15. The pattern of democracy in the twentieth century: a study of the Polity index

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1 INTRODUCTION

The Polity index (II-index) has provided a measure of democracy/dictatorship for about 52 independent countries since 1900. For a few countries it goes back even further, and over time about 100 countries have become independent and been added. The index is scaled from +10 for ‘perfect’ democracy to −10 for ‘perfect’ dictatorship.

Figure 15.1 shows the average II-score for all countries from 1900 to 2003 and for the 52 countries that are covered for most years. For most of the twentieth century, the II-index has fluctuated around zero. The 52 old countries of the index are dominated by countries in Europe and the Americas with European culture. The 100 new countries are mostly poorer, and have less democracy.

The pattern showed corresponds to our knowledge of a slow increase in democracy in the world. It also shows some well-known crises: the late 1920s and the 1930s represented a swing away from democracy, notably in Europe. In fact, the trend from 1900 to 1972 is of dubious significance, but since then there has been a large increase in democracy in the world.

For the whole of the twentieth century, few variables are available for many countries for the whole of the century, so we shall examine only the following three sets of variables:

- *Set 1: Income and political system change*  The long-run development of income is represented by (the logarithm to) gdp, that is, GDP per capita. Income is a catch-all variable, which covers the totality of development in a rather crude way. Political regimes, II, have much persistence, which is included in two ways: (i) the explained variable, $\Pi_{it}^T$, is
the average II for a period of $T$ years, from $t$ to $t + T$; and (ii) the initial value, $II_{t-1}$, is used as an explanatory variable.

- **Set 2: Periods** For reasons to be discussed, we have divided the data into five periods of $T = 20$ years each. An important criterion of validity of our analysis is whether the effects found are stable across these periods. This is formally tested in Table 15.7.

- **Set 3: The ‘story’ variables: oil, Old West and Islam** (i) We want to compare two ways of obtaining income: production and resource rent. Oil export is considered the cleanest case of resource rent. (ii) The countries of the West and Islamic countries seem to be diverging in many ways of which one is the form of government as measured by the II-score. We here speak of the ‘Muslim gap’. Consequently, binary dummies are used for three types of countries: major oil exporters, Old Western countries and Muslim countries.

Section 2 considers the theories examined, and Section 3 looks at the data asking how much we can expect these data to say. Section 4 gives a set of ordinary least squares (OLS) estimates, while Section 5 shows that little happens when the estimates are corrected for a set of potential problems. Section 6 gives the conclusions. Finally, Appendix 15A compares the scores of the Polity and the Gastil indices.

![Figure 15.1 Path of the Polity index, 1900–2003](image-url)
2 THE THEORIES EXAMINED

We consider the complex of theories shown in Figure 15.2. The six solid boxes represent the six variables used. Variables 4 to 6 are binary dummies, which are 1 if the event occurs and zero else:

1. $\Pi_{it}^{20}$, average II-score for each of five periods of $T = 20$ years. Range from $-10$ to $+10$.
2. $\Pi_{it-1}$, initial II-score for the year before each period starts. Integer range $-10$ and $+10$.
3. $y_{it-1}$, log to initial gdp, that is, GDP per capita for the year before each period starts. We use the natural logarithm to the data from Maddison (2003).
4. $OW_i$, the Old West is Western countries that were already rich in the first period, where ‘rich’ means that the gdp is above half of the US GDP.
5. $Oil_i$, countries where more than 50 per cent of exports are oil and gas.
6. $Mu_i$, countries with a majority of Muslims. If it is doubtful whether the criterion is fulfilled (for example, in the cases of Nigeria and Sudan), we use the secondary criterion that the government is Muslim (so that Nigeria is non-Muslim, while Sudan is Muslim).

![Figure 15.2 Causal structure](image-url)
The introduction mentions two main problems: the catch-all character of the gdp variable used to measure the relation between development and political system, and the strong inertia in political systems. These two problems are connected in two ways:

The first connection is that the following simple relation exists between the estimate of the coefficient to initial Polity $\beta$ and to income $\gamma$:

$$
\Pi_{it}^T = \alpha_{(i)}^T + \beta^T \Pi_{i,t-1} + \gamma^T y_{it-1} + u_t,
$$

as estimated; \hspace{1cm} (15.1a)

$$
\Pi_i^e = \frac{\alpha^T}{1 - \beta^T} + \frac{\gamma^T}{1 - \beta^T} y_i = \alpha^e + \gamma^e y_p,
$$

gives the implied steady-state values; \hspace{1cm} (15.1b)

$$
\Pi_{it}^T = \alpha_{(i)} + \mu^T y_{it-1} + u_t,
$$

as estimated. Here $\mu^T \to \gamma^e$, for large $T_s$. \hspace{1cm} (15.1c)

If $T$ is small, $\beta$ becomes large and $\gamma$ small and vice versa, but we expect $\gamma^e = \gamma^T/(1 - \beta^T)$ to be fairly stable for some range of $T$. Equation (15.1c) forces the regression to make the full adjustment to $y$ within $T$. This is a shortcut, but $\mu^T \approx \gamma^e$ if $T$ is sizeable. However, as $T$ grows, the distance to $y_{it-1}$ becomes so large that the estimate loses precision, and the number of observations falls. The choice of $T$ is thus crucial.

