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Jumps into democracy

Integrating the short and long run in the Democratic Transition

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Abstract:
When countries get wealthy, they normally become democracies. Kernel regressions reveal a robust long-run path in the *Polity* index as a function of income. The path looks exactly as a transition curve should, and, consequently, it is 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 economic development. 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: When a triggering event happens, most jumps are in the direction of the transition curve. Hence, the transition curve is an attractor for the jumps. This integrates the short and the long run.

Keywords: Democratic Transition, regime change, long-run development, kernel regression
JEL: O1, O43

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1. Introduction

Most poor countries are autocracies and wealthy countries are democracies, with a few well-understood exceptions, and the long-run *Democratic Transition* has been uncontroversial since Lipset (1959). However, two questions are still debated:[3] (1) What is the short-run mechanism that generates the long-run correlation? (2) What is the main causal direction between income and democracy?

Section 2 discusses the data. It is a sample of 6,996 pairs of observations for *income*, y, and the *political regime*, P. The P-data has the property of (a) *stepwise stability*, where spells of stability often last more than a decade. The changes are measured by two variables: (b) *Events*, when the regime changes, and *jumps*, J, which is the size of the change. From the (P, y)-pairs, we estimate (c) the *transition curve* from autocracy to democracy that is highly non-linear in income. (d) There are slightly more events after negative than positive income shocks. Items (a), (c) and (d) show why it is difficult to explain P by y with the panel regression techniques of the profession.

Section 3 reports kernel regressions on sorted and stacked cross-country panel data generate a perfect transition curve that is our estimate of the Democratic Transition, $\Pi = \Pi(y)$. The distance between an observed P-score and the estimated Π-curve is termed the *tension*, T. It measures how different a certain regime is to the average of all other countries at the same level of income. The sign on T indicates if the regime is relatively democratic ($T < 0$) or authoritarian ($T > 0$).

Section 4 confirms that alternative panel estimators work poorly in identifying a robust income effect on democracy that can explain the long run transition. Section 5 finds that *events* happen almost randomly in an economic perspective in the sense that they are not systematically related to short-run positive or negative income shocks.

In contrast, section 6 finds that if an *event* triggers a *jump*, it reduces the *tension* substantially. This means that the Π-curve works as an attractor for the jumps that are caused by random events. Consequently, we reach a mechanism combining short and long-run factors. It has two exogenous variables (bolded) and three causal relations:

[3]. Gundlach and Paldam (2009) confirm the long run effect, while Acemoglu *et al*. (2008) find no statistically significant income effect with 2FE. Murtin and Wacziarg (2014) use primary schooling levels instead of income as an explanatory variable for the Democratic Transition. 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. For negative income shocks that trigger a change toward democracy, see as well Burke and Leigh (2010) and Gassebner *et al*. (2012). Focusing on a sample of non-democracies, Dorsch *et al*. (2015) also report that negative income shocks trigger a change toward democracy.

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

This mechanism provides answers to the two debated questions mentioned in the first paragraph above: (1) The short-run mechanism gives the long-run Democratic Transition found by the kernel regression. (2) It is a causal mechanism from income to democracy.

An appendix with extra tables and kernels robustness experiments is available from the URL: http://martin.paldam.dk/Jumps-Appendix-page.php.

2. Measuring regime changes by the Polity index

Section 2.1 reports the data definitions. Section 2.2 explains why political regimes have stepwise stability (status quo equilibria), and section 2.3 gives examples of typical transition paths for two countries that will be generalized to the transition curve, $\Pi(y)$ in section 3.

Income, y, is the (natural) logarithm of GDP per capita from the Maddison Project database and, g, the real growth rate per capita.[4] 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 steady state to a dynamic modern one. Gundlach and Paldam (2017) see the Gran Transition as a process connecting the growth rate to initial income. The transition curve between the two steady states is found 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 two samples: 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	620	10.5	1.93%
OPEC	14	560	154 (9)	2	53	40	11.9	0.91%
All	157	6,996	1,011 (56)	181	721	660	10.6	1.85%

Notes: P is the polity index, y is income and g is the real growth rate as defined in text. a) The number in parentheses is gaps in the data. 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 Two variables calculated from the P-index: (Triggering) Events and Jumps

The Polity IV Project (Marshall *et al.* 2016) scores political regimes on an integer scale from −10, which is strict absolutism, to +10, which is 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. To

[4]. GDP data per capita is in 1990 international Geary-Khamis \$. 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 income data are missing for 2009 and 2010. For all but two countries, the missing Maddison Project data have been replaced using income growth rates available from the World Bank (WDI; GDP data per capita in fixed international \$).

allow for time series analysis, the Polity Project converts the Polity scores to the variable Polity2, where the three standardized authority scores are recoded as follows:

a. Foreign interventions [−66] are left blank in Polity2. We recode the blanks as zeros, and add a binary dummy, *Blank*, that is 1 if Polity is −66 and else zero.
b. Anarchy [−77] is coded as zeros in Polty2. We keep this coding, but add another binary dummy, *Zero*, that is 1 if Polity is −77 and else zero.
c. Regime transitions [-88] are interpolated polity scores in Polity2. We keep this coding.

