# Diversification and democracy

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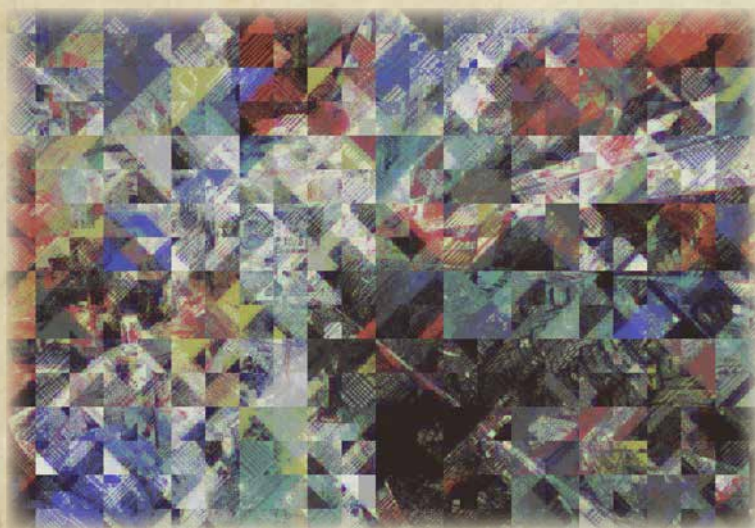
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Contents

Abstract

Does diversification of an economy improve the chances of democracy? This paper estimates the effect of export diversification on democracy levels, using data from 143 countries. The endogeneity of diversification is addressed by using variability within countries in fertile soil as an instrumental variable, controlling for country size. The results show that diversification has a significant, positive effect on levels of democracy. This suggests that less concentrated economic power in a society leads to more widely distributed political power. The results are robust to alternative measures of diversification and democracy, and to additional covariates. Results are also similar for diversification indices excluding oil, suggesting that the uncovered relationship is not entirely about oil.

Acknowledgements

About the authors

Ivar Kolstad is a senior researcher and coordinator of the natural resources research cluster at CMI. His current research focuses on natural resources and development, poverty dynamics, and corporate social responsibility. Kolstad has also done research on corruption, inequality, FDI, trade, aid and public financial management. He has managed a number of major research projects, funded by the World Bank, the Norwegian Ministry of Foreign Affairs, Norad, the Government of Malaysia, Irish Aid, and more. He has substantial experience from research in developing countries in Africa and Asia, in particular Angola and Bangladesh. Kolstad has a PhD from the Norwegian School of Economics and Business Administration, where he currently teaches business ethics.

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1   Introduction

There is a large literature discussing how the economic structure of countries affects their chances of becoming and remaining democracies. Following Lipset (1959), a number of studies have examined the idea that as incomes increase societies are more likely to become democratic, known as the modernization hypothesis (Acemoglu et al., 2008; Gundlach and Paldam, 2009; Kennedy, 2010; Boix, 2011). Other studies have focused more on the relationship between inequality and democracy, tracing their origins back to ideas expressed by Aristotle, de Toqueville and Marx, and offering similarly diverging hypotheses on how inequality affects democracy (Boix, 2003; Ansell and Samuels, 2010; Ahlquist and Wibbels, 2012). While levels and distribution of income have been seen as important in these studies, there is less emphasis on where the incomes originate from in terms of industrial sectors. It is plausible to think that incomes that originate from a highly concentrated industrial structure will lead to elites being more cohesive, and citizens more dependent on the elites for survival, compared to incomes that come from a more diversified industrial structure. Diversification of an economy is likely to lead to greater diversity in economic interests, including within elites, and less dependence and hence greater bargaining power for citizens since they face better outside options. If this is the case, diversification should improve chances for democracy.

This paper attempts to theoretically motivate and empirically estimate the impact of economic diversification on democracy. To our knowledge, this has not been done in previous studies. Studies that do see industrial structure as important for democracy tend to suggest that some industries are more conducive to democracy than others, rather than analyze the effects of diversification. In particular, countries with industries whose assets are mobile are believed to see less elite resistance to democratization, since elites will be less vulnerable to tax increases introduced in a democracy (Acemoglu and Robinson, 2006; Boix, 2003). This provides an argument for concentration in these forms of industries; our analysis complements these studies by looking at the effect of diversification. A number of studies also suggest that concentration in particular industries may harm chances of democracy, in particular concentration in resources such as petroleum and certain minerals (Ross, 2001; Aslaksen, 2010; Tsui, 2011). We add to these studies by examining the effect of diversification more generally.

A key problem in empirically estimating the effect of diversification on democracy is that diversification is endogenous. Unobserved variables could be driving an observed relation between the two variables, and several studies suggest that there is a reverse causal effect from democracy to diversification. Cuberes and Jerzmanowski (2009) argue that non-democracies have higher barriers to firm entry, leading to less diversification across sectors. Relatedly, Acemoglu (2008) argues that an oligarchic elite may create entry barriers to new firms, and de Waldemar (2009) finds a negative effect of rent-seeking on diversification. In our analysis, we attempt to address the endogeneity of diversification through an instrumental variable approach. Specifically, we use within-country variation in fertile soil as our instrument, controlling for country size. We expect (and find) that countries with greater heterogeneity in bio-topographical conditions will have more diversified economies in terms of exports. Moreover, controlling for country size, soil variability arguably is exogenous and can be used to identify the causal effect of diversification on democracy.

From our instrumental variable estimations, we find that diversification in exports has a statistically significant positive effect on democracy. The magnitude of the effect is also sizeable. The results hold for all standard measures of diversification, including the number of export products a country produces, and the Theil, Herfindahl and Gini indices of export concentration. The result also holds for all standard democracy indices used in the empirical literature on determinants of democracy. In addition, results are robust to the addition of a number of co-variates that could affect democracy, including income, population size, ethnic fractionalization, religious composition of the population, inequality, trade, education, latitude, region, and colonial history. The result also obtains for

diversification indices that exclude oil exports, and hence does not seem to be driven entirely by effects of concentration in oil.

The paper falls within the literature attempting to empirically estimate causal relationships between economic and political variables. Some studies in this literature have tested the modernization hypothesis, the idea that income increases chances of democracy, using country fixed effects to control for unobservable (time-invariant) country differences (Acemoglu et al., 2008; Boix, 2011). Since democracy tends to vary little over time, measurement error can create attenuation bias in such analyses. We therefore use an instrumental variable approach. Methodologically, our study is hence in the tradition of Acemoglu et al (2000). In the empirical literature on determinants of democracy, our approach is most closely related to that of Gundlach and Paldam (2009), who analyze the effect of income on democracy using measures of prehistoric biological and geographical conditions as their instrument for income. In the literature on diversification, our approach is related to that of Ramcharan (2006), who instruments for diversification of production using within-country variation in topographical conditions, specifically elevation, and estimates the effect of diversification on financial development.

Whereas our main contribution to the literature on economic and political structure is empirical, we also add to this literature through conceptualizing the role of diversification in democratization. While some studies do argue that diversification can improve chances of democracy (Ahlquist and Wibbels, 2012; Boix, 2011), this is mentioned mostly in passing and the role of diversification in doing so is not sufficiently explained and motivated. We attempt to provide a clearer theoretical case for a link between diversification and democracy by analyzing how diversification affects elite and citizen incentives to permit and press for democracy, hence situating our conceptual approach in the framework provided by Acemoglu and Robinson (2006).

Our conceptual and empirical analysis also speaks to the literature on globalization and development. There is considerable disagreement on the impact of greater openness to trade and investment on democracy, many of the arguments in this debate are summarized in Li and Reuveny (2003). Some studies suggest globalization has a positive effect by increasing development, flows of information, and mobility of elite assets, others suggest a negative effect mainly through an increased influence of multinational corporations. Empirical studies come to different conclusions on the effect of globalization, and include Rudra (2005), López-Córdova and Meissner (2008), Ahlquist and Wibbels (2012), Freeman and Quinn (2012) and Liu and Ornelas (2014). We complement these studies by analyzing the impact of the diversification of export across sectors, where these studies focus on the total amount of trade or the extent of financial openness.