The second connection between the effects of initial Polity and income is the statistical consequence of the above. If $T$ is chosen too small, $\beta \approx 1$, and given the time-series variation in the Polity data, the other coefficients will be estimated with low precision. In other words, the unit root in the regression causes the estimates to become nonsense.

The key causal relation modeled is the effect of income on the $\Pi$-score. Most of the literature argues that as income goes up, the political system gradually becomes more democratic. This is known as ‘Lipset’s Law’ (after Lipset, 1959, 1994). Lipset himself and several other writers (for example, Przeworski et al., 2000) argue that there may be causality the other way too. On the figure, this is called the ‘Reverse Lipset’ connection. Column (4) in Table 15.8 below shows that this is a much smaller effect, so in most of this chapter it is disregarded.

As argued in Paldam (2007), we consider the change in political system as a typical part of a whole set of changes known as the ‘Grand Transition’, where a poor country becomes rich through a complete transformation from low to high productivity. Here the level of education rises dramatically, society becomes secularized, corruption falls, family patterns change,
happiness increases and so on. In order to untangle some of the complexity, we divide it into two:

- **The Muslim–Oil nexus**, where we use the two binary dummies $Mu$ and $Oil$. They both get negative coefficients in the regressions – also in the other studies of the project. Most, but not all, of the oil countries are also Muslim. Some countries in the Old West group are large oil producers too, but they produce so much that oil does not dominate their exports. In many fields, a gap between the West and the world of Islam is appearing. Figure 15.3 shows the Muslim gap in the $II$-score. It is no less than 5.82 points, and it is even larger between the West and the community of Islam. Although the relative movements were unclear before the Second World War where data are thin anyhow, there is a clear upward trend ever since. We study the robustness of the negative coefficient to $Mu$ to the initial levels of income and $II$, and to oil. In particular, we want to study the dynamics of the gap. It is often alleged that Muslims have values that dominate the ones of democracy. This indicates that the gap is permanent, but others argue that this does not need to be the case and that the gap is thus transitory.

![Figure 15.3 The Muslim gap in the Polity data](image)

**Note:** The country composition has changed by a gradual inclusion of more and more countries. From 1900 to 1921 the sample included 47–48 non-Muslim countries and (only) five Muslim ones. Since 1959 the sample has included 83–113 non-Muslim and 26–41 Muslim ones.
The Old West nexus deals with the path dependency caused by an early transition. A hundred years ago, all rich countries were Western, and also democracy originated in the West. So arguably, the West had a historical advantage. If we do not control for ‘Old West’, we shall get an exaggerated effect of income.

As much of the action in the data is connected to the Grand Transition, this introduces a large element of mutual interaction into the reactions. The Grand Transition means that a large number of changes take place simultaneously. If enough variables are included in the relations, they come to contain much collinearity. Therefore, coefficients become significant or insignificant due to small flukes in the series.

We use gdp as the main variable covering the Grand Transition. However, instead of going through the Grand Transition, there is an alternative way of producing a high gdp, namely from resource rent. The most extreme type of resource rent comes from oil, where the production technique is fully international and not very labor intensive. The oil dummy is always highly significant and negative. It is hence not enough to be rich to become democratic. It is a product of the complex changes generated by the Grand Transition.

Recently, Acemoglu et al. (2005) demonstrated that the connection between income and democracy is weaker than hitherto believed. When they control for the initial II-score and fixed effects for countries, the significance of the coefficient disappears in most of their estimates. It is well known that the tool of fixed effects for countries is a powerful test of a cross-country model. It has made many effects vanish. However, in Section 3 we study the relation between the average and the initial level of II, that is, between $\Pi_i^T$ and $\Pi_i^{t-1}$. Acemoglu et al. work with an average of $T = 5$ years. As will be demonstrated, their $T$ often causes a (near) unit root in the relation, and with fixed effects added everything washes out. With a reasonable size of $T$, the model proves robust to fixed effects.

It is hence important to study the persistence in the Polity data to determine a proper size of $T$, and to calculate the effects of the choices.

3 THE DATA: WHAT CAN THEY TELL?

The Polity index is an old project at the Center for International Development and Conflict Management, University of Maryland, with M.G. Marshall, K. Jaggers and T.R. Gurr as the main researchers. The index has gone through several versions, and we use the one presently posted (downloaded in the early fall of 2005). We use the data as posted,
though to get the consistent series for 52 countries from 1900 to 2003, we have filled in a few gaps as best we could. These interpolations are used only in the graphs, not in the regressions.

The gdp data are from Maddison (2003). Some countries are covered by the Polity index, but have no gdp observations. Unfortunately, this is the case for most Muslim countries before 1960. Table 15.1 gives the dimensions in the data for the different periods.

Note that Western countries are prominent in the long series, while Muslim countries are included for the last two periods only. Altogether, 61 of the observations are of the 10–10 type, where both the initial and the average II-score are 10. Most of the Old West observations are in this category. When fixed effects for countries are added, these observations are effectively removed, and one end of the income spectrum is greatly reduced.

