Income, democracy and output growth volatility revisited

by

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Abstract

Economic diversification increases the level of democracy and leads to greater output stability. This is because diversification is associated with an increased share of the population organized into interest groups that compete to pressure governments to pursue policies favoring their particular group. The increase in the share of the population organized in this way is indicative of an increase in the level of democracy. As diversification and the level of democracy (number of interest groups) increases, the government must pursue policies aimed at satisfying the largest number of groups, which limits its scope to implement policies that destabilize output growth. Empirical support for these hypotheses is provided from applying dynamic and heterogeneous panel data estimation techniques to a panel of 117 countries over 1995-2015. The results show a positive and significant relationship between economic diversification and democracy on the one hand, and between diversification and output stability on the other hand. Moreover, a positive impact of economic development on democracy and output volatility is conditional on development being accompanied by economic diversification.

JEL classification: D72, 30, HG11, O43

Keywords: Economic diversification, Democracy, Income, Output volatility

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1 Introduction

There is a general consensus that output volatility has adverse effects on economic growth (Bernanke, 1983; Aizenman and Marion, 1993; Ramey and Ramey, 1995; Acemoglu et al., 2003; Mobarak, 2005). One strand of the literature on the causes of output volatility insists on the importance of the political regime prevailing in countries. In particular, democratic regimes would be bound from implementing distortive policies and are better able to cope with the consequences of external shocks and socio-political conflicts (e.g., Sah, 1991; Rodrik, 2000; Quinn and Wooley, 2001; Almeida and Ferreira, 2002; Mobarak, 2005; Nooruddin, 2011). A second strand emphasizes the importance of the economic structure. In particular, output volatility is less likely in economies with a more diversified production base because diversification increases resilience to external shocks (e.g., Koren and Tenreyro, 2007; Haddad et al., 2013).

In this paper we establish a link between these two different strands. Specifically, we show that a negative link between the level of democracy and output volatility depends on economic development being accompanied by economic diversification. In this regard, we revisit the modernization hypothesis advanced by Lipset (1959) and others that higher levels of development favor greater democracy and we show that the development—democracy correlation is conditional on development being associated with the diversification of production and the emergence of a plurality of organized interest groups that compete with each other in exerting pressure on the political elite to obtain benefits. As suggested by common agency models (e.g., Bernheim and Winston, 1986), as the number of organized interest groups increases the benefits that each of these

groups can obtain decreases, reducing the incentive they have to exert pressure. As such, the rents and political privileges that each group receives is reduced and the level of democracy increases. At the same time, the existence of a plurality of organized interest groups with different policy preferences leads to more stable policy choices and therefore favors a decrease in growth volatility. It follows that the development of democracy and lower growth volatility derive from a common cause: economic diversification. In support of this view, we report empirical results from a panel of 117 countries over the period 1995-2015, showing a positive and significant relationship between economic diversification and democracy on the one hand and between diversification and output stability on the other, and that a positive impact of development on the level of democracy and output volatility is conditional on development being accompanied by diversification.

The rest of the paper is organized as follows. Section 2 provides a brief review of the related literature. Section 3 presents a formal model of our hypothesis that economic diversification favors greater democracy and output stability. Section 4 reports supporting empirical results and Section 5 concludes.

2 Related literature

The relationship between economic development and democracy has been studied many times before but the debate is still open. Much of the discussion has centered around the validity of the modernization hypothesis, the cornerstone of which is the development-democracy correlation. The theory claims a causal relation whereby democratic regimes are created and consolidated in affluent societies (e.g., Lipset, 1959; Przeworski et al., 2000; Barro, 1999; Epstein et al., 2006). Higher incomes reduce the degree of conflict over the distribution of income and give way to

democratic institutions that discourage expropriation and support redistributive fiscal policies under the rule of law (e.g., Benhabib and Rustichini,1996; Benhabib and Przeworski, 2006). The modernization hypothesis has been attacked by Przeworkski et al. (2000) who found that higher income helped preserve democracy where it existed already but failed to detect thresholds of development that would make the emergence of democracy predictable. In addition, Acemoglu et al. (2008) found that once country and year fixed effects were included in a panel regression, income per capita no longer correlated with democracy.[1] Both the Przeworski et al. analysis and the main models of Acemoglu et al. focused on the years between 1950 and 2000. Other authors argue that including longer time spans of data provides results more supportive of the modernization hypotheses. Thus, Boix and Stokes (2003), Boix (2011) and Murtin and Wacziarg (2014) report that economic development significantly predicts democracy when much longer time spans are considered. Yet other papers show that indicators of development have a larger and more significant effect when the democracy measures are adjusted for top-censoring (Benhabib et al., 2011), or when the system-GMM estimator is used (Bobba and Coviello, 2007), or when income is measured in the medium run (10–20 years) rather than the very short run (1–5 years) (Treisman 2015).

In the debate on the validity of the modernization hypothesis, most of the empirical work has focused mainly on the causal role of per capita income (the measure of economic development) in democratization without paying much attention to how that income is generated. One exception is Boix (2003) who argues that resistance by the elite to increasing the level of democracy is high if they are rich in non-mobile assets, for example, land and property.[2] In addition, Ross (2001; 2012)

[1] This conclusion allows Acemoglu et al. (2019) to claim that democracy causes growth, not the other way around.
[2] If the elite has mobile assets, such as financial assets, and obtains income from this kind of wealth, it offers less resistance to extending democracy because it can evade any re-distributive fiscal policies advocated by the poor.

argues that emergence of democracy in resource-rich or 'rentier state' countries is difficult because the resources generated enable governments to suppress aspirations to democracy on the part of the population and/or they enable them to "buy off" citizens (e.g., with cheap gasoline and state jobs) rather than bargain with them over tax rates. Both of these views find broad confirmation in many cases of commodity exporter countries—for example, many oil producers have remained authoritarian despite having amongst the highest levels of GDP per capita in the world. However, there are some facts that they fail to explain, for example, why democracy has remained solid in some countries when the discovery of natural resources occurred after a process of industrialization (e.g., the Netherlands, Norway, United Kingdom), or why democratization has failed to emerge in developing countries that are poor in natural resources.

