February 9th 2017

Jumps into democracy

The short and long run in the Democratic Transition

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Abstract:
When countries become rich they normally become democracies. Kernel regressions reveal a robust long-run path in the standard political regime index as a function of income. It looks exactly as a transition curve should, and, consequently, it is highly non-linear. In the short run a political regime is often in status quo equilibrium, which is interrupted by infrequent discrete jumps. The jumps are triggered by events that are (almost) random in the perspective of economics. Hence, the long-run correlation between income and democracy is difficult to catch with short-run regression methods, but this does not mean that there is no relation: The distance of a political regime from the transition path – that is a function of income – is a robust predictor of the jumps.

Keywords: Democratic transition, regime change, long-run development, Kernel regression
JEL: O1, O43

Acknowledgements:
We are grateful to Markus Eberhardt for advice on mean group estimators and for sharing his Stata code and Vincenzo Mollisi for a careful read. The paper has been presented at a workshop at Deakin University, and at the Australasian Public Choice Society. We are grateful for comments received.

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1. Introduction

This paper deals with the relation between a political regime index, *P*, and income, *y*. The data used are discussed in section 2. It also defines three variables: *Events*, *E*, where the regime changes, *triggering events*, when the change is to a new system, and *jumps*, *J*, which is the size of the change.

When countries become wealthy they normally become democracies. Cross-country studies report a robust correlation between income and democracy; see Gundlach and Paldam (2009). Section 3 shows that Kernel regressions on sorted and stacked cross-country panel data generate a perfect transition path that is our estimate of the *Democratic Transition*, $\Pi = \Pi(y)$. The distance between *P* and the Π-path is termed the *tension*.

The *P*-data has the property of stepwise stability, often lasting more than a decade; (b) The underlying transition curve, Π, is highly non-linear; (c) Negative income shocks leads to (slightly) more jumps than positive income shocks. Therefore, it is not straightforward to explain *P* by *y*, by the regression techniques used by the profession.

Section 4 confirms that the whole spectrum of these techniques work poorly in the case at hand. This is sometimes interpreted to say that the relation between income and democracy is spurious, but this is at variance with the strong long-run transition curve. The purpose of this paper is to provide a data based theory that identifies the short-run effects that are consistent with the strong long-run findings. The theory has three causal relations as given by (1), where the two bold elements are exogenous:

(1) **Income** ➔ the transition path ➔ tension + **event** ➔ jump in direction of tension

With minor qualifications, the causal sequence (1) is confirmed by the data:

Section 5 shows that events happens almost randomly in an economic perspective, using income, tension and growth. However, Section 6 shows that if the event gives a jump, it is in average half the tension. Thus, the Π-path is an attractor for the jumps that happens randomly. This integrates the short and the long run of the Democratic Transition.

It should be mentioned that regime stability differs between countries and over time. This variation will only be analyzed in Tables 4 and 6. They show that fixed effects for countries and time are significant, but matter little for the transition.

2. Measuring regime changes by the Polity index

Section 2.1 reports the data definitions. Section 2.2 explains why political systems have status quo equilibria, and section 2.3 is an example showing how the typical data look.

Income, *y*, is the (natural) logarithms to the *gdp*-data from the Maddison project.[3] Some counts of the data are given in Table 1. The Democratic Transition is one part of the Grand Transition, which changes countries from a stagnant traditional state to a dynamic modern one. It is discussed in Paldam and Gundlach (2017) where it is seen as a process connecting the growth rate and the income level. It is shown to have a significant hump-shape, except in the OPEC countries where the curve has a negative slope throughout the full income range. Thus, we distinguish between the Main (with capital M) group of countries and the OPEC group.

Table 1. Some counts of the data: 1960-2010

Countries		Observations for (P, y, g)			Events	Jumps	Years per	Average
Group	Number	Available	Missing [a)]	Zeroes	*E*	*J*	jump	growth
Main	143 (7) [b)]	6,436	857 (47)	179	668	613	10.5	1.93%
OPEC	14	560	154 (9)	2	53	47	11.9	0.91%
All	157	6,996	1,011 (56)	181	721	660	10.6	1.85%

Notes: a) The number in the parenthesis is gaps. b) Seven OPEC countries only join the organization during the period or resign their membership. See Table A2 in the Appendix. Events and Jumps are explained in section 2.2.

2.1 Three variables calculated from the P-index: Events, Triggering Events and Jumps

The Polity IV Project (Marshall *et al.* 2016) codes political regimes on an integer scale from -10 to +10, where -10 refers to strict absolutism and +10 to a consolidated democracy. The Polity scores fall into three regime categories: *autocracies* from -10 to -6, *democracies* from +6 to +10, and (mixed) *anocracies* from -5 to +5.

The Polity index uses three special codes -66, -77, and -88, called standardized authority scores, for severe political instability due to: foreign intervention, anarchy, or regime transition, respectively. To allow for time series analysis the Polity Project converts the Polity scores to the variable Polity2 – our *P-score* – where the three authority scores are recoded:

[3]. They are real GDP data per capita in PPP prices. A total of 1,010 of the potential 51 x 157 = 8,007 observations are missing as countries were dependencies. For about half the countries, the gdp-data are missing for 2009 and 2010. For all but two countries the GDP data per capita in fixed international $ are available from the World Bank (WDI) Data to prolong the Maddison series.

Regime transitions [-88] are coded as interpolated polity scores – we follow this coding.

Anarchy [-77] is coded as zeros – we also follow this coding, but we have added a binary dummy, *Zero*, that is 1 if polity is -77 and else zero.

Foreign interventions [-66] are left blank. We recode the blanks as zero, and add another binary dummy, *Blank*, that is 1 if polity is -66 and else zero.

The two dummies *Zero* and *Blank* are used to see if the somewhat arbitrary coding affect the results – fortunately they are rarely significant. With the recoding 59 spells of zeros appears with a total of 237 observations, so it is the fraction 237/6,996 = 0.034 of all observations, so it is a small problem. The average zero-spell is 4 years, but as reported in Table A6 (in the appendix) the distribution is very skew, with a grim upper tail pointing to failed states. From Tables 1 and A6 one can check that everything adds up.[4]

The paper deals with the dynamics of political systems, but most years political systems are unchanged. Of the 6,996 *P*-scores only 721 differ in value from the preceding year's value – they are termed the *events*, *E*, in the data. Sixty-one of the events, which is 9%, of the 721 events give no system change, while 660 or 91% of the events *trigger* a system change. They are the *triggering events* where the system jumps:

(2) $J_{i,t} = P_{i,t} - P_{i,t\text{-}1}$. If $J_{i,t} \neq 0$, there is a *jump* in country *i* at time *t*.
In calculating (2) all zeroes are disregarded

The average (numerical) jump is 4.0 *P*-points. The distribution of the jumps is shown on Figure 1. They are surely of a very different size. Most jumps are upward, and the net positive jump is 591 *P*-points, or 3.76 points for the average country, which has 44.6 years of observations.

With an average growth rate of 1.85% the *gdp* increases $1.0185^{44.6} = 2.26$ times in the average country, so that income rises by 0.82 *y*-points. If these numbers are given a causal interpretation the *P*-score increases by 4½ *P*-points per *y*-point. This is a bit higher than the long-run result of 3 *P*-points found in section 3.1 and in Gundlach and Paldam (2009).

[4]. The 59 spells give rise to 108 events, and 47 triggering events, as 10 are at the start or end of the period, so that they generate one event only, i.e., 59 *x* 2 – 10 = 108. In 5 cases the system returns to the pre-zero system, so the zero-spell did not change the system, this gives 47 system changes in connection with the zero-spells. The difference between the 108 events and the 47 triggering events is 61. This is precisely the same as the difference between the 721 events in Table 1 and the 660 jumps.

