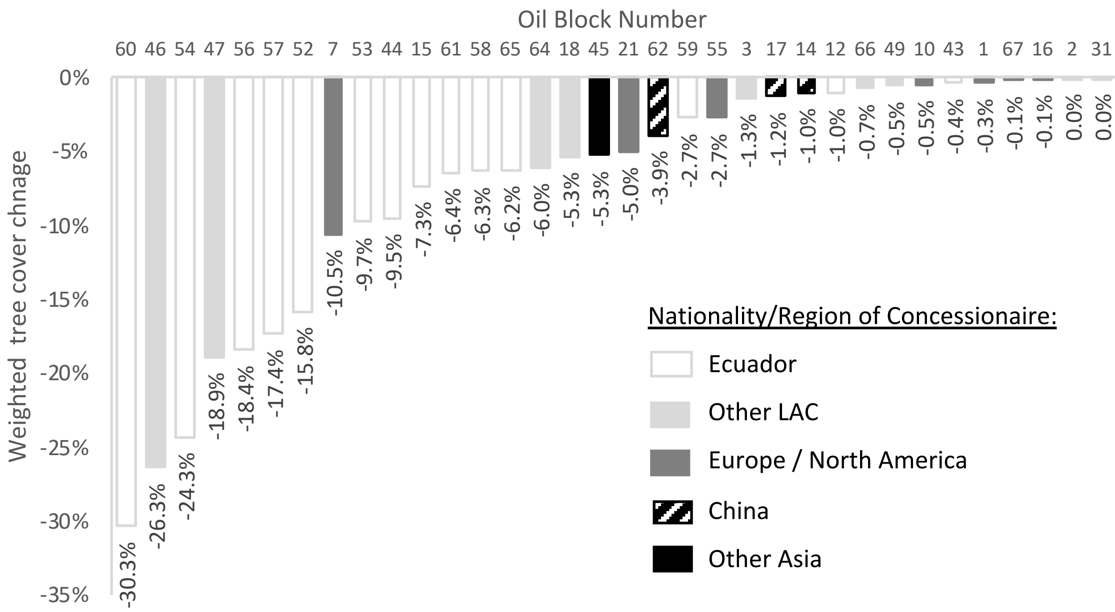
As mentioned above, the government of Ecuador does not keep a centralized database of environmental misconduct. However, it is possible to independently estimate one aspect of environmental management across Ecuador's active oil blocks: deforestation. The location of most of these blocks within the Amazon rainforest means that any new expansion of operations is likely to be associated with deforestation in one of the most biodiverse areas on the planet.

In order to estimate deforestation, Figure 3.12 is based on geospatial data from Hansen et al. (2013), who offer satellite data on tree cover change between 2000 and 2016, using a 30-meter grid.[24] Figure 3.12 shows the total net tree cover change within the boundaries of each oil block that was actively producing during the oil boom years of 2003 and 2013, weighted by the initial tree cover of each oil block (which ranges from zero to 100 percent). This initial tree cover is strongly related to the levels of biodiversity shown in Figure 3.5, with a correlation of 0.67 (p=0.008). Thus, deforestation in the richest sections of the Amazon basin appear more heavily weighted than the same levels of deforestation in less densely-forested areas. Unfortunately, it is impossible to limit the

[24] The level of granularity used in Hansen et al. (2013) is sufficient to capture all but the smallest encroachments into the forest, but is unable to differentiate between true deforestation and tree cover loss (defined as the loss of any tree cover, be it forest or plantation). For this reason, this section refers to these calculations as *estimates* of deforestation, and *measures* of net tree cover change.

measurements to the boom period, but the entirety of the 2003 to 2013 decade is encapsulated in this analysis.

Figure 3.12: Net tree cover loss in oil blocks active during the oil boom, 2000-2016, weighted by initial tree cover



Source: Author's analysis of Hansen et al (2013) data. Note: For oil blocks with joint nationalities or which changed nationalities during this time period, the nationality for the greatest time period is shown.

Figure 3.12 shows net tree cover change between 2000 and 2016. With only 17 countries represented across 34 blocks during the oil boom, the sample size is too small to support statistical analysis. However, it is clear from these figures that the Chinese oil companies have avoided the worst outcomes. PetroOriental (blocks 14 and 17) and Andes Petroleum (block 62) concessions experienced one and four percent tree cover loss, respectively. These levels are far better than the mean (7.2 percent tree cover loss) and substantially better than the median (5.1 percent tree cover loss) outcome for all oil blocks.

Figure 3.12 shows oil blocks by the nationality or region of each block's *plurality* concessionaire for the oil boom years. For example, as of this writing, Block 7 is associated with Petroamazonas (an Ecuadorian oil SOE) but for most of the oil boom, its concessionaire was Perenco (an Anglo-French oil firm), and so it is shown as European. Similarly, Block 16 is managed by a joint venture between companies based in the US, Spain, and China, with Spain's Repsol having the plurality stake (35 percent), so it is also shown as European. It is possible to further estimate deforestation associated with each country of concessionaire, by averaging across oil blocks and using concessionaire ownership stakes and block sizes as weights. For example, the deforestation associated with Chinese concessions is estimated in Table 3.7. Chinese oil companies had majority stakes in blocks 14, 17, and 62 (the blocks profiled in the current case study), as well as minority stakes in blocks 16 and 67. These blocks vary widely in their size and initial tree cover as well as the net tree cover change they experienced from 2000 to 2016. Table 3.7 combines these experiences to estimate the weighted average of overall deforestation under Chinese concessions: -1.6%.

Table 3.7: Calculation of average weighted tree cover change under Chinese concessions in Ecuador, 2000-2016

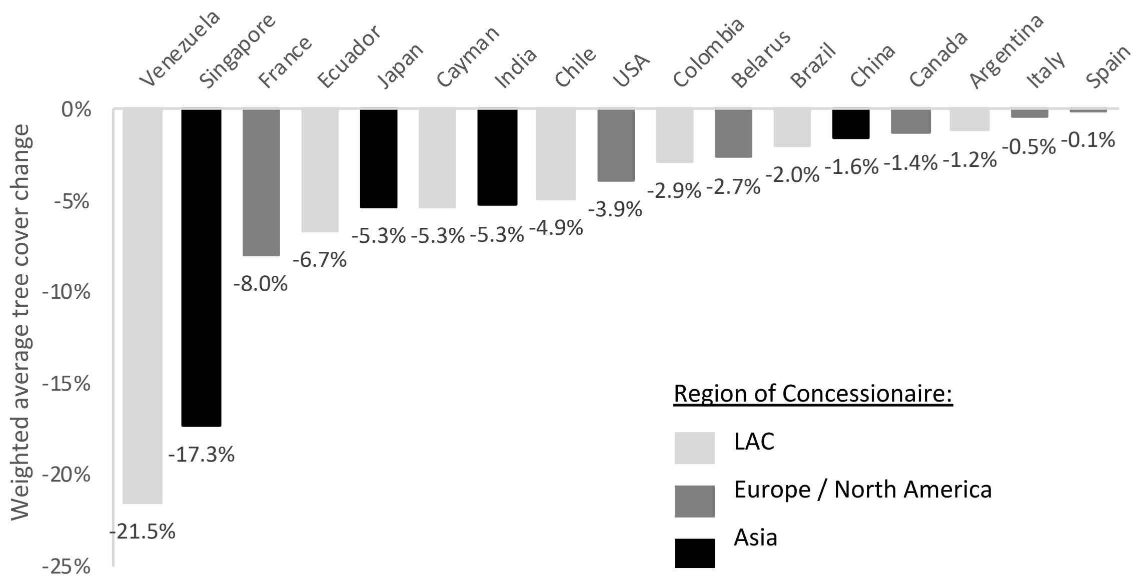
	Calculation of weights				Calculation of avg. TC change			Contrib. to TC change, Chinese concessions
Block	China's stake (% of 16 yrs.) A	Block size (km²) B	China's presence (km²-yrs.) C=A*B	Share of China's presence (%) D=C/sum(C)	TC, 2000 (%) E	Net TC change (%) F	Weighted TC change (%) G=E*F	(pctg.. pts.) H=D*G
14	61.5%	1,936.6	1,190.8	37.7%	97.5%	-1.0%	-1.0%	-0.4%
16	19.3%	1,256.8	242.9	7.7%	99.8%	-0.1%	-0.1%	0.0%
17	61.5%	1,779.4	1,094.2	34.7%	98.9%	-1.3%	-1.2%	-0.4%
62	61.5%	1,007.9	619.7	19.6%	92.6%	-4.2%	-3.9%	-0.8%
67	10.8%	68.1	7.4	0.2%	99.7%	-0.1%	-0.1%	0.0%
Sum			3,155.0	***100.0%***				***-1.6%***

Source: Author's analysis of Hansen et al (2013) data. Notes: The weighted tree cover change shown in Column F is identical to the weighting used in Figure 3.12. TC: tree cover.

Figure 3.13 shows the results of repeating the calculations in Table 3.7 for each country represented in Ecuadorian oil production from 2000 to 2016. No obvious trend emerges regarding regions with better or worse outcomes regarding deforestation. However, it is clear that Chinese oil companies have out-performed most of their peers.

Chinese oil companies' performance (-1.6 percent) is much better than a simple average of the 17 countries shown in Figure 3.13 (-5.3 percent) or their median (-3.9 percent).

Figure 3.13: Weighted average tree cover change by concessionaire nationality in Ecuador, 2000-2016



Source: Author's analysis of Hansen et al (2013) data.

3.4.1.3 Analysis

The social and environmental performance of Andes Petroleum and PetroOriental during Ecuador's oil boom appears to be on par or above average among all oil producers in Ecuador. However, as mentioned above, they may have had an advantage in this regard, by inheriting oil blocks where environmental damage had long since rendered traditional livelihoods impossible. A much more challenging test arose toward the end of the oil boom, when Andes Petroleum won an auction for two new oil blocks in an area where oil had never been developed. These were the first new oil blocks to be awarded after the environmental and social reforms of 2007 and 2010, and thus the first true test of Ecuador's high-road extractivism model. The performance of Andes Petroleum and the Ecuadorian government regarding this new test is discussed below.

3.4.2 New Concessions in the Southeastern Ecuadorian Amazon

In 2014, Andes Petroleum bid for and won two additional oil concessions, in Blocks 79 and 83 shown in Figure 3.14.[25] These blocks border the southern end of PetroOriental's current concessions, but they are farther away from Andes' current concession in the northern region of Tarapoa, Sucumbíos. The economy and ecology of the new concessions are quite different from Tarapoa. Moreover, unlike the Tarapoa concession, the new blocks will be greenfield projects. Because of these differences, it seems very unlikely that Andes will be able to expand its operations with the same positive community and government relations it has enjoyed in the past.

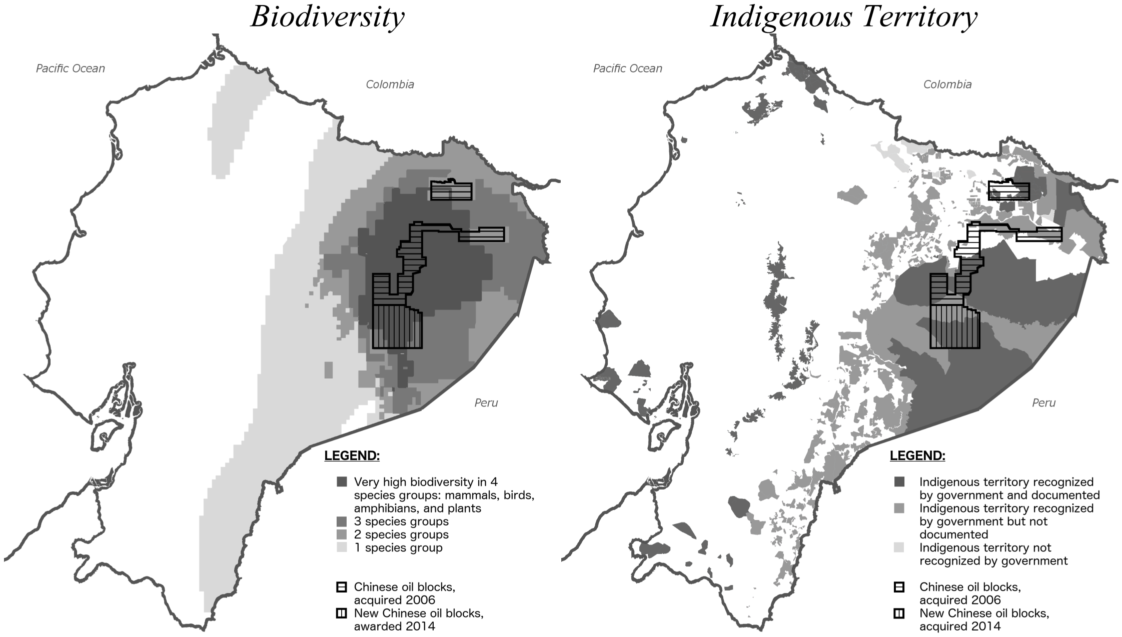
3.4.2.1 New Challenges in the Physical and Social Landscape of Blocks 79 and 83

The new sites will be greenfield projects just outside of the Yasuní National Park. As Figure 3.13 shows, they are located in an extremely biodiverse area of the Ecuadorian Amazon, richer even than the more famous Ishpingo-Tambococha-Tiputini (ITT) block on the eastern border. The prospect of new oil exploration in the Amazon has brought intense criticism from environmental and indigenous groups, including Amazon Watch, the Pachamama Alliance, Acción Ecológica, and others (Zuckerman 2014). Experts on the Ecuadorian Amazon, such as biologist Santiago Espinosa of the Pontífica Universidad Católica de Ecuador and conservationist Kelly Swing of Boston University and the Universidad San Francisco de Quito, believe that the government currently lacks the

[25] Andes Petroleum won these concessions through auction, though it was the only bidder for these two blocks. Two additional bids were registered and accepted for their respective blocks: Repsol Cuba, in Block 29; and a consortium comprised of Ecuadorian SOE PetroAmazonas, ENAP-Chile, and Belorosneft in Block 28.

institutional capacity to successfully manage the ecosystems near the planned extraction sites (Espinosa, 2014; Swing, 2013).

Figure 3.14: Sensitive territory and Andes Petroleum's new oil blocks, Ecuador



Note: Very high biodiversity is defined as being within the highest 6.4 percent of all South American land.
Source: Compiled from Bass et Al. (2010), LandMark (no date), and ARCH (2017).

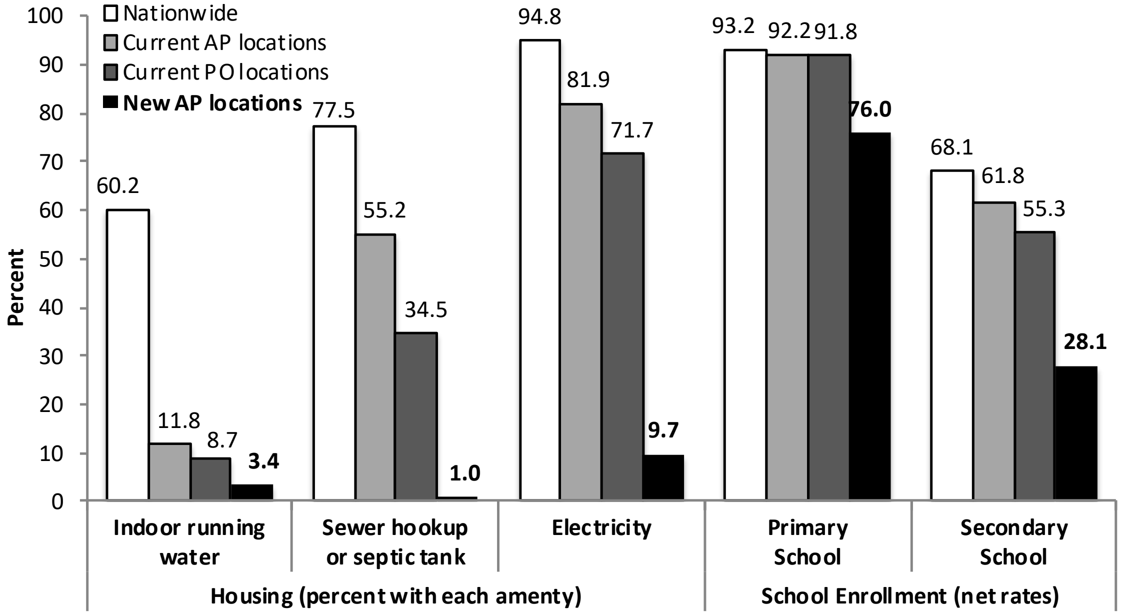
Furthermore, the social landscape in blocks 79 and 83 is quite different from the one Andes Petroleum has known in its current concession. First, unlike the northern Tarapoa block, the new southern concessions are entirely covered by indigenous territory, as Figure 3.14 shows. A majority is Sápara territory, with the remainder covered by Kichwa territory.[26] Of the two indigenous nations, the Sápara are a much smaller group and have smaller territory: the new oil concessions will cover 52 percent of total recognized Sápara lands (Castillo et al, 2016). Both groups are classified by UNESCO as

[26] The Sápara people were also commonly known as "Zápara" before 2009. Documents from before 2009 may refer to them using either spelling (see for example UNESCO, 2008). Newer official statements from the group exclusively use the spelling "Sápara" (see for example Association of Sápara Women, 2016; Ushigua and Ushigua, 2017)." For the sake of consistency, this essay uses the current name of the group: the Sápara Nation of Ecuador.

having endangered languages; the Sápara language is “critically endangered,” with only nine speakers (Moseley 2010). Although the Sápara nation is small (numbering less than 300), its language is one of just two Ecuadorian cultural practices included by UNESCO in the Representative List of Intangible Cultural Heritage of Humanity. In including the language, UNESCO highlighted their “oral culture that is particularly rich as regards their understanding of the natural environment … demonstrated by the abundance of their vocabulary for the flora and fauna and by their medicinal practices and knowledge of the medicinal plants of the forest” (UNESCO 2008). Respecting the rights of this indigenous group, recognized internationally for its vulnerability as well as its cultural importance, will be paramount in any attempt at socially responsible extraction on the part of Andes Petroleum.

In addition, residents in the southern concessions have very different living standards from the communities in Andes’ northern territory. The new concessions lie within the parish of Montalvo, Pastaza, among the poorest in the country. As Figure 3.15 shows, in 2013, at the time of the oil block auction, very few households in Montalvo had even the most basic services.

Figure 3.15: Basic service coverage, Ecuador and regions of Ecuador where Andes Petroleum (AP) and PetroOriental (PO) operate, 2013



Notes: Shown are averages of the parishes in each oil concession, weighted by the number of homes or school-age children in each parish. Andes Petroleum's current concession includes the parishes of Aguas Negras and Tarapoa, in Cuyabeno Canton, Sucumbíos. PetroOriental's current concessions include the parishes of Alejandra Labaca, Dayuma, El Edén, Inés Arango and Taracoa, in Orellana Canton, Orellana; and Arajuno, Arajuno Canton, Pastaza. Andes Petroleum's new concessions are in Montalvo, Pastaza Canton, Pastaza.
Source: Author's analysis of Sistema Nacional de Información (INEC) data.

As of 2013, during the concession auction, fewer than 10 percent of residents in the blocks won by Andes Petroleum had electricity in their homes, fewer than five percent had indoor running water, and only one percent had wastewater treatment through a sewer hookup or septic tank. These figures place Montalvo in the bottom three percent of Ecuador's parishes for running water and the bottom one percent for the other two services. The educational situation was equally grim. Only about three-fourths of children attended primary school, and fewer than one in three attended secondary school, putting Montalvo in the bottom one percent and two percent of parishes nationwide, respectively.

3.4.2.2 (Mis)Management of New Challenges Posed by New Landscapes

PetroOriental already has experience working in a delicate ecosystem: block 14 is located in and around the Yasuní National Park (shown in Figure 3.11). However, PetroOriental inherited that concession from Encana. This will be the first time either Andes Petroleum or PetroOriental has established new concessions anywhere in Ecuador, much less in the Amazon.

Unfortunately, problems with the prior informed consultation process have already begun to jeopardize Andes' prospects for positive community relations. Ecuador's constitution and international agreements set high standards for community consultation and participation, but they seem to have been circumvented in this case.

Ecuador is one of just 20 signatories to ILO Convention 169, which calls for nations to consult with indigenous groups prior to developing subterranean mineral deposits below tribal hunting, fishing, or otherwise traditional territory (ILO, 1989). Article 57 of Ecuador's new constitution also enshrines this requirement, with the added note that if the affected community does not agree to the proposal, the government must follow additional steps detailed in the 2010 Citizen Participation Law, which states that "if … a majority opposition emerges in the respective community, the decision to undertake the project or not will be made through a resolution, adequately debated …, which, in cases where it is decided that the project will be undertaken, must establish parameters that minimize the impact on communities and ecosystems; moreover, it must plan for mitigation, compensation, and damage repair; and where possible, it must include the members of the community in the labor force for the respective projects, in conditions that guarantee human dignity" (Article 83, author's translation). In sum, the prior consultation process must seek the community's majority approval; if the majority of the community opposes the project, a resolution to proceed in a limited-impact way must be drafted, debated, and approved.

Members of the Sápara nation claim that majority approval was never sought. Indeed, the Secretaría de Hidrocarburos (SHE), which conducted the consultation, does not claim to have sought it. Instead, SHE reports that the Sápara President at the time, Basilio Mucushigua, signed an agreement on November 21, 2012, allowing oil exploration in exchange for $5.95 million in local public investment (SHE, 2012). This neglect of majority opinion is not surprising, given its omission in Executive Decree 1247, which directed this particular consultation process (Correa, 2012). The Decree allows for comments to be submitted either through community meetings or individually at local consultation offices, provided that the offices are extensively advertised through local press, government, or community leaders. SHE reports that 16,469 people participated in this consultation process, throughout the 16 blocks that the government hoped to develop. However, Mazabanda (2013) estimates that the indigenous nations whose territories overlap with the oil blocks include 69,114 adults, and that the total adult population of the oil blocks is 141,397. Even if Mazabanda's estimates are significantly overstated, SHE consulted with only a small minority of the affected population. It is worth noting that it is equally likely that SHE's estimates are overstated. SHE include 10,469 people who participated directly in the consultation process, as well as 6,000 who participated in "socio-environmental management model" workshops, which are outside the scope of Executive Decree 1247; nor does SHE claim to have taken any precautions to avoid double-counting those who may be in both groups.[27]

It may still be argued that those who did not participate were voluntarily abstaining from the consultation. However, current Sápara President Kléver Ruiz and President of the Association of Sápara Women Gloria Ushigua said in interviews that they never saw or heard any of the advertisements required by Executive Decree 1247 (Ruiz 2014; Ushigua; 2014). Neither Ruiz nor Ushigua doubts that former Sápara President Mucushigua signed an agreement with the SHE. But both insisted that SHE never sought approval from the majority of the Sápara nation, in violation of the 2008 Constitution and the 2010 Citizen Participation Law, or even held a widely-advertised public comment period, as required by Executive Decree 1247.