Moreover, our analysis has some further relevance to the literature on natural resources, democracy and development. As noted, a number of studies suggest that countries concentrated in petroleum or certain minerals like diamonds are less likely to be democracies (Ross, 2001; Aslaksen, 2010; Tsui, 2011; Andersen and Ross, 2013), these findings are contested by other studies (Alexeev and Conrad, 2009; Haber and Menaldo, 2011). Whether or not there is an effect of resource dependence on democracy, some studies suggest that the effect of resources on development is conditional on levels of democracy. Notably, Robinson et al (2006) argue that democratic accountability reduces problems of patronage, or the use of resources revenues for political purposes, which is one explanation of the often inferior economic performance of countries rich in oil, known as the resource curse or the paradox of plenty (Auty, 1993; Sachs and Warner, 1995; Karl, 1997). Diversification is often argued to reduce the challenge of Dutch disease such economies may face, our results suggest that diversification may also have implications for our understanding of political economy challenges in these types of countries.

The paper is structured as follows. Section 2 presents the conceptual framework underlying our empirical analyses, theoretical arguments linking diversification to democracy, and implications of these arguments for the empirical approach. Section 3 presents the data used in the empirical analysis,

focusing in particular on the specifics of the instrumental variable, and the operationalization of the democracy and diversification variables. Section 4 presents our main results, and section 5 robustness tests including a discussion of the extent to which our results are driven by concentration in oil. Section 6 concludes.

2 Conceptual issues

In a diversified economy, industrial activity is spread over many sectors. In a democratic society, political power is similarly deconcentrated to individual citizens. What is the link between diversification and democracy? A simple argument would hold that diversification is associated with a more equal distribution of economic assets, which would likely result in a more equal distribution of political rights. However, this is an argument more about the effect of asset or income equality on democracy, than about the effect of diversification. Moreover, at least in principle it need not be the case that a diversified economy is a more equal one, a large proportion of the assets of a diversified economy can still be under the control of a concentrated elite. A theoretical discussion would hence have to revolve around the effect of diversification in itself, rather than associated economic features of countries.

Diversification does not really feature directly in existing political economy models of democracy. The exposition of the modernization theory by Lipset (1959) suggests that the effect of income on democracy mainly runs through increased levels of education and the expansion of the middle class. And while Lipset argues that industrialization and urbanization increase chances of democracy, this is more an argument that the existence of certain industries is favourable to democracy, than an argument about diversification. The model presented by Acemoglu and Robinson (2006), which analyzes democracy and authoritarianism as outcomes of strategic interaction between the elite and the citizens of a country, offers similar implications. A country where the elite owns companies intensive in human and physical capital have less to lose from democratization as their assets are mobile, and more to lose from a popular revolt as their businesses require cooperation from workers, and is hence more likely to democratize than a country where the elite owns land. Again, this implies a relation between the existence of certain industries and democracy, rather than an effect of diversification. In a review of existing studies, Wiig and Kolstad (2012:196) therefore conclude that existing theoretical arguments suggest that "it is the pattern of industrial activity rather than diversification per se, which affects … democracy".

Some empirical studies of democracy have made more explicit mention of diversification as a mechanism through which trade or economic growth affect democracy. In their study of trade and democracy, Ahlquist and Wibbels (2012:450) mention that diversification can "produce an alternative set of economic elites who seek protection from an authoritarian state". Ultimately, however, Ahlquist and Wibbels favour other mechanisms linking trade with democracy, and the potential role of diversification is not elaborated on. In a study of the modernization hypothesis, Boix (2011:813) suggests that economic growth in countries with historically favourable legal and economic institutions "triggered key social transformations such as declining inequality, an educated labor force, and more diversified economies. Those changes then reshaped the incentives of political actors, making them more willing to accept democracy". In later passages, however, it is clear that Boix is talking about the same type of expansion of sectors based on mobile assets that feature in the reasoning of Acemoglu and Robinson (2006), rather than an effect of diversification. A theoretical case for an effect of diversification on democracy therefore still remains to be made.

While diversification is not considered by Acemoglu and Robinson (2006), the basic structure of their model provides a natural starting point for considering its link to democracy. In very basic terms, their model sees political institutions as determined by elite incentives to permit democracy, and citizen incentives to revolt or fight for democracy. Elites lose from democracy as they will be made to pay higher taxes, but compare this with the costs of a citizen revolt in a non-democratic state and costs of repression. Citizens similarly compare potential gains they can make from revolting with the costs of staging a revolt. Let us consider how diversification affects elite and citizen incentives to allow or press for democratization, respectively.

From the perspective of the elite, a more diversified economy introduces the possibility of diverging interests within the elite, making their collective action problem in fighting popular demands for democracy more acute. This is related to the argument mentioned by Ahlquist and Wibbels (2012) that alternative elites may arise in a more diversified economy. These types of arguments seem to rest on an assumption of a sizeable elite with heterogeneous interests. However, even with a small elite and/or one with uniform economic interests, more diversified holdings could make calculations of outcomes from democratization and repression more unclear, making decisive elite action more difficult. A related argument is about risk; a well-diversified elite will be more protected from the risk of a regime change, and hence have less of an incentive to resist democracy. However, this may also cut the other way as a well-diversified elite will be more protected against the risk of a popular revolt.

From the perspective of the citizens, a well-diversified economy will mean that it is easier to switch to a job in a different industry, as there will more likely be industries having similar skill requirements as the one you are currently in. Workers will hence have less to lose from challenging the elite, as job loss poses less of a threat. This in a way also exacerbates the collective action problem of the elite, as employers with lower incentives to resist democracy will attract more workers. Workers with outside options like this may also have lower incentives to go the violent revolution path, as they have more to lose from the destruction it creates, and may hence choose to pursue democracy through more peaceful means. This is similar to the argument of Lipset (1959) and Acemoglu and Robinson (2006) that a larger middle class with some interest in the status quo tends to temper the strategies of the citizens, making violent and destructive confrontation less likely. However, the argument put forward here emphasizes outside employment options as the key factor, rather than a vaguer notion of middle class status.

These arguments largely suggest that economic diversification increases chances of democracy, as elite incentives or capabilities to resist democratization and repress the population are weakened, and citizen incentives to pursue democratization are strengthened. There are also arguments that point in the opposite direction, though. Several studies suggest that economic crises reduce the stability of a political system. Lipset (1959) considers this a particularly acute possibility where political systems lack perceived legitimacy, but points out that both democratic and undemocratic systems can be perceived as legitimate or illegitimate. Acemoglu and Robinson (2001) argue that economic crises represent a situation where opportunity costs of contesting power are lower, both for citizens attempting to introduce a democracy, and for an elite attempting to topple a democracy. In a diversified economy, recessions will be less pronounced, and we should hence see fewer of these crisis-induced transitions to and from democracy. Huntington (1991) suggests, however, that while both authoritarian and democratic systems depend on "performance legitimacy", democratic systems may be less vulnerable to economic downturn "because failure is blamed on the incumbents instead of the system, and the ouster and replacement of the incumbents help to renew the system" (ibid:27). If it is the case that economic crises predominantly destabilize authoritarian political systems, more diversified countries which experience fewer (or less deep) crises should see fewer transitions from authoritarianism to democracy than less diversified countries. This provides an argument that diversification reduces chances of democracy.

