State Capacity and Long-Run Economic Performance*

(Short title: State Capacity and Economic Performance)

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We present new evidence about the long-run relationship between state capacity – the fiscal and administrative power of states – and economic performance. Our database is novel and spans 11 European countries and 4 centuries from the Old Regime to World War I. We argue that national governments undertook two political transformations over this period: fiscal centralisation and limited government. We find a significant direct relationship between fiscal centralisation and economic growth. Furthermore, we find that an increase in the state's capacity to extract greater tax revenues was one mechanism through which both political transformations improved economic performance. Our analysis shows systematic evidence that state capacity is an important determinant of long-run economic growth.

Standard economic theory assumes that states are effective. Namely, states have enough administrative infrastructure to provide secure property rights, basic market regulations, and dispute resolution through courts. Yet effective states are only a

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recent historical development and represent just a fraction of modern nations.[1] Today's developing nations, like their historical predecessors, often confront problems of small administrative infrastructure. Effective states cannot be taken for granted.

While there is a large econometric literature on the economic effects of democracy, the corresponding literature on state capacity is small.[2] This paper tests the long-run relationship between state capacity and economic performance in Europe, the birthplace of modern economic growth. To the best of our knowledge, it is among the first papers to systematically test this relationship.[3]

Medieval European nation-states can be thought of as "mosaic states" (Strayer, 1970, p.53) that were not only built upon a patchwork of well-rooted local institutions, but competed with them for fiscal dominance. This lack of extractive capacity made it impossible for national governments to provide the administrative infrastructure necessary to facilitate economic activity. We argue that two political transformations resolved the long-standing state capacity problems faced by emergent nation-states in this context. The first political transformation was the implementation of uniform tax systems at the national level, or "fiscal centralisation". This transformation typically took place from 1789 onward. The second political transformation was the establishment of national parliaments with the ability to monitor state expenditures at regular intervals, or "limited government". This transformation typically took place decades after fiscal centralisation over the 1800s. We argue that both fiscal centralisation and

[1] For historical state formation, see Hintze (1906), Mathias and O'Brien (1976), Levi (1988), Brewer (1989), Tilly (1990), Hoffman and Rosenthal (1997), Epstein (2000), O'Brien (2011), Dincecco (2009, 2011), Karaman and Pamuk (2010), Rosenthal and Wong (2011), and Gennaioli and Voth (2012). For state capacity problems in sub-Saharan Africa, see Migdal (1988), Herbst (2000), Bates (2001), and Acemoglu and Robinson (2012). By contrast, states have played important development roles in Asian Tiger nations. See Wade (1990), Kang (2002), and Rodrik (2005).

[2] Papaioannou and Siourounis (2008) provides an overview of the democracy and growth literature; also see Acemoglu *et al.* (2014). A recent literature expands standard economic theory to incorporate state capacity. See Acemoglu *et al.* (2004), Acemoglu (2005), Besley and Persson (2009, 2011, 2013), and Acemoglu *et al.* (2011).

[3] Bockstette *et al.* (2002) finds a significant positive link between state antiquity and current economic development. Besley and Persson (2009, 2011) show significant positive correlations between past wars and current fiscal and economic outcomes. Dincecco and Prado (2012) find a significant positive relationship between current fiscal capacity and economic performance. They use historical war casualties to instrument for current fiscal institutions. Michalopoulos and Papaioannou (2013) show a significant positive impact of pre-colonial political centralisation on current economic development in Africa.

limited government increased the national government's capacity to extract greater tax revenues: a country like France, for example, could extract nine times more revenues per capita after the two political transformations than before them. Furthermore, we argue that greater state capacity had positive economic implications through several potential channels, including the creation of administrative infrastructure. Section 1 describes our hypotheses at length.

We evaluate our argument in two steps. We first test the direct relationship between political transformations and economic performance. Our econometric analysis uses a novel annual database that spans eleven European countries from the height of the Old Regime in 1650 to the eve of World War I in 1913. We model economic growth as a function of political transformations, country fixed effects that account for time-invariant country characteristics, year fixed effects that account for common time shocks, time-varying controls, and country-specific time trends that account for unobserved time-varying country-level heterogeneity.

The results show a significant direct role for fiscal centralisation in long-run economic performance. We find that fiscally centralised regimes saw an average annual growth rate in real per capita GDP that was 0.17% to 0.43% higher than fiscally fragmented regimes. To put these magnitudes into perspective, the average annual per capita GDP growth rate among sample countries over the 1650-1913 period was 0.62%. Our estimates thus suggest that the growth improvements associated with fiscal centralisation were equivalent to 27% to 69% of the average per capita GDP growth rate over this period, and 8% to 20% of its standard deviation. For another perspective, Papaioannou and Siourounis (2008) find that post-1960 democratic transitions were associated with a 1% increase in annual real per capita GDP growth during a period for which the world average annual growth rate was roughly 1.8% (Barro and Sala-i-Martin, 2004, p.4). This comparison suggests that fiscal centralisation was of roughly the same economic importance historically as some scholars argue that democratisation is today. Furthermore, we show evidence that the relationship between fiscal centralisation and economic growth was not just transitory but long-lasting: the *long-run* per

capita GDP growth rate for fiscally centralised regimes was 0.16 to 0.33 percentage points higher than for fiscally fragmented regimes. While we do not find evidence for a significant direct relationship between limited government and economic performance, the results suggest large interaction effects between the two political transformations.

There are several potential mechanisms through which political transformations could have improved economic performance. The second part of our econometric analysis tests one specific mechanism, greater state capacity, using the same methodology as before to isolate the within-country correlation between political transformations and fiscal outcomes. The results show that fiscally centralised and, to some extent, limited government regimes extracted per capita revenues at significantly higher rates than fiscally fragmented or absolutist regimes, respectively. Furthermore, there is some evidence for a significant relationship between limited government and improvements in the state's capacity to productively spend government funds. Finally, we find significant links between extractive capacity and subsequent economic performance. Our estimates suggest, for example, that extractive capacity improvements account for 42% to 58% of the difference in average annual per capita GDP growth rates between eighteenth-century England and France.

To conclude our analysis, we perform placebo tests that recode political transformations as if they had taken place decades prior to the actual years. The results provide additional evidence that reverse causation did not drive the relationships between political transformations and the economic and fiscal outcomes that we find. We discuss potential threats to inference and how we address them at length in Section 3.

Overall, the econometric analysis supports our argument that political transformations improved economic performance. The direct relationship between fiscal centralisation and economic growth is significant, large, and robust. Furthermore, we find evidence that greater state capacity was one mechanism through which both fiscal centralisation and, to some extent, limited government played significant economic roles. Our results also highlight the role of non-fiscal mechanisms through which fiscal centralisation worked.

Our paper relates to the literature that tests the long-run relationships between historical institutional factors and economic performance, including Engerman and Sokoloff (1997), La Porta *et al.* (1998), Hall and Jones (1999), Acemoglu *et al.* (2001, 2002, 2005), and Banerjee and Iyer (2005). However, this literature typically highlights the role of state predation rather than state capacity. Furthermore, it does not often test specific mechanisms through which institutional factors persist (see Nunn, 2009; Dell, 2010, is a recent exception).

Our paper also relates to the literature that views the state as an active participant in the development of modern capitalist systems, including Gerschenkron (1966), Magnusson (2009), and O'Brien (2011). We provide an econometric counterpart to these works. Our paper thus contributes to the debate about the institutional origins of the Industrial Revolution (Mokyr, 2008).

The rest of the paper proceeds as follows. Section 1 outlines the historical background and develops the fiscal and economic implications. Section 2 describes the data. Section 3 presents the econometric methodology. Section 4 reports the estimation results for the direct relationship between political transformations and economic performance. Section 5 reports the estimation results for the state capacity mechanism. Section 6 performs the placebo tests. Section 7 concludes.

1. Historical Overview

This section characterizes two political transformations that we argue resolved key state capacity problems in European history. Our historical account follows Dincecco (2009, 2011), which also provide sources. We first describe the political transformations, and then discuss potential mechanisms through which greater state capacity could improve economic performance.

1.1. Political Transformations

1.1.1. Fiscal centralisation

Most European states were fiscally fragmented before the nineteenth century. Contrary to conventional wisdom, early modern monarchs faced a host of incumbent local institutions that reduced their extractive powers. Epstein writes that

> decades of research on pre-modern political practices... has shown how "absolutism" was a largely propagandistic device devoid of much practical substance... The strength of a monarch's theoretical claims to absolute rule was frequently inversely proportional to his de facto powers.
>
> (Epstein, 2000, pp.13-14)

One general feature of fragmented states was the close relationship between local tax control and political autonomy. Local elites had strong incentives to oppose national-level fiscal reforms that threatened their traditional tax rights. The result was a classic public goods problem. Since each local authority attempted to free-ride on the tax contributions of other locales, the tax revenues that national governments could extract per capita were low.

To resolve the problem of local tax free-riding and establish greater extractive capacity, national governments had to gain the fiscal authority to impose standard tax menus, rather than bargain place by place over individual tax rates. So long as states equalized tax rates across locales at relatively high levels, extractive capacity rose.

1.1.2. Limited government

Although absolutist monarchs in early modern Europe spent government funds as they wished, elites in national parliaments exercised tax authority. Hoffman and Rosenthal (1997) argue that the main goal of absolutist monarchs was to fight wars, both for personal glory and for homeland defence. A key reason was the problem of royal moral

hazard in warfare (Cox, 2011). In Hoffman's words, absolutist monarchs

> likely provided far more defense than their average subject would have wanted. They went on the offensive too, and not just to protect their kingdoms. The reasons were not hard to understand. Victory was... a source of glory or a way to enhance their reputation.... they faced no major downside risk to their thrones, at least in the larger states, for loss in battle...
>
> (Hoffman, 2012, p.604)

Since parliamentary elites feared that absolutist monarchs would spend additional revenues in wasteful ways like foreign military adventures, they demanded the power of budgetary oversight before raising new taxes. To evade parliament, absolutist monarchs resorted to fiscal predation, which reinforced the fear that they could not be trusted. Parliamentary elites thus resisted tax requests and government revenues per capita were low.

Regular control over state budgets established the fiscal supremacy of parliament. The surrender of budgetary control was a credible way to resolve the royal moral hazard problem in warfare. In turn, extractive capacity rose.[4]

1.2. Economic Implications

Our historical account suggests that both fiscal centralisation and limited government increased extractive capacity. We now discuss potential channels through which greater state capacity could have improved economic performance.

