Structural Change and Economic Dynamics 59 (2021) 63–78

Contents lists available at ScienceDirect

Structural Change and Economic Dynamics

journal homepage: www.elsevier.com/locate/strueco

The distributional dimension of the resource curse: Commodity price shocks and income inequality

Soran Mohtadi[a], David Castells-Quintana[b,*]

[a] Department of Applied Economics, Universidad Autónoma de Barcelona, 08193 Bellaterra, Barcelona, Spain
[b] Department of Applied Economics, Universidad Autónoma de Barcelona, 08193 Bellaterra, Barcelona, Spain

ARTICLE INFO

Article history:
Received 30 March 2021
Revised 19 July 2021
Accepted 7 August 2021
Available online 15 August 2021

JEL classification:
O13
O15
Q33

Keywords:
resource curse
commodity price shocks
inequality
natural resources
resource booms
development

ABSTRACT

How does high dependence on natural resources affect income inequality? Surprisingly little is known about the impact of dependence on primary goods on income distribution. Building on insights from the resource curse literature, this paper studies the relationship between income shocks through changes in commodity prices and income inequality in a panel of 80 countries from 1990 to 2016. We analyze differentiated effects of commodity price shocks depending on the type of commodity (labor vs. capital-intensive). We also study differences across world regions and explore potential mechanisms by looking at different types of inequality (pay-driven vs. capital-rents-driven). Results show that commodity price shocks have an impact on income inequality. However, this impact depends on the type of commodity and inequality.

1. Introduction

A high dependence on natural resources is characteristic of many developing countries, especially the least developed ones, and has been of interest for both academics and policy makers.[1] Research into the (natural) "resource curse" suggests that high dependence on natural resources, especially under low institutional levels, can slow structural change and hinder economic development (see for instance, Caselli and Tesei, 2016; Boschini et al., 2013; Bazzi and Blattman, 2014).[2] High volatility in commodity prices has been found to (partially) explain many of the problems associated with the "resource curse", including high volatility in terms of trade and foreign direct investment, low rates of economic growth and higher socio-political instability (see Acemoglu et al., 2003; Van der Ploeg and Poelhekke, 2009; Sala-i-Martin and Subramanian, 2013; Ferraro and Peretto, 2018).[3] Nevertheless, little is known about the potential impact of changes in international commodity prices on the evolution of income inequality.

In this paper, we analyze the distributional dimension of the resource curse by studying the connection between resource booms due to changes in international commodity prices and the evolution of income inequality within countries. In doing so, we build a unique dataset looking at 23 commodities and the evolution of their international prices, as well as export shares of these commodities for 80 countries worldwide from 1990 to 2016 (based on data availability). With these data, we construct country-period specific commodity price shock, and relate these shocks to the evolution of income inequality in each of the 80 countries. We

* Corresponding author.
E-mail addresses: soran.mohtadi@e-campus.uab.cat (S. Mohtadi), david.castells.quintana@uab.cat (D. Castells-Quintana).

[1] For recent studies on income inequality on developing countries see for instance Addison et al., 2017; Castells-Quintana, 2019; Gradin et al., 2021.

[2] According to data, in least developed countries primary goods (i.e., commodities) still represent a big fraction of the economy (in some case up to 78%). Similarly, for three-quarters of all states in Sub-Saharan Africa and two-thirds of those in Latin America, the Caribbean, North Africa, and the Middle East, primary commodities still represent around half of their export income. In some cases, the figure goes up to 96%.

[3] For some regions, in the last decades, this volatility has represented a significant cycle of boom and collapse. For instance, in Latin America, commodity export prices increased during first decade of 21st century, but have declined sharply recently, which may be contributing to current social unrest in the region (Haslam, 2016, Siegel, 2016).

https://doi.org/10.1016/j.strueco.2021.08.002

differentiate between commodities based on their factor intensity (i.e., labor vs. capital). Positive price shocks on labor-intensive commodities are expected to reduce inequality by potentially increasing demand for (low-skilled) labor. By contrast, positive price shocks on capital-intensive commodities could increase inequality by potentially favoring rent-seeking. In this regard, we consider two types of inequality – pay- vs. capital-rents-driven inequality – to study these differentiated mechanisms for price shocks to affect income inequality differently based on the type of commodity.

In relation to existing studies, this paper is linked to several strands in the economics literature. First, our work relates to those in the traditional study of the "resource curse" (see Sachs and Warner, 1999; Papyrakis and Gerlagh, 2004; Arezki and van der Ploeg, 2010; Papyrakis, 2014). None of these papers focuses on income distribution. Second, our paper is closely linked to studies on the relationship between natural resources and income inequality (Gylfason and Zoega, 2002; Fum and Hodler, 2010; Carmignani and Avom, 2010; Parcero and Papyrakis, 2016; Behzadan et al., 2017; Kim and Lin, 2018; Davis, 2019; Kim et al., 2020 for world samples, Leamer et al., 1999, for Latin America, Farzanegan and Krieger, 2018, for Iran). While these papers study the natural-resources-inequality relationship, these papers usually look at one or two resources and do not consider commodity prices. Finally, our paper relates to those in the conflict literature focusing on commodity price shocks and showing differentiated effects on conflict and civil war depending on the factor intensity of the commodity (see Dube and Vargas, 2013, for Colombia, Bazzi and Blattman, 2014; Ciccone, 2020, for world samples).[4]

To the best of our knowledge, only two previous papers have analyzed the connection between commodity price shocks and distributional issues, specifically: Goderis and Malone (2011), looking at pay inequality in manufacturing sectors for the period 1965-1999, and Bhattacharyya and Williamson (2016), looking at income inequality in Australia. We contribute to the literature by i) analyzing the effects of commodity price shocks on income inequality looking at 23 commodities and taking a global view, ii) providing evidence of opposing effects of commodity price shocks on the distribution of income depending on the type of commodity, and iii) studying potential mechanisms for these differentiated effects to take place.

We show that non-agricultural (capital-intensive) price shocks are significantly associated with increases in inequality. This result is robust to a long list of controls, different specifications and estimation techniques, as well as to multiple robustness checks. We find that the inequality-increasing impact of non-agricultural price shocks is mostly felt in countries with high initial levels of inequality and low institutional quality, as is the case of many countries in Sub-Saharan Africa (SSA) and Latin America (LA). We also find suggestive evidence that agricultural (labor-intensive) commodity price shocks reduce pay inequality, while non-agricultural (capital-intensive) price shocks increase capital-income inequality.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature. Section 3 describes the data used to study the relationship between commodity price shocks and inequality. Section 4.1 presents the main empirical approach, including descriptive and econometric analysis, while section 4.2 explores mechanisms for differentiated effects of commodity price shocks on income inequality. Finally, Section 5 concludes and derives policy implications and avenues for further research.

2. Commodity price shocks and inequality: A brief literature review

2.1. Natural resources, commodity price shocks and income inequality

The socio-economic consequences of high dependency on natural resource have been widely investigated (see, for instance, Acemoglu et al., 2003; Van der Ploeg and Poelhekke, 2009; Fum and Hodler, 2010; Arezki and van der Ploeg, 2010; Sala-i-Martin and Subramanian, 2013; Carmignani and Avom, 2010; Bazzi and Blattman, 2014; Kim and Lin, 2018; Behzadan et al., 2017). The connection between high specialization in primary goods and patterns of economic development has been extensively studied (Carmignani and Avom, 2010; Kim and Lin, 2018; Behzadan et al., 2017). In a globalized world, high dependency on natural resources translates into high dependency on international commodity prices. And in recent decades, international commodity prices have shown high volatility (Van der Ploeg and Poelhekke, 2009).

For commodity-dependent countries, these changes in international prices can represent massive shocks. For every country, the extent of a shock depends on the array of commodities exported and on the share of each commodity in the countryś total exports. Thus, the interplay of changes in international commodity prices and each countryś export shares defines country-specific commodity price shocks. Shocks have the potential to influence several socio-economic outcomes, including foreign direct investment, trade flows, economic growth, and even socio-political stability (see Acemoglu et al., 2003; Van der Ploeg and Poelhekke, 2009; Sala-i-Martin and Subramanian, 2013). Recently, resource rents from higher commodity export prices have also been associated with populism and authoritarian institutions (Seghezza and Pittaluga, 2018). Commodity price shocks can also have potential effects on employment, its distribution across different sectors, and thus on structural change, as well as on wages across the economy. Consequently, commodity price shocks could be expected to have potential effects on the distribution of income within countries. But the direction of the impact of a commodity price shock on income inequality is not straightforward.

On the one hand, higher commodity prices can lead to less income inequality; rising prices for commodity exports can increase the demand for (low-skilled) labor, leading to higher wages and a more equal distribution of income. On the other hand, commodity price shocks can lead to more inequality; higher commodity prices generate rents that can be appropriated by few, usually already rich, individuals. Previous papers have already noted that natural resource rents can increase the gap between the rich and the poor (Ross, 1999), deteriorating the distribution of income (Kim and Lin, 2018). However, global evidence in this regard is very limited to date (i.e., Goderis and Malone, 2011).[5]

2.2. Commodity price shocks and the "opportunity cost" and "rapacity" effects

Given potential differences in the mechanisms for higher commodity prices to influence income distribution, we can expect

[4] This conflict literature suggests that inequality might be a key factor connecting commodity shocks and higher risk of conflict (see for instance Bazzi and Blattman, 2014). In this and related literature, institutions are shown to play a relevant role (see Mehlum et al., 2006; Cabrales and Hauk, 2011; Musayev, 2014; Caselli and Tesei, 2016; Krieger and Meierrieks, 2016). By performing a heterogeneity analysis at the global level, we also connect to these papers.

