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Jumps into democracy: The transition in the Polity Index

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Jumps into democracy: The transition in the Polity Index

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Abstract:

The Democratic Transition is the process of regime change from authoritarian at the traditional level of development to democratic at the modern level. This process is analyzed on 7,565 pairs of income and political regime data. Regimes are normally in local status quo equilibrium, so they have stepwise stability. The 158 countries are divided in two groups: A small OPEC group, where the transition is skew, and a Main group, where the data show the well-defined long-run path of the Democratic Transition. The distance to the transition path is termed the *tension* of the regime. The short-run changes are due *to triggering events* that cause *regime jumps*. Triggering events are almost random, while most jumps are in the direction of the tension. This mechanism integrates the short and the long run to give the transition.

Keywords: Transition path, triggering events, regime jumps
Jel.: O11, O43

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1. Introduction

Growth theory knows two basic steady states: The traditional and the modern. The traditional steady state produces with a traditional technology, which gives a low income level and a low growth of both population and production, while the regime (political system) is authoritarian. The modern steady state produces with a modern (international) technology. It gives a high income level; economic growth is moderate, population grows slowly, and the regime is democratic.

The modern steady state originated more than two centuries ago, and a substantial gap has developed between the countries at the two steady states. The change across this gap is the transition where the country adopts modern technology. It is a complex and volatile process in which the whole society changes. The changes extend to all kinds of institutions. This process is largely endogenous, but it contains scattered exogenous elements. They might be technological innovations, discovery of resources, or changes in institutions such as the political regime. Such events have a random component. They sometimes move the process of transition sideways, or even backward for a time, but the number of modern countries steadily increases as shown by Figure 1 below.

The whole process is termed the *Grand Transition*. Section 2 looks at the aggregate in the form of the transition in the growth rate, $g = g(y)$, where y is income. As income increases with growth, this describes the internal dynamics of development, which is the Grand Transition. The transition is skew in very resource rich countries, so we distinguish between the *Main* (with capital M) group with 6,965 observations and the *OPEC* group with 600 observations; see Appendix for the lists of the countries in the groups.

The rest of the paper deals with the *Democratic Transition*. It gives three main results: (R1) to (R3). Section 3 looks at the big picture and shows a perfect *transition path* (R1) in the data for the Main group. This is a long-run relationship that seems to be uncontroversial in the literature since Lipset (1959).[3] In the OPEC group also the Democratic Transition is skewed.

The transition paths in sections 2 and 3 are analyzed by kernel-regressions. This technique makes few assumptions about the structure of the data and economic theory.[4] It shows highly non-

3. Our papers are Paldam (2007), Jensen and Paldam (2007), Borooah and Paldam (2007), Gundlach and Paldam (2009, 2016), and Paldam and Gundlach (2012). These papers contain about 50 references, so they are limited at present.

4. The Epanechnikov kernel is used, but Kernel-curves are robust to the choice of kernel. However, the results are sensitive to the bandwidth. If it is too small, the curve becomes wobbly, and if it too large, the kernel converges to the average. In-between is a range where the kernel tells the same story once large data-stets are considered. To allow the

linear transition curves with narrow confidence internals for the Main group.

The strong long-run pattern must be an aggregate over time of some short-run model. Many researchers have applied the regression tools of our profession to find this model (see section 3.2), but it has proved difficult. We contend that the reason is that these tools are ill suited to handle political regime data. They contain a process that is non-linear and stepwise stable, so that it has infrequent jumps caused by triggering events.

Political systems are costly to change. The first demonstrators against an authoritarian regime are likely to be shot (or at least jailed), and so is the general making a failed coup. Thus, in nine out of ten years (see Table 1) a regime is in *status quo equilibrium*.

When the regime changes it is due to a *triggering event*, and the change is a discrete *jump*. In this paper the event is a binary dummy, which is 1 when an event occurs, and otherwise zero. The jumps are a quantitative change that is conditional on the triggering event. Section 3.3 gives the precise definitions – including the small difference between events and triggering events.

Section 4 looks at the 760 events found. (R2) Events turn out to be largely random. Thus, they are difficult to predict, and, in particular, our standard economic variables explain very little of the variation.

Section 5 analyzes the sizes and the direction of the 658 jumps found in the Main group of countries. Due to the stochastic nature of the triggering events the jumps have a substantial random element too. However, (R3) most jumps are in the direction of the transition path.

Thus, the transition path is an *attractor* for the jumps. The distance between the actual regime and the transition path is termed the *tension*. If it is small, the direction of the jump is random, but as the tension grows the direction of the jump is increasingly in its direction. This suggests that each point on the transition path would become a political equilibrium – to which the system would gradually converge – if the economy stalled at that level.

The attractor property of the transition path is the mechanism that gives the Democratic Transition. This neatly integrates the short and the long run.

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reader to see how the kernels on Figures 1 to 5 react to the bandwidth, a set of PowerPoint shows have been prepared. They can be downloaded from the URL: http://www.martin.paldam.dk/Jump-kernels.php.

2. The Grand Transition: A hump-shaped relation from income to growth

The present section builds on Paldam and Gundlach (2015), where everything is documented in far greater detail than at present. Section 2.1 defines the data, while section 2.2 considers the Grand Transition as a growth-path determined by income in the Main group of countries. Section 2.3 looks at the OPEC countries that became wealthy without a transition.

2.1 Data used: Economic and political

To study transitions it is important to have countries at a broad range of income levels. From 1960 data for a wide range of countries exists. The key explanatory variable is income, $y = \ln gdp$, where *gdp* is GDP per capita in fixed PPP prices.[5] Growth g is growth of *gdp*. As ln is the natural logarithm, the increase of one income unit is an increase of $e \approx 2.72$ times in the *gdp*. The income scale on Figures 1 to 5 has a range of 5 income units, so the *gdp* range covers $e^5 \approx 148$ times.

The political variable, used in sections 3 to 5, is the Polity 2 data (see references), which measure the political regime on a scale where authoritarian regimes score from -10 to -1, and democratic ones score from +1 to +10. Zero indicates that no system is in operation; e.g., there may be two or more regimes fighting or none at all. The 178 zeroes are thus a problem for the analysis. It will be explained how it is handled as we go along. The score is blank if the country is a colony or otherwise not independent. The data cover 158 countries over 55 years from 1960 to 2014. Potentially this should give 8,690 observations, but 1,125 are missing.[6]

Table 1. Counts of the data: 1960-2014

Countries		Observations for (P, y, g)			Events	Triggering	Years per
Group	Number	Available	Missing	Zeroes (P)		and jumps	jump
Main	144 (7) [a)]	6,965	1,090	172	711	658	10.6
OPEC	14	600	35	6	49	46	13.0
All	158	7,565	1,125	178	760	704	10.7

Note a) Seven OPEC countries only join the organization during the period or resign their membership. See Table A2 in the Appendix.

5. The gdp-data are from the Maddison Project (see references), updated from 2010 to 2014 using the World Development Indicators (see references).

6. Most missing observations are due to countries that came into existence after 1960. This, e.g., applies to the new countries that emerged after the collapse of the USSR and Yugoslavia in 1990. The Polity-data has gaps when a country is occupied (as Kuwait, 1990) or has joined another country (as Singapore, 1963-65).

