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The Consequences of Radical Reform: The French Revolution†

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In this article we exploit the variation in institutional reform created by the French Revolution in Europe, in particular within Germany, to investigate the consequences of radical, externally imposed reforms on subsequent economic growth. After 1792 French armies occupied and reformed the institutions of many European countries. The set of reforms the French imposed in the territories that they conquered were extensive and radical; they included the imposition of the civil legal code, the abolition of guilds and the remnants of feudalism, the introduction of equality before the law, and the undermining of aristocratic privileges. The long-run implications of these reforms are of interest both for historical reasons and also because they are related to current debates on institutional change. For example, the view that "designed" and externally imposed institutions are unlikely to foster economic progress would suggest that the French Revolution should have significant negative effects.[1] In contrast, the view that oligarchies, entry barriers, and restrictions on trade in labor and other markets were the main impediment to growth in Europe at the turn of the nineteenth century would suggest that the revolutionary reforms should have unleashed more rapid economic growth in affected areas (Mancur Olson 1982; Acemoglu 2008).[2]

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[1] Friedrich Hayek (1960) argued that institutions cannot be designed and have to evolve organically (and that this was the major reason for the inferiority of the civil code), and a recent literature has claimed that institutions have to be "appropriate" to the specific circumstances of countries (e.g., Daniel Berkowitz, Katharina Pistor, and Jean-Francois Richard 2003a; Berkowitz, Pistor, and Richard 2003b; Dani Rodrik 2007). Rafael La Porta et al. (1998) emphasize several inefficiencies associated with the French civil legal code.

[2] These issues are also related to the classic historical debate about the extent to which the institutions of the *ancien régime* impeded capitalism and economic growth and whether the French Revolution played a constructive or destructive role in European political development. The historical debate about the consequences of the French Revolution is also about its impact on political institutions and democracy, which is beyond the scope of the current article.

We investigate the economic consequences of the French Revolution and the reforms that were imposed on certain German polities as a consequence of the Revolutionary Wars. Parts of Germany, primarily the west and northwest, were invaded, ruled directly by France or through satellite states, and reformed, while the south and the east were not. We first investigate the reduced-form relationship between our definition of "French treatment," the length of French occupation (in years), and our main proxy for economic prosperity, urbanization rates. There is no evidence of a negative relationship. Instead, many of our estimates show significantly faster growth of urbanization in treated areas during the second half of the nineteenth century.[3]

We then use data on the timing of institutional reforms across German polities to investigate the effect of invasion both on various institutional outcomes and on long-run economic development. We show a strong association between institutional reforms and French invasion (or control). Using this relationship as a first stage, we then estimate instrumental-variables models, which indicate sizable effects of institutional reforms on subsequent growth. The purpose of this two-stage strategy is twofold. First, it allows us to distinguish the effect of the exogenous component of reforms from endogenous, "defensive" modernization. Second, it enables us to provide a test of the hypothesis that the effects of French invasion worked through the institutions that they imposed in the occupied parts of Germany. Overall, our results show no evidence that the reforms imposed by the French had negative economic consequences. On the contrary, evidence from a variety of different empirical strategies shows that they had positive effects.

Crucially for our identification strategy, parts of Germany did not *choose* the French institutions, but those institutions were *imposed* on them first by the Revolution and then by Napoleon.[4] Moreover, territorial expansion by French armies did not target places with a greater future growth potential. Instead, it had two major motives. The first was defensive, especially in response to the threat of Austrian or Prussian (or later British) attempts to topple the revolutionary regime. The second was ideological, as the French sought to export the revolutionary ideals to other countries, and at the same time tried to establish France's "natural frontiers."[5] In any case, the purpose of the institutional reforms of the French Revolution was not to foster industrialization per se, though they may have achieved this objective as a byproduct of their major goal of destroying the grip of the aristocracy, oligarchy, and the clergy on political and economic power.[6] Therefore, to a first approximation, we can think

[3] The working paper version of our study (Acemoglu et al. 2009) reports cross-national, Europe-wide evidence consistent with this pattern and also explores different definitions of "French treatment."

[4] In most cases, there were local Jacobin (local radical) forces in the countries occupied by the French armies, but the presence of such forces did not play a major role in determining which countries and cities were occupied by the French. See, for example, William Doyle (1989, chapter 9).

[5] The revolutionary leader George Danton stated: "Les limites de la France sont marquées par la nature, nous les atteindrons des quatre coins de l'horizon, du côté du Rhin, du côté de l'Océan, du côté des Alpes. Là, doivent finir les bornes de notre république" (speech to National Convention, January 31, 1793; quoted in Timothy C. W. Blanning 1983, p. 2).

[6] It is unlikely that the French could target areas with greater industrialization potential or that reforms were made specifically to encourage industrial growth. In fact, most likely no one at the turn of the nineteenth century could have anticipated the new technologies that were to arrive a few decades later (see the discussion in Joel Mokyr 2003). The exception to this statement is textiles. By 1800 the British and others had established some new technologies that increased productivity (e.g., in spinning) by an order of magnitude. Textiles are an important part of the economy in the Rhineland, discussed below, but there is no evidence that the French changed institutions in the

of the imposition of the institutions of the French Revolution as an "exogenous treatment" and investigate the economic implications of radical institutional reforms.

The rest of the article is organized as follows. Section I provides an overview of the history of the French Revolution and the subsequent invasion of Europe by the French. Section II discusses our data. Section III provides reduced-form evidence on the association between various measures of French occupation and our proxy for economic development, urbanization, across German polities. Section IV uses data on the nature and timing of institutional reforms to document the relationship between French occupation and these reforms and to estimate instrumental-variables models. Section V concludes, while several details on data collection and construction are contained in the online Appendices.

I. Historical Overview

A. *Europe before the Revolution*

Before the French Revolution, much of Europe was dominated by two kinds of oligarchies: the landed nobility in agriculture and the urban-based oligarchy controlling commerce and various occupations.[7] By the end of the eighteenth century, feudalism in its most rigid form had disappeared in many parts of Europe, but several attenuated variants of unfree labor relations in the countryside persisted. Serfdom still continued in much of Eastern Europe (see Jerome Blum 1978), while it had been replaced by various forms of taxes and tributes to landowners in other areas, which could nonetheless be quite onerous and inhibited the creation of flexible labor markets.[8] For example, in the Rhineland, the first area in Germany to come under French control, an attenuated form of serfdom (*Grundherrschaft*), which severely restricted freedom of movement, was still practiced (Blanning 1983). Moreover, various rights of the nobility and clergy created a very unequal political and economic situation in rural areas. These groups were frequently exempt from taxation, were subject to separate laws and courts, and enjoyed the right of taxation of the peasants under their control.