Figure 1. The distribution of the 660 jumps, *J*, by size

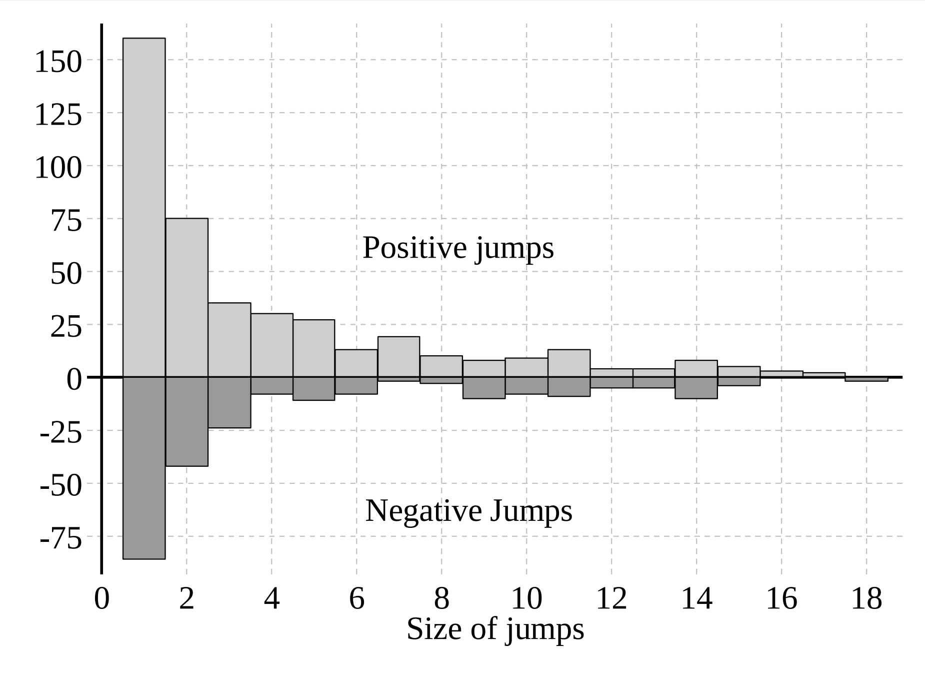
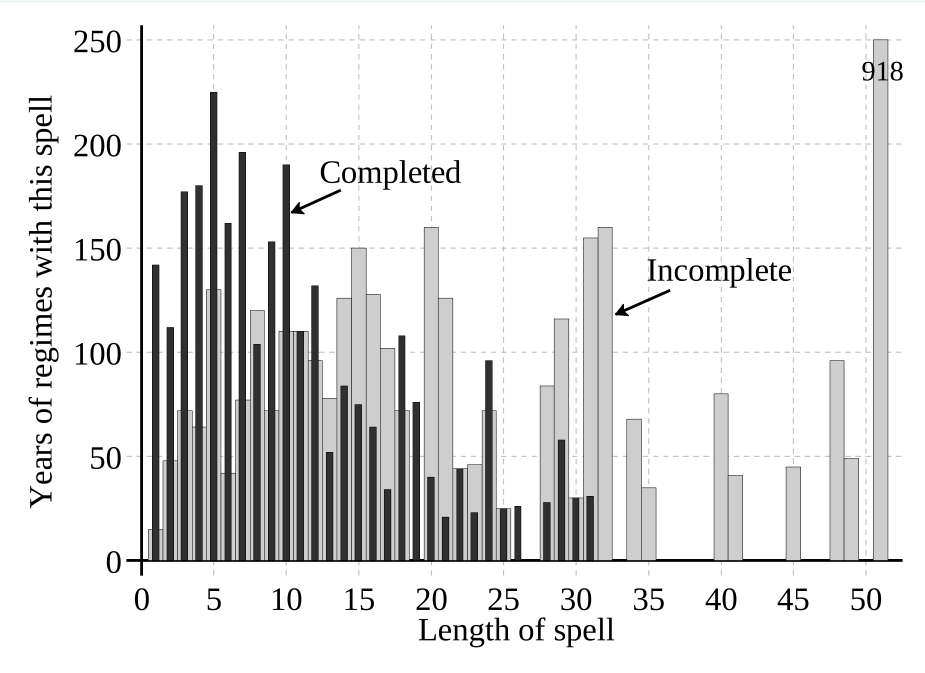


Figure 2. Years under regimes of different length



2.2 Regime spells

When the zeroes are deleted the data contains 810 regime spells, i.e., periods where the P-score is the same. Of these 522 are completed, while 288 are incomplete, so that they start when the data does, or ends when the data does, and thus they are likely to be longer than reported. Eighteen spells cover the full period – they are 16 western countries and Costa Rica, with +10 every year, and Saudi Arabia, with -10 all years.

Figure 2 shows the distribution of the spells. The average of all spells 7.5 years, but the average of the completed spells is 5.4 years, while it is 11.3 years for the incomplete spells, and we know that they last longer. If we use the standard device of multiplying the incomplete spells by two the average spell increases to become 15.6 years.[5]

Thus, regimes normally have a substantial duration once they get older than a couple of years as they reach *status quo equilibrium* for 3 reasons: (i) All regimes build a protective apparatus and some legitimacy.[6] (ii) Stakeholders emerge. They support the regime as they may lose their stake, if the regime changes. (iii) The first of those who want to change the regime, run a risk, i.e., the first to demonstrate against an oppressive regime may be shot.

Given the status quo equilibrium, it is clear that an event is needed before the regime changes. The data contains 728 such events, and we have read up the story of many of these events, which are reported in the media. They are different and often seemingly random.

2.3 An example for the long run

Figure 3 show two graphs of the P-index, $P_i = P_i(t)$ and $P_i = P_i(y_i)$, where i is a country index and t is time. The countries are Denmark and France, which have had much the same economic development, but a different political history.

The data start in 1820 with authoritarian regimes and end in 2010 with democratic ones. Both countries have had stable regimes where P is constant most years, but they also had an unusual period (Dk 1900-1915 and Fr 1869-1877): where P changed (almost) every year. Income varies as well – sometimes falling – thus the paths of $P_i = P_i(y_i)$ on Figure 3.b have some periods of zig-zag even when the trends on both figures are similar. The data used below cover only the high end for these two countries, but it includes 155 more countries, of which many are at the most volatile income interval.

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5. Eighteen spells are incomplete to both sides – they are multiplied by 4. The 2-rule has been checked for the old democracies they have in average laser 108 years. It is only slightly longer than 2 *x* 51 years.

6. There is a well-known trade-off between the legitimacy and oppression needed to obtain system stability. Most of the rich Western countries have a perfect score of 10 in the index, indicating a high level of legitimacy that allows them to persist with little oppression.