The two dummies *Zero* and *Blank* are used to see if the coding of *foreign interventions* and *anarchy* with zeros affects the results – this does not seem to be the case. With our recoding of *foreign interventions*, 237 zero-observations appear – they cluster in 59 spells. Zeros account for 237/6,996 = 3.4% of all observations in our sample. The average zero-spell is 4 years, but as reported in Table A6 (in the Appendix) the distribution is skew, with a grim upper tail pointing to failed states. From Tables 1 and A6 one can check that everything adds up.[5]

The paper deals with the dynamics of political regimes, but in most years, political regimes are unchanged. Of the 6,996 *P*-scores only 721 differ in value from the preceding year's value – these changes are termed the *events, E,* in the data. A regime change is *triggered* by 91% of the events. They are the *triggering events* where the regime jumps. However, 9% of the jumps are to zero, where no new system emerges. When all zeroes are disregarded, we get:

(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.

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

With an average growth rate of 1.85%, income increases by $1.0185^{44.6}$ = 2.26 times in the average country, so that income rises by 0.82 log-points. If these numbers are given a causal interpretation, the *P*-score increases by 4½ *P*-points per log-point of income. 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).

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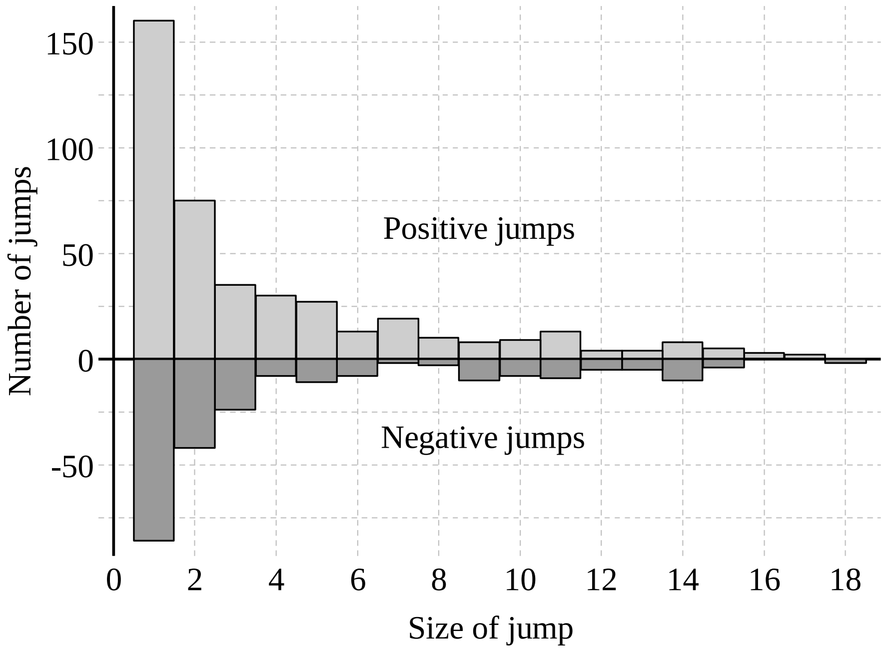
[5]. The 59 spells give rise to 108 events, and 47 triggering events, as 10 are at the start or end of the period, so that they generate one event only, i.e., 59 *x* 2 – 10 = 108. In 5 cases the regime returns to the pre-zero *P*-score, so the zero-spell did not change the regime, this gives 47 regime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

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



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 because they start (end) with the first (last) sample year. Hence, the incomplete regime spells are likely to be longer than reported. Eighteen spells cover the full period – they are 16 western countries and Costa Rica, with a *P*-score of +10 for every year, and Saudi Arabia with −10 for all years.

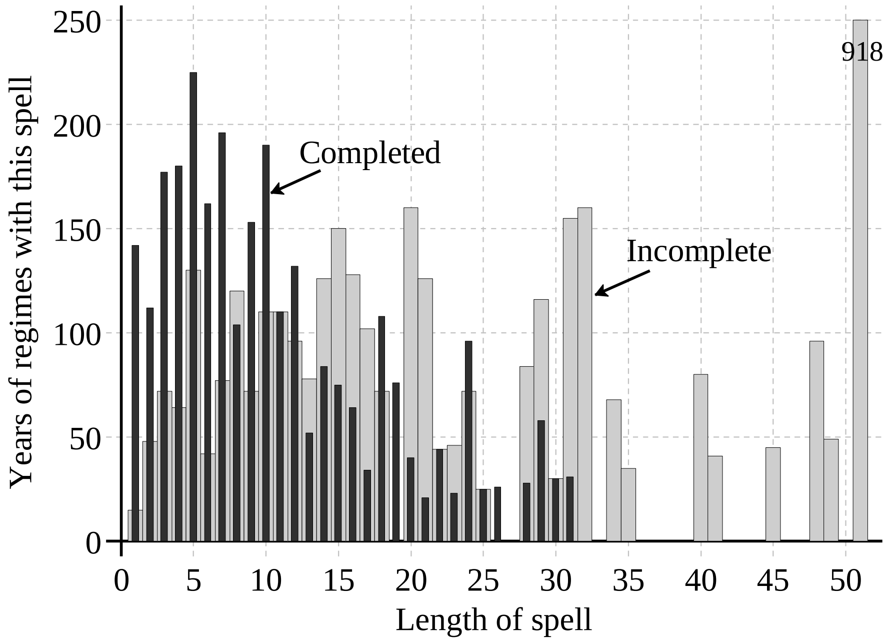
Figure 2 reports the distribution of the spells. The average of all spells is 7.5 years. The average of the completed spells is 5.4 years, while it is 11.3 years for the incomplete spells, which are known to last still longer. If the standard device of multiplying the incomplete spells by two is used, the average regime spell increases to 15.6 years.[6]

Thus, regimes normally have a substantial duration once they get older than a couple of years. Regimes reach *status quo equilibrium* for 3 reasons: (i) All regimes build a protective apparatus and some legitimacy.[7] (ii) Stakeholders who support the regime emerge. They may lose their stake if the regime changes. (iii) The first mover disadvantage: Those who want to change an oppressive regime run a high personal risk – they may even be shot.