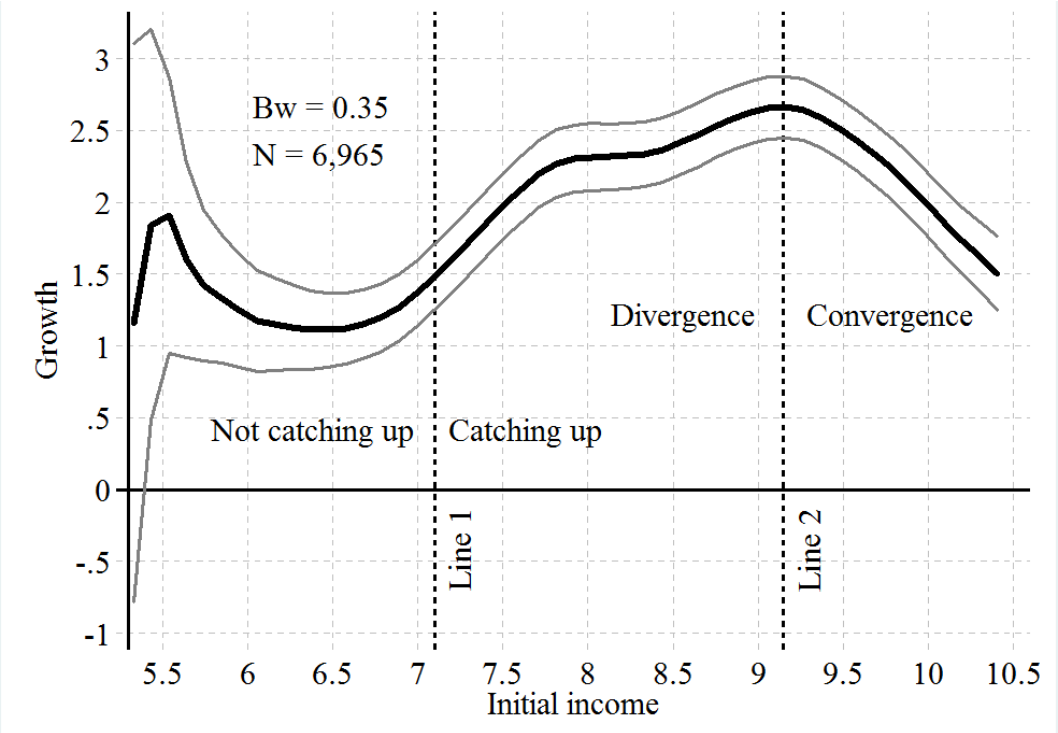
2.2 The hump-shaped Grand Transition in the Main group

Figure 1 shows a kernel-regression on the (g, y)-data. The kernel curve has the typical hump-shape found in large growth-income data sets.[7] The richest countries at the extreme right side grow at about 1.5%. The kernel has two important properties marked by the two lines:

Line 1 divides the countries, to the left and the right of the hump. Countries to the right of Line 1 are growing faster than 1½%, so they catch up with the rich countries, and will continue doing so till they are rich. Countries to the left of the slope are not catching up, but they do grow and will eventually cross Line 1 and start to catch up.

This seems rather positive, but the catch-up times implied by the figure are very long. Consider a poor country at the start of the hump and a rich country at the end of the hump. They differ by app 3 y-points or $e^3 = 20$ times. If the poor country grows by 1% more than the rich, it takes about 300 years to catch up.

Figure 1. Kernel of the growth-income relation for the Main group



Note: 'Bw' is bandwidth and the two gray lines show the 95% confidence interval. Paldam and Gundlach (2015) give estimates for a range of periods and bandwidths. The hump-shaped form is rather robust, but explains a small fraction of the variation; see Table 2.

7. See Lucas (2009) for a two-sector model that explains a non-linear growth-income relation, and Gundlach and Paldam (2015) for a detailed discussion of the empirical evidence for large cross-country panel data sets.

Table 2. Linear regressions showing divergence and convergence

	Divergence for income $y \leq 9.15$				Convergence for income $y > 9.2$			
	Income	Constant	R^2	*N*	Income	Constant	R^2	*N*
Estimate	**0.52**	**-2.82**	0.01	5,668	**-2.54**	**26.82**	0.05	1,297
t-ratio	(6.8)	(-4.1)			(-8.4)	(9.2)		

Note: Parentheses contain t-ratios. Bolded estimates are statistically significant.

Line 2 divides the countries by the sign of the slope on the kernel. The slope is the β measure of absolute convergence from Barro and Sala-i-Martin (2004). The curve shows the well-known property of divergence (where $\beta > 0$) to the left of Line 2, and convergence (where $\beta < 0$) to the right of Line 2, as found already by Baumol (1986). Estimates of two straight lines with the said slopes are given in Table 2.

It is sometimes claimed that a low-level equilibrium trap exists where countries that start to grow fall back to the previous income level. To get such a trap a certain interval should exist where the $g = g(y)$ curve has two properties: (trap 1) it intersects the horizontal axis at $y = y^*$, and (trap 2) it has a negative slope in the interval around the intersection. The full curve is above zero so (trap 1) is rejected. There is an interval fulfilling condition (trap 2) at a low level, but it is not robust to the bandwidth as it occurs where the data is so thin that the confidence interval widens. After $y = 6.5$ a rather strong divergence starts. Most low-income countries have actually entered the Grand Transition; see Paldam (2016) on the growth in Sub-Saharan Africa since the mid-1990s.

2.3 The skewness of the Grand Transition in the OPEC group

The horizontal axes on Figures 1 and 2 are the same, but the kernel on Figure 2 is estimated on much fewer observations, so the confidence interval is much wider, and hence the vertical axis is wider. For most of the range – at least for $y > 8.3$ – the two paths are significantly different. Also, the negative slope on the OPEC-curve is robust to a wide range of bandwidths ($0.1 < bw < 1$).

Figure 2 allows two conclusions: (i) Very resource rich countries have a different and much less successful transition than most other countries. (ii) They quickly become richer, but then they have less growth. This is precisely as expected from the Dutch Disease story; see, e.g., Paldam (2013) for a survey. The story carries over to the Democratic Transition as well.

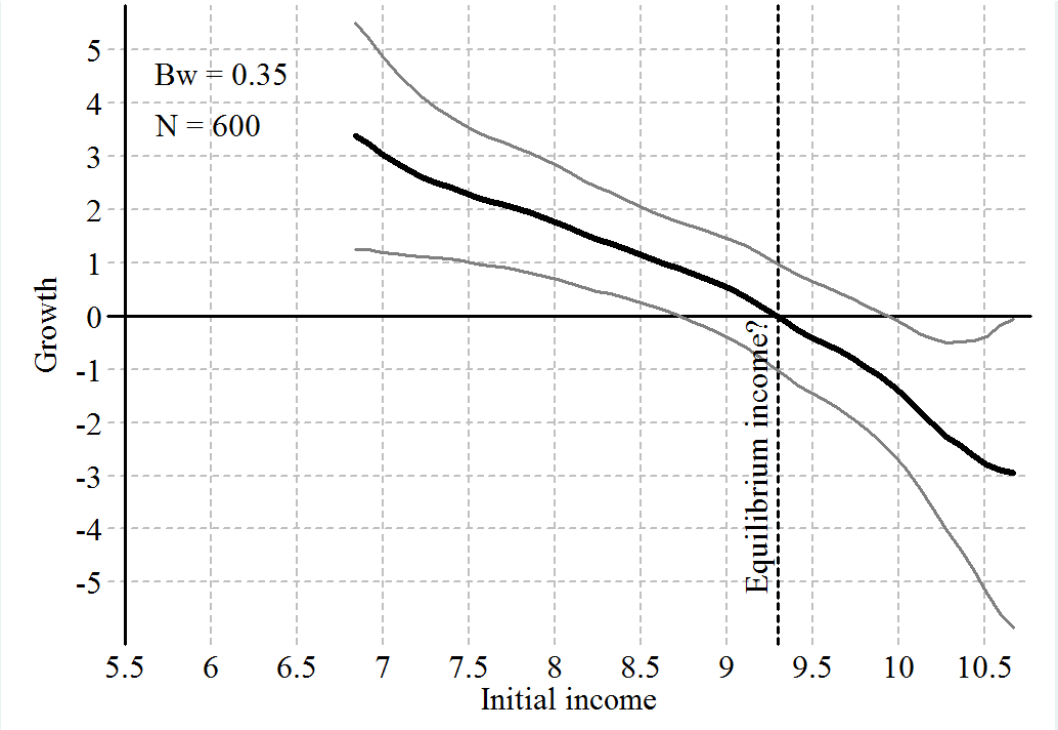
Figure 2 has the intriguing property of a high-level equilibrium trap. It shows a stable equilibrium by conditions (trap 1) and (trap 2) for the level of income at $y^* \approx 9.3$. If $y < y^*$, income grows, and if $y > y^*$, income falls. For a large range of bandwidths $0.1 < bw < 0.7$ such a point