Figure 3a. The P-index for Denmark and France over time

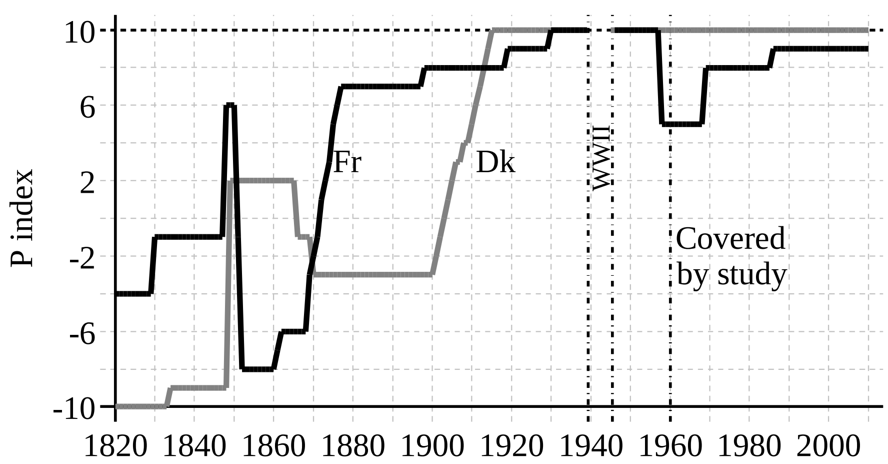
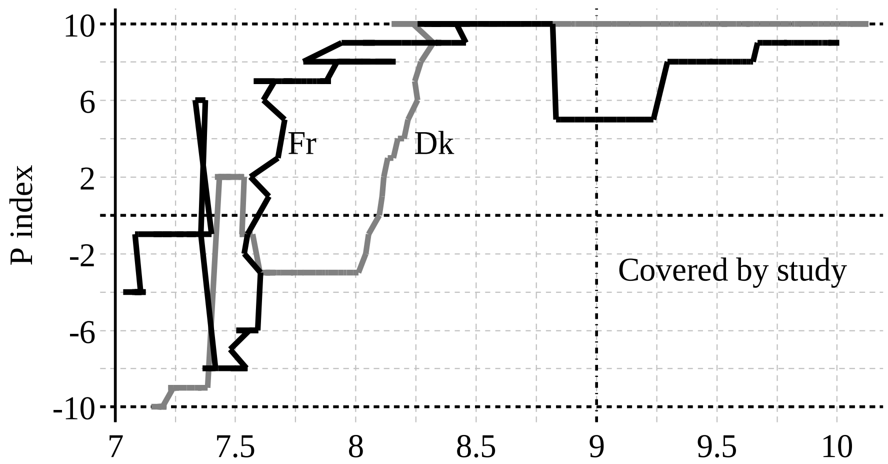


Figure 3b. The P-index for Denmark and France over income



Note: The horizontal axis is the logarithmic income axis, so the increase of 3 *y*-points from 7 to 10 is an increase in *gdp* of 20 times. The years of the German occupation (1940-45) are deleted on the Figures.

The two countries both became developed countries rather early, and are thus 'old' democracies, where the political system has obtained great legitimacy, so that only a small minority in the population wants a system change. Even France, which that in the 1950s and early 1960s participated in the war in Algeria, and then had the OAS uprising, stayed democratic. The data have no less than 14 Western countries with a P-score of 10 for all years. The stability at the top is also demonstrated in section 3.4.

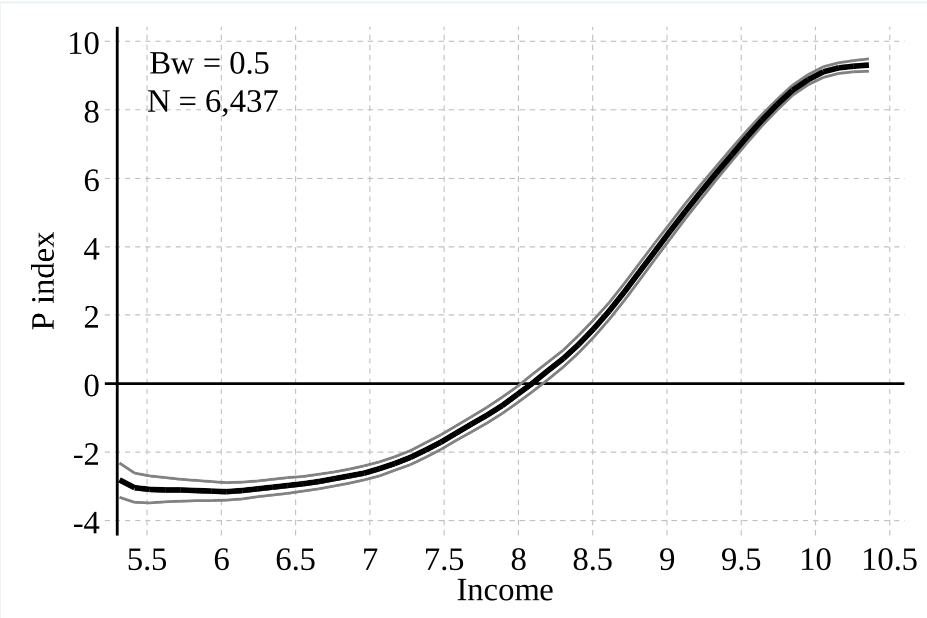
3. The long run: Kernel regressions give the transition path

Section 3.1 shows the path of the transition-curve, and section 3.2 discusses the robustness of the curve to the selection of country-group. Then follow the kernel in the OPEC group and an analysis of the variability around the path. We are not aware of any study that disagrees about the long-run transition, though there is some disagreement about the causal direction.[7]

3.1 The Democratic Transition, $\Pi = \Pi(y)$, in the Main group

To calculate the kernel, the data is first sorted by income. This scrambles the stable sections in the individual countries. Only 4% of the observations stand next to an observation for the same country. The kernel is a perfect transition curve that converges to a stable political system at the low end (where P = -3) and high end (where P = 9), i.e., by roughly 3 P-points per y-point.[8]

Figure 4. Kernel of the Polity-income relation for the Main group



Note: The gray lines are the 95% confidence interval. It does not change the curve if the observations, where P = 0, are deleted. The positive slope is obvious for all bw < 3.0. The data are thin for y below 6. Here the curve becomes wobbly for bw < 0.4. The flat bottom below y = 6.5 appears for bw < 1, and the flat top above y = 10 appears for bw < 0.7.

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[7]. The observation of the strong long-run relation between income and democracy goes back to Lipset (1959). The main proponent of the causality from democracy to income is Przeworski *et al.* (2000). Gundlach and Paldam (2009) give a formal causality test showing that the main direction of long-run causality is from income to the political system.

[8]. This is the same as in Gundlach and Paldam (2009), but a little less than in section 2.2. The difference between the two estimates of the rise in P is probably due to the upward jump in P in many countries when the Soviet Union collapsed. This gave an avalanche of events that is only vaguely related to income.

The kernel is an estimate of a smoothed moving average process, with a fixed bandwidth, bw. The curve is robust to the kernel formula, so we use Epanechnikov's kernel as recommended by Stata. The curve is less robust to the bw. If bw is set too small, the curve becomes wobbly, and if it is set too large the curve becomes linear and the slope falls till it becomes horizontal at the average. The kernel is robust and interesting for a range of bw's between 0.4 and 3.

The 95% confidence interval is narrow due to the large number of observations. The curve has a dominant positive slope, but it is, of course, highly non-linear. The curve on Figure 4 is used as the Π-curve below. The tension, T, is defined as the jump, J, as:

(3) $$T_{i,t} = P_{i,t} - \Pi(y_t)$$

For the Main group the correlation between T and J is 0.15 or if all years of stability (where $J = 0$) are deleted, it is 0.47, so the actual jumps are nicely correlated with the tensions.

3.2 Robustness of the curve to country groups and time intervals

The technique used merges all data to concentrate on the general pattern, but perhaps it does hide relevant information. The rather smooth form of the curve and the narrow confidence intervals suggest that this is not the case. Also, two sets of robustness tests have been made: (i) The data have been divided in five country groups, and (ii) in six decades. The resulting kernel-curves are posted at http://martin.paldam.dk/Jump-kernels.php.

Ad (i): The five groups are: Africa (Sub-Saharan), Asia, Europe (including the four overseas), Latin America and MENA (Middle East and North Africa). The analysis for Figure 4 has been run on the data for each group, and for all countries except the ones in the group. The only really different kernel is the one for the MENA-group. It looks a great deal as the OPEC-kernel on Figure 5 below. Also, most of the country-groups lack data for some of the income range, but if the oil-countries are disregarded, the kernels look as the curve shown on Figure 4.

The most reassuring is that the five curves without each country group are very similar. The only exception is that the curve without Europe misses so much at the top that it becomes a mixture of East Asian and oil countries, so the confidence interval becomes rater wide.