[6]. Eighteen spells are incomplete to both sides – they are multiplied by 4. The 2-rule has been checked for the old democracies: on average, they have lasted 108 years. It is only slightly longer than 2 *x* 51 years.

[7]. There is a trade-off between the legitimacy and oppression needed to obtain regime stability (Wintrobe 1998). 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 2. Spells of constant regimes (all)



In status quo equilibrium, an event is needed before the regime changes. The data contains 728 such events, and we have read up the story behind many of these events as reported in the media. In our reading, the reported events cannot be predicted from the perspective of economics – they appear to be random.

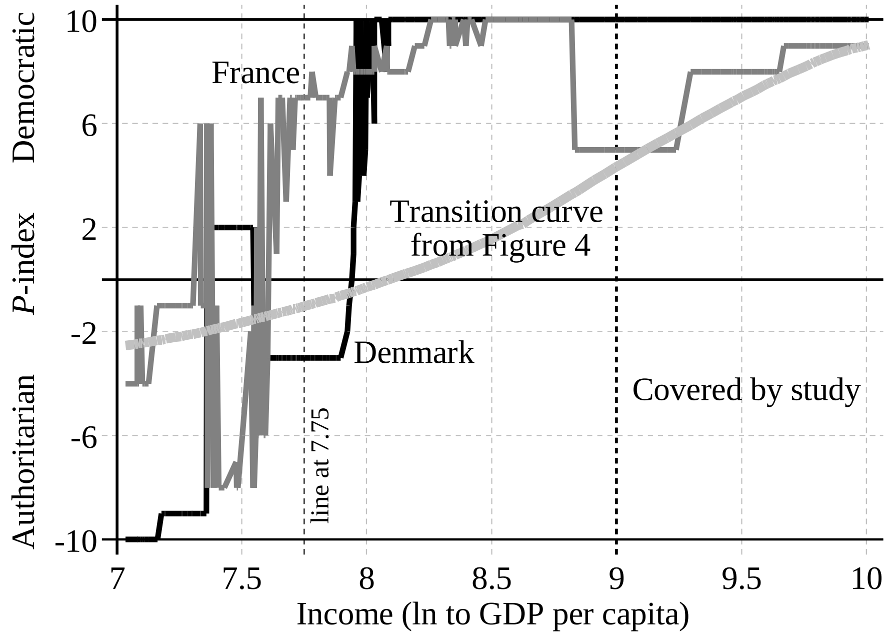
2.3 Two examples: Transition paths from Denmark and France

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

The data for Denmark and France 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 (Denmark 1900-1915 and France 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 have some periods of zig-zag even when the trends in both countries are similar. Both countries developed rather early, and they are 'old' democracies, where the regime has obtained great legitimacy,[8] so that only a small minority in each population wants a change.

[8]. France participated in the war/civil war in Algeria in the 1950s and early 1960s and then had the OAS uprising, but the country stayed democratic. Denmark became a democracy later than France, but then it stayed so.

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



Note: The income axis is logarithmic, so the increase of 3 *y*-points from 7 to 10 increases per capita income 20 times. Data points for the years of the German occupation (1940-45) are not reported. The bold light gray curve represents the Democratic Transition. For each *P*-score the *tension* is the vertical distance to the transition curve.

Our sample covers 1960-2010, so the estimates reported below do not capture the most volatile income interval observed for Denmark and France, from $7 < y < 8.5$, but the sample includes data points for many countries, which are in this income interval. Hence, it is probably not surprising that standard panel regressions do not identify a robust long-run income effect on democracy as long as they are based on a sample that may be dominated by high a volatility of the relation between income and democracy.

Figure 3 contains a preview: The bold light gray curve is the kernel estimate of the transition curve developed in the next section. The *P*-scores for both Denmark and France are mostly above the transition curve for income levels higher than 8 log points, so that they have ‘too much’ democracy, but at lower income levels they have also been below the curve. Consider the vertical line at $y = 7.75$ on the graph. Here the transition curve is $\Pi\ (7.75) = -1.01$. The vertical distances between this point and the observed *P*-scores of France and Denmark – termed the *tension* and discussed in more detail below – indicate that France has ‘too much’ democracy by about -5 *P*-points. Denmark has ‘too little’ democracy by about +1 point. If the political regime stays constant when income increases, a negative tension decreases (in absolute value) while a positive tension increases.

