Environmental Sociology

ISSN: (Print) 2325-1042 (Online) Journal homepage: https://www.tandfonline.com/loi/rens20

Gender inequality, reproductive justice, and decoupling economic growth and emissions: a panel analysis of the moderating association of gender equality on the relationship between economic growth and CO2 emissions

Julius Alexander McGee, Patrick Trent Greiner, Mackenzie Christensen, Christina Ergas & Matthew Thomas Clement

To cite this article: Julius Alexander McGee, Patrick Trent Greiner, Mackenzie Christensen, Christina Ergas & Matthew Thomas Clement (2020): Gender inequality, reproductive justice, and decoupling economic growth and emissions: a panel analysis of the moderating association of gender equality on the relationship between economic growth and CO2 emissions, Environmental Sociology, DOI: 10.1080/23251042.2020.1736364

To link to this article: https://doi.org/10.1080/23251042.2020.1736364

Published online: 05 Mar 2020.

ENVIRONMENTAL SOCIOLOGY
https://doi.org/10.1080/23251042.2020.1736364

Routledge
Taylor & Francis Group

ARTICLE

Gender inequality, reproductive justice, and decoupling economic growth and emissions: a panel analysis of the moderating association of gender equality on the relationship between economic growth and CO2 emissions

Julius Alexander McGee[a], Patrick Trent Greiner[b], Mackenzie Christensen[c], Christina Ergas[d] and Matthew Thomas Clement[e]

[a]Department of sociology, Portland State University, Portland, OR, USA; [b]Department of sociology, University of Oregon, Eugene, OR, USA; [c]Department of sociology, University of California Irvine, Irvine, CA, USA; [d]Department of sociology, University of Tennessee, Knoxville, TN, USA; [e]Department of sociology, Texas State University, Round Rock, TX, USA

ABSTRACT

Understanding how carbon dioxide emissions (CO_2) can be decoupled from economic growth is an important part of planning for climate change mitigation. A variety of critical environmental theories contend that the oppression of marginalized groups is interconnected with the mistreatment and destruction of nature. As a result, social equity, or the removal of barriers of structural inequality, often coincide with environmental quality and reduced environmental degradation. To date, there is limited research on the dialectical relationship between inequality, economic growth, and the environment. The present study seeks to further understand the relationship between social inequality and the environment by assessing how gender equality decouples economic growth from CO_2 emissions. We construct a fixed-effects panel regression model with robust standard errors that accounts for clustering in 140 nations to assess how gender inequality interacts with GDP per capita to influence CO_2 emissions per capita. Our findings indicate that in nations with more gender equality, the association between GDP per capita and CO_2 emissions is much lower than in nations with higher levels of gender inequality.

ARTICLE HISTORY
Received 21 May 2019
Accepted 26 February 2020

KEYWORDS
Environmental sociology; ecofeminism; decoupling; climate change

Introduction

Anthropogenic climate change, driven heavily by the emission of CO_2 into the atmosphere, is perhaps the largest environmental threat facing human civilization. Marked by rising sea levels, increased temperatures, and more extreme weather patterns, the effects of global climate change are increasingly more apparent (IPCC 2016). As such, a growing number of social scientists analyze the socioeconomic dynamics that induce CO_2 emissions (Dunlap and Brulle 2015; Stern, Sovacool, and Dietz 2016). Decades of research has established a clear link between economic growth and increased CO_2 emissions (Dietz and Rosa 1997; Fan et al. 2006; Jorgenson and Clark 2012; Wei 2011; York, Rosa, and Dietz 2003b). Additionally, a number of recent studies have demonstrated empirically that various forms of income inequality are associated with increases in CO_2 emissions (Jorgenson et al. 2015; Jorgenson, Schor, and Huang 2017; Knight, Schor, and Jorgenson 2017; McGee and Greiner 2018). While this line of research is unique and robust in its own right, ecofeminists have also long theorized that the oppression of marginalized groups, such as women, people of color, and animals (all groups whose oppression is tethered to income distribution patterns) is interconnected with the destruction of nature (Gaard 2011). Building on the empirical analyses that have demonstrated a clear link between income inequality and emissions, the present study seeks to explore how ecofeminist theories provide a nuanced understanding of the relationship between social inequality and emissions.

The present study explicitly expands on Ergas and York (2012) finding that nations with higher proportions of women in parliament have lower CO_2 emissions. In this study, the authors suggest that their findings are due in part to the historical legacy of women's oppression, which has relegated women to roles such as reproducers of life, subsistence laborers, and caregivers of children and the elderly (Denton 2002). As a result, the increasing number of women in parliamentary systems is often an indicator of reduced social and environmental inequality, as women are more likely than men to have strong concern for the environment (see Briscoe et al. 2019; Boyd 2002; Eisler, Eisler, and Yoshida 2003; Kalof et al. 2002; McCright 2010). Here we expand on Ergas and York (2012) findings by 1.) emphasizing a broader measurement of gender inequality; 2.) exploring how gender inequality moderates the relationship between economic growth and emissions; 3.) articulating the nuances of reproductive justice and economic growth. Our analysis is framed around the theory of critical

CONTACT Julius Alexander McGee julimcgee9@gmail.com

ecofeminism and critical environmental justice (Pellow 2016, 2017; Gaard 2017). As such, our goal is to explore how interlocking forms of oppression within and outside of state institutions correspond to environmental harm.

We construct a fixed-effects panel regression model with robust standard errors that accounts for clustering in 140 nations to assess how the relationship between economic growth and CO_2 emissions changes at different levels of gender inequality. We use the gender inequality index (GII) (United Nations 2016), which measures gender disadvantages in reproductive health, empowerment, and the labor market – in countries for which sufficient information is available to estimate gender inequality. We chose this measurement to capture the breadth of gender inequality at the national level. While our measurement is by no means perfect, it captures greater nuance in gender inequality than measures used in previous studies. Specifically, GII captures the multitude of ways that reproductive labor is exploited and expropriated. Thus, where as Ergas and York (2012) demonstrate that women's empowerment in the political sphere reduces environmental degradation, our study seeks demonstrate, in addition to the political sphere, how women's empowerment in terms of health and access to economic benefits reduce environmental degradation.

The logic of our modeling approach is in line with a critical ecofeminist framework, which understands the relationship between inequality and economic growth as a mutually interacting force behind environmental change. We hypothesize that economic development that is more conducive to the equitable distribution of resources amongst genders, is one that is less destructive to the environment. Our findings indicate that the relationship between economic growth and CO_2 emissions is more tightly coupled at high levels of gender inequality, and begins to decouple as gender inequality declines, supporting this hypothesis.

Background

The following sections will review research on the relationship between gender inequality and economic growth, and gender inequality and environmental degradation. Our goal is to establish an appropriate framework for understanding why and how gender inequality moderates the relationship between economic growth and emissions.

Our hypothesis is based on the assumption that gender inequality within nations tethers the expropriation of reproductive labor to the expropriation of the environment (Gaard 2017) such that reducing gender inequality decouples economic growth and environmental degradation. Specifically, we argue that gender inequality has a variable relationship to economic development such that the trajectory of gender inequality alters the relationship between economic growth and environmental conditions. To be clear, our discussion of relevant literature below is not intended to highlight gaps or limitations in previous research; rather, it is meant to provide the theoretical basis that advances the need for the further exploration of gender inequity and environmental problems.

Gender inequality and the environment

Gender and environment scholars have shown that cultural and material conditions affect gendered knowledge and experiences. In particular, ecofeminist scholars argue that there is a clear connection between social inequity, based on gender, race, nation, and other forms of stratification, and environmental exploitation. This is most readily seen in religious and scientific texts, which claim man's dominion over nature and simultaneously equate women with nature and indigenous peoples with beasts of burden (Merchant 1990). These discursive connections serve to justify and reinforce corporate externalities that disproportionately situate environmental burdens on the most vulnerable communities. Indeed, the Western logic of domination, inherent in capitalism, legitimizes the expropriation of women's reproductive labor, the labor of people of color, indigenous peoples' lands, and the environment. Unlike productive labor, which carries a monetary value that is estimated in traditional economic calculations, subsistence labor is treated as a natural resource whose wealth, in the form of reproduction, labor, or materials, is extracted with little or no remuneration. Accordingly, these different forms of oppression are interconnected and mutually reinforcing through geopolitical and economic relations. It is no accident that those who experience the most environmental ills, while contributing the least to these problems, also have the least political and/or monetary influence (Merchant 1990; Mies and Shiva 2014; Gaard 2017).