Ad (ii) The kernels for the six decades are also rather robust. The curves for the first decades are a bit thin at the top, so the bend at the top level does not show. However, the curve cannot exceed 10 so it must bend as it does from 1980 onwards.

3.3 A different case: The skewness of the Democratic Transition in the OPEC group

Figure 5 shows the kernel for the OPEC countries, where the scale is shifted downwards relative to Figure 4 by 6 Polity points. The confidence interval is broader on the OPEC kernel, and the curve is not as smooth as the one for the Main group. This is due to the much smaller number of observations. Here 29% of the observations stand next to an observation for the same country, so data from each country cluster somewhat, and the spells with a constant system affect the curve.

The kernel shows that OPEC countries are wealthier and more authoritarian than other countries. The wealthier they get, the more authoritarian they become. The kernels for the Main and the OPEC groups have no overlap of the confidence intervals. If the two kernels are seen together, it looks as if the OPEC-kernel came from the same kernel as the Main one for small values of y, but as income jumped the kernel just shifted to the right, and then it started to diverge.

The ruler of an oil-country can afford both an adequate armed protection and a distribution of rents to purchase a solid coalition behind his regime. This gives a drift toward a still more authoritarian regime. Thus, while the regime goes to +10 in other countries, it goes to −10 in very resource rich countries. However, countries, such as Norway, which have gone through the Grand Transition before the oil resource was exploited, remain democracies.

Figure 5. Kernel of the Polity-income relation for the OPEC group

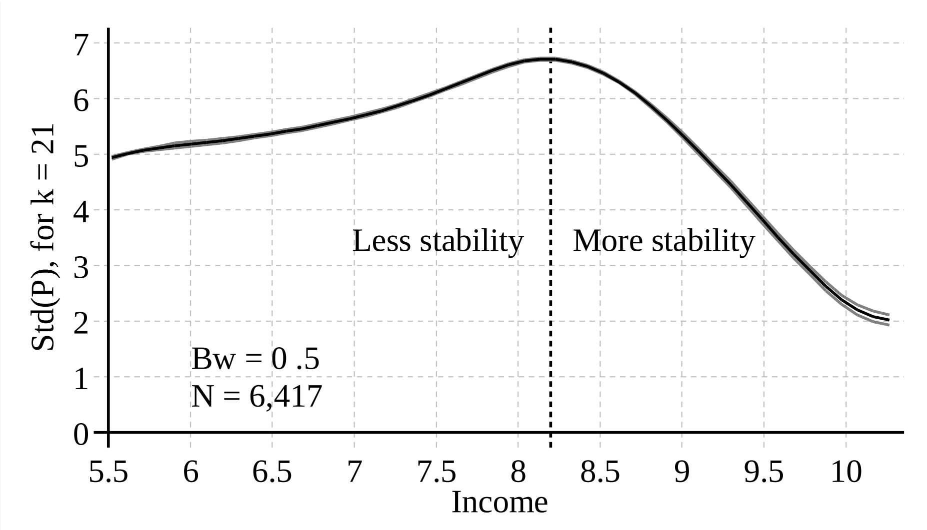
Note: See note to Figure 4. The kernel is unstable for bw < 0.3. However, for bw > 0.3 to 1 the kernel has a significant negative slope. Nine of the 13 OPEC countries are Muslim countries. They are much more authoritarian than the other OPEC countries; see Borooah and Paldam (2007) for an analysis.

3.4 *The regime variability over the transition for the Main group*

The stability of the polity-score over the transition is analyzed by a three step procedure: (i) The data are sorted by y, giving the (P_j, y_j)-ordered data for j = 1 to 6,437; (ii) a running standard deviation of the polity-score, $Sdt_k(P)$, has been calculated for a moving sequence of k = 21 *P*s in the ordered set. Each $Std_{21}(P)$ is placed next to the mid observation of income in the interval to give the $(Std_{21}(P)_j, y_j)$-set, which is still sorted by y. (iii) The $(\mathrm{Std}_{21}(P)_j, y_j)$-set is analyzed by kernel regressions as before. Figure 6 shows the result. This procedure is a double ‘averaging’, first over the k-sequence, and then by the kernel. This causes very narrow confidence intervals of the kernel.

The robustness of the kernel is analyzed by varying the bandwidth and k – the number of *P*s for which the Sdt_k is calculated. It turns out that the result is stable to a wide range for both parameters. The P-scores have rather high and growing regime volatility in the income range below y = 8.25, but when income increases, the kernel curve falls by more than three times. Regimes are rather stable when countries reach the modern steady state.

Figure 6. Kernel of the $(Std_{21}(P), y)$ relation for the Main group



Note: See note to Figure 4. The curve is calculated as explained in the text. The first and the last ten y’s get no standard deviation, hence N falls by 20 compared to Figure 4. Also, the calculation has been repeated after the 190 (P, y)-pairs where P = 0 is deleted. The resulting kernel-curve remains virtually the same.

4. Regression estimates of the transition

Section 4.1 introduces the empirical model. Section 4.2 looks at pooled parameter models, while section 4.3 considers heterogeneous parameter models. Finally, section 4.4 shows how the common dynamic process in the data looks.[9]

4.1 Standard panel regressions fail to identify a democratic transition

Our regression results for the democratic transition are based on "pooled" and "heterogeneous" parameter models. A common feature of the pooled models is that the within-effects of the explanatory variable *income* and the effects of common shocks are restricted to be the same for all sample countries. By contrast, the heterogeneous models allow for country-specific income effects and for country-specific effects of common shocks.

A most parsimonious dynamic specification of the democratic transition across countries i, over time t, with P_{it} as the political system and y_{it} as income, can be written as

(4) $$P_{it} = b_{1i}\, P_{i,t-1} + b_{2i}\, y_{i,t-1} + u_{it} \quad \text{with} \quad u_{it} = \mu_i + \lambda_i f_t + \varepsilon_{it},$$

where $(b_{2i})/(1-b_{1i})$ is the country-specific (heterogeneous) long-run parameter of interest and u_{it} is an error term that includes an unobserved country-specific effect μ_i and an unobserved common factor f_t with country-specific (heterogeneous) factor loadings λ_i.

The most popular panel estimators in the empirical growth literature (POLS, 2FE, Difference-GMM, System-GMM) impose the restriction of common within effects ($b_{ji} = b_j$) and identify μ_i and f_t with country and year dummies (or with first-differencing and cross-sectional demeaning). The presence of common shocks with possibly different effects across countries (country-specific factor loadings) and the possibility of nonstationary variables violate the implicit assumptions of cross-section independence and stationarity that are required for these panel estimators. More flexible "mean group" panel estimators have been suggested by Pesaran and Smith (1995), Pesaran *et al.* (1999), Pesaran (2006), and Bond and Eberhardt (2013). Table A3 in the appendix gives an overview of the differences between pooled and heterogeneous parameter models with regard to fixed effects and the modeling of unobservables.

[9]. See also Acemoglu *et al.* (2008) and Murtin and Wacziarg (2014)

4.2 Pooled parameter models

For a start, the estimates reported in the first and the second columns of Table 2 should reveal a reasonable range of the effect of income on the degree of democracy. Due to the inclusion of the lagged endogenous variable, pooled OLS (POLS) and two-way fixed effects (2FE) are known to produce biased results, though in different directions. This suggests that the true income effect is expected to be somewhere within the range given by these two estimates.