The urban oligarchy was perhaps even more pernicious to industrialization. Almost all major occupations were controlled by guilds, significantly limiting entry into those professions by others and often restricting adoption of new technologies and business practices. Several examples of guilds preventing innovation are provided by Herbert Kisch (1989), Sheilagh Ogilvie (2004), and Erik Lindberg (2009). In the major cities of the Rhineland, Cologne and Aachen, the adoption of new textile (spinning and weaving) machines was significantly delayed because of guild

Rhineland specifically because they foresaw great potential in the manufacture of cloth. Naturally, this does not rule out the possibility that the areas occupied by the French had greater potential for industrial growth for *other reasons.*

[7] This historical overview draws on Doyle (1989), Robert R. Palmer (1959), Palmer (1964), Georges Rudé (1988), Blanning (1983), Blanning (1986), Blanning (1996), David Gates (1997), Alexander Grab (2003), Charles J. Esdaile (1996), Esdaile (2001), and Geoffrey Ellis (2003).

[8] Since one could be concerned that including Eastern Europe in the sample leads the control group to be very heterogeneous, in the empirical work we show that all our results hold when we restrict our sample to Germany west of the Elbe river.

restrictions.[9] In addition, many cities were controlled by a few families for many generations, amassing wealth at the expense of potential new entrants with greater ability or better technologies.

B. *The Revolution and its Effect on Europe*

The first war between revolutionary France and the major European powers—the so-called War of the First Coalition—did not break out until 1792. Contrary to almost everyone's expectations, the armies of the new Republic were victorious in an initially defensive war. France's borders were thus expanded with an eye towards creating an effective buffer between the new Republic and the hostile monarchies of Prussia and Austria. The French quickly seized present-day Belgium, the Netherlands, and also much of modern-day Switzerland. By 1795, the French had firm control over the Rhineland (the left bank of the Rhine); in 1802 it was officially incorporated into France.

After Napoleon's takeover, the French impact spread much more widely throughout Europe. In Germany, where the direct control of the revolutionary armies had been limited to the Rhineland, Napoleon constructed a string of satellite buffer states on France's northeastern border. The Peace of Lunéville (February 1801) led to a massive reorganization of the territories that constituted the Holy Roman Empire. Hundreds of independent states, ecclesiastical territories and free imperial cities vanished and were consolidated into a cluster of larger kingdoms, principalities, and duchies; ultimately, their number shrank to fewer than 40 states (Grab 2003). Most of these states except Prussia were brought together in 1806 in the Confederation of the Rhine.

At the same time, Napoleon proceeded to reorganize the territories in northwest Germany into satellite states under his control. The Duchy of Berg on the right bank of the Rhine was formed in March 1806 (ruled by his brother-in-law Joachim Murat), the Kingdom of Westphalia (ruled by his brother Jérôme) in August 1807, and the Grand Duchy of Frankfurt in February 1810 (Napoleon's stepson, Eugene de Beauharnais, was supposed to inherit it). These were run by the French and persisted until the collapse following Napoleon's invasion of Russia. During this period Napoleon also took over parts of Northern Germany, including in December 1810 the annexation into France of the plains of Lower Saxony (later part of the Kingdom of Hanover) and the Hanseatic cities of Hamburg, Lübeck, and Bremen.

C. *Institutional Changes*

Many of the most radical institutional changes both in Europe in general and within Germany were undertaken during the invasion of the French revolutionary armies. While the impact of the French on the Rhineland during the 1790s remains controversial, especially because of the great deal of plunder and the resulting resentment by the local population mentioned above (see, e.g., Blanning 1983; Doyle 1989), the importance of the revolutionary reforms in Rhineland is not in question. Most significantly, between 1795 and 1798 the seigneurial regime and the

[9] Differing views, supporting the efficiency of guilds, have been expressed, e.g., by Stephan R. Epstein (1998). On this debate, see also Ogilvie (2007).

guilds were abolished (Blanning 1983), paving the way to a relatively free labor market. Equally important were the legal changes. For example, the French created a commercial court in Aachen in 1794 and followed with similar courts elsewhere in the Rhineland (Jeffry Diefendorf 1980), which were to play an important role in the creation of commercial and industrial businesses in the years to follow.

Although Napoleon was an Emperor seeking to solidify his control, ruthlessly when necessary, he nonetheless continued to implement the reforms initiated by the revolutionary armies (see Grab 2003; Owen Connelly 1965; J. Stuart Woolf 1991). Napoleon saw the imposition of the civil code (*Code Napoléon*) in the areas he controlled as his most important reform (Martyn Lyons 1994). Kisch emphasizes the economic importance of this (1989, p. 212): "When the many strands of commercial legislation were subsequently consolidated in the *Code Napoléon*, the Rhineland (on the left bank) was not only given a most up-to-date legal framework, but also a system of government in close harmony with the needs of a buoyantly industrializing society." The Rhineland was transformed from an oligarchy-dominated area to one open to new businesses and new entrants. Similar reforms were also systematically introduced into the German satellite kingdoms, such as the Kingdom of Westphalia, and the Grand Duchy of Berg.

In practice, Napoleon's institutional legacy outside of France is complicated, especially since he was more inclined to compromise with local elites at some times. Nevertheless, in most places there was a genuine attempt to continue and deepen the reforms brought by the Revolution. The motivations for these reforms seem to have been several. First, Napoleon had been deeply involved with the reforms of the revolutionary period and shared the ideological commitment of the early reformers. Second, like them, he wished to build a series of buffer states around France. Finally, reforms such as abolishing the political control of the elite, feudal privileges, and introducing equality before the law undermined existing elites and made it easier for Napoleon to establish control over the areas he conquered.

After the final collapse of Napoleon in 1815 the institutional reforms implemented over the previous 25 years suffered various fates. In the Rhineland, whose largest part was assigned to Prussia as a consequence of the Congress of Vienna, the new local elites successfully fought to preserve French institutions, such as the civil and commercial codes. Prussia itself was inclined to continue on the path of reforms begun under French rule (see Herbert A. L. Fisher 1903). The presence of a new elite created by the reforms and determined to hang onto them was a key factor. In other places, where the old ruling dynasties returned to power, such as in Hanover, Brunswick, and Hesse-Kassel, most reforms were rolled back. A return to the status quo ante was functional to the rulers' need to rely on *ancien régime* institutions to support their claim to power. In our econometric analysis in Section IV we specifically code reforms throughout the nineteenth century to examine this issue empirically.