Feminist political ecologists contend that, rather than essential gender characteristics, material and cultural factors–such as gendered divisions of labor, knowledge, legal rights, public space access, and land and natural resource access–coalesce to create very distinct gendered perspectives on and experiences in local environments (Rocheleau, Thomas-Slayter, and Wangari 1996). Specifically, persistent gendered sociocultural structures that position women as primary caregivers and subsistence farmers while also denying them access to political decision-making affect women's experiences and environmental knowledge. Gendered economic structures also affect work predominantly performed by women, such as caring for the elderly and children as well as household labor, which allows wage laborers (who are mostly men) to spend a significant proportion of their time participating in contracted labor agreements. Subsistence and reproductive labor is also environmentally tenuous (Seager, Mies, and Shiva 1995; Mies 2014; Shiva 2016). As a result, the circumstances of women and other marginalized groups are bound to ecological conditions.

The rise of neoliberal capitalism has resulted in the further proliferation and monetization of subsistence and reproductive labor. For instance, treaties under free trade agreements, such as the *General Agreement on Trade in Services* (GATS), monetize household labor and other forms of subsistence. However, this work is still predominantly performed by women and employment and wages are unstable (Mies and Shiva 2014). As a result, women disproportionately participate in informal labor that is not protected by unions and government policies. While to the myopic observer, these policies seem to address the fundamental issues associated with labor expropriation, upon closer examination, it is revealed that these forms of labor reproduce gender inequality on a global scale. Working and middle class women in the global north now rely on the cheap labor of women from the global south in a care chain (Hochschild 2000; Parreñas 2000, 2001), which increases the labor burdens of women in the global south (Mies 2007, 2014). Moreover, although subsistence work is increasingly becoming a form of wage labor, it is still environmentally tenuous and predominantly performed by women (Mies 2007).

Macro quantitative research in environmental sociology has interrogated this reality by integrating the theoretical underpinning of ecofeminism and feminist political ecology with various global theories on environmental degradation and unequal exchange. For example, Norgaard and York (2005) explore environmental treaty ratification cross-nationally and percent of women holding seats in parliament. Specifically, the authors merge ecofeminism and theories on gender and the environment to explore the implications of increased participation of women in parliamentary governments. They found that nations with higher proportions of women in parliament ratify a greater number of environmental treaties. Similarly, the United Nations (2016) reported that, between the years 1990–2004, 18 of the 70 most developed nations in the world had stabilized or reduced their carbon emissions. Of these 18 nations, 14 had a greater than average percentage of women as elected representatives (Buckingham 2010). Further, Shandra, Shandra, and London (2008) found that nations with a higher proportion of women's non-governmental organizations (NGOs) also had lower per capita rates of deforestation. Results from cross-national research conducted by Ergas and York (2012) demonstrate that CO_2 emissions per capita are lower in nations where women have higher political status.

McKinney (2014) work combines ecofeminism with theories of unequal ecological exchange (Bunker 1988; Hornborg 1998, 2001) to reveal the dialectical relationship between gender inequity and environmental harm as well as improved gender equity and environmental conditions. She finds that resource degradation disproportionately has a negative association to women, but that women's significant representation in government 'bodes well for the environment' (207). In addition, McKinney and Fulkerson (2015) find that ecological losses weaken women's status in nations. However, nations with greater female representation in governing bodies have lower climate footprints. Even if we do not fully understand the exact mechanisms for these relationships, taken together, these results indicate that when women have more political power – and greater gender equity – within nations overall environmental conditions tend to improve.

Gender inequality and economic growth

Building off Marilyn Waring (1988, 1999) foundational work in the late 1980 s, a significant body of feminist economic literature has increasingly examined the complex interplay between gender inequality and economic development. Waring was one of the first to notice the deleterious effects that women's nationally invisible unpaid labor has on their rights and autonomy. It was her work that inspired the United Nations' Gender Inequality Index (GII). Consistent with the three measures of the GII, the research that followed Waring's work has established that gender disadvantages in education, health, and labor market outcomes are key factors influencing long-term economic growth. Thus, by exploring the impact of gender inequality across multiple dimensions, this literature unveils how the interrelated nature of women's oppression compounds to shape economic development cross-nationally.

A number of studies examine the cost of gender inequality in education. While earlier research has suggested a positive relationship between gender gaps in education and economic growth (Barro and Lee 1994; Barro and Sala-i-martin 1995; Klasen and Lamanna 2009), more recent analyses, utilizing updated data and 'more careful econometric techniques' (Klasen and Lamanna 2009, 92), indicate that gender gaps in education actually reduce economic growth over time (King and Hill 1993; Dollar and Gatti 1999; Forbes 2000; Appiah and McMahon 2002; Klasen 2002; Knowles, Lorgelly, and Owen 2002; Klasen and Lamanna 2009). Notably, this economic loss is shown to be most significant among countries with the largest gender gaps. Theoretically, scholars reconcile these findings by arguing that gender inequality in educational attainment reduces the quality of human capital in a society, by 'artificially restricting the pool of talent from which to draw for education' (Klasen and Lamanna 2009, 93). In doing so, countries reduce economic growth by limiting the availability and quality of productive workers (Dollar and Gatti 1999; Klasen 2002; Esteve-Volart 2009; World Development Report 2012).

In addition, promoting female education has been shown to have a positive impact on the human capital of the next generation. According to the World Bank Report (1993), increased education promotes women's health knowledge, subsequently improving the health of their children. For instance, women with higher levels of education have been shown to have increased bargaining power within the household (Gummerson and Schneider 2012),which has a positive association to child health and nutrition (Thomas 1990; Klasen 1999). Economic and educational empowerment increases contraception use among women, leading-ing to improved reproductive health outcomes (Schuler and Hashemi 1994). In fact, a number of studies have established that promoting female education reduces child mortality and adolescent birth rates, stimulating economic development by increasing the rate of return to physical investments (Galor and Weil 1996; Klasen 2002; King, Klasen, and Porter 2008). Beyond the benefits bestowed to children, improving the status of women improves women's power within their community (Agarwal 1997). In turn, community membership can provide women with economic support through increased employment opportunities, access to credit, and help in crisis (Schuler and Hashemi 1994; Agarwal 1997).

Similar to gender inequality in education, reducing women's labor force participation decreases economic growth. In a study examining gender inequality and growth in India, Esteve-Volart (2004) found that gender bias in employment and managerial positions has a significant negative impact on economic growth over time. Further, using cross-national and panel regression models, Klasen and Lamanna (2009) found that gender gaps in employment, measured by examining relative labor force participation rates, significantly reduces economic growth in developing countries over time, particularly in the Middle East, North Africa, and South Asia. Examining this relationship, scholars argue that by restricting women's access to paid employment opportunities, countries increase their average cost of labor, subsequently disadvantaging their international competitiveness (World Bank 2001; Busse and Spielmann 2006; Klasen and Lamanna 2009). However, conflicting work by Seguino (2000a, 2000b) suggests that gender inequity in employment and education interact to contribute to economic growth among export-oriented, middle-income countries, as these countries are able to capitalize on the uncompensated reproductive and household labor of women. While this work examines a relatively small subset of semi–industrialized countries, it demonstrates (1) how different forms of gender inequality intersect to influence economic activity, and (2) that the association between gender inequality and economic activity varies cross-nationally.

Modeling approach

Our modeling approach is in line with previous research that has explored socioeconomic drivers of environmental degradation and the decoupling of economic growth and emissions (York, Rosa, and Dietz 2003a, 2003b; Ergas and York 2012; Jorgenson and Clark 2012; Dietz et al. 2015; York and McGee 2017; McGee et al. 2017; McGee and Greiner 2018). Our model assesses known drivers of emissions (the structure of population, and affluence) and additionally analyzes the moderating association of gender inequality. Traditional models assessing the relationship between socioeconomic activity and the environment have centered their analyses on theories of environmental degradation, such as unequal ecological exchange (Bunker 1988) and the treadmill of production (Schnaiberg 1980). These theories are employed to interpret the broader environmental implication of capital accumulation. We expand on these analyses theoretically by exploring how the association between capital accumulation and the environment changes as gender inequality decreases. Previous macro quantitative research exploring the relationship between gender equality and the environment has also incorporated broader aspects of world systems theory (Ergas and York 2012; McKinney 2014). We elected not to explore world systems theory quantitatively, due to the nature of our analysis. World systems positions are theorized to change over time (Clark and Beckfield 2009). Since we are using panel data, it is problematic to control for positions that may have changed within the time of our study. Nonetheless, we build on world systems theory by analyzing how structural changes in the global economy are associated with changes in the relationship between gender inequality and the environment over time.