Table 2. Pooled parameter models

	POLS	**2FE**	**AB**	**BB**	**CCEP**
Income per person [z-statistic]	**3.21** [7.8]	**-2.90** [3.0]	-10.52 [1.5]	**1.88** [2.3]	-0.30 [-0.3]
Observations	5,688	5,688	5,568	5,688	4,905
Countries	118	118	118	118	118
RMSE	1.73	1.70	1.66	1.81	1.57
Non-stat. residuals (CIPS *p*-val.)	0.00	0.00	0.00	0.00	0.00
Weak cross-sec. dependence (CD *p*-val.)	0.00	0.00	0.00	0.00	0.00
Instrument count			58	67	
AR1-*p*			0.00	0.00	
AR2-*p*			0.19	0.18	
Hansen test of overid. restrictions (*p*-val.)			0.29	0.04	
Diff.-in-Hansen test of IV subset (*p*-val.)				0.05	

Notes: Cross-country time series data, 1960-2010. OPEC members and countries with less than 21 consecutive time series observations excluded. All estimates based on dynamic model. Reported coefficients are long-run income effects. Bolded coefficients are statistically significant at the 5% level. POLS: Pooled OLS estimator. 2FE: Two-way Fixed Effects estimator. AB: Difference-GMM (Arellano-Bond) estimator. BB: System-GMM (Blundell-Bond) estimator. CCEP: Common Correlated Effects Pooled estimator. GMM estimates with restricted instrument count. All specifications except CCEP include year fixed effects; CCEP based on 3 lags of cross-section averaged variables.

In the same way, the AB (Arellano-Bond) and the BB (Blundell-Bond) estimators give results with different signs, while the CCEP (Common Correlated Effects Pooled estimator) gives a statistically insignificant coefficient close to zero. Thus, the results for the pooled parameter models do not provide convincing empirical evidence for a positive effect of income on democracy, in line with results of the recent literature.[10] The residual diagnostics for all estimators suggest that the null

[10]. Based on the same empirical model but on a different data set, Acemoglu et al. (2008) find no statistically significant effect with 2FE. Brückner and Ciccone (2011) claim a "window of opportunity" for democratic change after a *negative* income shock for a sample of sub-Saharan African countries. Their study does not consider a lagged endogenous variable in its estimation equation and may therefore it may suffer from misspecified dynamics. Brückner and Ciccone (2011) may actually estimate the short-run trigger rather than the long-run cause of a change in the political regime. For

hypothesis of non-stationary residuals[11] is rejected, which allows for the possibility of a cointegrating equilibrium relation between the degree of democracy and per capita income. However, the null hypothesis of weak cross-sectional dependence of the residuals[12] is rejected for all estimators. This implies that there is strong cross-sectional dependence in the residuals, thereby violating the conditions for unbiased estimates.

4.3 Heterogeneous parameter models

Table 3 reports the results for estimates of the democratic transition that are based on heterogeneous parameter models. All estimators allow for country-specific income effects (which are reported as unweighted cross-country averages) but differ with respect to the modeling of common shocks and weak cross-sectional dependence of the residuals (see again Table A3 for an overview). Four variants are considered.

Table 3. Heterogeneous parameter models

	PMG	**MG**	**CD-MG**	**CCEMG**	**AMG-D**	**AMG-S**
Income per person	-0.56	0.46	**-3.60**	0.77	-1.45	**-1.27**
[z-statistic]	[-1.7]	[0.47]	[-2.3]	[0.36]	[-1.69]	[-1.2]
Common dynamic process					**0.41**	**0.96**
					[6.0]	[7.3]
Observations	5568	5568	5568	4905	4120	4120
Countries	118	118	118	118	103	103
RMSE	1.55	1.68	1.64	1.44	1.48	2.18
Non-stationary residuals (CIPS p-value)	0.00	0.00	0.00	0.00	0.00	0.99
Weak cross-sec. dependence (CD p-value)	0.01	0.00	0.00	0.82	0.58	0.04

Notes: Cross-country time series data, 1960-2010. OPEC members and countries with less than 20 consecutive time series observations are excluded. All estimates based on dynamic model, except AMG-S. Reported coefficients are long-run income effects. Bolded coefficients are statistically significant at the 5% level (robust standard errors in parentheses. PMG: Pooled Mean Group. MG: Mean Group CD-MG: Cross-sectionally Demeaned Mean Group. CCEMG: Common Correlated Effects Mean Group. AMG: Augmented Mean Group. CD-MG is based on cross-sectionally demeaned variables. CCEMG is based on 4 lags of cross-section averaged variables. Both AMG estimators are based on a balanced sample in 1971-2010. AMG-S is based on a static model.

The Pooled Mean Group (PMG) estimator (Pesaran et al. 1999) allows for short-run country-specific effects but imposes the restriction that the long-run effects are the same for all countries.

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negative income effects that trigger a change in the political system toward democracy, see also Burke and Leigh (2010) and Dorsch *et al.* (2015), who focus on a sample of non-democracies.

[11]. The Correlated-Im-Pesaran-Shin (CIPS) unit root test is implemented with the Stata module `pescadf` (Lewandowski 2007).

[12]. The CD test for weak cross-sectional dependence Pesaran (2015) is implemented with the Stata module `xtcd2` (Ditzen 2016a).

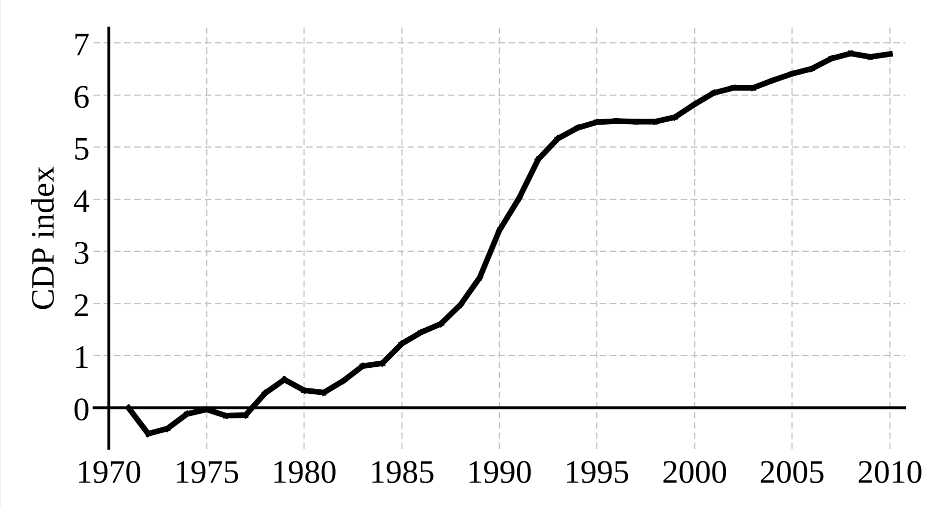
The mean group (MG) estimator (Pesaran and Smith 1995) does not explicitly control for cross-sectional correlation, but it can be estimated on cross-sectionally demeaned data (CD-MG). This imposes the restriction that a common shock has the same effect in each country. The Common Correlated Effects Mean Group (CCEMG) estimator (Pesaran 2006) allows for unobserved country-specific effects of common shocks but treats them as "nuisance parameters" that cannot be interpreted. The Augmented Common Correlated Effects Mean Group (AMG) estimator (Bond and Eberhardt 2013) goes one step further by explicitly identifying a common dynamic process.[13] As reported in Table 3, we do not find statistically significant income effects on the degree of democracy with the exception of the CD-MG estimator, which comes with a rejection of the null of weak cross-sectional dependence of the residuals. For all models, the residual diagnostics are favorable in the sense that they reject the null of non-stationary residuals, which is required for a possibly cointegrating relation between income and democracy. However, only CCEMG and the dynamic version of AMG do not reject the null of weak cross-sectional dependence of the residuals. Hence, even the two statistically preferred estimators do not identify a direct effect of income on the degree of democracy. The interesting result of Table 3 is that the two AMG estimators confirm a common dynamic process as a statistically significant driver of the transition from authoritarian to democratic political systems.