One possible explanation is that the link between development and democracy is based not so much on the nature of the assets and the income that they yield but on the structure of production and, in particular, on the degree of production diversification. For example, Acemoglu and Zilibotti (1997) provide evidence that economic development in resource-poor countries is often accompanied by a growing degree of production diversification, and several studies document a close connection between higher levels of income and income diversification (e.g., Cador et al. 2011).[3] At the same time, studies have shown how as economic diversification increases the number of organized interest groups capable of exerting pressure on the political class increases (e.g., Bischoff, 2003) and that competition between these groups encourages the efficient aggregation of individual preferences and the emergence of democracy (Dahl, 1971). Thus, when economic development is associated with economic diversification it allows an ever-larger number of individuals to bear the costs of organizing themselves into interest groups (Mitra, 1999). The

[3] Imbs and Wacziarg (2003) suggest that diversification reflects a growing preference for the diversified consumption of goods as incomes increase and that it enables a country to deal better with sector-specific shocks.

increase in the number of organized interest groups that derives from the foregoing and the competition between them favors an increase in the level of democracy.[4] In this view, democratization is the result of a bargaining process between interest groups and the political elite where the transition from autocracy to democracy takes the form of a continuous process characterized by the extension of political power to gradually larger sections of citizens (Dutt and Mobarak, 2015). This bargaining hypothesis allows for a reconsideration of the relationship between democracy and growth volatility, the empirical literature on which tends to conclude that democratic regimes favor output stability (see, e.g., Acemoglu et al., 2003; Mobarak, 2005; Agnello and Sousa, 2014). The political economy-based explanation for this is that democratic institutions discourage policymakers from taking distorting political choices either because of strong control over policymakers that limits this possibility (e.g., Acemoglu et al., 2003) or because democratic elections induce leaders to avoid highly risky policy gambles because voters are risk averse and prefer stability (e.g., Quinn and Woolley, 2001).[5] In this paper, we show that economic diversification is the crucial link between the level of development and democracy on the one hand and democracy and output volatility on the other. The next section of the paper provides a formal presentation of these relationships.

[4] Taking as reference the best-known survey on interest groups, the World Guide to Trade Association, it emerges that in 2002 (the last year in which the survey data are available) the number per country of interest groups was on average 1,239 for OECD countries and 105 for non-OECD countries. On the same year, the (increasing) index of democracy POLITY2 from Project Polity IV was on average equal to 9.7 for OECD countries and 1.6 for non-OECD countries.

[5] These explanations try to clarify the reasons for economic policy mismanagement in a democracy and why authoritarian regimes are less successful in dealing with external shocks compared to democracies. A second group of explanations emphasizes the fact that in democracies power is decentralized and divided, which makes it difficult for radical changes to be made (e.g., Henisz, 2000; Mobarak, 2005; Nooruddin, 2011; Dutt and Mobarak, 2015).

3. Democracy and competition among interest groups: an analytical framework

To show formally the plausibility of our hypothesis we employ a model based on three strands of the literature. The first strand is with respect to the common agency models, put forward initially by Bernheim and Winston (1986) and then developed by Grossman and Helpman (1994). In this literature interest groups pay contributions to policymakers (the common agent) and obtain favors in exchange, where the contribution of each interest group reflects its preferences with respect to the range of choices available. The equilibrium achieved through this bargaining process allows the maximization of the aggregate pay-off of existing interest groups and policymakers.[6]As the number of organized groups increases, the benefit of being organized decreases because a smaller unorganized population implies a decrease in the share of population on whom the cost of rents fall, and because as the number of organized interest groups increases, the competition between them also increases thereby decreasing the political and economic rent that each group can obtain. The second strand of the literature relates to the so-called pluralistic approach in political science developed by Dahl (1971). According to this approach democracy requires the existence of a considerable degree of social pluralism wherein a large number of materially motivated interest groups try to influence public opinion and decision making. The third strand is the literature linking democracy and growth volatility, which emphasizes the role of political demand and of the existence of a plurality of subjects with different characteristics and preferences. Within this strand, Dutt and Mobarak (2015) emphasize the role of competition between interest groups whereby as the number of these groups increases, the capacity of politicians to distinguish the

[6] Mitra (1999) assumes that organized interest groups are endogenous. They bear costs to organize themselves in pressure groups. Assuming these costs are fixed, the relative burden that each interest group has to face is comparatively lower the higher its income.

quality of policy choices and identify good policies decreases. Therefore, politicians tend to reduce the variance of the quality of the chosen policies. In this way growth volatility decreases. However, in our model we assume that in a democracy organized interest groups can exert pressure to obtain policy choices that conform their particular preferences and that as the number of organized groups increases the variance of the policy choices available to policymakers decreases, which in turn reduces the volatility of economic growth. Thus, in our model competition between organized interest groups explains why policymakers' choices tend to reflect the average preferences of the population as the number of organized interest groups and democratization increases, and why democracies exhibit a higher degree of output stability than do autocracies.

More formally, we consider an economy with N individuals and assume each individual has a preferred income growth rate y_i. Preferred growth rates are random variables normally distributed with mean equal to $\bar{y}_i$ and variance equal to one: $y_i \sim N(\bar{y}_i, 1)$. We also assume negative, and identical covariance among preferred growth rates. The individual's loss function, as a result of the policy choice y_0, is an increasing function of the distance between the growth rate chosen by the government and its preferred one. Using a quadratic loss function, this loss is:

$$(1)\ L^i = (y_i - y_0)^2$$

where y_i is the preferred growth rate of individual i, and y_0 is the policy chosen by the government. Individuals can organize themselves into interest groups in order to make their lobbying on the government more effective by giving it contributions. Since organization involves costs, the latter can only be borne by individuals who earn a certain income. As in Grossman and Helpman (1994), the government problem simplifies to maximize a weighted social-welfare function with

individuals in unorganized groups getting a weight of one and those in organized groups receiving a weight of a, greater than one:[7]

$$(2)\ min_{y_0} L^G = \min_{y_0} a\sum_{i=1}^{n}(y_i - y_0)^2 + \sum_{i=n+1}^{N}(y_i - y_0)^2$$

Therefore, the parameter $a > 1$ determines how much more the politician cares about organized interest groups than ordinary individuals. Eq. (2) yields the following expression for the optimal level of economic growth:

$$(3)\ y_0 = \frac{a\sum_{i=1}^{n} y_i + \sum_{i=n+1}^{N} y_i}{N + n(a-1)}$$

Eq. (3) shows that the level of economic growth chosen by the government is a weighted average of the population's preferred growth rate, where individuals organized into groups have a higher weight. As the number of interest groups increases the growth rate chosen by the government tends towards the mean of the preferred growth rate of population. This leads to our first proposition below:

> **Proposition 1**: An increase in the number of organized interest groups exerting pressure on the government leads to higher level of democracy.

Proposition 1 has several implications. First, it implies that the democratization process is the result of a bargaining between interest groups that leads to a gradual reduction of the privileges of initial dominant interest groups. This bargaining hypothesis allows us to reformulate Lipset's (1959) modernization hypothesis to one that conditions output growth to being associated with a diversification of production in order for the level of democracy to increase. Second, it offers an

[7] For simplicity we assume each interest group is formed by one individual.

alternative explanation to that of Boix (2003) and the rentier state hypothesis as to the reasons why democracy might struggle to establish itself and consolidate in resource-rich countries. This is that in such countries economic concentration is often high and the number of organized interest groups limited such that the government tends to satisfy the preferences of a few organized interest groups at the expense of those of a large part of the population. Third, it can explain why democracy has remained solid in countries where the discovery of natural resources occurred after the country had developed a diversified economy. Fourth, it suggests that there is no deterministic development from autocracy to democracy. Rather, a decrease in the number of organized interest groups tends to favor the decline of a democracy and its degeneration into a limited access order. Finally, the proposition suggests that 'formal' constitutional reforms, such as those related to forms of exporting democracy, are successful to the extent that there is a wide range of organized interest groups.