Although income and inequality have been found to have a direct association with emissions (Ravallion, Heil, and Jalan 2000; Jorgenson et al. 2015; Jorgenson et al. 2016a; Jorgenson, Schor, and Huang 2017; Knight, Schor, and Jorgenson 2017), our modeling technique assumes that the association of gender inequality is interconnected with economic activity, such that changes in gender inequality significantly alter the nature of the relationship between economic growth and emissions. Therefore, our model is constructed on the assumption that gender inequality will lead to a stronger or weaker association between economic development and emissions.

In general, our modeling technique speaks to a broader discussion on economic and environmental decoupling. Within these debates, scholars are generally concerned with the degree to which economic growth can continue without contributing to further consumption or emissions (Jackson and Victor 2019). While there is a degree of nuance in this debate between relative decoupling, which refers to a reduction in the intensity of emissions, and absolute decoupling, which refers to a complete reduction in emissions. In this instance, the term decoupling refers to the relative change in the nature of the relationship between GDP per capita and CO_2 emissions per capita, where economic growth results in substantially lower emissions when gender equality is considered. Conversely, tighter coupling refers to a change in the nature of the relationship between GDP per capita and emissions, where economic growth results in substantially more emissions when gender is considered. We hypothesize that gender equality moderates the association between economic growth and emissions, resulting in a less pronounced association between economic growth and per capita emissions at higher levels of gender equality.

Theoretically, our hypothesis assumes that decoupling occurs due to reductions in the expropriation of reproductive and subsistence labor. Specifically, we argue that higher rates of education, access to healthcare, and liberalization of labor options may decouple the exploitation of women and the environment, as women are given more autonomy. In this instance, subsistence labor moves away from being a form of expropriation to a form of exploitation. While the accumulation of wealth associated with subsistence labor is still a form of exploitation, it is now accounted for in traditional measurements of economic activity, such as GDP. Thus, we contend that increases in gender equality associated with economic growth are not necessarily reducing emissions. On the contrary, one may interpret decoupling of economic growth and emissions sparked by gender equity as simply increases in economic development that are less environmentally intensive.

Data and methods

We constructed fixed-effects panel regression models with robust standard errors that account for clustering in 140 nations (excluding former Soviet Republics[1]) in 1995, 2000, 2005, 2010–2014, using the nation as the unit of analysis and including dummy variables for each year to control for general period effects. Our panels are unbalanced due to unavailable data on GDP per capita in some years for nations, and unavailable data on GII in the years 1995, 2000, and 2005 in a few nations.[2] The GII was not collected annually until 2010. As a result, our data is weighted toward later years. We chose to include all available data in our models, which includes 1995 2000, and 2005, however we acknowledge the limitation of this approach. We ran additional models using the years 2010–2014 and our results did not substantially change. The models presented below include data from 1995, 2000 and 2005.

Our modeling approach also controls for any effects that are constant over the span of time examined for each nation, such as geographic and geological characteristics, and any effects that are constant across nations for a given point in time. Fixed-effects allows us to estimate how changes in our independent variable correlate with changes in our dependent variable. All reports of statistical significance or non-significance are based on a 0.05 alpha level with a two-tailed test.

We designated countries as less developed and developed using the World Bank's classification. The World Bank's classification of nations as developed or less developed uses gross national income to categorize nations with the highest income as developed and other nations as less developed. We acknowledge that there are numerous problems with this classification. Thus, we ran additional models (that can be made available upon request) that classified nations based on geographical location, which has been done in similar analyses (see Klasen and Lamanna 2009). In these models, the only region that had significantly different results from other regions was Southeast Asia. We constructed additional models that excluded these nations and our results did not substantially change. The models presented below include nations from Southeast Asia. The latest year that nations were categorized into developed and less developed for this study was 2015.

As a robustness check, models were also run wherein nations were grouped according to four income classifications (high, middle high, middle low, and low). We also ran models that included variables measuring foreign direct investment, exports as a percent of GDP, and manufacturing as a percent of GDP were included. The results of all of these analyses did not differ meaningfully from those presented here. Meanwhile each subsequent classification (middle high-income, low middle-income, and low-income) was not found to be substantively different from the main association of GII, GDP per capita, or the interaction of GII and GDP per capita. Controlling for foreign direct investment, exports as a percent of GDP, and manufacturing as a percent of GDP did not alter the substantive association of the interaction of GII and GDP per capita on emissions. Including these variables did reduce our sample size, as data on each variable is limited. Thus, we do not include these variables in the models presented here. We also estimated models that include a quadratic term for GDP per capita to assess the degree to which there is a Kuznets Curve (Dinda

2004). We estimated these models to assess how efforts to reduce emissions that are captured in GDP per capita, potentially affect our analysis. In these models, the quadratic term was not significantly different from zero. This suggests that efforts to reduce emissions that are captured in GDP per capita have not significantly reduced emissions in the nations and years we are analyzing. The results of these robustness checks are available upon request.

All data used in the models from this analysis, with the exception of gender inequality index (GII), are from the World Bank's world development indicators (World Bank 2017). The dependent variable in all of our models is national CO_2 emissions (metric tons) per capita from the burning of fossil fuels and cement. All of our models use two control variables – urbanization, which measures the percentage of individuals living in urban areas, and the percentage of the population that is between the ages of 15 and 64. Each of these variables have been found to significantly influence CO_2 emissions at the national level and are commonly used as controls in STIRPAT analyses (for more see York, Rosa, and Dietz 2003b; Liddle 2014). Additionally we include a dummy variable for less developed nations to assess whether developmental pathways alter the slope estimates of our main indicator variables.

Our models have two main indicator variables – GDP per capita in constant 2010 U.S. dollars and gender inequality. We measure gender inequality using the United Nations Development Progamme's (2016) gender inequality index (GII). The GII uses a range from 0, where women and men fare equally, to 1, where one gender fares as poorly as possible in all measured dimensions. The index captures gender-based disadvantage in three dimensions – reproductive health, empowerment, and the labor market. Reproductive health is measured using maternal mortality (deaths per 100,000 live births) and adolescent birth rate (births per 1,000 women ages 15–19). Empowerment consists of the difference in the percent of men and women that hold seats in parliament and the difference in the percent of men and women who have acquired at least a secondary education. Lastly, labor market consists of the difference in the percent of men and women (ages 15+) who participate in the labor market.

The GII captures aspects of gender inequality that are known to impact economic growth and CO_2 emissions (see above sections). As such, it is useful for understanding how the oppression of women moderates the relationship between economic growth and CO_2 emissions. We chose to use GII, as opposed to singular components that comprise the GII, or other measurements of inequality, because previous research suggests that the components of GII are linked to one another. However, the GII is not without its criticisms. In an assessment of the GII, Permanyer (2013) argues that the construction of the GII '(1) penalizes low-income countries for poor performances in the reproductive health indicators that are not entirely explained by the gender-related norms or discriminatory practices (but rather owe to their low-income status); (2) does not reach the expected or normatively desirable value of zero, even when women and men fare equally in all indicators; (3) allows deteriorations in women's education and economic participation to be compensated by equivalent deteriorations in men's corresponding dimensions, but somewhat arbitrarily does not have a counterpart compensation when a deterioration in women's reproductive health outcomes occurs; and (4) completely disregards men's average health status'. The author concludes that research using the GII should be cautious when interpreting results.

Broadly speaking, Permanyer's criticisms concern the ability of the GII to accurately compare gender inequality cross-nationally and consistently represent disparities between men and women. In response to the former point, we correct for this by including a dummy variable for economic development and interacting it with GII and GDP per capita, allowing the association of GII to vary based on the overall economic development of a nation. We interpret our results noting this difference, and find that the penalty acknowledged by Permanyer does not change the overall trajectory of the association between GII and GDP per capita. In regards to the latter point, although we agree with Permanyer's criticism that GII lacks an equivalent measurement for men's health, as it pertains to how the GII is used by the United Nations; our hypothesis is concerned with how the oppression of women moderates the relationship between economic growth and CO_2 emissions. Thus, we are less concerned with how women fare in a nation comparatively to men and more concerned with the overall oppressive circumstances faced by women. Indeed, men do not have a comparable measurement of maternal mortality and adolescent birth, however, the lack of a comparable measurement in the GII does not disqualify it from capturing the overall oppressive circumstances faced by women.