Besley and Persson (2013) argue that the state's extractive capacity is central to economic development.[5] They show strong correlations between fiscal capacity investments in administrative infrastructure, high tax levels, and economic prosperity.

[4] We base this argument on North and Weingast (1989). Scholars argue that factors beyond de jure parliamentary change, including political coalitions (Stasavage, 2003), de facto institutional reforms (Pincus and Robinson, 2010), and ministerial responsibility (Cox, 2011), were important to subsequent fiscal and economic outcomes in European history.

[5] Their argument follows a long tradition that includes Schumpeter (1918) and Kaldor (1963).

Following this lead, we focus on the creation of administrative infrastructure or "infrastructural power" (Mann, 1986) as a potential channel linking greater state capacity with improved economic performance. States can facilitate economic activity in several ways, including the provision of secure property rights, basic market regulations, and dispute resolution through courts. To erect the administrative infrastructure that facilitates this activity, states require sufficient revenues.[6] For example, Brewer (1989) relates England's historical military and economic rise to the establishment of limited government and greater extractive capacity following the Glorious Revolution of 1688 and the subsequent growth in administrative infrastructure. By contrast, Herbst (2000) links low revenues in Africa with weak administrative infrastructures and the lack of basic public services (e.g., security, courts) that facilitate economic activity.

While we emphasize the state's extractive role, a potential complementary channel is the state's capacity to play a productive economic role through the provision of growth-enhancing public services like education or physical infrastructure (Besley and Persson, 2013). By resolving the problem of royal moral hazard in warfare as described in the previous subsection, the establishment of limited government could have led to greater productive capacity. There is also reason to think that the centralised provision of particular public services was more growth-enhancing than the decentralised provision of similar services. For example, historical central government investments in mass primary education promoted common national languages and cultural identities (Lindert, 2004; Aghion *et al.*, 2012), which could have facilitated trade and innovation.

Political transformations could have also improved economic performance through non-fiscal mechanisms. Institutional fragmentation in early modern Europe imposed costs, delays, and risks that atomized domestic economies and reduced economic growth (Epstein, 2000). Although taxes were low overall, fiscal fragmentation led to high tax rates in sectors under royal control (Hoffman and Rosenthal, 1997). To prevent re-

[6] Prescott (e.g., 2004) argues that higher taxation accounts for the worker productivity shortfall in Europe relative to the United States. Our analysis does not find any evidence of a negative relationship between greater state capacity and economic performance. Still, there may be reason to think that different tax compositions (e.g., income vs. consumption-type taxes) may affect economic performance when state capacity is already high (i.e., at OECD-country levels).

source diversion into tax-exempt sectors, absolutist monarchs enacted rigid laws. By resolving this problem, fiscal centralisation increased investment mobility. Similarly, there are several potential mechanisms linking limited government with improved economic performance (Papaioannou and Siourounis, 2008). For example, representative rule can facilitate sound economic policy through efficient information gathering and transmission (Sen, 1999). Our empirical analysis accounts for the economic role of non-fiscal mechanisms.

In summary, we argue that political transformations improved economic performance through greater state capacity. The rest of the paper tests this argument. We first examine the direct relationship between political transformations and economic performance. We then examine the role of state capacity, by testing the links from political transformations to state capacity, and from state capacity to economic performance.

2. Data

2.1. Political Transformations

We define and code political transformations according to Dincecco (2009, 2011). The process of fiscal centralisation was completed the year that the national government first secured its revenues through a standard tax system with uniform rates throughout the country. Limited government was established the year that parliament gained the stable constitutional right to control the national budget on an annual basis. To ensure stability, parliament's power of the purse had to hold for at least two consecutive decades.[7]

[7] There is a close correspondence between this coding scheme and the schemes of De Long and Shleifer (1993), Acemoglu *et al.* (2005), and the Polity IV database of Jaggers and Marshall (2008). De Long and Shleifer (1993) use three measures: a binary indicator of absolutist versus non-absolutist regimes, an eight-point constitutional scale, and the categories of capital versus coercion from Tilly (1990). However, they code political regimes at 150-year intervals. Acemoglu *et al.* (2005) use two measures: categories of executive constraints and protection for capital, both from Jaggers and Marshall (2008). However, they code political regimes at 50- or 100-year intervals. While Jaggers and Marshall (2008) code executive constraints at yearly intervals, their data do not start until the 1800s.

Table 1 displays the dates for fiscal centralisation across sample countries. The Norman Conquest of 1066 undercut provincial authority in England and established a precocious uniformity of laws and customs.[8] Structural fiscal change took place swiftly and permanently in several parts of continental Europe after the fall of the Old Regime. The National Assembly transformed the French tax system during the Revolution (1789-99), a process completed by Napoleon upon taking power in 1799. The First French Republic conquered the Low Countries in 1795, and the Southern Netherlands including Belgium became French departments. The Batavian Republic, the successor to the Dutch Republic, established a national tax system under French rule in 1806. French conquest at the start of the 1800s was also the major catalyst for fiscal change on the Italian peninsula; France annexed Piedmont in 1802. Prussia undertook fiscal centralisation after a battle loss to France in 1806. Napoleon defeated Austria in 1805 and invaded Portugal in 1807 and Spain in 1808, but only implemented incomplete administrative reforms. Fiscal centralisation did not take place in Austria and Spain until the 1840s and in Portugal until the 1850s.[9] Traditional fiscal structures remained in Scandinavia well through the 1800s. Fiscal centralisation took place in Sweden in 1861 and in Denmark in 1903.

Table 2 displays the dates for limited government, which was typically established decades after fiscal centralisation over the 1800s.[10] Belgium was established as a constitutional monarchy after declaring independence from the Netherlands in 1830. In the Netherlands, the new constitution of 1848 called for the executive to submit annual budgets to parliament.[11] Kings Charles Albert of Piedmont and Frederick William

[8] England conjoined with Wales in 1536. The Act of Union of 1707 conjoined Scotland. A similar Act conjoined Ireland in 1800 (the Irish Free State was established in 1922). For consistency, we use the term "England" rather than "Great Britain" or the "United Kingdom" throughout the text.

[9] Austria and Hungary were the largest territories of the Austrian Empire (1804-67). The Compromise of 1867 led to the establishment of the Austro-Hungarian Empire (1867-1918). For consistency, we use the term "Austria" throughout the text.

[10] Elster (2000, ch.2) argues that the establishment of many modern constitutional governments was non-incremental and took place in moments of crisis. Also see Russell (2004, p.106). We thank Barry Weingast for alerting us to these works.

[11] The constitution under King William I (1815-40) gave parliament the right to audit state finances, but only at 10-year intervals (van Zanden and van Riel, 2010).

IV of Prussia also granted liberal constitutions in 1848.[12] The Compromise of 1867 marked the start of the constitutional era in Austria. Limited government was established in France after the capture of Emperor Napoleon III during war with Prussia.[13] A stable parliamentary regime was established in Spain in 1876. Limited government and fiscal centralisation took place within a decade of each other in Portugal and Sweden. A stable constitutional regime was established in Portugal in 1851, while the 1866 parliamentary reform in Sweden established a modern bicameral legislature.[14] Finally, limited government was established well before fiscal centralisation in the Dutch Republic (1572-1795) and in Denmark. The Dutch Republic is typically classified as constitutional (De Long and Shleifer, 1993; Acemoglu *et al.*, 2005; Stasavage, 2005), while King Frederick VII of Denmark established a two-chambered parliament after the 1848 revolutions.

One concern is the possibility of measurement error induced by the coding scheme for political transformations. The scheme codes fiscally fragmented regimes as wholly fragmented, even for states where fiscal divisions were small. Thus, some regimes coded as fragmented will include data associated with greater extractive capacity, reducing average capacity improvements after fiscal centralisation. Similarly, the scheme selects early dates for limited government. Because extractive capacity typically increased over time, some regimes that were coded as limited will include data associated with lower extractive capacity, reducing average capacity improvements. The systematic underestimation of the state capacity impacts of fiscal centralisation and limited government should bias the data against our hypotheses that political transformations improved economic performance by enabling states to effectively fulfill their extractive role.

More generally, the various ways in which early modern states tabulated annual

[12] Tilly (1966) and Ziblatt (2006, pp.113-16) alike code the post-1848 regime in Prussia as constitutional, although Tilly notes that the executive acted without legislative approval of military budgets during the 1860s.

[13] The July Monarchy of King Louis Philip (1830-48) was not coded as limited because it endured for less than two decades.

[14] Sweden enacted a constitution in 1809, but the executive retained absolute veto authority and parliament only met once every five years.

revenues suggests that, on average, they overestimated the amounts of available resources.[15] Pre-transformation regimes will thus appear to have greater extractive capacity. State accounting practices improved over time, reducing the number and magnitude of overestimates. These two features also bias the data against our hypotheses about the relationships between political transformations, extractive capacity, and economic performance.

2.2. Economic Performance

Our economic performance measure is the (logarithmic) annual growth rate of real per capita GDP from Maddison (2010).[16] These data are available for 1600, 1700, and annually from 1820 to 1913. We linearly interpolate the pre-1820 data to provide annual observations from 1650 onward for all years for which state capacity data are also available.

Figure 1 displays the time-demeaned average per capita GDP growth rates around political transformations. The top panel shows average per capita GDP growth rates for fifty years before and after fiscal centralisation (left panel) and limited government (right panel). Both political transformations were associated with economic improvements. The average per capita GDP growth rate for fiscally centralised regimes was around 0.90%, but only around 0.20% for fiscally fragmented regimes. Similarly, the average per capita GDP growth rate for limited government regimes (also around 0.90%) was high relative to absolutist regimes (around 0.35%).

The bottom panel zooms in on average per capita GDP growth rates for ten years before and after political transformations. We observe a sharp, sustained jump in per capita GDP growth rates in the decade after fiscal centralisation.[17] While there was

[15] Bonney (1995, pp.423-506) and O'Brien (2011, pp.408-20) discuss the limitations of historical budgetary data.

[16] GDP data from Barro and Ursúa (2010), a potential alternative, are not widely available before the 1850s. However, the post-1850 trends are similar to the Maddison data.