[5] Goderis and Malone (2011) provide some cross-country evidence, looking at the relationship between natural resource booms (commodity exports) and pay inequality for the period 1965-1999. They find that oil and mineral booms reduce inequality in the year of the boom. Lessman and Steinkrauss (2019) study the association between the spatial distribution of natural resources and spatial inequality.

that the impact of commodity price shocks on inequality will depend on the type of commodity, in particular, on its factor intensity. Omitting differentiated impacts depending on the type of commodity may explain the inconclusive results to date. If the inequality-*decreasing* effect of higher commodity prices is associated with higher employment opportunities and wages, we can expect to see the inequality-decreasing effect mostly when positive shocks take place in labor-intensive commodities. By contrast, if the inequality-*increasing* effect is associated with higher rents, we can expect to see the inequality-increasing effect mostly when positive shocks take place in capital-intensive commodities.

The relevance of differentiating commodities depending on their factor intensity has already been highlighted in the resource curse literature. Boschini et al. (2013) suggest that "point-source resources" (such as plantation crops, minerals and fuels), compared to "diffused resources" (such as other labor-intensive agricultural products), are expected to be more centrally controlled and therefore generating rents that are more easily appropriable by few individuals. Resource rents have also been associated with lower fiscal capacity (Crivelli and Gupta, 2014), and therefore the ability of the state to redistribute income. In this line, Auty and Furlonge (2019) discuss the "so-called" rent curse; the idea that high rents encourage rent siphoning for immediate enrichment, which can lead to higher inequality and lower long-run growth.

Contrary to what happens with the relationship between commodity price shocks and income inequality, the relationship between price shocks and conflict has been more extensively studied (see for instance Dube and Vargas, 2013; Bazzi and Blattman, 2014; Ciccone, 2020). According to Dube and Vargas (2013), a shock which raises wages will reduce conflict by decreasing labor supplied to appropriation activities. This wage mechanism is defined as an "opportunity cost effect". By contrast, a shock which raises the return to appropriation will increase conflict by increasing labor supplied to the conflict sector and rents captured by a few individuals. This appropriation mechanism is defined as a "rapacity effect".

Inequality and conflict are interrelated. Greater income inequality has been associated with higher risks of civil war onset (Fearon and Laitin, 2003), state violence and coups d'état (Galbraith and Purcell, 1999). Hence, workers in a conflict-prone society may choose between a productive sector and a criminal or illegal one. Therefore, in countries with abundance of natural resources and lower quality of institutions we may observe higher levels of inequality as well as higher propensity of conflict (Le Billon, 2014). Our analysis is therefore connected to that on conflict, and the impacts of commodity price shock on inequality can be understood as another dimension of the "resource curse".

2.3. Two types of inequality and the role of institutions

Beyond differentiating commodities based on their factor intensity, it may also be relevant to distinguish between the types of inequality: pay vs. capital-rents-driven inequality. If the reduction of inequality due to commodity price shocks is related to higher employment opportunities and higher wages for the low-skilled labor, we should expect this to be reflected in lower pay inequality. By contrast, if the increase in inequality due to commodity price shocks happens due to higher rents, we should expect this to be reflected mainly in a more unequal distribution in capital rents.

According to the literature, the potential inequality-increasing effect of higher commodity prices is also likely to depend on the institutional context. According to Ross (1999), the connection between natural-resource rents and increasing gaps between the rich and the poor heavily depends on the presence of weak institutions. Indeed, in many resource-rich countries with weak quality of institutions, local elites, together with foreign capital, have been able to appropriate most of the rising rents from natural resources (Bjorvatn and Naghavi, 2011). The role of political institutions has been widely studied in the resource curse literature (see, for example, the literature cited in Van der Ploeg, 2011). Countries with weak institutions are more prone to conflict (Musayev, 2014; Caselli and Tesei, 2016), and weak institutional settings also tend to correlate with high levels of inequality (Krieger and Meierrieks, 2016). In these countries, natural resource booms tend to lead to lower levels of development (Caselli and Tesei, 2016; Bazzi and Blattman, 2014). Similarly, in countries with weak institutions, the tax system is usually also weak. It is therefore normal to expect that a potential inequality-increasing impact of commodity price shocks to affect countries with weak institutions more severely.

To sum up, we expect that the effect of commodity price shocks on income inequality will depend on i) the type of commodity, ii) the type of inequality, and iii) the institutional context. For labor-intensive commodities, higher prices are expected to reduce inequality through lower pay inequality. For capital-intensive commodities, higher prices are expected to increase inequality through higher capital-rents inequality. And this last effect is expected to be more pronounced in countries with a weak institutional setting (and higher initial levels of inequality).

3. Data

Our empirical analysis is based on a unique (unbalanced) panel dataset consisting of 80 countries over the period from 1990 to 2016. These 80 countries concentrate most of the world exports of the commodities studied (up to 82% in the case of coffee and 89% in the case of oil). We study 23 highly traded commodities, collecting data on the evolution of their international prices, and looking at what these commodities represent as a share of total exports for each of our 80 countries.[6] Using these data, we construct commodity price shocks for every country-year observation, and combine these with data on the evolution of inequality in each country in our sample.

3.1. Inequality

Our main dependent variable is income inequality. Data for income inequality for several countries and for a long time span is scarce. To overcome this limitation, we use Gini coefficients from the SWIID (Standard World Income Inequality Database) version 6.1 (Solt, 2016).[7] The SWIID dataset is the most comprehensive dataset on inequality providing a very wide coverage of comparable inequality data across countries.[8]

For our empirical analysis, and as discussed in Section 2, we further consider two components of income inequality. First, we

[6] The commodities that are analyzed includes, oil, gas, coal, gold, diamond, silver, zinc, aluminum, iron, copper, tin, nickel and lead, coffee, cocoa, rice, sugar, banana, wheat, cotton, wool, wood and rubber, which contain more than 75% of all commodities that have been exported in year 2016, according to International Trade Statistics Yearbook (2016).

[7] SWIID uses a custom missing-data multiple-imputation algorithm to standardize observations collected from multiple sources (i.e., UTIP; OECD Income Distribution Database; The Socioeconomic Database for Latin America and the Caribbean generated by CEDLAS and the World Bank; Eurostat; the UN Economic Commission for Latin America and the Caribbean; national statistical offices around the world, and many other sources). SWIID recently updated the database to version 9.0. We check our results to using this latest version. Recent studies using SWIID data include Parcero and Papyrakis (2016); Kim and Lin (2018); Gylfason (2019); and Hartwell et al. (2019).

[8] We check the results using household disposable post-tax income data. Inequality after the political processes of rent-seeking and redistribution may be more relevant for policy makers. However, it is important to note that, for developing countries, surveys suggest little difference between pre- and post-tax inequality. Results are similar using either pre- or post-tax data.

consider pay inequality using data from the University of Texas Inequality Project (UTIP).[9] Based on the United Nations Industrial Development Organization (UNIDO), pay inequality measures inequality in wages and earnings in the manufacturing sector (as used for instance by Drehen and Gaston, 2008; Tan and Law, 2012; Doerrenberg and Peichl, 2014; Kim and Lin, 2018; Kim et al., 2020; Law et al., 2020). Using this data enables us to analyze the inequality among the employed individuals, and observe how commodity price shock impact on labor wages inequality depending on the type of commodity (labor vs capital intensive). For inequality in capital-rents there is no available data for international comparisons. What we do is therefore to calculate the difference between the household disposable income inequality and pay inequality. This gives us a (crude) measure to study the impacts of commodity shocks on (a proxy of) capital-income-driven inequality.[10]

3.2. Commodity Price Shocks

Our key explanatory variable is a country- period-specific measure of resource booms, which we calculate as an export-share-weighted commodity price shock. We construct this measure using a similar methodology to previous papers, as Bazzi and Blattman (2014), Musayev (2014) and Castells-Quintana (2017). To calculate these country- period-specific commodity price shocks, we rely on i) data on international commodity prices for every year in our period of analysis, ii) commodity exports for every one of our 23 commodities from every country and in every year in our sample, and iii) total GDP for every country-period observation. Data for international prices for our 23 commodities is collected from the IMF-IFS International Financial Statistics, the World Bank, the FRED Federal Reserve Economic Data and the World Gold Council. For commodity exports, we use data from the UNCTSD (United Nations Commodity Trade Statistics Database). With the UNCTSD data, we calculate shares of the 23 different commodities in total exports by country and year. For GDP, we rely on data from the World Development Indicators (World Bank).