II. Data

A. *Outcome Variables*

We consider 19 distinct preunitary polities in Germany, which represent either independent states in nineteenth-century Germany, or provinces of larger states

(Prussia, Bavaria). Our main measure of economic prosperity across these polities is the urbanization rate of the area, defined as the fraction of the population living in cities with more than 5,000 inhabitants. Paul Bairoch (1988, ch. 1) and Jan de Vries (1984) argue that only areas with high agricultural productivity and a developed transportation network could support large urban populations. Acemoglu, Johnson, and Robinson (2002) present evidence that in both the time-series and the cross-section there is a close association between urbanization and income per capita before as well as after industrialization.

Urbanization rates at the level of preunitary German polities are computed based on city size data from Bairoch, Jean Batou, and Pierre Chevre (1988), and on historical reconstructions of total populations based on various sources. Details on the construction of these data are given in online Appendix B. Urbanization rates after 1850 are obtained from the official statistical compilations of the German Empire. In addition to urbanization, we also use data on the sectoral composition of employment for 64 German districts for the years 1849, 1882, 1895, and 1907 (from Harald Frank 1994). The share of employment in industry is a good proxy for industrialization and thus enables us to check whether the patterns we see in the urbanization rates are associated with changes in industrialization.

B. *Other Variables*

Our "treatment" is defined as the number of years between 1792 and 1815 that the polity in question was under French occupation. We consider years in which the French had direct control over these territories or installed republics and principalities directly dependent on French directives; we exclude years and months of pure military invasion and control, such as for example in the case of Prussia. Table 1 lists all 19 polities considered in our dataset, sorted by their treatment status. To the extent that some of these areas implemented modernizing reforms under pressure from France (e.g., through the implicit or explicit threat of invasion), our treatment coding works against our hypothesis. Nevertheless, our two-stage least squares strategy will correct for this potential bias by instrumenting for our index of reform with the measure of French treatment.

We construct an index of reforms in Germany, both to show the impact of the French occupation on institutional reforms and as the right-hand-side variable in our instrumental-variables strategy. Historical sources (see online Appendix D for details) allow us to code the nature and timing of some of the reforms that took place. We focus on the enactment of the French civil code, the restructuring of agricultural relations and the abolition of guilds. We interpret these reforms as an index for the overall "package" of institutional reforms, which also includes changes in areas that are less easy to classify, such as the nature of state administration and tax collection, or the secularization of church lands (the latter was relevant only for Catholic territories). Table 1 reports the incidence of reforms in Germany, as represented by the first date of implementation.

Column 2 shows the date at which the different polities introduced a written civil code that guaranteed equality before the law. The French civil code (*Code Napoléon*) falls under this category, but so do the Saxon civil code of 1863 and the German civil

Table 1—Territories and Reforms

Territory	Years of French presence (1)	Civil code (2)	Abolition of serfdom (3)	Agrarian reform (4)	Abolition of guilds (5)	Reforms index as of 1850 (6)	Reforms index as of 1900 (7)	Pop. weights (1750) (8)
Panel A. Treatment								
Rhineland (Prussia)	19	1802	1798	1804	1795	50.25	100.25	1,439
Palatinate (Bavaria)	19	1802	1798	1804	1795	50.25	100.25	239
Mark/Ruhr (Prussia)	6	1810–15, 1900	1808	1825	1809	28.25	65.75	150
Westphalia (Prussia)	6	1810–15, 1900	1808	1825	1809	28.25	65.75	529
Brunswick	6	1808–14, 1900	1808–18, 1834	1809–18, 1834	1808–15, 1864	16	50	155
Province of Saxony (Prussia)	6	1808–15, 1900	1808	1809	1809	32.75	70.25	763
Hessen-Kassel	6	1808–14, 1900	1808–14, 1832	1809–14, 1832	1808–16, 1869	15.25	48	294
Hanover	3	1808–13, 1900	1808–14, 1833	1809–14, 1833	1808–15, 1869	14.25	47	1,090
Average	*9.98*					*32.41*	*72.88*	
Panel B. Control								
Baden	0	1810	1783	1820	1862	34.25	81.25	609
Bavaria, southern half	0	1900	1808	1826	1868	16.5	49.5	1,163
Hessen-Darmstadt	0	1900	1811	1816	1866	18.25	51.75	264
Saxony	0	1865	1832	1832	1862	9	52.25	1,020
Württemberg	0	1900	1817	1836	1862	11.75	46.25	925
Average	*0*					*16.31*	*54.46*	
Panel C. Control (*east of the Elbe*)								
Brandenburg (Prussia)	0	1900	1811	1821	1810	27	64.5	797
East Prussia (Prussia)	0	1900	1811	1821	1810	27	64.5	554
Pomerania (Prussia)	0	1900	1811	1821	1810	27	64.5	342
Silesia (Prussia)	0	1900	1811	1821	1810	27	64.5	1,053
Mecklenburg-Schwerin	0	1900	1820	1862	1869	7.5	37.25	217
Schleswig-Holstein	0	1900	1805	1805	1867	22.5	55.75	541
Average	*0*					*25.1*	*61.46*	

Notes: Sources for the dates of reform are listed in the online Appendix. Averages are weighted by total population in 1750 (reported in column 8, in 1,000s). The reform index in columns 6 and 7 has been computed exemplarily for two dates (1850, 1900) according to the formula reported in the text.

code (*Bürgerliches Gesetzbuch*) of 1900.[10] The civil code was introduced between 1802 and 1810 in the areas controlled by the French. Note that although Baden was never treated, it introduced a version of the French civil code in 1810.

The following two columns examine reforms in the agrarian sector: first, in column 3, the date of the effective abolition of serfdom (often a nominal though symbolic measure, as serfdom was not practiced any more around 1800 in most parts of Germany west of the Elbe) and, in column 4, the proclamation of measures determining the resolution of feudal landholding arrangements, such as the *Grundherrschaft*. In most cases, these measures consisted of laws allowing the possibility to turn feudal arrangements into free contracts and determining the price needed to redeem the property of a parcel of land (usually, 20–25 times the annual payment due to the landlord). From the dates in columns 3 and 4, it is evident how polities in the treated area undertook these reforms earlier than the ones in the control regions. At the same time, it also appears that the polities that were assigned to Prussia after the Congress of Vienna mostly maintained these reforms (Prussia itself

[10] Our results are robust to considering also other forms of written civil codes that did not recognize universal equality in front of the law, such as the Prussian *Allgemeines Landrecht* of 1795 or the Bavarian *Codex Maximilianeus* of 1756; see online Appendix E.