In testing these conflicting hypotheses, the basis for measuring diversification is an important consideration. Diversification of an economy can in principle be measured in many different ways, the principal ones in the literature tend to be in terms of production, or in terms of exports. Given the theoretical arguments presented above, we would argue that diversification measures based on exports are preferable to measures based on production. A country's export pattern by and large captures the distribution of activity that is competitive internationally, whereas the production pattern is both hard to measure accurately and perhaps more reflective of activities not based on an economic rationale. Diverging interests in the elite will more likely be picked up in competitive export industry data than in production figures that will also reflect rent-seeking activities whose continuation requires the continued coherence of the elite. And similarly, outside employment options for citizens may be perceived as more substantive if tied to internationally competitive firms.

As the above discussion indicates, diversification can be associated with a number of other features of an economy. More diversified economies could be richer, have a more educated population or less inequality, greater trade, or in other ways be different from less diversified economies. Our instrumental variable approach attempts to capture the causal effect of diversification on democracy, i.e. an effect not driven by other underlying characteristics of countries. In addition, we show that the identified effect does not seem to run through variables such as education, inequality or trade, as estimates are relatively unaffected by adding these variables as covariates.

3 Empirical approach

We address the endogeneity of diversification through an instrumental variable approach, using variability in fertile soil within countries as the instrument. The instrument is based on data on the proportion of a country's area that has fertile soil as calculated by Nunn and Puga (2012). Their calculation is based on work by Fischer et al (2002), who identify whether each cell on a 5-minute grid covering almost the entire land area of the Earth is subject to various constraints for growing rainfed crops. The percentage of the land surface area of each country that has fertile soil is then defined as soil not subject to severe constraints for growing rainfed crops in terms of either soil fertility, depth, chemical and drainage properties, or moisture storage capacity. We use this variable to construct an index of fertile soil variability within countries. If we denote by p_i the percentage of country I's area that has fertile soil, our index of soil variability is calculated as

$$Soil\ variability_i = p_i \cdot (1 - p_i) \tag{1}$$

This generates an index which runs from 0 to 0.25, where higher values indicate a country whose area is more heterogeneous in terms of fertile soil. For instance, a country whose entire area is either fertile (p_i=1) or wholly infertile (p_i=0), scores zero on the soil variability index. In contrast, a country whose area is half fertile and half infertile soil (i=0.5) gets the maximum value of 0.25 on the index.

We expect (and find) that countries with more heterogeneous soil have more diversified economies. The reasoning behind the instrument is as follows. Compared to a country A with a medium amount of fertile soil, a country B with a lot of fertile soil will have lower factor prices for land and higher factor prices for other inputs, and vice versa for a country C with little fertile soil. Imagine that products are distributed on a continuum according to their level of intensity in land, from low intensity to high intensity. The country B with abundant fertile soil will hence have a cost advantage in producing goods that are intensive in land, and the country C with scarce fertile soil a cost advantage in producing goods intensive in the other inputs. The country A with a medium amount of fertile land can have a cost advantage in producing goods of medium intensity if the effect of scarcity on factor prices is non-linear, in the sense that with increasing scarcity of a factor the price of the relatively scarce factor goes up faster than the price of the relatively abundant factor goes down. With sufficient non-linearity or a higher density of products around the middle of the product space, the country A with medium soil fertility can hence be more diversified.

Given the size of countries, their heterogeneity in terms of soil composition should be exogenous. In instrumenting for diversification with soil variability, we hence control for physical country size (in million square kilometres). As soil variability also could determine the population that can be supported in a given area, we also control for population size, and in line with the large previous literature on modernization, we control for income. The identification strategy depends on an effect of the instrument on democracy that only runs through diversification, in additional estimations we also control for other factors that soil variability could potentially affect. These include ethnic and other fractionalization, religious composition of the population, inequality, civil war, openness to trade, education, and latitude.

Due to the time-invariant nature of our instrument, we use cross-section instrumental variable estimation to identify the effect of diversification on democracy, as represented by equations (2) and (3). In the first stage, diversification is regressed on variability in fertile soil, and the predicted diversification values are then regressed on democracy. In both stages, we control for country covariates X_i, including income level, country area, and population size. Data for both democracy and diversification is from 2011, the latest available at the time of analysis. We lag the covariates one period, and for some variables where data is scarce, we use the average over the preceding decade in order to get as many observations as possible (see Table 1 for details).

$$Diversification_i = \alpha_1 + \beta_1 \cdot Soil\ variability_i + \gamma_1 X_i + \varepsilon_{1i} \qquad (2)$$

$$Democracy_i = \alpha_2 + \beta_2 \cdot Diversification(predicted)_i + \gamma_2 X_i + \varepsilon_{2i} \qquad (3)$$

Our dependent variable democracy is measured by standard indices commonly used in the literature. In our main estimations we use the Polity IV democracy index, which runs from 0 to 10, with higher values indicating greater democracy. This is an index of institutionalized democracy, which captures the competitiveness of political participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive (see Marshall et al (2013) for details). This index is used by among others Glaeser et al (2004; 2007). To show that our results are robust to the democracy index used, we run additional estimations using the Freedom House political rights and civil liberties indices, which we rescale to the same scale as the Polity IV democracy index to be able to more easily compare results. The Freedom House indices are used in Barro (1999), Acemoglu et al (2008), Aslaksen (2010), Oskarsson and Ottosen (2010), Csordás and Ludwig (2011), Heid et al (2012) and Barron et al (2014). For reasons of relative conceptual clarity, we prefer the Polity IV democracy index to the composite index used in other studies, which subtracts a measure of autocracy from the democracy score.[1] However, we show in an appendix that our results are robust to using this composite index as our dependent variable, since it has been used in a number of studies including Ross (2001), Gundlach and Paldam (2009), Persson and Tabellini (2009), Boix (2011), Brückner and Ciccone (2011), Haber and Menaldo (2011), Brückner et al (2012), Freeman and Quinn (2012), and Andersen and Ross (2013). Moreover, we show in the appendix that results also hold when using the dichotomous democracy measure due to Przeworski et al (2000), as elaborated on by Cheibub et al (2010), and employed in the studies of Persson and Tabellini (2009), Ahlquist and Wibbels (2012), Freeman and Quinn (2012), Gabessner et al (2013), and Barron et al (2014).

We base our diversification indices on data from the Base pour l'Analyse du Commerce International (Baci), which based on UN Comtrade data provides "comprehensive and disaggregated reconciled values and quantities of international trade" for over 200 countries (Gaulier and Zignago, 2010). The most detailed of these data break down bilateral trade volumes between countries according to the product classification of the 6-digit harmonized system (hs6). For our purposes, this gives us data on export value (in 1000 USD) disaggregated into 5111 product categories, for each of the countries covered. We use this data to construct four different indices of export diversification at the country level. This is to test the robustness of our results to the index used. The first index is simply the number of products a country exports, i.e. the number of the 5111 product categories for which a country has a positive export value. While simple, this index provides a view of diversification along the extensive margin, but of course does not reflect any concentration within the group of products actually produced.

The other three indices are adapted from the literature on inequality and industrial organization, and have been used in earlier studies of diversification. Let n be the number of product categories and x_{ik} be the export value of product category k from country i. Denote by $s_{ik} = x_{ik}/\sum_{k=1}^{n} x_{ik}$ the share that product category k comprises of country i's total exports, and let $\overline{x_i} = \sum_{k=1}^{n} x_{ik}/n$ be the average export value across product categories from country i. The Theil index of export concentration can then be written as:

$$Theil\ Index_i = \frac{1}{n}\sum_{k=1}^{n}\frac{x_{ik}}{\overline{x_i}}\ln\left(\frac{x_{ik}}{\overline{x_i}}\right) \qquad (4)$$

The Herfindahl index of export concentration, normalized to run from zero to one, can be written as:

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[1]See the discussion in Munck and Verkuilen (2002) and Cheibub et al (2010).

$$Herfindahl\ Index_i = \frac{\sum_{k=1}^{n}(s_{ik})^2 - \frac{1}{n}}{1 - \frac{1}{n}} \tag{5}$$

Finally, ordering products by increasing export share, the Gini coefficient can be written as:

$$Gini\ index_i = 1 - \sum_{k=1}^{n} \frac{(x_{ik} - x_{ik-1})}{n} \tag{6}$$

As opposed to the number of export products, the latter three indices are concentration indices, which means that higher scores imply less diversification. Note that all three indices have been calculated using the same total number of product categories for all countries, n=5111. This means that in calculating the indices, we also include observations of zero export values, in order to be able to meaningfully compare concentration across countries. Technically, since the Theil index is not defined for zero export values, in computing this index we have resolved this by setting export values equal to one for product categories that a country does not export. The Theil index then runs from zero to $\ln(5111) \approx 8.539$. The Herfindahl and Gini indices range from zero to one.