The commodity price shock is calculated from a commodity export price index, P_{it}, as a geometrically-weighted index of international export prices for country i in period t:

$$P_{it} = \frac{\prod_{j=1}^{J} P_{jt}^{w_{ijt-k}}}{cpi_t} \quad (1)$$

Where P_{jt} captures prices on international markets for commodity j in period t (normalized to 100 in 2010). Since prices are dollar-denominated, the index is deflated by the US consumer price index, cpi_t. Each commodity price is weighted by w_{ijt-k}, its average share in total national exports (excluding re-exports) from t-2 to t-4, to reduce potential reverse causality (Following Bazzi and Blattman, 2014). For robustness, we also check using time-invariant (fixed) export shares as commodity weights (following Ciccone, 2020).[11] Annual shocks are calculated as the log difference of the price index P_{it}, and scaled by the weight of total commodity exports to GDP -a time-invariant measure of the importance of commodity prices in the economy for country i; more commodity-dependent nations are obviously more sensitive to commodity price shocks. [12]

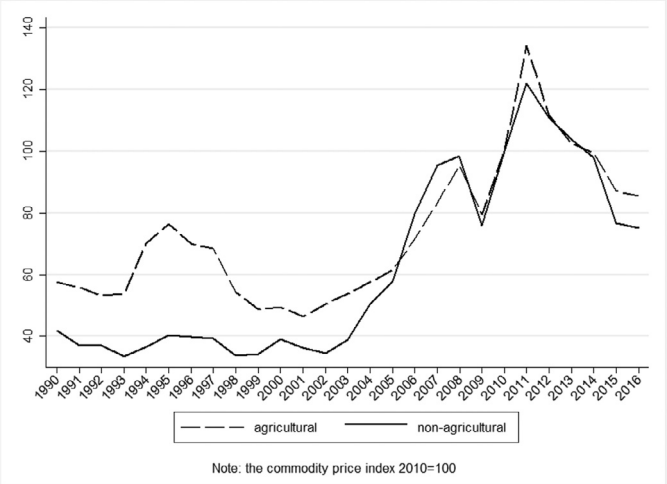


Figure 1. The annual evolution of commodity prices

Hence, in Equation (2), S_{it} is calculated as the annual difference in each country's log commodity export price index:

$$S_{it} = (\log P_{it} - \log P_{it-1}) * \frac{X_{iT}}{GDP_{iT}} \quad (2)$$

The measurement of commodity price shocks using export shares of commodities has several advantages, including wide data availability and the fact that international commodity prices are typically not affected by individual countries, and therefore are not likely to be endogenous with respect to the growth of individual countries (something we also consider in our robustness checks).

To test our prediction that the effect of commodity price shocks depends on the factor intensity of the commodity, and following the literature, we distinguish between agricultural vs. non-agricultural commodities. As shown by previous papers, agricultural commodities are, on average, labor-intensive - for instance coffee, cocoa, rice, banana, cotton, wool, wood and rubber - while non-agricultural commodities are, on average, capital intensive - for instance hydrocarbons and minerals (see Goderis and Malone, 2011; Musayev, 2014; Bazzi and Blattman, 2014).

Figure 1 illustrates the annual evolution of agricultural and non-agricultural global prices from 1990 to 2016. As shown, the main increase in global prices happened between 2002 and 2011 (with a previous increase for agricultural commodities in 1995). From 2011 onwards, commodities display a decrease in their global prices.

3.3. Conflict and other controls

As the literature has mainly focused on the impacts of commodity prices shocks on conflict, and we have seen how conflict may be associated with income inequality, we consider intentional homicides (per 100,000 people), from the UN Office on Drugs and Crime's Intentional Homicide Statistics database.

[9] The Theil index as a measure of pay inequality is calculated from industrial sector statistics provided by the United Nations Industrial Development Organization (for more information on the underlying data and construction of the index, see Conceição et al., 2001; Galbraith and Kum, 2005, and Galbraith et al. 2014).

[10] We follow the idea from recent analysis of income sources using micro data. We calculate the difference between the SWIID Gini (0-100) and UTIP-UNIDO, multiplied by 100. Our proxy for capital-income-driven changes in inequality relies on the within-country evolution of this difference. We acknowledge that this is a very basic proxy and results using this measure should be taken with caution. For robustness, as explained below, we check our results calculating our proxy for capital-income inequality in three different ways: i) as the difference between SWIID disposable income inequality and UTIP-UNIDO pay inequality, ii) as the difference between SWIID market income inequality and UTIP-UNIDO pay inequality, or iii) as the difference between EHII income inequality and UTIP-UNIDO pay inequality.

[11] Ciccone (2020) claims that time-varying export shares partly reflects changes in the quantity and variety of countries' exports, which can jeopardize causal estimation.

[12] The average of the ratio is taken in 1990 to 2016 to calculate *X/GDP* for each country. This scaling increases the expected size and precision of any impact of prices on growth and political instability (Bazzi and Blattman, 2014).

Table 1
Descriptive statistics, main variables

Variables		Mean	Std. Dev.	Min	Max	Observations
Income inequality	overall	38.62	8.09	20.21	58.45	N=1869 countries=80 T=23.36
Income inequality (changes)	overall	0.01	0.42	-2.09	2.30	N=1789 countries=80 T=22.36
Commodity price shocks	overall	0.2	0.2	-1.21	2.99	N=1760 countries=80 T=22
Conflict (levels)	overall	8.17	13.41	0.1	93.2	N=1044 countries=80 T=13.05
Conflict (changes)	overall	-0.04	2.21	-14.9	36.20	N=924 countries=68 T=13.58
Quality of Institutions	overall	66.33	13.72	19.16	96.08	N=1680 countries=71 T=23.66

Table 2.a
Inequality and conflict

	No Year FE	Year FE
No country FE	0.045	0.056*
Country FE	0.045	0.055*

Note: The panel includes 889 observations. * p<0.1.

Table 2.b
Conflict and commodity price shocks

	No Year FE	Year FE
No country FE	-0.054*	-0.053
Country FE	-0.054*	-0.051

Note: The panel includes 947 observations. * p<0.1.

Table 2.c
Inequality and commodity price shocks

	No Year FE	Year FE
No country FE	0.042*	0.031
Country FE	0.042*	0.031

Note: The panel includes 1528 observations. * p<0.1.

Table 3.a
Inequality and agricultural price shocks

	No Year FE	Year FE
No country FE	0.008	-0.005
Country FE	0.008	-0.005

Note: The panel includes 1528 observations for 80 countries. * p<0.05.

Table 3.b
Inequality and non-agricultural price shocks

	No Year FE	Year FE
No country FE	0.049*	0.043*
Country FE	0.049*	0.043*

Note: The panel includes 1528 observations for 80 countries. * p<0.05.

We also consider other several variables relevant to explain income inequality at the country level, including economic growth rates, income per capita (in logs), the share of investment, the share of government spending, and the average years of schooling. For robustness, and following the literature, additional control variables are also included: total population, fertility rates, and the quality of institutions. Finally, variables that may correlate with commodity price shocks, such as trade openness and the inflation rate, are also considered. Table A.1 in the Appendix, lists all variables definitions and sources, while descriptive statistics for main variables, as well as list of countries included in the analysis, can be found in Tables A.2 and A.3 in the Appendix.

4. Inequality and commodity price shocks: an empirical analysis

4.1. Descriptive analysis

Table 1 provides descriptive statistics for income inequality, commodity price shocks, conflict, and the quality of institutions. In our sample, the average level of inequality, measured by the Gini coefficient (from 0 to 100) is 38.6. For commodity price shocks, a value above zero indicates that the country faces higher commodity export prices. According to Table 1, the mean of overall commodity price shocks for our sample is 0.2 (or 20 per cent), indicating that over the 1990-2016 period our 80 countries faced, on average, more positive shocks in commodity export prices than negative ones. Looking at specific countries, we find a connection between high inequality levels and low quality of institutions (see Table A.4), as previously highlighted in the literature (Chong and Gradstein, 2007).

Tables 2.a, 2.b, and 2.c show the pairwise correlations between our main variables (commodity price shocks, inequality, conflict, and institutions) controlling for year and country fixed effects.[13] The introduction of country fixed effects allows us to control for country-specific characteristics, while the introduction of year fixed effects allows us to control for global shocks.[14] A positive correlation between commodity price shocks and inequality is found; price shocks are positively associated with higher inequality. There is a positive association between inequality and conflict, in line with the literature (Collier and Hoeffler, 2004; Fearon and Laitin, 2003; Fearon, 2008; Blattman and Miguel, 2010; Esteban and Ray, 2011). Higher quality of institutions is associated with lower income inequality (in line with Parcero and Papyrakis, 2016) and lower risk of civil war and conflict (in line with Caselli and Tesei, 2016; Musayev, 2014).

Following our discussion in Section 2, in Table 3, the commodities considered are disaggregated into agricultural and non-agricultural.[15] Table 3.a shows a negative association between inequality and agricultural price shocks, while Table 3.b shows a positive association between inequality and non-agricultural price shocks, even after controlling for country and year fixed effects.

Finally, we also explore differences in the relationship between commodity price shocks and income inequality across world regions: Europe (EU), North America (NA), Asia (A), Oceania (OC), Latin America (LA), Sub-Saharan Africa (SSA), and the Middle East (ME). Table A.6 in Appendix A shows average values for income distribution and quality of institutions for each of these world regions. As expected, countries in SSA and LA have, on average, the

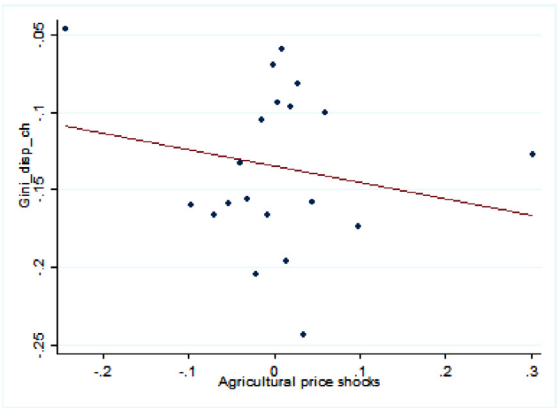
[13] Table A.4 in the Appendix, shows simple correlations (i.e., without fixed effects) for our key variables.