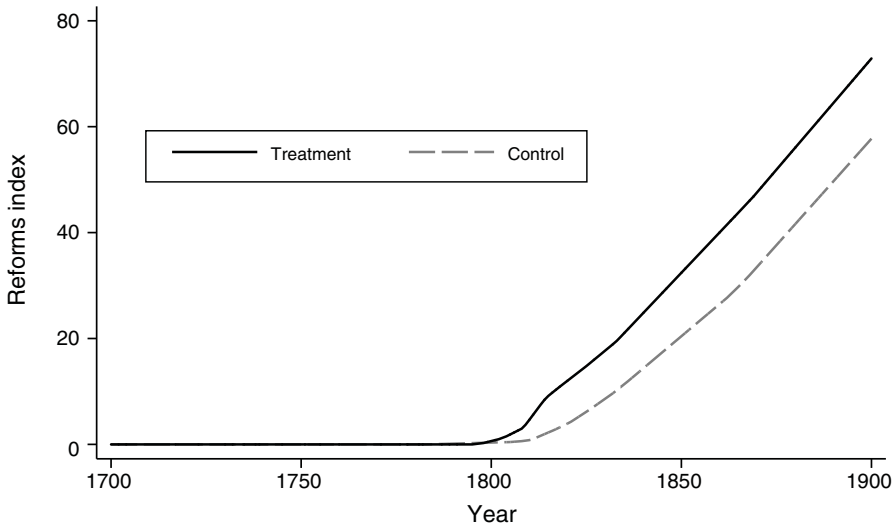

FIGURE 1. REFORMS INDEX, BY TREATMENT GROUP

is the archetypal example of "defensive modernizer"). In contrast, other states such as Brunswick, Hanover, and Hesse-Kassel, where the old rulers returned after 1815, tried to roll back the Napoleonic reforms.

Column 5 records the date in which guilds were abolished, either effectively or indirectly, by removing mandatory membership for craftsmen. We know that the abolition of guilds often went hand in hand with a liberal stance in granting concessions to set up industries and manufacturing activities, outside of the traditional crafts, even though we did not code this latter feature explicitly. Again, we see that the treated polities were early reformers (though with some setbacks), whereas the other states, with the exception of Prussia, liberalized the crafts system only later in the nineteenth century.

In columns 6 and 7 we construct a simple index of reforms at two exemplary dates, 1850 and 1900. For each polity, the index is computed simply by adding the number of years each particular reform had been in place and dividing by 4. As an example, consider the Duchy of Brunswick, which was controlled by the French through the Kingdom of Westphalia, and where the old ruling dynasty was restored by the Congress of Vienna. By 1850 there had been six years of validity of the *Code Napoléon*, the abolition of serfdom had been in place for 26 years, agrarian reforms for 25 years, and the abolition of guilds for seven years. Therefore the value of the index for the Brunswick in 1850 is $(6 + 25 + 26 + 7)/4 = 16$.

This index shows a clear distinction between parts of western Germany that were reformed by the French, those places which defensively modernized, like Prussia or Baden, and the rest of Germany—this distinction is evident in the average values reported at the bottom of each panel of Table 1, and in Figure 1. In 1850, for instance, the reform index was 50.25 for the Rhineland and 28.25 for Westphalia. The fact that it was 27 for the Prussian provinces east of the Elbe and 34.25 for Baden highlights the potential extent of defensive modernization and suggests that to be able to interpret the differences between treated and untreated polities as being due to institutions, an instrumental-variables strategy is crucial.

TABLE 2—DESCRIPTIVE STATISTICS

	West of the Elbe			Whole sample	
	All (1)	Control (2)	Treated (3)	Control (4)	All (5)
Urbanization in 1700	5.86	5.49	6.35	7.40	7.08
	[4.22]	[2.89]	[5.93]	[5.75]	[5.61]
Urbanization in 1750	7.89	7.66	8.09	8.90	8.59
	[4.12]	[4.19]	[4.4]	[4.91]	[4.61]
Urbanization in 1800	10.23	8.45	11.75	10.22	10.81
	[4.37]	[3.47]	[4.71]	[5.16]	[4.92]
Urbanization in 1850	13.78	12.38	14.97	14.45	14.65
	[6.01]	[5.42]	[6.65]	[7.9]	[7.26]
Urbanization in 1875	25.70	22.22	28.67	25.19	26.52
	[10.7]	[9.15]	[11.69]	[11.2]	[11.21]
Urbanization in 1900	39.89	35.60	43.55	38.27	40.29
	[13.92]	[12.12]	[15.2]	[14.4]	[14.54]
Share Protestant	0.579	0.532	0.618	0.677	0.654
	[0.343]	[0.385]	[0.303]	[0.347]	[0.33]
Latitude	50.43	49.28	51.41	50.97	51.14
	[1.5]	[1.15]	[0.98]	[2.22]	[1.85]
Longitude	9.89	10.89	9.03	12.78	11.34
	[2.01]	[2.08]	[1.51]	[3.49]	[3.42]
Distance to Paris	592.4	631.8	558.7	808.9	712.9
	[146.3]	[158]	[128.2]	[261.4]	[251]

Note: Mean values (weighted by total population in 1750), standard deviations in brackets.

C. *Descriptive Statistics*

Table 2 records some basic descriptive statistics for our dataset, both in the sample of 13 polities west of the Elbe (five of them in the treatment area) and in the entire sample of 19 polities. Note that the treatment area (column 3) lies entirely west of the Elbe. Areas to the east of the Elbe had stronger feudal labor relations before the nineteenth century and may thus be less comparable to, and thus worse controls for, the Western polities occupied by the French. We thus take these 13 polities to be our baseline sample. Nevertheless, we believe that the areas east of the Elbe are still useful because they provide evidence against a related but different hypothesis that part of the effects of French occupation within Germany are partly (or largely) due to defensive modernization efforts of Prussia.

The first six rows of Table 2 describe urbanization rates in the six time periods considered; this evolution is also depicted in Figures 2A and 2B. We can see that there is little difference between the urbanization levels of treatment and control groups prior to 1789. Indeed, in 1750 urbanization is slightly greater in the control group when the whole sample is considered; in contrast, urbanization is slightly greater in the treatment area when only polities west of the Elbe are considered.[11] In both cases, however, urbanization grows more rapidly in the treatment group after 1800. West of the Elbe, for example, by 1900 urbanization is almost 8 percentage

[11] The panel is not balanced, as urbanization rates are missing for the Rhineland, Westphalia, Brunswick, Baden, and Silesia in 1700.