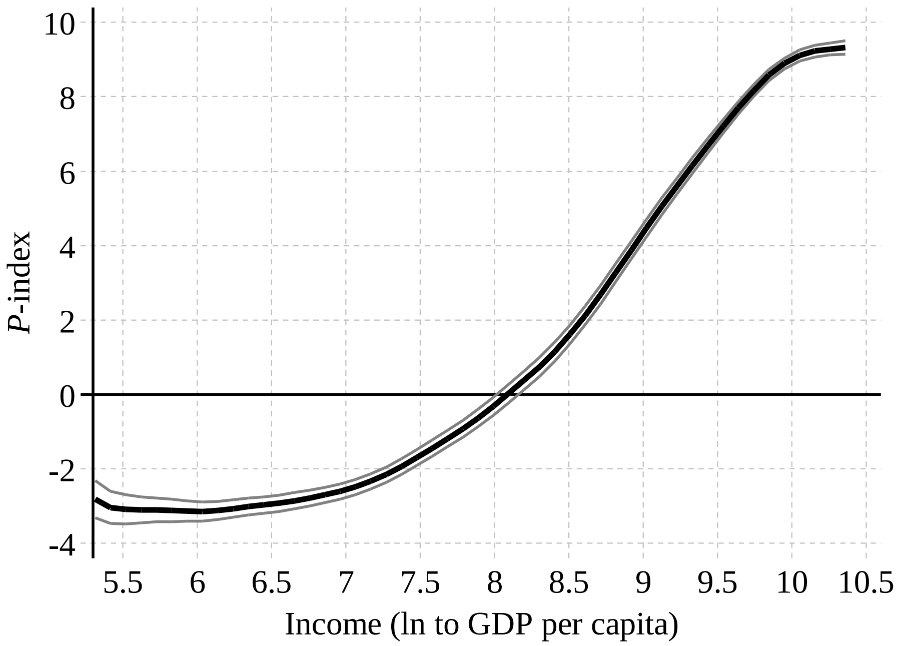
3. The long run: The transition curve estimated by kernel regressions

While the long-run transition as such is not seriously disputed in the literature, there is some disagreement about the causal direction.[9] Section 3.1 reports the estimate of the transition curve. Section 3.2 discusses the robustness of the curve to the selection of country-groups and time-periods. Section 3.3 demonstrates that the OPEC-group represents a special case of a (missing) Democratic Transition. Section 3.4 analyzes the income dependency of the variation around the transition curve.

3.1 The kernel representation of the Democratic Transition for the Main group and the tension

Figure 4 is the *Π*-curve of the Democratic Transition. To estimate the curve, the data is first sorted by income. Only 4% of the income-sorted and stacked observations stand next to an observation for the same country. Hence, this scrambles the regime spells in the individual countries.

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



Note: Epanechikov kernel with 95% confidence interval, N = 6,437 and bw = 0.5. The curve is robust to the deletion of observations where P = 0. The positive slope is robust for bw < 3.0. The flat bottom below y = 6.5 occurs for bw < 1, and the flat top above y = 10 appears for bw < 0.7.

[9]. For instance, Przeworski *et al.* (2000) claim causality from democracy to income. Based on instrumental variables estimation, Gundlach and Paldam (2009) find that the main direction of long-run causality is from income to the political regime.

The Π-curve is a perfect transition curve that converges to stable political regimes at the low end (where $P = -3$) and the high end (where $P = 9$). So on average across all data points, a political regime changes by roughly 3 P-points per log-point of income.

The kernel regression is an estimate of a smoothed moving average process, with a fixed bandwidth, *bw*. The curve is robust to the smoothing formula (the kernel). We use the default option (Epanechnikov's kernel) suggested by Stata. The curve is sensitive to the selection of the *bw*. If it 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 zero at the mean. The kernel is robust and interesting for a range of *bw*'s between 0.4 and 3.

The bold light gray curve on Figure 3 is the relevant part of the curve from Figure 4. The transition curve is an equilibrium path in the sense that that if income would become constant at a certain $\underline{y}$, the regime would converge to $\Pi(\underline{y})$. Consequently, the vertical distance between $P_{i,t}$ and $\Pi(y_{i,t})$ is termed the *tension*. It measures the difference between the transition curve and the observed P-score, at the same level of income:

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

Equations (2) and (3) look a bit alike, but the correlation between $J_{i,t}$ and $T_{i,t}$ is only 0.15 in the *Main* group, when J is set at zero for all years of stability, but the correlation becomes 0.47 if only the jump-years are considered. This difference is discussed in more detail in sections 5 and 6.

When income increases for a constant P-score, tension will increase if $T > 0$ and decrease if $T < 0$, as has been illustrated on Figure 3. Both P-paths are positively correlated to the Transition curve (the coefficient of correlation is 0.78 for Denmark and 0.56 for France). However, if we only consider the years from 1960 to 2010, as in our sample, the correlations fall substantially, notably for Denmark, where $P = 10$ for all years in the sample.

Figure 3 shows a lot of variation around the transition curve while Figure 4 has narrow confidence intervals, but the latter is calculated for 6,437 data pairs from 150 countries across the full income scale. With so many data points, the transition curve becomes robust and the 95% confidence interval rather narrow.

3.2 *Robustness of the transition curve to country groups and time intervals*

The kernel technique merges all data to concentrate on the general pattern, but perhaps it misses relevant information. The narrow confidence intervals suggest that this is not the case. Also, two robustness checks have been made by dividing the *Main* sample into (i) five country groups and (ii) six decades. The resulting transition curves for the subsamples are posted in the Appendix that also includes many experiments with variable bandwidths.

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 same analysis as for Figure 4 has been run for each regional country group and for merged groups of countries that each excludes one of the regional groups. The only subsample with a kernel of the Polity-income relation that looks different from Figure 4 is the one for the *MENA*-group (see Figure 5 below on the *OPEC* kernel). Disregarding the oil countries, the kernels for the subsamples look like parts of the transition curve from Figure 4. The most reassuring result from the robustness checks is that the transition curves for the five subsamples that each excludes one of the regional country groups all look very similar. The only exception is that the transition curve for the subsample without Europe loses so many high-income observations that it becomes a mixture of *East Asian* and *MENA* (oil) countries, hence the confidence interval widens substantially.