[17] Structural break tests for real per capita GDP levels using Bai and Perron (2003)'s algorithm indicate that the 95% confidence intervals for the structural breaks encompassed the dates of political transformations for the majority of countries in the sample.

a smaller jump associated with limited government, it was not sustained. The zoom view also suggests that per capita GDP growth slowed in the years just before political transformations, raising the possibility that regular recovery from economic downturns rather than political change drove the growth improvements that we observe. Section 3 describes how we address this concern.

2.3. State Capacity

Our main state capacity measure uses per capita national government revenues to proxy for the state's extractive capacity. The revenue and population data are from Dincecco (2011) and Dincecco *et al.* (2011). Our second measure uses per capita non-military expenditures by national governments to proxy for the state's productive capacity. Data that are disaggregated beyond non-military expenditures (e.g., education) are only available for a reduced number of sample countries. The Appendix describes the sources and construction methods for the spending data.

The fiscal data form an unbalanced panel. We linearly interpolate, but never extrapolate, any missing revenue data to provide annual observations from 1650 to 1913. We also linearly interpolate population data between census years. The non-military spending data are not widely available before 1816. We do not interpolate any missing expenditure observations, because the links between tax bases and government spending were not always straightforward (e.g., during wartime).

Simple calculations show that the average annual growth rate of per capita revenues for fiscally centralised regimes (1.76%) was more than twice as high as for fiscally fragmented regimes (0.82%). Likewise, the average annual growth rate of per capita revenues for limited government regimes was 1.60%, but only 1.14% for absolutist regimes, a difference of 0.46 percentage points. The share of non-military expenditures in total expenditures also increased by roughly 13 percentage points after both fiscal centralisation and limited government.

Finally, we use cumulative railway networks in miles from Bogart (2008) as a non-fiscal proxy for the state's "infrastructural power." Even if the state does not directly

finance, build, or operate transport systems, it can play a key role as facilitator (see Section 1). We thus favor the total railway network to the government-built part of the network as the proper measure. However, the econometric results for the relationship between fiscally centralised regimes and government-built railway networks were similar to those reported. Data limitations prevented us from testing this relationship for limited government regimes.

3. Econometric Methodology

To test the direct relationship between political transformations and economic performance, we estimate the benchmark regression equation

$$\Delta y_{i,t} = \alpha_0 + \alpha_1 C_{i,t} + \alpha_2 L_{i,t} + \mathbf{X'}_{i,t-1}\boldsymbol{\alpha_3} + \mu_i + \lambda_t + \epsilon_{i,t}. \quad (1)$$

The dependent variable is the (logarithmic) annual growth rate of real per capita GDP in country i between $t-1$ and t. The fixed effects μ_i account for time-invariant country characteristics including geography, the nature and quality of initial political institutions (Bockstette *et al.*, 2002; Acemoglu *et al.*, 2005), initial economic and technological conditions (Comin *et al.*, 2010), and cultural norms (Greif and Tabellini, 2010), while the fixed effects λ_t account for common time shocks. $\mathbf{X'}_{i,t-1}$ includes an external conflict dummy for each year that a sample country participated in an European war, an internal conflict dummy for each year of civil war, coup, or revolution, and a control for annual population growth. $C_{i,t}$ and $L_{i,t}$ are dummy variables that take the value 1 upon fiscal centralisation and limited government, respectively, in country i (and take the value 0 beforehand). The coefficients α_1 and α_2 thus provide within-country estimates of the relationships between the two political transformations and economic performance.

Equation 1 addresses several common limitations of the cross-country growth literature (Durlauf *et al.*, 2005). Country fixed effects account for time-invariant characteristics and initial conditions that may influence economic and political development alike.

Furthermore, by including lags of the dependent variable among the regressors in some specifications, we not only account for autocorrelation and growth persistence, but can also quantify the short- and long-run relationships between political transformations and economic and fiscal outcomes.[18]

However, a set of methodological challenges still remains. A first concern is reverse causation. Economic growth may promote political reforms and not vice versa (e.g., Glaeser *et al.*, 2004; see Acemoglu *et al.*, 2008, for a counterargument). Beyond classic reverse causation, the growth estimates will be upwardly biased if political transformations took place during an economic upswing, because the coefficients α_1 and α_2 would reflect this trend. Similarly, if political transformations took place during an economic downturn, then the estimates may simply reflect the impacts of regular recovery that would have taken place even without political change.

We address this concern in several ways. To test whether political transformations took place during economic upswings or downturns, we allow for time-varying impacts of political transformations (Giavazzi and Tabellini, 2005; Laporte and Windmeijer, 2005). We also perform placebo tests (Bertrand *et al.*, 2004; Stasavage, 2013) that recode political transformations as if they had taken place decades prior to the actual dates. Finally, we implement the Granger-style causality test proposed by Angrist and Pischke (2009, ch.5).

A second concern is omitted variable bias. While fixed effects control for constant unobserved country-level heterogeneity, they do not account for the potential omission of relevant time-varying explanatory variables that could be correlated with political transformations. To address this possibility, we modify our benchmark model to include country-specific time trends.[19] Similarly, we allow for income level differences and

[18] The bias induced by the inclusion of a lagged dependent variable in least square dummy variable (LSDV) models decreases with the panel's time dimension T (Nickell, 1981). Judson and Owen (1999) show that the LSDV estimator outperforms alternative dynamic panel data models when T is 30; for our unbalanced panel with annual observations, T ranges from 50 to 264, with an average value of 194. Furthermore, Judson and Owen show that the bias for the coefficients of the other regressors, including the those of our variables of interest, $C_{i,t}$ and $L_{i,t}$, is small. For robustness, we used lagged observations dated $t-2$ and earlier to instrument for $\Delta y_{i,t-1}$ following Bond *et al.* (2010), and implemented the bias-corrected LSDV estimator proposed by Bruno (2005). The results were similar to those reported.

[19] Country-specific time trends also help account for the non-stationarity of the political reform dummies,

control for convergence dynamics by including lagged real per capita GDP in $\mathbf{X}'_{i,t-1}$ in some specifications.

There are other concerns related to the unique historical nature of our database. Our benchmark model uses cluster-robust standard errors that accommodate heteroskedasticity and within-cluster correlation. However, the number of sample countries (i.e., 11) is small, which may bias downward the standard errors (Donald and Lang, 2007; Cameron *et al.*, 2008). For robustness, the regression tables also report p-values for the two-sided Wald hypothesis tests computed according to Cameron *et al.* (2008)'s wild bootstrap-t procedure. This procedure is useful for small sample sizes like ours because it does not rely on asymptotic approximations.[20]

Although we use a wide variety of techniques to address the various methodological concerns, our within-country estimates do not necessarily capture the causal effects of political transformations on economic and fiscal outcomes. The historical record indicates that the causes and consequences of political transformations were the result of complex interactions between a broad range of factors, some of which our econometric framework invariably omits. While our estimates are not causal in nature, we believe that our analysis highlights novel data patterns about the relationships between political transformations, state capacity, and economic performance.

4. Political Transformations and Economic Performance

Table 3 displays the benchmark estimation results for the direct relationship between political transformations and annual real per capita GDP growth.[21] Column 1 reports

since once sample countries adopted centralised and limited regimes they typically did not revert.

[20] To account for cross-sectional dependence beyond that captured by time fixed effects, we also computed Driscoll-Kraay (1998) standard errors, which are robust to general forms of spatial and temporal dependence regardless of the size of N. The results were similar to those reported.

[21] We tested the time series properties of the main variables by performing common panel-data unit root tests (e.g., Maddala and Wu, 1999; Levin *et al.*, 2002; Im *et al.*, 2003) with and without country-specific trends. All tests failed to reject the hypothesis that the (log) level of per capita GDP contains unit roots for every sample country. However, the null was always rejected when this variable was first-differenced. These tests also suggest that the state capacity measures are stationary. Still, given the well-known reservations about the power and reliability of these tests (Baltagi, 2005), we report results in Sections 4 and 5 for a broad range of specifications that take into account both theoretical considerations and time series properties.

the results for the static panel model with country fixed effects. There were significant positive growth improvements after both fiscal centralisation and limited government. Fiscally centralised regimes saw an average annual per capita GDP growth rate that was 0.66% higher than fiscally fragmented regimes, while limited government regimes saw an average annual per capita GDP growth rate 0.32% higher than absolutist regimes. Column 2 controls for common time shocks by introducing year fixed effects. The coefficient for $C_{i,t}$ falls to 0.22, but is still more than two standard deviations greater than zero. The coefficient for $L_{i,t}$ is no longer significant. A potential explanation is that, because the establishment of limited government typically took place just before or during the Industrial Revolution (Mokyr, 1998), it may be difficult to disentangle the two events. To account for unobserved time-varying country-level heterogeneity, Column 3 introduces country-specific time trends to the Column 2 specification. There is a small increase in the magnitude of the coefficient for fiscal centralisation, which remains significant.

Columns 4 and 5 test potential interactions between the two political transformations. In this context, the individual coefficients for $C_{i,t}$ and $L_{i,t}$ measure the economic impacts of fiscal centralisation and limited government, respectively, when the transformation in question was undertaken in the absence of the other, while the coefficient for $C_{i,t} \times L_{i,t}$ measures the non-additive impact of the two political transformations combined. Column 4 shows that the coefficients for $C_{i,t}$ and $C_{i,t} \times L_{i,t}$ are positive, but not significant. It is well-known that time fixed effects impose large costs in terms of lost degrees of freedom for very long panels like ours (Wooldridge, 2003; Cameron and Trivedi, 2010). To address this potential problem, Column 5 repeats the previous specification after replacing the year fixed effects with a linear time trend to account for common time shocks. Now the coefficient for fiscal centralisation is significant, with a point estimate of 0.25. Furthermore, the coefficient for the interaction term is 0.31 and is significant. This result suggests that the joint impact of political transformations was notably greater than the sum of the individual impacts. Holding all else constant, the average annual per capita GDP growth rate for a country in our sample where

limited government followed fiscal centralisation was 1%, but only 0.63% if the second political transformation was never undertaken.

Columns 6 and 7 repeat the specifications in Column 2 (country and year fixed effects) and Column 3 (plus country-specific time trends) for the dynamic panel model that introduces two lags of the dependent variable to account for growth persistence.[22] The coefficient for fiscal centralisation remains significant, with an increase in the annual per capita GDP growth rate of 0.29% to 0.34%. Furthermore, the dynamic panel results indicate that fiscally centralised regimes not only saw a short-run increase in growth, but also a significant increase in long-run per capita GDP growth rates of 0.22 to 0.25 percentage points per year.