[14] The binned scatter plots have been applied based on all data points to purge from year and country fixed effects. Here, all observations are grouped into 20 bins. We also checked the data and these points are not the individual outlier countries.

[15] Table A.5 lists all commodities.

a

Inequality and agricultural price shocks in SSA and LA



b

Inequality and non-agricultural price shocks in SSA and LA

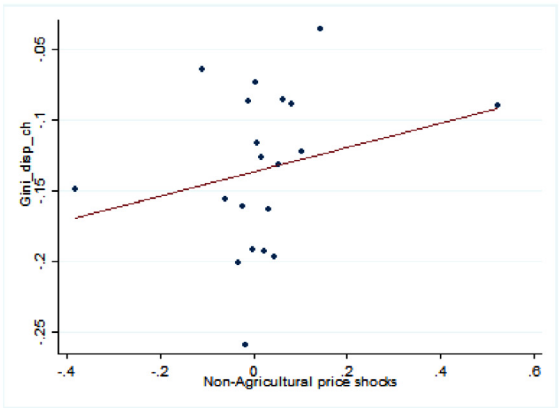
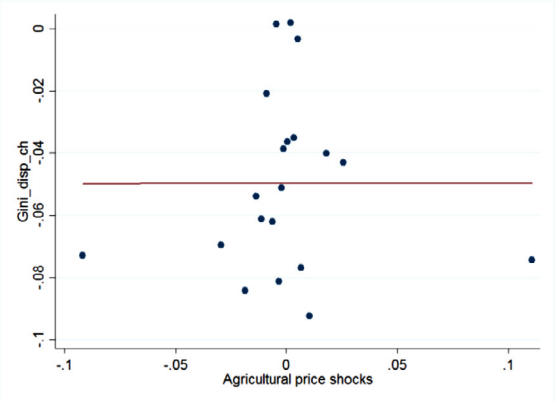


Figure 2.a. Inequality and agricultural price shocks in SSA and LA

a

Inequality and agricultural price shocks in the rest of the world



b

Inequality and non-agricultural price shocks in the rest of the world

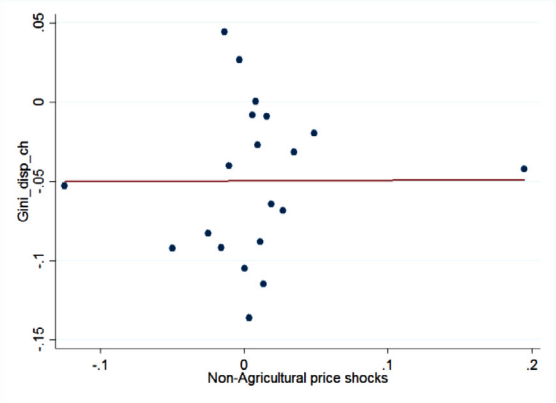


Figure 3.a. Inequality and agricultural price shocks in the rest of the world

highest inequality levels and the lowest quality of institutions. As Figures 2.a and 2.b show, in SSA and LA, the regions with the worst income distribution and lowest institutional quality, commodity price shocks in agricultural commodities are negatively associated with changes in inequality, while shocks in non-agricultural commodities are positively associated with changes in inequality. By contrast, we find no significant association in the rest of the world (see Figures 3.a and 3.b).

4.2. Econometric analysis

In this section, we consider a simple empirical model that allows us to test the relationship between resource booms and income distribution. In particular, the association between commodity price shocks and income inequality is analyzed using the following specification:

$$\Delta inequality_{it} = \alpha_i + \delta_t + \beta_1 S_{it} + \varepsilon_{it} \quad (3)$$

where $\Delta inequality_{it}$ stands for changes in household income inequality in country i in period t. Given the long coverage of our data (1990-2016), we consider alternatively year-to-year variation as well aggregating over 3-year periods. α_i controls for time-invariant country-specific characteristics. Period-specific effects, δ_t, are also included to control for common global shocks. The key independent variable is S_{it}, the annual commodity prices shock in country i in period t. Finally, ε_{it} is an idiosyncratic error term. The coefficient of interest is β_1, which captures the relationship between commodity price shocks and income inequality.

In a second step, we differentiate commodities based on their labor intensity. Thus, we analyze whether changes in prices of agricultural (i.e., labor-intensive) commodities affect income inequality differentially than non-agricultural (i.e., capital-intensive) ones:

$$\Delta inequality_{it} = \alpha_i + \delta_i + \gamma_1 agri_{it} + \gamma_2 nonagri_{it} + \epsilon_{it} \quad (4)$$

where $agri_{it}$ stands for agricultural price shocks and $nonagri_{it}$ stands for non-agricultural price shocks.

Table 4
Main results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Commodity price shocks	0.07**	0.05	0.02				0.03	
	(0.03)	(0.03)	(0.04)				(0.05)	
Agricultural price shocks				-0.01	-0.01	-0.12		-0.18*
				(0.08)	(0.1)	(0.07)		(0.1)
Non-agricultural price shocks				0.12**	0.09*	0.1**		0.11**
				(0.04)	(0.04)	(0.04)		(0.04)
Controls	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes	Yes	Yes
Country FE	No	No	Yes	No	No	Yes	Yes	Yes
Additional controls	No	No	No	No	No	No	Yes	Yes
Observations	1528	1153	1153	1528	1153	1153	953	953
No. of countries	80	75	75	80	75	75	66	66

Notes: Dependent variable: the change in Inequality (Gini coefficient). All control variables are lagged one year. Controls include: income (logs), economic growth, investment, government consumption and secondary schooling. Additional controls include: population (logs), fertility rate, openness, quality of institutions, and inflation (logs). The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

All left-hand-side variables are included one period before, and we cluster errors at the country level.[16] Our identification strategy relies on the fact that international commodity price shocks are not affected by individual countries (below we test for this) and therefore are expected to be exogenous to changes in inequality levels within countries. We also perform several robustness checks to reinforce the validity of our empirical strategy and our results.

4.3. Main results

Table 4 presents our main results. Column 1 presents pooled-OLS estimates. The regression yields a positive and significant coefficient, indicating that the higher export-share-weighted average of commodity prices, the higher inequality. Column 2 introduces some controls (at the expense of losing observations), while column 3 introduces country fixed effects to control for time-invariant country characteristics.[17] The coefficient for commodity price shocks yields a positive but no longer significant result.[18]

A non-significant coefficient for commodity price shocks could be masking differentiated effects of commodity price shock depending on the type of commoditiy, as discussed in Section 2. Consequently, in columns 4 to 6 of Table 4, we differentiate between agricultural and non-agricultural commodities (i.e., capital-intensive vs labor-intensive commodities). In all three columns, while price shocks in agricultural commodities yield a negative coefficient, price shocks in non-agricultural commodities yield a positive and significant coefficient. In columns 7 and 8, additional controls are included (i.e., population in logs, fertility rate, openness, quality of institutions, and inflation in logs). The main results hold, suggesting that inequality increases in response to resource booms associated with non-agricultural (i.e., capital-intensive) commodities.[19]

4.4. Robustness

Our main results are robust to several additional checks. First, they are robust to the exclusion of major exporters of one commodity. Although world prices are typically unaffected by individual countries, our estimates could suffer from endogeneity if a major commodity exporter has an influence on world prices. To address this concern, we do two things: i) exclude countries which exports represent more than 10% of total world exports, and ii) exclude countries where a single commodity represents more than 50% of the country's total exports. In the first case, we exclude 12 countries. In the second case, we exclude 11 countries. Our results do not seem to be affected by major exporters (see Tables A.8 and A.9, in the Appendix). To further address endogeneity concerns, we check the robustness of our results to using time-invariant export shares in the construction of our commodity price shock. Main results are not affected.[20] Second, our results are also robust to controlling for initial levels of inequality, considering a dynamic model estimated using different techniques, including GMM estimations, as standard with dynamic models (see Table A.10).[21] Third, our main results do not change significantly when we aggregate commodity price shocks over 3-year periods to reduce short-run noise in the data (see Table A.11).[22] In all cases, we find that non-agricultural commodity price shocks significantly increase inequality.

Finally, we check whether our main results are robust to a different specification considering whether increases in global non-agricultural commodity prices were relevant or not for each country in our sample. To do so, we classify countries into "treated" or "untreated" depending on whether they exported non-agricultural commodities in the whole period (>1) or not (=1). For each group, treated and untreated, we calculate the average Gini coefficient for every period and plot its evolution over time, beside that of the average non-agricultural price index for countries in our sample (see Figure A.2 in the Appendix). Looking at the evolution of inequality for the two groups, we see a sharp increase in the average Gini of our treated group along a sharp increase in the non-agricultural price index from around 2007-2009 to 2014, something that we do not see for the untreated group. With this classification between treated and untreated countries, we run a simple *Difference-in-Differences* (*Diff-in-Diff*) estimation where we consider the sharp increase in prices between 2009 and 2014 as treatment, and find a positive and significant "effect" of treatment (see Table A.12). In

[16] As data to measure income inequality comes from SWIID, our regressions use multiple imputation estimates (100 imputations) as suggested by Solt (2016).