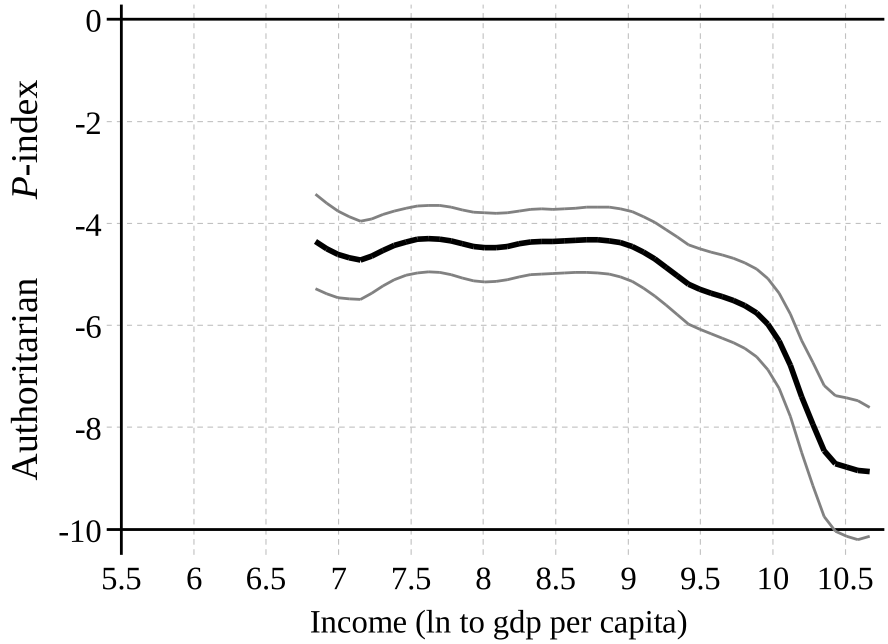
Ad (ii): The kernels for the six decades are also rather robust. The transition curves for the first decades suffer from a low number of high-income observations, so the bend of the curve at the top level does not appear. However, the curve cannot exceed a *P*-score of +10 by definition, so it must bend as it does from 1980 onwards.

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

Figure 5 reports the kernel for the *OPEC* group of countries, where the vertical scale is shifted downwards by 6 Polity points relative to Figure 4. 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 individual countries are clustering somewhat and the spells with a constant regime affect the curve.

The kernel indicates 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 they would start at about the same at low income levels (small values of y), but when income grows, the slope of the *OPEC* curve remains flat and later turns negative, giving the opposite of the result for the *Main* group in Figure 4.

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



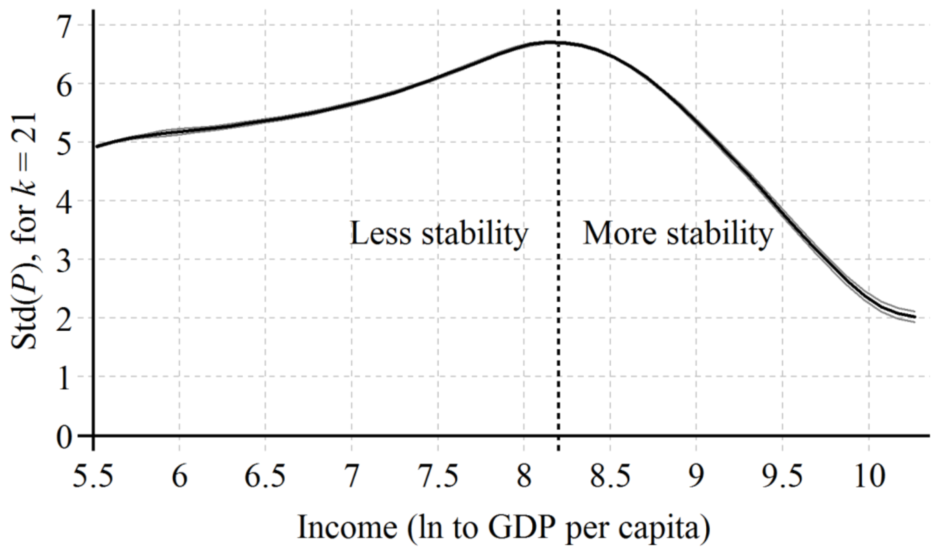
Note: See note to Figure 4. N = 560 and bw = 0.5. The kernel is unstable for $bw < 0.3$; but for $bw > 0.3$ to 1 the kernel has a significant negative slope. Nine of the 13 OPEC countries are Muslim countries. They are much more authoritarian than the other OPEC countries; see Borooah and Paldam (2007) for an analysis.

One reason for this outcome may be that the authoritarian ruler of an oil-country receives the resource rent, so he can afford both an adequate armed protection of his regime and a distribution of rents to purchase a solid coalition in support of his regime. This gives a drift toward a still more authoritarian regime. Thus, while the *P*-score goes to +10 in other countries, it goes to −10 in very resource rich countries. This outcome may be termed the political resource curse. But resource-rich countries such as Norway, which have gone through the Democratic Transition long before the oil resource was exploited, apparently escape the political resource curse and remain democracies.