We now turn to the question of whether the number of interest groups impacts on income volatility. For this we calculate the variance of y_0, which is the growth rate chosen by the government. In so doing we recall that each preferred growth rate is a random variable with a mean preferred growth rate and variance normalized to one.

$$(4)\ Var(y_0) = \frac{\{a^2 \sum_{i=1}^{n} var(y_i) + \sum_{i=n+1}^{N} var(y_i) + \sum_{i=1}^{N} \sum_{j \neq i} a_i a_j cov(y_i, y_j)\}}{[N + n(a-1)]^2}$$

where a_i is equal to a for organized groups and 1 for unorganized individuals. Using the fact that we have assumed unit variance for all growth rates, and that all covariances are the same, eq. (4) simplifies to:[8]

[8] Assuming unit variance eq. (4) becomes: $Var(y_0) = \frac{\{n(a^2-1) + N + \sum_{i=1}^{N} \sum_{j \neq i} a_i a_j \sigma_{i,j}\}}{[N + n(a-1)]^2}$. Assuming that all covariances are the same, the previous formula simplifies to $Var(y_0) = \frac{\{n(a^2-1) + N + [a^2 n(n-1) + 2n(N-n)a + (N-n)(N-n-1)]\sigma_{i,j}\}}{[N + n(a-1)]^2}$.

(5) $Var(y_0) = \frac{\{n(a^2-1)+N+[n^2(a^2-2a+1)-n(a^2-2Na+2N+1)+N^2-N]\sigma_{i,j}\}}{[N+n(a-1)]^2}$

The value of n that maximizes the variance of output growth is:[9]

(6) $n^* = \frac{2N(a-1)^2(1-\sigma_{i,j})-\sqrt{4N^2(a-1)^4(1-\sigma_{i,j})^2-4(a-1)^2[-(a^2-1)+\sigma_{i,j}(a^2+1)]N^2[(a-1)^2+\sigma_{i,j}(-a^2+2a-3)]}}{2(a-1)^2[-(a^2-1)+\sigma_{i,j}(a^2+1)]}$

Since we have assumed that the covariance among preferred growth rates is negative, the number of organized interest groups that maximize output volatility, n^*, is positive. Up to n^* the variance of output increases, then it decreases. By way of illustration, in Table 1 we simulate the number of interest groups that maximize the variance of output on the assumption that the value of the covariance is -0.3.[10] The table reports the value of n^* for different values of the population, N, and of the weight given by the policymaker to organized groups, a. It shows that as the weight given by the government to each interest group increases, the number of interest groups after which the variance of output starts to decrease is reduced. For example, if the policymaker gives a high weight to the preferences of interest group, a =10, the variance of output decreases when more than 9 per cent of the population is organized into interest groups. This leads to our second proposition below.

> **Proposition 2**: Output volatility decreases as the number of interest groups with different preferences increases as the government gives less weight to the preferences of each group.

[9] The other solution is for a negative value of n.
[10] Changes in this parameter change the results only slightly.

From Propositions 1 and 2 it emerges that both the level of democracy and the volatility of output depend on the number of organized interest groups with different economic preferences. The presence of a large number of organized interest groups induces the government to consider the preferences of larger sections of the population, but the existence of groups with different preferences limits the government's policy choices and provides for more stable policymaking overall.[11] The result is less volatility of output and growth.

Table 1- Simulation of the number of interest groups that maximize output variance

	N=10	N=20	N=50	N=100	N=1000
a=2	4.5	8.5	21	42.5	422
a=5	2	3.4	8.5	16.8	168.2
a=10	1	1.8	4.5	9	91.0
a=20	0.5	1.0	2.4	4.8	47.6
a=100	0.1	0.2	0.5	1.0	9.9

4 Democracy, diversification and volatility: empirical evidence

Our empirical analysis proceeds in two steps. In the first step, we examine whether the number of organized interest groups affects the level of democracy (Proposition 1). In the second step, we examine whether the number of organized interest groups affects growth volatility (Proposition 2).

[11] What is stated in the Second Proposition is very similar to the hypothesis of those who believe that in democratic regimes output volatility is lower than in dictatorships due to the existence of various actors with different characteristics and preferences.

Both sets of results come from employing a data panel comprising 117 countries with populations over 3 million for the 1995 to 2015 period.

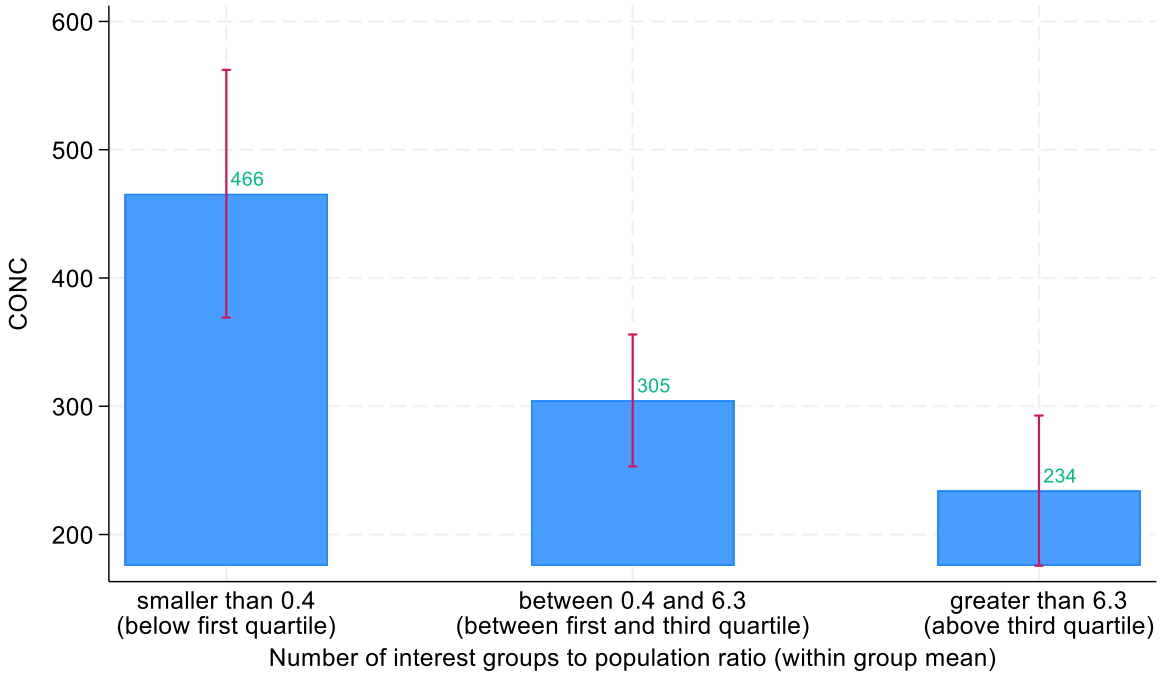
In finding the data useful for the estimates, the most difficult problem to solve was finding a proxy for the number of organized interest groups present in each country. A useful proxy for this purpose used several times in the past is the number of private associations in each country reported by the World Guide of Trade Associations. This Guide contains a world-wide list of interest groups and covers more than 170-180 countries and several hundreds categories of groups. However, because the Guide of Trade Associations is published from time to time its data are not appropriate for estimates of panel data that requires a proxy of the number of interest groups which, unlike that made available by the Guide, is continuous and not discrete. Since the model in section 3 assumes a close relationship between the number of organized interest groups and the degree of diversification of the economy, the existence of a relationship was verified between the data relating to interest groups reported by the World Guide of Trade Associations[12] and the export concentration index calculated by UNCTAD[13] for the year 2002.