[17] Table A.7 in the Appendix shows the coefficients for all controls.

[18] The results were also checked using pre-tax income inequality and the results were unchanged.

[19] The results remained unchanged using the latest version of SWIID database, version 9.0.

[20] Results are available upon request.

[21] The lagged level of inequality enters with a negative sign and is significant at 1 percent.

[22] The change in commodity prices is the average over last 3 years. The average of price changes over 3 years is taken to reduce the role of extremely transitory shocks as well as to control for measurement error. However, using rolling windows can introduce serial correlation.

Table 5
Results by world regions

	OECD		Non-OECD		SSA & LA		Non-OECD, Non- SSA & LA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Commodity price shocks	-0.15		0.07		0.03		0.1	
	(0.12)		(0.04)		(0.06)		(0.21)	
Agricultural price shocks		0.31		-0.19		-0.34*		-0.36
		(0.22)		(0.14)		(0.19)		(0.26)
Non-agricultural price shocks		-05		0.15***		0.13**		0.25
		(0.32)		(0.03)		(0.06)		(0.28)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	375	375	578	578	356	356	257	257
No. of countries	21	21	45	45	29	29	18	18

Note: Dependent variable: the change in Inequality (Gini coefficient). All control variables are lagged one year. Note that two countries in our SSA & LA sample are OECD members. Controls include: Income (logs), economic growth, investment, government consumption and secondary schooling. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

other words, given a sharp increase in the price of non-agricultural commodities, countries that exported non-agricultural commodities experienced an increase in inequality compared to countries that did not export non-agricultural commodities. These results reinforce our main finding of a positive impact of non-agricultural price shocks on the evolution of inequality.[23]

4.5. Results by world region

In Table 5, we let the effects of commodity price shock to vary across different world regions, to analyze potential differences in the relationship between commodity price shocks and inequality in different contexts. In columns 1 to 4, we differentiate between developed (22 OECD members) and developing countries (53 non-OECD members). For developed countries, we find non-significant coefficients (columns 1 and 2). For developing countries, by contrast, we find a negative (but non-significant) coefficient for agricultural commodities and a positive and highly significant coefficient for non-agricultural commodities (column 4). These results suggest that the positive short-run effect of higher capital-intensive prices on inequality occurs only in resource-rich developing countries, but not in resource-rich developed countries.

According to Figures 2 and 3 in section 4.1, the relationship between commodity price shocks and income inequality is stronger in SSA and LA than in rest of the world. Consequently, in columns 5 and 6 of Table 5, we consider only countries in SSA and LA, while in columns 7 and 8 we consider non-OECD countries not in LA or SSA. For countries in SSA and LA, we find a negative coefficient for agricultural price shocks and a positive coefficient for non-agricultural price shocks, being both significant (see column 6). For the rest of non-OECD countries, we find non-significant coefficients (see column 7 and 8).[24]

Results so far support the hypothesis that, in developing countries, a rise in non-agricultural (i.e., capital intensive) commodity prices lead to higher inequality, while a rise in agricultural (i.e., labor intensive) commodity prices leads to lower inequality. These effects seem particularly relevant in SSA and LA. This may be explained by the fact that countries in these two regions are characterized by high reliance on commodity exports, compared to the rest of the world. Additionally and as already highlighted, countries in SSA and LA tend to show significantly higher levels of income inequality and lower levels of institutional quality than countries elsewhere. As discussed in Section 2, the level of institutional quality is a key factor explaining potential effects of natural endowments and commodity price shock.[25]

4.6. Potential mechanisms

Finally, and following our discussion in Section 2, we study potential mechanisms for different commodity price shocks to affect income inequality differently. According to our expectations, agricultural (i.e., labor-intensive) price shocks lower inequality, and this may happen due to an increase in wages (i.e., the 'opportunity cost' effect). By contrast, non-agricultural (capital-intensive) price shocks will increase inequality, and this may happen due to an increase in capital-rent revenues (i.e., the 'rapacity effect'). In this line, we consider two different types of inequality – pay vs. capital-rents-driven inequality – as in Equation (5):

$$\Delta\, g_{it} = \alpha_i + \delta_i + \gamma_1 agri_{it} + \gamma_2 nonagri_{it} + \epsilon_{it} \quad (5)$$

where g_{it} is either pay inequality or our proxy for capital-income inequality of country i in period t. The hypothesis is that while higher prices of agricultural (i.e., labor-intensive) commodities reduce pay inequality, higher prices of non-agricultural (i.e., capital-intensive) commodities increase capital-income inequality.

Results are presented in Table 6. In columns 1 to 4 we consider the whole world sample. In columns 5 to 8 we only consider countries in SSA and LA, following results in Table 5. Columns 1, 2, 5 and 6 consider pay inequality as the dependent variable, while columns 3, 4, 7 and 8 consider our proxy for capital-rents inequality. For agricultural (i.e., labor-intensive) price shocks, we find non-significant coefficients. However, for the SSA-and-LA subsample, the coefficients are negative in sign, as expected. For non-agricultural (i.e., capital-intensive) price shocks, results show a negative and highly significant coefficient on pay inequality, but a positive and highly significant coefficient on capital-income inequality. These results suggest that while non-agricultural price

[23] As our key variables (inequality and price shocks) are continuous and show yearly variability, our preferred specifications and results are those presented in Table 4, using the full information in our panel data. Diff-in-Diff results should only be taken as robustness to our main results, and offering an insight into a long-run impact of a rise in international prices. A more detailed Diff-in-Diff analysis is out of the scope and aim of the paper.

[24] Note that two countries in our SSA & LA sample are OECD members. Results in columns 5 and 6 of Table 5 are robust to excluding these two countries. Results are also robust to including additional controls as in column 7 of Table 4 (i.e., population in logs, fertility rate, openness, quality of institutions, and inflation in logs).

[25] Table A.13 in the Appendix reports the suggestive evidence of a potential role of initial levels of inequality and quality of institutions.

Table 6
The mechanisms

	the whole sample				SSA & LA			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variables:	pay inequality		capital rents inequality		pay inequality		capital rents inequality	
Commodity price shocks	-0.18		0.18		-0.94**		0.91*	
	(0.23)		(0.27)		(0.39)		(0.48)	
Agricultural prices shocks		0.6		-0.87		-0.39		-0.23
		(0.57)		(0.58)		(1.04)		(1.24)
Non-agricultural price shocks		-0.46**		0.56**		-1.04**		1.11***
		(0.18)		(0.17)		(0.4)		(0.45)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	669	669	668	668	149	149	148	148
No. of countries	50	50	50	50	17	17	17	17

Note: all control variables are lagged one year. Controls include: Income (logs), economic growth, investment, government consumption and secondary schooling. The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

shocks reduce pay inequality they increase capital rents inequality, as expected.[26]

We perform two robustness checks to results in Table 6. First, we consider an alternative measure of income inequality relying on the Estimated Household Income Inequality (EHII) dataset.[27] Tables A.14 and A.15 in the Appendix, present results for the whole sample and for our SSA-and-LA subsample, respectively. Main results hold. Second, we consider total natural resource rents (as % of GDP). As mentioned in Section 2, in developing countries, local elites together with foreign capital have been able to appropriate most of the rents from natural resources. As natural resource rents mostly relate to non-agricultural commodities, such as oil, gas and minerals, we can expect i) non-agricultural prices shock to be associated with natural resource rents, and ii) natural resource rents to be associated with income inequality. This is precisely what we find in Table A.16 in the Appendix, especially significant for our SSA-and- LA subsample.

5. Conclusions

In this paper, we have analyzed a relatively neglected dimension of the resource curse, namely the impact of commodity booms on the evolution of income distribution. In doing so, we have taken a global look studying the evolution of inequality for more than 80 countries during more than two decades (1990-2016), and combining this with the evolution of international prices for 23 globally traded commodities. This has allowed us to study how commodity price shock influence income inequality, considering differentiated effects depending on the type of commodity (labor vs. capital-intensive) and different components of income distribution (pay vs. capital-rents inequality).

Our results show that commodity price shocks have an impact on income inequality. However, this impact depends on the type of the commodity, with non-agricultural (capital-intensive) price shocks significantly increasing inequality. This result is found to be robust to a long list of controls, different specifications and estimation techniques, as well as multiple robustness checks. We also found evidence of the heterogeneities across countries; the inequality-increasing effects of non-agricultural price shocks are mostly felt in countries with high initial levels of inequality and low institutional quality, as is the case of many countries in Sub-Saharan Africa and Latin America. Looking at potential mechanisms, we have also found suggestive evidence that agricultural (labor-intensive) commodity price shocks reduce pay inequality, while non-agricultural (capital-intensive) price shocks increase capital-income inequality.

The results in this paper have important policy implications. In particular, results highlight important heterogeneities in the role of different price shocks for economic development. As international commodity prices have shown high volatility in recent decades, it is important for policy makers to understand how changes in different prices can have different effects, including on the internal distribution of income.

[26] Results are robust controlling for wages and capital tax following Dube and Vargas (2013).

[27] The EHII provides an index ranging from 0 to 100 and is built by combining information from the Deninger and Squire Gini coefficients with a more precise Theil-index-based measure of dispersion of pay within the industrial sector, and using data from the UTIP-UNIDO database (see Galbraith and Kum, 2005). The EHII has been used by Meschi and Vivarelli, 2009; Goderis and Malone, 2011; Kim and Lin, 2018; Kim et al., 2020, among others.