3.4 The regime variability over the transition for the Main group

The variability of the *P*-score over the transition is analyzed by the income-sorted and stacked (P_j, y_j) data in the sample used for Figure 4, where N = 6,437. Treating these data as if they represented an ordered sequence of observations, a running standard deviation of the *P*-score, $Sdt_k(P)$, is calculated for a moving sequence of k = 21 *P*-scores. Each $Std_{21}(P)$ is placed next to the mid observation of income in the relevant interval to give the ($Std_{21}(P)_j$, y_j)-set, which is still sorted by y.

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



Note: See note to Figure 4. N = 6,417 and bw = 0.5. 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.

The ($\text{Std}_{21}(P)_j$, y_j)-set is analyzed by kernel regressions as before giving Figure 6. The underlying procedure is a double 'averaging', first over the k-sequence, and then by the kernel regression. This causes very narrow confidence intervals around the kernel curve.

The robustness of the kernel is analyzed by varying the bandwidth and k – the number of P-scores for which the Sdt_k is calculated, i.e., the 'length' of the moving sequence of P-scores. It turns out that the result is stable to a wide range for both parameters.

The main result is that the P-scores have a rather high and growing standard deviation in the income range below y = 8.2, which points to a high degree of political regime volatility in this income interval (see also Figure 3 for Denmark and France). However, when income increases beyond 8.2 log points, the declining kernel-curve indicates a substantial decrease in political regime volatility, from a standard deviation of the P-score of almost seven to about two. When countries reach the modern steady state, they become stable democracies.

4. Panel regression estimates of the Democratic Transition

Section 4.1 introduces the empirical model. Section 4.2 looks at pooled parameter models reported in Part A of Table 2. Section 4.3 considers heterogeneous parameter models, reported in Part B of Table 2, which identify a common dynamic process. Section 4.4 visualizes the common dynamic process that underlies the Polity-income data.

4.1 Standard panel regressions fail to identify the 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 Polity score and y_{it} as log per capita income as before, can be written as

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

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.

Table 2. Regressions using a range of estimators

	Part A. Pooled parameter models				
	POLS-T	**2FE**	**AB**	**BB**	**CCEP**
Income per person	**3.21**	**-2.90**	-10.52	**1.88**	-0.30
[z-statistic]	[7.8]	[3.0]	[1.5]	[2.3]	[-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	

	Part B: 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**
[z-statistic]					[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 21 consecutive time series observations 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.
The estimators are: POLS-T: Pooled OLS with time-fixed effcts. 2FE: Two-way Fixed Effects. AB: Difference-GMM (Arellano-Bond) with restricted instrument count BB: System-GMM (Blundell-Bond) with restricted instrument count. CCEP: Common Correlated Effects Pooled including year fixed effects and 3 lags of the cross-section averaged variables. PMG: Pooled Mean Group using 4 lags of cross-section averaged variables. MG: Mean Group. CD-MG: Cross-sectionally Demeaned Mean Group. CCEMG: Common Correlated Effects Mean Group. AMG-D: Augmented Mean Group. AMG-S is based on a static model.

4.2 Part A: Pooled parameter models

The estimates reported in the first and the second columns of Part A 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 the two reported estimates – which is of little help in the present case because the range includes zero.

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 (see note 3). The residual diagnostics for all estimators in part A suggests that the null hypothesis of non-stationary residuals[10] 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[11] is also 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 Part B: Heterogeneous parameter models

Part B of Table 2 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 Table A3 for an overview). Four variants are considered.

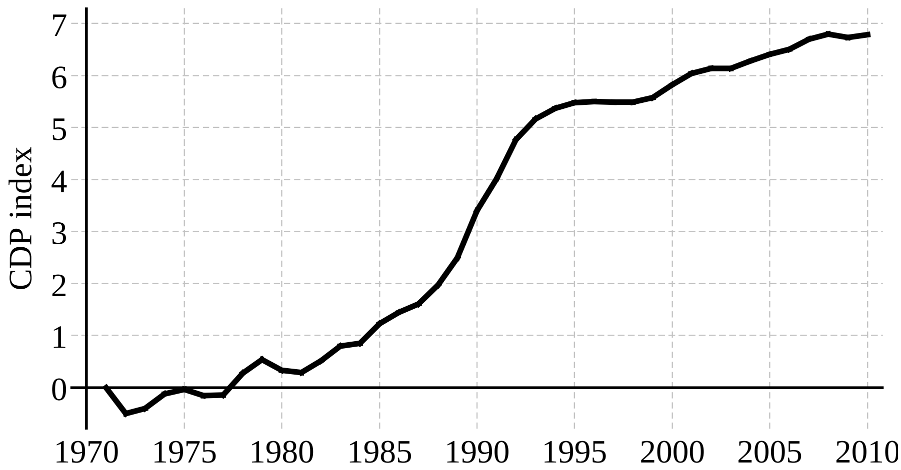
The Pooled Mean Group (PMG) estimator (Pesaran *et al*. 1999) allows for short-run country-specific effects but imposes the restriction that the long-run effects are the same for all countries. The mean group (MG) estimator (Pesaran and Smith 1995) does not explicitly control for cross-sectional correlation, but when it is estimated on cross-sectionally demeaned data (CD-MG), the restriction is imposed 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 a step further by explicitly identifying a common dynamic process that is caused by otherwise unobservable variables.[12]

As reported in part B of Table 2, we do not find statistically significant income effects on

[10]. The Correlated-Im-Pesaran-Shin (CIPS) unit root test is implemented with the Stata module `pescadf` (Lewandowski 2007).
[11]. The CD test for weak cross-sectional dependence Pesaran (2015) is implemented with the Stata module `xtcd2` (Ditzen 2016a).
[12]. PMG, MG, and CCEMG are implemented with the Stata module xtdcce2 (Ditzen 2016b); AMG is implemented with the Stata module `xtmg` (Eberhardt 2012).

the degree of democracy with the exception of the CD-MG estimator, where the reported negative income effect 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 robust direct effect of income on the degree of democracy. The remaining interesting result of Table 2 is that the two AMG estimators confirm the presence of a common dynamic process as a statistically significant driver of the transition from an authoritarian to a democratic regime.