Table 4 tests the robustness of the main results. Column 1 introduces the controls for external and internal conflicts and population growth to the static panel model with country and year fixed effects. Column 2 adds country-specific time trends to this specification. The magnitude and significance of the coefficients for fiscal centralisation are similar as before. None of the controls have systematic growth impacts.[23]

There is the possibility that our previous results conflate the direct economic impacts of fiscal centralisation with the advent of modern industrial growth, which took place throughout Europe from the 1850s onward (Mokyr, 1998). Column 3 thus restricts the previous specification to the period before 1845. The magnitude of the coefficient for $C_{i,t}$ increases to 0.32 and remains significant.

The next three columns report results for the dynamic panel model. Column 4 repeats the Column 2 specification with country-specific time trends. The magnitude and significance of the coefficient for fiscal centralisation resembles previous estimates.

[22] As shown, both lags are statistically significant. A model with a single lag, the structure favored by commonly-used information criteria (AIC, BIC), leads to nearly identical estimates for the political reform indicators. We also tested longer lag structures of up to 8 lags to mimic other specifications present in the long-run growth literature (e.g., Gemmell *et al.*, 2011). The results for α_1 and α_2 were unchanged. Finally, allowing for different lag lengths for each sample country did not significantly alter these results.

[23] If we allow for contemporaneous correlations between the time-varying controls and $\Delta y_{i,t}$, then the negative coefficients for external conflict and population growth become statistically significant. However, the estimated relationship between fiscal centralisation and economic growth is unchanged. We report the results that exclude contemporaneous correlations to address concerns about the possible endogeneity of the controls (Jones, 1995; Gemmell *et al.*, 2011).

To control for conditional convergence, Column 5 includes the three-year lag of log per capita GDP, $\ln y_{i,t-3}$. The coefficient for $C_{i,t}$ remains positive, but is no longer significant. Column 6 thus repeats the previous specification using a linear time trend as justified previously. Now the coefficient for fiscal centralisation is highly significant, with a point estimate of 0.43.

Columns 7 to 9 show the results that use averaged rather than annual data observations. Some scholars highlight the merits of using annual data in growth regressions (Attanasio *et al.*, 2000; Papaioannou and Siourounis, 2008), while others argue that observations averaged over longer periods are more appropriate for growth determinants that change slowly or infrequently (Durlauf *et al.*, 2005). Taking data averages can also filter out business cycle fluctuations and adjustments to occasional shocks (Islam, 1995; Beck *et al.*, 2000), and help attenuate the effects of (transient) measurement errors (Bond *et al.*, 2010). Column 7 thus estimates the static model with country and year fixed effects using five-year data averages.[24] Columns 8 and 9 use 10- and 25-year averages, respectively. The main results obtained using the annual data hold for the averaged data. Fiscal centralisation saw significant growth improvements, while the coefficients for limited government are statistically indistinguishable from zero.

To better assess the evolution of the relationships between political transformations and economic performance, we relax the assumption that the impacts of fiscal centralisation and limited government are constant over time and replace $C_{i,t}$ and $L_{i,t}$ with five "pulse" dummies each. The regression equation that we now estimate is

$$\Delta y_{i,t} = \alpha_0 + \sum_{j=1}^{5} \alpha_{1,j} \widetilde{C}_{i,t}^{j} + \sum_{j=1}^{5} \alpha_{2,j} \widetilde{L}_{i,t}^{j} + \mathbf{X}'_{i,t-1} \boldsymbol{\alpha_3} + \mu_i + \lambda_t + \epsilon_{i,t}, \tag{2}$$

where the first four pulse dummies span non-overlapping five-year intervals before and after each political transformation: $\widetilde{C}_{i,t}^{1}, \widetilde{L}_{i,t}^{1} = 1$ for years 6 to 10 before; $\widetilde{C}_{i,t}^{2}, \widetilde{L}_{i,t}^{2} = 1$ for years 1 to 5 before; $\widetilde{C}_{i,t}^{3}, \widetilde{L}_{i,t}^{3} = 1$ for years 0 to 4 after (including the transformation

[24] Since the average number of observations for the five-year averaged dataset is 39, the LSDV estimator is still preferable to alternative models (Judson and Owen, 1999). While the generalized method of moments (GMM) estimator (Arellano and Bond, 1991) gives similar results to those reported, these results should be interpreted with caution due to the well-known weaknesses of the GMM estimator for small N panels.

year itself); and $\widetilde{C}^4_{i,t}, \widetilde{L}^4_{i,t} = 1$ for years 5 to 9 after. To measure the long-run relationships between political transformations and economic performance, $\widetilde{C}^5_{i,t}$ and $\widetilde{L}^5_{i,t}$ take the value 1 from the tenth year post-transformation onward, and 0 otherwise.[25]

Figure 2 displays the results of this exercise. Neither "pre-treatment" dummy is significant, which suggests that there were no systematic economic differences between the decade prior to political transformations and the benchmark period (i.e., more than a decade prior). To put it differently, the positive relationship between fiscal centralisation and economic performance that we find in Tables 3 and 4 does not appear to be driven by regular recovery from any pre-transformation economic downturn, or by anticipatory effects. Nor do we find evidence for any significant economic changes in the first five years post-transformation. This result may highlight the importance of "institutional consolidation" before any impacts of political transformations could be realized. By contrast, the coefficient for $\widetilde{C}_{i,4}$ shows evidence for medium-run economic improvements. The average annual real per capita GDP growth rate was 0.48% higher 5 to 9 years after fiscal centralisation. This coefficient is significant at the 10% level. Similarly, fiscally centralised regimes saw highly significant economic improvements from the tenth year post-transformation onward, with a long-run per capita GDP growth gain of 0.24 percentage points per year. The size of this coefficient resembles the long-run estimates from the dynamic specifications in Tables 3 and 4.[26]

Overall, the analysis in this section shows an important direct role for fiscal centralisation in economic performance. The coefficient estimates for $C_{i,t}$ are significant, large, and robust: fiscally centralised regimes grew faster than fiscally fragmented regimes by an average of 0.17% to 0.43% higher per year. Given that the average annual real per

[25] For robustness, we tested shorter and longer pulse dummy lengths and different numbers of pulse dummies overall. We also tested a variation of Equation 2 that replaced just one political reform indicator with pulse dummies but held the other indicator constant. The results of these tests consistently indicated a highly significant positive long-run impact of $C_{i,t}$ on per capita GDP growth.

[26] As another robustness check, we relaxed the assumption that the impact of political transformations was the same for all cross-sectional units. In the spirit of Pesaran and Smith (1995)'s mean group-style estimator, we estimated the dynamic models in Table 4 for each sample country and then averaged the coefficients. The point estimate for the long-run relationship between fiscal centralisation and economic growth was roughly 0.30 and was significant. While we interpret this result with caution due to the small N, it provides further support for our main conclusions.

capita GDP growth rate among sample countries over the 1650-1913 period was 0.62%, our estimates indicate that the growth improvements associated with fiscal centralisation were equivalent to about one-quarter to two-thirds of the actual per capita GDP growth rate over this period, and 8% to 20% of its standard deviation. As noted in the introduction, these magnitudes suggest that fiscal centralisation was roughly as important historically to economic development as democratisation is sometimes thought to be today (Papaioannou and Siourounis, 2008). Furthermore, the economic improvements associated with fiscal centralisation were long-lasting. Fiscally centralised regimes saw a significant increase in long-run per capita GDP growth rates of 0.16 to 0.33 percentage points per year. While the coefficient estimates for limited government are typically positive, the direct relationship between this political transformation and economic performance is not significant. However, we do find some evidence of significant interaction effects between the two political transformations, such that the joint impact of fiscal centralisation and limited government combined was much greater than the sum of each transformation when undertaken independently.

As described in Section 1, there are several potential mechanisms through which political transformations could have improved economic performance. We now examine one specific mechanism: greater state extractive and productive capacity.

5. Role of State Capacity

5.1. Political Transformations and State Capacity

To test for the relationship between political transformations and state capacity, we use a modified version of Equation 1 which takes the dependent variable $\Delta E_{i,t}$, the (logarithmic) annual growth rate of state capacity in country i between $t-1$ and t.

Table 5 displays the estimation results for growth in per capita revenues, our measure of the state's *extractive* capacity. Column 1 shows the static panel model with country and year fixed effects. There was a significant extractive capacity improvement after fiscal centralisation. Fiscally centralised regimes saw an average annual growth

rate of per capita revenues that was 1.41% higher than fiscally fragmented regimes. The estimate for limited government is positive, but not significant.[27] Column 2 introduces the standard time-varying controls. The magnitude of the estimate for $C_{i,t}$ increases slightly and remains significant.

Column 3 introduces country-specific time trends. The coefficient for fiscal centralisation increases further to 2.93 and remains significant. The estimate for $L_{i,t}$ becomes significant (for p-values computed using cluster-robust standard errors) once we replace the year fixed effects with a linear time trend to reduce the cost of lost degrees of freedom as in Column 4.

Column 5 restricts the Column 3 specification to the pre-1845 data to further control for the potential fiscal impacts of the Industrial Revolution. The coefficient for $C_{i,t}$ roughly doubles in size to 6.61. The coefficient for $L_{i,t}$ is also large and significant.[28]

Columns 6 and 7 repeat the specifications in Columns 3 and 4 for the dynamic panel model with two lags of the dependent variable. The estimates for both fiscal centralisation and limited government are similar in magnitude and significance as before. Furthermore, these estimates indicate that fiscally centralised regimes saw a large increase in the long-run growth rate of per capita revenues of 2.89 to 3.02 percentage points per year.

To account for conditional convergence, Column 8 includes the three-year lag of log per capita revenues, $\ln E_{i,t-3}$, in the specification from Column 6. The coefficient for $C_{i,t}$ is again large and significant. The results also indicate that fiscal centralisation was associated with a significant increase in (log) per capita revenue *levels* of 37% over the long run.[29]

Table 6 displays the estimates for the model with country and year fixed effects,

[27] However, if we use log per capita revenue levels as the dependent variable and re-run the Table 5 regressions, then the estimates for limited government are nearly always significant.

[28] Unlike for economic growth, the Table 5 regressions do not show evidence of significant interaction effects between the two political transformations.