emerges, and it only moves a little. It appears that this observation lacks a theoretical justification, but if it could be made, it may explain, e.g., the amazingly constant income of Venezuela – at approximately that income level – for the last 60 years (even disregarding the present crisis).

The analysis in sections 3 and 4 uses another finding from Paldam and Gundlach (2015): When the variance around the growth-income-kernel is analyzed in more detail, as done in section 3.5 for the *P*-score, a similar curve to Figure 5 appears for the growth rate:[8] The curve has a much higher variation before the peak of the hump (at the intersection with line 2) than later. Thus, some countries can make the transition (much) faster than the average, while others are slower.

The process of the Grand Transition causes great changes, including changes in the income distribution among the major groups of the society, where hitherto well-off groups lose and new groups gain. Also, the Gini may get skewer – at least temporarily. Thus, old political alliances are likely to break down and new ones will form.

Figure 2. Kernel of the growth-income relation for the OPEC group



Note: See note to Figure 1.

8. The curve discussed at present is the ($Std_k(g)$, y)-kernel. Figure 5 is an analysis of the ($Std_k(P)$, y)-kernel as explained in section 3.5. The two kernels are calculated in the same way as explained in section 3.5.

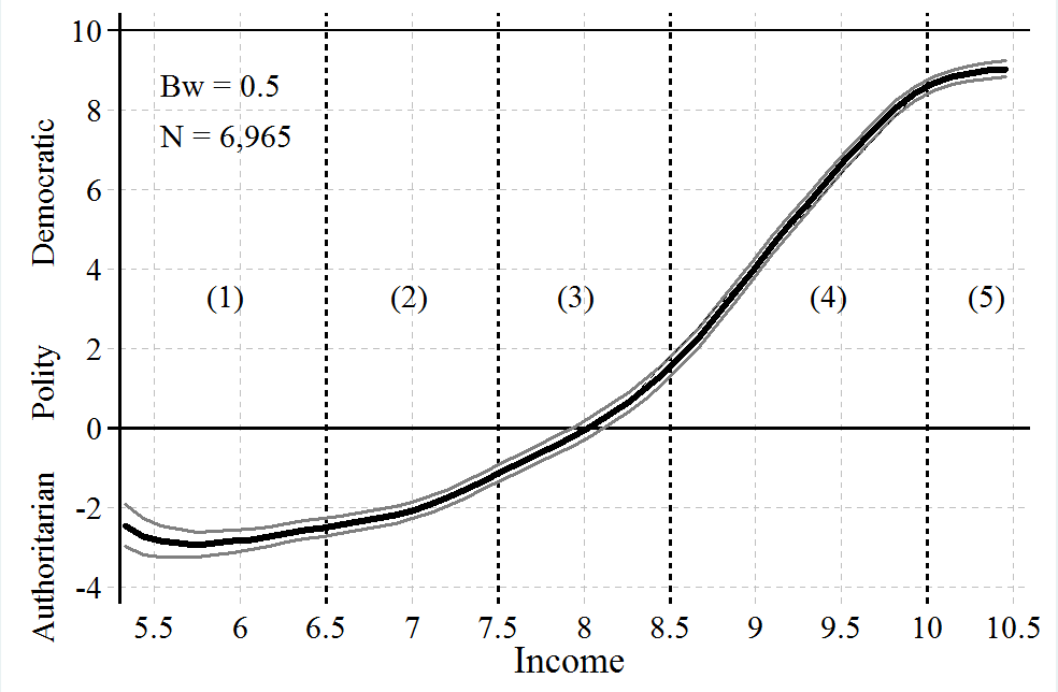
3. Result (R1): The path of the Democratic Transition

Section 3.1 shows that the democratic transition has a well-defined path, and section 3.2 asks why it has proven so difficult to find the long-run results in the short run. Section 3.3 defines the four key variables in our theory: The *events*, *E*, the *triggering events*, E^T, the *jumps*, *J*, and the *tension*, *T*. Then follow the kernel in the OPEC group and an analysis of the stability of the kernel.

3.1 The Democratic Transition in the Main group

Figure 3 shows the kernel curve in the Main group of countries. Thanks to the stepwise stability, the kernel-curve needs a slightly larger bandwidth than in the (*g*, *y*)-case to stabilize. However, for bw $\geq$ 0.3 the (*P*, *y*)-kernel is smooth. The kernel is a perfect transition curve that converges to different stable levels of democracy at low and high income. The 95% confidence interval is narrow due to the large number of observations. The curve has a dominant positive slope.

Figure 3. Kernel of the Polity-income relation for the Main group



Note: See note to Figure 1. The gray lines are the 95% confidence interval. The numbers (1) to (5) refer to the linear approximation in Table 3. 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.

Table 3. A stepwise linear approximation, L, to the transition-curve on Figure 3

	Income y interval	Polity P at Start	End	Slope ($\Delta P/\Delta y$)	Line
(1)	$y <$ 6.5	-2.7	-2.7	0	$L = -2.7$
(2)	6.5 $\leq y <$ 7.5	-2.7	-1.1	1.6	$L = -2.7 + 1.6(y - 6.5)$
(3)	7.5 $\leq y <$ 8.5	-1.1	1.5	2.6	$L = -1.1 + 2.6(y - 7.5)$
(4)	8.5 $\leq y <$ 10	1.5	9	5	$L = +1.5 + 5(y - 8.5)$
(5)	10 $\leq y$	9	9	0	$L = +9$

Note: The L-approximation is (almost) within the confidence interval on Figure 3.

Table 3 is a step-linear approximation, L, to the transition curve. It is chosen to be within the confidence interval. The kernel has also been estimated on the data for the 6 decades separately. The form proved rather robust. Thus, Figure 3 is the basic form of the Democratic Transition. We are not aware of any study that disagrees about the long-run transition, though there is some disagreement about the causal direction.[9]

3.2 From the short to the long run: Aggregation over time

The fact that the long-run transition is so strong in the data must mean that something happens in the short run also. It should be possible to estimate a relation that, when aggregated over time, becomes the long-run pattern. But it has proved elusive when researchers look for it with the standard regression tools of the profession.

This discussion was started by Acemoglu *et al.* (2008), who found no sign of the transition in the short to medium run. Another analysis (Murtin and Wacziarg 2014) stresses the role of education in the transition, rather than income.