4.4 The common dynamic process

Figure 7 reveals that the evolution of the common dynamic process that drives the democratic transition looks like the stylized path of the democratic transition that has been claimed since Lipset (1959) – and it looks like the Kernel regression result shown in Section 3.1. The slope of the common dynamic process is positive, apart from minor fluctuations, but not linear. The non-linearity underlines that the democracy index may be best described as a jump variable. The non-linearity in combination with substantial noise in the data may also explain why it has been difficult to estimate statistically significant income effects with linear regression equations. In any case, the absence of a statistically significant income effect does not imply that there is no democratic transition: our results suggest that the democratic transition is driven by a dynamic process that is shared among countries and apparently correlated with the *average* cross-country level of per capita income, which has steadily increased over time.

[13]. PMG, MG, and CCEMG are implemented with the Stata module xtdcce2 (Ditzen 2016b); AMG is implemented with the Stata module xtmg (Eberhardt 2012).

Figure 7. The evolution of the CDP, common dynamic process, of the democratic transition



Note: Based on year dummy coefficients of an estimate of the Democratic Transition in first differences of the static model.

The panel estimators employed in Tables 2 and 3 are an attempt to try a full spectrum of standard regression techniques on the democratic transition, but a direct effect of the level of income on the degree of democracy has not been identified. Polity scores (and their changes) measure the character and stability of political systems. Perhaps the on-off dynamics of political systems differ fundamentally from the more persistent dynamics of economic systems. As pointed out in Section 2, the pooled Polity index is stable for an average period of more than one decade and as will be shown below, the average stability period comes with a large standard deviation due to the discrete jumps that interrupt the stability. In combination, processes with stepwise stability and discrete jumps may inhibit the identification of a democratic transition with linear regression techniques.

5. Events are almost random

The data for the Main group contains 675 events. Most of these events are reported in the international media (such as the Economist), so they are easy to look up. Some are economic crisis, but most are political, such as an internal fight within the regime, a corruption scandal, the death of the ruler for natural or other reasons, etc. Consequently, they are different indeed and rather hard to predict. We try to predict these crises using the following 5 variables: Initial income, y; the tension variable, T, from equation (2) above; and two growth variables, g and $g5$, which refer to the same year, as P, and to an average of the previous 5 years, respectively.

Table 4a. Probit regressions explaining the 675 events, *E*, in the Main group

N = 6,437	(1)	(2)	(3)	(4)	(5)
Tension, T	**0.014** [3.8]	**0.023** [4.8]	**0.020** [3.4]		**0.012** [3.5]
Initial income, $y_{(-)}$	**-0.213** [-9.9]	**-0.167** [-2.3]	**-0.312** [-3.4]	**-0.209** [-9.7]	
Growth, g	**-0.018** [-4.6]	**-0.020** [-4.8]	**-0.019** [-4.4]	**-0.017** [-4.4]	
Growth last 5 years, $g5$	**-0.018** [-2.7]	**-0.019** [-2.6]	-0.014 [-1.8]	**-0.019** [-3.0]	
Constant	**0.447** [2.7]	-4.128 [-0.1]	-2.862 [-0.0]	**0.418** [2.5]	**-1.259** [-59.6]
Country fixed effect	NO	YES	YES	NO	NO
Time fixed effects	NO	NO	YES	NO	NO
Pseudo R^2	0.044	0.119	0.133	0.041	0.003
Pure effect of FEs		0.102	0.119		

Table 4b. OLS regressions explaining the 675 events, *E*, in the Main group

N = 6,437	(1)	(2)	(3)	(4)	(5)
Tension, T	**0.003** (4.0)	**0.005** (5.2)	**0.004** (3.6)		**0.002** (3.5)
Initial income, $y_{(-)}$	**-0.036** (-10.1)	**-0.022** (-2.0)	**-0.045** (-3.1)	**-0.034** (-9.8)	
Growth, g	**-0.003** (-4.8)	**-0.003** (-5.0)	**-0.003** (-4.6)	**-0.003** (-4.7)	
Growth last 5 years, $g5$	**-0.003** (-2.8)	**-0.003** (-2.8)	**-0.003** (-2.0)	**-0.004** (-3.2)	
Constant	**0.400** (14.4)	**0.210** (2.0)	**0.394** (2.9)	**0.391** (14.1)	**0.105** (27.4)
Country fixed effect	NO	YES	YES	NO	NO
Time fixed effects	NO	NO	YES	NO	NO
R^2	0.029	0.073	0.083	0.026	0.002
Pure effect of FEs		0.062	0.074		

Note: See Table 2. Parentheses contain t-ratios. Brackets contain z-values. The pure effect of the fixed effect is reached by running the regression in the column without the four economic variables. The tension variable above the dashed line is for comparison with the results in Table 6. These regressions have also been run with dummy variables for zero and blanks and with robust standard errors. It gave marginal changes only.

In addition, a set of fixed effects country dummies and time fixed effects are made. The 14 Western countries with constant *P*-values and year 1960 are used as constant. Table 4 shows both probit and OLS regressions.

With N = 6,437 'everything' is normally statistically significant. This is also the case in Table 4, even when only a small fraction of the variation is explained. Events are largely independent of the variables analyzed given the small size of the coefficients. Also, the fixed effects provide about 85% of the explanatory power. The most important observation from Table 4 is that the tension variable that plays a key role in section 6 below (analyzing the size of the jumps) turns out to explain virtually none of the variation, as $\Delta R^2 \approx 0.002$ to the variable.

The coefficients to both growth variables become statistically significant, but the effects are tiny, and both negative; see Gassebner *et al.* (2013), Burke and Leight, (2010). Consider the effect of growth of 0.02% in regressions (1) and (2) of Table 4a. Imagine a boom where the economy grows 3 percentage points faster than it usually does. That reduces the chance of a system change by not more than $3 \cdot 0.02\% \approx 0.06\%$. The effect seems to be the same for both growth variables.

It has often been assumed that governments and regimes that are successful in generating high economic growth become popular and hence more stable so that the coefficients on the growth variables is negative. However, it is also predicted that high economic growth is disruptive for old political structures so that the coefficients is positive. We find that the effect on the growth variables is negative, but very small.

Another way to analyze the income dependency of the triggering events is the count given in Table 5. It shows that the number of triggering events falls with the income level. This is as expected from sections 2 and 3, but it contradicts the expected stability at the low level, but then there are few countries left in the traditional steady state where development has not (yet) started.

Table 5. The number of events, *E*, at different income levels

Income level	*N*	Events	Fraction	Test
$y < 6.5$	613	102	16.64%	0.00%
$6.5 < y < 7.5$	1921	252	13.12%	0.00%
$7.5 < y < 8.5$	1788	208	11.63%	2.76%
$8.5 < y < 9.5$	1390	105	7.55%	0.00%
$9.5 < y$	725	8	1.10%	0.00%
Sums	6437	675	10.49%	-

Note: Test is a two-sided binominal test that each row is a random draw from the rest.

6. Jumps are explained by tensions

Section 5 showed that it is difficult to explain *when* events happen. We now turn to *what* happens. The data contains 704 jumps. As the mechanism is different in the OPEC countries, they are excluded from the analysis. This reduces the number of jumps to 620 for the Main group. The jumps are analyzed in Table 6, using the same five variables T, y, g, and $g5$ as in Table 4.

6.1 The 620 jumps in the Main group

Compared with Table 4a a much larger fraction of the variation is explained in Table 6. The tension variable, T, is the dominating variable, as a comparison of regressions (1) and (5) shows. The tension variable is a function of $P(y)$, and the coefficient on y has some covariance with T, but in column (4), where T is omitted, income becomes insignificant.

The two growth variables have no effect. The size of the jumps is thus independent of growth. The effect of the tension, T, is about 0.5. So the jumps are in the right direction, but to get to the transition path normally requires several jumps.