Recently, the GII has been used in empirical studies to explore how gender inequality is associated with the transmission of HIV (Richardson et al. 2014). Additional studies have explored how GII predicts the prevalence of violence enacting against women (Gressard, Swahn, and Tharp 2015; Redding et al. 2017). Finally, a 2016 study by Marphatia et al. explored how GII is associated with child malnutrition. In all of these studies, GII is discussed as a strong predictor of health, violence, and child nutrition, demonstrating its usefulness as a measurement of complex gender dynamics.

All variables are in natural log form (except period dummy variables). Thus, the regression models estimate elasticity coefficients where the coefficients for an independent variable is the estimated net percentage change in the dependent variable associated with a 1% increase in the independent variable. Elasticity models are common in structural human ecology (Dietz and Jorgenson 2013) and transform traditional additive regressions into multiplicative models, allowing models to convey the proportional association between the independent and dependent variables.

Results

Table 1 shows the descriptive statistics of all the variables used in our analysis unlogged. Table 2 displays the nations in the less developed and developed groupings. Table 3 shows the statistical models used to analyze the moderating association of gender inequality on the relationship between economic growth and CO_2 emissions. Model 1 in Table 3 shows the association of each variable used in our analysis and CO_2 emissions per capita. Here we find that GDP per capita, GII, and the percentage of the population age 15–64 all have a positive and significant association to emissions per capita. Also, note that in models not shown here we tested for a potential non-linear association between GDP per capita and CO_2 emissions per capita, and found that the non-linear term was not significant at.05 test. The findings in Model 1 are all consistent with previous research (see York, Rosa, and Dietz 2003b; Jorgenson and Clark 2012; Ergas and York 2012).

In Model 2 of Table 3 we assess whether or not our dummy variable for less developed nations significantly alters the slope estimates of GDP per capita and GII. Based on previous findings (Jorgenson and Clark 2012), we expected the association between GDP per capita and emissions to be different in developed and less developed nations, however through years analyzed in our model this is not the case. As is the case with model 1, model 2 demonstrates that GDP per capita, gender inequality, and the proportion of the nation that is of an economically productive age (15–64) are positive and significant drivers of CO_2 emissions per capita.

Table 1. Descriptive statistics of dependent and independent variables (unlogged).

Variable	Mean	Standard deviation	Minimum	Maximum
CO2 emissions per capita (metric tons)	4.786	6.595	.011	70.136
GII	.392	.193	.04	.831
GDP per capita (in constant 2010 U.S dollars)	2.89e+11	1.16e+12	2.14e+07	1.69e+13
Population ages 15–64	61.333	7.096	45.708	85.963
Percent urban population	56.074	24.856	5.416	100

Table 3. Association of Gender Inequality Index (GII) and GDP Per Capita on emissions per capita in in developed and less developed nations (all variables are log transformed).

Independent variables	Model 1 coefficients (standard errors)	Model 2 coefficients (standard errors)	Model 3 coefficients (standard errors)
GDP per capita	.726***	.485***	.630***
	(.091)	(.148)	(.163)
GII	.265***	.229***	.-1.257
	(.071)	(.070)	(.723)
Population age 15-64	1.205***	.847*	.786*
	(.335)	(.407)	(.398)
Percent urban population	.273	.116	−.016
	(.289)	(.288)	(.288)
Less developed nations	−.016	−2.695	−2.853
	(.025)	(1.433)	(1.623)
Less developed nations*GDP per capita		.319	.348
		(.178)	(.197)
Less developed nations*GII		−.119	−.755
		(.169)	(1.201)
GDP per capita*GII developed nations			.138*
			(.070)
GDP per capita*GII less developed nations			.247*
			(.110)
R2 within	.467	.458	.483
Nations	140	140	140
Nation-years	1,011	1,011	1,011

p <.001***; p <.01**; p <.05*(two-tailed tests with 0 as null hypothesis); standard errors in parentheses.

Table 2. Less developed and developed nation groupings.

Less Developed	Developed
Afghanistan, Albania, Algeria, Argentina, Bangladesh, Belize, Benin, Bhutan, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, China, Colombia, Democratic Republic of the Congo, Republic of the Congo, Costa Rica, Cote d'Ivoire, Cuba, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Fiji, Gabon, The Gambia, Ghana, Guatemala, Guyana, Haiti, Honduras, India, Indonesia	Australia, Austria, The Bahamas, Bahrain, Barbados, Belgium, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, South Korea, Kuwait, Luxembourg, Malta, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Qatar, Saudi Arabia, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Tonga, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States, Uruguay
Iran, Iraq, Jamaica, Jordan, Kenya, Lao PDR, Lebanon, Lesotho, Liberia, Libya, Malawi, Malaysia, Maldives, Mali, Mauritania, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Namibia, Nepal, Nicaragua, Niger, Pakistan, Panama, Papua New Guinea, Paraguay Peru, Philippines, Romania, Rwanda, Samoa, Sao Tome and Principe, Senegal, Serbia, Sierra Leone, South Africa, Sri Lanka, St. Lucia, Sudan, Suriname, Swaziland, Tanzania, Thailand, Togo, Tonga, Tunisia, Turkey, Uganda, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe	

Model 3 of Table 3 is included in order to explore the moderating association that gender inequality has on economic development, as well as whether such moderation differs substantially in less developed nations relative to developed nations. In order to explore this, we incorporate an interaction term between the indicators GDP per capita and GII in model 3, which we then interact with a dummy variable for economic development (less developed is coded as 1 and more developed is coded as 0, making developed nations the reference group). It is important to note that the inclusion of complex interaction terms, by necessity, introduces multicollinearity into models. However, multicollinearity arising from the inclusion of interactions and quadratic terms can, in fact, be ignored without biasing interpretations due to inflated standard error estimates so long as the variables being interacted are not highly collinear themselves (Cortina 1993). Variance inflation factors of GDP per capita and GII were found to be 1, suggesting that these two variables are sufficiently independent from one another to avoid type II errors arising as a result of the inclusion of the three-way interaction term. Including the interaction term between GDP per capita and GII requires that the relationship between the main association of these two variables and CO_2 emissions be interpreted as conditional. The result of this is that the associations are reported for GDP per capita (0.630) and GII (−1.257) are the estimated associations and significance of each variable when the other is 0. The coefficient for the interaction between GDP per capita and GII is positive and significant in both developed and less developed nations. This indicates that as GII – or gender inequality broadly speaking – increases so too does the association that GDP per capita has with CO_2 emissions per capita. Additionally, the positive and significant coefficient for the interaction between GDP per capita and GII in less developed nations suggests that the association of this interaction is stronger in less developed countries than it is in more developed ones.

The inclusion of the interaction terms makes the interpretation of individual coefficients notably more complex. The significant interaction between GDP per capita, GII, and the more developed/less developed dummy requires that these variables be interpreted in light of one another. In order to aid in the interpretation of these results, in Table 4 we have reported the estimated coefficients for GDP per capita and the GII at the 1st percentile, the 25th percentile, the median, the 75th percentile, and the 99th percentile of the variables that they are conditioned upon. Examination of Table 4 demonstrates that beyond the first percentile of GII (0.049) GDP per capita has a positive and significant relationship to CO_2 emissions per capita in both more developed and less developed nations. Importantly, this finding suggests that, across all nations, when gender inequality is at its lowest observed value there is no expected association between economic development and CO_2 emissions. In other words, in highly gender equal societies there does appear to be a decoupling between GDP per capita and CO_2 emissions per capita. Further, as can be seen in Table 4, as the value of the GII increases the association between GDP per capita and emissions per capita becomes increasingly positive. As suggested in Table 3, the increase in the size of the association between GDP per capita and emissions is also notably larger in less developed nations than it is in developed nations, indicating that in less developed nations increases in gender inequality leads to a tighter coupling between economic development and environmental impact than it does in more developed ones.