Beyond the consultation process, evidence suggests that Pres. Mucushigua was no longer president at the time of the agreement, rendering it void. A Sápara resolution from August of 2012 – three months prior to the agreement – reports that in a national congress over three days, the Sápara nation sanctioned Pres. Mucushigua for allowing SHE representatives to enter Sápara territory, by relieving him of office and replacing him with Luis Armas (NASE, 2012). A joint report by Ecuador's national and Amazon-specific indigenous confederations states that Pres. Armas was recognized as the legal representative of the Sápara nation by the Ecuadorian government's Council on the Development of Nationalities and Peoples in Ecuador (Consejo de Desarrollo de las

[27] Representatives of the Ecuadorian government asked not to be quoted on this matter. In an anonymous interview, a government source reiterated the government's confidence in the process and asserted that there was full backing of indigenous communities for the current oil expansion, while acknowledging that no vote or poll was taken to determine majority support or opposition.

Nacionalidades y Pueblos del Ecuador – CODENPE) on September 21 (Ordoñez, Rivadeneira, and Mazabanda, 2016).

The internal conflict over oil continued to intensify over the coming months. Ordoñez, Rivadeneira, and Mazabanda (2016) report that in January of 2013 (two months *after* the agreement with SHE), former president Mucushigua met separately with those who favored the agreement, who re-named him to the post, an act that was registered with CODENPE, prompting the remainder of the nation to meet and name Kléver Ruiz as president, which was *not* recognized by CODENPE. Both Ruiz and Ushigua indicate that the community is deeply divided between ethnic Sápara, opposed to the drilling, and other residents (including Mr. Mucushigua) who are in the minority but who welcome the oil exploration.

It is unlikely that Andes will be able to win over the indigenous communities in their oil blocks easily. When asked what she would like to say to Andes Petroleum, Ushigua replied "The indigenous Sápara say to the hydrocarbon companies that we do not want oil exploitation; we want to be left alone …. We ask the big countries to please respect our rights and our life that comes from nature" (Ushigha, 2014, author's translation). The national and Amazonian indigenous confederations have sided with Ruiz, Ushigua, and the other Sápara and Kichwa opposed to drilling, issuing a declaration directed to oil companies in 2013 (after the Mucushigua-SHE agreement but before the concession auction bidding period was closed) stating that:

> "Our nationalities and peoples have not given their consent to the realization of petroleum activities in our territories. The few agreements that the government claims to have signed with indigenous communities are the result of coopting leaders and of the division created in our organizations. None of these agreements was signed with the knowledge and approval of legitimately called assemblies" (CONAIE and CONFENIAE, 2013, author's translation).

The statement ends with a stark warning: “we declare ourselves to be in permanent mobilization for the defense of our territories” (Ibid).

3.4.2.3 Further Developments: Moving Forward After an Unsuccessful Consultation

Andes Petroleum signed a contract for the exploration and development of blocks 79 and 83 in January 2016, two years after winning the oil block auction. This contract establishes a sales price to the Ecuadorian government of $47 per barrel and gives the company four years to explore, with a possible two-year extension (Araujo, 2016). Since that time, the affected Sápara community has not given up its demands. Two weeks after the contract was signed, the Association of Sápara Women issued a statement denouncing the government for moving forward with contract despite indigenous opposition and demanding, *inter alia* “respect for our rights as an indigenous nation, conservation of our territory, our forests, and the Ecuadorian Amazon [and] the nullification of the contract with Andes Petroleum Ecuador” (Association of Sápara Women, 2016).

The Sápara and Kichwa nations have developed a resistance strategy that incorporates two approaches: making international demands while building relationships with non-indigenous allies. Through the first strategy, they have requested action from the United Nations Special Rapporteur on the Rights of Indigenous Peoples as well as Andes Petroleum itself. Simultaneously, they have reached out to potential allies among environmentalists, ecotourists, and medical tourists worldwide.

The Sápara began their international campaign the same year the oil auction closed: 2014. Ruiz and Ushigua wrote to Vicky Tauli-Corpuz, then incoming Special Rapporteur on the Rights of Indigenous Peoples at the United Nations, explaining the situation from their perspective and requesting that she carry out a fact-finding mission in

Ecuador (Ruiz and Ushigua, 2014). While Ms. Tauli-Corpuz did eventually come to Ecuador for a conference on indigenous Amazonian peoples in Ecuador in 2016, the topic was limited to voluntarily isolated tribes, which does not include the Sápara (Tauli-Corpuz, 2016; UASB, 2016).

In May of 2017, Sápara representatives delivered a letter to the offices of the Chinese representatives to the United Nations in New York, explaining the Sápara people's recognition by UNESCO and requesting "that the Chinese delegation to the United Nations protect ancient cultures such as ours, urging Chinese state-owned company Andes Petroleum to refrain from entering our territories, since our country has not respected or protected human rights" (Ushigua and Ushigua, 2017). As of this writing, no answer has been forthcoming.

Another aspect of the indigenous response to Andes Petroleum's expansion, on the part of both the Kichwa and Sápara peoples, has been that of strengthening relationships with potential allies outside of the Amazon. Both indigenous nations sent representatives to the People's Climate March in New York in September 2014. At preparations for the March, Ushigua stated publicly: "We are ready to fight with all the strength of our ancestors against the companies and governments to protect the land from which we came, a land that must remain free from oil exploration" (Zuckerman, 2014). They returned for subsequent years' marches, and their presence gained star power when famed actor and activist Leonardo DiCaprio joined hands with them literally as well as figuratively in 2017, posting photos of them together to his social medial accounts (Bruner, 2017).

The Sápara Nation, with the assistance of national environmental organizations such as the Pachamama Alliance and Terra Mater, has also launched an outreach effort called Naku (taken from the Sápara word for "forest"). Naku involves two arms: a "Sápara immersion" ecotourism program and educational experience, and a "healing center" where chronic illness sufferers can come for traditional Sápara treatments (Castillo et al., 2016).

It is no exaggeration to say that civil society around the country and around the world is paying attention to what happens next. At this writing, Andes Petroleum and the Sápara people appear to be headed toward inevitable conflict, in a pattern reminiscent of Ecuadorian oil conflicts of decades past. Rather than establishing a new "high-road" approach to extractivism, the nation appears to have retraced its steps on the same road it has taken many times.

3.5. Discussion

This essay seeks to evaluate Ecuador's turn toward "high-road extractivism," and the extent to which a new relationship with Chinese oil companies gave the regulatory space necessary to carry out its new investment regulations and establish a less destructive form of existing as an oil-based economy. The results show that Andes Petroleum and PetroOriental have generally complied with this new legal framework, avoiding environmental or social misconduct that would engender conflict or deforestation. However, by the end of the oil boom, Ecuador's new oil paradigm broke down – not because of the performance of Chinese oil companies, but despite it.

The failure of Ecuador to successfully carry out its own commitments to human rights may be due in part to Executive Decree 1247's assignation of FPIC duties to SHE, rather than to a ministry or agency dedicated to indigenous affairs, such as CODENPE. SHE's mission is explicitly oriented toward expediting production: "To study, measure, and evaluate hydrocarbon assets, promote them, seek out national and/or international investment, oversee and administer, in a sovereign manner, hydrocarbon areas and contracts, legally and ethically, so that they may contribute in a sustained fashion to good living for Ecuadorians" (SHE, n.d., author's translation). By tasking SHE with a precedent-setting first attempt at operationalizing Ecuador's new FPIC requirements, Correa gave the process to staff without the institutional incentives or independence necessary to ensure that indigenous concerns were taken into account.

The importance of regulatory independence in Latin America for the success of private investment has been well established, especially in the sector of infrastructure. Pargal (2003) shows that the existence of government regulatory bodies was associated with greater private infrastructure investment in Latin America in the 1980s and 1990s, but that the location of regulatory bodies *within* sectoral ministries was also positively associated with greater investment. In other words, regulatory independence may slow private infrastructure investment in the region. However, Guasch, Laffont, and Straub (2003) show that concessions awarded in context with regulatory independence were less likely to be renegotiated later, indicating that infrastructure contracts established in such an environment are likely to encounter fewer problems during their lifespans. Guasch, Laffot and Straub (2007) revisit the subject with a deeper analysis and find that regulatory independence is especially important in contract success in Latin American contexts characterized by weak governance; it may provide a counterweight to political pressure to move forward with symbolic but poorly-considered "white elephant" projects.

As Foster (2005) points out, obstacles to regulatory independence in Latin America go beyond whether the regulators are housed within their own agencies or within sectoral ministries, and can also entail the extent to which they have financial and personnel autonomy or risk budgetary or operational interference by the executive branch or other government entity with a vested interest in expediting projects. While the challenge of establishing and empowering truly independent regulatory bodies is an ongoing concern throughout Latin America, the case examined here appears to be a "perfect storm" of political interference in a safeguard process. The prior consultation was carried out by the sectoral ministry, acting under an executive decree that did not meet the standards stipulated in the Citizen Participation Law. It is no surprise, then, that the resulting consultation process failed to live up to Ecuadorian's much vaunted vision of a more sustainable and inclusive form of oil extraction.

Beyond Ecuador, the topic of conflicting incentives within ministries tasked with regulating the extractive sector has been the source of political controversy throughout Andean nations over the course of this commodity boom. Particularly, toward the end of the boom, as falling prices reduced public hydrocarbon and mining revenue, Ballón et al. (2017) and Ray et al. (2017) find that governments were likely to curtail social and environmental protections or weaken their applications. While these counter-reforms were often enacted in the name of expediting new investments, they frequently have had the opposite results. Protracted social conflict, stemming from the rolling back of rights already in existence, can jeopardize the ability of those new investments to move forward on *any* timeline, as the example of weakened prior consultation explored in this chapter shows. The question for other governments considering weakening social and environmental regulations surrounding extractive sectors, then, may not be whether they can afford to maintain their system of protections, but whether they can afford *not* to.

3.6. Conclusion

After 30 years of environmental degradation, social conflict, and economic instability stemming from its identity as an oil producer, Ecuador sought to change this paradigm, welcoming new investment partners to operate under a new regulatory framework in the amenable economic context of a global oil boom. This scenario created a natural experiment for the viability of this new model of "high-road extractivism."

Chinese SOEs appear to have acted as good faith partners in supporting Ecuador's new approach, establishing relatively peaceful relations with neighboring communities and preventing major deforestation in the oil blocks under their management. However, the Ecuadorian state has missed its own standard for social inclusion in new oil investment decisions. The involvement of state hydrocarbons agency in overseeing human rights safeguards created an intrinsic, though implicit, conflict of interest, one that translated into *explicit* conflict among communities. It also created a very familiar scenario for Ecuador, in which the state was unwilling or unable to protect human rights in the face of a foreign oil company's interest in exploring and developing oil reserves. Rather than putting oil development on a new, more sustainable footing, Ecuador's institutional missteps seem to have reinforced the old model. It remains to be seen if the damage can be undone. Nonetheless, lessons abound for other nations considering re-orienting their commodities sector by starting again with new relationships and new rules. As difficult as it may be for governments to regulate and oversee the performance of foreign investors, it can prove even more difficult, in less obvious ways, to regulate and oversee themselves.

CONCLUSION

This dissertation crosses many policy areas and sectors, but centers on one perennial challenge: shifting away from old, commodity-driven economic activity in LAC and toward more economically diversified, socially inclusive, and environmentally sustainable models. In doing so, it makes the case for interconnectedness among several areas of policy making. First, the results of this work show that structuralist and environmental approaches to economic management can benefit each other. Second, the challenge of diversification is intrinsically multidisciplinary and requires collaboration between economists, political scientists, and ecologists, among other experts.

C.1 Interconnectedness of Structuralist and Ecological Approaches in LAC

Structuralist and environmental economists have not always seen each other as allies or collaborators working toward similar ends. For example, Seguino (2014) claims that Alice Amsden, when asked about integrating concerns about livelihoods and the environmental during a visit to the University of Vermont's Gund Institute for Ecological Economics and Sustainability, explained candidly that in her view livelihoods must always take priority and that environmental concerns must be secondary. For another example, the author attended a 2014 event, on the invitation of the Ecuadorian Environment Ministry, on "Achieving Equilibrium in the Amazon," positing environmental and livelihoods issues as conflicting goals, rather than reinforcing approaches. The findings of this dissertation, however, suggest that structuralist and environmental approaches to economic policies in LAC are complementary in nature and that collaboration across these approaches can help each field approach its goals.

C.1.1 LAC Structuralist Economics as Complementary to Ecological Economics

Essay 1 shows that primary commodity production in LAC is intrinsically more carbon- and water- intensive than manufacturing. The water use disparity is global in nature: no region or income level of countries has limited the water use or contamination from primary commodity production to the levels of manufacturing output. But even if "high-road" reforms are enacted to limit the water use and contamination, the carbon intensity remains. So, in order to limit the environmental impacts of production in LAC, either on the global (climate) or local (water) scale, it will be necessary to shift up the value chain.

Essay 3 profiles Ecuador, a country famous for having the "greenest constitution in the world," and also for the outsized importance of oil as an export, making it an apt case study of "high-road extractivism" in practice in LAC. The small, open, and dollarized nature of Ecuador's economy makes it particularly exposed to trends in global commodity prices and foreign investor preferences. Its results show that the Ecuadorian government, caught between conflicting incentives of attracting foreign investment for oil exploration and development and upholding its highly ambitious social and environmental protections, failed to uphold those protections. Ironically, the inadequacy of the prior consultation process helped create such a conflictive situation that it may jeopardize the ability of Andes Petroleum to carry out oil exploration in its new concessions. In favoring oil expansion over social and environmental protections, Ecuador may have ended up with neither. Furthermore, given that the Sápara nation removed President Mucushigua from office for having allowed SHE personnel to enter Sápara territory, it is doubtful that a prior consultation – even if it had met the requirements of the Citizen Participation Law – would have resulted in majority support for new oil exploration. Thus, even if Ecuador had been able to establish sufficient regulatory independence to guarantee the fulfillment of its “high-road” commitments, those commitments would have stood in conflict with the expansion of oil production. If Ecuador jeopardizes oil expansion either by *honoring* or by *not honoring* its social and environmental protections, the only way forward for the country is to diversify away from oil as a driver of economic activity.

C.1.2 LAC Ecological Economics as Complementary to Structuralist Economics

Infrastructure is a core part of the structuralist approach to economic management, as a primary public good together with scientific research and education. Furthermore, it facilitates the establishment of value chains and can enhance clustering effects discussed in Amsden (2001). In South America, specifically, the IIRSA and later COSIPLAN initiatives were established to foster regional integration with the ultimate goal of creating new regional value chains with a greater regional participation in value added and employment, and less vulnerability to global commodity price swings (Estevadeordal and Blyde, 2016). Ideally, such regional infrastructure plans might be able to help with the structural transformation of the regional economy away from dependence on extraction of raw materials from the Amazon basin and the myriad environmental and social problems that have accompanied it (Samaniego et al, 2016). But without careful planning, South American infrastructure can simply facilitate more (or more efficient) extraction of those raw materials from the Amazon basin, reinforcing old trading patterns rather than feeding new ones. In other words, one major challenge facing policy makers is to enable new foci of economic activity and transportation between those foci without opening up new sections of the Amazon for additional natural resource exploitation. Chapter 2 of this dissertation shows that one effective way to plan infrastructure projects without opening up the Amazon rainforest and reinforcing old extractivist patterns is to incorporate the voices of indigenous communities who currently rely on the forest for their livelihoods. Expanding the agricultural and extractive frontiers into the Amazon rainforest puts their traditional livelihoods at risk, through competition for land and clean water. So, it is not surprising that projects requiring formal prior consultation with those communities are associated with significantly less tree cover loss than those projects without such protections.

C.2 Interconnectedness Across Disciplines: Areas for Future Research

This dissertation attempts to establish the interconnectedness of the agendas of structuralist and environmental economists in LAC. Further work into the ways in which economic planners and environmental regulators can support each other's goals will be crucial in forming and pursuing a common vision of diversified, sustainable economic growth.

For example, further research into institutional design and management may help resolve a potential paradox between the results of chapters 2 and 3. Chapter 2 shows that in general, incorporating formal stakeholder engagement into infrastructure planning can help prevent deforestation. However, Chapter 3 shows that formal stakeholder engagement is not always carried out in a meaningful way. The difference between these two results is not simply attributable to the presence of DFIs in Chapter 2. As Table 2.14 shows, there is no statistically significant difference in impact between prior consultation processes mandated only by national government and those mandated by both national governments *and* DFIs. Nor is the difference solely a product of the setting of the failed prior consultation process in Chapter: Ecuador. Table 2.11 shows no significant difference among countries in the importance of prior consultation.

It is likely that the difference in these results is related to institutional factors in the hydrocarbons and infrastructure ministries involved in consultation processes. The Ecuadorian consultation process highlighted in Chapter 3 was in many ways doomed to failure. It was carried out by Hydrocarbons Ministry, which had never before carried out such a process, under an executive decree that did not require the process to meet the requirements of the Citizen Participation Law. To date, it is the only prior consultation process every carried out by Ecuador's Hydrocarbons Ministry. In contrast, infrastructure ministries oversee many more projects and one would hope that their staff have more experience, expertise, and commitment to procedure. For example, the agency within Peru's Transportation and Communications Ministry that oversees social and environmental safeguards (the Dirección General de Asuntos Socio Ambientales), was established in through concessional assistance from CAF. It was established to be a permanent oversight body capable of regulating all transportation and communications projects, not simply to facilitate one project as in the case of the Ecuadorian oil consultation (Dammert Bello, 2018).

It is clear from the political interference in Ecuador's prior consultation process that regulatory independence is an important factor in regulators' ability to fulfil their mandates. Unfortunately, Gilardi, Jordana, and Levi-Faur (2006) find social and environmental protections are less likely to have politically autonomous regulators than other areas of government oversight such as economic competition. However, even bureaucratic independence is insufficient for establishing and comparing the *de facto* autonomy of social and environmental regulators. For example, Guasch and Spiller (1999), in their treatise on regulation in Latin America, enumerate five requirements for effective regulatory institutions: managerial freedom, political autonomy, accountability to the public as well as to elected officials, checks and balances to prevent arbitrary decisions, and incentives to prevent capture of individual regulators. Clearly, the findings of chapters 2 and 3 of this dissertation show a need for more research in the area of institutional design and effective environmental regulation in LAC, especially with regard to the thorny policy challenges of economic diversification. Unfortunately, such research is well beyond the scope of this dissertation.

If structuralist economics is to be relevant in the 21st Century, it will need to incorporate pressing environmental concerns that are now inseparable from issues of livelihoods and economic sustainability, especially in such socially and environmentally sensitive regions such as the Amazon basin. Achieving that relevance will require taking into account the interconnectedness of the “three pillars” of sustainability: economic stability, environmental conservation, and social inclusion. Furthermore, the importance of regulatory independence for government infrastructure plans shows that the goal of working toward more diversified, inclusive, and sustainable economic models is an intrinsically interdisciplinary endeavor, requiring research beyond the bounds of economics. To face this challenge effectively, economists, ecologists, and social scientists of all stripes will be well served by more collaborative, interdisciplinary, and mixed-methods research.

APPENDIX A

ADDITIONAL INFORMATION FOR CHAPTER 1

A.1 Combining Data from Lall with Data from Peters and WaterStat

This essay uses trade data from the UN Comtrade database. For a few country/year combinations, UN Comtrade has no data, and so imputations were taken instead, substituting imports reported by the rest of the world in place of exports reported by the missing country. These include:

- Anguilla: 2005, 2009-2013
- Antigua and Barbuda: 2003, 2004, 2006, 2008
- Bermuda: 2003-2011
- Cuba: 2007-2013
- Dominica: 2011, 2013
- Haiti (all years)
- Honduras: 2008, 2013
- Macao: 2013
- Montserrat: 2011
- Netherlands Antilles: 2004, 2009-2013
- Saint Kitts and Nevis: 2012, 2013
- Saint Lucia: 2009-2013
- Saint Vincent and the Grenadines: 2013
- Trinidad and Tobago: 2011-2013
- Turks and Caicos: 2010, 2013
- Venezuela: 2007

Sanjaya Lall's technology classification system assigns a category for almost all 3-digit SITC codes. The remaining codes, such as 999 (miscellaneous, not otherwise classified), are listed separately as "other," but these make up a miniscule share of exports and are largely excluded from this analysis.

Glen Peters' GHG intensity calculations estimate an emissions level per dollar for each GTAP category. Unfortunately, UN Comtrade data is not available in GTAP categories, but a translation between the two systems is relatively simple, as GTAP categories tend to be umbrella categories covering several SITC categories each.

WaterStat water footprint estimates are available for 6-digit HS codes (for agricultural products) and for industrial products on average for each country. No translation was necessary, as Comtrade offers HS disaggregation. Unfortunately, WaterStat has several gaps, which were imputed following the method below.

- Where WaterStat has an intensity value listed for an umbrella category but not the sub-categories, the category average intensity is applied to the subcategories.
- Similarly, where WaterStat has an intensity value for all subcategories but not the aggregated category, a simple average is used for category-level trade flows.
- Where WaterStat is missing a value for the last in a series of sub-categories, usually a miscellaneous sub-category, a simple average of other sub-categories is used.
- Processed foodstuffs not included in WaterStat are considered industrial.
- WaterStat excludes seafood (category 03, 1504, 1603, 1604, and 1605) because it considers it to be a "low or non-water consumptive product." (For more, see Hoekstra 2003). Those categories are excluded here.

- Category 50 (silk) is not included in WaterStat but it is an important element of Chinese exports (China exported 417 million USD of silk in 2013). To avoid omitting it altogether, this study uses the estimate of 54,000 m^3/metric ton established in Indian production, by Astudillo et al. (2014). Astudillo et al. estimate that this water footprint could be reduced to 26,700 with production process reforms. The authors state that Chinese silk has a lower water footprint because the production methods are more efficient. Thus, this study uses the low estimate of 26,700 m^3/MT for Chinese silk, the higher value for Indian silk, and omits it for LAC countries, which do not export significant levels of silk.
- Several uncommon items are omitted altogether from this analysis, such as human hair, live primates, pet food, and miscellaneous animal products not for human consumption.
- Other calculations, which vary by line item, are available upon request.

WaterStat has data for more countries for agricultural products than for industrial products. A few assumptions for industrial water intensity levels were necessary:

- Hong Kong and Macao are assumed to have the same intensities as mainland China (as many exports from those territories originate in the mainland).
- WaterStat contains industrial water intensity levels for only two Caribbean nations: Barbados and the Dominican Republic. A simple average of these two intensities is applied to other Caribbean nations included in WaterStat for agricultural but not industrial purposes: the Bahamas, Dominica, Montserrat, and Saint Vincent and the Grenadines.