Figure 7. The evolution of the common dynamic process (CDP) of the Democratic Transition



Note: Coefficients on year dummies of an estimate in first differences of the static model.

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 that has been claimed since Lipset (1959) – and it looks like the kernel regression from Figure 4. The slope of the common dynamic process is positive, apart from minor fluctuations, but not linear. The non-linearity underlines that the *P*-score 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 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.

The panel estimators employed in Table 2 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. *P*-scores (and their changes) measure the nature and stability of political regimes. Perhaps the on-off dynamics of regimes differ fundamentally from the more persistent dynamics of economic systems. As pointed out in Section 2, the pooled *P*-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 caused by random events 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 result from political conflict, such as an internal fight within the regime, a corruption scandal, the succession after the death of the ruler for natural or other reasons, etc. Consequently, events do not follow a common pattern and are rather hard to predict. We try to explain the events using the following five variables: initial income, y; the tension, T, from equation (2) above; an annual growth rate, g, and a growth rate averaged over the preceding five years.

Table 3a. 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]	**0.020** [4.2]	**0.012** [2.4]		**0.012** [3.5]
Initial income, $y_{(-)}$	**-0.213** [-9.9]	**-0.417** [-8.1]	**-0.545** [-9.1]	**-0.209** [-9.7]	
Growth, g	**-0.018** [-4.6]	**-0.022** [-5.5]	**-0.021** [-5.2]	**-0.017** [-4.4]	
Growth last 5 years, $g5$	**-0.018** [-2.7]	**-0.014** [-1.9]	-0.011 [-1.3]	**-0.019** [-3.0]	
Constant	**0.447** [2.7]	1.628 [-3.9]	-2.067 [-1.0]	**0.418** [2.5]	**-1.259** [-59.6]
Country dummies	NO	YES	YES	NO	NO
Year dummies	NO	NO	YES	NO	NO
Pseudo R^2	0.044	0.112	0.135	0.041	0.003
Effect of dummies		0.079	0.101		

Table 3b. 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 dummies	NO	YES	YES	NO	NO
Year dummies	NO	NO	YES	NO	NO
R^2	0.029	0.073	0.083	0.026	0.002
Effect of dummies		0.062	0.074		

Note: See Table 2. Brackets contain z-values. Parentheses contain t-ratios. 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 5. 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, sets of country- and year dummies are included, where the 14 Western countries with constant *P*-scores and the year 1960 are used as omitted categories, respectively. Table 3 reports both probit and OLS regressions.

With N = 6,437, 'everything' is normally statistically significant. This is also the case in Table 3, even when only a small fraction of the variation is explained. Events are largely independent of the included explanatory variables, given the small estimated coefficients. Also, the country- and year dummies provide about 85% of the explanatory power – such as it is. The most important observation from Table 3 is that the tension variable, which plays a key role in section 6 below, turns out to explain virtually none of the variation: column (5) shows that the inclusion of *tension* contributes 0.2% to a statistical explanation of the variation of the events. Hence the probability of an event does not depend on the distance of the *P*-score from its equilibrium value on the transition curve.

The coefficients to both growth variables are estimated to be negative and statistically significant, but they are tiny. Consider the estimated effect of growth *g* of 0.02% in regressions (1) and (2) of Table 3a. Imagine a boom where the economy grows by 3 percentage points faster than it usually does. Taking the estimated coefficient at face value, such a boom would reduce the chance of a political regime change by no more than 3 *x* 0.02% ≈ 0.06%. For the averaged 5-year growth rate *g*5, the estimated effect appears to be of the same negligible order of magnitude.

Table 4. The number of events, *E*, at different income levels

Income level	*N*	Events	In %	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%
Sum	6437	675	10.49%	-

Note: *Test* is a two-sided binominal test of H0: Each row is a random draw from the full sample.

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 are negative. However, it has also been predicted that high economic growth is disruptive for old political structures so that the coefficients on the growth variables are positive. We find that a positive change in the growth rate has a negative effect on the probability of an event, but also that the size of the probability is close to zero.

Differentiating the number of events by the level of income is another way to analyze the potential (missing) income dependency of the triggering events (Table 4). The count data show that the number of triggering events falls with the income level. This is as expected from sections 2 and 3: except for OPEC countries, only a small minority of the population wants a change of the political regime at high income levels. At low income levels, the expected stability (absence of events) of the political regime is not confirmed, but then there are few countries left in the traditional steady state where development has not (yet) started.

The result in Table 4 partly reflects that many LDCs have political regimes built around a single person – when the person changes there is often also a regime change triggered by an event. This is not the case in developed countries, where widely respected institutions secure that rulers can change without a change of the regime, and hence without an event.

6. Jumps are explained by the tension

Section 5 found that it is difficult to explain *when* events happen. We now turn to explaining *what* happens after a triggering event: a jump. The data contains 704 jumps. Since the OPEC countries (see section 3.3) represent a special case, they are excluded from the further analysis. This reduces the number of jumps to 620 for the *Main* group. The jumps are analyzed in Table 5, using the same five variables *T*, *y*, *g*, and *g*5 as in Table 3.