As discussed, it is important that $T$ is chosen within a certain range: if $T$ is small, a unit root enters the regression, and if $T$ is large, information is lost. We decided to choose $T = 20$ after consideration of the following three

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<td>Of which 10–10*</td>
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<td>9</td>
<td>12</td>
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### Table 15.1 Some descriptive statistics: the data of the regressions

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<th>Period 3</th>
<th>Period 4</th>
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<td>Of which 10–10*</td>
<td>5</td>
<td>9</td>
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### Averages and standard deviation of observations

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<th>Period 4</th>
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<td>0.61</td>
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<td>SD</td>
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<td>(6.28)</td>
<td>(6.67)</td>
<td>(6.95)</td>
<td>(6.50)</td>
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<td>Init Polity</td>
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<td>4.00</td>
<td>0.71</td>
<td>−0.46</td>
<td>−1.94</td>
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<td>SD</td>
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<td>(6.35)</td>
<td>(7.60)</td>
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</tr>
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<td>Dif</td>
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<td>1.00</td>
<td>−2.07</td>
<td>0.93</td>
<td>−2.54</td>
</tr>
<tr>
<td>SD</td>
<td>(2.71)</td>
<td>(3.22)</td>
<td>(4.94)</td>
<td>(3.59)</td>
<td>(4.36)</td>
</tr>
<tr>
<td>Log y</td>
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<td>7.93</td>
<td>7.64</td>
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<td>SD</td>
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<td>(0.55)</td>
<td>(0.85)</td>
<td>(1.30)</td>
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<td>2633</td>
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<td>SD</td>
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<td>(1341)</td>
<td>(1731)</td>
<td>(2735)</td>
<td>(5647)</td>
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</tbody>
</table>

* Cases where the average Polity score is equal to the initial one and of these cases where both are 10.
persistence measures, where the first two measure the persistence of the cross-country pattern and the third measures the inertia over time:

\begin{align}
\text{Cor}_t (\Pi_r, \Pi_{r+\text{j}}), & \text{ for } j = 1, \ldots, 20, & \text{cross-country persistence function} & \text{(15.2a)} \\
\text{Cor}_t (\Pi_r, \Pi^T_{r+1}), & \text{ for } T = 1, \ldots, 20, & \text{cross-country persistence of initial and average } \Pi & \text{(15.2b)} \\
\text{Av}_t [\text{cor}_t(\Pi_{rt}, \Pi_{rt+j})], & \text{ for } j = 0, \ldots, 30, & \text{standard autocorrelation function} & \text{(15.2c)}
\end{align}

Figure 15.4 shows the three functions. They are calculated for the 52 countries where the data are complete for all periods (with a few interpolations), with the said lags.

The cross-country persistence (15.2a) starts at 0.98 (for \( j = 1 \)) and falls to 0.9 (for \( j = 5 \)), so the correlation between the initial and the average \( \Pi \)-scores is no less than 0.94 for a five-year average. This is too close to a unit root. Even for a 10-year average, the correlation between the average and the initial \( \Pi \)-scores is still 0.9. For a 20-year average, the correlation (15.2b) is 0.85. This is high, but it proves to work, and it still gives 329 observations.

The autocorrelation functions confirm the observation of high persistence. Note the cyclical pattern of autocorrelation in the 13 countries of the Old West. It reflects the fact that a few of these countries (notably Germany) have had one period of dictatorship in the twentieth century. However, in the second half of the century none of the Old Western countries have deviated much from the ideal 10 points, see Figure 15.5.

The figure shows how much the Old West deviates from the average path, which was also depicted on Figure 15.1. Note that once we control for the initial level, the Old West hardly contributes anything to the rise in democracy for the period since 1920, where the series is virtually trendless for these countries.

### 4 THE BASIC OLS REGRESSIONS

This section presents OLS regressions for the individual periods and for all periods stacked. Section 5 demonstrates that only rather marginal improvements occur when these regressions are re-estimated using estimators that correct for various potential problems.

The model used is a simple exploratory framework between the variables defined at the start of Section 2. All regressions in Tables 15.2–7 have \( \Pi_{it}^{20} \) – the average Polity index for a 20-year period – as the variable explained.
Notes:
1. Calculation done after stacking of the observations for the five periods. Every correlation is done on more than 5000 pairs of observations.
2. The autocorrelations are calculated for each of the 52 countries, and three averages are presented.

Figure 15.4 Three measures of persistence in the Polity data
If the constant $\alpha$ is broken up into fixed effects, the subscript $i$ applies – this is only done in Table 15.8:

$$
\Pi_{it}^{20} = \alpha_{(i)}^{20} + \beta^{20} \Pi_{i(t-1)} + \gamma^{20} y_{i(t-1)} + \lambda_{1}^{20} OW_{i} + \lambda_{2}^{20} Oil_{i} + \lambda_{3}^{20} Mu_{i} + u_{i}.
$$

(15.3)

With this model, we have experimented with the deletion of variables in various combinations and with various estimators. From the model, the steady-state values of the coefficients are estimated by multiplying with $z = 1 / (1 - \beta^{20})$, so that $\gamma^{\infty} \approx z \gamma^{20}$, $\lambda_{1}^{\infty} \approx z \lambda_{1}^{20}$ and so on. We can then examine how robust these estimates are compared to the corresponding ones when the second term, with a lagged initial value of $\Pi$, is omitted as explained above.