A.2 Deflation

For most specific raw commodities, including most agricultural, extractive, and chemical goods, this study uses the deflators found in the World Bank GEM Commodities database:

- Aluminum
- Ammonia
- Bananas
- Barley
- Beef
- Beverages
- Chicken
- Coal
- Cocoa
- Coconut oil
- Coffee
- Copper
- Cotton
- Crude petroleum oil
- Fertilizers
- Fishmeal
- Gold
- Groundnut oil
- Iron
- Lead
- Liquid natural gas
- Maize
- Misc. energy products
- Misc. metals, minerals
- Misc. raw agric. prods.
- Natural gas
- Nickel
- Oranges
- Palm kernel oil
- Palm oil
- Phosphate
- Phosphate
- Platinum
- Potassium
- Rice
- Rubber
- Sheep
- Shrimp
- Silver
- Sorghum
- Soybean meal
- Soybean oil
- Soybeans
- Sugar
- Superphosphate
- Tea
- Timber
- Tin
- Tobacco
- Urea
- Wheat
- Woodpulp
- Zinc

Simple averages of existing related commodities were used for miscellaneous seafood, oilseeds, precious metals, and hydrocarbons.

For food commodities not found in the GEM Commodities database, this exercise uses the broader categories of deflators found in the FAO Food Price Index (FPI) database: meat, dairy, cereals, vegetable oils, sugars, and miscellaneous food products. For example, pork is not included in the GEM database, so it is deflated using the FPI deflator for meat. For manufactured and miscellaneous goods, this exercise uses the country of origin's export price deflator, calculated by UN ECLAC (CEPALStat).

A.3 Statistical Analysis of GHG Intensity Levels of Exports

By definition, an export basket contains a range of products, each with their own environmental intensity. This section examines the distribution of those products across GHG intensity levels and compares the distribution of LAC exports to China with LAC exports to the rest of the world.

Figure A.3.1 shows the cumulative distribution of exports from LAC to China and to the rest of the world, measured against the GHG intensity of each commodity and weighted by the real (2004) dollars of exports of each commodity. The red line (representing exports to China) is mostly to the right of the gold line (representing other LAC exports). This position indicates that overall, LAC exports to China have a higher GHG intensity than other LAC exports.

Figure A.3.1: Cumulative distribution of exports across GHG intensity levels, by destination

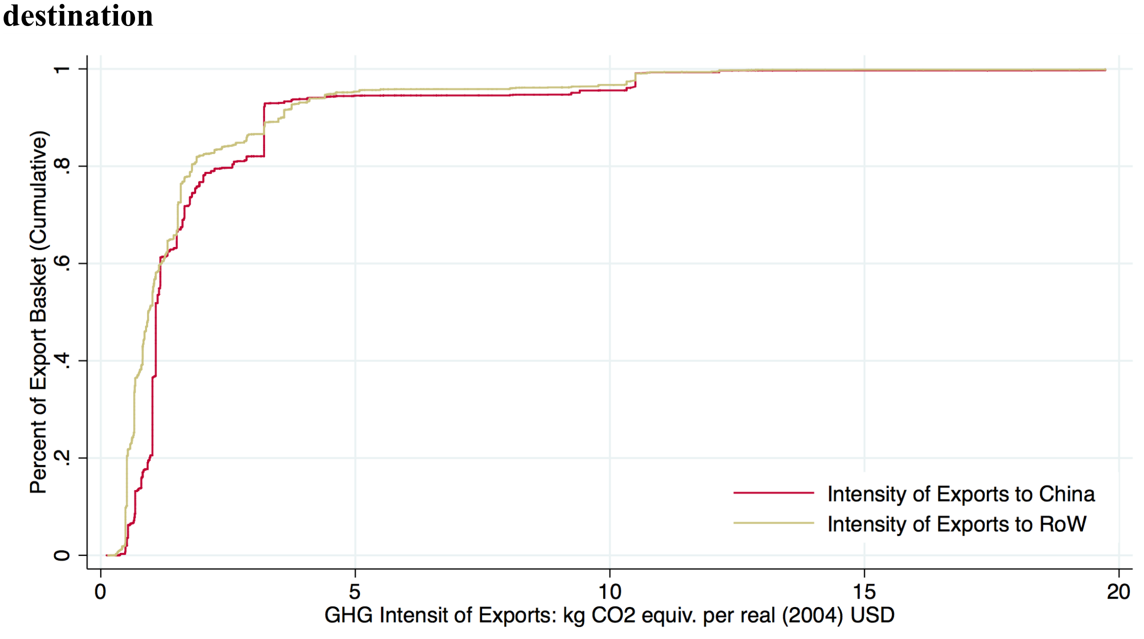


Figure A.3.2 shows that exports to China appear more GHG-intensive in the Caribbean and in Mexico and Central America, but less intense in South America.

Mexico alone accounts for roughly 40 percent of all LAC exports, which explains the region-wide difference in Figure A.3.1.

Figure A.3.2: Cumulative distribution functions of export basket GHG intensity, by sub-region

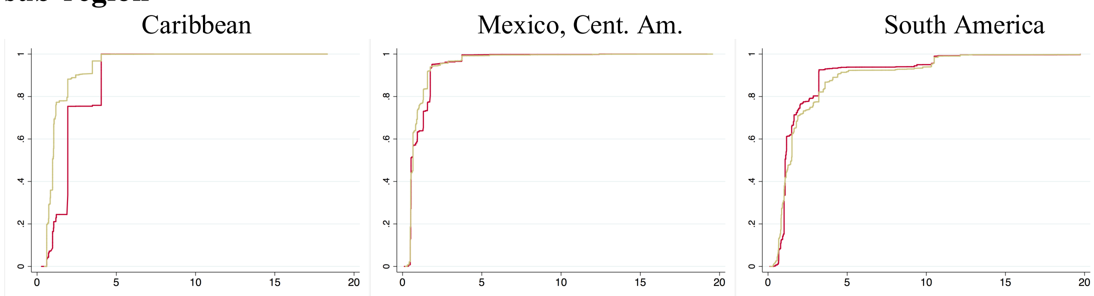


Figure A.3.3 shows the cumulative distribution functions of exports across GHG intensity levels for each LAC country. Exports to China appear significantly more GHG intense than other exports in most Caribbean countries, Mexico, Ecuador, Honduras, Uruguay, and Venezuela. In contrast, exports to China appear significantly *less* GHG intense in most other South American countries.

Figure A.3.3: Cumulative distribution functions of export basket GHG intensity, by country

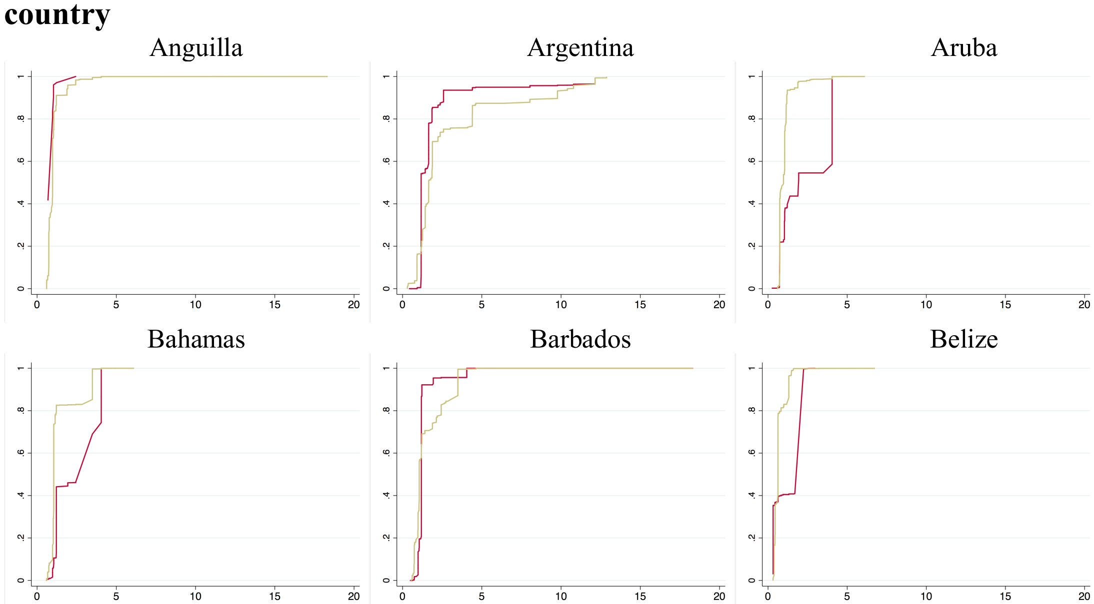


Figure A.3.3, continued: Cumulative distribution functions of export basket GHG intensity, by country

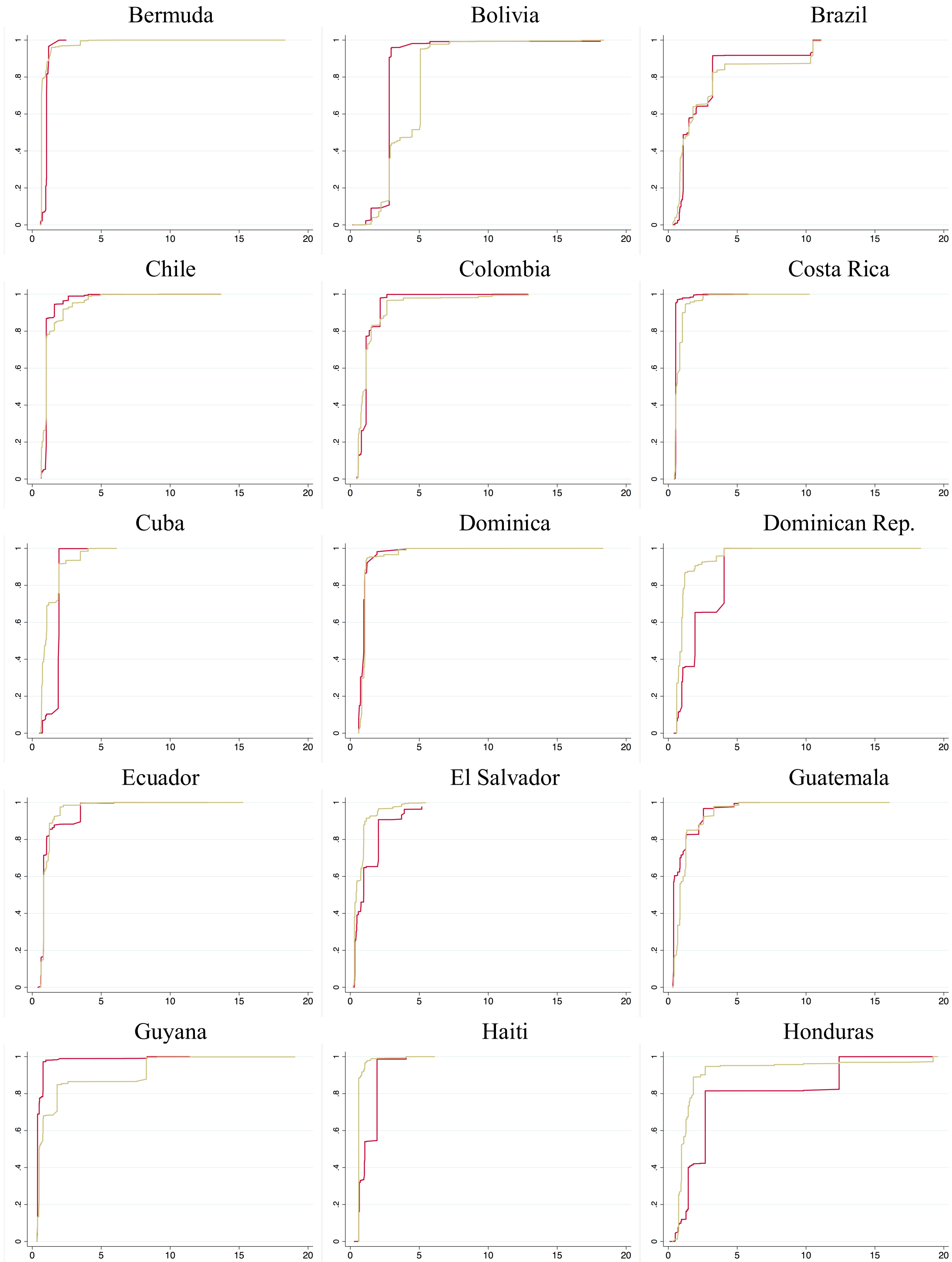
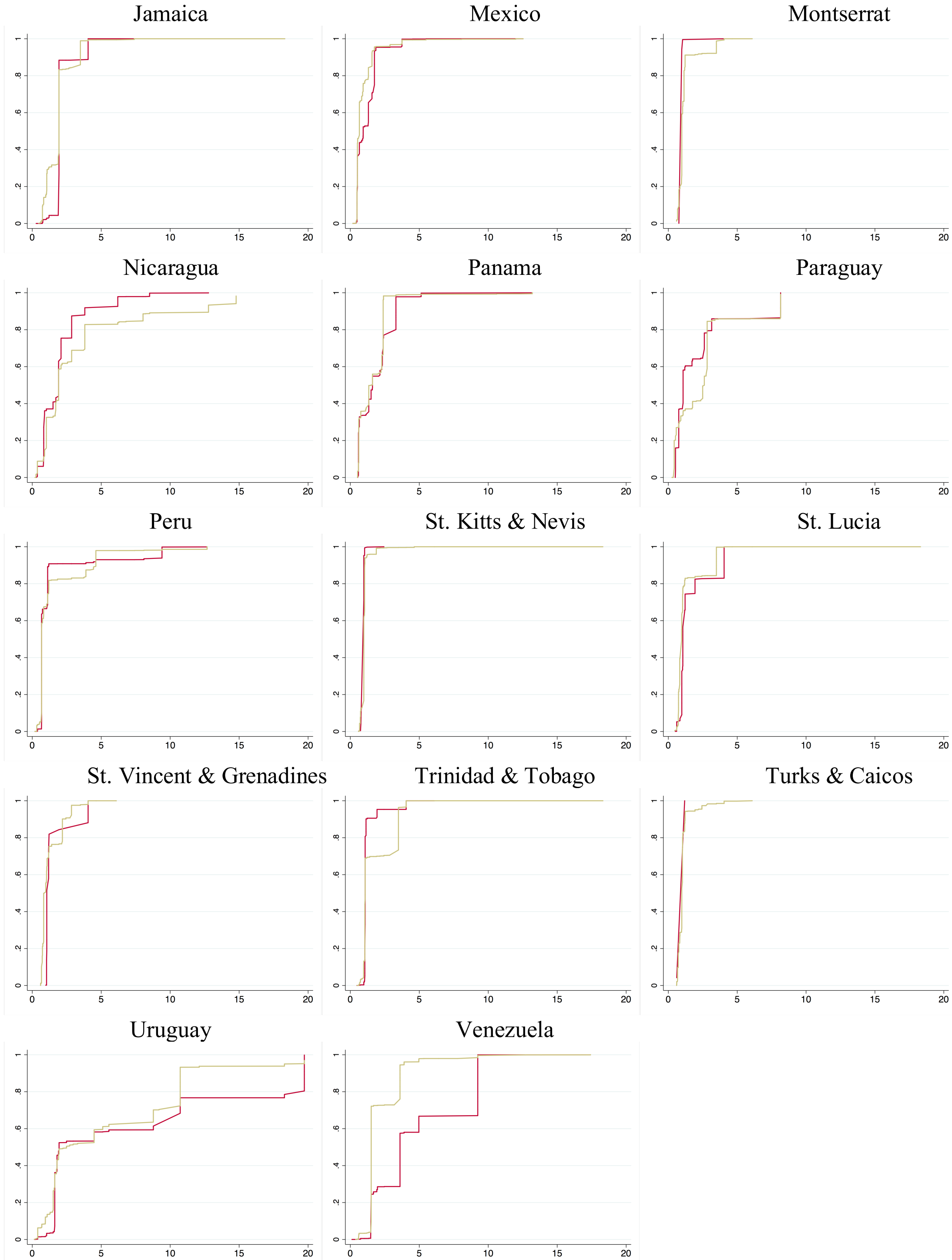


Figure A.3.3, continued: Cumulative distribution functions of export basket GHG intensity, by country



Tables A.3.1 and A.3.2 show two different statistical tests for the impact of China on the water intensity of LAC exports. First, a two-sample t-test is conduction to establish whether the means of the distributions shown in Figures A.3.1 through A.3.3 above are statistically significant. Second, regression analysis is conducted to distinguish the impact of China and the impact of time (in other words, the progression of the commodity boom in general) on the changing average GHG intensity of these exports over the decade studied here.

The regression analysis is repeated separately for each sub-region and country rather than incorporating them all into one analysis with interaction variables. This choice prevents the unnecessary introduction of additional heteroskedasticity. It takes the form

$$\left(\frac{GHG}{USD}\right)_i = \alpha + \delta_1 China_i + \beta_1 Year_i$$

Where:

- $\left(\frac{GHG}{USD}\right)$ represents the mean GHG intensity of a given export basket.
- *i* corresponds to each of 20 export baskets: to China and the rest of the world over a 10-year period from 2004 to 2013, weighted by their value in millions of real (2004) US dollars, so that years with higher exports are weighted more heavily.
- *Year* is the calendar year less 2008 (the midpoint of the sample)
- *China* is a binary variable (1= exports to China, 0 = exports to elsewhere).

Eleven countries and territories had insufficient exports to China during the study period to calculate country-level coefficients: Anguilla, Antigua and Barbuda, Aruba, Dominica, Montserrat, the Netherlands Antilles, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and the Turks and Caicos Islands. However, their exports are included in overall LAC and Caribbean exports in Table A.3.2.

Venezuela is an outlier, because not all of Venezuela's exports to China are registered as such in the UN Comtrade database. Venezuela's oil exports (which account for the overwhelming majority of the country's total exports) go to refineries in countries that are often not the final destination. Many of Venezuela's trading partners use their own refineries, but China's imports of Venezuelan oil go through intermediary countries. So, UN Comtrade reports only non-oil exports from Venezuelan to China, which is hardly an accurate representation of the whole. With this in mind, it is worth repeating the regressions for South America and for LAC overall without Venezuela. The relationship holds, because Venezuela accounts for only 6.8 percent of the region's total exports during the decade studied.

Finally, Tables A.3.1 and A.3.2 list the ratio of average emission intensities of exports to China compared to other exports. For example, the region-wide value of 1.16 indicates that overall, LAC exports to China cause 16 percent more net GHG emissions per dollar than other LAC exports.

Table A.3.1: Mean GHG intensities and regressions results for LAC region and sub-regions

	Average GHG Intensity of Exports					Two-sample t-test		Regression Results						
	To China		To R.o.W.		China/ R.o.W.[1]	T-statistic	N	China		Year		Intercept		R^2
	Mean	SE	Mean	SE				Coeff.	SE	Coeff.	SE	Coeff.	SE	
LAC Overall														
W/ Venezuela	1.96	0.00	1.69	0.00	1.16	58.2***	5,273,434	0.28***	0.05	0.00	0.00	1.69***	0.01	0.6893
W/O Venezuela	1.93	0.00	1.65	0.00	1.17	60.5***	4,912,485	0.28***	0.04	0.00	0.00	1.65***	0.01	0.7691
Sub-Regions														
Caribbean	2.26	0.03	1.30	0.00	1.74	29.8***	69,006	0.94***	0.18	-0.01	0.01	1.31***	0.03	0.6344
Mex., Cent. Amer.	1.03	0.00	0.96	0.00	1.08	15.4***	2,354,278	0.08	0.05	0.00*	0.00	0.96***	0.01	0.3597
South America	2.08	0.01	2.36	0.00	0.88	-51.8***	2,850,150	-0.29***	0.05	0.01	0.01	2.36***	0.02	0.6388
S. Amer. W/O Venez.	2.05	0.01	2.38	0.00	0.86	-61.2***	2,489,201	-0.35***	0.04	0.02***	0.00	2.37***	0.01	0.8605

[1] This column shows the ratio of average intensity of LAC-China exports to the average intensity of other LAC exports. A value greater than 1.0 indicates that exports to China are more GHG intensive than other exports, and a value less than 1.0 represents the opposite.