The correlation between these two variables is high. Indeed, Figure1 shows that countries with a low ratio of interest groups to the population (below the first quartile of the distribution) have a high concentration of exports (average CONC at 466) while it decreases when moving towards countries that have a higher ratio of interest groups to the population (bar in the center and on the right).

[12] See Zils (2003).

[13] The index of export concentration constructed by UNCTAD is imputed using the Herfindahl-Hirschman index (HHI) of the product concentration of merchandise export by sector. The sample used here starts in 1995 because in that year UNCTAD started the systematic publication of this index of export concentration. As for the number of countries, the cut off is set at 3 million inhabitants as below a certain country size the diversification of production is necessarily limited.

Figure 1 - Correlation between the data of the World Guide of Trade Associations and concentration of exports (CONC)



On the basis of this evidence, we used the UNCTAD export concentration index (CONC) as a proxy of the number of interest groups in each country.

Table 2 presents unconditional correlations between the export diversification (CONC), expressed using different percentiles, and democracy (POLITY2,) real GDP per capita (Y) and output volatility (VOL). The table suggests a strong positive correlation between export diversification and democracy. The relationship is less marked between the level of democracy and the level of per capita income with the lowest level of democracy not reached at the lowest level of per capita income. This might reflect the fact that countries rich in natural resources, characterized by a low level of democracy and a relatively high per-capita income, are included in the last row of the table. Finally, the table suggests that the relationship between export concentration, democracy and output volatility is broadly linear.

Table 2 - Diversification, income and democracy

CONC	POLITY2	Y	VOL
CONC<10th	8.6	26629	2.1
25th<CONC<50th	4.7	14316	2.8
50th<CONC<75th	2.1	11417	3.2
CONC>90th	-1.9	13571	6.5

Notes: CONC is the export concentration index, POLITY2 is the Polity democracy index, Y is real GDP per capita, and VOL is the standard deviation of GDP per capita over a 10-year rolling period.

4.1 Econometric identification and data

First, we test the hypothesis that the degree of economic diversification affects the level of democracy employing the following specification:

$$(7)\ DEM_{it} = \beta_0 + \beta_1 DEM_{t-1} + \beta_2 Y_{i,t-1} + \beta_3 CONC_{i,t-1} + \beta_4 X_{i,t-1} + \beta_5 Z_{i,t} + \epsilon_{it}$$

Where DEM_{it} measures the level of democracy, $Y_{i,t-1}$ is a measure of income, $CONC_{i,t-1}$is a measure of income diversification, X_{it-1} is a vector of lagged control variables, Z_{it} is a vector of time variant dummies to control for drastic political changes (e.g., coups, civil wars) and ϵ_{it} is the idiosyncratic error term. The level of democracy is represented by the POLITY2 democracy index taken from the database of the Polity IV project. The level of income is measured by real GDP per capita taken from the Maddison Project Database. As already mentioned, we used the variable CONC to pick up the number of organized interest groups in each country. The variables in $X_{i,t-1}$ include population size (POP), which might be expected to impact on the degree of political

competition, the level of human capital formation (EDU) to capture the influence of education (Lipset, 1959), and the ratios to GDP of foreign direct investment (FDI) and exports (EXP) because openness can impact the influence of interest groups on the political class. Data on the level of human capital formation is from the Penn World Tables and that on population, foreign direct investment and foreign trade are from the World Bank's World Development Indicator database. Second, we test the hypothesis that the volatility of output depends on the level of democracy and income diversification in the following specification:

$$(8)\ VOL_{it} = \beta_0 + \beta_1 VOL_{i,t-1} + \beta_2 DEM_{i,t-1} + \beta_3 CONC_{i,t-1} + \beta_4 X_{i,t-1} + \beta_5 Z_{i,t} + \epsilon_{it}$$

Where VOL_{it} is the volatility of output growth, which we measure by the standard deviation of the growth of per capita income calculated over a ten-year rolling period (Mobarak, 2005), and $DEM_{i,t-1}$, $CONC_{i,t-1}$, $X_{i,t-1}$, $Z_{i,t}$ and ϵ_{it} are as defined in Eq. (7). In this specification, the control variables in $X_{i,t-1}$ include the growth of GDP per capita, the ratio of broad money to GDP (MON) to control for the effect of monetary policy, the terms of trade (TOT), defined by the ratio of export unit value to import unit value, because a deterioration in the terms of trade may worsen balance of payment and make output more volatile, the ratio of domestic credit to private sector to GDP (CREDIT) because greater financial depth supports income diversification, risk management practices, and financial inclusion all of which should diminish output volatility, and openness to foreign trade (TRADE) and investment (FDI) because they can smooth the time path of net worth and reduce output volatility. Data on the ratios of broad money and credit to GDP and on the terms of trade are also from the World Bank's World Development Indicator database.

In a robustness check, we replace our main variable of interest (CONC), employed in equations (7) and (8), with the number of interest groups to population ratio collected from the World Guide of Trade Association. This Guide contains a world-wide list of interest groups, covering more than 170 countries and hundreds of categories. Despite offering more data granularity, the coverage of these data is limited to 2002 only. Therefore, we use it as a robustness check to see how CONC correlates to the ratio of the number of interest groups to population as well as to control that our results hold also cross-sectionally when using a different measure of interest groups.

Table 3 reports the descriptive statistics of the variables used in the empirical analysis. The Table is divided in three panels. In Panel A, we report the descriptive statistics of our dependent variables, while Panels B and C for the explanatory and the other control variables, respectively.

Figure 2 reports also the dynamics of our variables of interest, i.e., the level of democracy (POLITY2), output growth volatility (VOL) and economic income diversification (CON), over time. As displayed, the index capturing the level of democracy increased constantly over the sample period, from about 2.6 in 1995 to about 4.2 in 2015. Albeit volatile over the sample period, the economic income diversification index showcases a decreasing trend overall, with the index falling by about 22 percentage points since the start of the sample,[14] therefore, the relationship between these two variables, also from a temporal perspective, seems to be negative. From Figure 2 emerges also that output volatility has been on an increasing trend until 2004, it declined during the years preceding the Global Financial Crisis, while increasing again after it.