Table 15.2 shows that when we include only initial Polity and income, everything becomes significant. Also, it appears that the coefficients to the two initial variables, log $y$ and $\Pi$, are fairly constant, but the implied steady-state value of the effect of income is not very stable.

When the full model is estimated – in Table 15.3 – we get much the same picture, and now the implied steady-state effects of income are reasonably stable, around 4 Polity points. In the stacked regressions, all coefficients are forced to be the same. Table 15.4 shows a set of such stacked regressions, with experiments for the three dummies.

When we repeat Table 15.4 without either income or initial Polity (as done in Table 15.5), all story variables obtain significant coefficients with
the signs mentioned. So there is some multicollinearity in the model. When initial Polity, $\Pi_{t-1}$, is excluded in Table 15.5, the fit of all other variables increases as it should, and the increase in the constant variables is largest. However, the fall in $R^2$ is substantial. Note that the long-run effects of income are quite stable. If it is estimated as in Table 15.5, it forces the full adjustment to happen in one period (of 20 years) and it is only 10–20 percent lower.

The conclusions so far are as follows. Income has an effect which is always positive and normally significant. Its size is $\gamma^{20} \approx 1.6$. For $\beta = 0.6$, this implies a long-run effect $\gamma^{\infty} \approx 4.0$. The scale of $y$ is in (natural) logs to gdp, and it is ‘translated’ into ratios in Table 15.6. Very poor and very rich countries differ by 50 times. This gives 15.6 points on the Polity scale in the long run. For countries that differ only two or 10 times, it is 2.8 and 9.2 points, respectively, on the Polity scale in the long run – note how long the long run is in this field. The effect of income on the political system is thus substantial, but it takes some time for the full effect to be felt.

The initial Polity index is always positive, significant and stable at around 0.65. The three story variables tell a consistent story: Oil is always negative, and, as soon as there are more than one observations, also significant and stable. Ow is mostly significant, and then always positive and reasonably stable. The least convincing of the three variables is Mu. It applies to the last two periods only, where it is negative and mostly significant.

### Table 15.2 OLS cross-country estimates for each 20-year period, and stacked

<table>
<thead>
<tr>
<th>Explaining av Polity</th>
<th>Cross-country estimate for 20-year periods</th>
<th>Stacked</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Pi_{t}^{\gamma}$</td>
<td>1900–20</td>
<td>1921–40</td>
</tr>
<tr>
<td></td>
<td>$(−3.3)$</td>
<td>$(−2.1)$</td>
</tr>
<tr>
<td>$y_{-1}$, income init</td>
<td>$2.77$</td>
<td>$3.07$</td>
</tr>
<tr>
<td></td>
<td>$(3.5)$</td>
<td>$(2.1)$</td>
</tr>
<tr>
<td>$\Pi_{t-1}$, initial</td>
<td>$0.67$</td>
<td>$0.68$</td>
</tr>
<tr>
<td></td>
<td>$(8.9)$</td>
<td>$(5.6)$</td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>$0.85$</td>
<td>$0.77$</td>
</tr>
<tr>
<td>$N$</td>
<td>31</td>
<td>34</td>
</tr>
</tbody>
</table>

Implied steady-state value of the effect of income

| $y$, long run | 8.39 | 9.59 | 7.73 | 5.87 | 2.60 | 4.74 |

Note: Bold estimates are significant. Below each is the $t$-ratio (in brackets).
5 CORRECTIONS OF POTENTIAL PROBLEMS AND A REPLICATION

Models can suffer from many potential problems, but estimators have been developed to deal with many of these. A handful of these estimators are applied in Tables 15.7 and 15.8.

One such problem is residual autocorrelation – that is, the countries differ to the same side from one period to the next, by more than is removed by initial Polity. This is taken into account by the GLS estimate, ‘SURE’. When Tables 15.3 and 15.6 are compared, it appears that nearly all $t$-ratios increase in Table 15.7 as they should, and this causes two more coefficients to become significant, but the basic picture is unchanged.

The SURE technique also allows us to test whether we are permitted to make the coefficients the same for all five periods as in the stacked regressions. It appears that we are doing so for all variables except $Mu$. We

### Table 15.3  OLS cross-country estimates for each 20-year period, and stacked (including only initial Polity and income)