Table A.3.2: Mean GHG intensities and regressions results for LAC countries

	Average GHG Intensity of Exports					Two-sample t-test		Regression Results						
	To China		To R.o.W.		China/ R.o.W.[1]	T-statistic	N	China		Year		Intercept		R^2
	Mean	SE	Mean	SE				Coeff.	SE	Coeff.	SE	Coeff.	SE	
Argentina	2.08	0.02	2.99	0.01	0.69	-55.5***	403,735	-0.93***	0.11	-0.07***	0.01	3.04***	0.03	0.8720
Bahamas	2.78	0.26	1.46	0.01	1.90	5.0***	4,911	1.13*	0.42	0.03**	0.01	1.43***	0.03	0.5226
Barbados	1.29	0.10	1.52	0.02	0.84	-2.4*	3,064	-0.19	0.52	-0.01	0.02	1.53***	0.06	0.0253
Belize	1.57	0.23	0.69	0.01	2.29	3.8***	1,784	0.84*	0.30	0	0.01	0.69***	0.03	0.4285
Bermuda	1.05	0.03	0.85	0.01	1.24	5.7**	4,103	0.19	1.25	0	0.02	0.86***	0.05	0.0069
Bolivia	3.03	0.16	4.07	0.01	0.74	-6.6***	35,122	-0.91***	0.19	0.02*	0.01	4.04***	0.03	0.6183
Brazil	2.50	0.01	2.83	0.00	0.89	-39.5***	1,022,431	-0.41***	0.08	0.07***	0.01	2.8***	0.03	0.7969
Chile	1.14	0.00	1.26	0.00	0.90	-45.5***	342,229	-0.13***	0.01	0.01***	0.00	1.26***	0.00	0.9496
Colombia	1.23	0.01	1.38	0.00	0.90	-18.4***	225,467	-0.1	0.11	-0.03**	0.01	1.4***	0.02	0.4904
Costa Rica	0.57	0.00	0.80	0.00	0.71	-81.3***	75,141	-0.23***	0.04	0	0.00	0.8***	0.01	0.6746
Cuba	1.81	0.01	1.23	0.01	1.47	64.6***	21,034	0.59**	0.14	-0.02	0.02	1.24***	0.05	0.5114
Dominican Rep.	2.31	0.05	1.14	0.00	2.02	24.5***	49,671	1.18***	0.20	-0.02	0.01	1.15***	0.03	0.6831
Ecuador	1.17	0.03	1.04	0.00	1.13	5.0***	90,499	0.13*	0.06	0	0.00	1.04***	0.01	0.2480
El Salvador	1.11	0.14	0.73	0.01	1.52	2.7**	34,806	1.12	0.54	-0.01	0.01	0.74***	0.02	0.2820
Guatemala	0.92	0.06	1.19	0.00	0.78	-4.6***	47,570	-0.22	0.20	0	0.01	1.18***	0.02	0.0789
Guyana	0.47	0.02	1.88	0.40	0.25	-32.8***	4,782	-1.34***	0.19	0.05***	0.01	1.84***	0.03	0.8229
Haiti	1.34	0.10	0.68	0.00	1.98	6.8***	6,649	0.64***	0.08	0	0.00	0.69***	0.01	0.8061
Honduras	3.91	0.23	1.92	0.02	2.03	8.5***	23,946	1.96	1.43	0	0.06	1.93***	0.19	0.0989
Jamaica	2.20	0.04	1.91	0.01	1.15	7.9***	10,663	0.33*	0.15	0.02	0.01	1.91***	0.03	0.2790
Mexico	1.15	0.00	0.91	0.00	1.26	47.0***	2,100,911	0.25***	0.03	-0.01***	0.00	0.92***	0.00	0.8740
Nicaragua	2.00	0.17	3.60	0.04	0.56	-9.1***	13,462	-1.54	1.84	-0.17**	0.05	3.96***	0.16	0.4557
Panama	1.80	0.06	1.64	0.01	1.10	2.5*	56,658	0.17	0.22	0.07***	0.01	1.59***	0.02	0.7818
Paraguay	2.38	0.11	3.20	0.07	0.74	-6.1***	31,544	-0.81	0.84	-0.01	0.04	3.22***	0.13	0.0521
Peru	1.47	0.02	1.55	0.01	0.95	-5.0***	159,906	-0.13	0.10	0.08***	0.01	1.49***	0.04	0.7489
Trinidad, Tobago	1.25	0.03	1.75	0.00	0.71	-15.4***	91,941	-0.43	0.45	-0.04**	0.01	1.79***	0.03	0.4425
Uruguay	7.50	0.14	6.96	0.06	1.08	3.6***	39,867	0.69	0.45	-0.08	0.04	7.03***	0.12	0.2394
Venezuela	4.90	0.06	2.21	0.00	2.21	45.1***	360,949	2.61*	1.05	-0.07*	0.03	2.24***	0.09	0.4010

[1] This column shows the ratio of average intensity of LAC-China exports to the average intensity of other LAC exports. A value greater than 1.0 indicates that exports to China are more GHG intensive than other exports, and a value less than 1.0 represents the opposite.

Note on representation: Anguilla, Antigua and Barbuda, Aruba, Dominica, Montserrat, Netherlands Antilles, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and Turks and Caicos are omitted due to small sample sizes, but their exports are included in overall and Caribbean exports in Table A.3.2, above.

A.4 Statistical Analysis of Water Intensity Levels of Exports

Figure A.4.1 shows the cumulative distribution of exports from LAC to China and to the rest of the world, measured against the water intensity of each good and weighted by the real (2004) dollars of exports of each good. The results show that LAC exports to China fall roughly into two categories: about 60 percent have extremely low water intensity, and an additional share (over 20 percent) have intensity levels between 6 and 8 cubic meters per dollar. In contrast, over 80 percent of exports to the rest of the world have very low intensity.

Figure A.4.1: Cumulative distribution of exports across water intensity levels, by destination

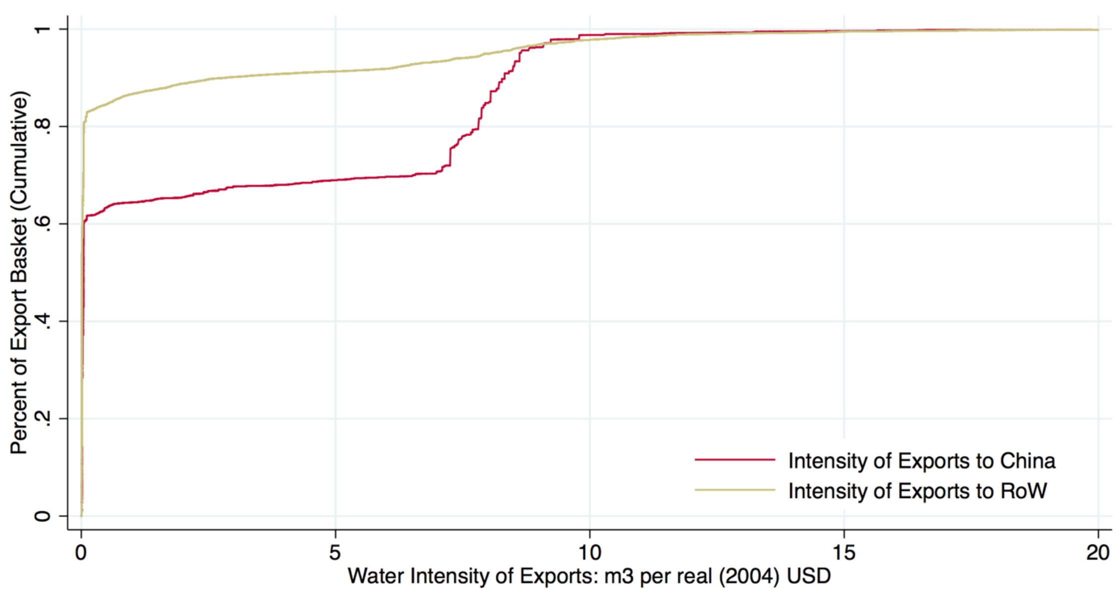
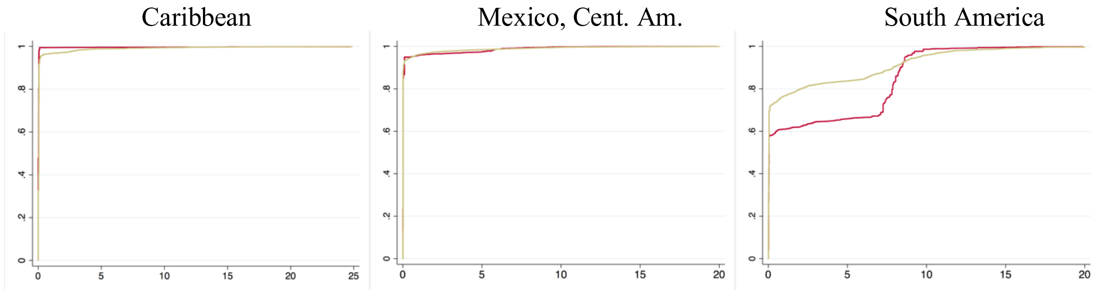


Figure A.4.2, disaggregated by sub-region, shows that the results for LAC overall are due primarily the experiences of South America.

Figure A.4.2: Cumulative distribution functions of export basket water intensity, by sub-region



Among countries (below) it is clear that exports to China are more water intense in Argentina, Brazil, Guatemala, and Uruguay, and *less* intense in several smaller countries.

Figure A.4.3: Cumulative distribution functions of export basket water intensity, by country

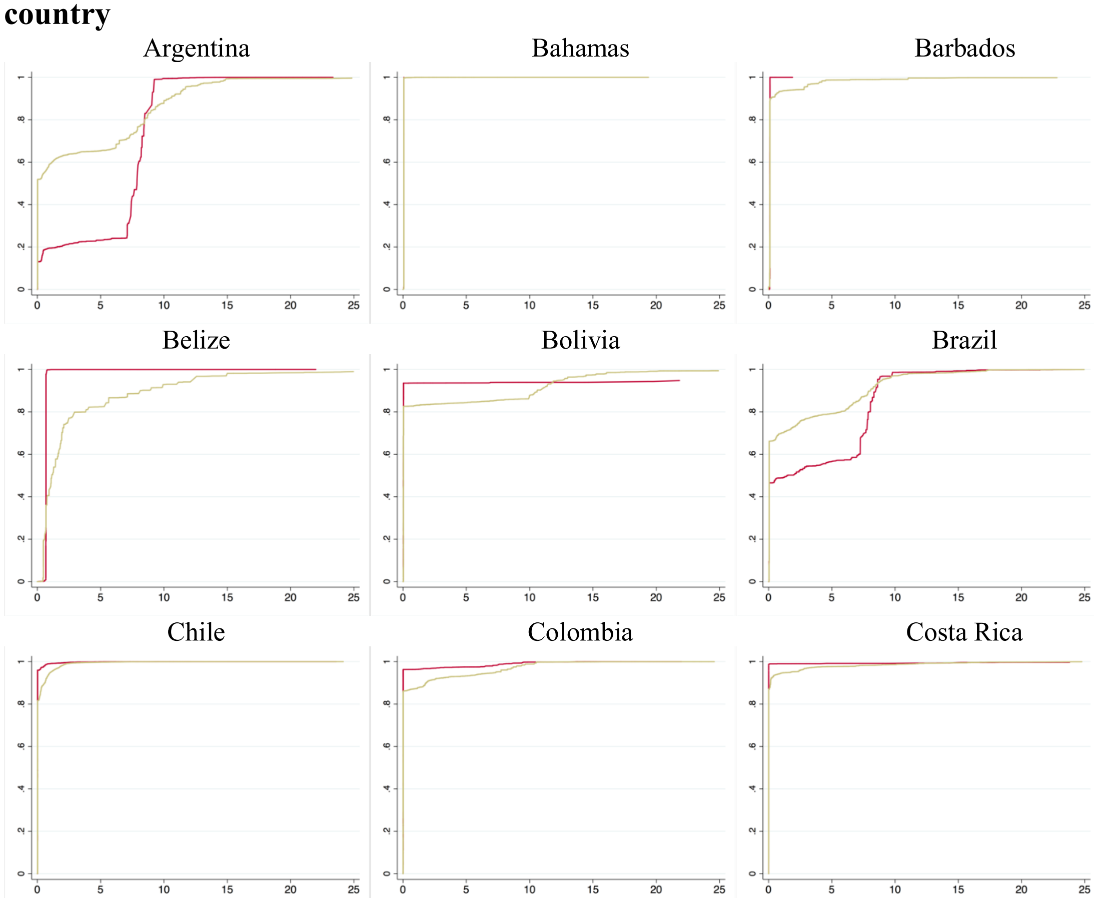


Figure A.4.3, continued: Cumulative distribution functions of export basket water intensity, by country

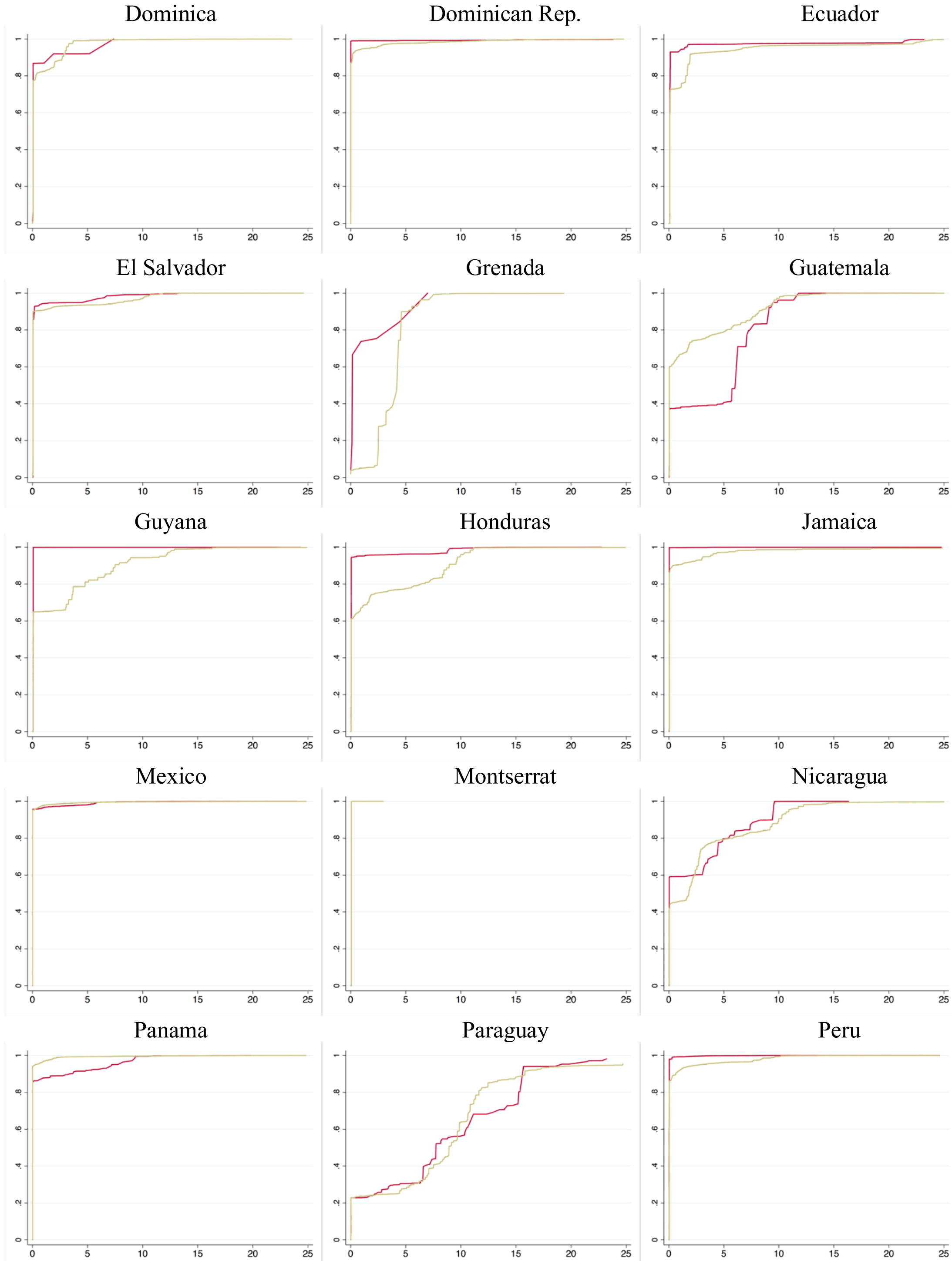
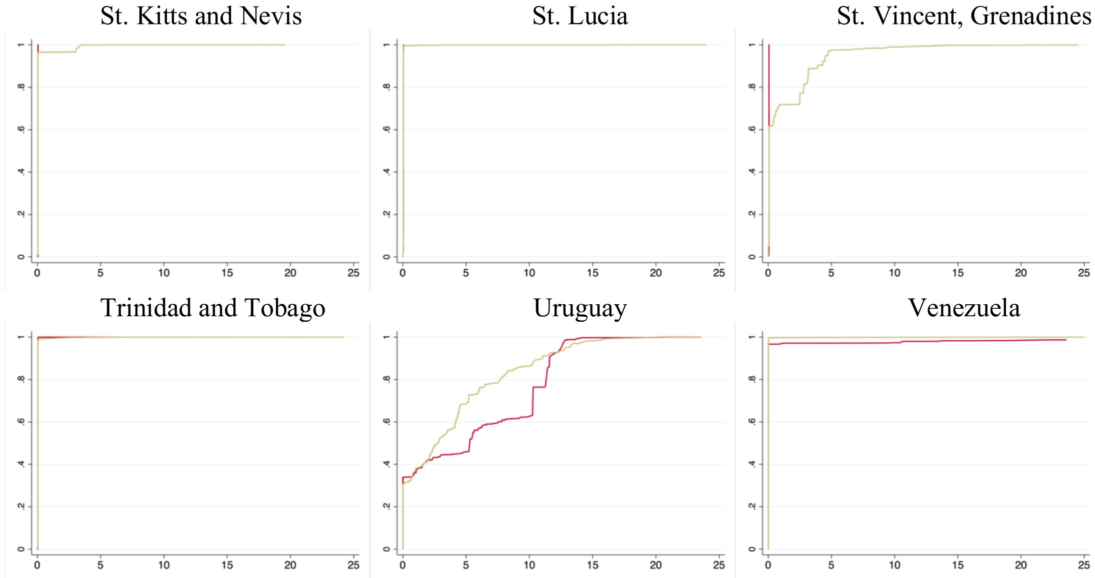


Figure A.4.3, continued: Cumulative distribution functions of export basket water intensity, by country



Tables A.4.1 and A.4.2 show two different statistical tests for the impact of China on the water intensity of LAC exports. First, a two-sample t-test is conduction to establish whether the means of the distributions shown in Figures A.4.1 through A.4.3 above are statistically significant. Second, regression analysis is conducted to distinguish the impact of China and the impact of time (in other words, the progression of the commodity boom in general) on the changing average water intensity of these exports over the decade studied here.

The regression analysis is repeated separately for each sub-region and country rather than incorporating them all into one analysis with interaction variables. This choice prevents the unnecessary introduction of additional heteroskedasticity. It takes the form

$$\left(\frac{H_2O}{USD}\right)_i = \alpha + \delta_1 China_i + \beta_1 Year_i$$

Where:

- $\left(\frac{H_2O}{USD}\right)$ represents the mean water intensity of a given export basket.

- *i* corresponds to each of 20 export baskets: to China and the rest of the world over a 10-year period from 2004 to 2013, weighted by their value in millions of real (2004) US dollars, so that years with higher exports are weighted more heavily.
- *Year* is the calendar year less 2008 (the midpoint of the sample)
- *China* is a binary variable (1= exports to China, 0 = exports to elsewhere).

Five countries and territories had insufficient exports to China during the study period to calculate country-level coefficients: Dominica, Montserrat, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines. However, their exports are included in overall LAC and Caribbean exports in Table A.4.2. In addition, Anguilla, Antigua and Barbuda, Bermuda, Cuba, Grenada, Haiti, and the Netherlands Antilles are omitted from the analysis entirely because water intensity estimates for their national production are unavailable.

As with Appendix A.3, the tables here show the LAC region and South America both with and without Venezuela in order to address this country's outlier status. Finally, Tables A.4.1 and A.4.2 list the ratio of average emission intensities of exports to China compared to other exports. For example, the region-wide value of 2.80 indicates that overall, LAC exports to China can be expected to use or contaminate 180 percent more net GHG emissions per dollar than other LAC exports.

Table A.4.1: Mean water intensities and regressions results for LAC region and sub-regions

	Average Water Intensity of Exports					Two-sample t-test		Regression Results						
	To China		To R.o.W.		China/	T-statistic	N	China		Year		Intercept		R^2
	Mean	SE	Mean	SE	R.o.W.			Coeff.	SE	Coeff.	SE	Coeff.	SE	
LAC Overall														
W/ Venezuela	2.70	0.01		0.97	2.80	225.1***	4,792,095	1.64***	0.07	0.00	0.01	0.94***	0.02	0.9622
W/o Venezuela	2.72	0.01		1.03	2.60	218.7***	4,513,788	1.60***	0.08	0.00	0.01	1.00***	0.02	0.0620
Sub-Regions														
Caribbean	0.05	0.02		0.23	0.20	-7.7***	117,296	-0.09	0.05	-0.01*	0.00	0.23***	0.01	0.3975
Mex., Cent. Amer.	0.25	0.01		0.24	1.03	0.9	2,234,613	0.01	0.14	-0.01	0.01	0.25***	0.02	0.0861
South America	2.96	0.01		1.74	1.71	143.7***	2,440,186	1.16***	0.09	0.01	0.01	1.65***	0.03	0.9036
S. Amer. W/o Venez.	2.98	0.01		1.98	1.50	115.8***	2,161,879	0.96***	0.10	0.01	0.01	1.87***	0.03	0.8562

Note on sample sizes and weights: For the two-sample t-test, the unit of analysis is millions of real (2004) dollars of exports during the decade studied here. The sample sizes are the corresponding number of millions of dollars of exports during that time. Since the two-sample test statistic eliminates any possibility that the differing means could be the result of chance, it is possible to conduct regression analysis on just the mean intensity level of the whole basket of exports from each reporter to China or to the rest of the world. For these regression functions, the sample size is 20 (two exports markets and 10 years). The regression analysis uses analytic weights of the dollar value of each year's exports (in millions), which allows years with more exports (in real terms) to be counted more heavily.

Note on country representation: Antigua and Barbuda, Bermuda, Cuba, Haiti, and the Netherlands Antilles are omitted from the analysis because water intensity estimates for their national production are unavailable.

Table A.4.2: Mean water intensities and regressions results, by countries

	Avg. Intensity of Exports					Two-sample t-test		Regression Results						
	To China		To R.o.W.		China/	T-statistic	N	China		Year		Intercept		R^2
	Mean	SE	Mean	SE	R.o.W.			Coeff.	SE	Coeff.	SE	Coeff.	SE	
Argentina	6.36	0.02	3.50	0.01	1.8	143.0***	379,925	2.88***	0.28	-0.06*	0.03	3.39***	0.09	0.8671
Bahamas	0.06	0.00	0.06	0.00	1.0	-0.9	3,442	0.01	0.01	0.00***	0.00	0.05***	0.00	0.7979
Barbados	0.11	0.00	0.50	0.06	0.2	-6.5***	2,079	-0.27	0.58	-0.02	0.02	0.41***	0.06	0.0804
Belize	0.68	0.00	2.71	0.11	0.3	-18.2***	1,594	-1.89	1.78	0.05	0.06	2.27***	0.17	0.0872
Bolivia	1.85	0.29	1.98	0.03	0.9	-0.6	36,542	0.01	0.39	-0.16***	0.02	2.18***	0.06	0.7942
Brazil	3.81	0.01	2.07	0.00	1.8	142.4***	1,003,350	1.66***	0.10	0.04**	0.01	2.01***	0.03	0.9522
Chile	0.05	0.00	0.18	0.00	0.3	-77.1***	292,376	-0.12***	0.01	0.01***	0.00	0.16***	0.00	0.9676
Colombia	0.23	0.02	0.69	0.01	0.3	-29.0***	196,367	-0.32**	0.10	-0.06***	0.01	0.72***	0.02	0.8670
Costa Rica	0.21	0.02	0.70	0.01	0.3	-25.0***	56,119	-0.44**	0.11	0.00	0.01	0.66***	0.02	0.4910
Dominican Republic	0.06	0.05	0.39	0.01	0.1	-7.2***	43,108	-0.15	0.13	0.01	0.01	0.35***	0.02	0.2231
Ecuador	0.63	0.10	1.42	0.02	0.4	-7.7***	69,790	-0.62**	0.19	0.02*	0.01	1.13***	0.02	0.5003
El Salvador	0.47	0.29	0.72	0.01	0.7	-1.7	30,874	-0.29	0.31	-0.01	0.00	0.68***	0.01	0.1832
Guatemala	5.07	0.24	2.12	0.02	2.4	10.7***	42,715	2.39*	1.02	-0.02	0.03	2.01***	0.09	0.2603
Guyana	0.07	0.00	2.38	0.06	0.0	-37.6***	4,126	-1.94*	0.73	-0.04	0.03	2.01***	0.10	0.3283
Honduras	0.30	0.09	2.26	0.03	0.1	-23.1***	20,969	-1.57	1.60	-0.10	0.07	2.22***	0.21	0.1710
Jamaica	0.03	0.00	0.63	0.03	0.0	-19.6***	9,216	-0.67***	0.14	-0.07***	0.01	0.56***	0.03	0.7652
Mexico	0.18	0.01	0.15	0.00	1.2	4.2***	2,024,608	0.04	0.15	-0.01	0.01	0.16***	0.02	0.1338
Nicaragua	2.55	0.46	3.03	0.05	0.8	-1.8	11,440	-0.39	2.58	-0.21**	0.07	3.03***	0.23	0.3621
Panama	0.84	0.18	0.14	0.01	5.9	3.8***	52,152	0.41	0.71	-0.02	0.03	0.15*	0.06	0.0360
Paraguay	9.08	0.34	8.71	0.09	1.0	0.7	28,485	-0.69	1.94	-0.61***	0.09	9.43***	0.29	0.7241
Peru	0.05	0.00	0.50	0.01	0.1	-63.2***	123,484	-0.43***	0.03	0.02***	0.00	0.44***	0.01	0.9401
Trinidad & Tobago	0.05	0.00	0.07	0.00	0.7	-15.0***	59,946	-0.01	0.01	0.00***	0.00	0.07***	0.00	0.8007
Uruguay	5.75	0.10	4.07	0.02	1.4	16.3***	35,713	1.24**	0.42	0.12**	0.04	3.55***	0.12	0.5387
Venezuela	0.83	0.13	0.03	0.00	25.6	6.1***	278,829	0.83**	0.25	0.00	0.01	0.03	0.02	0.3996

See the note on sample sizes and weights on Table A.3.2, above.