Table 1 includes a full presentation of all the variables used in our analysis, including a number of additional covariates. As noted, our main specification includes income (GDP per capita in PPP adjusted constant USD), land area, and population size. Our main sample thus consists of 143 countries, listed in Table A1 in the appendix. In additional estimations, we also control for ethnic fractionalization, religious composition, income inequality, civil war, openness to trade, enrolment in tertiary education, latitude, region, and colonial history. Results are also robust to a range of other covariates, including other measures of fractionalization (religious, linguistic), civil war, education (years of schooling, enrolment in primary and secondary education), we do not however show these results.

Table 1. Table of main variables

Variable	Explanation	Source
Dependent variables		
Democracy	Polity Democracy Index	Quality of Government Institute
Political Rights	Freedom House political rights index, rescaled (0 - low democracy, 10 - high democracy)	Quality of Government Institute
Civil Liberties	Freedom House civil liberties index, rescaled (0 - low democracy, 10 - high democracy)	Quality of Government Institute
Independent variables		
Exportproducts	Number of hs6 product categories for which a country has positive export values	BACI International Trade Database
Theil Index	Theil index calculated from export values for all hs6 product categories	BACI International Trade Database
Herfindahl Index	Normalized Herfindahl index calculated from export values for all hs6 product categories	BACI International Trade Database
Gini Index	Gini index calculated from export values for all hs6 product categories	BACI International Trade Database
GDP/capita (ln)	Log of GDP per capita, PPP adjusted, constant 2005 USD	World Development Indicators
Land area	Land area in million squared kilometers	World Development Indicators
Population	Population size in millions	World Development Indicators
Ethnic fractionalization	Ethnic fractionalization index from Alesina et al (2003)	Quality of Government Institute
Proportion Catholic	Catholics as percentage of population in 1980 from La Porta et al (1999)	Quality of Government Institute
Proportion Muslim	Muslims as percentage of population in 1980 from La Porta et al (1999)	Quality of Government Institute
Proportion Other	Percentage of population belonging to other denominations (than Catholicism, Protestantism and Islam) in 1980 from La Porta et al (1999)	Quality of Government Institute
Inequality	Gini index based on disposable income from Solt (2008), averaged over period 2001 to 2010	Quality of Government Institute
Civil war	Dummy variable equal to one if a country has experienced civil war in the period 2001-2010. Based on the type 3 armed conflict indicator from the UCDP/PRIO conflict database	Quality of Government Institute
Openness to trade	Ratio of exports + imports to GDP, averaged over period 2001 to 2010	World Development Indicators
Education (tertiary)	Gross enrolment in tertiary education, averaged over period 2001 to 2010	World Development Indicators
Latitude	The absolute value of the latitude of the capital city, divided by 90	Quality of Government Institute
Instrument		
Soil variability	Variation in fertile soil. On the basis of the FAO/UNESCO Digital Soil Map of the World and linked soil association composition table and climatic data compiled by the Climate Research Unit of the University of East Anglia, Fischer et al. (2002) identify whether each cell on a 5-minute grid covering almost the entire land area of the Earth is subject to various constraints for growing rainfed crops. Based on plates 20 (soil moisture storage capacity constraints), 21 (soil depth constraints), 22 (soil fertility constraints), 23 (soil drainage constraints), 24 (soil texture constraints), and 25 (soil chemical constraints) in Fischer et al. (2002), Nunn and Puga (2012) calculate the percentage of the land surface area of each country that has fertile soil (defined as soil that is not subject to severe constraints for growing rainfed crops in terms of either soil fertility, depth, chemical and drainage properties, or moisture storage capacity). Denote by p the percentage of the country's area that has fertile soil. Our variable of soil variability is equal to p*(1-p).	Constructed from Nunn and Puga (2012)

Table 2 presents descriptive statistics for our main sample of 143 countries, which increases to 167 countries when the Freedom House indices are used as dependent variables. The exportproduct index shows that the number of product categories exported ranges from 130 to almost 5000, with the mean country exporting about half of the total 5111 products in the hs6 classification. The four diversification indices are highly correlated (not shown in the table), but we notice from Table 2 that the Gini coefficient tends to concentrate in the higher values, reflecting an underlying Lorenz curve which is pushed far to the right by a number of product categories with little or no exports. For the covariates, we see that our sample contains countries with substantial variation in other characteristics.

Table 2. Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Democracy	143	5.90	3.73	0.00	10.00
Political Rights	167	6.06	3.46	0.00	10.00
Civil Liberties	167	6.20	2.99	0.00	10.00
Exportproducts	143	2463.40	1592.11	130.00	4939.00
Theil Index	143	4.75	1.67	1.75	8.48
Herfindahl Index	143	0.17	0.22	0.00	0.99
Gini Index	143	0.95	0.04	0.81	1.00
GDP/capita (ln)	143	8.69	1.29	5.82	11.16
Land area	143	0.83	2.10	0.00	16.38
Population	143	45.57	153.99	0.49	1337.71
Ethnic fractionalization	141	0.46	0.26	0.00	0.93
Proportion Catholic	143	30.65	35.81	0.00	96.90
Proportion Muslim	143	24.84	35.32	0.00	99.50
Proportion Other	143	34.15	32.42	0.30	100.00
Inequality	129	38.64	8.26	22.70	64.76
Civil war	143	0.20	0.40	0.00	1.00
Openness to trade	141	85.81	43.50	25.81	397.89
Education (tertiary)	129	30.12	25.06	0.49	95.00
Latitude	143	0.29	0.20	0.00	0.71
Soil variability	143	0.18	0.08	0.00	0.25

To get a better picture of how the diversification indices rate countries in terms of diversification, Table 3 presents the ten most concentrated and ten most diversified countries in our main sample, ranked according to the Theil index. As the top of the table indicates, the most concentrated economies tend to be oil producing ones in Asia, Africa and Latin America. Iraq has the most concentrated economy in the world, followed by Angola. Among the least concentrated economies from the bottom of the table, we find a number of developed European countries, the most diversified being Italy, Germany and Austria, and also the United States and China. While not shown in the table, the ranking does not change much if we instead use to Herfindahl or Gini indices. Iraq and Angola remain the most concentrated, and the same countries tend to be among the most diversified. The picture changes a bit more if countries are ordered by the number of export products. This tends to push smaller and poorer countries towards the high end of concentration, and Timor-Leste and the Comoros are the countries exporting the fewest products. The group of the most diversified economies does not change that much, though, the country exporting the most products is the United States, followed by China and Germany.