Gundlach and Paldam (2016) is a systematic study of the whole range of estimators proposed. The main result is that the Democratic Transition can be explained by a dynamic process that is shared across countries and strongly related to average cross-country income. Such a common dynamic process cannot be identified with conventional panel estimators that ignore cross-section dependence and technology heterogeneity. Since cross-country spillovers of political shocks can be related to jumps and hence to non-linearities in regime changes, it is probably no surprise that the estimated common dynamic process looks like the transition path of Figure 3. However, the analysis shows that the short run results are somewhat unstable.

9. 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 Przeworsky *et al.* (2000). Gundlach and Paldam (2009) give a formal causality test proving that the main direction of long-run causality is from income to the political system.

Our contention is that the weak short-run results are due to the choice of techniques that force the researchers to overlook that the process is non-linear and stepwise stable and to disregard the distinction between the largely random triggering events and the actual jumps of the regime, which is found to depend on the distance from the transition path; see sections 4 and 5.

When Figures 1 and 3 for the Grand Transition and the Democratic Transition are compared, they should be stable at the two ends of the income range where the economies are closest to the two steady states. This is further analyzed in section 3.5. Figure 3 further suggests that an income factor should be found throughout the analysis below, as indeed it is, though it is an indirect effect – working through the tension variable – in section 5 analyzing the jumps.

3.3 Events, the zero-problem, triggering events, jumps and tensions

Our theory is that the transition path (approximated by L) is an attractor for the political system. The difference between the actual political system (measured by P) and the path is the tension of the system. We distinguish between events, and the jumps they cause. Section 4 shows that the events are almost random, while section 5 shows that the jumps are a function of the tension. Whenever P changes value, it is an event. However, it is a problem that P sometimes changes to zero. P is zero 178 times in the data. This is 2.3% of the observations. They cause the 8% difference between the 760 events and the 704 triggering events.

If P changes from $P_{t\text{-}1} \neq 0$ to $P_t = 0$, it is not a jump to a new political system, but to no system, which is an unstable situation. This is considered an event. When the system changes from zero, i.e., from $P_t = 0$ to $P_{t+} \neq 0$, it is another event. If it changes back to the old system, where $P_{t\text{-}1} = P_{t+}$, the two events failed to become triggering events. However, if it changes to a new system, $P_{\text{-}1} \neq P_{t+}$, there has been a jump. The triggering event occurs at t-1, even when it takes more than a year for the system to settle down. Fortunately, most events are triggering events as well. Deleting the 178 zeroes from P_t, yields the $P^{nZ}{}_t$ series, which is 97.7% of the observations.

(1) $J_t = P^{nZ}{}_t - P^{nZ}{}_{t\text{-}1}$, *jump*, when $P^{nZ}{}_t \neq P^{nZ}{}_{t\text{-}1}$

(2) $T_t = L(t) - P_{t\text{-}1}$, *tension*, the distance to the transition path

When jumps and tensions, J_t and T_t, are compared, both use $P_{t\text{-}1}$, for the previous year.

(3) $E_t = 1$, if $P_t \neq P_{t\text{-}1}$ else 0, *event*. Most, but not all, events are also triggering events.

(4) $E^T{}_t = 1$, if $P^{nZ}{}_t \neq P^{nZ}{}_{t\text{-}1}$ else 0, *triggering event*, where a jump occurs.

The jumps are only defined conditional of a triggering event. We would like to have an independent measure of events, but we have not found such a measure.

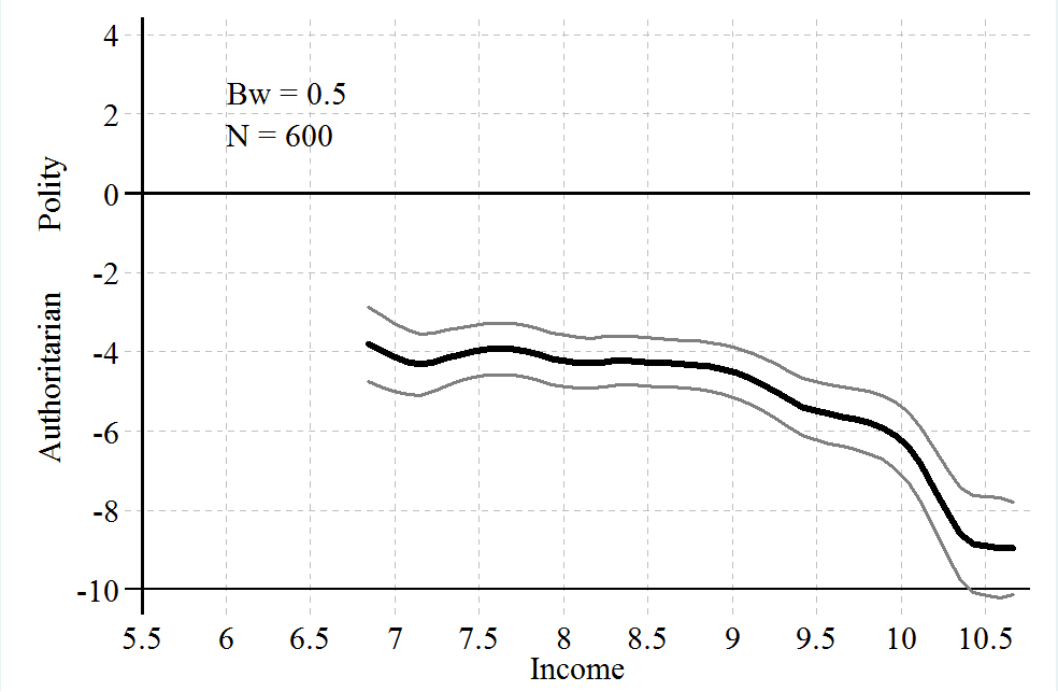
3.4 The skewness of the Democratic Transition in the OPEC group

Figure 4 shows the kernel for the OPEC countries. The scale of Figures 3 and 4 is the same, except for a downward shift of the vertical axis of 6 Polity points of Figure 4. Once again, the confidence interval is broader on the OPEC kernel.

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. When the two kernels are seen together, it looks as 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.

In an oil-country the ruler can afford as well an adequate armed protection as a distribution of rents to purchase a solid coalition behind his regime. This gives a drift toward still more authoritarian regimes.

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

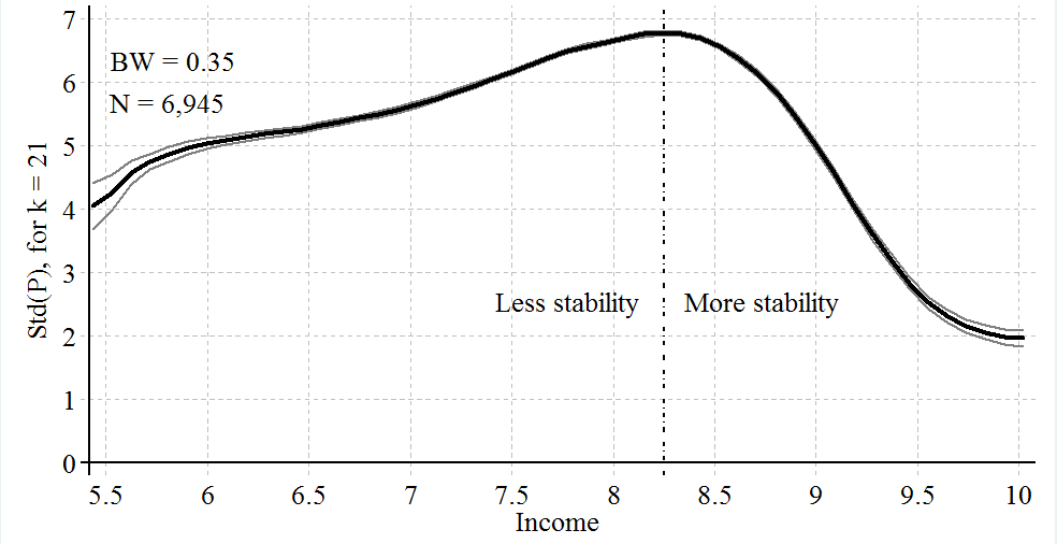


Note: See note to Figure 1. The kernel is unstable for bw < 0.3. However, for bw > 0.3 to 1 the kernel has a significant negative slope.