[29] We computed the long-run impact on per capita revenue levels as minus the ratio of the coefficients for $C_{i,t}$ and $\ln E_{i,t-1}$, with standard errors obtained using the delta method (Papaioannou and Siourounis, 2008). Re-running the Column 6 regression with $\ln E_{i,t}$ as the dependent variable indicates that fiscal centralisation saw a significant short-term annual increase in per capita revenue levels of 4%.

time-varying controls, and country-specific time trends for our alternative state capacity measures. Columns 1 and 2 show the results for growth in per capita non-military expenditures, our measure of the state's *productive* capacity. In line with the theoretical implications as described in Section 1, the coefficient for limited government is always positive and becomes significant (for p-values computed using cluster-robust standard errors) once we control for conditional convergence in the dynamic panel model as in Column 2.

For contrast, Column 3 shows the results for growth in per capita *military* expenditures. Unlike the previous results, there is no evidence that limited government regimes saw increases in the average annual growth rate of per capita military expenditures (the coefficient for $L_{i,t}$ is negative). This comparison supports the case that the establishment of limited government was associated with changes toward non-military spending. The estimates for fiscal centralisation are never significant across these specifications.

Recall from Section 2 that expenditure data disaggregated beyond military expenditures are not widely available. With this important caveat in mind, Columns 4 and 5 show the results for growth in per capita education expenditures for the static and dynamic panel models, respectively. The estimates for $L_{i,t}$ are positive, large, and significant. These results suggest that education was one non-military item upon which limited government regimes spent funds. Again, the estimates for $C_{i,t}$ are not significant.

Columns 6 and 7 show the results for growth in cumulative railway networks, our non-fiscal state capacity measure. The coefficients for $L_{i,t}$, while positive, are not significant for this measure. By contrast, the coefficient for $C_{i,t}$ becomes significant (for p-values computed using cluster-robust standard errors) once we account for conditional convergence in the dynamic panel model as in Column 7. This result provides some further evidence that fiscal centralisation enhanced the "infrastructural power" of states.

In summary, Table 5 shows an important role for political transformations in greater state capacity. The estimates indicate that fiscally centralised regimes and, to some

extent, limited government regimes extracted per capita revenues at significantly higher rates than fiscally fragmented regimes or absolutist regimes, respectively. Fiscally centralised regimes saw an average annual growth rate of per capita revenues that was 1.41% to 4.27% higher than fiscally fragmented regimes. Given that the average annual growth rate of per capita revenues over the 1650-1913 period was 1.36%, these estimates are sizeable. Furthermore, the extractive capacity improvements associated with fiscal centralisation were enduring. Fiscally centralised regimes saw an increase in long-run growth rates of per capita revenues of 1.54 to 1.65 percentage points per year. While Table 6 shows some evidence for a significant relationship between limited government and productive capacity improvements, this evidence is less robust. Taken together, these results suggest that political transformations had more important consequences for extractive capacity than for productive capacity. To complete the analysis of the state capacity mechanism, we now test for the relationship between state capacity and economic performance.

5.2. State Capacity and Economic Performance

Following Bond *et al.* (2010), the benchmark regression equation that we estimate is

$$\Delta y_{i,t} = \beta_0 + \sum_{j=1}^{2} \beta_j \Delta\, E_{i,t-j} + \beta_3 \ln E_{i,t-3} + \mathbf{X'}_{i,t-1}\boldsymbol{\beta_4} + \mu_i + \lambda_t + \epsilon_{i,t}, \qquad (3)$$

where, as before, $\Delta y_{i,t}$ is the (logarithmic) annual growth rate of real per capita GDP in country i between $t-1$ and t, $\Delta E_{i,t-j}, j = 1, 2$, are the first two lags of the (logarithmic) annual growth rate of state capacity, and $\ln E_{i,t-3}$ is the three-year lag of the state capacity measure in log levels.[30]

Table 7 displays the estimation results. The first five columns test per capita revenues, our measure of the state's extractive capacity. Column 1 shows the results

[30] We excluded contemporaneous correlations between $\Delta y_{i,t}$ and the state capacity measures to address endogeneity concerns (Jones, 1995; Gemmell *et al.*, 2011). For robustness, we included either $\Delta E_{i,t}$, $\ln E_{i,t}$, or both variables as regressors in Equation 3, using past values of the state capacity measures and historical variables including state antiquity (Bockstette *et al.*, 2002) and protection of capital (Acemoglu *et al.*, 2005) as instruments. The results were similar to those reported.

for the static panel model with country and year fixed effects. Column 2 introduces the standard time-varying controls. Column 3 adds country-specific time trends. There is a significant relationship between extractive capacity improvements and subsequent per capita GDP growth across all specifications: the coefficient of interest, $\ln E_{i,t-3}$, is always positive and significant, with values between 0.11 and 0.15. A comparison of eighteenth-century England, which had undertaken both political transformations, and France, which was still fiscally fragmented and absolutist, helps put these magnitudes into perspective. English per capita revenues, which averaged 7.50 gold grams from 1700 to 1788, were more than double the French average over this period, at 3.71 gold grams. Our estimates thus suggest that, ceteris paribus, this difference in extractive capacity was associated with an annual per capita GDP growth rate for England that was between 0.08 and 0.11 percentage points higher than for France. Given that the actual average annual per capita GDP growth rate for France over the 1700-88 period was 0.19, these magnitudes are large.

Column 4 repeats the Column 3 specification for the dynamic panel model with two lags of the dependent variable. The coefficient for $\ln E_{i,t-3}$ remains highly significant and increases in magnitude to 0.18, implying a long-term impact on the per capita GDP growth rate of 0.13 percentage points per year. Recall that fiscal centralisation was associated with a significant long-run increase in per capita revenue (log) levels of 37% (Column 8 of Table 5). A simple back-of-the-envelope calculation thus suggests that the impact of fiscal centralisation on the long-run annual per capita GDP growth rate that went through the revenue channel was about 0.05 percentage points, or roughly 15% to 30% of the total long-run per capita GDP growth improvements associated with this political transformation.

To further assess the relative importance of this mechanism, Column 5 shows the results for the Column 3 specification after introducing the dummy variables for fiscal centralisation and limited government. The magnitude and significance of the coefficient for $\ln E_{i,t-3}$ is similar as before. The coefficient for fiscal centralisation is also significant, with a similar point estimate (0.26) as the equivalent Section 4 specification

(i.e., Column 2 of Table 4). Taken in combination, these results suggest that, while greater extractive capacity was one mechanism through which fiscal centralisation improved long-run economic performance, non-fiscal mechanisms as noted in Section 1 (e.g., reductions in internal tariff barriers that increased investment mobility) were also of great significance.

Column 6 shows the results for growth in per capita non-military expenditures. The coefficient for $\ln E_{i,t-3}$ is negative and not significant. We do not report the results for the other alternative state capacity measures, which were also not significant.

Overall, Tables 5, 6, and 7 show evidence that greater state capacity was one mechanism that linked political transformations with better economic performance. There is a significant positive relationship between fiscal centralisation and, to some extent, limited government and extractive capacity, and between greater extractive capacity and economic growth. While we did not find evidence for a direct relationship between limited government and economic performance in Section 4, these results suggest that limited government played some indirect economic role through extractive capacity improvements. These results also indicate that fiscal centralisation improved economic performance through both fiscal and non-fiscal mechanisms. To conclude the analysis, the next section uses placebo tests to further evaluate the robustness of the main results.

6. Placebo Tests

The historical evidence described in Section 2 highlights the role of critical junctures in political transformations (Acemoglu and Robinson, 2012, ch.4). Similarly, the results of the pulse dummy exercise show no evidence of anticipatory effects during the decade prior to political transformations (Figure 2). For further robustness, we now perform placebo tests (Bertrand *et al.*, 2004; Stasavage, 2013) that address the possibility that economic and fiscal differences across political regimes were the result of underlying trends that preceded political transformations, rather than the transformations them-

selves. We recode political transformations as if they had taken place decades prior to the actual dates and then re-estimate the static and dynamic models with country and year fixed effects and time-varying controls. If the coefficients for the placebo transformations are not significant, then this analysis will reinforce our previous results about the economic and fiscal importance of political transformations.

Table 8 displays the estimation results for the placebo tests. Panel A reports the results when the dependent variable is annual real per capita GDP growth. Column 1 shows the results for the political transformation placebos 25 years prior to the actual dates, while Columns 2 to 4 increase the placebos to 50, 75, and 100 years prior, respectively. The coefficients for the fiscal centralisation placebos are small, negative, and not significant. For example, the 25-year placebo estimate in the static model is 0.007, versus 0.21 in the original specification (Table 4, Column 1).

Panel B repeats the placebo tests when the dependent variable is per capita revenue growth. The placebo coefficients for fiscal centralisation or limited government are typically not significant, and the magnitudes are routinely smaller than in the original specifications. More than 80% of the placebo estimates are negative.

Panel C estimates the placebo models when the dependent variable is per capita non-military expenditure growth. We report the results for 25-, 30-, 35-, and 40-year placebos (we cannot compute the 50-year placebo due to the lack of non-military expenditure data prior to 1816). Nearly all of the coefficients for the limited government placebos are negative, and none are significant.

As an even further robustness check for reverse causation, we implement the procedure proposed by Angrist and Pischke (2009, ch.5). Our main result from Section 4 is that there is a significant relationship between fiscal centralisation and annual real per capita GDP growth. If $C_{i,t}$ impacts $\Delta y_{i,t}$ but not the other way around, then the coefficients for the leads $C_{i,t+\tau}$, $\tau = 1, \ldots, q$, should not be statistically significant in a regression of the sort

$$\Delta y_{i,t} = \alpha_0 + \alpha_{1,0} C_{i,t} + \sum_{\tau=1}^{q} \alpha_{1,\tau} C_{i,t+\tau} + \alpha_2 L_{i,t} + \mathbf{X'}_{i,t-1} \boldsymbol{\alpha_3} + \mu_i + \lambda_t + \epsilon_{i,t}. \quad (4)$$

Figure 3 displays the results of this regression for two specifications: the first with $q = 3$ and no controls (left panel), and the second with $q = 20$, time-varying controls, and country-specific trends (right panel). Only the coefficient for $C_{i,t}$ remains significant across specifications. The $\alpha_{1,\tau}$s alternate between positive and negative coefficients, with p-values ranging from 0.13 to 0.81. Using different specifications or q values, or simultaneously including leads for $C_{i,t}$ and $L_{i,t}$, leads to broadly similar results.