Table 3. 10 most and 10 least concentrated economies in the main sample

Country	Export products	Theil index	Herfindahl index	Gini index
Iraq	668	8.480577	.9878063	.9982079
Angola	680	8.354405	.9464675	.9978949
Chad	152	8.259516	.9091074	.9917966
Eritrea	158	8.020873	.9165822	.9864095
Sudan	569	7.958477	.824419	.9951745
Venezuela	2029	7.832878	.7315947	.9978372
Azerbaijan	1450	7.777124	.7717369	.9958887
Gabon	612	7.739021	.6910733	.9957256
Congo	552	7.738413	.7334283	.9940432
Equatorial Guinea	271	7.668503	.6006376	.9920844
⋮				
⋮				
Czech Republic	4553	2.369045	.0072619	.8830778
United States	4939	2.33323	.0115188	.8749446
Turkey	4521	2.180637	.0054508	.8693475
Spain	4739	2.171961	.0094431	.8466359
Poland	4560	2.156763	.004799	.8715453
China	4895	2.154203	.0089939	.8453763
France	4801	2.146459	.0100328	.8488799
Austria	4595	1.9556	.0036046	.855015
Germany	4812	1.896379	.0060665	.82263
Italy	4783	1.745633	.004665	.8148357

A further description of the main sample of countries in terms of our instrument soil variability is provided in Figure 1. Each hollow dot represents a country, and the solid dots mark the values for fertile soil and soil variability for the labelled countries. As the figure illustrates, the most diversified countries tend to have medium levels of fertile soil, and thus maximum values on soil variability, indicated by Italy, Germany, Austria and the United States. The most concentrated economies in our main sample, in the figure represented by Iraq, Angola and Chad, tend to have less fertile soil and hence lower values on the instrument. While not seen in the figure, the countries at the higher range in terms of fertile soil tend to have medium levels of diversification, i.e. higher than the countries in the medium range of fertile soil. This figure is an indication of the relationship our instrumental variable is meant to pick up, but this will of course be tested more carefully in the regression analysis below.

Figure 1: Fertile soil and variability for main sample and some highlighted countries
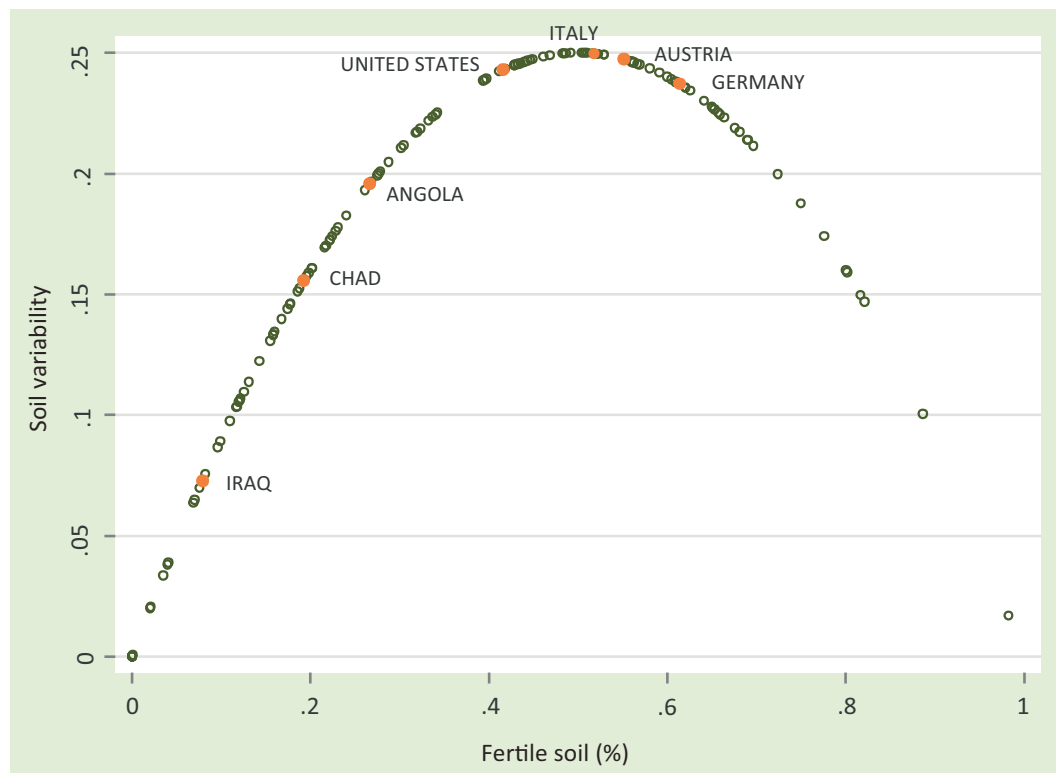
4 Results

Table 4 contains the main results from our empirical analysis, using the Polity IV democracy index as the dependent variable. The first two columns of Panel A present the results for the first and second stages of the instrumental variable regression, when the number of export products is used as the index of diversification. The first column reveals that the fertile soil variability instrument is positively and significantly related to diversification in terms of export products. In other words, countries with more variability in fertile soil export more products, as expected. The instrument is strong, as seen in the bottom row of the first column the F-test for whether the instrument should be included in the first stage yields a value just shy of 17, which is well above conventional requirements for instrument strength of 10 (Stock et al, 2002). The top row of column two contains our main result, which is that diversification has a significantly positive effect on democracy. Countries that diversify in terms of exporting a higher number of products on average become more democratic. The effect is substantial, an expansion of exports into 100 new product categories increases the score on the democracy index by 0.5 points. The third column in Panel A provides corresponding OLS estimates for comparison. The coefficient for diversification is here also significantly positive, but significantly smaller than the estimate from the instrument variable regression (p<0.004).

The results are similar across all the four diversification indices. The last three columns of Panel A in Table 4 show results when the Theil index is used as the main explanatory variable. Column four shows that soil variability is a strong predictor of a country's score on the Theil index. Recall that this index is an index of concentration, so higher values signify less diversification. The negative coefficient for the soil variability index thus means that countries with more variation in fertile soil are less concentrated, i.e. more diversified. The instrument has an F-value of more than 22 in the first stage, so the instrument is even stronger in this case than for the number of export products. And there is a significant and negative effect of concentration on democracy in the second stage, as seen in column five. So the earlier finding that diversification increases democracy is upheld. The coefficient is also large, a one standard deviation decrease in the Theil index entails an increase in the Polity democracy index by five points. The instrumental variable estimate is again significantly larger than the corresponding OLS estimate (p<0.006).

Table 4. Main results. Dependent variable: Polity IV democracy index.

Panel A

Dependent variable	IV - 1st stage Diversification	IV - 2d stage Democracy	OLS Democracy	IV - 1st stage Diversification	IV - 2d stage Democracy	OLS Democracy
Exportproducts		0.005***	0.001***			
		(0.00)	(0.00)			
Theil Index					-3.184***	-1.275***
					(0.63)	(0.16)
GDP/capita (ln)	901.635***	-3.709***	-0.301	-0.639***	-1.011**	0.189
	(53.53)	(1.22)	(0.37)	(0.08)	(0.48)	(0.25)
Land area	65.576***	-0.287**	-0.121	0.067*	0.272*	0.074
	(23.27)	(0.14)	(0.10)	(0.04)	(0.14)	(0.10)
Population	2.277***	-0.014***	-0.004	-0.003***	-0.010**	-0.004
	(0.52)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Soil variability	4645.419***			-7.657***		
	(1127.57)			(1.62)		
Constant	-6349.533***	26.052***	5.235**	11.718***	30.042***	10.432***
	(454.95)	(7.70)	(2.62)	(0.69)	(6.94)	(2.81)
r2	0.669	.	0.262	0.415	.	0.348
N	143	143	143	143	143	143
F_instrument	16.973			22.246		

Panel B

Dependent variable	IV - 1st stage Diversification	IV - 2d stage Democracy	OLS Democracy	IV - 1st stage Diversification	IV - 2d stage Democracy	OLS Democracy
Herfindahl Index		-27.931***	-7.528***			
		(7.15)	(1.17)			
Gini Index					-155.361***	-46.076***
					(35.00)	(7.90)
GDP/capita (ln)	-0.042***	-0.157	0.682***	-0.014***	-1.210**	0.338
	(0.01)	(0.46)	(0.23)	(0.00)	(0.53)	(0.28)
Land area	0.005	0.183	0.007	0.003***	0.514**	0.111
	(0.01)	(0.15)	(0.10)	(0.00)	(0.22)	(0.12)
Population	-0.000***	-0.007*	-0.002	-0.000***	-0.015**	-0.004
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Soil variability	-0.873***			-0.157***		
	(0.23)			(0.04)		
Constant	0.692***	12.055**	1.305	1.101***	163.849***	46.721***
	(0.13)	(4.90)	(2.09)	(0.02)	(36.99)	(9.37)
r2	0.171	.	0.298	0.389	.	0.288
N	143	143	143	143	143	143
F_instrument	14.236			16.177		

Panel B of Figure 4 yields results for the Herfindahl and Gini indices that are very similar. The instrument is strong also for these measures of diversification (the F-value is 14 and 16, respectively), and has the expected sign. Concentration as measured by either index has a significantly negative effect on democracy, and the order of the effect per standard deviation change in diversification is similar to that of the Theil index. The instrument variable estimates are also substantially greater (in absolute terms) than the corresponding OLS estimates ($p < 0.003$ for both indices).