Table 6. Explaining the jumps, *J*, in the Main group

N = 620	(1)		(2)		(3)		(4)		(5)	
Tension, *T*	**0.469**	(13.8)	**0.676**	(15.7)	**0.760**	(15.4)			**0.454**	(13.4)
Income, *y*	**0.743**	(3.2)	**1.881**	(2.5)	**2.280**	(2.5)	0.460	(1.7)		
Growth, *g*	-0.055	(-1.7)	-0.036	(-0.9)	0.027	(0.7)	-0.026	(-0.7)		
Growth, *g*5	-0.016	(-0.3)	-0.043	(-0.7)	0.073	(-0.9)	-0.067	(-1.0)		
Constant	-5.017	(-2.9)	-14.81	(-2.6)	-22.90	(-3.0)	-2.520	(-1.3)	0.518	(2.6)
Country fixed effect	NO		YES		YES		NO		NO	
Time fixed effects	NO		NO		YES		NO		NO	
R^2	0.241		0.413		0.530		0.007		0.224	
Pure effect of FEs			0.109		0.276					

Note: See note to Table 4.

6.2 Comparing the explanations of events and jumps

The main new finding from the analysis in the paper is the difference between explanations of the events, *E*, and the jumps, *J*. This is best done by comparing the OLS-regressions in Tables 4b and 6. The two tables have the same explanatory variables. The regressions are made as similar as possible, but it is still difficult to compare levels of R^2.

Table 7. A comparison of the fit of estimates in Tables 4b and 6

Explaining	Table	R^2	Marginal R^2			
		level	Tension, T	Income, y	Growth, g	Growth, $g5$
Regression		(1)	(3)	(3)	(3)	(3)
Events, E	4b	0.002	0.002 [a)]	0.002	0.005	0.005
Jumps, J	6	0.241	0.252 [b)]	0.007	0.001	0.001

Note: The marginal R^2 is made from estimate (3) in the two tables by deleting one variable at a time. It is interesting to note that when *Tension* is omitted, income turns sign, so that the effect of *Tension* is even larger in (3) than the total effect of all variables in (1). The marginal effects of the tension in (a) and (b) differ by 148 times.

It is statistically less problematic to compare the marginal R^2, as done in Table 7. In the two OLS-regressions, there is a large difference between the contribution of the T-variable in explaining the jumps in row 3 and the events in row 2 of Table 7. In fact, T gives virtually no contribution at all in Table 3, while it is the only variable that counts in Table 7. This confirms the two claims of the article: Events happen randomly, while most jumps are in the direction of the tension.

The reader may think that this comparison is ‘unfair’ as Table 4b is calculated for all 6,437 observations, while Table 6 uses data for the 620 jumps only. However, section A3 in the Appendix reports a re-calculation of Tables 6 and 7 using all 6,437 observations taking $J = 0$ as a ‘jump’ of zero. The results still hold, though the difference between the results for the Tension variable in the two tables falls from a factor of 148 to a factor of 27.

Table 8. The size of the numerical tension $|T|$ and the direction of the jumps

	(1) Tension, T	(2) all	(3) wrong	(4) right	(5) fraction	(6) p-value
(1)	$0 \leq \; |T| \; < 1$	57	28	29	50.9	50.00%
(2)	$1 \leq \; |T| \; < 2$	52	25	27	51.9	44.49%
(3)	$2 \leq \; |T| \; < 3$	42	16	26	61.9	8.21%
(4)	$3 \leq \; |T| \; < 4$	80	41	39	48.8	63.12%
(5)	$4 \leq \; |T| \; < 5$	95	28	67	70.5	0.00%
(6)	$5 \leq \; |T| \; < 6$	61	17	44	72.1	0.04%
(7)	$6 \leq \; |T| \; < 7$	57	16	41	71.9	0.06%
(8)	$7 \leq \; |T| \; < 8$	55	15	40	72.7	0.05%
(9)	$8 \leq \; |T| \; < 9$	48	9	39	81.3	0.00%
(10)	$9 \leq \; |T| \; \leq 20$	73	17	56	76.7	0.00%
(1) – (10)	All	620	212	408	65.8	0.00%

Note: The theory predicts that the jumps are to the same side as T, so that the signs on J and T are the same. Column (5) is (4) in % of (2). Column (6) in the one-sided binominal test for H0: The number of right jumps is random.

6.3 An analysis of the direction of the jumps

Once it is known that T is the only variable that counts as an explanation of the jumps, it is easy to get closer to the theory, as done in Table 8. It counts the number of jumps that are *wrong* and *right*, where the right jumps are in the direction predicted by the tension. Consider row (1). A total of 57 jumps occur for tensions in the interval $0 < |T| < +1$. Of these, 29 are in the *right* direction, as predicted by the tension, while 28 are *wrong.* The standard binominal test reported is the probability that 29 or more of 57 random draws are right – the probability is 50%. It is reported in column (6).

As we go down in column (6) the probability that the draw is random falls except in row (4),[14] and for all $|T| \geq 4$, the jumps are significantly non-random in the direction suggested by the theory. And, of course, for all 620 observations in the last row of the table, randomness is rejected. Here 65.8% of the jumps are right. The probability that this can happen by chance is below 0.005%.

[14] Row (4) is probably just a freak outcome happening by chance. However, it is strange – maybe it reveals a bias in the way the data are compiled?

7. Conclusions: Three results

Economic development knows two main steady states: a traditional and a modern. The transition path from the traditional to the modern steady state is the Grand Transition. It also affects the regime (political system), giving the Democratic Transition.

Our first result is that the democratic transition is well defined by the data. Figure 4 is a perfect transition curve. The distance from the transition path to the actual regime is defined as the tension of the system. After a few years, any regime tends to become a status-quo equilibrium that sticks for a period. Time series for measures of regimes, such as the Polity index, therefore have a stepwise constant structure. Most years regimes are stable, but then something happens:

(i) An *event* occurs that changes the regime. Our second result is that events happen (almost) randomly in the sense that standard economic variables explain very little of the variation. They are also unaffected by the tension.

(ii) Some events result in a period of anarchy and a return to the old regime, but most are triggering events that cause a regime *jump*. Our third result is that most jumps are in the direction of the tension.

We believe that the distinction between the random triggering event and the directional jumps is new to the literature. We also believe that the importance of the tension for the jump is a new result that integrates the short and the long run of the Democratic Transition.

Another way to express the basic finding is to note that the transition path acts as an *attractor* for the jumps caused by random events. This suggests that if income would stall at some intermediate income level, the regime would converge to the position on the transition curve for that income. However, there are probably no steady states at an intermediate income level.

Consequently, the main result is that the attractor property of the political transition path explains the democratic transition.

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Appendix: Data and technique

The Appendix has 3 sections. A1 lists the countries, A2 compares the estimators, and A3 gives some extra regressions.

A.1 The countries and years covered

Table A1 covers the Main group and Table A2 the OPEC group.