Turning to the estimated association of GII on CO_2 emissions conditional upon GDP per capita, Table 4 indicates that it is only at rather high levels of GDP per capita that GII has a direct impact upon CO_2 emissions per capita. Specifically, close examination of the expected coefficients for GII at various levels of GDP per capita reveals that it is not until GDP per capita is greater than or equal to approximately the 75.5th percentile of all nations ($20,537) that GII is expected to have a statistically significant impact on CO_2 emissions per capita in less developed nations. Similarly, it is not until GDP per capita is greater than or equal to the 78th percentile of all nations ($23,318) that the

Table 4. Estimated slope coefficients for GDP Per Capita and GII conditional upon one another in developed and less developed nations.

Estimated GDP Per Capita Coefficients			Estimated GII Coefficients		
GII Values	Developed Nations	Less Developed Nations	GDP Values	Developed Nations	Less Developed Nations
1st Percentile	0.214	0.234	1st Percentile	−0.482	−0.624
(GII = 0.049)	(0.190)	(0.288)	($278)	(0.334)	(0.382)
25th Percentile	0.422**	0.605***	25th Percentile	−0.255	−0.219
(GII = 0.221)	(0.142)	(0.148)	($1,436)	(0.223)	(0.237)
Median	0.515***	0.772***	Median	−0.072	0.108
(GII = 0.434)	(0.143)	(0.112)	($5,411)	(0.137)	(0.178)
75th Percentile	0.551***	0.836***	75th Percentile	0.109	0.432
(GII = 0.564)	(0.147)	(0.109)	($20,122)	(0.070)	(0.222)
99th Percentile	0.591***	0.909***	99th Percentile	0.312***	0.797*
(GII = 0.756)	(0.154)	(0.114)	($88,394)	(0.096)	(0.344)

p <.001***; p <.01**; p <.05*(two-tailed tests with 0 as null hypothesis); standard errors in parentheses.

association of GII on emissions is estimated to be statistically significant in more developed nations. Importantly, though the estimated main association of GII was found to be negative in both less developed and more developed nations, at the levels of GDP per capita where the association of GII on emissions is statistically meaningful, the coefficients are positive. Further, we note that there are no developed nations with a GDP per capita equal to or greater than the 75.5th percentile of all nations. This finding illustrates both that 1) gender inequality, as measured by the GII, only has a direct impact on CO_2 emissions per capita in relatively wealthy, more developed nations, and 2) in such nations increasing gender inequality negatively impacts the environment. While beyond the scope of this analysis, this finding suggests that gender equality that is interconnected with high levels of economic development increases emissions. Future research that disaggregates the components of GII may be able to identify the nuances behind this phenomenon.

In Figure 1 (found here), we present the results graphically using a three-dimensional plot of the estimated relationship between GDP per capita, GII, and CO_2 emissions in both less developed and more developed nations. These results can be seen statically in Figure 1 (a,b) below. In general, Figure 1 demonstrates that, at low levels of GII, GDP per capita has a minimal association with emissions in both more developed and less developed nations. Further, as GII increases the association between GDP per capita and emissions becomes increasingly positive, though the rate of increase is much more dramatic in less developed nations than it is in more developed nations. This is true of the association of GII as well, where at lower levels of GDP per

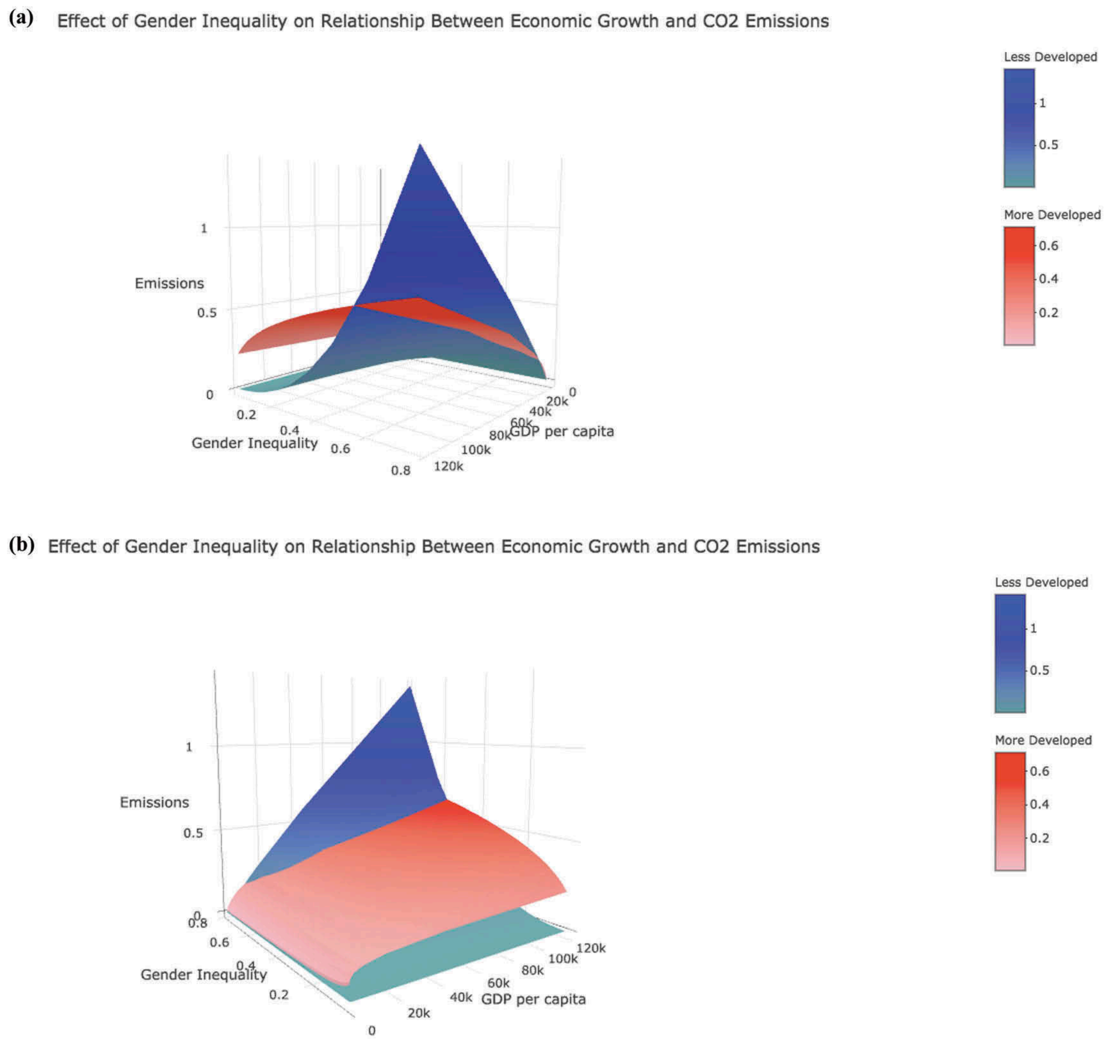

Figure 1. (a) Displays the results of the interaction between GII and GDP per capita on CO_2 emissions per capita in Developed and Less Developed Nations, allowing us to see this relationship when GDP per capita and GII are at their highest values. Figure 1.a provides a view of the relationship between GDP per capita and emissions when GII is at its highest values, and, conversely, a view of the relationship between GII and CO_2 emissions per capita when GDP is at its highest values. (b). Displays the results of the interaction between GII and GDP per capita on CO_2 emissions per capita in Developed and Less Developed Nations, providing a view of the relationship between GDP per capita and CO_2 emissions per capita when GII is at its lowest. This perspective also allows for a view of the relationship between emissions and the interaction between GII and GDP per capita throughout most values in Developed Nations. Similarly, from this perspective it is possible to the view effect of the interaction on emissions at higher levels of GII in Less Developed Nations.

capita it can be seen to have a weak negative association with emissions (though the relationships are not statistically significant at these levels of GDP per capita), and at higher levels of GDP per capita (greater than about 20,000 USD) the relationship begins to be positive, and dramatically so in less developed nations. Interestingly, Figure 1 indicates that though more developed nations are expected to have greater emissions than less developed nations throughout the majority of the observed values, at very high levels of GII and GDP per capita the estimated levels of emissions are higher in less developed nations than in developed ones.

Discussion and conclusion

The findings presented here indicate that 1) increasing gender inequality in both developed countries and less developed countries leads to a tighter coupling between economic growth and CO_2 emissions and, 2) the association of gender inequality on the relationship between economic development and CO_2 emissions is much stronger in less developed countries. Still the question remains, why and how does this phenomenon occur? Because our data cannot answer these questions effectively, we believe it is necessary to return to the three constitutive components of the GII and explore how changes in each are related to ecofeminist and feminist political ecologist theories on anthropogenic drivers of environmental degradation.