The results for all four diversification indices thus provide a stable and consistent picture. As countries diversify their economies, they become more democratic. Further robustness tests reaffirm these results, and are presented in the following section and in the appendix.

For the covariates, examining the first stage regressions provides the following picture. Richer economies tend to be more diversified (less concentrated) in terms of exports. Larger economies in terms of population size are also more diversified. Results are a bit more mixed for physical country size. In the second stage estimations, income is negatively related to democracy. This might suggest that beyond the effect of diversification there is not much of a modernization effect, but we stress that our results only capture correlations for the income variable. Larger countries in terms of population tend to be less democratic, while the pattern for physical country size is unclear.

5 Robustness

Table 5 shows that our results are robust to substituting the Freedom House political rights index for the Polity democracy index as our dependent variable. The specifications are otherwise the same. This increases our sample to 167 countries. The soil variability instrument remains sufficiently strong and has the same sign as in regressions using the Polity democracy index. The results for the four diversification variables in the second stage are also similar, albeit with somewhat smaller coefficients (in absolute terms). They remain significantly larger (in absolute terms) than OLS estimates (not shown, p<0.003). Robustness to further democracy indices is demonstrated in Tables A2, A3 and A4 in the appendix. Results are very similar for the Freedom House civil liberties index, for the Polity combined index, and for the democracy dummy due to Przeworski et al (2000).

Table 5. Results using Freedom House political rights index as dependent variable

Dependent variable	IV - 1st stage *Diversification*	IV - 2d stage *Democracy FH pol rights*	IV - 1st stage *Diversification*	IV - 2d stage *Democracy FH pol rights*	IV - 1st stage *Diversification*	IV - 2d stage *Democracy FH pol rights*	IV - 1st stage *Diversification*	IV - 2d stage *Democracy FH pol rights*
Exportproducts		0.003***						
		(0.00)						
Theil Index				-2.211***				
				(0.51)				
Herfindahl Index						-19.029***		
						(5.18)		
Gini Index								-123.483***
								(39.30)
GDP/capita (ln)	816.099***	-1.150	-0.556***	0.046	-0.036***	0.595*	-0.012***	-0.247
	(62.52)	(0.81)	(0.08)	(0.35)	(0.01)	(0.31)	(0.00)	(0.50)
Land area	109.990***	-0.482***	0.056	-0.031	0.004	-0.086	0.003***	0.231
	(25.57)	(0.14)	(0.04)	(0.13)	(0.01)	(0.13)	(0.00)	(0.23)
Population	2.421***	-0.008**	-0.003***	-0.007**	-0.000***	-0.004	-0.000***	-0.011**
	(0.65)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Soil variability	4938.745***		-6.637***		-0.771***		-0.119***	
	(1057.75)		(1.44)		(0.20)		(0.04)	
Constant	-5926.086***	10.160*	10.875***	16.597***	0.621***	4.378	1.075***	125.347***
	(549.74)	(5.19)	(0.76)	(5.34)	(0.12)	(3.34)	(0.02)	(41.00)
r2	0.549	.	0.330	0.067	0.138	.	0.275	.
N	167	167	167	167	167	167	167	167
F_instrument	21.801		21.200		14.553		7.796	

In Table 6, we add a range of further covariates to our specification, using the Polity IV democracy index as the dependent variable, and the number of export products as the main explanatory variable. The results show that the effect of diversification is not much affected by adding indices of ethnic fractionalization, religious composition of the population, income inequality, civil war, openness to trade, education, latitude, dummies for colonial history, or regional dummies. The estimated coefficients for the diversification indices are also robust to the combination of these variables (not shown in table). They remain significant for combinations of covariates that retain the sample of countries. For combinations that substantially reduce the sample, there is a clear selection problem in that the countries where data is missing tend to be the less diversified ones. If all the covariates below are included the sample is reduced by 26 countries, cutting 15 of the 30 least diversified countries from the sample, including Iraq, Eritrea, Sudan, Gabon and Equatorial Guinea in the top ten of Table 3. This makes the instrument weak, and estimates of diversification more imprecise, but with coefficients highly similar to (and even a bit higher than) the main estimations.

Table 6. Results for number of export products with added covariates. Dependent variable: Polity IV democracy index

Dependent variable	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy
Exportproducts	0.005***	0.004***	0.005**	0.005***	0.005***	0.007***	0.005***	0.005***	0.005***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP/capita (ln)	-3.551***	-2.912**	-2.897	-3.854***	-3.557***	-3.265**	-3.596***	-3.082***	-3.054**
	(1.16)	(1.20)	(2.13)	(1.28)	(1.28)	(1.26)	(1.25)	(1.06)	(1.27)
Land area	-0.243	-0.249**	-0.294*	-0.269**	-0.303**	-0.246	-0.272**	-0.311**	-0.453***
	(0.16)	(0.11)	(0.15)	(0.13)	(0.13)	(0.18)	(0.13)	(0.14)	(0.15)
Population	-0.013***	-0.010**	-0.012*	-0.014***	-0.014***	-0.018**	-0.014***	-0.011***	-0.011**
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)
Ethnic fractionalization	-1.876								
	(2.39)								
Proportion Catholic		-0.001							
		(0.01)							
Proportion Muslim		-0.031*							
		(0.02)							
Proportion Other		-0.019							
		(0.02)							
Inequality			0.100						
			(0.07)						
Civil war				-0.932					
				(0.98)					
Openness to trade					-0.005				
					(0.01)				
Education (tertiary)						-0.102			
						(0.08)			
Latitude							-3.187		
							(3.52)		
Constant	26.356***	23.074***	16.217	27.356***	25.221***	21.856***	25.538***	22.015***	24.353***
	(7.28)	(7.41)	(12.55)	(8.27)	(7.78)	(7.52)	(7.94)	(6.41)	(8.57)
r2	.	.	.	.	.	.	.	.	.
N	141	143	129	143	141	129	143	143	143
Colonial dummies	No	No	No	No	No	No	No	Yes	No
Region dummies	No	No	No	No	No	No	No	No	Yes

Table A5, A6 and A7 in the appendix provide similar estimations as Table 6, for the Theil, Herfindahl and Gini indices, respectively. All results are essentially the same.

A question that naturally arises in relation to the result that diversification leads to more democracy, is whether this is driven entirely by the effect of natural resources, in particular oil. Our results are robust to adding the absolute level of exports of petroleum as a covariate. However, a problem arises in including resource dependence measures, such as the level of natural resource exports in merchandize exports or GDP, in the estimations. This would entail explaining concentration through another measure of concentration in the first stage estimations, where the resource dependence measure would soak up all the variation. Another way to address this issue would be to split the sample according to oil exporting and non oil-exporting countries. This, however, leads to too few observations in the non oil-exporting group to meaningfully run estimations.