<table>
<thead>
<tr>
<th>Explaining av polity $\Pi_{it}$</th>
<th>(1) 1900–20</th>
<th>(2) 1921–40</th>
<th>(3) 1941–60</th>
<th>(4) 1961–80</th>
<th>(5) 1981–00</th>
<th>(6) Stacked</th>
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</thead>
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<tr>
<td>Constant</td>
<td>$-10.16$</td>
<td>$-14.28$</td>
<td>$-23.01$</td>
<td>$-12.92$</td>
<td>$-10.20$</td>
<td>$-12.75$</td>
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<td>($-1.1$)</td>
<td>($-1.0$)</td>
<td>($-1.5$)</td>
<td>($-3.2$)</td>
<td>($-3.7$)</td>
<td>($-6.3$)</td>
</tr>
<tr>
<td>$y_{t-1}$, income init</td>
<td>$1.43$</td>
<td>$1.80$</td>
<td>$3.12$</td>
<td>$1.51$</td>
<td>$1.64$</td>
<td>$1.75$</td>
</tr>
<tr>
<td></td>
<td>($1.1$)</td>
<td>($1.0$)</td>
<td>($1.5$)</td>
<td>($2.9$)</td>
<td>($4.7$)</td>
<td>($6.6$)</td>
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<td>$\Pi_{t-1}$, initial</td>
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<td>$0.65$</td>
<td>$0.47$</td>
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<td>($9.0$)</td>
<td>($5.0$)</td>
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<td>($-1.0$)</td>
<td>($-0.2$)</td>
<td>($-0.5$)</td>
<td>($-1.7$)</td>
<td>($-4.8$)</td>
<td>($-4.9$)</td>
</tr>
<tr>
<td>$OW$</td>
<td>$1.62$</td>
<td>$2.01$</td>
<td>$2.06$</td>
<td>$2.65$</td>
<td>$-1.01$</td>
<td>$1.63$</td>
</tr>
<tr>
<td></td>
<td>($1.2$)</td>
<td>($1.1$)</td>
<td>($0.9$)</td>
<td>($2.2$)</td>
<td>($-0.8$)</td>
<td>($2.7$)</td>
</tr>
<tr>
<td>$Mu$</td>
<td>n.a.</td>
<td>n.a.</td>
<td>$5.72$</td>
<td>$0.71$</td>
<td>$-2.09$</td>
<td>$-0.81$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>($1.4$)</td>
<td>($0.9$)</td>
<td>($-2.8$)</td>
<td>($-1.5$)</td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>$0.85$</td>
<td>$0.77$</td>
<td>$0.64$</td>
<td>$0.82$</td>
<td>$0.76$</td>
<td>$0.75$</td>
</tr>
<tr>
<td>$N$</td>
<td>31</td>
<td>34</td>
<td>41</td>
<td>99</td>
<td>124</td>
<td>329</td>
</tr>
</tbody>
</table>

Note: See note to Table 15.2.
have also tied all coefficients at the same time. This tie is accepted, so the deviation of the coefficients to \( Mu \) is of little importance in the total picture. It still changes the results very little; however, when we use the loss in \( R^2 \) compared to the untied (independent) regressions for each period, the loss is 0.02, 0.04, 0.06, 0.01 and 0.03, respectively. As is also obvious from the changes in the coefficients, it is only in Period 3 that the ties matter to the result. It is also here that one observation for one Muslim country gives a strange result in Table 15.3.

Table 15.8 demonstrates that we can correct the estimates for several additional problems. In order not to drown the chapter in very similar results, we report only re-estimates of the stacked model with all explanatory variables, using various estimators that each correct the regression for one potential problem. Each column is one such regression.

Column (1) is White’s correction of the error terms of the regression for heteroscedasticity. The results are virtually unchanged, so heteroscedasticity is not a problem. The same correction has been computed for individual periods, but again, this has little effect.
Table 15.5  Stacked OLS cross-country estimates (with no initial level for the Polity index)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-32.47</td>
<td>-34.57</td>
<td>-22.38</td>
<td>-28.27</td>
<td>-25.98</td>
<td>-31.31</td>
<td>-20.01</td>
<td>-23.51</td>
</tr>
<tr>
<td></td>
<td>(-11.9)</td>
<td>(-13.7)</td>
<td>(-8.0)</td>
<td>(-10.7)</td>
<td>(-9.7)</td>
<td>(-12.2)</td>
<td>(-7.5)</td>
<td>(-8.7)</td>
</tr>
<tr>
<td>$y_{-1}$, income init</td>
<td>4.24</td>
<td>4.60</td>
<td>2.79</td>
<td>3.83</td>
<td>3.35</td>
<td>4.24</td>
<td>2.60</td>
<td>3.10</td>
</tr>
<tr>
<td></td>
<td>(12.2)</td>
<td>(14.3)</td>
<td>(7.7)</td>
<td>(11.5)</td>
<td>(9.5)</td>
<td>(13.1)</td>
<td>(7.5)</td>
<td>(8.8)</td>
</tr>
<tr>
<td>Oil</td>
<td>-8.27</td>
<td>-6.58</td>
<td>-6.60</td>
<td>-5.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-7.9)</td>
<td></td>
<td>(-6.5)</td>
<td></td>
<td>(-6.1)</td>
<td></td>
<td>(-5.0)</td>
<td></td>
</tr>
<tr>
<td>$OW$</td>
<td>6.76</td>
<td>5.47</td>
<td>6.01</td>
<td>5.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(8.1)</td>
<td>(6.8)</td>
<td>(7.5)</td>
<td>(6.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Mu$</td>
<td>-5.05</td>
<td>-3.41</td>
<td>-4.19</td>
<td>-3.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-6.6)</td>
<td>(-4.4)</td>
<td>(-5.9)</td>
<td>(-4.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>0.31</td>
<td>0.42</td>
<td>0.43</td>
<td>0.39</td>
<td>0.49</td>
<td>0.45</td>
<td>0.48</td>
<td>0.51</td>
</tr>
<tr>
<td>$N$</td>
<td>329</td>
<td>329</td>
<td>329</td>
<td>329</td>
<td>329</td>
<td>329</td>
<td>329</td>
<td>329</td>
</tr>
</tbody>
</table>

Equation (15.1) The excess size of the implied steady-state coefficients from Table 15.4

$(\gamma^c - \mu^2)/\gamma^c$ 11% 10% 19% 11% 20% 13% 20% 22%

Note: See Table 15.2.