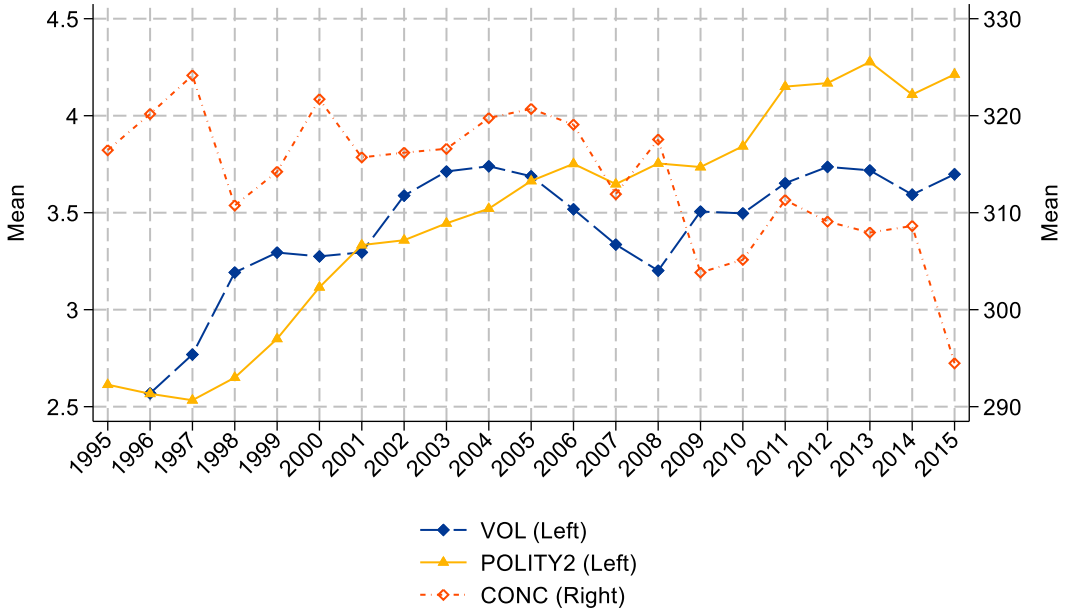
[14] In the Appendix, we provide pairwise correlation matrices (Tables A1 and A2).

Table 3 - Descriptive Statistics

Variable	Obs.	Mean	Standard deviation	Min	Max
Panel A. Dependent variables					
VOL	2,242	3.47	4.17	0.07	56.64
POLITY2	2,523	3.49	6.48	-10.00	10.00
FREEDOM	2,572	3.60	1.97	1.00	7.00
B&R	2,583	0.57	0.50	0.00	1.00
BOIX	2,583	0.42	0.49	0.00	1.00
Panel B. Explanatory variables					
CONC	2,545	313.57	218.67	45.00	983.00
Y	2,479	8.98	1.28	1.95	11.71
Panel C. Other controls					
POP	2,428	9.72	1.26	7.39	14.13
EDU	2,583	7.73	0.30	6.96	8.23
MON	2,583	51.31	36.55	5.21	247.02
TOT	2,583	115.93	39.00	21.40	458.57
CREDIT	2,583	46.35	42.64	1.17	221.29
EXP	2,583	35.74	23.62	0.01	228.99
FDI	2,583	4.04	6.87	-15.84	103.34
GR_GDP per capita	2,360	0.02	0.06	-0.04	0.15

Notes: VOL is the standard deviation of the GDP per capita growth rate during the decade. POLITY2 is the Polity democracy index from POLITY4 project. FREEDOM is the Freedom House index. CONC is the export concentration index. Y is the logarithm of GDP per capita in real terms. POP is the logarithm of population. Edu is the level of education in years. MON is the ratio of broad money to GDP. TOT is the percentage ratio of export unit value indexes to import unit value indexes. CREDIT is the ratio of domestic credit to the private sector to GDP. EXP is the ratio of export to GDP. FDI is the ratio of foreign direct investment to GDP. GR_GDP per capital is the annual growth rate in GDP per capita.

Figure 2 Evolution of POLITY2, VOL and CONC over the period 1995-2015



Note: CONC is the export concentration index. VOL is the standard deviation of the GDP per capita growth rate during the decade. POLITY2 is the Polity democracy index from POLITY4 project.

4.2. Methodology

Estimating the link between income, economic diversification and democracy poses endogeneity challenges stemming from possible measurement errors, omitted variable bias and reverse causality. A common approach in economic development studies has been to employ difference Generalized Methods of Moment (GMM) estimators. However, Arellano and Bover (1995) show that use of the difference GMM is problematic when the dependent variable is persistent. Accordingly, we estimate Eq. (7) and (8) using the system GMM (S-GMM) estimator and report the Arellano and Bond (1991) test statistic for the absence of second order serial correlation and the Hansen (1982) test statistic for the validity of the instruments used. We use the two steps

estimator methodology, i.e., using the inverse of the covariance matrix of the moment vector from the first-step estimation as the weighting matrix in the second step and standard errors that are computed using the Windmeijer bias-corrected estimator (Windmeijer, 2005). We also limit the number of instruments generated in the S-GMM, making the instrument count linear in T and therefore avoiding the proliferation of too many instruments as mentioned by Roodman (2009). Specifically, we keep the number of instruments lower than the number of groups in each specification.

5. Empirical results

5.1 Income diversification and democracy

The baseline results from estimating equation (7) are presented in Table 4. The regression include fixed year effects and in each case the AR(2) and Hansen test statistics are acceptable. Column (1) of the table include lagged democracy and lagged GDP per capita as determinants of democracy. The coefficient on lagged democracy is large and statistically significance, suggesting democracy is highly persistent. The coefficient on GDP per capita is positive and statistically significant (at 5% level) but its impact on democracy is relatively small: *ceteris paribus*, an increase in GDP per capita of 10% leads to an increase in the democracy index of about 0.03. Column (2) adds the export concentration variable (CONC), which is our proxy for income diversification. The coefficient is negative and highly significant (at the 1% level) and suggests that countries with greater export diversity (i.e., less export concentration) are more democratic. In addition, the coefficient GDP per capita loses its statistical significance.

Table 4 - System GMM baseline results for democracy and income diversification

	(1)	(2)	(3)	(4)
	POLITY2	POLITY2	POLITY2	POLITY2
L.POLITY2	0.7497***	0.7525***	0.7458***	0.6640***
	(0.0486)	(0.0480)	(0.0520)	(0.0016)
L.Y	0.3271**	0.1585	-0.0714	0.1601***
	(0.1265)	(0.1033)	(0.1562)	(0.0354)
L.CONC		-0.0031***	-0.0025***	0.0055***
		(0.0008)	(0.0008)	(0.0004)
L.Y*L.CONC				-0.0093***
				(0.0000)
Control variables	NO	NO	YES	YES
Observations	2,296	2,269	2,262	2,262
Number of ID	117	117	117	117
AR(2)	0.189	0.240	0.216	0.190
Hansen test	0.253	0.196	0.451	0.671
Year-FE	YES	YES	YES	YES

Notes: L indicates one period lag. POLITY2 is the Polity democracy index from POLITY4 project. Y is the logarithm of the GDP per capita. CONC is the export concentration index. Other controls include the logarithm of population, the level of education in years; the ratio of exports to GDP; and the ratio of foreign direct investment to GDP. Standard errors are computed using the Windmeijer bias-corrected estimator. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

The magnitude of the coefficient of CONC is also economically meaningful: a one standard deviation from the mean in the export diversification index (i.e., one standard deviation from the mean decrease in CONC) corresponds to an increase in the democracy index of 0.67 points.