Due to limitations in our data, we cannot parse out the mechanisms that lead to the above results. However, to begin to develop such an understanding, we turn to the potential ways in which political empowerment of women might lead to a reduction in the GDP per capita, CO_2 emissions per capita relationship. As noted above, ecofeminism contends that the extent of natural resource exploitation is interconnected with the devaluation of reproductive and subsistence labor that is typically performed by women. For example, Waring (1999) has noted how the economic value added by nature, and much of the work performed by women globally, is systematically ignored within the United Nations System of National Accounts, specifically in measurements of GDP and gross national income. Increases in gender equality may increase the ability of GDP to capture the value of work performed by women. Further, Waring, Marilyn (1999) demonstrated that, routinely, it is not until resources such as forests and water sources are damaged and must be repaired that they are considered of value in the economic sense of the word. Unfortunately, such valuation does not take place until after the populations, which rely on these resources for fuel, water, food, and fiber, have lost access to them. Due to socio-cultural conditions that structure gendered divisions of labor, such burdens fall primarily on the shoulders of women, who are commonly responsible for tasks such as collecting water and biomass as a result of the imposition of traditional gender roles (Dankelman 2008, 2010). Beyond the increase in workload that women often experience as a result of climate change, a phenomenon that is particularly acute in less developed nations, previous research has also found that women are typically more vulnerable in the event of natural disasters, where women often face an increased risk of experiencing sexual and domestic violence (Aguilar, Granat, & Owren 2015). Considering research that shows distinct gendered environmental experiences, it seems plausible that nations in which the percent of women who hold parliamentary seats more closely approximates the percent of men in such positions would generally be more aware of, and concerned with, the outcomes of climate change – and, thus, more likely to implement policies which mitigate CO_2 emissions tied to economic processes. Though such a possibility is not directly examined here, previous research has demonstrated that nations where women have a larger share of parliamentary seats are more likely to ratify international environmental treaties (Norgaard and York 2005), and that nations where women have higher political status have lower CO_2 emissions per capita on average (Ergas and York 2012).

In addition to the effect that changes in women's empowerment has on political and economic processes that are related to CO_2 emissions per capita, changes in the education, health, and labor component of the GII provides a potential pathway for the decoupling of GDP per capita and CO_2 emissions. Further, access to paid labor also increases women's bargaining power within the family, which results in higher family savings and productive family investments (Seguino et al. 2003). These savings and investments may be used to alleviate the environmental impacts of reproductive and subsistence labor as it grants women more control over household resources. Thus similar to the indirect effect that women's empowerment has on the environment at the national level (Norgaard and York 2005; Ergas and York 2012), increasing women's power within the family may produce positive environmental outcomes.

Finally, education, healthcare, and labor force participation are all activities accounted for in estimates of GDP per capita. Gross domestic product (GDP) is the sum of a nation's private consumption, gross investment, government investment, government spending, and the net of imports/exports. To alleviate the disparity between men and women's educational attainment, it is likely that governments increase spending in order to accommodate the growing number of women in schools. Similarly, it is likely that governments and private entities enhance investments and spending to increase women's healthcare. Reducing the disparity in labor force participation between men and women increases private consumption and potentially increases government spending and private investments. Thus, gender equality may increase national levels of GDP in less environmentally destructive ways, resulting in decoupling, but not declines, in overall CO_2 emissions.

Comprehensively, it seems that increases of gender equality decouple economic growth from emissions; however, we urge caution when interpreting the broader implications of these results. First, it should be noted that decoupling does not suggest CO_2 emissions are declining. It simply means that the relationship between economic growth and emissions is less pronounced at higher levels of GII. Second, as is the case with all macro quantitative research using aggregate data, our findings are based on relative associations and do not indicate causal mechanisms. Thus, our findings do not indicate that gender equality is a singular cause of decoupling, rather a strong correlative factor in instances of decoupling. Further, our data do not capture the all of the intricate and complex relations between nations. Specifically, the power dynamics between nations that result in certain country's production occurring at the behest of other country's consumption. Finally, understood within the context of previous research on inequality and the environment (Ravallion, Heil, and Jalan 2000; Jorgenson et al. 2015; Jorgenson et al. 2016b; Jorgenson, Schor, and Huang 2017; Knight, Schor, and Jorgenson 2017; McGee and Greiner 2018), our findings provide further evidence that there is a positive relationship between inequality and environmental degradation (Pellow 2017). We recommend further research on this topic to better understand this phenomenon.[3]

Notes

1. We exclude former Soviet Republics because previous research has found that economic development in these nations have unique associations to CO_2 emissions (see York 2008). Robustness checks revealed that while our overall findings are consistent when we include former soviet republics, on their own, they have a significantly different correlation than all other nations.
2. Robustness checks reveal that our findings are substantively unchanged when we exclude nations with missing data points in order to have balanced panels.
3. As a robustness check models were also run wherein nations were grouped according to income classification as opposed to the World Bank's development classification. The results of these analysis did not differ meaningfully from those presented here. The results of these robustness checks are available upon request.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Julius Alexander McGee is an assistant professor of sociology at Portland State University. His research explores socioeconomic factors that mitigate and contribute to climate change.

Patrick Trent Greiner is an assistant professor of sociology at Vanderbilt University. His research engages with the relationships among social structures, inequality, and environmental outcomes. He is also interested in the interface of resource management, biodiversity loss, environmental justice, and public policy.

MacKenzie A. Christensen is a Ph.D. student in the Department of Sociology at the University of California, Irvine. Her research interests include gender, social demography, and technology and digitalization. Her most recent project examines cross-national gender differences in technological self-efficacy, with particular attention to how national indicators of gender inequality and societal affluence shape cultural gender beliefs.

Christina Ergas is an Assistant Professor at the University of Tennessee. She completed a Postdoctoral Fellowship at the Institute at Brown for Environment and Society in 2017 and received a PhD from the University of Oregon in 2013. Dr. Ergas generally researches the relationship between social inequities and the natural environment. A few journals she has published research include *Social Science Research*, *Rural Sociology, Journal of World-Systems Research, Critical Sociology,* and *Organization and Environment.*

Matthew Thomas Clement is an Assistant Professor of Sociology at Texas State University, where he teaches classes on statistics and environmental sociology. His research focuses on two questions pertaining to socio-environmental interactions: How does modern development transform and respond to changes in the built and natural environments, and what role does urbanization play in this process? Previous work on these topics has been published in Population and Environment, Social Forces, and Social Science Research.

ORCID

Mackenzie Christensen http://orcid.org/0000-0001-9124-9888

References

Agarwal, B. 1997. "Bargaining"and Gender Relations: Within and beyond the Household." *Feminist Economics* 3 (1): 1–51. doi:10.1080/135457097338799.

Aguilar, L., M. Granat, and C. Owren. 2015. "Roots for the Future: The Landscape and Way Forward on Gender and Climate Change." In Lorena Aguilar, Margaux Granat, and Cate Owren (Eds.)., *Global Gender and Climate Alliance and International Union for Conservation of Nature*. Washington, DC: IUCN & GGCA.

Appiah, E., and W. McMahon. 2002. "The Social Outcomes of Education and Feedback on Growth in Africa." *Journal of Development Studies* 38 (4): 27–68. doi:10.1080/00220380412331322411.

Bank, W. 2001. *Engendering Development*. Washington, DC: World Bank.

Barro, R., and J. Lee. 1994. "Economic Growth in a Cross Section of Countries." *Quarterly Journal of Economics* 106 (1): 407–443. doi:10.2307/2937943.

Barro, R., and X. Sala-i-martin. 1995. *Economic Growth*. New York, NY: McGraw-Hill.