Instead, as an initial approach to this, we have calculated diversification excluding crude oil exports (or more precisely exports in hs6 category 270900; "petroleum oils and oils from bituminous minerals, crude"). Table 6 shows results when Theil, Herfindahl and Gini indices of diversification ex oil are used as explanatory variables, and the Polity IV democracy index as the dependent variable. Results for diversification indices ex oil are similar to results for the comprehensive diversification indices, and point estimates even a bit higher. This suggests that the estimated effect of diversification on democracy is not entirely about oil.

Table 7. Results excluding oil

Dependent variable	IV - 1st stage Diversification	IV - 2d stage Democracy	OLS Democracy	IV - 1st stage Diversification	IV - 2d stage Democracy	OLS Democracy	IV - 1st stage Diversification	IV - 2d stage Democracy	OLS Democracy
Theil Index ex oil		-4.338***	-1.205***						
		(1.03)	(0.24)						
Herfindahl Index ex oil					-55.051***	-7.304***			
					(18.70)	(2.35)			
Gini Index ex oil								-182.332***	-41.072***
								(46.53)	(8.69)
GDP/capita (ln)	-0.660***	-1.840**	0.205	-0.041***	-1.258	0.693***	-0.015***	-1.658**	0.394
	(0.07)	(0.79)	(0.30)	(0.01)	(1.08)	(0.26)	(0.00)	(0.70)	(0.30)
Land area	0.038	0.223	0.020	-0.000	0.054	-0.044	0.003***	0.515**	0.071
	(0.03)	(0.18)	(0.11)	(0.00)	(0.15)	(0.11)	(0.00)	(0.26)	(0.12)
Population	-0.002***	-0.012**	-0.003	-0.000***	-0.008*	-0.001	-0.000***	-0.016**	-0.004
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Soil variability	-5.621***			-0.443***			-0.134***		
	(1.42)			(0.16)			(0.04)		
Constant	11.339***	41.913***	9.722***	0.565***	23.824**	0.852	1.097***	192.802***	41.368***
	(0.59)	(11.31)	(3.44)	(0.10)	(11.46)	(2.37)	(0.02)	(49.32)	(10.27)
r2	0.470	.	0.256	0.212	.	0.183	0.396	.	0.237
N	143	143	143	143	143	143	143	143	143
F_instrument	15.715			8.018			12.810		

6 Conclusion

While it has been suggested that more diversified economies have a better chance of becoming democracies, this relationship has to our knowledge not been the subject of theoretical or empirical analysis. This paper provides an analysis of possible mechanisms through which diversification can affect prospects for democracy. A more diversified economy likely has a less unified elite, and citizens who have better outside employment options and hence less to lose from challenging the elite. On the other hand, diversified economies may experience fewer economic crises in which opportunity costs of challenging power are lower, and hence see fewer transitions from authoritarianism to democracy. Our empirical analysis suggests that the former mechanisms are more important; we find a significant and sizeable positive effect of diversification on democracy. While this indicates that less concentrated economic power in a society leads to more widely distributed political power, more work should nevertheless be conducted to elaborate further on the mechanisms through which this happens.

The analysis adds to the literature on the link between economic and political structure in societies, and by focusing on export structure to the literature on globalization and development. Our results are also highly relevant to the topic of development in natural resource rich economies, and in particular to the literature taking a political economy approach to this topic. While diversification is typically seen as a way to counteract Dutch disease problems, our analysis suggests that diversification can also reduce problems of democratic inaccountability which undermine development prospects of oil and mineral rich economies. We would warn though that this analysis implies little in terms of easy policy measures to improve prospects for democracy in undemocratic countries highly concentrated in petroleum exports like Angola. While diversification improves chances of democracy in a country, it also undermines the power of the elite, and measures to increase diversification are hence likely to be resisted, undermined, perverted, or captured by elites in these countries. A focus on domestic industrial policy interventions depending on the implementation of the elite are hence unlikely to be effective. To improve prospects of democracy through diversification, some form of external change is likely needed that reduces oil rents, and hence elite incentives and means to cling to power. Alternatively, other avenues than diversification should be explored to improve chances of democracy in resource rich countries.

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Appendix

Table A 1. Country sample

Albania	China	Gambia	Laos	Oman	Suriname
Algeria	Colombia	Georgia	Latvia	Pakistan	Sweden
Angola	Comoros	Germany	Lebanon	Panama	Switzerland
Armenia	Congo	Ghana	Liberia	Papua New Guinea	Syria
Australia	Congo, Democratic Republic	Greece	Lithuania	Paraguay	Tajikistan
Austria	Costa Rica	Guatemala	Macedonia	Peru	Tanzania
Azerbaijan	Cote d'Ivoire	Guinea	Madagascar	Philippines	Thailand
Bahrain	Croatia	Guinea-Bissau	Malawi	Poland	Timor-Leste
Bangladesh	Cyprus	Guyana	Malaysia	Portugal	Togo
Belarus	Czech Republic	Honduras	Mali	Qatar	Trinidad and Tobago
Benin	Denmark	Hungary	Mauritania	Romania	Turkey
Bhutan	Djibouti	India	Mauritius	Russia	Turkmenistan
Bolivia	Dominican Republic	Indonesia	Mexico	Rwanda	Uganda
Brazil	Ecuador	Iraq	Moldova	Saudi Arabia	Ukraine
Bulgaria	Egypt	Ireland	Mongolia	Senegal	United Arab Emirates
Burkina Faso	El Salvador	Israel	Morocco	Sierra Leone	United Kingdom
Burundi	Equatorial Guinea	Italy	Mozambique	Singapore	United States
Cambodia	Eritrea	Japan	Nepal	Slovakia	Uruguay
Cameroon	Estonia	Jordan	Netherlands	Slovenia	Uzbekistan
Canada	Ethiopia	Kazakhstan	New Zealand	Solomon Islands	Venezuela
Cape Verde	Fiji	Kenya	Nicaragua	South Africa	Vietnam
Central African Republic	Finland	Korea, South	Niger	Spain	Yemen
Chad	France	Kuwait	Nigeria	Sri Lanka	Zambia
Chile	Gabon	Kyrgyzstan	Norway	Sudan	

Table A 2. Results using Freedom House civil liberties index as dependent variable

	IV - 2d stage	IV - 2d stage	IV - 2d stage	IV - 2d stage
Dependent variable	*Democracy FH Civil Lib*	*Democracy FH Civil Lib*	*Democracy FH Civil Lib*	*Democracy FH Civil Lib*
Exportproducts	0.002***			
	(0.00)			
Theil Index		-1.843***		
		(0.43)		
Herfindahl Index			-15.867***	
			(4.29)	
Gini Index				-102.964***
				(32.14)
GDP/capita (ln)	-0.832	0.165	0.624**	-0.079
	(0.71)	(0.30)	(0.26)	(0.42)
Land area	-0.355***	0.021	-0.025	0.239
	(0.12)	(0.10)	(0.11)	(0.19)
Population	-0.008***	-0.006***	-0.004**	-0.010**
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	8.506*	13.873***	3.685	104.553***
	(4.55)	(4.56)	(2.83)	(33.65)
r2	.	0.185	.	.
N	167	167	167	167

Table A 3. Results using revised combined Polity score as dependent variable

Dependent variable	IV - 2d stage Democracy Polity2	IV - 2d stage Democracy Polity2	IV - 2d stage Democracy Polity2	IV - 2d stage Democracy Polity2
Exportproducts	0.004***			
	(0.00)			
Theil Index		-2.687***		
		(0.51)		
Herfindahl Index			-23.469***	
			(5.87)	
Gini Index				-130.486***
				(28.05)
GDP/capita (ln)	-3.458***	-1.159***	-0.425	-1.308***
	(1.04)	(0.39)	(0.38)	(0.42)
Land area	-0.207*	0.266**	0.191	0.468***
	(0.11)	(0.12)	(0.13)	(0.18)
Population	-0.012***	-0.009**	-0.006*	-0.013**
	(0.00)	(0.00)	(0.00)	(0.01)
Constant	26.957***	30.159***	14.835***	142.310***
	(6.56)	(5.64)	(4.00)	(29.61)
r2	.	.	.	.
N	144	144	144	144