CRediT authorship contribution statement

Soran Mohtadi: Conceptualization, Methodology, Software, Investigation, Writing – original draft, Visualization. **David Castells-Quintana:** Conceptualization, Methodology, Validation, Formal analysis, Writing – review & editing, Supervision.

Acknowledgments

We thank James K. Galbraith, Oriol Roca Sagales, Vicente Royuela, Sambit Bhattacharyya, Pedro Trivin, Motasam Tatahi and Julian Messina for their valuable discussions and comments. We are also grateful for comments received at the UAB-Applied Economics seminars (2018), at the 2nd Catalan Economic Society Conference (2019), at the UB-AQR-IREA seminars (2019), at the University of Buenos Aires (2019), and at the 44th symposium of the Spanish Economic Association (SAEe). David Castells-Quintana acknowledges the support of the Spanish Ministry of Science and Innovation (Project ID: PID2019-104723RB-I00) and the Agency for Management of University and Research Grants (Project ID: 2017SGR1301).

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.strueco.2021.08.002.

Appendix

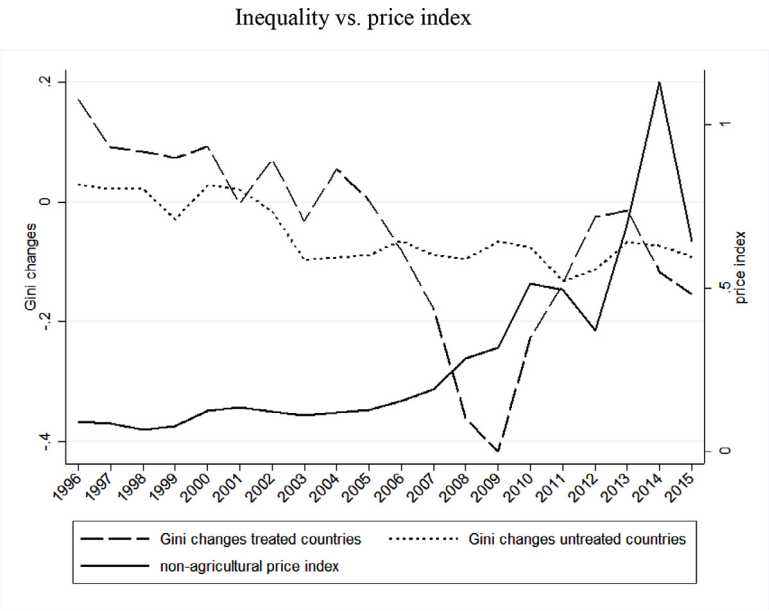


Figure A.2. Inequality vs. price index.

Table A.1
Variable names, definitions and sources

Main variables	Description	Source
Inequality (changes)	Income inequality measured by the Gini coefficient	SWIID v6.1 (Solt, 2016)
S_{it}	Commodity price shocks	Constructed with data from the IMF-IFS and from the UNCTSD (2017)-Comtrade
Conflict	Intentional homicide, Number of deaths purposely inflicted by another person, per 100,000 population	World Bank-World Development Indicators (WDI)
Pay inequality (changes)	Calculate measures of industrial pay inequality and provides a wage inequality Theil measure.	UTIP-Unido
Capital rents inequality (changes)	The difference between income inequality and pay inequality	Our calculation
Wage (changes)	Wage and salaried workers, total (% of total employment)	WDI
Capital tax rents (changes)	Taxes on income, profits and capital gains (% of total taxes)	WDI
GDP per capita	Per capita GDP (in logs)	WDI
Growth rate of GDP per capita	Cumulative annual average per capital GDP growth rate	WDI
Institutions	The sum of the political risk components including: Government stability, Socioeconomic conditions, Investment Profile, Internal conflict, External conflict, Corruption, Military in politics, Religious tensions, Law and Order, Ethnic tensions, Democratic accountability and Bureaucracy quality.	ICRG International Country Risk Guide
Investment	Investment share (%GDP)	WDI
Government consumption	Government consumption (%GDP)	WDI
Schooling	Gross enrolment ratio, secondary, both sexes (%)	WDI
Population	Total population (in logs)	WDI
Fertility	Fertility rate, total (births per woman)	WDI
Openness	Trade openness, measured as the sum of exports and imports of goods and services (%GDP)	WDI
Inflation	Inflation, consumer prices (annual %)	WDI
Natural resource rents	Total natural resources rents(%GDP) are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	WDI

Table A.2
Descriptive statistics

Variable	Obs.	No. of countries	Mean	Std.Dev.	Min	Max
Income inequality (changes)	1789	80	-0.01	0.42	-2.09	2.30
Commodity price shocks	1760	80	0.02	0.21	-1.21	3.05
Agricultural commodity price shocks	1760	80	0.002	0.11	-0.83	1.19
Non-agricultural commodity price shocks	1760	80	0.013	0.15	-1.21	2.61
Conflict (changes)	947	73	-0.04	2.18	-14.9	36.2
Pay inequality (changes)	1101	66	0.07	1.45	-10.93	14.71
Capital rents inequality (changes)	1070	62	-0.02	1.32	-9.1	10.59
Wage (changes)	1975	79	0.23	1.13	-9.3	7.58
Capital tax rents (changes)	1243	66	0.15	4.08	-59.55	56.43
GDP per capita (logs)	2130	80	8.4	1.67	5.09	11.42
GDP per capita (growth)	2046	80	2.02	4.44	-67.80	36.98
Investment	2084	80	22.66	7.78	0	61.46
Government consumption	2072	80	15.74	6.2	2.04	76.22
Schooling	1642	79	75.43	34.08	5.21	163.93
Population	2157	80	16.65	1.5	11.15	21.04
Fertility	2160	80	3.25	1.81	0.91	7.72
Openness	2108	80	75.7	55	0	442.62
Institutions	1704	72	66.37	13.68	19.16	96.08
Inflation	1975	80	1.72	1.41	-4.09	10.1
Natural resource rents (changes)	2055	80	-0.12	2.75	-25.11	21.51

Table A.3
List of countries

1	Algeria	29	Honduras	57	Peru
2	Angola	30	Hong Kong	58	Philippines
3	Argentina	31	Hungary	59	Poland
4	Australia	32	India	60	Qatar
5	Belgium	33	Indonesia	61	Romania
6	Benin	34	Iran	62	Russia
7	Bolivia	35	Iraq	63	Rwanda
8	Brazil	36	Ireland	64	Senegal
9	Bulgaria	37	Italy	65	Singapore
10	Burkina Faso	38	Japan	66	South Africa
11	Burundi	39	Kazakhstan	67	Spain
12	Cameroon	40	Kenya	68	Sweden
13	Canada	41	Korea	69	Switzerland
14	Central African Republic	42	Lesotho	70	Thailand
15	Chile	43	Lithuania	71	Togo
16	China	44	Madagascar	72	Turkey
17	Colombia	45	Malawi	73	Uganda
18	Costa Rica	46	Malaysia	74	United Kingdom
19	Czech Republic	47	Mali	75	United States
20	Dominica	48	Mauritania	76	Uruguay
21	Ecuador	49	Mexico	77	Venezuela
22	Ethiopia	50	Netherlands	78	Viet Nam
23	France	51	New Zealand	79	Zambia
24	Gambia	52	Nicaragua	80	Zimbabwe
25	Germany	53	Niger		
26	Ghana	54	Nigeria		
27	Guinea	55	Norway		
28	Haiti	56	Paraguay		

Table A.4
Correlation matrix, main variables

	Income inequality (changes)	Commodity price shocks	Conflict (changes)	Institutions
Income inequality (changes)	1			
Commodity price shocks	0.042*	1		
Conflict (changes)	0.045	-0.054*	1	
Institutions	0.178*	-0.005	-0.067*	1

Note: *P<0.1

Table A.5
List of Commodities

Non-Agricultural		
Oil	Zinc	Nickel
Natural Gas	Aluminum	Diamond
Coal	Iron	Lead
Gold	Copper	
Silver	Tin	
Agricultural		
Coffee	Cotton	Rubber
Banana	Wool	Rice
Wheat	Wood	
Sugar	Cocoa	

Table A.6
The average rate of inequality and quality of institutions in different regions of the sample

	Inequality	Institutions
Asia	39.8	68.42
Europe	30.45	78.09
Latin America	**45.92**	**63.28**
Middle East	38.84	57.18
North America	33.51	83.55
Oceania	32.16	85.23
Sub-Saharan Africa	**41.04**	**55.98**
Total	38.62	66.37