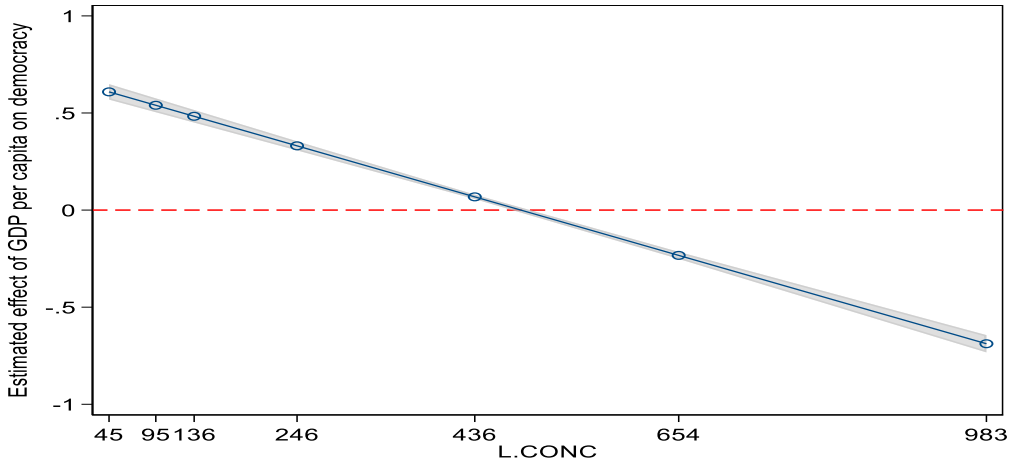
Column (3) reports results after adding all of the control variables (coefficients not shown) to the estimates. The coefficient on export diversification remains statistically significant and economically meaningful.

This result supports our hypothesis (Proposition 1) that the higher the degree of income diversification, the higher the competition between interest groups and the more likely is democratization. In column (4) we include an interaction term (L.Y*L.CONC) where the coefficient on this variable reflects the conditional effect of export concentration on GDP per capita as it effects the level of democracy. The coefficient on the variable is negative and statistically significant at the 1% level: a 1 standard deviation increase in export concentration reduces the positive effect on democracy of a 1% increase in GDP per capita by 2.03% in a year.[15] As an illustration of this relationship, we plot, in Figure 3, the estimated coefficient (L.Y*L.CONC) at different levels of L.CONC. For the selection of L.CONC levels, we rely on the descriptive statistics and select the min (45), the 10th percentile (95), the 25th percentile (136), the median (246), the 75th percentile (436), the 90th percentile (654) and the max (983). As shown in Figure 2 and considering the two extreme values (min and max), a 1% increase in GDP per capita raises the level of democracy by about 0.6 points if the country's export diversification is high (L.CONC=45), while it reduces it by about 0.7 points for countries with more concentrated export (L.CONC=983).

Figure 3 allows us also to look at the "breaking point", i.e. the point at which an increase in GDP per capita does not increase further the level of democracy because of excessive export concentration. Indeed, Figure 3 shows that just above the 75th percentile of L.CONC (436) a 1% increase of GDP per capita has a negative effect on democracy.

[15] For example, in column (4) of Table 3: -2.03 = -0.0093(coefficient on the interaction term)*218.67(the standard deviation of CONC reported in Table 3).

Figure 3 - Estimated effect of GDP per capita on democracy



Note: CONC is the export concentration index. The values displayed on the horizontal axis are taken from the descriptive statistics. Specifically, we select the min (45), the 10th percentile (95), the 25th percentile (136), the median (246), the 75th percentile (436), the 90th percentile (654) and the max (983). Confidence interval at the 95% level in grey.

We carry out two robustness tests to support this result. First, we re-estimate Eq. (7) employing three alternative indices of democracy as the dependent variable. These are: the index of democracy calculated by Freedom House (FREEDOM), which is based on a score for the level of political rights and civil liberties in each country that ranges from 1 (most free) to 7 (least free); and the dichotomous indices of democracy calculated by Boix et al. (2012), BOIX, and Bjornskov and Rode (2020) (B&R), both of which score 1 for democracy and 0 for dictatorship but differ with respect to the requisites considered crucial for the transition from dictatorship to democracy. The statistical characteristics of the variables are shown in Table 3. The results of these estimates, presented in columns (1)-(6) of Table 5, are similar to the results obtained using POLITY2 in that greater democracy is characterized by higher income diversification and that the degree of income diversification conditions the impact of real GDP per capita on democracy.

Table 5 - Robustness check: results for alternative index of democracy and estimation method

	(1)	(2)	(3)	(4)	(5)	(6)
	FREEDOM		B&R		BOIX	
L.FREEDOM	0.8089***	0.7920***				
	(0.0409)	(0.0401)				
L.B&R			0.7482***	0.7215***		
			(0.0499)	(0.0074)		
L.BOIX					0.9022***	0.8932***
					(0.0231)	(0.0044)
L.Y	-0.0459	-0.3960***	0.0004	0.0231*	0.0035	0.0224**
	(0.0382)	(0.1331)	(0.0132)	(0.0133)	(0.0053)	(0.0100)
L.CONC	0.0006***	0.0073***	-0.0001**	0.0006***	-0.0001**	0.0004***
	(0.0001)	(0.0025)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
L.Y*L.CONC		-0.0008***	-0.0001***	-0.0001***		-0.0001**
		(0.0002)	(0.0000)	(0.0000)		(0.0000)
Control variables	YES	YES	YES	YES	YES	YES
Observations	2,315	2,315	2,315	2,315	2,315	2,315
Countries	118	118	118	118	118	118
Estimation	System	System	System	System	System	System
methodology	GMM	GMM	GMM	GMM	GMM	GMM
AR(2)	0.570	0.844	0.238	0.250	0.348	0.411
Hansen test	0.318	0.964	0.864	0.757	0.703	0.703
Year-FE	YES	YES	YES	YES	YES	YES

Notes: L indicates one period lag. CONC is the export concentration index. FREEDOM is the Freedom House democracy index. B&R is the B&R democracy index. BOIX is the Boix democracy index. For the definitions of other variables see the notes to Table 3. Standard errors are computed using the Windmeijer bias-corrected estimator. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

The results from employing the Boix and B&R indices, in particular, confirm the hypothesis that the trend in the number of organized interest groups undermines the survival of a limited access order. The results also confirm the fact that economic decline, if associated with a reduction in economic diversification and competition between interest groups, tends to favor a reduction in the level of democracy. Democracy, therefore, is not acquired once and for all but can deteriorate.