Table 15.6  Converting the effects to income into Polity points, and speed of adjustment

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Size of gaps between incomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>Medium term</td>
<td></td>
</tr>
<tr>
<td>Long run</td>
<td></td>
</tr>
</tbody>
</table>

Polity points

Medium term 1.6 0.6 1.1 1.8 2.6 3.7 6.3
Long run 4.0 1.6 2.8 4.4 6.4 9.2 15.6

Speed of adjustment

Years

Adjustment 0.6 60% 84% 94% 97% 99% 100%

Note: The relation between the variables is: $4 = \gamma^c = \gamma^20/(1-\beta) = 1.6(1-0.6)$.

Column (2) takes the fact that Polity is truncated to lie between –10 and 10 into account. Table 15.1 showed that the corner solution (+10) occurs in no less than 61 of the 329 cases. OLS may thus be inappropriate. Therefore, the model is estimated using the Tobit estimator. The results increase the effect of income a little (as it should), but they are otherwise unchanged.
Table 15.7  SURE estimates for each 20-year period and tests for one coefficient tie

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>−11.93</td>
<td>−16.69</td>
<td>−23.77</td>
<td>−13.18</td>
<td>−10.43</td>
<td>−11.74</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>(−1.4)</td>
<td>(−1.3)</td>
<td>(−1.7)</td>
<td>(−3.4)</td>
<td>(−3.9)</td>
<td>(−5.56)</td>
<td></td>
</tr>
<tr>
<td>$y_{t−1}$, income init</td>
<td>1.68</td>
<td>2.13</td>
<td>3.22</td>
<td>1.54</td>
<td>1.67</td>
<td>1.66</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>(1.5)</td>
<td>(1.2)</td>
<td>(1.7)</td>
<td>(3.2)</td>
<td>(4.9)</td>
<td>(6.2)</td>
<td></td>
</tr>
<tr>
<td>$\Pi_{t−1}$ initial</td>
<td>0.66</td>
<td>0.63</td>
<td>0.43</td>
<td>0.65</td>
<td>0.53</td>
<td>0.59</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>(9.7)</td>
<td>(5.32)</td>
<td>(4.2)</td>
<td>(13.2)</td>
<td>(10.9)</td>
<td>(20.4)</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>−2.22</td>
<td>−0.69</td>
<td>−2.78</td>
<td>−1.81</td>
<td>−5.13</td>
<td>−3.22</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>(−1.1)</td>
<td>(−0.2)</td>
<td>(−0.7)</td>
<td>(−1.8)</td>
<td>(−4.9)</td>
<td>(−4.7)</td>
<td></td>
</tr>
<tr>
<td>$OW$</td>
<td>1.43</td>
<td>1.83</td>
<td>2.19</td>
<td>2.75</td>
<td>−0.91</td>
<td>1.22</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>(1.2)</td>
<td>(1.7)</td>
<td>(1.0)</td>
<td>(2.3)</td>
<td>(−0.8)</td>
<td>(1.9)</td>
<td></td>
</tr>
<tr>
<td>$Mu$</td>
<td>n.a.</td>
<td>n.a.</td>
<td>5.51</td>
<td>0.66</td>
<td>−2.13</td>
<td>−0.73</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.4)</td>
<td>(0.9)</td>
<td>(−3.0)</td>
<td>(−1.4)</td>
<td></td>
</tr>
<tr>
<td>$R^2$ adj</td>
<td>0.87</td>
<td>0.79</td>
<td>0.64</td>
<td>0.81</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$N$</td>
<td>31</td>
<td>34</td>
<td>41</td>
<td>99</td>
<td>124</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Implied steady-state value of the effect of income

$y$, long run

| 4.94 | 5.76 | 5.65 | 4.40 | 3.55 | 4.05 |

Note: Columns (1) to (5) allow coefficients to be different. Column (6) shows the key result from six regressions with one tied coefficient. The Wald-test examines whether the tie is accepted.
Table 15.8  Other estimates: White, Tobit and fixed effects for countries and 2SLS