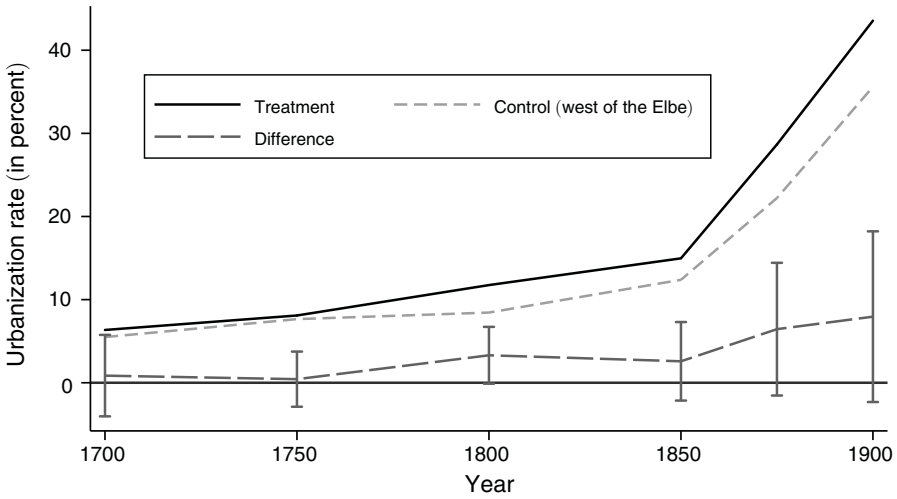

FIGURE 2A. URBANIZATION RATES, BY TREATMENT GROUP

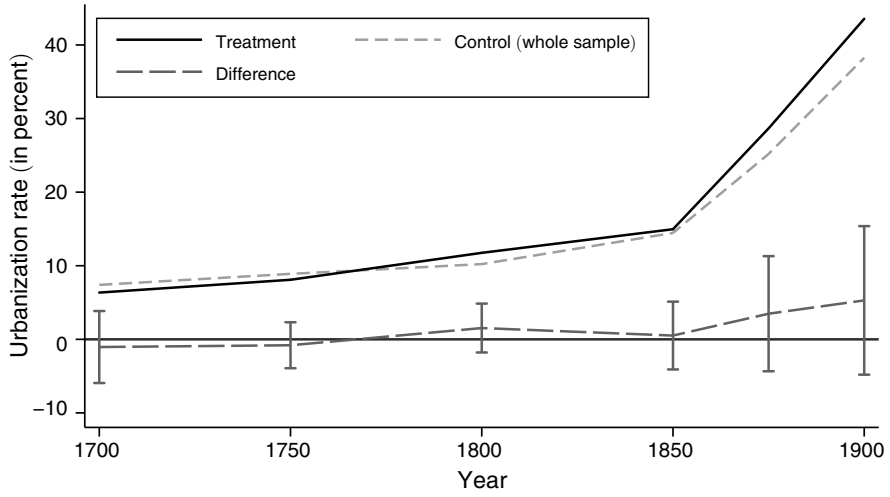

FIGURE 2B. URBANIZATION RATES, BY TREATMENT GROUP

points higher in areas occupied by Napoleon. The remaining four rows give descriptive statistics of the control variables used in parts of our analysis. The treated polities lie slightly more to the north and to the west of the control polities (and are thus closer to Paris). The share of Protestant population is also similar between treated and control polities.

III. Reduced-Form Evidence

In this section we use ordinary least squares (OLS) regressions to investigate the reduced-form relationship between our three measures of treatment and the

urbanization rates across German polities. The panel includes data for the periods 1700, 1750, 1800, 1850, 1875, and 1900. Our basic reduced-form regression model is as follows:

$$(1)\quad u_{jt} = d_t + \delta_j + \sum_{\tau \in \mathcal{T}^{pre}} \alpha_\tau \times d_\tau \times I_j + \sum_{\tau \in \mathcal{T}^{post}} \alpha_\tau \times d_\tau \times I_j + \mathbf{X}'_{jt} \times \boldsymbol{\gamma} + \varepsilon_{jt},$$

where u_{jt} is the urbanization rate in polity j at time t, the d_ts denote a full set of time effects, the δ_js denote a full set of polity fixed effects, $\mathbf{X}_{jt}$ is a vector of other covariates, which will be included in some of the robustness checks, and ε_{jt} is a disturbance term. The key variable of interest is the treatment variable I_j, which corresponds to the number of years of French presence. The coefficients of interest are thus $\{\alpha_t\}_{\tau \in \mathcal{T}^{pre}} \alpha_\tau$ and $\{\alpha_t\}_{t \in \mathcal{T}^{post}} \alpha_\tau$, where $\mathcal{T}^{pre}$ is the set of years before and $\mathcal{T}^{post}$ is the set of years after treatment, which together allow us to look at both pretrends and post-French Revolution differential effects $\left(\sum_{\tau \in \mathcal{T}} \alpha_\tau \times d_\tau \times I_j \text{ stands for a separate interaction for each } \tau \text{ in } \mathcal{T}\right)$. Under our hypothesis that French occupation was "econometrically exogenous," we expect the coefficients $\{\alpha_t\}_{t \in \mathcal{T}^{pre}}$ not to be significantly different from zero, and if the French reforms were indeed beneficial for long-run economic growth, $\{\alpha_t\}_{t \in \mathcal{T}^{post}}$ should be positive.

Throughout the paper, all standard errors are robust, clustered at the country/polity level to allow for an arbitrary variance-covariance matrix capturing potential serial correlation in the residual error term (see Jeffrey Wooldridge 2002, ch. 7).[12]

A. *Main Results*

We start in column 1 of Table 3 with our baseline sample, West of the Elbe. We also use population in 1750 as weights, since there are significant differences in the size of the polities in our sample.[13] The set $\mathcal{T}^{post}$ includes the treatment years 1850, 1875, and 1900, $\mathcal{T}^{pre}$ comprises 1750 and 1800, with 1700 as the omitted year. In column 1 we see that $\hat{\alpha}_{1750} = -0.491$ and $\hat{\alpha}_{1800} = -0.247$, indicating that areas with greater years of French presence were growing somewhat more slowly in the eighteenth century, though this differential is declining toward 1800. $\hat{\alpha}_{1850} = -0.160$ with a standard error of 0.250, so that by 1850 there was no (statistical or economic) effect of years of French presence on the growth of urbanization. By 1875, however, there is a positive association between years of French presence and urbanization, and by 1900, this effect is stronger: the estimated coefficient $\hat{\alpha}_{1900}$ is equal to 0.634. This implies a positive differential of 12 percentage points for areas treated with 19 years of French presence, which corresponds to approximately one standard deviation—a magnitude that is economically large but reasonable.[14] Even though the

[12] The Huber-White standard errors turn out to be smaller than the standard errors clustered at the country/polity level in almost all cases.