Overall, the results of the placebo and Angrist-Pischke tests provide additional evidence that reverse causation does not drive the relationships between political transformations and the economic and fiscal outcomes that we find. They thus reinforce our previous findings.

7. Conclusion

This paper presents new evidence about the long-run relationship between state capacity and economic performance. We focus on Europe, the birthplace of modern economic growth. National governments in European history were typically fiscally fragmented and absolutist. We argue that both fiscal centralisation and limited government increased the state's capacity to extract greater tax revenues, and that greater state capacity had positive economic implications through the creation of administrative infrastructure and other channels.

To test this argument, we perform a panel data analysis on a novel database that spans eleven countries and four centuries. Our analysis accounts for potential biases including simultaneity, omitted variables, and unobserved heterogeneity. Placebo tests allow us to further evaluate the validity of our argument. The results suggest that fiscal centralisation rather than limited government was the most consequential political change to occur in Europe from the Old Regime to World War I. We find a significant direct relationship between fiscal centralisation and economic growth. Furthermore, we find that greater state capacity was one mechanism through which fiscal centralisation and, to some extent, limited government played significant economic roles. To the best

of our knowledge, these results are among the first to show systematic evidence that state capacity is a significant determinant of long-run economic growth.

Our analysis indicates that fiscal centralization operated through both fiscal and non-fiscal mechanisms. One extension is to identify the main non-fiscal mechanisms. We believe that our results take a first step that can guide future research in this direction.

Data Appendix

The database and do-file will be available upon publication from the website https://sites.google.com/site/mdincecco/.

Data for per capita tax revenues in gold grams from 1650 to 1913 are from Dincecco (2011, appendices A.1, A.2, A.3). See Section 2 for further details.

Data sources for per capita military and education expenditures are listed ahead. Disaggregated expenditure data in home currencies were converted into gold grams following the methodology in Dincecco (2011, appendix A.2). Data for total expenditures and population are from Dincecco (2011, appendices A.1, A.2) unless otherwise stated. Per capita non-military expenditures were computed as per capita total expenditures minus per capita military expenditures.

Austria. Military spending data are from Pammer (2010). Education expenditure data were not available.

Belgium. Military spending data are from Singer (1987). They were downloaded from the Correlates of War website as the National Military Capabilities Dataset, Version 4.0. Education expenditure data were not available.

Denmark. Military spending data are from Singer (1987). They were downloaded from the Correlates of War website as the National Military Capabilities Dataset, Version 4.0. Education expenditure data were not available.

England. Military and education spending data are from Mitchell (1988, public finance table 4). To compute military expenditures, spending for the Army and Ordnance and for the Navy were summed. Education expenditures uses the category for Education, Art, and Science.

France. Military and and education spending data are from Fontvieille (1976, tables CVXI-XXXV).

Netherlands. Military spending data are from van Zanden (1996, table 4) for 1816-41. Van Zanden provides data averages for 1816-20, 1821-4, 1825-9, 1831-4, 1835-9, and 1841-50. The average for 1816-20 was used for 1816, the average for 1821-4 for

1821, and so on. The military spending shares closely match those from van Zanden and van Riel (2010, table 2.1). Total expenditure data from this source were used in combination with the information on shares to back out military expenditures. For 1816-30 we divided these figures by the expenditure share for the Southern Netherlands (i.e., Belgium, Luxembourg, and their hinterlands) according to van Zanden (1996, table 5) to derive military expenditures for the (Northern) Netherlands, as data for total expenditures from Dincecco (2011) exclude the Southern Netherlands. The source for the 1816-41 data does not provide education spending, which is included under the expenditure category for Home Affairs. Military and education spending data are from van Zanden and van Riel (2010, table 2.3) for 1850-1913. They provide data shares at 10-year intervals for 1850, 1860, 1870, 1880, 1890, 1900, and 1913. Total expenditure data from this source were used in combination with the information on shares to back out military expenditures.

Piedmont. Military spending data are from Dincecco *et al.* (2011) for 1830-59, the Ufficio Storico (1980, pp. 508-9) for 1861-9 (Italy), and Hobson (1993) for 1870-1913 (Italy). Education expenditures are from Felloni (1959) for 1830-59 and Brosio and Marchese (1986, table 4a) for 1861-1913 (Italy). Population data are from Dincecco *et al.* (2011) for 1830-59.

Portugal. Military and education spending data are from Silveira (1987, table 8) for 1816-27, Mata and Valério (2001, table 1) for 1832-45, and Mata (1993, table 1) for 1851-1913. To compute military expenditures, spending by the Ministerio da Guerra (after 1827; Exercito beforehand) and the Ministerio da Marihna were summed. There was no education ministry over this period. Education expenditures thus uses the category for the education burden (Encargos cum Instruções). Since the total military spending calculation matches well with the Encargos cum Difesa category (and perfectly from 1884 onward), we are confident that the same holds for education. Dincecco (2011) does not provide total expenditures for Portugal for 1833; this data point was taken from Mata and Valério (2001, table 1).

Prussia. The German Reich (1871-1945) was a federal system and a great deal of taxing

and spending was done at the state (e.g., Prussian) level. The federal government was responsible for military expenditures and welfare (Ziblatt, 2006). Spoerer (2010, table 4.1) provides Prussian military and welfare expenditures for 1847 and 1867. After unification there are only Reich data available for these categories. These data were not used because there was no clear way of integrating the pre-1871 Prussian series with the post-1870 Reich one. Spoerer's data for Prussia were supplemented with 1820 data for military defence from Ziblatt (2006, table 3.1). Here total Prussian expenditures from 1821 were used due to data availability.

Spain. Military spending data are from Carreras and Tafunell (2006), table 12.8 for 1816-42 and table 12.13 for 1845-1913. To compute military expenditures, spending by the Ministerio de Guerra (through 1842; the Ministerio de Defensa from 1845 onward) and the Ministerio de Marina were summed. The sources for the 1816-99 data do not provide education spending, which is included under the expenditure category for the Ministerio de Estado through 1842 and the Ministerio de Fomento from 1845 onward. Education spending data for the Ministerio de Fomento are displayed for 1900-13 (Ministerio de Educación y Ciencia).

Sweden. Military spending data are from Krantz and Schön (2010, table XI). At the central government level, there were no separate expenditure categories for infrastructure or education.

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Table 1

Dates of Fiscal centralisation

	Year	Event
England	1066	Establishment of uniform rule after Norman Conquest
France	1790	Major administrative reforms during French Revolution
Belgium	1795	Major administrative reforms after French annexation
Piedmont	1802	Major administrative reforms after French annexation
Netherlands	1806	Major administrative reforms under French control
Prussia	1806	Major administrative reforms after French defeat in battle
Spain	1845	Major administrative reforms after Moderate Coup of 1843
Austria	1848	Major administrative reforms during Year of Revolutions
Portugal	1859	Major administrative reforms after Revolutionary Era
Sweden	1861	Abolition of traditional tax system
Denmark	1903	Abolition of traditional tax system

Data source and notes. Dincecco (2011). See text for definition of fiscal centralisation.

Table 2
Dates of Limited Government

	Year	Event
Netherlands	1572	Establishment of Dutch Republic (1572-1795) after revolt from Spain
	1848	Implementation of new constitution during Year of Revolutions
England	1688	Establishment of constitutional monarchy during Glorious Revolution
Belgium	1831	Founded as constitutional monarchy after Revolution of 1830
Piedmont	1848	Establishment of constitutional monarchy during Year of Revolutions
Prussia	1848	Establishment of constitutional monarchy during Year of Revolutions
Denmark	1848	Establishment of constitutional monarchy during Year of Revolutions
Portugal	1851	Establishment of constitutional monarchy after Revolutionary Era
Sweden	1866	Introduction of bicameral legislature
Austria	1867	Establishment of constitutional monarchy after defeat by Prussia
France	1870	Formation of constitutional regime during war with Prussia
Spain	1876	Establishment of constitutional monarchy after civil war

Data source and notes. Dincecco (2011). See text for definition of limited government.

Table 3
Political Transformations and Economic Performance, 1650-1913

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable is Real Per Capita GDP Growth						
Fiscal centralisation	0.657	0.222	0.268	0.166	0.249	0.292	0.344
	(0.087)	(0.086)	(0.125)	(0.094)	(0.099)	(0.116)	(0.171)
	(0.000)	(0.041)	(0.033)	(0.137)	(0.030)	(0.063)	(0.063)
Limited government	0.321	0.053	-0.028	-0.102	-0.108	0.049	-0.080
	(0.109)	(0.165)	(0.146)	(0.230)	(0.113)	(0.225)	(0.205)
	(0.027)	(0.757)	(0.837)	(0.728)	(0.385)	(0.836)	(0.738)
Fiscal centralisation * Limited government				0.232	0.311		
				(0.239)	(0.126)		
				(0.433)	(0.010)		
Lag (1) per capita GDP growth						-0.185	-0.195
						(0.094)	(0.094)
Lag (2) per capita GDP growth						-0.168	-0.178
						(0.056)	(0.053)
R-squared	0.049	0.202	0.207	0.202	0.055	0.244	0.254
Observations	1,772	1,772	1,772	1,772	1,772	1,750	1,750

Notes. Estimation method is OLS. All specifications include country fixed effects. Columns 2-4 and 6-7 include year fixed effects and Column 5 includes a linear time trend. Additionally, Columns 3 and 7 include country-specific time trends. Cluster-robust standard errors clustered by country in parentheses (first line below coefficients) and p-values for two-sided Wald tests computed according to Cameron *et al.* (2008)'s wild bootstrap-t procedure also in parentheses (second line below coefficients for Fiscal centralisation, Limited government, and interaction term).