3.5 The stability of the political system over the transition for the Main group

To analyze the stability of the polity-score over the income range of the transition, the data has been analyzed by a three step procedure: (i) they have been sorted by y, giving the (P_j, y_j)-ordered data for j = 1 to 6,965; (ii) a running standard deviation of the polity-score, $Sdt_k(P)$, has been calculated for a moving sequences of k = 21 Ps in the ordered set. Each $Std_{21}(P)$ is placed next to the mid observation for income in the interval, to give the $(Std_{21}(P)_j, y_j)$-set, which is still sorted by y. (iii) The $(\text{Std}_{21}(\text{P})_j, y_j)$-set is analyzed by kernel regressions as before. Figure 5 shows the result. This procedure is a double 'averaging', first over the k-sequence, and then by the kernel. This causes the very narrow confidence intervals around the kernel.

Figure 5. Kernel of the Std(Polity)-income relation for the Main group



Note: See note to Figure 1. The curve is calculated as described in the first paragraph of section 3.5. The first and the last ten y's get no standard deviation, hence N falls by 20 compared to Figure 3. 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 robustness of the kernel is analyzed by varying the bandwidth and k – the number of Ps 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 Stds in the income range below y = 8.25, but when income increases, the Stds fall by more than three times. Political systems are rather stable when countries reach the modern steady state.

Thus, while the regime goes to +10 in other countries, it goes to −10 in very resource rich countries.[10] However, countries, such as Norway, which have gone through the Grand Transition before the resources have been exploited, remain democracies. Also, when the countries in the Main group become democracies their political system stabilizes.

10. Nine of the 13 OPEC countries are Muslim countries. They are even more authoritarian than the other OPEC countries; see Borooah and Paldam (2007) for more general results.

4. Result (R2): The near randomness of events

The data contains 760 events as defined in Section 3.3. Each event has a *story*, which is often unique. It starts with a 'primary event' (not included in the data). It leads to a short-run dynamic political process, which causes a break in the political system (that is included) as an *event*. In some cases the break is to a 'zero' system that may last several years. After that the system may go back to the old system, so that the event does not become a triggering event.

4.1 Explaining the 711 events in the Main group

Table 4 shows both probit and OLS regressions. For each of the 6,965 annual observations in the Main group, the following 5 variables have been compiled: The dependent variable, *E*, is 1 in the 711 cases when an event occurs, and otherwise zero; income, *y*; the tension variable, *T*, from equation (2) in section 3.3; and two growth variables, *g* and *g*5, which refer to the same year and to an average of the previous 5 years, respectively. Finally, a set of 158 fixed effects dummies is made for the 158 countries.

The probit regressions delete the country dummies for countries with no change. For comparison these countries are used as the constant in the OLS regressions. The results prove rather robust to the inclusion of country-fixed effects.

Table 4. Explaining the events in the Main group, N = 6,965

The 6,965 observations contain 711 events	(1) Probit	(2) Probit	(3) Probit	(4) Probit	(5) OLS	(6) OLS	(7) OLS	(8) OLS
Tension, *T*	0.001	-0.004	0.002	-0.005	0.000	0.000	0.000	-0.001
	[0.4]	[-0.8]	[0.5]	[-1.0]	(0.2)	(-0.6)	(0.5)	(-1.0)
Income, *y*	**-0.210**	**-0.207**			**-0.034**	**-0.025**		
	[-10.2]	[-3.3]			(-10.4)	(-2.8)		
Growth same year, *g*	**-0.017**	**-0.020**			**-0.003**	**-0.004**		
	[-4.4]	[-5.0]			(-4.8)	(-5.2)		
Growth last 5 years, *g*5	**-0.015**	**-0.021**			**-0.003**	**-0.003**		
	[-2.4]	[-2.9]			(-2.6)	(-3.0)		
Constant	**0.422**	-0.810	**-1.270**	**-2.792**	**0.386**	**0.249**	**0.102**	0.000
	[2.7]	[-1.3]	[-62.4]	[-14.8]	(14.8)	(3.0)	(28.1)	(0.0)
Country fixed effect	NO	YES	NO	YES	NO	YES	NO	YES
Pseudo R^2	0.041	0.115	0.000	0.101				
R^2					0.026	0.067	0.000	0.059

Note: See note to Table 2. Brackets contain z-values. The tension variable above the dashed line is for comparison with the results in Table 7. The rest of the estimates do not change if the tension variable is deleted.

With $N = 6{,}965$ 'everything' normally becomes statistically significant, but the estimated effects are often economically insignificant. This is also the case in Table 4, where the fixed effects provide most of the explanatory power. Only income gives an effect that matters for the second digit – the other variables only matter for the third decimal.

The most important observation is that the tension variable that plays a key role in section 5 analyzing the jumps refuses to become significant. And, as the reader can guess, it has no effect on the other estimates if it is deleted, see section 5.2.

The coefficients to both growth variables become statistically significant, but the effects are tiny. Consider the effect of growth of 0.02% in regressions (1) and (2). Imagine a boom where the economy grows 3 percentage points faster than it usually does. That reduces the chance of a system change by about $0.02 \cdot 3\% = 0.06\%$. The effect seems to be the same in the same year and for a 5-year period. It is known from Table 1 that the average period of regime stability is 10.6 years, so the probability of an event is about 9%. Thus, the decrease of 0.06% should be seen relatively to 9%, so it becomes $0.06 \cdot 9\% = 0.5\%$ as the increase caused by the 3% extra growth. It is low anyhow.

4.2 The constant number K of events per year except for the 5 years 1989/93

Figure 6a shows the distribution of the 760 events over the 55 years. A visual inspection suggests that if the number of countries had been constant, the number of events over time would also have been constant at $E \approx 14$, except for the five years 1989/93. The easiest way to confirm this impression is to look at Figure 6b, which shows a kernel regression through the black endpoints on Figure 6a. A horizontal line can be drawn within the confidence interval if the five years are deleted.

The years 1989/93 are the years of the collapse of the USSR. As late as 1987 very few predicted that a collapse was imminent. Even fewer saw that the independence of the 14 new states that broke with Russia was a realistic possibility. Most of the events that caused the collapse took place in the center, i.e., in Moscow. Seen from the other 27 ex-communist countries the events were an exogenous shock.

The shock spread to Albania and Yugoslavia that were socialist, but not under Russian dominance. Even more interestingly, the shock spread to the rest of the world and caused about 50 extra regime changes as countries adjusted to the demise of one of the two superpowers.