Note on country representation: Dominica, Montserrat, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines are omitted from this step due to small sample sizes, but their exports are included in the "Caribbean" category in Table A.3.1, above.

Anguilla, Antigua and Barbuda, Bermuda, Cuba, Grenada, Haiti, and the Netherlands Antilles are omitted from the analysis entirely because water intensity estimates for their national production are unavailable

APPENDIX B

ADDITIONAL INFORMATION FOR CHAPTER 2

B.1 Completed, International DFI-Financed Infrastructure Projects Included in This Analysis, and the Corresponding Site-Specific Radii used in Models 4-13

The following tables give a timeline of project approvals by country, bank, and type of project. These tables show the choice of each project's site-specific radius, used in Models 4 through 13. Where applicable, those choices entail tree cover change as a function of the radius chosen for measurement, and the resulting site-specific radius, defined as the x-intercept of the second derivative of these functions. In other cases, an explanation is provided for an alternate choice in site-specific radius.

Table B.1.1: Projects in Bolivia

Approval Year	Type	DFI(s)	Project Name	Tree Cover Change as a Function of Radius	Radius (km)
2002	Road	CAF/ IADB	Santa Cruz – Puerto Suárez	$y=0.0006x^3-0.0131x^2+0.0891x-0.4544$	7
		IBRD	La Paz – Oruro [1]	N/A (zero tree cover within 10km)	10
			Rio Seco – Huarina [1]	N/A (zero tree cover within 4km)	4
			Tiquina – Copacabana [1]	N/A (zero tree cover within 3km)	3
			Yacuiba – Boyuibe [1]	$y=0.0003x^3-0.006x^2+0.0484x-0.2821$	7
			Yamparáez – Sucre [1]	N/A (zero tree cover within 6km)	6
2004	Port	IFC	Puerto Aguirre	N/A (zero tree cover change nearby)	1
	Road	IADB	La Paz – Caranavi	$y=-0.00004x^3+0.0007x^2-0.0031x-0.0082$	6
2006	Road	CAF	Huachacalla – Pisiga	N/A (zero tree cover within 10km)	10
			Integración Sur, Phase 2	N/A (zero tree cover within 10km)	10
			Riberalta – Guayamerín	$y=-0.00006x^3+0.0002x^2+0.017x-0.3844$	1
			Uyuni – Potosi	N/A (zero tree cover within 10km)	10
		IADB	Quiquibe – Yucumo [2]	$y=0.0002x^3-0.0046x^2+0.0273x-0.1707$	8
			Yucumo – Rurrenbaque [2]	$y=0.0006x^3-0.0126x^2+0.1076x-0.6697$	7
2011	Road	CAF	La "Y" de Integración	N/A (zero tree cover within 10km)	10
			Uyuni – Cruce Condo K	N/A (zero tree cover within 10km)	10
2012	Road	CAF	Chacapuco – Ravelo	N/A (zero tree cover within 10km)	10
			Quillacollo – Suticollo	N/A (zero tree cover change within 10km)	10
			Uyuni – Tupiza	N/A (zero tree cover within 10km)	10

Notes:
[1] These roads were jointly financed through the "Road Rehabilitation and Maintenance" program.
[2] These roads were jointly financed through the "Santa Bárbara-Rurrenabaque Northern Corridor Highway Improvement" program.

Table B.1.2: Projects in Colombia

App. Year	Type	DFI(s)	Project Name	Tree Cover Change as a Function of Radius	Radius (km)
2005	Dam, w/ res.	IADB	Porce III	N/A (unrelated TC loss at 7km)	6
2006	Road	IADB	Andes – Jardin [3]	$y=-0.00006x^3+0.0005x^2+0.004x-0.0658$	3
			Angelópolis – Caldas [3]	$y=0.0002x^3-0.0054x^2+0.052x-0.2259$	9
			Bolombolo – Venecia [3]	N/A (zero tree cover change within 1km)	1
			Entrerrios – San Pedro [3]	$y=-0.0001x^3+0.0013x^2+0.0023x-0.0971$	4
			La Fabiana – Valparaiso [3]	$y=0.0001x^3-0.0029x^2+0.0204x-0.0583$	10
			Marinilla – Guatape [3]	$y=-0.0001x^3+0.0006x^2+0.0157x-0.1205$	2
			Montenegro – La Fabiana-El Líbano-Tamesis [3]	N/A (unrelated TC gain at 6km)	5
			Puerto Triunfo – Autopista [3]	N/A (unrelated TC loss at 7km)	6
			Titiribi – Albania [3]	N/A (unrelated TC loss at 4km)	3
2007	Port	IFC	Terminal Maritimo Muelles el Bosque S.A.	N/A (zero tree cover change within 2km)	2
	Road	CAF	Buga – Buenaventura	$y=-0.0001x^3+0.0031x^2-0.0201x+0.0097$	10
2009	Dam, w/ res.	CAF	Sogamoso	N/A (unrelated TC loss at 5km)	4
	Fossil fuel power	CAF/IFC	Termoflores	N/A (zero tree cover within 2km)	2
		CAF/IFC/IIC	Termo Rubiales	N/A (zero tree cover within 2km)	2
2010	Port	CAF/IFC	Puerto Santa Marta	N/A (zero tree cover within 2km)	2
		IFC/IIC	Puerto Buenaventura	N/A (zero tree cover change within 1km)	1
2011	Dam, RoR	IIC	Patico – La Cabrera	N/A (zero tree cover change within 2km)	2
	Port	CAF/IFC	Puerto Bahía	$y=-0.0025x^3+0.023x^2+0.0716x-0.6722$	3
2014	Dam, RoR	IIC	Los Molinos	N/A (zero tree cover change within 2km)	2

Notes:

[3] These roads were jointly financed through the "Roads for Integration and Social Equality" program.

Table B.1.3: Projects in Ecuador

App. Year	Type	Bank(s)	Project Name	Tree Cover Change as a Function of Radius	Radius (km)
2000	Dam, RoR	BNDES	San Francisco	$y=0.00005x^3-0.0009x^2+0.0055x-0.0105$	6
2004	Dam, RoR	IBRD	Abanico [4]	N/A (zero tree cover change within 2km)	2
			Sabanilla [4]	N/A (zero tree cover change within 2km)	2
2007	Dam, w/ res.	IADB	Baba	$y=-0.0016x^3+0.0308x^2-0.1851x+0.1812$	6
2010	Dam, RoR	CHEXIM	Coca-Codo Sinclair	$y=0.0001x^3-0.0024x^2+0.0129x-0.0242$	8
			Sopladora	N/A (zero tree cover within 6km)	6
2011	Fossil fuel power	CDB	Termoesmeraldas	N/A (zero tree cover change within 2km)	2
	Unconv. renewables	CDB	Villonaco Norte (wind)	N/A (zero tree cover change within 1km)	1
2012	Dam, RoR	BNDES	Manduriacu	$y=0.0037x^3-0.0721x^2+0.4322x-0.7892$	6
		CAF	San José de Minas	N/A (zero tree cover change within 1km)	1
		CAF/IFC	San Bartolo	N/A (zero tree cover change within 1km)	1
	Road	CAF	Ruta Viva	$y = 0.0002x^3 - 0.0019x^2 + 0.0025x - 0.0176$	3
2013	Dam, RoR	CDB	Minas San Francisco	N/A (zero tree cover change within 1km)	3
2014	Unconv. renewables	CAF	Gran Solar	$y=0.005x^3-0.1128x^2+0.8056x-1.8256$	8

Notes:

[4] These dams were jointly financed through the "SIBIMBE" program, with the Netherlands Clean Development Facility.

Table B.1.4: Projects in Peru

Year	Type	Bank(s)	Project Name	Tree Cover Change as a Function of Radius	Radius (km)
2003	Road	IADB/IFC	Red Vial 5 Toll Road Ancón – Pativilca	N/A (zero tree cover change within 10km)	10
2004	Dam, w/res.	IBRD	Cerro Mulato [5]	N/A (zero tree cover change within 3km)	3
			El Sauce [5]	N/A (unrelated tree cover loss at 2km)	1
			Moche I & II [5]	N/A (zero tree cover within 10km)	10
			Tanguche I & II [5]	N/A (zero tree cover within 10km)	10
			Tunnel Graton [5]	N/A (zero tree cover within 10km)	10
2005	Road	CAF	Corredor Vial Interoceánico Sur, Rte. 2 [6]	$y=0.0001x^3-0.0022x^2+0.0123x-0.0318$	7
			Corredor Vial Interoceánico Sur, Rte. 3 [6]	$y=0.0006x^3-0.0124x^2+0.0955x-0.437$	7
			Corredor Vial Interoceánico Sur, Rte. 4 [6]	$y=0.00003x^3-0.0009x^2+0.0091x-0.0684$	10
2006	Road	IADB	Canta – Huayllay	N/A (zero tree cover within 10km)	10
			Sullana – El Alamor	$y=0.0004x^3-0.0054x^2+0.0348x+0.0978$	5
2009	Biofuel	IADB	Maple, Inc. sugar ethanol project	N/A (zero tree cover within 7km)	7
	Road	CAF	Red Vial4: Pativilca – Casma – Chimbote – Trujillo	N/A (zero tree cover within 10km)	10
2010	Dam, w/ res.	IFC	Hydro Cheves	N/A (zero tree cover within 8km)	8
	Road	CAF	Camaná – Dv. Quilca – Matarani – Ilo – Tacna [7]	N/A (zero tree cover within 10km)	10
			Casma – Yaután – Huaraz [7]	N/A (zero tree cover within 2km)	2
			Churín – Oyón [7]	N/A (zero tree cover within 10km)	10
			Lunahuaná – DV. Yauyos-Chupaca [7]	N/A (zero tree cover within 1km)	1
			Reposo – Saramiriza [7]	$y=0.00003x^3-0.0012x^2+0.015x-0.1027$	13
			Tingo María – Aguaytía [7]	y=-0.00004x3+0.0004x2+0.001x-0.1077	3
			Aguaytía – Pucallpa [7]	y=-0.0003x3+0.0087x2-0.0796x-0.356	10
			Tocache – DV. Tocache [7]	$y=-0.0002x^3+0.0045x^2-0.0212x-0.2788$	8
			Trujillo-Sirán-Huamachuco [7]	$y=-0.0003x^3+0.0053x^2-0.0396x+0.0699$	6
		CAF/ IBRD	Chongoyape – Cochabamba – Cajamarca [8]	$y=-0.0004x^3+0.008x^2-0.0494x+0.0583$	7
			Ollantaytambo – Quillabamba [8]	$y=-0.00001x^3+0.0001x^2-0.0004x-0.0006$	3
			Lima – Canta [8]	N/A (zero tree cover within 10km)	10
2011	Dam, RoR	CAF	Las Pizarras	N/A (zero tree cover within 11km)	1
2012	Dam, RoR	CAF	Canchayllo	N/A (zero tree cover within 10km)	10
2013	Port	IFC	Callao Muelle Norte	N/A (zero tree cover within 10km)	10
2014	Unconv. renewables	CAF/ IADB	Marcona/Tres Hermanas (wind)	N/A (zero tree cover within 10km)	10

Notes: [5] These dams were jointly financed through the "Poechos" program.
[6] These dams were jointly financed.
[7] These roads were jointly financed through the "Infraestructura Vial de Perú" program.
[8] These roads were jointly financed through the IBRD's "Peru Safe and Sustainable Transport" program *and* CAF's "Infraestructura Vial de Perú" program.

B.2 Methodology: Environmental Performance Index

EPI scores used here are derived from the Environmental Performance Index project managed by Yale University and the Columbia University Earth Institute, with a few adjustments as noted below:

1. As EPI methodology changes over time, in order to calculated scores that are comparable across years, scores are normalized across countries for each year. Two versions of these scores are available: one series from 2000 to 2010 (Yale and CIESIN, 2012), and another from 2007 to 2015 (Hsu, 2016). For the years 2007 through 2010, averages are taken for each country across the two indices, and those results are then normalized.
2. For multilateral development banks, weighted averages are calculated using countries' representation on bank boards for each year.

BIBLIOGRAPHY

"Agunida v. Texaco, Inc., 303 F. 3d 470, 473 (2nd Cir. 2002)." 2002. *Leagle.* https://www.leagle.com/decision/2002773303f3d4701734.

"Ex Trabajadores de CONAZUL Nunca Fueron Parte de Andes Petroleum, Afirman sus Autoridades." 2009. *Ecuador Inmediato* January 26, 2009. http://www.ecuadorinmediato.com/index.php?module=Noticias&func=news_user_view&id=96467&umt=ex_trabajadores_conazul_nunca_fueron_parte_andes_petroleum_afirman_autoridades.

"Fausto Ortiz Expuso Alternativas Económicas Para no Explotar el ITT." 2013. Ecuavisa, 28 August 2013. http://www.ecuavisa.com/articulo/noticias/contacto-directo/39408-fausto-ortiz-expuso-alternativas-economicas-no-explotar-itt.

"Indians Sue Texaco." 1993. Associated Press, November 4, 1993. Accessed 15 March 2018 from https://news.google.com/newspapers?id=NqxdAAAAIBAJ&sjid=el0NAAAAIBAJ&pg=5128,400486&dq=cristobal+bonifaz&hl=en.

"Presidente Destaca Importancia Estratégica de Relaciones con China." 2011. *El Telégrafo,* 6 July. https://www.eltelegrafo.com.ec/noticias/informacion-general/1/correa-destaca-importancia-estrategica-de-relaciones-con-china.

ADB, IADB, and ADBI (Asian Development Bank, Inter-American Development Bank, and Asian Development Bank Institute). 2012. *Shaping the Future of the Asia and the Pacific–Latin America and the Caribbean Relationship*. Manila: Asian Development Bank. http://hdl.handle.net/11540/165.

Aiyar, Shekar, Romain Duval, Damien Puy, Yiqun Wu, and Longmei Zhang. 2013. "Growth Slowdowns and the Middle-Income Trap." Washington: International Monetary Fund Working Paper. https://www.imf.org/~/media/Websites/IMF/imported-full-text-pdf/external/pubs/ft/wp/2013/_wp1371.ashx.

Aizawa, Motoko and Chaofei Yang. 2010. "Green Credit, Green Stimulus, or Green Revolution?" *The Journal of Environment and Development* 19, no. 2 (June): 119-144. https://doi.org/10.1177/1070496510371192.

Álvarez, Yomar. 2013. "Una Propuesta Desde el Ecologismo Para Proteger a Una Parte del Parque Nacional Yasuní" in *Yasuní Zona de Sacrificio: Análisis de la Iniciativa ITT y los Derechos Colectivos Indígenas,* Adriana Chamorro, Yomar Álvarez, Juan Carlos Franco, Rodrigo López, and María José Narváez, Eds. Quito: FLACSO.

Amsden, Alice. 2001. *The Rise of the Rest: Challenges to the West from Late-Industrializing Economics.* Oxford University Press.

Anguelovski, Isabelle and Joan Martínez Alier. 2014. "The 'Environmentalism of the Poor' revisited: Territory and Place in Disconnected Glocal Struggles."

Ecological Economics 102 (June): 167-176. https://doi.org/10.1016/j.ecolecon.2014.04.005.

Anonymous Representative of the Ministerio de Coordinación de los Sectores Estratégicos. 2015. Personal interview. March 5, 2015.

Antweiler, Werner, Brian Copeland, and Scott Taylor. 2001. "Is Free Trade Good for the Environment?" *American Economic Review* 91, no. 4 (September): 877-908. https://dx.doi.org/10.1257/aer.91.4.877.

Araujo, Alberto. 2016. "USD 47 de Tarifa en Dos Bloques del Suroriente." *El Comercio,* 26 January. http://www.elcomercio.com/actualidad/tarifa-bloques-suroriente-contrato-petroleo.html.

ARCH (Agencia de Regulación y Control Hidrocarburífero). 2017. "Boletín Estadística 2016." Quito: Government of Ecuador. http://www.controlhidrocarburos.gob.ec/wp-content/uploads/boletin-estadistico/ESTADÍSTICAS-ARCH-2015_2016-07-15_Para-publicar.pdf.

ARCH (Agencia de Regulación y Control Hidrocarburífuro). 2011-2013. "Producción Nacional de Petróleo Fiscalizado: Reportes Históricos." http://www.arch.gob.ec/index.php/descargas/produccion-nacional-petroleo-fiscalizado.html.

Arezki, Rabah, Kaddour Hadri, Prakash Loungani, and Yao Rau. 2013. "Testing the Prebisch-Singer Hypothesis since 1650: Evidence from Panel Techniques that Allow for Multiple Breaks." Washington: IMF Working Paper. https://www.imf.org/external/pubs/ft/wp/2013/wp13180.pdf.

Asamblea Constituyente de Bolivia. 2009. "Nueva Constitución Política del Estado." http://www.mindef.gob.bo/mindef/sites/default/files/nueva_cpe_abi.pdf.

Asamblea Nacional Constituyente. 1991. "Constitución Política de Colombia." *Gazeta Constitucional* 114 (July 4). http://www.corteconstitucional.gov.co/inicio/Constitucion%20politica%20de%20Colombia.pdf.

Asamblea Nacional del Ecuador. 2008. "Constitución de la Repúbica del Ecaudor." http://www.asambleanacional.gob.ec/sites/default/files/documents/old/constitucion_de_bolsillo.pdf.

Asamblea Nacional del Ecuador. 2010a. "Ley Orgánica de Participación Ciudadana." Registro Oficial Suplemento 175, 20 Apr. 2010. *Organization of American States*. http://www.oas.org/juridico/PDFs/mesicic4_ecu_org6.pdf.

Asamblea Nacional del Ecuador. 2010b. "Ley Reformatoria a la Ley de Hidrocarburos y a la Ley de Régimen Tributario Interno" *Registro Oficial No. 244 – Martes 27 de Julio 2010 Suplemento*. http://www4.eppetroecuador.ec/lotaip/pdfs/vigente/Ley_Reformatoria_Hidrocarburos.pdf

Association of Sápara Women. 2016. "Statement of the Sápara Women's Association on Oil Exploration in Their Territory." http://amazonwatch.org/news/2016/0209-statement-of-the-sapara-womens-association-on-oil-exploration-in-their-territory.

Astudillo, Miguel, Gunnar Thalwitz, and Fritz Vollrath. 2014. "Life Cycle Assessment of Indian Silk." *Journal of Cleaner Production* 81 (15 October): 158-167. https://doi.org/10.1016/j.jclepro.2014.06.007.

Baker, Shalanda. 2013. "Why The IFC's Free, Prior, and Informed Consent Policy Does Not Matter (Yet) to Indigenous Communities Affected by Development Projects." *Wisconsin International Law Journal* 30, no. 3: 669-705. https://hosted.law.wisc.edu/wordpress/wilj/files/2014/04/Baker_print.pdf.

Ballón, Eduardo and Raúl Molina. 2017. "Minería y Marcos Institucionales en la Región Andina: El Superciclo y su Legado, o las Difíciles Relaciones entre Políticas de Promoción de la Inversión Minero-Hidrocarburífera y las Reformas Institucionales." Lima: Natural Resource Governance Initiative. https://resourcegovernance.org/sites/default/files/documents/giz-reporte-version-10.pdf.

Baluarte, David. 2004. "Balancing Indigenous Rights and a State's Right to Develop in Latin America: The Inter-American Rights Regime and ILO Convention 169." *Sustainable Development Law and Policy* 4, no. 2 (Summer): 66-74. http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1373&context=sdlp.

Barbier, Edward B. 2004. "Agricultural Expansion, Resource Booms and Growth in Latin America: Implications for Long-run Economic Development." *World Development* 32, no. 1 (January): 137-157. https://doi.org/10.1016/j.worlddev.2003.07.005.

Bass, Margot S., Matt Finer, Clinton N. Jenkins, Holger Kreft, Diego F. Cisnero-Heredia, Shawn F. McCracken, Nigel C. A. Pitman, Peter H. English, Kelly Swing, Gorky Villa, Anthony Di Fiore, Christian C. Voigt, and Thomas H. Kunz. 2010. "Global Conservation Significance of Ecuador's Yasuní National Park." PLoS ONE 5, no. 1: e8767. https://doi.org/10.1371/journal.pone.0008767.

Baumann, Renato. 2010. "Setor Externo Brasileiro no Início do Século XXI." *Revista Brasileira de Política Internacional* 53. http://dx.doi.org/10.1590/S0034-73292010000300003.

BCE (Banco Central del Ecuador). 2014. "Informe Estadístico Mensual." Quito: Finance Ministry. https://contenido.bce.fin.ec/home1/estadisticas/bolmensual/IEMensual.jsp.

Bebbington, Anthony and Jeffrey Bury, Eds. 2013. *Subterranean Struggles: New Dynamics of Mining, Oil, and Gas in Latin America.* University of Texas Press.

Bedón Garzón, René Patricio. 2017. "Aplicación de los Derechos de la Naturaleza en Ecuador." *Capa* 14, no. 28. DOI: http://dx.doi.org/10.18623/rvd.v14i28.1038.