Table A 4. Results using democracy dummy due to Przeworski (2000) as dependent variable

Dependent variable	IV - 2d stage Democracy Przeworski	IV - 2d stage Democracy Przeworski	IV - 2d stage Democracy Przeworski	IV - 2d stage Democracy Przeworski
Exportproducts	0.000***			
	(0.00)			
Theil Index		-0.360***		
		(0.09)		
Herfindahl Index			-3.095***	
			(0.87)	
Gini Index				-20.087***
				(7.52)
GDP/capita (ln)	-0.287**	-0.092	-0.003	-0.140
	(0.12)	(0.06)	(0.05)	(0.09)
Land area	-0.071***	0.002	-0.007	0.044
	(0.02)	(0.02)	(0.02)	(0.04)
Population	-0.001***	-0.001**	-0.001	-0.002*
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	2.157***	3.204***	1.217**	20.895***
	(0.77)	(0.90)	(0.57)	(7.81)
r2	.	.	.	.
N	167	167	167	167

Table A 5. Results for Theil Index with added covariates. Dependent variable: Polity IV democracy index

Dependent variable	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy
Theil Index	-3.185***	-2.821***	-2.853**	-3.175***	-3.204***	-3.887***	-3.436***	-2.973***	-3.128***
	(0.75)	(0.81)	(1.16)	(0.63)	(0.67)	(1.31)	(0.78)	(0.72)	(0.99)
GDP/capita (ln)	-0.939**	-0.968*	-0.442	-0.973**	-0.896*	-0.351	-0.547	-0.788*	-0.445
	(0.46)	(0.51)	(0.86)	(0.49)	(0.53)	(0.52)	(0.45)	(0.44)	(0.43)
Land area	0.269*	0.228	0.169	0.265*	0.241	0.447	0.350**	0.235	0.092
	(0.14)	(0.14)	(0.17)	(0.15)	(0.15)	(0.30)	(0.16)	(0.15)	(0.18)
Population	-0.010**	-0.008*	-0.008*	-0.010**	-0.010**	-0.013**	-0.011**	-0.009**	-0.008
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Ethnic fractionalization	0.407								
	(2.31)								
Proportion Catholic		-0.007							
		(0.02)							
Proportion Muslim		-0.030							
		(0.02)							
Proportion Other		-0.034*							
		(0.02)							
Inequality			0.102*						
			(0.05)						
Civil war				0.300					
				(0.91)					
Openness to trade					-0.008				
					(0.01)				
Education (tertiary)						-0.064			
						(0.06)			
Latitude							-7.064*		
							(3.68)		
Constant	29.191***	30.011***	19.521*	29.611***	29.761***	29.346***	29.220***	26.338***	26.594***
	(6.59)	(7.89)	(11.51)	(6.91)	(7.22)	(9.03)	(7.38)	(6.28)	(7.73)
r2	.	0.078	.	.	.	.	.	0.039	.
N	141	143	129	143	141	129	143	143	143
Colonial dummies	No	No	No	No	No	No	No	Yes	No
Region dummies	No	No	No	No	No	No	No	No	Yes

Table A 6. Results for Herfindahl Index with added covariates. Dependent variable: Polity IV democracy index

Dependent variable	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy
Herfindahl Index	-27.376***	-26.251***	-21.740**	-27.525***	-29.799***	-32.380**	-29.167***	-25.330***	-27.484***
	(8.06)	(9.92)	(9.63)	(6.97)	(7.70)	(13.23)	(8.21)	(6.94)	(10.50)
GDP/capita (ln)	-0.175	-0.270	0.574	0.013	-0.061	0.208	0.140	-0.062	0.418
	(0.49)	(0.49)	(0.54)	(0.40)	(0.50)	(0.71)	(0.51)	(0.45)	(0.50)
Land area	0.186	0.167	0.027	0.150	0.158	0.237	0.223	0.090	0.067
	(0.15)	(0.16)	(0.12)	(0.15)	(0.17)	(0.27)	(0.17)	(0.15)	(0.16)
Population	-0.007*	-0.005	-0.004	-0.007**	-0.007*	-0.007	-0.007*	-0.006	-0.005
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Ethnic fractionalization	-0.492								
	(2.76)								
Proportion Catholic		-0.005							
		(0.02)							
Proportion Muslim		-0.025							
		(0.03)							
Proportion Other		-0.040**							
		(0.02)							
Inequality			0.053						
			(0.06)						
Civil war				1.423					
				(1.49)					
Openness to trade					-0.011				
					(0.01)				
Education (tertiary)						-0.027			
						(0.06)			
Latitude							-3.951		
							(3.79)		
Constant	12.331**	14.831**	2.602	10.266**	12.324**	10.135*	10.799**	10.657**	6.900
	(5.31)	(5.68)	(6.42)	(4.30)	(5.23)	(5.79)	(4.97)	(4.60)	(5.61)
r2	.	.	.	.	.	.	.	.	.
N	141	143	129	143	141	129	143	143	143
Colonial dummies	No	No	No	No	No	No	No	Yes	No
Region dummies	No	No	No	No	No	No	No	No	Yes

Table A 7. Results for Gini Index with added covariates. Dependent variable: Polity IV democracy index

Dependent variable	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy	IV - 2d stage Democracy
Gini Index	-161.429***	-135.226***	-150.999**	-154.914***	-158.638***	-209.308**	-177.211***	-157.875***	-165.358**
	(42.79)	(41.42)	(73.79)	(34.71)	(39.02)	(88.65)	(48.73)	(47.30)	(63.64)
GDP/capita (ln)	-1.081**	-1.087**	-0.784	-1.173**	-1.227*	-0.294	-0.414	-0.992*	-0.553
	(0.51)	(0.54)	(1.13)	(0.52)	(0.65)	(0.62)	(0.44)	(0.55)	(0.49)
Land area	0.511**	0.433**	0.420	0.506**	0.523**	0.812	0.686**	0.610**	0.292
	(0.23)	(0.22)	(0.32)	(0.22)	(0.25)	(0.51)	(0.29)	(0.28)	(0.32)
Population	-0.015**	-0.012**	-0.014	-0.015**	-0.015**	-0.021*	-0.017**	-0.015**	-0.014*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Ethnic fractionalization	1.929								
	(2.56)								
Proportion Catholic		-0.006							
		(0.02)							
Proportion Muslim		-0.028							
		(0.03)							
Proportion Other		-0.026							
		(0.02)							
Inequality			0.172*						
			(0.09)						
Civil war				0.283					
				(1.01)					
Openness to trade					-0.001				
					(0.01)				
Education (tertiary)						-0.102			
						(0.09)			
Latitude							-12.548**		
							(5.49)		
Constant	167.579***	145.413***	149.343*	163.056***	167.161***	209.966**	181.206***	162.273***	170.637***
	(43.10)	(42.96)	(76.00)	(36.55)	(41.37)	(86.46)	(49.57)	(47.47)	(63.48)
r2	.	.	.	.	.	.	.	.	.
N	141	143	129	143	141	129	143	143	143
Colonial dummies	No	No	No	No	No	No	No	Yes	No
Region dummies	No	No	No	No	No	No	No	No	Yes

INDEXING TERMS

Remittances	Democracy
Diversification	Political economy
Concentration	

Does diversification of an economy improve the chances of democracy? This paper estimates the effect of export diversification on democracy levels, using data from 143 countries. The endogeneity of diversification is addressed by using variability within countries in fertile soil as an instrumental variable, controlling for country size. The results show that diversification has a significant, positive effect on levels of democracy. This suggests that less concentrated economic power in a society leads to more widely distributed political power. The results are robust to alternative measures of diversification and democracy, and to additional covariates. Results are also similar for diversification indices excluding oil, suggesting that the uncovered relationship is not entirely about oil.