<table>
<thead>
<tr>
<th>Column</th>
<th>(1) White</th>
<th>(2) Tobit</th>
<th>(3a) Fixed effects</th>
<th>(3b) Fixed effects</th>
<th>(4) 2SLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-12.74</td>
<td>15.81</td>
<td>-28.47</td>
<td>-23.66</td>
<td>-7.92</td>
</tr>
<tr>
<td>(y_{t-1}), income init</td>
<td>1.75</td>
<td>2.20</td>
<td>3.35</td>
<td>2.94</td>
<td>1.19</td>
</tr>
<tr>
<td>(\Pi_{t-1}), initial</td>
<td>0.56</td>
<td>0.63</td>
<td>0.25</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>-3.70</td>
<td>-4.50</td>
<td>0.26</td>
<td>-1.03</td>
<td>-3.44</td>
</tr>
<tr>
<td>OW</td>
<td>1.63</td>
<td>3.78</td>
<td>n.a.</td>
<td>n.a.</td>
<td>1.69</td>
</tr>
<tr>
<td>Mu</td>
<td>-0.81</td>
<td>-0.64</td>
<td>n.a.</td>
<td>n.a.</td>
<td>-1.14</td>
</tr>
<tr>
<td>(R^2) adj</td>
<td>0.76</td>
<td>0.24*</td>
<td>0.78</td>
<td>0.81</td>
<td>n.a.</td>
</tr>
<tr>
<td>N</td>
<td>329</td>
<td>329</td>
<td>293</td>
<td>293</td>
<td>233</td>
</tr>
</tbody>
</table>

Implied steady-state value of the effect of income \(\gamma\), long run

| 3.98 | 5.95 | (3.35) | 3.92 | 2.70 |

Note: * Pseudo-\(R^2\), not comparable.

Column (3) allows for country-specific fixed effects. We report panel estimates using the within-groups estimator. Again, the conclusions are unaffected, though the persistence of democracy is lower, as is to be expected from the estimator used. Note that column (3) reports two regressions: (3a) includes fixed effects in the model, and (3b) replaces the initial Polity with fixed effects. It is obvious that the collinearity between the two variables that are accounting for path dependency is large. Also, the use of fixed effect for countries does not permit any constant binary dummy in the regression. We can keep in Oil as some countries change from ‘non-oil’ to ‘oil’ – however, it is just a couple, so the variable drops in fit.

Column (4) corrects for the potential endogeneity bias. This implies the loss of one cross-section, and it does reduce the size of the coefficient to log \(\gamma\) from 1.75 to 1.19. We use the lagged value of initial GDP per capita as an instrument for initial GDP per capita. This reduction is almost significant, but it may be due to a changed sample. However, it does suggest that there is some reverse causality in the relation. The 2SLS regression has no impact on the remaining conclusions.
Finally it should be mentioned that we have replicated everything on the Gastil index for the available period; that is, 1972–2004 (see Paldam, 2005). Fortunately, the Gastil index has slightly less persistence, and for $T=16$ we get two periods: Period 1 is 1973–88, with 1972 as the initial year. Period 2 is 1989–2004, with 1988 as the initial year. Data are available for 135 and 154 countries, respectively, so $N=289$. With a conversion of the Gastil scale to the Polity scale (see Appendix 15A), all results also replicate nicely as regards size. The only small deviation from the results is that the variable Oil gives slightly weaker results in the Gastil data, while the $Mu$ variable gives considerably stronger results. In the Gastil data, all coefficients to $Mu$ are significant.

6 INTERPRETING THE RESULTS

The pattern found is simple and clear, and it is constant across the twentieth century. As we have only five variables, we shall go through their effects one by one.

The Polity index contains strong inertia. Political systems do not change very often. Also, countries have a history that matters in a fairly long time perspective. Two methods can be used to account for path dependency: the first is to use the initial level of the index as an explanatory variable, and the second is to use fixed effects for countries. The two methods try to do almost the same, so they have strong collinearity. If the first method is used, the Polity average has to span a considerable period to prevent a near unit root from destroying the regression. If the second method is used, we are unable to use explanatory variables that are constant, such as culture or ‘old’ history. We have found that in connection with the Polity index, a time unit of 20 years works. This time unit gives a coefficient to initial Polity of about 0.6, so the model can be estimated with reasonable precision.

Income is significant throughout, and gives a substantial effect when the full adjustment has taken place. The Grand Transition gives an increase of 30 to 40 times in income. This increases the Polity index by no less than 12–14 points. However, it is not income as such, but the Grand Transition that matters. The transition to democracy is thus part of the whole process of development, not just an effect of income change.

Another interesting calculation is based on Maddison’s estimates of world gdp for the twentieth century: these say that world gdp has increased 4.8 times (that is, 1.6 percent per year) during the whole of the twentieth century. This corresponds to about 6 points on the index. Figure 15.1 shows that is precisely what has happened.

This is visible from the consistently negative sign to the Oil variable, and the substantial size of the estimated coefficient. Oil countries are 4 points
less democratic than other countries. Countries that have been wealthy throughout the century are all ‘Old West’, and also democracy emerged in the West. We cannot separate the two historical facts, but we find that the OW variable is mostly significant, and when significant it is always positive. It adds 2 points on the Polity scale to be Old West.

We also get a negative effect of Islam, but it is somewhat unstable over time. The Mu variable interacts with both the Oil variable and the income variable. Muslim countries are only rich if they have oil. When we then include a variable, accounting for path dependency as the initial Polity score, the relation contains too much collinearity, and we are unable to sort out the independent effect of Islam. However, given that Islam is exogenous even in the time perspective of a century, it is reasonable to argue that Islam is causal, and income is more endogenous.