5.2 Income diversification, democracy and output volatility

The baseline results from estimating Eq. (8) are presented in Table 6. Column (1) includes only the POLITY2 variable to represent the level of democracy and excludes all the other regressors from the estimation. The coefficient on the lagged dependent variable is large and significant at the 1% level, confirming the strong persistence of output volatility (VOL). The coefficient on the POLITY2 measure of democracy is negative and statistically significant at 5% level: *ceteris paribus*, a unit increase in POLITY2 leads to a decrease of output volatility of about 0.013 percentage points. However, when income diversification (CONC) is included in the regression (Column 2) the coefficient of POLITY2 loses magnitude and becomes statistically insignificant. The coefficient on income diversification is positive and significant at the 1% level, suggesting that diversification reduces output volatility. In terms of economic impact, a one standard deviation from the mean in income diversification (that is one standard deviation from the mean decrease in CONC) corresponds to a decrease in output volatility by 0.13 percentage point. In column (3) we report results that include the control variables, which makes little difference to the size and significance of the coefficient on income diversification. Finally, in columns (5) and (6) we add an interaction term (L.POLITY2*L.CONC) to assess whether the impact of democracy on output

volatility is conditional on the degree of income diversification. In both of these estimates, the coefficients on the interaction term are positive and statistically significant (albeit at the 10% level) and indicate that a 1 standard deviation increase in income diversification reduces the positive effect on output volatility of a 1% increase in democracy by 0.04% in a year in each case, and the coefficients on POLITY2 return to statistical significance (albeit at only the 10%).[16] In other words democracy is important in reducing output volatility but this importance is conditioned in part on the degree of income diversification.

In Figure 4 we follow a similar exercise to that carried out for Figure 3 and plot the estimated relationship at different levels of L.CONC. Again we rely on the descriptive statistics and select the min (45), the 10th percentile (95), the 25th percentile (136), the median (246), the 75th percentile (436), the 90th percentile (654) and the max (983) for the selection of L.CONC levels. As displayed in Figure 4 and considering the two extreme values (min and max), a 1 point increase in the democracy index (L.POLITY2) reduces output volatility by about 5.8 percentage point only if the degree of economic diversification is high (L.CONC=45), while it increases output volatility by about 14% in those countries with high economic product concentration (L.CONC=983). In addition, Figure 4 shows that for values approximately below (above) the median of L.CONC, a 1 point increase in the democracy index reduces (augments) output volatility.

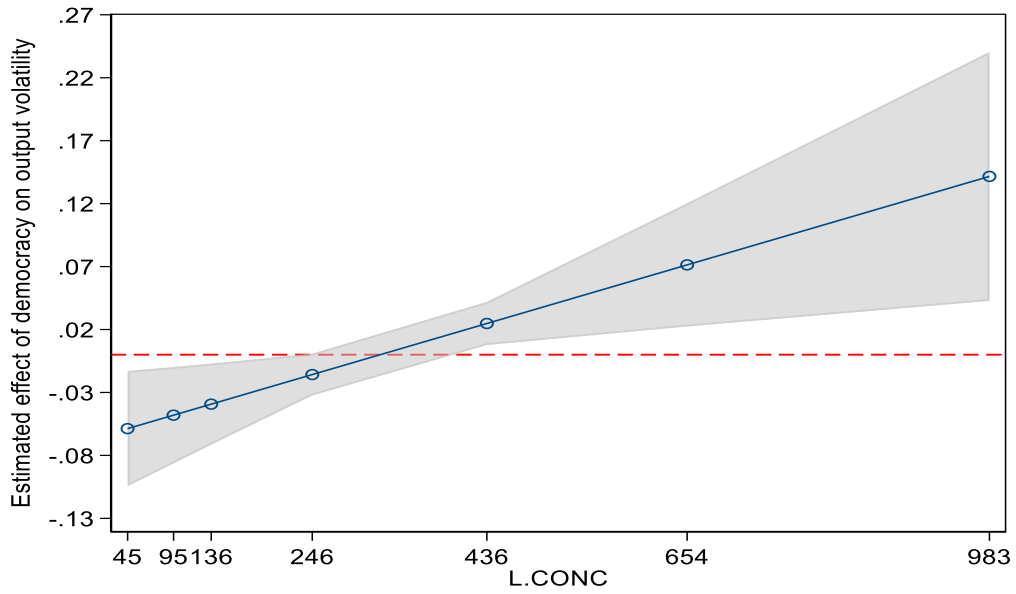
[16] 0.04 = -0.0002(coefficient on the interaction term)*218.67(the standard deviation of CONC reported in Table 3).

Table 5 - System GMM results for output volatility, democracy and income diversification

	(1)	(2)	(3)	(4)
	VOL	VOL	VOL	VOL
L.VOL	0.9271***	0.9184***	0.9274***	0.9175***
	(0.0576)	(0.0480)	(0.0512)	(0.0526)
L.POLITY2	-0.0129**	-0.0016	0.0013	-0.1064*
	(0.0053)	(0.0047)	(0.0055)	(0.0560)
L.CONC		0.0005***	0.0004**	-0.0009***
		(0.0002)	(0.0002)	(0.0003)
L.POLITY2*L.CONC				0.0003**
				(0.0001)
Other controls	NO	NO	YES	YES
Observations	2,072	2,047	2,040	2,040
Number of countries	117	117	117	117
AR(2)	0.229	0.223	0.248	0.292
Hansen test	0.249	0.278	0.162	0.362
Year-FE	YES	YES	YES	YES

Notes: L indicates one period lag. CONC is the export concentration index. POLITY2 is the Polity democracy index from POLITY4 project., and VOL is the standard deviation of GDP per capita over a 10-year rolling period. Other controls include the logarithm of population, the level of education in years; the ratio of exports to GDP; the ratio of foreign direct investment to GDP and the growth of GDP per capita. Standard errors are computed using the Windmeijer bias-corrected estimator. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Figure 4 - Estimated effect of democracy on output volatility



Note: CONC is the export concentration index. The values displayed on the horizontal axis are taken from the descriptive statistics. Specifically, we select the min (45), the 10th percentile (95), the 25th percentile (136), the median (246), the 75th percentile (436), the 90th percentile (654) and the max (983). Confidence interval at the 95% level in grey.

We subject this result to the same types of robustness test used in estimating Eq. (7). That is, as a first test we employ the Freedom House, BOIX and Bjornskov and Rode (2020) as alternative indices of democracy. Specifically, we use both continuous (Freedom) and binary of democracy in place of the POLITY2 measure. The results are shown in Columns (1) to (6) of Table 6. They are similar to the results obtained using POLITY2 in Table 5 and show that the coefficient on CONC remains positive and statistically significant (although at the 5% level), which further validates our findings.