Boyd, E. 2002. "The Noel Kempff Project in Bolivia: Gender, Power, and Decision-making in Climate Mitigation." *Gender & Development* 10 (2): 70–77. doi:10.1080/13552070215905.
Briscoe, M. D., J. E. Givens, S. O. Hazboun, and R. S. Krannich. 2019. "At Home, in Public, and in Between: Gender Differences in Public, Private and Transportation Pro-environmental Behaviors in the US Intermountain West." *Environmental Sociology* 5 (4): 374–392. doi:10.1080/23251042.2019.1628333.
Buckingham, S. 2010. "Call in the Women." *Nature* 468 (7323): 502. doi:10.1038/468502a.
Bunker, G. 1988. *Underdeveloping the Amazon: Extraction, Unequal Exchange, and the Failure of the Modern State*. Chicago, Illinois: University of Chicago Press.
Busse, M., and C. Spielmann. 2006. "Gender Inequality and Trade." *Review of International Economics* 14 (3): 362–379. doi:10.1111/roie.2006.14.issue-3.
Clark, R., and J. Beckfield. 2009. "A New Trichotomous Measure of World-system Position Using the International Trade Network." *International Journal of Comparative Sociology* 50 (1): 5–38. doi:10.1177/0020715208098615.
Cortina, J. M. 1993. "Interaction, Nonlinearity, and Multicollinearity: Implications for Multiple Regression." *Journal of Management* 19 (4): 915–922. doi:10.1177/014920639301900411.
Dankelman, I. 2008. *Gender, Climate Change and Human Security: Lessons from Bangladesh, Ghana and Senegal*. Women's Environment and Development Organization, Senegal.
Dankelman, I. 2010. "Climate Change, Human Security, and Gender." In *Gender and Climate Change: An Introduction*, edited by I. Dankleman, pp. 83-105. London: Routledge.
Denton, F. 2002. "Climate Change Vulnerability, Impacts, and Adaptation: Why Does Gender Matter?" *Gender & Development* 10 (2): 10–20. doi:10.1080/13552070215903.
Dietz, T., and A. Jorgenson, eds. 2013. *Structural Human Ecology: New Essays in Risk, Energy, and Sustainability*. Pullman, Washington: Washington State University Press.
Dietz, T., and E. A. Rosa. 1997. "Effects of Population and Affluence on Co2 Emissions." *Proceedings of the National Academy of Sciences USA* 94: 175–179. doi:10.1073/pnas.94.1.175.
Dietz, T., K. A. Frank, C. Whitley, J. Kelly, and R. Kelly. 2015. "Political Influences on Greenhouse Gas Emissions from Us States." *Proceedings of the National Academy of Sciences* 112 (27): 8254–8259. doi:10.1073/pnas.1417806112.
Dinda, S. 2004. "Environmental Kuznets Curve Hypothesis: A Survey." *Ecological Economics* 49: 431–455. doi:10.1016/j.ecolecon.2004.02.011.
Dollar, D., and R. Gatti. 1999. *Gender Inequality, Income, and Growth: Are Good Times Good for Women?* Washington, DC: Mimeograph, World Bank.
Dunlap, R. E., and R. J. Brulle, eds. 2015. *Climate Change and Society: Sociological Perspectives*. New York, NY: Oxford University Press.
Eisler, A. D., H. Eisler, and M. Yoshida. 2003. "Perception of Human Ecology: Cross-cultural and Gender Comparisons." *Journal of Environmental Psychology* 23 (1): 89–101. doi:10.1016/S0272-4944(02)00083-X.
Ergas, C., and R. York. 2012. "Women's Status and Carbon Dioxide Emissions: A Quantitative Cross-national Analysis." *Social Science Research* 41 (4): 965–976. doi:10.1016/j.ssresearch.2012.03.008.
Esteve-Volart, B. 2004. *Gender Discrimination and Growth: Theory and Evidence from India*. London School of Economics. STICERD Discussion Papers DEDPS42. London, United Kingdom.
Esteve-Volart, B., and M. Bagues. 2009. "Are Women Pawns in The Political Game? Evidence from Elections to The Spanish Senate." *Evidence from Elections to the Spanish Senate (September 30, 2009). Fundacion de Estudios de Economia Aplicada (FEDEA)-Working Paper* 2009-30 (2009). doi:10.2139/ssrn.1480945.
Fan, Y., L.-C. Liu, W. Gang, and Y.-M. Wei. 2006. "Analyzing Impact Factors of CO 2 Emissions Using the STIRPAT Model." *Environmental Impact Assessment Review* 26 (4): 377–395. doi:10.1016/j.eiar.2005.11.007.
Forbes, K. 2000. "A Reassessment of the Relationship between Inequality and Growth." *American Economic Review* 90 (4): 869–887. doi:10.1257/aer.90.4.869.
Gaard, G. 2011. "Ecofeminism Revisited: Rejecting Essentialism and Re-placing Species in a Material Feminist Environmentalism." *Feminist Formations* 23 (2): 26–53. doi:10.1353/ff.2011.0017.
Gaard, G. 2017. *Critical Ecofeminism*. Washington, DC: Lexington Books.
Galor, O., and D. N. Weil. 1996. "The Gender Gap, Fertility, and Growth." *American Economic Review* 85 (3): 374–387.
Gressard, L. A., M. H. Swahn, and A. T. Tharp. 2015. "A First Look at Gender Inequality as A Societal Risk Factor for Dating Violence." *American Journal of Preventive Medicine* 49 (3): 448–457. doi:10.1016/j.amepre.2015.05.017.
Gummerson, E., and D. Schneider. 2012. "Eat, Drink, Man, Woman: Gender, Income Share and Household Expenditure in South Africa." *Social Forces* 91 (3): 813–836. doi:10.1093/sf/sos173.
Hochschild, A. R. 2000. "Global Care Chains and Emotional Surplus Value." In *On the Edge: Living with Global Capitalism*, edited by W. Hutton and A. Giddens, pp. 249-261. London: Jonathan Cape.
Hornborg, A. 1998. "Towards an Ecological Theory of Unequal Exchange: Articulating World System Theory and Ecological Economics." *Ecological Economics* 25 (1): 127–136. doi:10.1016/S0921-8009(97)00100-6.
Hornborg, A. 2001. *The Power of the Machine: Global Inequalities of Economy, Technology, and Environment*. Walnut Creek, CA: Alta Mira Press.
IPCC. 2016."Fifth Assessment Report." Accessed November 2017. https://www.ipcc.ch/report/ar5/accessed
Jackson, T., and P. A. Victor. 2019. "Unraveling the Claims for (And Against) Green Growth." *Science* 366 (6468): 950–951. doi:10.1126/science.aay0749.
Jorgenson, A., J. Schor, and X. Huang. 2017. "Income Inequality and Carbon Emissions in the United States: A State-level Analysis, 1997–2012." *Ecological Economics* 134: 40–48. doi:10.1016/j.ecolecon.2016.12.016.
Jorgenson, A. K., and B. Clark. 2012. "Are the Economy and the Environment Decoupling? A Comparative International Study, 1960–2005 1." *American Journal of Sociology* 118 (1): 1–44. doi:10.1086/665990.
Jorgenson, A. K., J. B. Schor, K. W. Knight, and X. Huang. 2016a. "Domestic Inequality and Carbon Emissions in Comparative Perspective." *In Sociological Forum* 31 (2): 770–786. doi:10.1111/socf.2016.31.issue-S1.
Jorgenson, A. K., J. B. Schor, K. W. Knight, and X. Huang. 2016b. "Domestic Inequality and Carbon Emissions in Comparative Perspective." *Sociological Forum* 31 (1): 770–786. doi:10.1111/socf.2016.31.issue-S1.
Jorgenson, A. K., J. B. Schor, X. Huang, and J. Fitzgerald. 2015. "Income Inequality and Residential Carbon Emissions in the United States: A Preliminary Analysis." *Human Ecology Review* 22 (1): 93–106. doi:10.22459/HER.

Jorgenson, A.K., and B. Clark. 2012. "Are The Economy and The Environment Decoupling? a Comparative International Study, 1960–2005." *American Journal Of Sociology* 118 (1): 1-44. doi:10.1086/665990.

Kalof, L., Dietz, T., Guagnano, G. and Stern. 2002. "Race, Gender and Environmentalism: The Atypical Values and Beliefs of White Men." *Race, Gender & Class* 9: 112–130.

King, E., and A. Hill. 1993. *Women's Education in Developing Countries: Barriers, Benefits, and Policies*. Baltimore: Johns Hopkins Press.

King, E., S. Klasen, and M. Porter. 2008. *Gender and Development Challenge Paper*. Prepared for the 2008 round of Copenhagen Consensus Project. Copenhagen, Denmark.

Klasen, S. 1999. "Does Gender Inequality Reduce Growth and Development?" *Policy Research Report Working Paper 7*, World Bank, Washington, DC. doi:10.1046/j.1469-1809.1999.6320101.x.