Table A1. The Main group

1	Afghanistan	30	Congo Kin	59	India	88	Morocco	117	Spain
2	Albania	31	Costa Rica	60	Ireland	89	Mozambique	118	Sri Lanka
3	Argentina	32	Côte d'Ivoire	61	Israel	90	Myanmar	119	Sudan
4	Armenia	33	Croatia	62	Italy	91	Namibia	120	Swaziland
5	Australia	34	Cuba	63	Jamaica	92	Nepal	121	Sweden
6	Austria	35	Czech R	64	Japan	93	Netherlands	122	Switzerland
7	Azerbaijan	36	Czechoslovakia	65	Jordan	94	New Zealand	123	Syria
8	Bahrain	37	Denmark	66	Kazakhstan	95	Nicaragua	124	Taiwan
9	Bangladesh	38	Djibouti	67	Kenya	96	Niger	125	Tajikistan
10	Belarus	39	Dominican R	68	Korea N	97	Norway	126	Tanzania
11	Belgium	40	Egypt	69	Korea S	98	Oman	127	Thailand
12	Benin	41	El Salvador	70	Kyrgyzstan	99	Pakistan	128	Togo
13	Bolivia	42	Equat. Guinea	71	Laos	100	Panama	129	Trinidad &
14	Botswana	43	Eritrea	72	Latvia	101	Paraguay	130	Tunisia
15	Brazil	44	Estonia	73	Lebanon	102	Peru	131	Turkey
16	Bulgaria	45	Ethiopia	74	Lesotho	103	Philippines	132	Turkmenistan
17	Burkina Faso	46	Finland	75	Liberia	104	Poland	133	Uganda
18	Burundi	47	France	76	Lithuania	105	Portugal	134	UK
19	Cambodia	48	Gambia	77	Macedonia	106	Romania	135	Ukraine
20	Cameroon	49	Georgia	78	Madagascar	107	Russia	136	Uruguay
21	Canada	50	Germany	79	Malawi	108	Rwanda	137	USA
22	Cape Verde	51	Ghana	80	Malaysia	109	Senegal	138	USSR
23	CAR	52	Greece	81	Mali	110	Serbia	139	Uzbekistan
24	Chad	53	Guatemala	82	Mauritania	111	Sierra Leone	140	Vietnam
25	Chile	54	Guinea	83	Mauritius	112	Singapore	141	Yemen
26	China	55	Guinea-Bissau	84	Mexico	113	Slovak R	142	Yugoslavia
27	Colombia	56	Haiti	85	Moldova	114	Slovenia	143	Zambia
28	Comoros	57	Honduras	86	Mongolia	115	Somalia	144	Zimbabwe
29	Congo Bra	58	Hungary	87	Montenegro	116	South Africa		

Table A2. The OPEC group. Only included when members

Founding members		Present members		From	Present members		From
1	Iran	6	Qatar	1961	11	Angola	2007
2	Iraq	7	Libya	1962	12	Ecuador	1973-92 and from 2007
3	Kuwait	8	UAE	1967	Past members		Membership period
4	Saudi Arabia	9	Algeria	1969	13	Indonesia	1962-2009
5	Venezuela	10	Nigeria	1971	14	Gabon	1975-1995

Note: The two main conditions for OPEC membership are: (i) that a country has a ‘substantial net export of crude petroleum’, and (ii) that the members accept an application from the country. Source: OPEC home page (ref).

A2 The estimators used in section 4

Tables 2 and 3 use a total of 12 regressions estimators. They are developed with a different use in mind. Table A3 tries to list these uses.

Table A3. Panel estimators compared

	Long-run slope coefficient	Fixed effects		Modelling of common shocks	
		Country	Time	Coefficient	Evolution restricted
		Pooled parameter models used in Table 2			
POLS-T	Pooled	No	Yes	Pooled	Yes
2FE	Pooled	Yes	Yes	Pooled	Yes
AB	Pooled	Implicit	Yes	Pooled	Yes
BB	Pooled	Implicit	Yes	Pooled	Yes
CCEP	Pooled	Yes	No	Heterogeneous	No
		Heterogeneous parameter models used in Table 3			
PMG	Pooled	Individual	No	Not modelled	-
MG	Heterogeneous	Individual	No	Not modelled	-
CD-MG	Heterogeneous	Individual	Implicit	Pooled	Yes
CCEMG	Heterogeneous	Individual	Substituted	Heterogeneous	No
AMG	Heterogeneous	Individual	Substituted	Heterogeneous	No

Notes: “Implicit" indicates that country-fixed effects are eliminated by first differences and time-fixed effects are eliminated by cross-section demeaning. "Individual" indicates that country-fixed effects are handled by individual estimates for each sample country. "Substituted" indicates that time-fixed effects are substituted by cross-section averages of the dependent and independent variables.
Pooled parameter models. POLS: Pooled OLS estimator. 2FE: Two-way Fixed Effects estimator. AB: Difference-GMM (Arellano-Bond) estimator BB: System-GMM (Blundell-Bond) estimator. CCEP: Common Correlated Effects Pooled estimator. PMG: Pooled Mean Group estimator.
Heterogeneous parameter models. MG: Mean Group estimator. CD-MG: Cross-sectionally Demeaned Mean Group estimator. CCEMG: Common Correlated Effects Mean Group estimator. AMG: Augmented common correlated effects Mean Group estimator.

A3 Extra tables for documentation

Table A4. Explaining the jumps in the Main group by all observations, N = 6,437

	(1)		(2)		(3)		(4)		(5)	
Tension, T	**0.043**	(11.9)	**0.087**	(17.2)	**0.102**	(17.8)			**0.043**	(11.9)
Income, y	-0.019	(-0.9)	**0.200**	(3.2)	**0.297**	(3.5)	0.004	(0.2)		
Growth, g	-0.006	(-1.5)	-0.005	(-1.3)	0.003	(0.7)	-0.005	(-1.2)		
Growth, $g5$	-0.000	(-0.1)	-0.003	(-0.4)	0.005	(0.6)	-0.008	(-1.2)		
Constant	0.244	(1.5)	**-2.142**	(-3.5)	**-3.130**	(-4.0)	0.076	(0.5)	**0.079**	(3.6)
Country fixed effect	NO		Yes		YES		NO		NO	
Time fixed effects	NO		NO		YES		NO		NO	
R^2	0.022		0.055		0.077		0.001		0.022	
Pure effect of FEs			0.010		0.029					

Note: See Table 4.

The text in section 6 argues that the regressions to explain the jumps should be done only for the 620 jumps in the main group. Perhaps it is more comparable to Table 4 if it is run for all observations (for the Main group) taking all the 5,817 values where $J = 0$ as a jump of zero. This is done in Table A4, while Table A5 is compared with Table 4 using the same format as Table 7. The same pattern appears though the difference between the explanation of the events and the jumps become smaller, but it is still large, and the *Tension* is still only variable that matter apart from the fixed effects.

Table A5. A comparison of the fit of estimates in Tables 4b and 6

	Table	R^2	Marginal R^2			
		level	Tension, T	Income, y	Growth, g	Growth, $g5$
Regression		(1)	(3)	(3)	(3)	(3)
Events	4b	0.002	0.002 [a)]	0.002	0.005	0.005
Jumps	A4	0.022	0.047 [b)]	0.002	0.000	0.000

Note: See note to Table 7. The marginal effects of the tension in (a) and (b) differ by 27 times.

Table A6. The spells of zero

(1) Spell	(2) Nr	(3) Years	(4) Trun.	(5) Ev1	(6) Ev2	(7) Tr	(1) Spell	(2) Nr	(3) Years	(4) Trun.	(5) Ev1	(6) Ev2	(7) Tr
1	29	29	2	28	28	23	10	2	20	2	2		
2	7	14	2	7	5	5	11	3	33		3	3	3
3	4	12	1	3	4	4	12	1	12		1	1	1
4	4	16		4	4	4	13	1	13		1	1	1
5	2	10	1	1	2	2	…						
6	1	6		1	1	1	18	1	18	1	1		
7	1	7		1	1	1	…						
8	1	8		1	1	1	30	1	30		1	1	1
9	1	9	1	1			Sum	59	237	10	56	42	47

Notes: (1) is the length of the spell, (2) is the number of spells of that length, (3) is the product of (1) and (2), (4) is the number of truncated spells the either starts the first year of the data in 3 instances) or ends at the last year in 7 instances. This gives the difference between (5) the event at the start and (6) the event at the end of the spell. (7) is a count of the triggering event giving a jump. Note that 59 spells, minus 7 unfinished spells and 5 jumps back to the same value as before gives 47 triggering jumps.