Benítez, Jeeyla 2014. "Deuda: En 2013 China era Financista, Ahora es Cobrador," *Hoy*, June 22. http://www.hoy.com.ec/noticias-ecuador/deuda-en-2013-china-era-financista-ahora-es-cobrador-608792.html.

Bennear, Lori S. and Sheila M. Olmstead. 2008. "The Impacts of the "Right to Know:" Information Disclosure and the Violation of Drinking Water Standards." *Journal of Environmental Economics and Management* 56, 117-130.

Bértolo, Luis and José Antonio Ocampo 2012. *The Economic Development of Latin America Since Independence.* Oxford, UK: Oxford University Press.

Bhagwati, Jagdish. 1958. "Immiserizing Growth: A Geometrical Note." *Review of Economic Studies* 25, no. 3 (June): 201-2015. https://doi.org/10.2307/2295990.

Biewald, Anne, Susanne Rolinski, Hermann Lotze-Campen, Christoph Schmitz, and Jan Philipp Dietrich. 2014. "Valuing the impact of trade on local blue water." *Ecological Economics* 101 (May): 43-53. https://doi.org/10.1016/j.ecolecon.2014.02.003.

Birdsall, Nancy and David Wheeler. 1993. "Trade Policy and Industrial Pollution in Latin America: Where are the Pollution Havens?" *Journal of Environment & Development* 2, no. 1 (Winter): 137-149. https://doi.org/10.1177/107049659300200107.

Blanchard, Olivier and Julien Acalin. 2016. "What Does Measured FDI Actually Measure?" Washington, DC: Peterson Institute for International Economics Policy Brief. https://piie.com/publications/policy-briefs/what-does-measured-fdi-actually-measure.

Blanton, Thomas. 2007. "The Struggle for Openness in International Financial Institutions." *The Right to Know*, Ann Florina, Eds. New York: Columbia University Press.

Blattman, Christopher, Jason Hwang, and Jeffrey G. Williamson. 2007. "Winners and Losers in the Commodity Lottery: The Impact of Terms of Trade Growth and Volatility in the Periphery 1870–1939." *Journal of Development Economics* 82 no. 1 (January): 156-179. https://doi.org/10.1016/j.jdeveco.2005.09.003.

BNF (Banco Nacional de Fomento). 2000-2012. "Estadística." Online database, consulted March 15, 2018. https://www.bnf.fin.ec/index.php?option=com_joomdoc&view=documents&path=estadisticas&Itemid=56&lang=es.

Bonilla, Omar. 2010. "The Manta–Manaos Project: Nature, Capital and Plunder," in *The CEECEC Handbook*: *Ecological Economics from the Bottom-Up*, vol. 2, (2010), pp. 7-22. http://www.ceecec.net/wp-content/uploads/2010/11/THE-CEECEC-HANDBOOK.pdf.

Bradlow, Daniel. 2005. "Private Complainants and International Organizations: A Comparative Study of the Independent Inspection Mechanisms in International Financial Institutions." *Georgetown Journal of International Law* 36 (Winter): 403-494.

Braütigam, Deborah and Kevin Gallagher. 2014. "Bartering Globalization: China's Commodity-backed Finance in Africa and Latin America," *Global Policy* 5, no. 3 (September): 346-352. https://doi.org/10.1111/1758-5899.12138.

Brooke, James. 1994. "Pollution of Water Tied to Oil in Ecuador." *New York Times,* 22 March. https://www.nytimes.com/1994/03/22/science/pollution-of-water-tied-to-oil-in-ecuador.html.

Brown, Marie, Bruce Jenkins, Patricia Leon, and Aaron Seyedin. 2013. "Global Review of Grievance Redress Mechanisms in World Bank Projects." Washington, DC: World Bank Group. https://openknowledge.worldbank.org/bitstream/handle/10986/20117/903880WP0Box380edressMechanismsinWB.pdf?sequence=1&isAllowed=y.

Bruner, Raisa. 2017. "Here's a Photo of Engaged Citizen Leo DiCaprio Making a Statement at the Climate March." *Time,* May 1, 2017. http://time.com/4761810/leo-dicaprio-climate-march/.

Buchanan, Graeme M., Bradley C. Parks, Paul F. Donald, Brian F. O'Donnell, Daniela Runfola, John P. Swaddle, Łucasz Tracewski, and Stuart H. M. Butchart. 2016. "The Impacts of World Bank Development Projects on Sites of High Biodiversity Importance." Williamsburg, VA: College of William and Mary AidData. http://docs.aiddata.org/ad4/files/wps20_world_bank_biodiversity_0.pdf.

Buckley, Peter J., L. Jeremy Clegg, Adam R. Cross, Xin Liu, Hinrickh Voss, and Ping Zheng. 2007. "The Determinants of Chinese Outward Foreign Direct Investment." *Journal of International Business Studies* 38, no. 4 (July): 499-518. https://doi.org/10.1057/palgrave.jibs.8400277.

Buiter, Willem H. and Douglas D. Purvis. 1980. "Oil, Disinflation, and Export Competitiveness: A Model of the "Dutch Disease." Cambridge: NBER Working Paper. http://www.nber.org/papers/w0592.pdf.

Bunker, Stephen G. 1985. *Underdeveloping the Amazon: Extraction, Unequal Exchange, and the Failure of the Modern State.* University of Chicago Press.

Buntaine, Mark T. 2016. *Giving Aid Effectively: The Politics of Environmental Performance and Selectivity at Multilateral Development Banks.* New York: Oxford University Press.

Cadena, Andrés, Jaana Remes, Nicolás Grosman, and André de Oliveira. 2017. “Where will Latin America’s Growth Come From?” New York: McKinsey and Company Discussion Paper, (April). https://www.mckinsey.com/~/media/mckinsey/global%20themes/employment%20and%20growth/how%20to%20counter%20three%20threats%20to%20growth%20in%20latin%20america/mgi-discussion-paper-where-will-latin-americas-growth-come-from-april-2017.ashx.

CAF (Development Bank of Latin America). 2010. “CAF’s Environmental Strategy.” http://publicaciones.caf.com/media/1407/estrategia_ambiental_eng.pdf.

CAF (Development Bank of Latin America). 2015. “Environmental and Social Safeguards for CAF/GEF Projects.” https://www.caf.com/media/2759391/d0-7_s_e_safeguards_manual_to_caf-gef_projects_may_2015_28.pdf.

CAF (Development Bank of Latin America). 2016. “Salvaguardas Ambientales y Sociales.” https://www.caf.com/media/7834014/salvaguardas%20ambientales%20y%20sociales.pdf

CAIC (Comisión para la Auditoría Integral del Crédito Público). 2008. *Final Report of the Integral Auditing of the Ecuadorian Debt: Executive Summary.* Quito: Ministry of Economy and Finance. http://www.auditoriadeuda.org.ec/images/stories/documentos/Libro_CAIC_English.pdf.zip.

Campos, Nauro F. and Jeffrey B. 1999. “Development Performance and the Institutions of Governance: Evidence from East Asia and Latin America.” *World Development* 27, no. 3 (March): 439-452. https://doi.org/10.1016/S0305-750X(98)00149-1.

Cariño, Joji. 2005. “Indigenous Peoples' Right to Free, Prior, Informed Consent: Reflections on Concepts and Practice.” *Arizona Journal of International and Comparative Law* 22:1, 19-39. http://arizonajournal.org/wp-content/uploads/2015/11/Carino-Formatted.pdf.

Carrera, Paola. 2014. Personal interview, July 25.

Carruthers, David V. 2008. “Where Local Meets Global: Environmental Justice on the US-Mexico Border.” in *Environmental Justice in Latin America: Problems, Promise, and Practice,* David V. Carruthers, Ed. Cambridge: MIT Press.

Castillo, M., J. Félix, C. Mazabanda, M. Melo, M. Moreno de los Ríos, R. Narváez, B. Páez, and M. Ushigua. 2016. *La Cultura Sápara en Peligro: ¿El Sueño es Posible? La Lucha de un Pueblo por su Supervivencia Frente a la Explotación Petrolera*. Quito: Terra Mater, la Nación Sapara del Ecuador and NAKU.

Cattaneo, Andrea. 2001. “Deforestation in the Brazilian Amazon: Comparing the Impacts of Macroeconomic Shocks, Land Tenure, and Technological Change.” *Land Economics* 77, no. 2 (May): 219-240. https://dx.doi.org/10.2307/3147091.

CBRC (China Banking Regulatory Commission). 2012. "Green Credit Guidelines." http://www.cbrc.gov.cn/chinese/files/2012/E9F158AD3884481DBE005DFBF0D99C45.doc.

Chen, Gang, Ryan P. Powers, Luis M. T. de Carvalho, and Brice Mora. 2015. "Spatiotemporal Patterns of Tropical Deforestation and Forest Degradation in Response to the Operation of the Tucuruí Hydroelectric Dam in the Amazon Basin." *Applied Geography* 63 (September): 1-8. https://doi.org/10.1016/j.apgeog.2015.06.001.

Chen, Zach. 2014. Personal interview, July 24.

CHEXIM (Export-Import Bank of China). 2016. "White Paper on Green Finance, The Export-Import Bank of China." http://cms.eximbank.gov.cn/upload/accessory/20172/20172201624516937087.pdf.

Chi, Zhang. 2016. *The Domestic Dynamics of China's Energy Diplomacy*. Singapore: World Scientific Publishing.

CLACSO (Consejo Latinoamericano de Ciencias Sociales). 2000-2012. "Observatorio Social de América Latina: Cronologías." http://www.clacso.org.ar/institucional/1h.php.

CNRA (California Natural Resources Agency). (No Date). CEQA: The California Environmental Quality Act. Website, accessed 15 March 2018. http://resources.ca.gov/ceqa/.

Code of Federal Regulations. 2011. "Part 1021 – National Environmental Protection Act Implementing Procedures, Chapter X - Department of Energy (General Provisions). Website, accessed 15 March 2018. https://www.gpo.gov/fdsys/pkg/CFR-2011-title10-vol4/xml/CFR-2011-title10-vol4-part1021.xml.

Cole, Matthew. 2004. "Trade, the Pollution Haven Hypothesis and the Environmental Kuznets Curve: Examining the Linkages." *Ecological Economics* 48, no. 1 (January): 71-81. https://doi.org/10.1016/j.ecolecon.2003.09.007.

CONAIE and CONFENIAE (Confederación de Nacionalidades Indígenas del Ecuador and Confederación de las Nacionalidades Indígenas de la Amazonía Ecuatoriana). 2013. "CONAIE Y CONFENIAE Advierten a las Empresas Petroleras que no Participen en la Ronda Suroriente." Press release, 14 July. https://issuu.com/impactos_en_amazonia/docs/comunicado_confeniae

Congreso de la República. 2011. "Ley del Derecho a la Consulta Previa a los Pueblos Indígenas u Originarios, Reconocido en el Convenio 169 de la Organización Internacional del Trabajo (OIT)." *El Peruano.* http://www.ilo.org/dyn/natlex/docs/ELECTRONIC/88881/101786/F114786124/PER88881.pdf.

Congreso Nacional. 2005. "Código de Trabajo, Codificación 2005-2017." Quito. http://www.trabajo.gob.ec/wp-content/uploads/downloads/2012/11/Código-de-Tabajo-PDF.pdf.

Conselho Federal de Administração. 2013. "Plano Brasil de Infraestrutura Logística." http://www.cfa.org.br/servicos/publicacoes/planobrasil_web1.pdf.

Cook, Maria Lorena and Joseph C. Bazler. 2013. "Bringing Unions Back In: Labour and Left Governments in Latin America." Ithaca: Cornell University ILR School Working Paper. https://digitalcommons.ilr.cornell.edu/workingpapers/166/.

Cordonier Segger, Marie-Claire and H.E. Judge C. G. Weeramantry, Eds. 2017. *Sustainable Development Principles in the Decisions of International Courts and Tribunals*. New York: Routledge.

Correa, Rafael. 2008. "Decreto Ejecutivo 1121: Reglamento a la Supresión de Tercerización e Intermediación Laboral." http://www.trabajo.gob.ec/wp-content/uploads/2016/10/REGLAMENTO-A-LA-SUPRESION-DE-TERCERIZACION-E-INTERMEDIACION-LABORAL.pdf.

Correa, Rafael. 2012. "Decreto Ejecutivio 1247." http://www.hidrocarburos.gob.ec/wp-content/uploads/downloads/2012/08/PDF-DECRETO_1247-19-JUL-2012.pdf.

Critical Ecosystem Partnership Fund. 2001. "The Southern Region of the Mesoamerican Biodiversity Hotspot: Nicaragua, Costa Rica, Panama." http://www.cepf.net/Documents/final.mesoamerica.southernmesoamerica.ep.pdf.

Cuddington, John T. 1992. "Long-Run Trends in 26 Primary Commodity Prices: A Disaggregated Look at the Prebisch-Singer Hypothesis." *Journal of Development Economics* 39, no. 2 (October): 207-227. https://doi.org/10.1016/0304-3878(92)90037-A.

Daly, Erin. 2012. "The Ecuadorian Exemplar: The First Ever Vindications of Constitutional Rights of Nature." *Review of European Community & International Environmental Law* 21, no. 1 (April): 63-66. https://doi.org/10.1111/j.1467-9388.2012.00744.x.

Dammert Bello, Juan Luis. 2015. *Hacia Una Ecología Política de la Palma Aceteira en el Perú.* Lima: Oxfam.

Dammert Bello, Juan Luis. 2018, Forthcoming. "Salvaguardas Ambientales y Sociales en el Financiamiento de Proyectos de Infraestructura en la Amazonía Sur del Perú." Boston: Boston University Working Paper.

Deruyttere, Anne. 2004. "Perceived Challenges to Recognition of Prior and Informed Consent of Indigenous Peoples and Other Local Communities: The Experiences of the Inter-American Development Bank." *Sustainable Development Law and*

Policy 4, no. 2 (Summer): 66-74. http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1379&context=sdlp.

DeWenter, Kathryn, L., and Paul H. Malatesta. 2001. "State-Owned and Privately Owned Firms: An Empirical Analysis of Profitability, Leverage, and Labor Intensity." *American Economic Review* 91:1 (Mar.), 320-334. DOI: https://dx.doi.org/10.1257/aer.91.1.320.

Dirección Nacional de Asesoría Jurídica de la PGE. 1978. "Ley de Hidrocarburos: Decreto Supremo 2967." *Registro Oficial 711 de 15-Nov-1978*. http://www.hidrocarburos.gob.ec/wp-content/uploads/downloads/2015/03/12-Ley-de-Hidrocarburos.pdf.

Domínguez, Rafael and Sara Caria. 2016. "Ecuador en la Trampa de la Renta Media." *Problemas del Desarrollo* 187, no. 47 (October-December): 89-112. https://doi.org/10.1016/j.rpd.2016.10.004.

Eckholm, Erik. 1984. "World Bank Is Urged to Halt Aid to Brazil for Amazon Settlement." *New York Times,* 17 October. http://www.nytimes.com/1984/10/17/us/world-bank-is-urged-to-halt-aid-to-brazil-for-amazon-settlement.html.

ECLAC (UN Economic Comissions for Latin America and the Caribbean). (No Date). "CEPALStat." Online database, accessed October 22, 2015. http://estadisticas.cepal.org/cepalstat/web_cepalstat/Portada.asp?idioma=i.

ECLAC (UN Economic Comissions for Latin America and the Caribbean). 2015. "Latin America and the Caribbean and China: Toward a New Era of Economic Cooperation". http://repositorio.cepal.org/bitstream/handle/11362/38197/S1500388_en.pdf.

ECLAC. 2004. *Foreign Investment in Latin America and the Caribbean, 2003*. Santiago: United Nations Economic Commission for Latin America and the Caribbean. https://repositorio.cepal.org/bitstream/handle/11362/1127/1/S04274_en.pdf.

Eichengreen, Barry. 2008. *Globalizing Capital: A History of the Internaitonal Monetary System*. Princeton University Press.

Erichson, Howard M. 2013. "The Chevron-Ecuador Dispute, Forum Non Conveniens, and the Problem of Ex Ante Inadequacy." *Stanford Journal of Complex Litigation* 1, no. 2 (Spring): 417-428. https://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1552&context=faculty_scholarship

Escóbar, Lus. 2014. "Edificarán Uno de los Puentes Más Largos Sobre el Río Beni." *Página Siete.* http://www.paginasiete.bo/economia/2014/8/20/edificaran-puentes-largos-sobre-beni-29889.html.

Espinoza Echeverría, Sebastián and Verónica Guayanlema. 2017. "Balance y Proyecciones del Sistema de Subsidios Energéticos en Ecuador." Quito: Friedrich Ebert Stiftung Foundation. http://library.fes.de/pdf-files/bueros/quito/13648.pdf.

Estevadeordal, Antoni and Juan S. Blyde. 2016. "La Elusiva Búsqueda de Una Mayor Integración Productiva en América Latina y el Caribe." In *Desarrollo e Integración en América Latina,* Antonio Prado, Ricardo Carneiro, Daniel E. Perrotti, and Roman Zivy, Eds. Santiago: United Nations Economic Commission for Latin America and the Caribbean. https://repositorio.cepal.org/bitstream/handle/11362/40896/1/S1421004_es.pdf.

FAO (Food and Agriculture Organization of the United Nations) (2010). "Global Forest Resources Assessment 2010." http://www.fao.org/forestry/fra/fra2010/en/.

Fearnside, Philip M., Adriano M. R. Figueiredo, and Sandra C. M. Bonjour. 2012. "Amazonian forest loss and the long reach of China's influence." *Environment, Development, and Sustainability* 15, no. 2 (April): 325-338. https://doi.org/10.1007/s10668-012-9412-2.

Fearnside, Philip. 2002. "Avança Brasil: Environmental and Social Consequences of Brazil's Planned Infrastructure in Amazonia." *Environmental Management* 30, no. 6 (December): 735-747. https://doi.org/10.1007/s00267-002-2788-2.

Fearnside, Philip. 2004. "Greenhouse Gas Emissions from Hydroelectric Dams: Controversies Provide a Springboard for Rethinking a Supposedly 'Clean' Energy Source." *Climatic Change* 66, no. 1-2: 1-8. https://doi.org/10.1023/B:CLIM.0000043174.02841.23.

Fearnside, Philip. 2008. "The Roles and Movements of Actors in the Deforestation of Brazilian Amazonia." *Ecology and Society* 13, no. 1 (June). http://www.ecologyandsociety.org/vol13/iss1/art23/.

Feenstra, Robert C., Robert Inklaar, and Marcel P. Timmer. 2015. "The Next Generation of the Penn World Table." *American Economic Review* 105, no. 10, 3150-3182. Available for download at www.ggdc.net/pwt.

Financial Times. No Date. "fDiMarkets." Online database, accessed January 15, 2015. http://www.fdimarkets.com.

Finer, Matt and Clinton N. Jenkins. 2012. "Proliferation of Hydroelectric Dams in the Andean Amazon and Implications for Andes-Amazon Connectivity." *PLOS One* 7, no. 4, e35126. https://doi.org/10.1371/journal.pone.0035126.

Finer, Matt and Leda Huta. 2005. "Yasuní Blues: The IMF, Ecuador and Coerced Oil Exploitation." *Multinational Monitor* 26, no. 5/6 (May/June): 29-33. http://www.multinationalmonitor.org/mm2005/052005/finer.html.

Finer, Matt, Remi Moncel, and Clinton N. Jenkins. 2010. "Leaving the Oil Under the Amazon: Ecuador's Yasuní-ITT Initiative." *Biotropica* 42, no. 1 (January): 63-66. https://doi.org/10.1111/j.1744-7429.2009.00587.x.

Fontaine, Guillaume. 2003. *El Precio del Petróleo: Conflictos Socio-Ambientales y Gobernabilidad en la Región Amazónica.* Quito: FLACSO. http://www.flacso.org.ec/docs/precio_petroleo.pdf.

Foster, Vivien. 2005. "Ten Years of Water Service Reform in Latin America: Toward An Anglo-French Model." Washington: World Bank Water Supply and Sanitation Sector Board Discussion Paper Series, Paper No. 3. http://documents.worldbank.org/curated/en/962281468269682959/pdf/320270WSSServiceReform.pdf.

Foulon, Jérôme, Paul Lanoie, and Benoît Laplant. 2002. "Incentives for Pollution Control: Regulation or Information?" *Journal of Environmental Economics and Management* 44, no. 1 (July): 169-187. https://doi.org/10.1006/jeem.2001.1196.

Fritz, Barabara and Lena Lavinas, Eds. 2016. *A Moment of Equality for Latin America? Challenges for Redistribution.* New York: Routledge.

Gallagher, Kevin and Roberto Porzecanski. 2010. *The Dragon in the Room: China and the Future of Latin American Industrialization*. Stanford University Press.

Gallagher, Kevin P. and Fei Yuan. 2017. "Standardizing Sustainable Development: A Comparison of Development Banks in the Americas." *Journal of Environment & Development* 26, no. 3 (September): 243-271. https://doi.org/10.1177/1070496517720711.

Gallagher, Kevin, Amos Irwin, and Katherine Koleski, 2012. "The New Banks in Town: Chinese Finance in Latin America." Washington, DC: Inter-American Dialogue. http://ase.tufts.edu/gdae/Pubs/rp/GallagherChineseFinanceLatinAmerica.pdf.

Gaveau, David L.A., Matthew Linkie, Suyadi, Patrice Levang, and Nigel Leader-Williams. 2009. "Three Decades of Deforestation in Southwest Sumatra: Effects of Coffee Prices, Law Enforcement and Rural Poverty." *Biological Conservation* 142, no. 3 (March): 597-605. https://doi.org/10.1016/j.biocon.2008.11.024.

GCF (Green Climate Fund). 2016. "Accreditation Master Agreement Between the Green Climate Fund and the Corporación Andina de Fomento" https://www.greenclimate.fund/documents/20182/383071/AMA_-_CAF.pdf/101632f0-6348-4383-916b-c19b72381a6d.

GEF (Global Environment Facilty). 2015. "Progress Report on the Pilot Accreditation of GEF Project Agencies." https://www.thegef.org/sites/default/files/council-meeting-documents/EN_GEF.C.48.10.Rev_.01_Progress_Report_on_the_Pilot_Accreditation_of_GEF_Project_Agencies_4.pdf.

GEI (Global Environmental Institute). 2017. "Comparing Financial Institutions' Environmental and Social Policies: Chinese and International Development Banks." http://www.geichina.org/_upload/file/report/Policy_Bank_1_pager_EN.pdf.

Gilardi, Fabrizio, Jacint Jordana, and David Levi-Faur. 2006. "Regulation in the Age of Globalization: The Diffusion of Regulatory Agencies across Europe and Latin America." Barcelona: Institut Barcelona D'Estudis Internacionals. https://dx.doi.org/10.2139/ssrn.960739.