Figure 6a. The distribution of the events in 158 countries over the 55 years

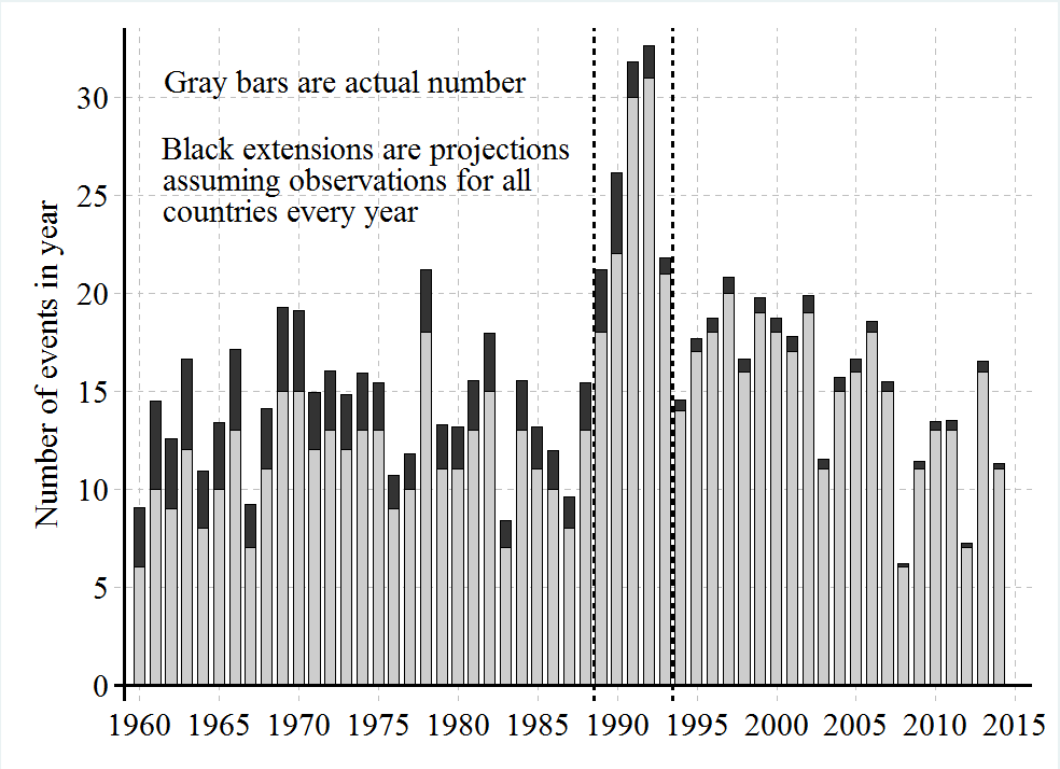
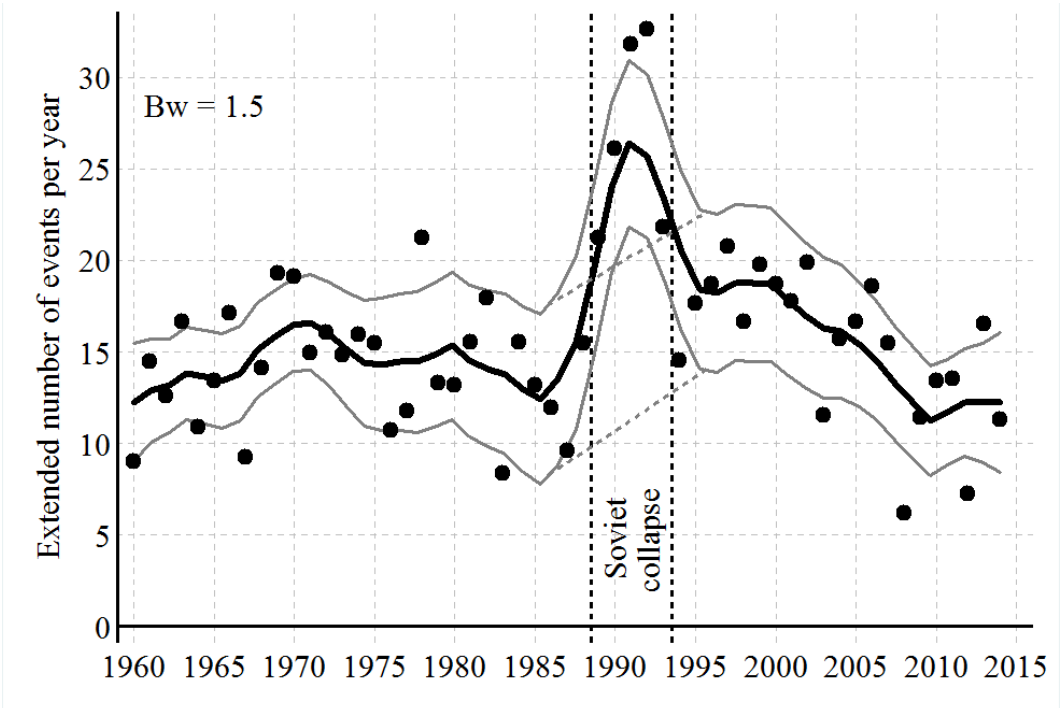


Figure 6b. Kernel of the black observations from Figure 6a



Note: The events do not include the first regime in a new country. The black extension of the columns on Figure 6a presumes that all countries have been independent all years and have had the same frequency of events for all years. If the five years 1989/93 are deleted, the curves join up from 1987 to 1995 as shown by the dashed lines. Now a straight horizontal line can be drawn within the confidence interval.

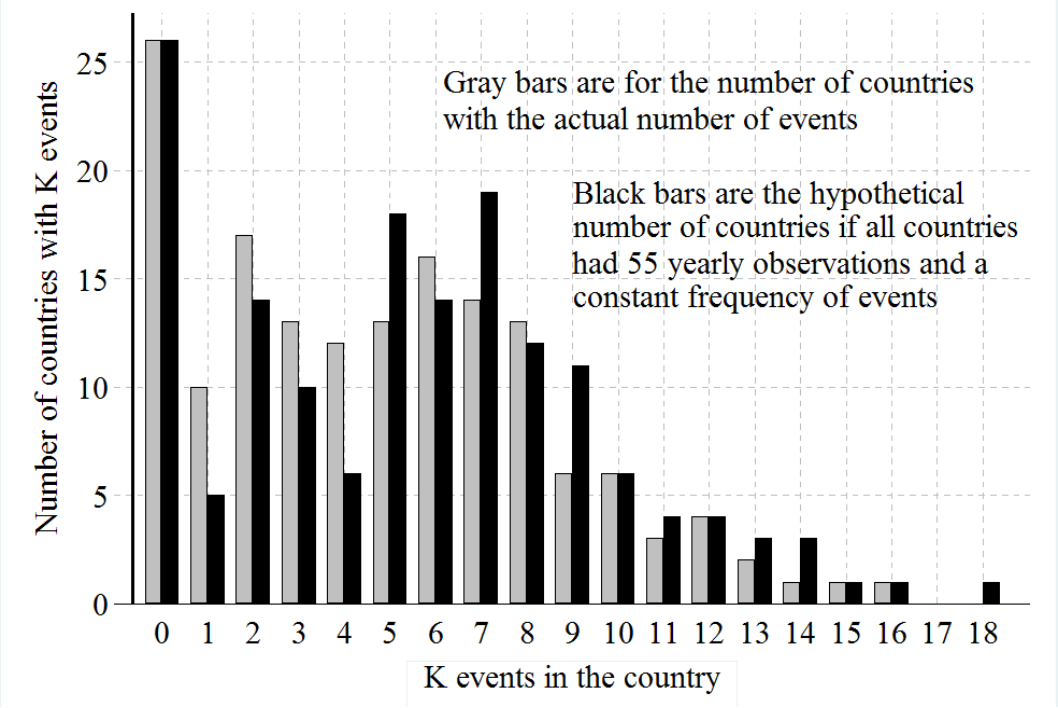
Another story is the cases of very high inflation in Latin America. Paldam (1987) documents that such events normally caused a regime change. If the inflation happened under a civilian government, it caused a military coup and vice versa. This is an economic mechanism, but, on the other hand, it is difficult to explain why such inflations happened.