[13] Total population size in 1750 varies between less than 200,000 inhabitants (Brunswick, Mark) and over a million (Rhineland, Silesia, Hanover, Bavaria). Unweighted regressions might be driven by sudden changes in urbanization in the smaller polities as a few cities pass the 5,000 threshold to be included in the urbanization data; weighted regressions avoid this problem by giving greater weight to changes in the larger polities, which are both likely to be better measured and less subject to measurement error. Nevertheless, as is well known, there is no ex ante reason for either specification to be preferred, and throughout we report both weighted and unweighted specifications.

[14] One concern is that the number of clusters in Table 3 is relatively small (13/19 polities), raising the possibility that asymptotic approximations may not be valid. As a remedy, we use the alternative wild bootstrap procedure

Table 3—Urbanization in Germany

	Dependent variable: urbanization rate			
	West of the Elbe		All	
	Weighted (1)	Unweighted (2)	Weighted (3)	Unweighted (4)
Years French presence × 1750	−0.491	−0.252	−0.488	−0.197
	[0.249]	[0.172]	[0.235]	[0.164]
Years French presence × 1800	−0.247	−0.0425	−0.268	−0.0471
	[0.225]	[0.153]	[0.227]	[0.178]
Years French presence × 1850	−0.160	0.0332	−0.221	−0.0235
	[0.250]	[0.153]	[0.249]	[0.181]
Years French presence × 1875	0.402	0.354	0.266	0.252
	[0.326]	[0.295]	[0.303]	[0.299]
Years French presence × 1900	0.634	0.529	0.503	0.506
	[0.408]	[0.401]	[0.376]	[0.423]
Observations	74	74	109	109
Number of states	13	13	19	19
p-value for joint significance after 1800	0.0532	0.463	0.0205	0.214

Notes: All regressions have full set of territory and year dummies. Robust standard errors clustered by territory. Weighted regressions are weighted by territories' total population in 1750.

coefficients $\hat{\alpha}_{1875}$ and $\hat{\alpha}_{1900}$ are not individually significant, the *p*-value of the *F*-test for the joint significance of all post-treatment years (1850, 1875, and 1900) at the bottom of the table shows that post-treatment years are jointly statistically different than the pre-1850 dates (at a 5 percent level of significance).[15]

Column 2 repeats the same analysis without population weights. The results are qualitatively similar, though weaker: the negative pretrend is reduced, but the coefficients relating to the years 1875 and 1900 are not jointly significant anymore. Including also the territories east of the Elbe within the control region, as done in columns 3 and 4, reinforces the baseline results, both in the weighted and in the unweighted case. In column 3, the magnitudes of the coefficients are very similar to those of the restricted sample in column 1. The *F*-test for joint significance of the effects posttreatment years now rejects the null at 2 percent.

We are also able to augment our data by adding the years 1880, 1885, 1895, 1905, and 1910 for 12 of our 19 polities. Repeating our baseline regressions on the unbalanced panel that includes these years, we obtain very similar results both for the West of the Elbe sample and for the whole sample, except that the *F*-tests now always reject the hypothesis that there is no differential effect of posttreatment years at less than 1 percent in all specifications (details available upon request).

(based on the *t*-statistics with the null hypothesis imposed) suggested by A. Colin Cameron, Jonah B. Gelbach and Douglas L. Miller (2008), computing the significance levels in 10,000 replications. This procedure has varying effects on the significance levels of the results in Table 3. Results of weighted regressions usually become less significant using bootstrapped *t*-statistics, whereas results of unweighted regressions are generally unaffected or improved by this procedure. For example, in column 1 the *p*-value for $\hat{\alpha}_{1900}$ increases slightly from 0.146 to 0.285, whereas in column 2 the *p*-value for $\hat{\alpha}_{1900}$ falls from 0.212 to 0.115. Similar results apply to the other estimates in Tables 3, 4, and 6.

[15] The *F*-test enables us to investigate the hypothesis of whether there is any positive effect of French reforms, as opposed to the *t*-tests, which are for the hypothesis that they had a positive effect in a specific year.

Overall, these results show no evidence of a negative effect of French occupation on German polities. On the contrary, the estimates, and particularly the joint significance tests of post-treatment years, suggest that polities occupied and reformed by the French experienced more rapid urbanization, especially after 1850. This is not surprising. French reforms were accompanied by the disruptions caused by invasion and war, and this often had quite destructive and exploitative aspects (see, for instance, Blanning 1983, Blanning 1986).[16] Thus, the short-term impact of French invasion may well have been negative. But this is uninformative about the long-run economic impact of Revolution-imposed institutional changes. The most plausible hypothesis is that the major role of the reforms was in creating an environment conducive to innovation and entrepreneurial activity. This environment mattered most in the dissemination of the Industrial Revolution, which took place in Continental Europe in the second half of the nineteenth century.[17] Our evidence of positive effects in the second half of the nineteenth century is consistent with this hypothesis.

B. *Robustness*

Table 4 investigates the robustness of our basic reduced-form results. In column 1, we drop the coal-producing region of the Ruhr (corresponding to the former County of Mark), since the presence of coal might have created a differential growth advantage in the second half of the nineteenth century. The results are very similar to the baseline estimates.

Columns 2–6 add a full set of interactions between each of our year dummies and various time-invariant characteristics that may have caused divergent development paths. In column 2, for example, we include interactions between the year dummies and fraction of the population of the area that is "Protestant" (i.e., $\sum_{\tau} \eta_{\tau} \times D_{\tau} \times Protestant_{j}$). Column 3 instead includes a full set of year interactions with latitude to check whether our results could be due to time-varying effects of geography. In both cases, the inclusion of the sets of covariates has little effect on the magnitudes of our estimates (though with the latitude controls, the effects are no longer jointly significant at 5 or 10 percent).

More importantly, columns 4 and 5 include a full set of year interactions with longitude and with the distance to Paris. Since areas further west and closer to Paris are more likely to have been occupied by French forces, these interactions are important to check whether our exclusion restriction—that years of French presence are uncorrelated with other potential determinants of differential growth during the nineteenth century—is valid. Reassuringly, the positive effects in 1875 and 1900 are now both larger and more precisely estimated. The time interactions with longitude and distance to Paris are themselves jointly significant at the 10 percent level or

[16] Though it is possible that our urbanization measure fails to capture the short-run destructive effects of the French wars, the working paper version of our work (Acemoglu et al. 2009) reported cross-country evidence showing similar results with Maddison's estimates of GDP per capita.