González Serna, Aura, Mónica Castañeda Gómez, and Diana Patricia Giraldo Ramírez. 2017. "La Economía Extractiva y la Economía Tradicional en el Municipio De Mutatá: Una Aproximación Sistémica en Perspectiva de Impactos Socio-Ambientales (1990-2015)." *Rural Urbano* 7, no. 1: 151-174.

Goodland, Robert. 2004. "Free, Prior, and Informed Consent and the World Bank Group." *Sustainable Development Law and Policy* 4, no. 2 (Summer): 66-74. http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1381&context=sdlp.

Griffith, Breda. 2011. "Middle-Income Trap." in *Frontiers in Development Policy*, Raj Nallari, Shahid Yusuf, Breda Griffith, and Rwitwika Bhattacharya, Eds. Washington: World Bank. https://www.openknowledge.worldbank.org/bitstream/handle/10986/2350/644420PUB0Fron00ID0187850BOX361537B.pdf?sequence=1&isAllowed=y.

Grilli, Enzo R. and Maw Cheng Yang. 1988. "Primary Commodity Prices, Manufactured Goods Prices, and the Terms of Trade of Developing Countries: What the Long Run Shows." *The World Bank Economic Review* 2, no. 1 (January): 1-47. https://doi.org/10.1093/wber/2.1.1.

Grossman, Gene and Alan Krueger. 1995. "Economic Growth and the Environment." *Quarterly Journal of Economics* 110, no. 2 (May): 353-377. https://doi.org/10.2307/2118443.

Guasch, J. Luis and Pablo Spiller. 1999. *Managing the Regulatory Process: Design, Concepts, Issues, and the Latin American and Caribbean Story.* Washington: The World Bank.

Guasch, J. Luis, Jean-Jacques Laffont, and Stéphane Straub. 2003. "Renegotiation of Concession Contracts in Latin America." Washington: World Bank Policy Research Working Paper 3011. https://openknowledge.worldbank.org/handle/10986/5802.

Guasch, J. Luis, Jean-Jacques Laffont, and Stéphane Straub. 2007. "Concessions of Infrastructure in Latin America: Government-Led Renegotiation." *Journal of Applied Econometrics* 22, no. 7 (December): 1267-1294. https://doi.org/10.1002/jae.987.

GW (Global Witness). 2007. "Unofficial Translation: Guidelines for Environmental and Social Impact Assessments of the China Export and Import Bank's Loan Projects." https://www.globalwitness.org/sites/default/files/library/Chinese%20guidelines%20EN.pdf.

Haller, Tobias, Annja Blöchlinger, Markus John, Esther Marthaler, Sabine Ziegler, Eds. 2007. *Fossil Fuels, Oil Companies, and Indigenous Peoples: Strategies of multinational oil companies, states, and ethnic minorities; Impact on environment, livelihoods, and cultural change.* London: Lit Verlag.

Hansen, M.C., P.V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 no. 6160: 850-853. Data accessed 20 November 2017 from http://earthenginepartners.appspot.com/science-2013-global-forest.

Harvey, David I., Neil M. Kellard, Jakob B. Madsen, and Mark E. Wohar. 2010. "The Prebisch-Singer Hypothesis: Four Centuries of Evidence." *The Review of Economics and Statistics* 92, no. 2 (May): 367-277. https://doi.org/10.1162/rest.2010.12184.

Himberg, Harvey. 2015. "Comparative Review of Multilateral Development Bank Safeguard Systems." Washington, DC: World Bank Group. https://consultations.worldbank.org/Data/hub/files/consultation-template/review-and-update-world-bank-safeguard-policies/en/phases/mdb_safeguard_comparison_main_report_and_annexes_may_2015.pdf.

Hirschman, Albert O. 1968. "The Political Economy of Import-Substituting Industrialization in Latin America." *The Quarterly Journal of Economics* 81, no. 1 (February): 1-32. https://doi.org/10.2307/1882243.

HKND Group 2014. "Nicaragua Canal Project Description." Hong Kong Nicaragua Canal Development Group. http://hknd-group.com/portal.php?mod=view&aid=148.

Hoekstra, Arjen, Ed. 2003. "Virtual Water Trade." UNESCO IHE Institute for Water Education, Value of Water Research Report Series No. 12. Proceedings of the International Expert Meeting on Virtual Water Trade, 12-13 December 2003, Delft.

Hsu, Angel, Nikola Alexandre, Sam Cohen, Pamela Jao, Elena Khusainova, Don Mosteller, Yuqian Peng, Carlin Rosengarten, Jason D. Schwartz, Ariana Spawn, Amy Weinfurter, Kaiyang Xu, Daphne Yin, Alisa Zomer, Maria Ivanenko, Professor Alex R. Cook, Jie Min Foo, Ji Yi, Jayshree Sarathy, Diego Torres-Quintanilla, David Wong, Cameron Yick, Anna Young, Peter Hirsch, Anne Householder, Cory Nestor, Shreya Shah, Yinan Song, Chendan Yan, Marc A. Levy, Alex de Sherbinin, Malanding Jaiteh, Tricia Chai-Onn, Daniel C. Esty, and

Lisa Dale. 2016. "Environmental Performance Index, 2016 Backcasted Scores." Online database, consulted 9 March 2018 from http://epi2016.yale.edu/downloads.

Humphrey, Chris and Katharina Michaelowski. 2013. "Shopping for Development." *World Development* 44: 142-155. http://dx.doi.org/10.1016/j.worlddev.2012.12.007.

Humphrey, Chris. 2015. "The 'Hassle Factor' of MDB Lending and Borrower Demand in Latin America." In *Global Economic Governance and the Development Practices of the Multilateral Development Banks*, S. Park and J. Strand, ed., pp. 143-166. New York: Routledge.

Hurley, Lawrence. 2017. "U.S. Top Court Hands Chevron Victory in Ecuador Pollution Case." *Reuters,* 19 June. https://www.reuters.com/article/us-usa-court-chevron/u-s-top-court-hands-chevron-victory-in-ecuador-pollution-case-idUSKBN19A1V4.

IAD (Inter-American Dialogue). 2018. "China-Latin America Finance Database." Online database, consulted March 6, 2018. https://www.thedialogue.org/map_list/.

IADB (Inter-American Development Bank). 1990. "Strategies and Procedures on Sociocultural Issues as Related to the Environment." http://services.iadb.org/wmsfiles/products/Publications/362137.pdf.

IADB (Inter-American Development Bank). 1996. "1996 Annual Report on the Environment and Natural Resources. https://publications.iadb.org/bitstream/handle/11319/2100/1996%20Annual%20Report%20on%20the%20Environment%20and%20Natural%20Resources.pdf?sequence=1&isAllowed=y.

IADB (Inter-American Development Bank). 2006a. "Environment and Safeguards Compliance Policy." http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=665902.

IADB (Inter-American Development Bank). 2006b. "Operational Policy on Indigenous Peoples." http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=39430632.

IADB (inter-American Development Bank). 2009. "Proposal to Establish the Independent Consultation and Investigation Mechanism: Input Received During the Public Consultation Process, May 6 – September 30, 2009)." http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=2206830.

IADB (Inter-American Development Bank). 2014. "MICI Complaint Detail: Bolivia - Santa Barbara-Rurrenabaque Northern Corridor Highway Improvement Program." Website, accessed 20 November 2017 from https://idblegacy.iadb.org/en/mici/complaint-detail-2014,1804.html?ID=BO-MICI001-2011.

IDFC (International Development Finance Club). 2015. "IDFC Green Finance Mapping for 2014." Frankfurt: International Development Finance Club. https://www.idfc.org/Downloads/Publications/01_green_finance_mappings/IDFC_Green_Finance_Mapping_Report_2015.pdf.

IEO (Independent Evaluation Office). 2010. "Safeguards and Sustainability Policies in a Changing World: And Independent Evaluation of the World Bank Group Experience." Washington, DC: World Bank Group. http://siteresources.worldbank.org/EXTSAFANDSUS/Resources/Safeguards_eval.pdf.

IFC (International Finance Corporation). 1998. "Procedure for Environmental and Social Review of Projects." http://www.ifc.org/wps/wcm/connect/8b64370048855267ab74fb6a6515bb18/ESRP1998.pdf?MOD=AJPERES.

IFC (International Finance Corporation). 2006a. "IFC E&S Review Procedures." https://www.ifc.org/wps/wcm/connect/befd3a80488559a683a4d36a6515bb18/ESRP2006.pdf?MOD=AJPERES.

IFC (International Finance Corporation). 2006b. "International Finance Corporation's Performance Standards on Social & Environmental Sustainability." http://www.ifc.org/wps/wcm/connect/ac3381804886593bb892fa6a6515bb18/IFC%2BPerformance%2BStandards.pdf?MOD=AJPERES&attachment=true&id=1322803957411.

IFC (International Finance Corporation). 2009. "Addressing Grievances from Project-Affected Communities: Guidance for Projects and Companies on Designing Grievance Mechanisms." http://www.ifc.org/wps/wcm/connect/cbe7b18048855348ae6cfe6a6515bb18/IFC%2BGrievance%2BMechanisms.pdf?MOD=AJPERES&CACHEID=cbe7b18048855348ae6cfe6a6515bb18.

IIC (Inter-American Investment Corporation). 2005. "Disclosure of Information Policy." https://www.iic.org/sites/default/files/pdf/disclosure_of_information_policy_in_english.pdf.

IIC (Inter-American Investment Corporation). 2010. "Inter-American Investment Corporation Statement regarding its participation in the revised Independent Consultation and Investigation Mechanism." http://www.iic.org/sites/default/files/pdf/iic_revised_independent_investigation_mechanism-2010-03-16.pdf.

IIC (Inter-American Investment Corporation). 2013. "IIC Environmental and Social Sustainability Policy." http://www.iic.org/environmental-and-social-sustainability-policy.pdf.

ILO (International Labour Organisation). (No Date). "History of Indigenous Peoples within the ILO." Website, accessed 8 March 2018 from http://pro169.org/c-107-and-ilo-history/.

ILO (International Labour Organization) 1989. "Convention 169 – Indigenous and Tribal Peoples Convention, 1989." http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C169.

IMF (International Monetary Fund) 2014. "World Economic Outlook Database." Online database, accessed 2 September 2014. http://www.imf.org/external/pubs/ft/weo/2014/01/weodata/index.aspx.

IMF (International Monetary Fund). 2017. "World Economic Outlook Database October 2017." Online database, accessed 19 March 2018. https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx.

INFRALATAM. 2017. "Infraestructura Agregada - Todos los Sectores." Online database, accessed 5 December 2017 from http://inicio.infralatam.info.

IR (International Rivers). 2007. "Issuance Notice of the 'Guidelines for Environmental and Social Impact Assessments of the China Export and Import Bank's (China EXIM Bank) Loan Projects.'" Website, accessed 26 November 2017. https://www.internationalrivers.org/sites/default/files/attached-files/china_exim_bank_august_2008_guidance.doc.

Ismail, Kareem. 2010. "The Structural Manifestation of the 'Dutch Disease': The Case of Oil Exporting Countries. Washington: IMF Working Paper. http://www.imf.org/~/media/Websites/IMF/imported-full-text-pdf/external/pubs/ft/wp/2010/_wp10103.ashx.

Kennedy, William. 1999. "Environmental Impact Assessment and Multilateral Financial Institutions" in *Handbook of Environmental Impact Assessment, Vol. 2,* Judith Petts, Ed. https://leseprobe.buch.de/images-adb/28/20/2820ad8a-650b-427a-b127-988bcd5087be.pdf.

Kimerling, Judith. 1991. "Disregarding Environmental Law: Petroleum Development in Protected Natural Areas and Indigenous Homelands in the Ecuadorian Amazon." *Hastings International and Comparative Law Review* 14: 849-903.

Kimerling, Judith. 2001. "International Standards in Ecuador's Amazon Oil Fields: The Privatization of Environmental Law." *Columbia Journal of Environmental Law* 26: 289-397.

Konar, Shameek and Mark A. Cohen. 1997. "Information as Regulation: The Effect of Community Right to Know Laws on Toxic Emissions." *Journal of Environmental Economics and Management* 32, 192-124.

Krauss, Clifford. 2014. "Big Victory for Chevron Over Claims in Ecuador." *New York Times,* 4 March. https://www.nytimes.com/2014/03/05/business/federal-judge-rules-for-chevron-in-Ecuadorian-pollution-case.html.

Kvam, Reidar. 2017. "Meaningful Stakeholder Consultation." Washington: Inter-American Development Bank. http://dx.doi.org/10.18235/0000776#sthash.vEQiTXlu.dpuf.

Lall, Sanjaya. 2000. "The Technological Structure and Performance of Developing Country Manufactured Exports, 1985–98." *Oxford Development Studies* 28, no. 3: 337-369. https://doi.org/10.1080/713688318.

LandMark. (No Date). "LandMark Global Platform of Indigenous and Community Lands." Website, accessed 20 November 2017. http://www.landmarkmap.org/map/.

Larrea, Carlos and Lavinia Warnars. 2009. "Ecuador's Yasuni-ITT Initiative: Avoiding Emissions by Keeping Petroleum Underground." *Energy for Sustainable Development* 13: 219-223. https://doi.org/10.1016/j.esd.2009.08.003.

Larsen, Peter Bille. 2016. "The 'New Jungle Law': Development, Indigenous Rights and ILO Convention 169 in Latin America." *International Development Policy | Revue internationale de politique de développement*, 7, no. 1. https://dx.doi.org/10.4000/poldev.2220.

Latinobarómetro. 2013. "Informe 2013." Santiago, Chile. 1 November. http://www.latinobarometro.org/documentos/LATBD_INFORME_LB_2013.pdf.

Laurance, William F., Anna Peletier-Jellema, Bart Geenen, Harko Koster, Pita Verweij, Pitou Van Dijck, Thomas E. Lovejoy, Judith Schleicher, and Marijke Van Kuijk. 2015. "Reducing the Global Environmental Impacts of Rapid Infrastructure Expansion." *Current Biology* 25, no. 7: R295-R262. https://doi.org/10.1016/j.cub.2015.02.050.

Laurance, William F., Miriam Goosem, and Susan G. W. Laurance. 2009. "Impacts of roads and linear clearings on tropical forests." *Trends in Ecology and Evolution* 24, no. 12: 659-669. http://izt.ciens.ucv.ve/ecologia/Archivos/ECO_POB%202009/ECOPO5_2009/Laurance%20et%20al%202009.pdf.

Lavinas, Lena and André Simões. 2017. "Política Social e Heterogeneidade Estrutural na América Latina: A Virada do Século XXI." *Revista de Economia Contemporânea* 21, no. 2 (May-August). http://dx.doi.org/10.1590/198055272128.

Leah Temper, Daniela del Bene and Joan Martinez-Alier. 2015. Mapping the frontiers and front lines of global environmental justice: the EJAtlas. *Journal of Political Ecology* 22: 255-278. https://ejatlas.org/.

Leff, Enrique. 2001. *Justicia Ambiental: Construcción y Defensa de los Nuevos Derechos Ambientales, Culturales, y Colectivos en América Latina.* Mexico City: UNDP. https://agua.org.mx/wp-content/uploads/2012/11/justicia_ambiental_e_leff.pdf.

León Áviles, José 2013. "Experiencias de Políticas Públicas en la Costa Caribe de Nicaragua." Managua: Gobierno de Reconciliación y Unidad Nacional, Consejo de Desarrollo de la Costa Caribe. http://myslide.es/documents/jose-leon-aviles-consejo-de-desarrollo-costa-caribe-experiencias-de-politicas-publicas-en-la-costa-caribe-de-nicaragua.html.

Levinson, Arik and M. Scott Taylor. 2004. "Unmasking the Pollution Haven Effect." Cambridge, MA: NBER Working Paper 10629.

Limerick, Nicholas. 2014. "No es lo Mismo Quichua que Kichwa." *GK,* 28 July. https://gk.city/2014/07/28/no-es-lo-mismo-quichua-que-kichwa/.

Littig, Beate and Erich Griessler 2005. "Social Sustainability: a Catchword Between Political Pragmatism and Social Theory." *International Journal for Sustainable Development* 8, no. ½: 65-79. https://doi.org/10.1504/IJSD.2005.007375.

Lódola, Agustín, Rafael Brigo, and Fernando Morra. 2010. "Mapa de Cadenas Agroalimentarias de Argentina." *Cambios Estructurales en las Actividades Agropecuarias,* Guillermo Anlló, Robert Bisang, and Guillermos Salvatirra, Eds. Santiago: UN ECLAC. http://repositorio.cepal.org/bitstream/handle/11362/3804/1/lcw350.pdf.

Lovejoy, Thomas 2014. "Exploration, Extraction, Remediation." Presentation delivered at the "Achieving equilibrium in the Amazon: Balancing Economic Development, Human Rights and Environmental Justice – Past, Present, and Future" conference hosted by the Ministries of the Environment and Foreign Relations, Quito, Ecuador, July 29.

Lustig, Nora. 2014. "Income Redistribution and Poverty Reduction in Latin America: The role of social spending and taxation in achieving development goals." *Development* 57, no. 3-4 (Decemeber), 388-399. https://doi.org/10.1057/dev.2015.4.

MacKay, Fergus. 2005. The Draft World Bank Operational Policy 4.10 on Indigenous Peoples: Progress or More of the Same?" *Arizona Journal of International & Comparative Law* 22, no. 1: 65-98. https://www.researchgate.net/publication/265116468_The_draft_world_bank_operational_policy_410_on_indigenous_peoples_Progress_or_more_of_the_same.

Malingreau, Jean-Paul and Compton J. Tucker. 1988. "Large-Scale Deforestation in the Southeastern Amazon Basin of Brazil." *Ambio* 17, no. 1: 49-55. https://doi.org/10.1007/s13280-011-0196-7.

Marshall, Adriana. 2000. "Labor Market Regulation, Wages, and Workers' Behavior – Latin America in the 1990s." Delivered at the 2000 meeting of the Latin American Studies Association, Washington, DC. http://lasa.international.pitt.edu/Lasa2000/Marshall.PDF.

Martinez-Alier, Joan. 2002. *The Environmentalism of the Poor.* Northampton: Edward Elgar.

Martinez-Alier, Joan. 2014. "The Environmentalism of the Poor." *Geoforum* 54: 239-241. https://doi.org/10.1016/j.geoforum.2013.04.019.

Mazabanda, Carlos. 2013. "Consulta Previa en la Décimo Primera Ronda Petrolera ¿Participación Masiva de la Ciudadanía?" Amazon Watch. http://amazonwatch.org/assets/files/2013-07-consulta-previa-en-la-11a-ronda.pdf.

Mazzucato, Mariana. 2013. *The Entrepreneurial State: Debunking Public vs. Private Sector Myths.* London: Anthem Press.

MEER (Ministerio de Electricidad y Energía Renovable) (No Date-1). "Cambio de la Matriz Energética." https://www.celec.gob.ec/index.php?option=com_content&view=article&id=91&Itemid=269.

MEER (Ministerio de Electricidad y Energía Renovable) (No Date-2). "Proyectos de Generación: Coca-Codo Sinclair." http://www.energia.gob.ec/coca-codo-sinclair/.

Mekonnen, Mesfin and Arjen Hoekstra. 2012. "A Global Assessment of the Water Footprint of Farm Animal Products." *Ecosystems* 15, no. 3 (April): 401-415. http://dx.doi.org/10.1007/s10021-011-9517-8.

Mekonnen, Mesfin and Hoekstra, Arjen. 2011. "National Water Footprint Accounts: The Green, Blue and Grey Water Footprint of Production and Consumption," Value of Water Research Report Series No.50 (May), Delft, the Netherlands: UNESCO-IHE. http://waterfootprint.org/media/downloads/Report50-NationalWaterFootprints-Vol1.pdf.

Mekonnen, Mesfin and Hoekstra, Arjen. 2011. "The Green, Blue and Grey Water Footprint of Crops and Derived Crop Products." *Hydrology and Earth System Sciences* 15:5 (May), 1577-1600. https://doi.org/10.5194/hess-15-1577-2011.

Mesquita Moreira, Mauricio. 2007. "Fear of China: Is There a Future for Manufacturing in Latin America?" World Development 35, no. 3 (March): 355-376.

Mikesell, Raymond F. and Lawrence F. Williams. 1992. *International Banks and the Environment: From Growth to Sustainability: An Unfinished Agenda.* San Francisco: Sierra Club Books.

Ministerio de Educación. 2016. "Asignatura Optativa: Lengua Kichwa." 2016. https://educacion.gob.ec/wp-content/uploads/downloads/2016/10/Asignatura-Optativa-Lengua-Kichwa-LL-3BGU.pdf.

Ministerio de Hidrocarburos. 2014. "Informe de Gestión 2014." Quito: Government of Ecuador. http://www.hidrocarburos.gob.ec/wp-content/uploads/downloads/2015/03/INFORME-DE-GESTION-2014.pdf.

Mody, Ashoka and Antu Panini Murshid. 2005. "Growing Up with Capital Flows." *Journal of International Economics* 65, no. 1 (January): 249-266. https://doi.org/10.1016/j.jinteco.2004.02.003.

Molina Carpio, Sylvia. 2014. "El Puente Rurrenabaque – San Buenaventura: La Responsabilidad del BID y del Estad en una Obra sin Consenso Territorial." La Paz: Foro Boliviano sobre Medio Ambiente y Desarrollo. https://www.scribd.com/doc/239224203/El-Puente-Rurrenabaque-San-Buenaventura-La-responsabilidad-del-BID-y-del-Estado-en-una-obra-sin-consenso-territorial.

Moseley, Christopher, ed. 2010. *Atlas of the World's Languages in Danger, 3rd edn.* Paris, UNESCO Publishing. Online version: http://www.unesco.org/culture/en/endangeredlanguages/atlas

MRNNR (Ministerio de Recursos Naturales No Renovables). 2012. "Informe de Gestión 2012." Quito: Government of Ecuador. http://www.hidrocarburos.gob.ec/wp-content/uploads/2013/02/informe_gestion_mrnnr_2012.pdf.

Myers, Margaret and Guo Jie 2015. "China's Agricultural Investment in Latin America: A Critical Assessment." Washington, DC: Inter-American Dialogue. http://www.thedialogue.org/wp-content/uploads/2015/06/Chinas-Agricultural-Investment-in-Latin-America.pdf.

Narins, Thomas P. 2012. "China's Eye on Ecuador: What Chinese Trade with Ecuador Reveals about China's Economic Expansion into South America," *The Global Studies Journal*, 4, no. 2, p. 300.

NASE (Nación Sápara del Ecuador). 2012. "En Conambo Se Eligió y Posesionó a la Nueva Dirigencia de la NASE." Press release, 30 August. http://comunamazonica.blogspot.com/2012/09/nacion-sapara-del-ecuador-rechaza.html.