It is also easy to point to regime changes where the old dictator became weak or died. There are also cases of failed policies and major scandals that gave rise to riots toppling the government, and maybe even changing the political regime.

4.3 The number of events per country

The number of events, K, in a country is a measure of the political stability of the country. The frequency of countries (out of the 158 countries) with $K = 0, 1, \ldots, 18$ events is shown on Figure 7. Only 95 countries have a full data set. The number of events per country has been adjusted for missing observations as explained in the note to the figure.

Figure 7. The frequency of countries with K events



Note: The correction is made in countries with only $n < 55$ observations. Here the number of events j is corrected to $j(55/n)$ rounded to the nearest integer. The estimated events are used in Table 5.

Table 5 shows three regressions (1) to (3), where the (adjusted) number of triggering events per country is explained by the average income, $\bar{y}$, and the average growth rate, $\bar{g}$, for the countries, and two regional dummies.

Table 5. Regressions on the country averages for the variables, N = 158

	(1)	(2)	(3)		(4)	(5)	(6)
Dependent: Adjusted number of events, *AE*				Dependent: Average growth, $\bar{g}$			
Growth, $\bar{g}$	-0.259		**-0.561**	AE	-0.046		**-0.094**
	(-1.4)		(-2.9)		(-1.4)		(-2.9)
Income, $\bar{y}$	**-1.523**	**-1.676**		Income	**0.516**	**0.592**	
	(-4.6)	(-5.4)			(3.6)	(4.5)	
West	**-2.662**	**-2.489**	**-5.272**	West	**-0.783**	-0.669	-0.127
	(-2.7)	(-2.6)	(-6.2)		(-1.9)	(-1.6)	(-0.3)
OPEC	-0.289	0.029	-1.509	OPEC	**-1.228**	**-1.229**	**-0.953**
	(-0.3)	(0.0)	(-1.5)		(-3.0)	(-3.0)	(-2.3)
Constant	**18.629**	**19.332**	**7.355**	Constant	-1.833	**-2.716**	**2.487**
	(7.5)	(7.9)	(15.3)		(-1.5)	(-2.7)	(10.4)
R^2	0.339	0.331	0.247	R^2	0.159	0.137	0.149

Note: See note to Table 2. The top estimates in columns (1) and (4) are both borderline significant. The estimates over the dashed line have a simultaneity problem, and as the averages are over 55 years $\bar{g}$ and $\bar{y}$ have some collinearity. The West- and the OPEC-dummies are defined in the Appendix.

There is an obvious simultaneity problem with the estimate above the dashed line in the table, so the reverse regressions (4) to (6) are also reported. It is a well-known result that investors want political predictability, and hence system stability; see, e.g., Borner *et al*. (1995). This should have an effect on growth. As shown in columns (4) and (6) there is an effect, but it is small. Also, the highest number of changes (16) has occurred in Thailand, which has developed rather fast.

It has often been assumed that governments and regimes that are successful in generating high economic growth become popular and hence more stable. However, it is also often predicted that high economic growth is disruptive for old political structures and creates tensions (i.e., increases the tension variable). Thus, it is not clear what the connection is, and the effect is weak anyhow.

The stability after the transition is analyzed by including a dummy-variable for the West (see Appendix), which is a group that for some time – often (much) more than the period covered – has been in the modern steady state. It appears that these countries have an extra stability amounting to 3-4 Polity points. Also, and OPEC dummy is used, but to no effect.

Table 6. The number of events at different income levels

Income level	*N*	Events	Probability
$y < 6.5$	635	109	17.2%
$6.5 < y < 7.5$	2,117	272	12.8%
$7.5 < y < 8.5$	2,112	229	10.8%
$8.5 < y < 9.5$	1,748	138	7.9%
$9.5 < y$	953	12	1.3%
Sums	7,565	760	10.0%

Another way to analyze the income dependency of the triggering events is the simple count given in Table 6. 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 at the lowest level.

5. Result (R3): Most jumps are toward the transition path

The data contains 704 jumps. As the mechanism is different in the OPEC countries, they are excluded from the following analysis. This reduces the number of jumps to 658 for the Main group, relative to 711 events. The jumps are analyzed in the standard way in Table 7, using the same five variables *T*, *y*, *g*, and *g*5 as in Table 4.

5.1 The 658 jumps in the Main group

The regressions explain a moderate fraction of the variation, and the tension variable, *T*, is the dominating variable, and no other variable becomes significant. Also, *T* is the only variable that survives a testing down process, where the least significant variable is excluded until only significant ones remain. The tension variable is a function of *P*(*y*), and the coefficient on *y* has some covariance with *T*, but even when *T* is omitted in column (3) income is still 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 0.4. So the jumps are in the right direction, but to get to the transition path requires a number of jumps, see the appendix table for some examples.

Table 7. Explaining the jumps in the Main group, $N = 658$

	(1)	(2)	(3)	(4)	(5)
Tension, *T*	**0.385**	**0.377**			
	(11.2)	(11.2)			
Income, *y*	-0.110		0.271		
	(-0.5)		(1.2)		
Growth, *g*	0.011			-0.004	
	(0.3)			(-0.1)	
Growth, *g*5	-0.081				-0.030
	(-1.4)				(-0.5)
Constant	1.677	**0.773**	-1.183	**0.869**	**0.898**
	(1.0)	(3.9)	(-0.7)	(4.0)	(4.0)
R^2	0.165	0.161	0.001	0.000	0.000

Note: See note to Table 2. When the multiple regression (1) is tested down to the significant variables, it results in regression (2). If income is replaced by initial income, the results barely change.

5.2 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 4 and 7. The two tables have the same explanatory variable when the columns in Table 4 including fixed effects are disregarded. Even when the regressions are made as similar as possible, it is difficult to compare levels of R^2. However, the levels are so different that they are worth pointing to as done in Table 8.

It is statistically less problematic to compare the marginal R^2. 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 8. In fact, *T* gives no contribution at all in Table 4, while it is the only variable that counts in Table 7. This confirms the main claims of the article: (R2) events are largely random, while (R3) most jumps are in the direction of the tension.

Table 8. A comparison of the fit of estimates in Tables 4 and 7

Table	Col.	Estimator	R^2	Marginal R^2 or pseudo R^2			
			level	Tension, *T*	Income, *y*	Growth, *g*	Growth, *g*5
4	(1)	Probit	0.0407	0.0000	0.0239	0.0042	0.0012
4	(5)	OLS	0.0261	0.0000	0.0149	0.0031	0.0009
7	(1)	OLS	0.1648	0.1613	0.0003	0.0001	0.0024

Note: See text. For the probit regression the R^2 is the pseudo R^2.

5.3 A distribution-free analysis 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 9. 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 50 jumps occur for tensions in the interval $-1 < T < +1$. Of these, 28 are in the *right* direction, as predicted by the tension, while 22 are *wrong.* The standard binominal test reported is the probability that 28 or more of 50 random draws are right. The probability is 24%. So it might easily happen by chance. From $0 < |T| < 4$ the jumps are random.