[17] This argument is similar to that of Stanley L. Engerman and Kenneth L. Sokoloff (1997) and Acemoglu, Johnson, and Robinson (2002) who argue that the divergence of institutions in colonial societies, which took place between 1500 and 1800, had little economic impact until the age of industry. David Landes (1969 chs. 4–5) points out how the catch-up of continental Europe took place concurrently with the expansion of advanced industrial techniques to areas beyond textile manufacturing, in particular to railway construction, iron production, and chemical industry.

Table 4—Urbanization in Germany, Controls

	Dependent variable: Urbanization rate west of the Elbe							
	Without Mark/ Ruhr (1)	Protestant (2)	Latitude (3)	Longitude (4)	Distance to Paris (5)	Number of old territories (6)	Initial urbanization (7)	Arellano-Bond GMM (8)
Years French presence × 1750	−0.565 [0.281]	−0.547 [0.308]	−0.600 [0.356]	−0.435 [0.244]	−0.446 [0.278]	−0.531 [0.294]	−0.458 [0.267]	
Years French presence × 1800	−0.324 [0.249]	−0.336 [0.295]	−0.356 [0.324]	−0.256 [0.215]	−0.244 [0.248]	−0.288 [0.264]	−0.209 [0.245]	0.0520 [0.126]
Years French presence × 1850	−0.235 [0.275]	−0.229 [0.310]	−0.261 [0.356]	0.0182 [0.210]	−0.0269 [0.242]	−0.114 [0.257]	−0.136 [0.261]	0.372 [0.379]
Years French presence × 1875	0.324 [0.324]	0.353 [0.312]	0.292 [0.374]	0.623 [0.250]	0.561 [0.271]	0.374 [0.305]	0.418 [0.284]	
Years French presence × 1900	0.552 [0.411]	0.573 [0.370]	0.512 [0.451]	0.893 [0.321]	0.836 [0.325]	0.656 [0.382]	0.650 [0.363]	1.249 [0.713]
Lagged urbanization								−0.955 [1.345]
Observations	68	74	74	74	74	74	74	35
Number of states	12	13	13	13	13	13	13	13
p-value for joint significance after 1800	0.128	0.0705	0.176	0.0791	0.0625	0.0959	0.109	0.0312
p-value for joint significance covariates	·	0.0217	0.414	0.0222	0.0815	0.0267	0.123	

Notes: All regressions have full set of territory and year dummies. Robust standard errors clustered by territory. All regressions are weighted by territories' total population in 1750. Controls in columns 2–6 (Protestant, latitude, longitude, distance to Paris, number of prerevolutionary territories, urbanization in 1750) are included as a full set of interactions with time dummies.

less, and generally positive in value (the coefficient estimates that are not reported indicate somewhat faster urbanization growth further to the east).

Column 6 investigates the possibility that differential growth across German polities in the nineteenth century is driven by the removal of internal borders, which followed the reorganization of territories between 1792 and 1815. Some polities, such as Württemberg or the Rhineland, resulted from the dissolution and merger of dozens of minor territories. To control for the possible effects of these changes, we include a set of interactions between the number of prerevolutionary polities and post-1800 year dummies. In column 6, these interaction terms (not reported to save space) are jointly significant but negative. In any case, the point estimates for the effects of French presence are largely unaffected.

The presence of negative point estimates for 1750 and 1800 raise a potential concern that there might be mean-reverting dynamics in the growth of different polities, potentially confounding our estimates. To deal with this issue and as an additional check for differential trends, in column 7 we include a full set of interactions between initial urbanization $u_{j,1750}$ (1750 is the first date with complete urbanization figures for all polities) and the full set of year dummies. This is a flexible (and demanding) way of controlling for any mean reversion effects or preexisting trends. Nevertheless, this flexible specification has little effect on our estimates. For example, $\hat{\alpha}_{1900}$ is now 0.650 (standard error 0.362) and the interactions between initial urbanization and the year dummies are individually and jointly insignificant. Column 8 explicitly introduces the lagged dependent variable on the right-hand side as a more direct check against mean

Table 5—Occupational Shares in Germany

	Dependent variable: share of population employed in agriculture			Dependent variable: share of population employed in industry		
	West of the Elbe		All	West of the Elbe		All
	Weighted (1)	Unweighted (2)	Weighted (3)	Weighted (4)	Unweighted (5)	Weighted (6)
Years French presence, 1849	−0.430	−0.411	−0.508	0.055	0.061	0.374
	[0.468]	[0.460]	[0.346]	[0.376]	[0.342]	[0.369]
Years French presence, 1882	−0.450	−0.486	−0.585	0.420	0.386	0.594
	[0.285]	[0.244]	[0.253]	[0.256]	[0.240]	[0.267]
Years French presence, 1895	−0.570	−0.601	−0.658	0.472	0.449	0.640
	[0.266]	[0.242]	[0.182]	[0.248]	[0.231]	[0.222]
Years French presence, 1907	−0.554	−0.585	−0.724	0.350	0.321	0.570
	[0.281]	[0.264]	[0.237]	[0.284]	[0.251]	[0.237]

Notes: Each cell corresponds to one cross-sectional regression. District level data. Robust standard errors clustered at the state level. All regressions weighted by the districts' total population in 1849. Number of observations (baseline/west of Elbe): 39/23 (1849), 62/44 (other years).

reversion. To ensure consistency, these models are estimated using the Generalized Method of Moments (GMM) strategy suggested by Manuel Arellano and Stephen R. Bond (1991). We drop 1875 to obtain a panel with equidistant dates. The results are generally similar to the baseline OLS estimates; the effect of the lagged dependent variable itself is insignificant. Also noteworthy is that in this specification we find no evidence of preexisting trends favoring areas subsequently occupied by the French. We find this reassuring for our overall empirical strategy.

C. *Additional Outcome Variables*

In addition to the previous results based on urbanization rates as our outcome variable, in Table 5 we provide evidence using the sectoral composition of employment as the outcome variable. Data are available for 64 districts across Germany for the years 1849, 1882, 1895, and 1907. The advantage of using sectoral shares is that it delivers a check on our results based on urbanization rates, through a variable that closely captures the move out of agricultural activities and into the industrial and manufacturing sectors. The disadvantage is that, given that the data start in 1849, we cannot check for pretrends in the period before 1800. Given the lack of data before 1800, we simply report a series of cross-sectional regressions of the form:

$$y_{jt} = d_t + \alpha_t \times I_j + \varepsilon_{jt}, \tag{2}$$

for each t. Here y_{jt} is the outcome variable (sectoral shares of agriculture or industry/manufacturing) in district j at time t, d_t now denotes a year-specific constant, I_j again represents years of French presence in district j, ε_{jt} is a disturbance term, and α_t is the coefficient of interest. In particular, changes in α_ts can be interpreted as differential growth related to French treatment.