Table 4

Political Transformations and Economic Performance, 1650-1913: Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent Variable is Real Per Capita GDP Growth								
Fiscal centralisation	0.206	0.246	0.316	0.337	0.216	0.429	0.220	0.272	0.377
	(0.096)	(0.132)	(0.101)	(0.170)	(0.170)	(0.097)	(0.073)	(0.080)	(0.130)
	(0.064)	(0.086)	(0.015)	(0.084)	(0.238)	(0.011)	(0.000)	(0.000)	(0.000)
Limited government	0.080	-0.002	0.020	-0.068	0.045	0.138	-0.055	-0.043	-0.159
	(0.175)	(0.142)	(0.035)	(0.198)	(0.231)	(0.152)	(0.191)	(0.172)	(0.374)
	(0.644)	(0.983)	(0.467)	(0.760)	(0.845)	(0.360)	(0.758)	(0.807)	(0.673)
External conflict dummy (lagged)	0.264	0.271	0.072	0.189	0.160	-0.003	-0.066	-0.218	0.310
	(0.279)	(0.279)	(0.054)	(0.214)	(0.226)	(0.106)	(0.084)	(0.114)	(0.450)
Internal conflict dummy (lagged)	0.030	0.101	-0.429	-0.038	-0.117	0.144	-0.252	-0.320	-0.534
	(0.239)	(0.250)	(0.120)	(0.249)	(0.207)	(0.169)	(0.425)	(0.186)	(0.411)
Population growth (lagged)	0.008	0.009	-0.000	0.003	0.001	-0.002	0.003	0.029	-0.017
	(0.008)	(0.007)	(0.001)	(0.006)	(0.006)	(0.003)	(0.015)	(0.028)	(0.095)
Lag (1) per capita GDP growth				-0.193	-0.185	-0.177			
				(0.093)	(0.092)	(0.096)			
Lag (2) per capita GDP growth				-0.177	-0.170	-0.139			
				(0.054)	(0.058)	(0.053)			
Lag (3) log per capita GDP					-0.612	0.223			
					(0.832)	(0.420)			
R-squared	0.205	0.211	0.208	0.256	0.247	0.096	0.425	0.626	0.720
Observations	1,757	1,757	1,027	1,746	1,746	1,746	350	173	65

Notes. Estimation method is OLS. All specifications include country fixed effects. All specifications include year fixed effects except for Column 6, which includes a linear time trend. Additionally, Columns 2-4 include country-specific time trends. Column 3 restricts the data to before 1845 and Columns 7-9 use 5-, 10-, and 25-year data averages, respectively. Cluster-robust standard errors clustered by country in parentheses (first line below coefficients) and p-values for two-sided Wald tests computed according to Cameron *et al.* (2008)'s wild bootstrap-t procedure also in parentheses (second line below coefficients for Fiscal centralisation and Limited government).

Table 5

Political Transformations and Extractive Capacity, 1650-1913

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable is Per Capita Revenue Growth							
Fiscal centralisation	1.405	1.467	2.929	3.254	6.610	3.770	3.923	4.268
	(0.497)	(0.531)	(0.926)	(0.738)	(2.526)	(1.251)	(0.907)	(1.081)
	(0.001)	(0.007)	(0.039)	(0.025)	(0.108)	(0.028)	(0.006)	(0.035)
Limited government	0.438	0.047	0.717	1.215	1.883	1.209	1.601	5.117
	(0.564)	(0.638)	(0.652)	(0.631)	(0.758)	(0.989)	(0.807)	(2.791)
	(0.466)	(0.973)	(0.348)	(0.120)	(0.017)	(0.254)	(0.080)	(0.236)
External conflict dummy (lagged)		-0.774	-0.777	-1.257	0.620	0.957	-0.540	1.526
		(1.237)	(1.115)	(0.508)	(1.180)	(1.887)	(0.692)	(1.796)
Internal conflict dummy (lagged)		2.697	3.008	1.854	4.190	2.106	1.262	0.499
		(0.858)	(0.962)	(1.587)	(1.518)	(1.131)	(1.823)	(2.495)
Population growth (lagged)		-0.191	-0.192	-0.064	-0.226	-0.274	-0.134	-0.256
		(0.110)	(0.110)	(0.090)	(0.056)	(0.171)	(0.149)	(0.162)
Lag (1) per capita revenue growth						-0.173	-0.169	-0.227
						(0.026)	(0.028)	(0.030)
Lag (2) per capita revenue growth						-0.132	-0.128	-0.201
						(0.049)	(0.044)	(0.057)
Lag (3) log per capita revenues								-11.401
								(2.405)
R-squared	0.160	0.162	0.165	0.008	0.176	0.197	0.045	0.235
Observations	1,760	1,748	1,748	1,748	1,019	1,734	1,734	1,734

Notes. Estimation method is OLS. All specifications include country fixed effects. All specifications include year fixed effects except for Columns 4 and 7, which include linear time trends. Additionally, Columns 3-8 include country-specific time trends. The sample period is 1650-1845 for Column 5. Cluster-robust standard errors clustered by country in parentheses (first line below coefficients) and p-values for two-sided Wald tests computed according to Cameron *et al.* (2008)'s wild bootstrap-t procedure also in parentheses (second line below coefficients for Fiscal centralisation and Limited government).

Table 6

Alternative State Capacity Measures, 1816-1913

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable is State Capacity Growth Measure						
	Non-Mil Exps	Non-Mil Exps	Mil Exps	Edu Exps	Edu Exps	RR Miles	RR Miles
Fiscal centralisation	-4.606	-0.429	0.046	-0.006	-0.117	1.224	2.718
	(3.405)	(3.715)	(0.029)	(0.068)	(0.116)	(1.393)	(0.920)
	(0.417)	(0.927)	(0.180)	(0.877)	(0.384)	(0.357)	(0.128)
Limited government	1.194	7.069	-0.066	0.081	0.138	2.480	4.927
	(5.418)	(2.933)	(0.042)	(0.016)	(0.011)	(4.512)	(4.255)
	(0.866)	(0.139)	(0.157)	(0.000)	(0.000)	(0.556)	(0.531)
External conflict dummy (lagged)	-1.070	2.860	-0.149	-0.062	-0.007	-5.338	-0.604
	(3.084)	(3.748)	(0.064)	(0.030)	(0.045)	(3.746)	(1.730)
Internal conflict dummy (lagged)	3.800	0.036	0.030	-0.040	-0.045	1.784	3.069
	(1.893)	(2.225)	(0.075)	(0.070)	(0.070)	(5.488)	(4.778)
Population growth (lagged)	0.423	-0.050	-0.003	-0.011	0.006	-3.221	0.221
	(0.264)	(0.061)	(0.003)	(0.047)	(0.058)	(3.885)	(1.081)
Lag (1) dependent variable log level						-54.445	
						(33.094)	
Lag (1) dependent variable		-0.496			-0.370		-0.202
		(0.054)			(0.103)		(0.060)
Lag (2) dependent variable		-0.294			-0.061		-0.134
		(0.044)			(0.051)		(0.033)
Lag (3) dependent variable log level		-32.955					-28.164
		(3.745)					(5.003)
R-squared	0.186	0.348	0.200	0.463	0.515	0.495	0.517
Observations	724	694	728	330	320	435	413

Notes. Estimation method is OLS. All fiscal variables are in per capita terms. All specifications include country and year fixed effects and country-specific time trends. The sample period is 1870-1913 for Columns 6 and 7. Cluster-robust standard errors clustered by country in parentheses (first line below coefficients) and p-values for two-sided Wald tests computed according to Cameron *et al.* (2008)'s wild bootstrap-t procedure also in parentheses (second line below coefficients for Fiscal centralisation and Limited government).

Table 7

State Capacity and Economic Performance, 1650-1913

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable is Real Per Capita GDP Growth					
Lag (1) per capita revenue growth	-0.003	-0.004	-0.003	-0.003	-0.003	
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	
Lag (2) per capita revenue growth	0.001	0.001	0.001	-0.001	0.001	
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	
Lag (3) log per capita revenues	0.112	0.117	0.154	0.184	0.159	
	(0.031)	(0.033)	(0.064)	(0.089)	(0.073)	
	(0.000)	(0.000)	(0.000)	(0.029)	(0.023)	
Lag (1) per capita non-mil exp growth						-0.007
						(0.005)
Lag (2) log per capita non-mil exp growth						0.000
						(0.008)
Lag (3) log per capita non-mil exps						-0.032
						(0.380)
						(0.880)
Fiscal centralisation					0.260	
					(0.130)	
					(0.059)	
Limited government					-0.043	
					(0.131)	
					(0.718)	
External conflict dummy (lagged)		0.295	0.296	0.216	0.287	0.897
		(0.300)	(0.298)	(0.247)	(0.285)	(0.880)
Internal conflict dummy (lagged)		0.037	0.124	0.000	0.111	0.853
		(0.263)	(0.285)	(0.266)	(0.267)	(0.284)
Population growth (lagged)		-0.000	0.001	0.001	0.001	0.025
		(0.006)	(0.006)	(0.006)	(0.006)	(0.024)
Lag (1) per capita GDP growth				-0.193		
				(0.092)		
Lag (2) per capita GDP growth				-0.175		
				(0.054)		
R-squared	0.204	0.205	0.211	0.255	0.211	0.206
Observations	1,736	1,736	1,736	1,736	1,736	699

Notes. Estimation method is OLS. All specifications include country and year fixed effects. Additionally, Columns 3-6 include country-specific time trends. The sample period is 1816-1913 for Column 6. Robust standard errors clustered by country in parentheses (first line below coefficients) and p-values for two-sided Wald tests computed according to Cameron *et al.* (2008)'s wild bootstrap-t procedure also in parentheses (second line below coefficients for Lag (3) Log per capita revenues, Fiscal centralisation, Limited government, and Lag (3) Log per capita non-military expenditures).