Table A.7
The coefficients of Table 4 (controls)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: the change in Inequality (Gini coefficient)								
Commodity price shocks	0.07**	0.05	0.02				0.03	
	(0.03)	(0.03)	(0.04)				(0.05)	
Agricultural price shocks				-0.01	-0.01	-0.12		-0.18
				(0.08)	(0.10)	(0.1)		(0.11)
Non-agricultural price shocks				0.12**	0.09*	0.1**		0.11**
				(0.04)	(0.04)	(0.04)		(0.04)
Log (income)		0.04**	-0.11		0.04**	-0.1	-0.11	-0.09
		(0.01)	(0.23)		(0.01)	(0.23)	(0.2)	(0.26)
Economic growth		0.004	-0.003**		0.004	-0.003	-0.002	-0.002
		(0.003)	(0.004)		(0.003)	(0.004)	(0.004)	(0.004)
Investment		0.0001	-0.003		0.00009	-0.003	-0.003	-0.003
		(0.01)	(0.004)		(0.001)	(0.004)	(0.004)	(0.004)
Government spending		0.008**	0.01**		0.008**	0.01**	0.009	0.01
		(0.002)	(0.006)		(0.002)	(0.006)	(0.007)	(0.007)
Schooling		-0.0005	-0.003*		-0.0005	-0.003*	-0.005	-0.005
		(0.0007)	(0.002)		(0.0007)	(0.002)	(0.002)	(0.002)
Total population							0.51	0.49
							(0.33)	(0.32)
Fertility							0.17	0.162*
							(0.1)	(0.1)
Openness							-0.001	-0.001
							(0.001)	(0.001)
Quality of Institutions							0.002	0.002
							(0.005)	(0.004)
Inflation							-0.01	-0.01
							(0.03)	(0.03)
Year FE	No	No	Yes	No	No	Yes	Yes	Yes
Country FE	No	No	Yes	No	No	Yes	Yes	Yes
Observations	1528	1153	1153	1528	1153	1153	969	969
Number of countries	80	75	75	80	55	78	67	67

Table A.8
Exclude countries which exports represent more than 10% of total world exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Commodity price shocks	0.07**	0.05	0.009				0.01	
	(0.03)	(0.03)	(0.04)				(0.05)	
Agricultural price shocks				0.007	0.01	-0.14*		-0.23**
				(0.09)	(0.11)	(0.07)		(0.1)
Non-agricultural price shocks				0.11**	0.07	0.08*		0.09*
				(0.05)	(0.04)	(0.04)		(0.05)
Controls	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes	Yes	Yes
Country FE	No	No	Yes	No	No	Yes	Yes	Yes
Additional controls	No	No	No	No	No	No	Yes	Yes
Observations	1284	965	965	1284	965	965	786	786
No. of countries	68	64	64	68	64	64	55	55

Note: Dependent variable: the change in Inequality (Gini coefficient). All control variables are lagged one year. Controls include: income (logs), economic growth, investment, government consumption and secondary schooling. Additional controls include: population (logs), fertility rate, openness, quality of institutions, and inflation (logs). The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

Table A.9
Exclude countries where a single commodity represents more than 50% of the country's total exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Commodity price shocks	0.05	0.04	0.01				0.02	
	(0.03)	(0.03)	(0.04)				(0.05)	
Agricultural price shocks				-0.05	-0.08	-0.12		-0.18
				(0.09)	(0.11)	(0.08)		(0.11)
Non-agricultural price shocks				0.11**	0.09*	0.08*		0.09**
				(0.05)	(0.04)	(0.04)		(0.04)
Controls	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes	Yes	Yes
Country FE	No	No	Yes	No	No	Yes	Yes	Yes
Additional controls	No	No	No	No	No	No	Yes	Yes
Observations	1336	1034	1034	1336	1034	1034	858	858
No. of countries	69	65	65	69	65	65	58	58

Notes: Dependent variable: the change in Inequality (Gini coefficient). All control variables are lagged one year. Controls include: income (logs), economic growth, investment, government consumption and secondary schooling. Additional controls include: population (logs), fertility rate, openness, quality of institutions, and inflation (logs). The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

Table A.10
Controlling for inequality in levels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inequality $_{t-1}$	-0.007***	-0.008***	-0.02*	-0.007***	-0.008***	-0.02*	-0.02*	-0.02**
	(0.001)	(0.001)	(0.01)	(0.001)	(0.001)	(0.01)	(0.01)	(0.01)
Commodity price shocks	0.08**	0.07*	0.03				0.03	
	(0.03)	(0.04)	(0.04)				(0.05)	
Agricultural price shocks				-0.02	-0.04	-0.12		-0.2*
				(0.11)	(0.1)	(0.1)		(0.08)
Non-agricultural price shocks				0.14**	0.12**	0.1**		0.1**
				(0.04)	(0.05)	(0.04)		(0.04)
Controls	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes	Yes	Yes
Country FE	No	No	Yes	No	No	Yes	Yes	Yes
Additional controls	No	No	No	No	No	No	Yes	Yes
Observations	1528	1153	1153	1528	1153	1153	953	953
Number of countries	80	75	75	80	75	75	66	66

Notes: Dependent variable: the change in Inequality (Gini coefficient). All control variables are lagged one year. Controls include: Income (logs), economic growth, investment, government consumption and secondary schooling. Additional controls include: population (logs), fertility rate, openness, quality of institutions, and inflation (logs). The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

Table A.11
3-year commodity price shocks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
3-year commodity price shock	0.17***	0.12**	0.03				0.03	
	(0.04)	(0.04)	(0.07)				(0.08)	
3-year agricultural price shock				0.05	0.008	-0.25		-0.36**
				(0.11)	(0.14)	(0.19)		(0.17)
3-year non-agricultural price				0.22**	0.16**	0.15*		0.19**
shock				(0.06)	(0.06)	(0.08)		(0.07)
Controls	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes	Yes	Yes
Country FE	No	No	Yes	No	No	Yes	Yes	Yes
Additional controls	No	No	No	No	No	No	Yes	Yes
Observations	1613	1205	1205	1613	1205	1205	1034	1034
Number of countries	80	75	75	80	75	75	66	66

Notes: Dependent variable: the change in Inequality (Gini coefficient). All control variables are lagged one year. Controls include: Income (logs), economic growth, investment, government consumption and secondary schooling. Additional controls include: population (logs), fertility rate, openness, quality of institutions, and inflation (logs). The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

Table A.12
Difference-in-Difference estimation

Dependent variable: the change in Inequality (Gini coefficient)			
	untreated	treated	*Diff-in-Diff*
Period * treated	0.009	1.138	1.12
Std. Error	0.057	0.444	0.448
P>|t|	0.88	0.011**	0.012**
Number of observations	618	238	856

Notes: we take the 2009-2014 as the treatment period. Treated countries are those having Pit>1 for the period of analysis. ** p<0.05

Table A.13
The role of initial level of inequality and quality of institutions

	(1)	(2)
Agricultural price shocks	0.04	
***OECD**	(0.21)	
Non-agricultural price	-0.25	
shocks***OECD**	(0.28)	
Agricultural price shocks *	-0.11	
Non-OECD	(0.08)	
Non-agricultural price shocks*	0.13***	
Non-OECD	(0.03)	
Agricultural price shocks *		-0.09
Non-OECD, Non-SSA& LA		(0.32)
Non-agricultural price shocks*		0.29
Non-OECD, Non- SSA& LA		(0.29)
Agricultural price shocks ***SSA**		-0.11
& LA		(0.08)
Non-agricultural price		0.12***
shocks***SSA & LA**		(0.02)
Controls	Yes	Yes
Year FE	Yes	Yes
Country FE	Yes	Yes
Observations	1153	1153
No. of countries	75	75

Table A.14
Robustness to Table 6, the whole sample

Dependent variables:	(1) income inequality (EHII)	(2)	(3) pay inequality	(4)	(5) capital rents inequality	(6)
Commodity price shocks	0.12		-0.18		0.29	
	(0.07)		(0.23)		(0.24)	
Agricultural prices shocks		-0.41		0.6		-1.11**
		(0.59)		(0.57)		(0.44)
Non-agricultural price shocks		0.28**		-0.46**		0.79***
		(0.11)		(0.18)		(0.18)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	
Additional controls	Yes	Yes	Yes	Yes	Yes	
Observations	703	669	669	623	623	
No. of countries	54	50	50	50	50	

Note: all control variables are lagged one year. Controls include: Income (logs), economic growth, investment, government consumption and secondary schooling. The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

Table A.15
Robustness to Table 6, Sub-Saharan and Latin-American countries

Dependent variables:	(1) income inequality (EHII)	(2)	(3) pay inequality	(4)	(5) capital rents inequality	(6)
Commodity price shocks	-0.02		-0.94		0.94*	
	(0.12)		(0.35)		(0.41)	
Agricultural prices shocks		-1.63*		-0.39		-1.77
		(1.13)		(1.04)		(1.15)
Non-agricultural price shocks		0.28*		-1.04**		1.46***
		(0.15)		(0.41)		(0.45)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	
Additional controls	Yes	Yes	Yes	Yes	Yes	
Observations	209	149	149	142	142	
No. of countries	20	17	17	17	17	

Note: all control variables are lagged one year. Controls include: Income (logs), economic growth, investment, government consumption and secondary schooling. The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

Table A.16
Robustness to Table 6 using natural resource rents

	the whole sample				SSA & LA			
	(1)	(2)	(3) income inequality	(4) capital rents inequality	(5)	(6)	(7) income inequality	(8) capital rents inequality
Dependent variables:	natural resource rents				natural resource rents			
Commodity price shocks	0.83**				0.18			
	(0.31)				(0.32)			
Agricultural prices shocks		-1.36**				-2.67**		
		(0.59)				(1.14)		
Non-agricultural price shocks		1.67**				1.01**		
		(0.59)				(0.42)		
Natural resource rents			0.007*	0.03			0.01**	0.1**
			(0.004)	(0.02)			(0.005)	(0.03)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	995	995	1071	717	393	393	394	171
No. of countries	67	67	66	54	30	30	29	19

Note: all control variables are lagged one year. Controls include: Income (logs), economic growth, investment, government consumption and secondary schooling. The time span goes from 1990 to 2016. All estimations are done with multiple-estimation regressions (100 imputations). Robust standard errors (clustered by country) in parentheses. ***P<0.01, **P<0.05, *P<0.1.