Klasen, S. 2002. "Low Schooling for Girls, Slower Growth for All? Cross-Country Evidence on the Effect of Gender Inequality in Education on Economic Development." *World Bank Economic Review* 16 (3): 345–373. doi:10.1093/wber/lhf004.

Klasen, S., and F. Lamanna. 2009. "The Impact of Gender Inequality in Education and Employment on Economic Growth: New Evidence for a Panel of Countries." *Feminist Economics* 15 (3): 91–132. doi:10.1080/13545700902893106.

Knight, K. W., J. B. Schor, and A. K. Jorgenson. 2017. "Wealth Inequality and Carbon Emissions in High-income Countries." *Social Currents* 4 (5): 403–412. doi:10.1177/2329496517704872.

Knowles, S., P. Lorgelly, and D. Owen. 2002. "Are Educational Gender Gaps a Brake on Economic Development? Some Cross-Country Empirical Evidence." *Oxford Economic Papers* 54 (1): 118–149. doi:10.1093/oep/54.1.118.

Liddle, B. 2014. "Impact of Population, Age Structure, and Urbanization on Carbon Emissions/Energy Consumption: Evidence from Macro-Level, Cross-Country Analyses." *Population and Environment* 35 (3): 286–304. doi:10.1007/s11111-013-0198-4.

McCright, A. M. 2010. "The Effects of Gender on Climate Change Knowledge and Concern in the American Public." *Population and Environment* 32 (1): 66–87. doi:10.1007/s11111-010-0113-1.

McGee, J., C. E. Alexander, P. T. Greiner, and M. T. Clement. 2017. "How Do Slums Change the Relationship between Urbanization and the Carbon Intensity of Well-being?" *PloS One* 12 (12): e0189024. doi:10.1371/journal.pone.0189024.

McGee, J. A., and P. T. Greiner. 2018. "Can Reducing Income Inequality Decouple Economic Growth from CO2 Emissions?" *Socius* 4: 2378023118772716.

McKinney, L. 2014. "Gender, Democracy, Development, and Overshoot: A Cross-National Analysis." *Population and Environment* 36 (2): 193–218. doi:10.1007/s11111-014-0217-0.

McKinney, L. A., and G. M. Fulkerson. 2015. "Gender Equality and Climate Justice: A Cross-national Analysis." *Social Justice Research* 28 (3): 293–317. doi:10.1007/s11211-015-0241-y.

Merchant, C. 1990. *The Death of Nature: Women, Ecology and the Scientific Revolution*. NY: Harper One.

Mies, M. 2007. "Patriarchy and Accumulation on a World Scale Revisited. (Keynote Lecture at the Green Economics Institute, Reading, 29 October 2005)." *International Journal of Green Economics* 1 (3–4): 268–275. doi:10.1504/IJGE.2007.013059.

Mies, M. 2014. *Patriarchy and Accumulation on a World Scale: Women in the International Division of Labour*. London, United Kingdom: Zed Books Ltd.

Mies, M., and V. Shiva. 2014. *Ecofeminism*. NY: Zed Books.

Norgaard, K., and R. York. 2005. "Gender Equality and State Environmentalism." *Gender & Society* 19 (4): 506–522. doi:10.1177/0891243204273612.

Parreñas, R. S. 2000. "Migrant Filipina Domestic Workers and the International Division of Reproductive Labor." *Gender and Society* 14 (4): 560–580. doi:10.1177/089124300014004005.

Parreñas, R. S. 2001. *Servants of Globalization: Women, Migration, and Domestic Work*. Stanford, CA: Stanford University Press.

Pellow, D. N. 2016. "Toward a Critical Environmental Justice Studies: Black Lives Matter as an Environmental Justice Challenge." *Du Bois Review: Social Science Research on Race* 13 (2): 221–236. doi:10.1017/S1742058X1600014X.

Pellow, D. N. 2017. *What Is Critical Environmental Justice?* New York, NY: John Wiley & Sons.

Permanyer, I. 2013. "A Critical Assessment of the UNDP's Gender Inequality Index." *Feminist Economics* 19 (2): 1–32. doi:10.1080/13545701.2013.769687.

Ravallion, M., M. Heil, and J. Jalan. 2000. "Carbon Emissions and Income Inequality." *Oxford Economic Papers* 52 (4): 651–669. doi:10.1093/oep/52.4.651.

Redding, E. M., M. T. Ruiz-Cantero, J. Fernández-Sáez, and M. Guijarro-Garvi. 2017. "Gender Inequality and Violence against Women in Spain, 2006–2014: Towards a Civilized Society." *Gaceta sanitaria* 31: 82–88. doi:10.1016/j.gaceta.2016.07.025.

Richardson, E. T., S. E. Collins, T. K. James H., K. Jones, H. Tram, V. L. Boggiano, L. Bekker, and A. R. Zolopa. 2014. "Gender Inequality and HIV Transmission: A Global Analysis." *Journal of the International AIDS Society* 17 (1): 19035. doi:10.7448/IAS.17.1.19035.

Rocheleau, D., B. Thomas-Slayter, and E. Wangari. 1996. *Feminist Political Ecology: Global Issues and Local Experiences*. New York, NY: Routledge.

Schnaiberg, A. 1980. *The Environment: From Surplus to Scarcity*. New York, NY: Oxford University Press.

Schuler, S. R., and S. M. Hashemi. 1994. "Credit Programs, Women's Empowerment, and Contraceptive Use in Rural Bangladesh." *Studies in Family Planning* 25: 65–76.

Seager, J., M. Mies, and V. Shiva. 1995. *Earth Follies: Feminism, Politics and the Environment*. Routledge, Oxfordshire.

Seguino, S. 2000a. "Accounting for Gender in Asian Economic Growth." *Feminist Economics* 6 (3): 27–58.

Seguino, S. 2000b. "Gender Inequality and Economic Growth: A Cross-country Analysis." *World Development* 28 (7): 1211–1230.

Seguino, S., and M. S. Floro. 2003. "Does Gender Have Any Effect on Aggregate Saving?" *International Review of Applied Economics* 17 (2): 147–166.

Shandra, J. M., C. L. Shandra, and B. London. 2008. "Women, Non-governmental Organizations, and Deforestation: A Cross-national Study." *Population and Environment* 30 (1–2): 48–72.

Shiva, V. 2016. *Earth Democracy: Justice, Sustainability and Peace*. London, United Kingdom: Zed Books Ltd.

Stern, P. C., B. K. Sovacool, and T. Dietz. 2016. "Towards a Science of Climate and Energy Choices." *Nature Climate Change* 6 (6): 547.

Thomas, D. 1990. "Intrahousehold Resource Allocation: An Inferential Approach." *Journal of Human Resources* 25: 634–664.

United Nations. 2016. "Human Development Indicators." Accessed September 2017. http://hdr.undp.org/en/content/human-development-index-hdi
Waring, M. 1988. *If Women Counted: A New Feminist Economics*. NY: Harper and Row.
Waring, Marilyn. 1999. *Counting for Nothing: What Men Value and What Women are Worth*. Buffalo, NY: University of Toronto Press.
Wei, T. 2011. "What STIRPAT Tells about Effects of Population and Affluence on the Environment?" *Ecological Economics* 72: 70–74.
World Bank. 1993. *World Development Report*. New York, NY: Oxford university Press.
World Bank. 2017. "World Development Indicators." Accessed 1 October 2017. http://data.worldbank.org/data-catalog/world-development-indicators
World Development Report Gender Equality and Development. 2012. Accessed 2 February 2018. http://siteresources.worldbank.org/INTWDR2012/Resources/7778105-1299699968583/7786210-1315936222006/Complete-Report.pdf
York, R. 2008. "De-carbonization in Former Soviet Republics, 1992–2000: The Ecological Consequences of De-modernization." *Social Problems* 55 (3): 370–390.
York, R., E. Rosa, and T. Dietz. 2003a. "Footprints on the Earth: The Environmental Consequences of Modernity." *American Sociological Review* 68 (April): 279–300.
York, R., E. Rosa, and T. Dietz. 2003b. "STIRPAT, IPAT, and ImPACT: Analytic Tools for Unpacking the Driving Forces of Environmental Impacts." *Ecological Economics* 46 (3): 351–365.
York, R., and J. A. McGee. 2017. "Does Renewable Energy Development Decouple Economic Growth from CO2 Emissions?" *Socius* 3: 2378023116689098.