Table 6 - Robustness checks: alternative indices of democracy and estimation methodology

	(1)	(2)	(3)	(4)	(5)	(6)
	VOL	VOL	VOL	VOL	VOL	VOL
L.VOL	0.9172***	0.8832***	0.9186***	0.8975***	0.9182***	0.8810***
	(0.0425)	(0.0370)	(0.0420)	(0.0364)	(0.0422)	(0.0428)
L.Freedom	0.0330	1.1237*				
	(0.0299)	(0.6787)				
L.B&R			-0.0161	-1.7353		
			(0.0346)	(1.3115)		
L.Boix					0.0201	-2.2057**
					(0.0803)	(0.8172)
L.CONC	0.0004*	0.0174*	0.0006***	-0.0028*	0.0005***	-0.0026***
	(0.0002)	(0.0086)	(0.0002)	(0.0017)	(0.0002)	(0.0008)
L.DEMOCRACY*L.CONC		0.0040**		0.0057*		0.0075**
		(0.0018)		(0.0030)		(0.0029)
Other controls	YES	YES	YES	YES	YES	YES
Observations	2,083	2,083	2,083	2,083	2,083	2,083
Number of countries	118	118	118	118	118	118
Estimation method	System	System	System	System	System	System
	GMM	GMM	GMM	GMM	GMM	GMM
AR(2)	0.140	0.192	0.137	0.184	0.137	0.163
Hansen test	0.440	0.466	0.411	0.406	0.394	0.462
Year-FE	YES	YES	YES	YES	YES	YES

Notes: L. means lag one period. CONC is the export concentration index. VOL is the standard deviation of GDP per capita over a 10-year rolling period. FREEDOM is the Freedom House democracy index. B&R is the B&R democracy index. BOIX is the Boix democracy index. POLITY2 is the POLITY2 democracy index form the POLITY4 project. DEMOCRACY is either the Freedom, Boix or POLITY2 measure of democracy for inclusion in the interaction term. For the other variables see the notes to Table 3. Standard errors are computed using the Windmeijer bias-corrected estimator. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

As a final robustness check, we perform cross sectional analyses for the year 2002 where we replace CONC with the number of private associations reported by the World Guide of Trade Associations. In order to take account of the different size of countries this variable has been normalized with the population (GROUPS per capita). Table 7 presents the results.

Table 7 - Robustness check: Cross-section estimates with interest groups to population ratio

	(1)	(2)	(3)	(4)
	POLITY2	POLITY2	VOL	VOL
GDP per capita	0.0000	-0.00008***		
	(0.0000)	(0.0001)		
GROUPS per capita	0.0698**	0.0414**	-0.0175***	-0.0140***
	(0.0302)	(0.0160)	(0.0056)	(0.0049)
POLITY			-0.0464	0.0035
			(0.0371)	(0.0437)
Observations	103	101	103	103
Number of countries	103	101	103	103
Other controls	No	Yes	No	Yes

Notes: POLITY2 is the POLITY2 democracy index from POLITY4 project. VOL is the standard deviation of GDP per capita over a 10-year rolling period. Interest groups/population is the number of interest group to population ratio.

Despite the lower number of observations entering the estimation, we find a positive and statistically significant (at the 5% level) relationship between GROUPS per capita and POLITY2, and a negative and statistically significant (at the 1% level) relationship GROUPS per capita and

VOL, corroborating the baseline results and reassuring once more on the validity of CONC as a proxy for the number of interest groups.

6. Conclusions

Evaluations of the modernization hypothesis—that economic development drives the creation and consolidation of democracy—-have tended to ignore the ways in which output grows as economies develop, in particular whether growth is associated with income (output) diversification. In this paper, we have argued that the modernization hypothesis remains broadly valid if income growth is accompanied by income diversification. We hypothesized that an increase in per-capita income allows a greater number of individuals to organize themselves into pressure groups, and that as the sources of income diversify, these interest groups tend to have different economic preferences, which leads them to compete with each other in exerting pressure on the political class to satisfy their preferences. As the number of interest groups increases the amount of pressure that each can exert—and hence the benefits that they can obtain—diminishes. Therefore, the persistent dominance of one or a few organized interest groups on the remaining groups becomes less likely and hence the level of democracy rises. Moreover, the existence of a large number of organized interest groups with different economic preferences induces policymakers to make policy choices aimed at satisfying as many groups as possible. By behaving in this way, the governments of democratic countries avoid large fluctuations in output and output volatility in those countries tends to be less than it is in less democratic counties. These hypotheses are supported by our

empirical results from a panel of countries, confirming the importance of income diversification as a driver of both the level of democracy and the stability of output growth.

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Appendix

Table A1 - Correlation Matrix for POLITY2

	POLITY2	GDP per capita	CONC	POP	EDU	EXP	FDI
POLITY2		0.28	-0.51	0.07	0.41	-0.03	0.05
GDP per capita	0.28		-0.31	-0.00	0.61	0.39	0.06
CONC	-0.51	-0.31		-0.19	-0.52	0.01	-0.03
POP	0.07	-0.00	-0.19		-0.01	-0.31	-0.18
EDU	0.41	0.61	-0.52	-0.01		0.31	0.10
EXP	-0.03	0.39	0.01	-0.31	0.31		0.30
FDI	0.05	0.06	-0.03	-0.18	0.10	0.30	

Notes: POLITY2 is the Polity democracy index from POLITY4 project. CONC is the export concentration index. GDP per capita is the logarithm of GDP per capita in real terms. POP is the logarithm of population. Edu is the level of education in years. EXP is the ratio of export to GDP. FDI is the ratio of foreign direct investment to GDP.

Table A2 - Correlation Matrix for VOL

	VOL	POLITY2	CONC	POP	MON	TOT	CREDIT	EXP	FDI	GR capita
VOL		0.16	-0.28	0.16	0.08	-0.12	0.16	-0.09	-0.05	-0.16
POLITY2	0.16		-0.52	0.07	0.11	-0.15	0.33	-0.03	0.05	-0.03
CONC	-0.28	-0.52		-0.19	-0.35	0.37	-0.45	0.01	-0.03	0.03
POP	0.16	0.07	-0.19		0.17	-0.04	0.14	-0.31	-0.18	0.03
MON	0.08	0.11	-0.35	0.17		-0.12	0.61	0.19	0.02	-0.06
TOT	-0.12	-0.15	0.37	-0.04	-0.12		-0.14	0.01	0.00	0.04
CREDIT	0.16	0.33	-0.45	0.14	0.61	-0.14		0.22	0.04	-0.08
EXP	-0.09	-0.03	0.01	-0.31	0.19	0.01	0.22		0.30	0.01
FDI	-0.05	0.05	-0.03	-0.18	0.02	0.00	0.04	0.30		0.07
GR capita	-0.16	-0.03	0.03	0.03	-0.06	0.04	-0.08	0.01	0.07	

Notes: VOL is the standard deviation of GDP per capita over a 10-year rolling period. POLITY2 is the Polity democracy index from POLITY4 project. CONC is the export concentration index. POP is the logarithm of population. MON is the ratio of broad money to GDP. TOT is the percentage ratio of export unit value indexes to import unit value indexes. CREDIT is the ratio of domestic credit to the private sector to GDP. EXP is the ratio of export to GDP. FDI is the ratio of foreign direct investment to GDP. GR capital is the annual growth rate in GDP per capita.