References

Acemoglu, D., Johnson, S., Robinson, J., Thaicharoen, Y., 2003. Institutional causes, macroeconomic symptoms: volatility, crises and growth. Journal of Monetary Economics 50 (1), 49–123.

Addison, T., Pirttilä, J., Tarp, F., 2017. Inequality: Measurement, Trends, Impacts and Policies. Review of Income and Wealth 63, 603–607.

Arezki, R., Van der Ploeg, F., 2010. Trade policies, institutions and the natural resource curse. Applied Economics Letters 17, 1443–1451.

Auty, R.M., Furlonge, H.I, 2019. The Rent Curse: Natural Resources, Policy Choice, and Economic Development. Oxford University Press, USA.

Bazzi, S., Blattman, C., 2014. Economic shocks and conflict: Evidence from commodity prices. American Economic Journal: Macroeconomics 6 (4), 1–38.

Behzadan, N., Chisik, R., Onder, H., Battaile, B., 2017. Does inequality drive the Dutch disease? Theory and evidence. Journal of International Economics 106, 104–118.

Bhattacharyya, S., Williamson, J.G, 2016. Distributional consequences of commodity price shocks: Australia over a century. Review of Income and Wealth 62 (2), 223–244.

Bjorvatn, K., Naghavi, A., 2011. Rent seeking and regime stability in rentier states. European Journal of Political Economy 27, 740–748.

Blattman, C., Miguel, E., 2010. Civil war. Journal of Economic Literature 48 (1), 3–57.

Boschini, A., Pettersson, J., Roine, J., 2013. The resource curse and its potential reversal. World Development 43, 19–41.

Cabrales, A., Hauk, E., 2011. The quality of political institutions and the curse of natural resources. The Economic Journal 121 (551), 58–88.

Carmignani, F., Avom, D., 2010. The social development effects of primary commodity export dependence. Ecological Economics 70 (2), 317–330.

Caselli, F., Tesei, A., 2016. Resource windfalls, political regimes, and political stability. Review of Economics and Statistics 98 (3), 573–590.

Castells-Quintana, D., 2017. Malthus living in a slum: Urban concentration, infrastructure and economic growth. Journal of Urban Economics 98, 158–173.

Castells-Quintana, D., 2019. Urban Inequality in Latin America: All the Horizon. Regional and Urban Economy Review. Armand Colin 239–257.

Chong, A., Gradstein, M., 2007. Inequality and Institutions. The Review of Economics and Statistics 89 (3), 454–465.

Ciccone, A. 2020. International commodity prices and civil war outbreak: new evidence for Sub-Saharan Africa and beyond.

Collier, P., Hoeffler, A., 2004. Greed and grievance in civil war. Oxford Economic Papers 56 (4), 563–595.

Conceição, P., Galbraith, J.K., Bradford, P., 2001. The theil index in sequences of nested and hierarchic grouping structures: implications for the measurement of inequality through time, with data aggregated at different levels of industrial classification. Eastern Economic Journal 27 (4), 491–514.

Crivelli, E., Gupta, S., 2014. Resource blessing, revenue curse? Domestic revenue effort in resource-rich countries. European Journal of Political Economy 35, 88–101.

Doerrenberg, P., Peichl, A., 2014. The impact of redistributive policies on inequality in OECD countries. Applied Economics 46 (17), 2066–2086.

Dreher, A., Gaston, N, 2008. Has globalization increased inequality? Review of International Economics 16 (3), 516–536.

Dube, O., Vargas, J.F, 2013. Commodity price shocks and civil conflict: Evidence from Colombia. The Review of Economic Studies 80 (4), 1384–1421.

Esteban, J., Ray, D., 2011. Linking conflict to inequality and polarization. American Economic Review 101 (4), 1345–1374.

Farzanegan, M. R. and Krieger, T. 2018. Oil rents shocks and inequality in Iran. CESifo Working Paper, No. 6876.

Fearon, J., 2008. Economic development, insurgency, and civil war. Institutions and Economic Performance 292, 328.

Fearon, J.D., Laitin, D.D, 2003. Ethnicity, insurgency, and civil war. American Political Science Review 97 (1), 75–90.

Ferraro, D., Peretto, P.F, 2018. Commodity prices and growth. The Economic Journal 128 (616), 3242–3265.

Fum, R.M., Hodler, R., 2010. Natural resources and income inequality: The role of ethnic divisions. Economics Letters 107 (3), 360–363.

Galbraith, J.K., Kum, H., 2005. Estimating the inequality of household incomes: A statistical approach to the creation of a dense and consistent global data set. Review of Income and Wealth 51 (1), 115–143.

Galbraith, J.K., Halbach, B., Malinowska, A., Shams, A., Zhang, W., 2014. UTIP Global Inequality Data Sets 1963-2008: Updates, Revisions and Quality Checks (Working Paper No. 68). University of Texas at Austin.

Galbraith, J.K., and Purcell, G. 1999. Inequality and state violence: A preliminary report. UTIP Working Paper No. 4.

Goderis, B., Malone, S.W, 2011. Natural resource booms and inequality: theory and evidence. The Scandinavian Journal of Economics 113 (2), 388–417.

Gylfason, T., Zoega, G., 2002. Inequality and economic growth: do natural resources matter? Center for Economic Studies and ifo Institute (CESifo) Working Paper 712 (5).

Gylfason, Thorvaldur, 2019. Inequality Undermines Democracy and Growth. Center for Economic Studies and ifo Institute (CESifo Working Paper 7486.

Hartwell, C.A., Horvath, R., Horvathova, E., Popova, O., 2019. Democratic institutions, natural resources, and income inequality. Comparative Economic Studies 61 (4), 531–550.

Haslam, P.A., 2016. Overcoming the resource curse: Reform and the rentier state in Chile and Argentina, 1973–2000. Development and Change 47 (5), 1146–1170.

Kim, D.H., Lin, S.C, 2018. Oil abundance and income inequality. Environmental and Resource Economics 71 (4), 1–24.

Kim, D.H., Chen, T.C., Lin, S.C, 2020. Does oil drive income inequality? New panel evidence. Structural Change and Economic Dynamics 55, 137–152.

Krieger, T., Meierrieks, D., 2016. Does Income Inequality Lead to Terrorism? CESifo Working Paper Series (5821).

Law, S.H., Naseem, N.A.M., Lau, W.T., Trinugroho, I., 2020. Can innovation improve income inequality? Evidence from panel data. Economic Systems 44 (4), 100815.

Le Billon, P., 2014. Natural resources and corruption in post-war transitions: matters of trust. Third World Quarterly 35 (5), 770–786.

Leamer, E.E., Maul, H., Rodriguez, S., Schott, P.K, 1999. Does natural resource abundance increase Latin American income inequality? Journal of Development Economics 59 (1), 3–42.

Lessmann, C., Steinkraus, A., 2019. The geography of natural resources, ethnic inequality and civil conflicts. European Journal of Political Economy 59, 33–51.

Mehlum, H., Moene, K., Torvik, R., 2006. Institutions and the resource curse. The Economic Journal 116 (508), 1–20.

Meschi, E., Vivarelli, M., 2009. Trade and income inequality in developing countries. World development 37 (2), 287–302.

Musayev, V. 2014. Commodity price shocks, conflict and growth: the role of institutional quality and political violence. MPRA Paper No. 59786.

Papyrakis, E., Gerlagh, R., 2004. The resource curse hypothesis and its transmission channels. Journal of Comparative Economics 32 (1), 181–193.

Papyrakis, E., 2014. A development curse: formal vs. informal activities in resource-dependent economies. International Journal of Social Economics 41 (3), 244–264.

Parcero, O.J., Papyrakis, E., 2016. Income inequality and the oil resource curse. Resource and Energy Economics 45, 159–177.

Ross, M.L., 1999. The political economy of the resource curse. World Politics 51 (2), 297–322.

Sachs, J.D., Warner, A.M, 1999. The big push, natural resource booms and growth. Journal of Development Economics 59 (1), 43–76.

Sala-i-Martin, X., Subramanian, A., 2013. Addressing the natural resource curse: An illustration from Nigeria. Journal of African Economies 22 (4), 570–615.

Seghezza, E., Pittaluga, G.B, 2018. Resource rents and populism in resource-dependent economies. European Journal of Political Economy 54, 83–88.

Siegel, K.M., 2016. Fulfilling Promises of More Substantive Democracy? Post-neoliberalism and Natural Resource Governance in South America. Development and Change 47 (3), 495–516.

Solt, F., 2016. The standardized world income inequality database. Social Science Quarterly 97 October 2017, SWIID Version 6.1.

Tan, H.B., Law, S.H, 2012. Nonlinear dynamics of the finance-inequality nexus in developing countries. The Journal of Economic Inequality 10 (4), 551–563.

Van der Ploeg, F., 2011. Natural resources: curse or blessing? Journal of Economic literature 49 (2), 366–420.

Van der Ploeg, F., Poelhekke, S., 2009. Volatility and the natural resource curse. Oxford Economic Papers 61 (4), 727–760.