Table 8
Placebo Tests

	(1)	(2)	(3)	(4)
Panel A: Dependent Variable is Real Per Capita GDP Growth				
	25 yrs prior	50 yrs prior	75 yrs prior	100 yrs prior
			Static Model	
Fiscal centralisation (placebo)	0.007	-0.158	-0.079	-0.037
	(0.132)	(0.106)	(0.074)	(0.092)
Limited government (placebo)	-0.048	-0.037	-0.035	-0.045
	(0.173)	(0.107)	(0.086)	(0.075)
Observations	1,757	1,757	1,757	1,757
			Dynamic Model	
Fiscal centralisation (placebo)	0.012	-0.188	-0.099	-0.047
	(0.163)	(0.135)	(0.096)	(0.127)
Limited government (placebo)	-0.018	-0.056	-0.043	-0.071
	(0.237)	(0.126)	(0.103)	(0.090)
Observations	1,746	1,746	1,746	1,746
Panel B: Dependent Variable is Per Capita Revenue Growth				
	25 yrs prior	50 yrs prior	75 yrs prior	100 yrs prior
			Static Model	
Fiscal centralisation (placebo)	-0.232	-0.727	-0.340	-1.868
	(0.879)	(0.950)	(0.812)	(0.938)
Limited government (placebo)	0.164	-0.536	-1.034	-0.598
	(0.619)	(0.937)	(1.489)	(1.357)
Observations	1,748	1,748	1,748	1,748
			Dynamic Model	
Fiscal centralisation (placebo)	0.070	-1.025	-0.569	-2.207
	(0.720)	(1.172)	(1.096)	(1.367)
Limited government (placebo)	0.671	-0.689	-0.917	-0.471
	(1.138)	(1.177)	(1.819)	(2.011)
Observations	1,734	1,734	1,734	1,734
Panel C: Dependent Variable is Per Capita Non-Military Expenditure Growth				
	25 yrs prior	30 yrs prior	35 yrs prior	40 yrs prior
			Static Model	
Fiscal centralisation (placebo)	1.018	0.684	3.709	8.720
	(2.086)	(2.502)	(5.273)	(12.342)
Limited government (placebo)	-2.378	-4.855	-5.861	-3.916
	(4.203)	(6.402)	(8.632)	(10.660)
Observations	724	724	724	724
			Dynamic Model	
Fiscal centralisation (placebo)	-2.025	-1.696	-3.142	-5.846
	(2.871)	(2.892)	(5.214)	(21.222)
Limited government (placebo)	-0.922	-4.036	-4.369	2.116
	(3.376)	(5.904)	(7.541)	(6.964)
Observations	694	694	694	694

Notes. Estimation method is OLS. All specifications include country and year fixed effects and time-varying controls. The sample period is 1650-1913 for Panels A and B and 1816-1913 for Panel C. Robust standard errors clustered by country in parentheses.

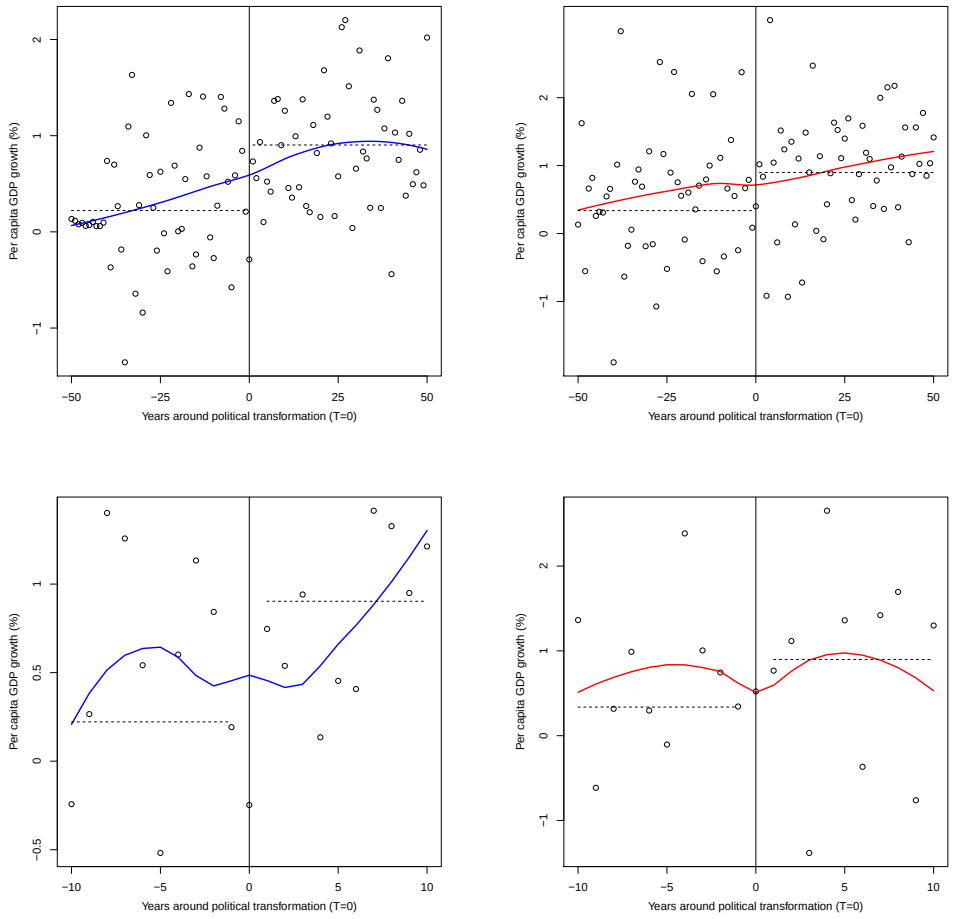

Fig. 1. *Time-Demeaned Average Real Per Capita GDP Growth Around Political Transformations*
Notes. Top panel shows 50 years before and after and bottom panel shows 10 years before and after. Left panel shows fiscal centralisation and right panel shows limited government. Circles represent average per capita GDP growth rates across sample countries. Solid lines represent locally-weighted regression curves fitted to data. Dashed horizontal lines represent pre-transformation and post-transformation average per capita GDP growth rates.

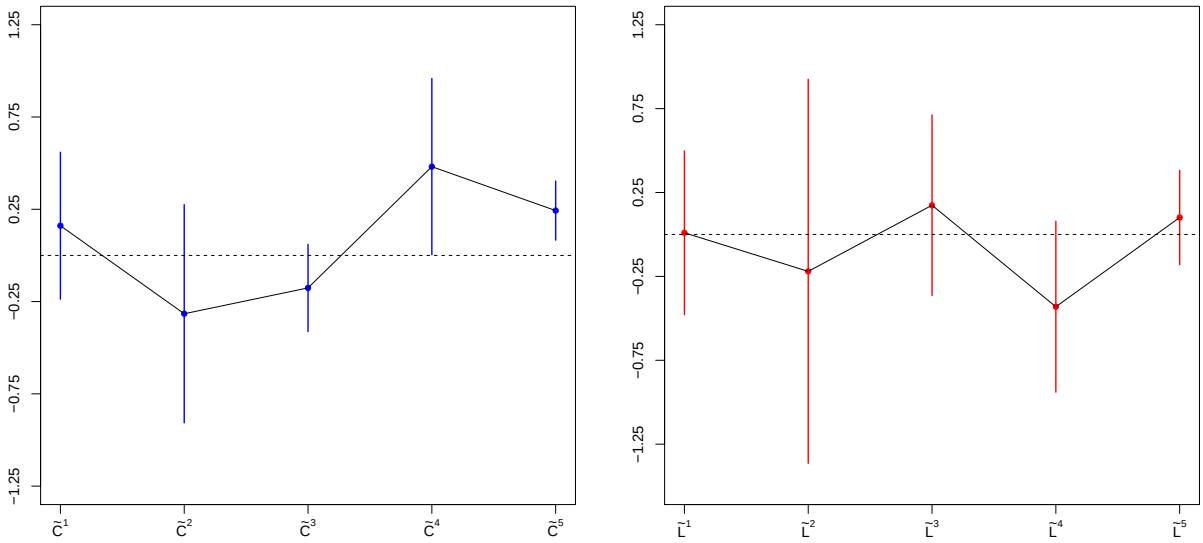

Fig. 2. *Time-Varying Relationship Between Political Transformations and Real Per Capita GDP Growth*
Notes. Left panel shows fiscal centralisation and right panel shows limited government. Dots correspond to point estimates for coefficients of pulse dummies and solid lines represent 90% confidence intervals (Equation 2). $\widetilde{C}^1_{i,t}, \widetilde{L}^1_{i,t} = 1$ for years 6 to 10 before political transformations; $\widetilde{C}^2_{i,t}, \widetilde{L}^2_{i,t} = 1$ for years 1 to 5 before; $\widetilde{C}^3_{i,t}, \widetilde{L}^3_{i,t} = 1$ for years 0 to 4 after (including transformation year itself); $\widetilde{C}^4_{i,t}, \widetilde{L}^4_{i,t} = 1$ for years 5 to 9 after; and $\widetilde{C}^5_{i,t}, \widetilde{L}^5_{i,t} = 1$ from 10th year post-transformation onward.

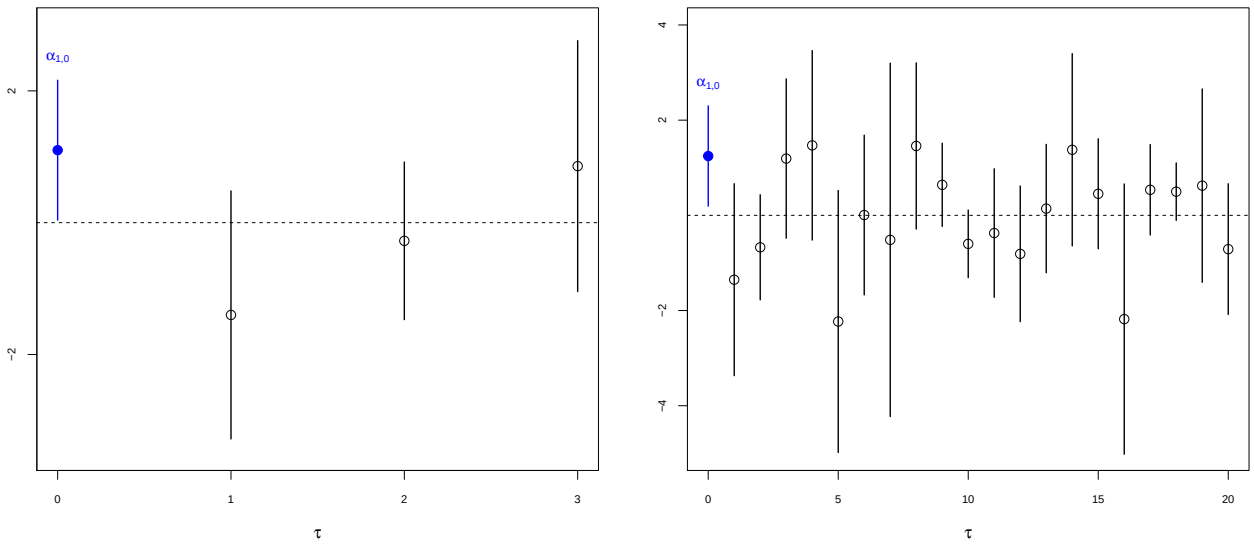

Fig. 3. *Conditional Correlations Between Real Per Capita GDP Growth and "Future" Political Transformations*

Notes. Dots represent point estimates for $\alpha_{1,0}$, the coefficient for $C_{i,t}$ in Equation 4. Circles are point estimates for $\alpha_{1,\tau}$, $\tau = 1, \ldots, q$. Solid lines represent 90% confidence intervals.