6.1 The 620 jumps in the Main group

The five explanatory variables explain a much larger fraction of the variation in the jumps (Table 5) than in the variation of the events (Table 3b). Now the tension variable, *T*, is the dominating variable, in the regressions (1) to (3) and (5). When it is excluded in regression (4) the R^2-scre drops below 0.01. The tension variable is a function of *P*(*y*), hence *y* has some covariance with *T*, but in column (4), where *T* is omitted, income becomes statistically insignificant. The two growth variables have no measurable effect, such that the size of the jumps is independent of economic growth. The estimated effects of the tension, *T*, are all positive with a size between 0.5 and 0.75. Therefore, the average jump is towards more democracy, but getting to the transition curve normally requires several jumps.

Table 5. 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 dummies	NO	YES	YES	NO	NO
Year dummies	NO	NO	YES	NO	NO
R^2	0.241	0.413	0.530	0.007	0.224
Effect of dummies		0.109	0.276		

Note: See note to Table 3.

6.2 Comparing the explanations of events and jumps

The main new finding is the difference between explanations of the events, *E*, and the jumps, *J*.

This is best done by comparing the OLS-regressions in Tables 3b and 5. 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 6. A comparison of the fit of estimates in Tables 3b and 5

Explaining Regression	Table	N	R^2 (1)	Marginal R^2 Tension, T (3)	Income, y (3)	Growth, g (3)	Growth, $g5$ (3)
Events, E	3b	6'437	0.029	0.002	0.002	0.005	0.005
Jumps, only $J \neq 0$	5	620	0.241	0.252	0.007	0.001	0.001
Jumps, incl. $J = 0$	Appendix	6'437	0.022	0.047	0.002	0.000	0.000

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 statistically significant, so that the effect of *tension* is even larger in (3) than the total effect of all variables in (1).

It is statistically less problematic to compare the marginal R^2, as done in Table 6. The key difference is the contribution of the T-variable in the two tables: T gives virtually no contribution in Table 3.It is the only variable that counts in Table 5. This confirms the main claims of the paper: Events happen randomly, while most jumps are in the direction of the transition curve and thereby reduce the tension.

The reader may think that this comparison is 'unfair' as Table 3 is calculated for all 6,437 observations, while Table 5 uses data for the 620 jumps only. Section A3 in the Appendix reports a re-calculation of Table 5 using all 6,437 observations including $J = 0$ as a 'jump' of size zero. The above 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.

6.3 An analysis of the direction of the jumps

Once it is known that T is the main variable that counts as an explanation of the jumps, the next step is to differentiate the jumps by their direction, conditional on their sizes. Table 7 counts the number of jumps that are towards and away from the transition curve, so the *right* jumps are in the direction predicted by the tension and the *wrong* jumps are in the opposite direction. Consider row (1). A total of 57 jumps occur for tension in the interval size $0 < |T| < 1$. Of these, 29 are in the *right* direction, as predicted by the tension, while 28 are in the *wrong* direction. The reported p-value of a one-sided binominal test (column (6)) gives the probability that 29 or more of 57 random draws produce a jump in the right direction – for an interval size of the tension between zero and one, the probability is not better than flipping a coin.

Table 7. The size of the numerical tension $|T|$ and the direction of the jumps

	(1)	(2)	(3)	(4)	(5)	(6)
		Number of jumps				Test
	Tension, *T*	All	Wrong	Right	Right %	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: *Right* jumps are in the direction towards the transition curve. *Test* is a one-sided binominal test for H0: The number of right jumps is random.

As the size of the tension increases over the subsequent rows of Table 7, the probability falls that the draw is random, except in row (4).[13] For all $|T| \geq 4$, the jumps are significantly non-random in the *right* direction towards the transition curve. For all 620 jumps in the sample (last row of Table 7), 65.8% are in the right direction. The probability that this can happen by chance is below 0.005%.

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

7. Conclusion: 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 political regime, giving the Democratic Transition. *Our first result* is that the democratic transition is well defined by the data. Figure 4 shows that kernel regressions identify a perfect transition curve. This confirms previous research such as Gundlach and Paldam (2009).

The vertical distance between the transition curve and the observed democracy score of a regime is defined as the tension of the regime. After a few years, most regimes tend to reach a status-quo equilibrium that sticks for some time. Time series measures of regime characteristics, such as the Polity index, reveal the stepwise stability of political regimes. A regime change may only occur after an *event*. *Our second result* is that events happen (almost) randomly in the sense that standard economic variables explain very little of their variation across countries and over time. They are also unaffected by the tension.

Some events result in a period of anarchy followed by a return to the old regime, but most events are triggering events that cause a regime *jump*. *Our third result* is that most jumps are in the direction of the transition curve. The conceptual distinction between the randomness of triggering events and the directional jumps to different regime types has not been discussed in the literature up to now. The implied relevance of the tension for the jump is a new empirical result that integrates the short and the long run of the Democratic Transition.

Consequently, we have demonstrated that the long-run transition curve acts as an *attractor* for the jumps caused by random events. This suggests that if income would stall at some intermediate income level, the political regime would converge to the position on the transition curve for that income level. However, there are probably no steady states at an intermediate income level. Hence conditional on persistent economic growth, all countries are predicted to reach a democratic equilibrium in the long run, with the possible exception of the oil countries.

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Appendix: Available on the URL: http://martin.paldam.dk/Jumps-Appendix-page.php

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