The fact that the data reject that the coefficient is stable gives us some hope that the present divergence between the political systems in the West and those of the Muslim world is transitory only. This brings us back to Figure 15.3, which shows the large divergence that has taken place over the last 50 years. There is, however, an optimistic kink for the last five years.

NOTES

* This chapter parallels Paldam (2007), which examines the Gastil index, and Borooah and Paldam (2007), who use a different technique on the Gastil index. Paldam (2005) replicates the results in this chapter as closely as possible to the Gastil index (converted to the Polity scale). Many of the constructive comments we have received to the previous papers are reflected here.

1. Jensen and Paldam (2006) demonstrate how the two most successful models linking development aid to development react to fixed effects. One of the two disintegrates, while the other remains.
2. We could probably have chosen T as low as 15 and as high as 30, and still have reached virtually the same results, so we have used the secondary criterion that an integer should result, when T is divided into 100.
3. The estimator is biased for large N and fixed T for the case of the dynamic model, so our results are at best suggestive.

REFERENCES


APPENDIX 15A  THE RELATION BETWEEN THE GASTIL AND THE POLITY INDICES

The Gastil index from Freedom House is the index for the political system that is used by most economists, so it is worth comparing the two indices. The Gastil index goes from 1972 to 2003, and it is reversely scaled so that it rather measures an absence of democracy. Table 15A.1 gives the scales and an end point consistent conversion of the two. This chapter uses the Polity scale throughout for both Polity and Gastil indices.

Figure 15A.1 compares the average path for the period from 1972 to 2003 for the two indices, when the Gastil index is converted to the Polity scale. The figure shows that the two indices are closely related, though the Polity index is a bit more ‘optimistic’ than the Gastil index.

Table 15A.1  Comparing the scales of the two indices

<table>
<thead>
<tr>
<th>Fix points</th>
<th>Polity, P</th>
<th>Gastil, G</th>
<th>Conversions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full democracy</td>
<td>10</td>
<td>1</td>
<td>( P = \frac{40 - 10G}{3} )</td>
</tr>
<tr>
<td>Midway</td>
<td>0</td>
<td>4</td>
<td>( G = 4 - \frac{3P}{10} )</td>
</tr>
<tr>
<td>Full dictatorship</td>
<td>-10</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Note: While this conversion is fine at the end points, it is concave in-between, as the Polity index is more optimistic than the Gastil index, see Figure 15A.3 and Table 15A.2.
With regard to the individual countries, the two indices are also reasonably well correlated. This is demonstrated in Figure 15A.2, which covers the 1994–2003 period. That is, in the period after the breakup of USSR, where the number of countries covered by both indices is 152. It is at least 25 less for any other decade.

Figure 15A.2 shows that over most of the range, Polity scores are more optimistic, so that even when the end points are the same, the Polity index is on average 2.24 points higher.

Figure 15A.3 shows how the deviations between the two indices are distributed. The distribution is reasonably normal, but some countries deviate considerably.

It is interesting to note the most extreme outliers. Table 15A.2 gives the 10 most extreme deviations. It is unfortunate that large deviations are found for rather substantial countries where the facts are well-known. Perhaps it is understandable that a unique theocratic system such as Iran can generate a large difference in judgment, but it is puzzling that differences which are almost as large emerge for Russia, Indonesia and Turkey.

Transformation:

\[ 3P = 40 - 10G \]

Correlation 0.92

*Figure 15A.2  Scatter of observations for the Gastil and Polity indices, 1994–2003*
Democracy across the world

Figure 15A.3  Deviations between the two indices, 1994–2003

Table 15A.2  The most extreme deviations, based on averages, 1994–2003

<table>
<thead>
<tr>
<th></th>
<th>Polity</th>
<th>Gastil</th>
<th>Difference</th>
<th>In % of range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>3.29</td>
<td>-2.67</td>
<td>5.95</td>
<td>30</td>
</tr>
<tr>
<td>Ukraine</td>
<td>7.00</td>
<td>1.00</td>
<td>6.00</td>
<td>30</td>
</tr>
<tr>
<td>Russia</td>
<td>5.71</td>
<td>-0.83</td>
<td>6.55</td>
<td>33</td>
</tr>
<tr>
<td>Colombia</td>
<td>7.00</td>
<td>0.33</td>
<td>6.67</td>
<td>33</td>
</tr>
<tr>
<td>Guatemala</td>
<td>8.00</td>
<td>0.67</td>
<td>7.33</td>
<td>37</td>
</tr>
<tr>
<td>Congo Kinshasa</td>
<td>0.00</td>
<td>-7.83</td>
<td>7.83</td>
<td>39</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>-1.86</td>
<td>-10.00</td>
<td>8.14</td>
<td>41</td>
</tr>
<tr>
<td>Turkey</td>
<td>7.00</td>
<td>-1.33</td>
<td>8.33</td>
<td>42</td>
</tr>
<tr>
<td>Somalia</td>
<td>0.00</td>
<td>-9.33</td>
<td>9.33</td>
<td>47</td>
</tr>
<tr>
<td>Iran</td>
<td>3.00</td>
<td>-7.33</td>
<td>10.33</td>
<td>52</td>
</tr>
</tbody>
</table>

Note: The range is the 20 points between perfect democracy (+10) and prefect dictatorship of (−10).