North, James. 2015. "Ecuador's Battle for Environmental Justice Against Chevron." *The Nation,* 2 June. https://www.thenation.com/article/ecuadors-battle-environmental-justice-against-chevron/.

O'Donnell, Guillermo. 1998. "Polyarchies and the (Un)Rule of Law in Latin America." Presented at the Latin American Studies Association, Chicago. http://lasa.international.pitt.edu/LASA98/O'Donnell.pdf.

Ocampo, Diana María and Sabastian Agudelo. 2014. "Consulta Previa in Chile, Colombia, Guatemala and Peru: Colombia Case Study." *Americas Quarterly* (Spring). http://www.americasquarterly.org/content/country-study-colombia.

OEM (Observatorio de Energía y Minas). 2018. "Base de datos actualizada al 13 de marzo 2018." Quito: Universidad de los Andes. Online database, accessed 3 May 2018 from http://www.observatorioenergiayminas.com.

Oil Pollution Act, H. R. 1465, 101st Congress. 1990.

Ordoñez, Wilson, Felipe Rivadeneira, and Carlos Mazabanda. 2016. *Informe Sobre el Derecho a la Libertad de Asociación de los Pueblos Indígenas del Ecuador*. Quito: Confederación de Nacionalidades Indígenas del Ecuador, Confederación de Nacionalidades Indígenas de la Amazonia Ecuatoriana, Centro de Derechos Humanos de la Pon cia Universidad Católica del Ecuador, and Terra Mater. http://terramater.ec/informe-final/.

Orellana, Marcos A. 2002. "Indigenous Peoples, Mining, and International Law." London: International Institute for Environment and Development. http://pubs.iied.org/pdfs/G00529.pdf.

Ostrom, Elinor and Charlotte Hess. 2007. "A Framework for Analyzing the Knowledge Commons" in *Understanding Knowledge as Commons,* Charlotte Hess and Elinor Ostrom, Eds. Cambridge, MA: MIT Press.

Palacio González, Alfredo. 2006. "Executive Decree 1672: Reglamento Aplicación de Ley 42 Reformatoria a Ley de Hidrocarburos." http://www.controlhidrocarburos.gob.ec/wp-content/uploads/MARCO-LEGAL-2016/Registro-Oficial-Suplemento-312-Decreto-Ejecutivo-1672.pdf.

Palacios, Luisa. 2008. "Latin America as China's Energy Supplier" in *China's Expansion into the Western Hemisphere: Implications for Latin America and the United States*, Riordan Roett and Guadalupe Paz, Eds. Washington: Brookings Institution Press.

Palley, Thomas I. 2003. "The Overvalued Dollar and the US Slump," in *Dollar Overvaluation and the World Economy*. Eds. C. Fred Bergsten and John Williamson. Washington, D.C.: Institute for International Economics, 145-163.

Palma, José Gabriel. 2014) "De-Industrialisation, 'Premature' De-Industrialization, and the Dutch-Disease." *Revista Necat* 3, no. 5 (January-June): 7-23. http://stat.ijie.incubadora.ufsc.br/index.php/necat/article/download/3118/4060.

Pappalardo, Salvatore Eugenio and Massimo De Marchi. 2009. "Biodiversity Conservation Projects, Sustainable Development and Environmental Conflicts: The Cooperation Approach in the Ecuadorian Amazon." Proceedings of University Coordination for Cooperation & Development (CUCS) Conference, Pavia.

Pargal, Sheoli. 2003. "Regulation and Private Sector Investment in Infrastructure: Evidence from Latin America." Washington: World Bank Policy Research Working Paper 3037. http://hdl.handle.net/10986/18269.

Paus, Eva. 2012. "Confronting the Middle Income Trap: Insights from Small Latecomers." *Studies in Comparative International Development* 47, no. 2 (June): 115-138. https://doi-org.ezproxy.bu.edu/10.1007/s12116-012-9110-y.

Pellegrini, Lorenzo, Murat Arsel, Fander Falconí, and Roldan Muradian. 2014. "The Demise of a Nnew Conservation and Development Policy? Exploring the Tensions of the Yasunı́ ITT initiative." *The Extractive Industries and Society* 1, no. 2 (November): 284-291. http://dx.doi.org/10.1016/j.exis.2014.05.001.

Peters, Glen. 2011. "Growth in emission transfers via international trade from 1990 to 2008." *Proceedings of the National Academy of Sciences of the United States of America* 108, no. 21 (24 May): 8903-8908. http://www.pnas.org/content/108/21/8903.

Peters, Glen. 2013. Personal correspondence.

Pfaff, Alexander S. P. 1997. "What Drives Deforestation in the Brazilian Amazon? Evidence from Satellite and Socioeconomic Data." Washington DC: World Bank Policy Research Working Paper. http://documents.worldbank.org/curated/en/754481468769744158/pdf/multi-page.pdf.

Plater, Zygmunt J. B. 1988. "Damming the Third World: Multilateral Development Banks, Environmental Diseconomies, and International Reform Pressures on the Lending Process." *Denver Journal of International Law and Policy* 17: 121-153.

Pont Vidal, Josep. 2008. "Trabajo y Relaciones Laborales en los Enclaves Minero-Metalúgicos de la Amazonia Oriental." *European Review of Latin American and Caribbean Studies* 84 (April): 37-59.

Porzecanski, Arturo 2010. "When Bad Things Happen to Good Sovereign Debt Contracts: The case of Ecuador," *Law and Contemporary Problems*, 73, no. 4: 251-271. https://scholarship.law.duke.edu/lcp/vol73/iss4/17.

Pozo, Erik. 2012. "¿De Campesino a Indígena?" *Ideele* 221 (July). http://revistaideele.com/ideele/content/¿de-campesino-ind%C3%ADgena.

Prebisch, Raúl. 1950. *The Economic Development of Latin America and its Principal Problems*. New York: United Nations Department of Economic Affairs. http://archivo.cepal.org/pdfs/cdPrebisch/002.pdf.

Ramasamy, Bala, Matthew Yeung, and Sylvie Laforet. 2012. "China's outward foreign direct investment: Location choice and firm ownership." *Journal of World Business* 47, no. 1 (January): 17-25. https://doi.org/10.1016/j.jwb.2010.10.016.

Ray, Rebecca and Adam Chimienti. 2017. "A Line in the Equatorial Forests: Chinese Investment and the Environmental and Social Impacts of Extractive Industries in Ecuador." in *China and Sustainable Development in Latin America: The Social and Environmental Dimension*, Rebecca Ray, Kevin Gallagher, Andrés López, and Cynthia Sanborn, eds. http://www.bu.edu/pardeeschool/files/2014/12/Ecuador1.pdf.

Ray, Rebecca and Kevin Gallagher. 2015. "China-Latin America Economic Bulletin – 2015 Edition." Boston: BU Global Economic Governance Initiative. http://www.bu.edu/pardeeschool/files/2015/02/Economic-Bulletin-2015.pdf.

Ray, Rebecca, Kevin Gallagher, Cynthia Sanborn, and Andrés López. 2017. *China and Sustainable Development in Latin America: The Social and Environmental Dimension.* London: Anthem Press.

Red Amazónica de Información Socioambiental Georreferenciada. (No Date). "Mapa Online." Website, accessed 20 November 2017. https://www3.socioambiental.org/geo/RAISGMapaOnline/.

Rey, Hélène 2015. "Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence." Cambridge, MA: NBER Working Paper No. 21162. http://www.nber.org/papers/w21162.

Rich, Bruce. 1994. *Mortgaging the Earth: The World Bank Environmental Impoverishment, and the Crisis of Development.* Boston: Beacon Press.

Richards, Peter D., Robert J. Myers, Scott M. Swinton, and Robert T. Walker. 2012. "Exchange Rates, Soybean Supply Response, and Deforestation in South America." *Global Environmental Change* 22, no. 2 (May): 454-462. https://doi.org/10.1016/j.gloenvcha.2012.01.004.

Rival, Laura. 2010. "Ecuador's Yasuní-ITT Initiative: The Old and New Values of Petroleum." *Ecological Economics* 70, no. 2 (December): 358-365. https://doi.org/10.1016/j.ecolecon.2010.09.007.

Rivasplata Cabrera, Francisco, Jorge Zanafria Vásconez, Martha Torres Marcos-Ibáñez, Silvia Molino Carpio, and Vanessa Torres Rico. 2014. *Altas y Bajas en las Salvaguardas: ¿Cómo Actúan BNDES, China Ex Im Bank, CAF y BID?* Lima: Coalición Regional por la Transparencia y la Participación. http://www.ambienteysociedad.org.co/wp-content/uploads/2015/01/Altas-y-Bajas-en-las-Salvaguardas.pdf.

Rodrik, Dani. 1998. "Who Needs Capital-Account Convertibility?" *Essays in International Finance* 207: 55-65. https://www.princeton.edu/~ies/IES_Essays/E207.pdf.

Ruiz, Klever and Gloria Ushigua. 2014. "Letter to Ms. Vicky Tauli-Corpuz and Mr. Diego Zorrilla." http://amazonwatch.org/assets/files/2014-sapara-letter-to-un.pdf.

Ruiz, Klever. (2014). Personal interview, August 30.

Saatchi, Sassan S., Nancy L. Harris, Sandra Brown, Michael Lefsky, Edward T. A. Michard, William Salas, Brian R. Zutta, Wolfgang Buermann, Simon L. Lewis, Stephen Hagen, Silvia Petrova, Lee White, Miles Silman, and Alexandra Morel. 2011. "Benchmark Map of Forest Carbon Stocks in Tropical Regions across

Three Continents." *Proceedings of the National Academy of Sciences of the United States of America*. 108, no. 24 (14 June). https://doi.org/10.1073/pnas.1019576108.

Samaniego, Joseluis, Luis Miguil Galindo, José Eduardo Alatorre, Jimy Ferrer, Heloisa Schnieder, and Daneil E. Perrotti. 2016. "América Latina y el Caribe: Integración Para el Desarrollo Sostenible." In In *Desarrollo e Integración en América Latina,* Antonio Prado, Ricardo Carneiro, Daniel E. Perrotti, and Roman Zivy, Eds. Santiago: United Nations Economic Commission for Latin America and the Caribbean. https://repositorio.cepal.org/bitstream/handle/11362/40896/1/S1421004_es.pdf.

Sanborn, Cynthia and Juan Luís Dammert. 2014. "Caso de Estudio: Perú," in *Las Mejores (y Peores) Prácticas Para la Extracción de Recursos Naturales en América Latina*, Richard André, Ryan Berger, Wilda Escarfuller et Al, Ed. Americas Society / Council of the Americas. http://www.as-coa.org/sites/default/files/MiningSynthesisReport.pdf.

Sanborn, Cynthia and Victoria Chonn Ching. 2017. "Chinese Investment in Peru's Mining Industry: Blessing or Curse?" in *China and Sustainable Development in Latin America: the Social and Environmental Dimension,* Rebecca Ray, Kevin Gallagher, Cynthia Sanborn, and Andrés López, Eds. London: Anthem Press.

Sanborn, Cynthia, Verónica Hurtado, and Tania Ramírez. 2016. "La Consulta Previa en Perú: Avances y Retrocesos." Lima: Universidad del Pacífico. http://repositorio.up.edu.pe/bitstream/handle/11354/1195/DI6.pdf?sequence=6.

Sánchez, Luis and Orlando Reyes. 2016. "La demanda de Gasolinas, Gas Licuado de Petróleo y Electricidad en el Ecuador: Elementos para una Reforma Fiscal Ambiental." Santiago: United Nations Economic Commission for Latin America and the Caribbean. https://repositorio.cepal.org/bitstream/handle/11362/40629/1/S1600529_es.pdf.

Sanderson, Henry and Michael Forsyth. 2013. *China's Superbank,* Bloomberg Press.

Sanford, Jonathan. 1998. "Multilateral Development Banks' Environmental Assessment and Information Policies: Impact of the Pelosi Amendment." Washington, DC: Congressional Research Service, 12 February. http://congressionalresearch.com/98-180/document.php?study=MULTILATERAL+DEVELOPMENT+BANKS+ENVIRONMENTAL+ASSESSMENT+AND+INFORMATION+POLICIES+IMPACT+OF+THE+PELOSI+AMENDMENT.

Saravia López, Alejandra and Adam Rua Quiroga. 2017. "An Assessment of the Environmental and Social Impacts of Chinese Trade and FDI in Bolivia" in *China and Sustainable Development in Latin America: The Social and Environmental Dimension*, Rebecca Ray, Kevin Gallagher, Andrés López, and Cynthia Sanborn, eds. http://www.bu.edu/pardeeschool/files/2014/12/Bolivia1.pdf.

Sato, Misato. 2014. "Product level embodied carbon flows in bilateral trade." Ecological Economics 105 (September): 106-117. https://doi.org/10.1016/j.ecolecon.2014.05.006.

Schemo, Diana Jean. 1998. "Ecuadorians Want Texaco to Clear Toxic Residue." *New York Times,* 1 February. http://www.nytimes.com/1998/02/01/world/Ecuadorians-want-texaco-to-clear-toxic-residue.html.

Schneider, Ben Ross and David Soskice. 2009. "Inequality in Developed Countries and Latin America: Coordinated, Liberal and Hierarchical Systems." *Economy and Society* 38, no. 1: 17-52. https://doi.org/10.1080/03085140802560496.

Seguino, Stephanie. 2014. "How Economies Grow: Alice Amsden and the Real World Economics of Late Industrialization." Presented at the Alice H. Amsden Memorial Lecture, University of Witwatersrand, Johannesburg, South Africa, September 4, 2014. http://www.tips.org.za/files/paper_stephanie_seguino_amsden_memorial_lecture_0.pdf.

SENPLADES (Secretaría Nacional de Planificación y Desarrollo). 2013. *Plan Nacional para el Buen Vivir, 2013-2017*. http://www.buenvivir.gob.ec/documents/10157/26effa35-aaa8-4aec-a11c-be69abd6e40a.

SHE (Secretaría de Hidrocarburos del Ecuador). (2012). "Consulta Previa: Resumen Ejecutivo." http://www.secretariahidrocarburos.gob.ec/wp-content/uploads/downloads/2013/08/resumen_ejecutivo_consulta_previa.pdf.

SHE (Secretaría de Hidrocarburos del Ecuador). 2012. "Misión / Visión/ Valores." Website, accessed 19 March 2018 from http://www.secretariahidrocarburos.gob.ec/mision-vision-valores/.

Singer, Hans. 1949. "Economic Progress in Underdeveloped Countries." *Social Research* 16, no. 1 (March), 1-11. http://www.jstor.org/stable/40982245.

Sinnot, Emily, John Nash, and Augusto de la Torre. 2010. *Natural Resources in Latin America and the Caribbean: Beyond Booms and Busts?* Washington: World Bank. https://www.openknowledge.worldbank.org/bitstream/handle/10986/2482/555500PUB0Natu1EPI1991501801PUBLIC1.pdf?sequence=1&isAllowed=y.

Stern, David. 1998. "Progress on the Environmental Kuznets Curve?" *Environment and Development Economics* 3, no. 2 (May): 173-196.

Strong, S. I. 2013. "Discovery under 28 U.S.C. Sec. 1782: Distinguishing International Commercial Arbitration and International Investment Arbitration." *Stanford Journal of Complex Litigation* 1, no. 2 (Spring): 295-372.

Survival International. (No Date). "The Uncontacted Frontier." Website, accessed 20 November 2017. https://www.survivalinternational.org/tribes/amazonuncontactedfrontier.

Swensen, Jennifer J., Catherine E. Carter, Jean-Christophe Domec, and Cesar I. Delgado. 2011. "Gold Mining in the Peruvian Amazon: Global Prices, Deforestation, and Mercury Imports." *PLoS ONE* 6, no. 4. https://doi.org/10.1371/journal.pone.0018875.

Swing, Kelly. 2011. "Day of Reckoning for Ecuador's Biodiversity." *Nature* 469 (20 January): 267. http://www.nature.com/news/2011/110119/full/469267a.html.

Swing, Kelly. 2013. Personal interview, September 19.

Tanasescu, Mihnea. 2013. "The Rights of Nature in Ecuador: The Making of an Idea." *International Journal of Environmental Studies* 70, no. 6: 846-861. https://doi.org/10.1080/00207233.2013.845715.

Tauli-Corpuz, Victoria. 2016. "Pueblos Indígenas en Aislamiento en el Marco de los Estándares Internacionales de Derechos Humanos." Presented at the I Congreso Sobre Pueblos Indígenas Aislados en la Amazonía Ecuatoriana: Situación y Problemática Conference, Universidad Andina Simón Bolívar, 22 November 2016. http://unsr.vtaulicorpuz.org/site/images/docs/special/2016-11-22-unsr-intervencion-ecuador-pueblos-en-aislamiento.pdf.

Thorpe, Rosemary and Laurence Whitehead, Eds. 1987. *Latin American Debt and the Adjustment Crisis.* London: MacMillan Press.

UASB (Universidad Andina Simón Bolívar). 2016. "I Congreso Sobre Pueblos Indígenas Aislados en la Amazonía Ecuatoriana." Website, accessed 19 March 2018. http://uasb.edu.ec/contenido?i-congreso-sobre-pueblos-indigenas-aislados-en-la-amazonia-ecuatoriana-situacion-y-problematica.

UN COMTRADE (United Nations Commodity Trade Statistics Database). (No Date). "UN Comtrade Database." Online database, accessed 19 March 2018. https://comtrade.un.org.

UNESCO (United Nations Educational, Scientific, and Cultural Organization). 2008. "Oral heritage and cultural manifestations of the Zápara people." *Intangible Cultural Heritage.* http://www.unesco.org/culture/ich/en/RL/00007

United Nations Statistical Division. (No Date). "UN Comtrade." Online database, accessed October 22, 2015. http://comtrade.un.org.

Ushigua, Gloria. 2014. Personal correspondence.

Ushigua, Manari and Gloria Ushigua. 2017. Letter to Ambassadors Liu Jieji and Wu Hatao. http://amazonwatch.org/assets/files/2017-05-01-un-sapara-china-letter-english.pdf.

Vakis, Renos, Jamele Rigolini, and Lenoardo Luccheeti. 2016. *Left Behind: Chronic Poverty in Latin America and the Caribbean.* Washington: World Bank. https://openknowledge.worldbank.org/handle/10986/21552.

Valdivia, Gabriela. 2007. "The 'Amazonian Trial of the Century': Indigenous Identities, Transnational Networks, and Petroleum in Ecuador." Alternatives: Global, Local, Political. 32, no. 1 (January): 41-72. https://doi.org/10.1177/030437540703200103.

Verburg, René, Saulo Rodrigues Filho, Diego Lindoso, Nathan Debortoli, Gabriela Litre, and Marcel Bursztyn. 2014. "The Impact of Commodity Price and Conservation Policy Scenarios on Deforestation and Agricultural Land Use in a Frontier Area within the Amazon." *Land Use Policy* 37 (March): 14-26. https://doi.org/10.1016/j.landusepol.2012.10.003.

Vernengo, Matias and Mathew Bradbury. 2011. "The Limits to Dollarization in Ecuador: Lessons from Argentina." *Journal of World Systems Research* 17, no. 2. https://doi.org/10.5195/jwsr.2011.403.

Wade, Robert H. 2016. "The Role of the State in Escaping the Middle-Income Trap: The Case for Smart Industrial Policy." *METU Studies in Development* 43, no. 1 (April): 21-42.

Water Footprint Network. 2012. "WaterStat." Online database, accessed October 22, 2015. http://waterfootprint.org/en/resources/water-footprint-statistics/.

WB (World Bank). (No Date). "Global Economic Monitor Commodities." Online database, accessed 19 March 2018. http://databank.worldbank.org/data/reports.aspx?source=global-economic-monitor-commodities.

WB (World Bank). (No Date). "Operations Manual." Website, accessed 20 November 2017. https://policies.worldbank.org/sites/PPF3/Pages/Manuals/Operational%20Manual.aspx.

WB (World Bank). 1991. "Operational Directive 4.20: Indigenous Peoples." in *The World Bank Operational Manual*. https://www.ifc.org/wps/wcm/connect/835cc50048855270ab94fb6a6515bb18/OD420_IndigenousPeoples.pdf?MOD=AJPERES

WB (World Bank). 1999. "Environmental Assessment Sourcebook 1999." https://siteresources.worldbank.org/INTSAFEPOL/1142947-1116495579739/20507372/Chapter1TheEnvironmentalReviewProcess.pdf.

WB (World Bank). 2003. "Implementation of Operational Directive 4.20 on Indigenous Peoples: An Independent Desk Review." http://lnweb90.worldbank.org/OED/oeddoclib.nsf/DocUNIDViewForJavaSearch/472DE0AEA1BA73A085256CAD005CF102/$file/IP_evaluation.pdf.

Whytock, Christopher. 2013. "Some Cautionary Notes on the Chevronization of Transnational Litigation." *Stanford Journal of Complex Litigation* 1, no. 2 (Spring): 467-485.

Wickstrom, Stefanie. 2008. "Cultural Politics and the Essence of Life: Who Controls the Water?" in *Environmental Justice in Latin America: Problems, Promise, and Practice,* David V. Carruthers, Ed. Cambridge: MIT Press.

Wolf, Sidney M. 1996. "Fear and Loathing about the Public Right to Know: The Surprising Success of the Emergency Planning and Community Right-to-Know Act." *Journal of Land Use and Environmental Law* 11, no. 2: 217-324.

World Bank Inspection Panel "Accountability at the World Bank: The Inspection Panel at 15 Years." 2009. Washington: World Bank. http://siteresources.worldbank.org/EXTINSPECTIONPANEL/Resources/380793-1254158345788/InspectionPanel2009.pdf

World Commission on Dams. 2001. "Dams and Development: A New Framework for Decision-Making." http://pubs.iied.org/pdfs/9126IIED.pdf.

World Resources Institute. 2014. "Cait 2.0 Climate Data Explorer" Online database, accessed May 16, 2018. http://cait.wri.org/historical.

Wyrth, David A. 1998. "Partnership Advocacy in World Bank Environmental Reform" in *The Struggle for Accountability,* Jonathan A. Fox and L. David Brown, Eds. Cambridge: MIT Press. http://lawdigitalcommons.bc.edu/cgi/viewcontent.cgi?article=2019&context=lsfp.

Yale and CIESIN (Yale Center for Environmental Law and Policy and the Center for International Earth Science Information Network of Columbia University). 2012. "Historical EPIs (2000-2010)" Online database, consulted 9 March 2018 from http://sedac.ciesin.columbia.edu/data/set/epi-environmental-performance-index-pilot-trend-2012/data-download.

Zuckerman, Adam. 2014. "Voices from Ecuador Echo in New York," *Amazon Watch*. 20 September. http://amazonwatch.org/news/2014/0920-voices-from-ecuador-echo-in-new-york.