However, for all $|T| \geq 4$ the jumps are significantly non-random in the direction suggested by the theory. The test result becomes better as the tension rises.

For all observations in the last row of the table, randomness is rejected. Here 60.6% of the jumps are right. The probability that this can happen by chance is below 0.005%.

Table 9. 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) Test %
(1)	$\|T\|$ <1	50	22	28	56.0	23.99
(2)	1≤ $\|T\|$ <2	57	32	25	43.9	85.54
(3)	2≤ $\|T\|$ <3	86	40	46	53.5	29.50
(4)	3≤ $\|T\|$ <4	69	39	30	43.5	88.58
(1) – (4)	$\|T\|$ <4	262	133	129	49.2	62.13
(5)	4≤ $\|T\|$ <5	89	31	58	65.2	**0.28**
(6)	5≤ $\|T\|$ <6	71	27	44	62.0	**2.84**
(7)	6≤ $\|T\|$ <7	61	22	39	63.9	**1.98**
(8)	7≤ $\|T\|$ <9	94	37	57	60.6	**2.47**
(9)	9≤ $\|T\|$	81	9	72	88.9	**0.00**
(5) – (9)	4< $\|T\|$	396	126	270	68.2	**0.00**
(1) – (9)	All	658	259	399	60.6	**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 the number of right jumps is random.

The transition curve is estimated from a kernel regression that 'uses' some degrees of freedom, but even if the tests are run for $Df = N - 10$, the significant results remain for the large groups in the last two rows of the table. The result that the prediction is only strong for large values of the tension variable has another consequence: It implies that if the approximation used for the transition curve differs, the result will be virtually identical.

6. Conclusions

Economic development has two 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 system, giving the Democratic Transition.

Our first result (R1) is that the democratic transition is well defined by the data. Figure 3 is a perfect transition curve. The distance from the transition path to the actual political system is defined as the tension of the system.

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 two things may happen:

(i) An *event* occurs that changes the regime. Result (R2) is that these events are (largely) random in the sense that standard economic variables explain very little of the variation. They are also unrelated to the tension. Some events result in a period of a zero regime and a return to the old regime, but most are *triggering events*.

(ii) A triggering event causes a regime *jump*. Result (R3) 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 is an *attractor* for the jumps caused by random events. This suggests that if income would stall at some intermediate level, the political system would converge to the position on the transition curve for that income. However, it is difficult to find steady states at an intermediate level.

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

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Appendix: The countries covered, some examples and the length of spells

A.1 The countries covered

The countries are always divided in two groups: The Main group and the OPEC group_

Table A1. The Main group

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

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 at URL: http://www.opec.org/opec_web/en/about_us/24.htm.

A2 Data for some countries.

For illustration, the data for the countries in the Main group with the 25 most negative tensions and the 25 most positive tensions are reported in Table A1. The tears covered are for the year of the jump.

Table A1. The highest tensions and the resulting jumps

	The 25 most negative tensions					The 25 most positive tensions				
	Country	Years	P_{-1}	T	J	Country	Years	P_{-1}	T	J
1	Lesotho	1970	9	-11.70	-18	Oman	1991	-10	12.98	1
2	Madagascar	1997	9	-11.69	-1	Argentina	1973	-9	12.91	15
3	India	1975	9	-11.22	-2	Argentina	1981	-9	12.68	1
4	Mauritius	1982	9	-11.07	1	Syria	2000	-9	12.52	2
5	Mongolia	1996	9	-10.97	1	Oman	2002	-9	12.49	1
6	Malaysia	1969	10	-10.83	-9	Mauritania	2005	-6	12.35	1
7	Myanmar	1962	8	-10.70	-14	Portugal	1974	-9	12.30	6
8	Niger	1996	8	-10.70	-14	Mauritania	2009	-5	12.20	3
9	Bangladesh	1974	8	-10.70	-10	Turkmenistan	2013	-9	12.05	1
10	Madagascar	1998	8	-10.68	-1	Argentina	1983	-8	11.54	16
11	Laos	1960	8	-10.67	-9	Mauritania	2006	-5	11.48	2
12	Gambia	1994	8	-10.25	-15	Jordan	1984	-10	11.42	1
13	Nigeria	1964	8	-10.20	-1	Czechoslovakia	1989	-7	11.39	1
14	Gambia	1981	8	-10.05	-1	Bahrain	1993	-10	11.33	1
15	Pakistan	1977	8	-10.01	-15	Taiwan	1987	-7	11.30	6
16	Kenya	2007	8	-9.88	-1	Bahrain	2012	-8	11.25	-2
17	El Salvador	1984	9	-9.72	-1	Bahrain	1973	-10	11.20	3
18	Madagascar	2011	7	-9.70	-4	Spain	1975	-7	11.15	4
19	Korea S	1961	8	-9.69	-15	Bahrain	2001	-9	10.78	1
20	Kenya	2013	8	-9.65	1	Mauritania	1991	-7	10.68	1
21	Dominican R	1966	8	-9.53	-11	Greece	1974	-7	10.51	8
22	Lesotho	1999	8	-9.47	-6	Uruguay	1978	-8	10.40	1
23	Haiti	1999	7	-9.47	-5	USSR	1988	-7	10.30	1
24	Senegal	2007	8	-9.44	-1	Hungary	1988	-7	10.29	5
25	Uganda	1967	7	-9.36	-13	Czechoslovakia	1990	-6	10.25	14
	Average			-10.29	-6.56	Average			11.51	3.76

Note: The variables are defined in the paper. Relative to the transition path, the negative tensions are countries with too much democracy, while the positive tensions are countries with too little democracy.

46 of the 50 jumps have the same sign as the tension, but as found in the paper the jumps are normally smaller than the tensions. In average the 50 jumps are 0.48 times the tensions, almost as estimated in column (3) of Table 7

A3 The distribution of the spells of a constant regime

The distribution of the spells is reported in Table A2. No less than 175 cases have spells of 1 year only. However, the data also contains 278 incomplete spells that start before 1960 or end after 2014. In particular, the data contains 27 countries with constant *P*-values for all years. This includes 17 western countries, where $P = 10$. In average *P* had been constant for 33 years before 1960 in these countries. Also, these countries will continue as democracies in the foreseeable future. Thus, the completed spell gives an underestimated impression of the true length of the average spell.

Table A2. All spells between the events. The time unit is the year

Shorter spells – most complete			Intermediate spells			Long spells – all incomplete		
Size	Complete	Incomplete	Size	Complete	Incomplete	Size	Complete	Incomplete
1	175	23	21	4	3	41		
2	65	14	22	3	5	42		
3	66	24	23	1	2	43		
4	58	8	24	4	6	44		2
5	47	19	25	1	3	45		1
6	33	2	26	1	1	46		
7	30	13	27		1	47		3
8	14	13	28	1	3	48		
9	19	14	29	2	2	49		
10	21	10	30	1	2	50		2
11	13	7	31	1	6	51		
12	11	11	32	2	7	52		
13	5	7	33			53		
14	8	6	34			54		1
15	5	7	35			55		19
16	4	9	36					
17	1	5	37			Count	609	278
18	7	7	38		1	Avrage	5.33	10.60
19	5	3	39		1	Median	3	10
20	1	5	40					

Note that the time span analyzed is 55 years, but data for all years is only present for 73 countries. Methods are available to estimate the true spell-distribution from a set of truncated data, but as the distribution depends upon the income levels it will be a complex estimation. For space reasons this will not be done at present.

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