The results in Table 5 show that, both west of the Elbe and in the whole sample, there was already less agricultural and more industrial employment in areas

occupied by the French by 1849, though these differences are not statistically significant. They become larger and statistically significant by 1882 and remain so until 1908. This evidence therefore corroborates the pattern that emerges from the urbanization data, suggesting that there was more rapid industrialization in areas that underwent more significant reforms because of French occupation and invasion.

IV. Institutional Reforms and Economic Growth

In this section, we first use the data we collected on institutional reform across the German polities to document the relationship between French occupation and (the timing of) reforms, thus establishing a firm link between French control and dimensions of institutional reforms that we can measure. We then use this relationship as the first stage for a two-stage least squares (2SLS) strategy, where we estimate the effect of an index of institutional reforms on growth during the nineteenth century. This 2SLS strategy has three distinct advantages. First, it enables us to show a simple link between institutional reforms and growth in the nineteenth century. Second, the reduced-form evidence is difficult to interpret because some of the control polities, such as Baden or the provinces of Prussia east of the Elbe, also underwent institutional reforms, in part in a process of "defensive modernization" in response to the threat of further French domination in continental Europe. The 2SLS estimates will be more readily interpretable. Third, this strategy will enable us to conduct overidentification tests to investigate whether we can reject the hypothesis that the effects of French occupation are working primarily or solely through the institutional reforms.

A. *French Occupation and Institutional Reforms*

Table 1 and Figure 1 depicted our overall reform index and illustrated the relationship between our various reform measures and years of French presence. To summarize the relationship between the reform index and French occupation more succinctly and in a way that can be used as the first stage for our 2SLS strategy, we posit the following simple regression equation:

$$R_{jt} = d_t + \delta_j + \psi \times t \times T_{t>1800} \times I_j + \eta_{jt}, \tag{3}$$

where R_{jt} is the value of our reform index for polity j at time t; d_t and δ_j are time effects and polity fixed effects; as usual, I_j is our treatment variable, years of French presence, and η_{jt} is a disturbance term. The variable $T_{t>1800}$ is a dummy for post-1800 dates (1850, 1875, and 1900), so that $t \times T_{t>1800}$ is a linear time trend that turns on after 1800 (and is equal to 0 before then).[18] Intuitively, this form implies that the longer it has been since a polity has undergone French occupation, the higher its reform index will be. This functional form is reasonable given the process of reform in Germany, which started earlier in areas under French occupation but, by the late 1800s, spread similar reforms to the rest of Germany.

[18] To simplify the interpretation of coefficients, time t is divided by 1,000.

TABLE 6—URBANIZATION IN GERMANY, IMPACT OF REFORMS

	Dependent variable: urbanization rate				
	West of the Elbe			All	
	Weighted (1)	Weighted, overid (2)	Unweighted (3)	Weighted (4)	Unweighted (5)
Panel A. OLS estimation					
Reforms index	0.281	0.281	0.220	0.268	0.191
	[0.114]	[0.114]	[0.122]	[0.110]	[0.105]
Panel B. First stage					
French presence × post1800 × trend	1.166		1.116	1.006	0.960
	[0.107]		[0.143]	[0.108]	[0.145]
F-statistic excluded instruments	119.7	121.6	61.85	87.57	43.71
p-value *F*-statistic	0.000	0.000	0.000	0.000	0.000
Panel C. 2SLS estimation					
Reforms index	0.291	0.321	0.204	0.284	0.193
	[0.102]	[0.112]	[0.124]	[0.112]	[0.143]
Observations	74	74	69	109	109
Number of states	13	13	12	19	19
p-value overidentified test		0.328			

Notes: All regressions have full set of territory and year dummies. Robust standard errors clustered by territory. Weighted regressions are weighted by territories' total population in 1750. The overidentified regression in column 2 uses a full set of interactions of "Years of French presence" and year dummies as excluded instruments.

Estimates from equation (3) are shown in panel B of Table 6. The first column, using the sample west of the Elbe and population in 1750 as weights, shows a strong relationship between our French occupation interaction variable and the reform index. The coefficient estimate is 1.166 (standard error = 0.107). This strong relationship indicates that even though there were reforms in German areas not occupied by the French (perhaps because of "defensive modernization"), occupation by the French was a significant determinant of reform. Column 2 replaces the French occupation interaction variable $t \times T_{t>1800} \times I_j$ with a set of interactions of year dummies (from 1850 on) with years of French presence and reports the *p*-value of joint significance of all these interaction terms. This specification also supports the hypothesis of a link between French rule and the implementation of reform (*p*-value = 0.000). Finally, columns 3–5 confirm these results by looking at specifications without population weights and using the whole of Germany including areas east of the Elbe in the sample. The magnitudes of the estimated coefficients are very similar.

B. *Two-Stage Least Squares Estimates*

We next turn to the 2SLS estimates of the effect of our reform index on urbanization. We posit the following second-stage equation:

$$u_{jt} = d_t + \delta_j + \phi \times R_{jt} + \upsilon_{jt}, \tag{4}$$

where u_{jt} is urbanization, d_t and δ_j are time effects and polity fixed effects.

The results of estimating (4) using (3) as the first-stage relationship are also shown in Table 6. Panel A shows the OLS relationships for comparison. In the OLS, there is a positive and significant association between our reform index and urbanization in all specifications reported in Table 6.

Panel B reports the 2SLS estimates of (4). For our baseline setup, column 1 shows an estimate of $\hat{\phi} = 0.290$ (standard error $= 0.102$), which is highly significant. Interestingly, this coefficient is of similar magnitude to the OLS estimate, which suggests that three biases likely to be present in the OLS could be canceling each other. The first of these biases is that the timing of reform is endogenous, which will lead to an upward bias. The second is that many of the "control" polities also underwent reforms, perhaps in response to the French threat, causing a potential downward bias. The third is that the OLS coefficient might be subject to considerable (downward) attenuation, both because the extent of reform is measured with error and also because, conceptually, our reform index is only a proxy for a broader range of institutional reforms undertaken during this era.

Column 2 estimates the same model on the same sample, but now using all post-1800 interactions (i.e., the $\sum_{\tau \in \mathcal{T}^{post}} \alpha_\tau \times d_\tau \times I_j$ terms in terms of equation (1), where this set $\mathcal{T}^{post}$ includes 1850, 1875, and 1900) as instruments. This not only enables us to have a stronger first stage, but also, because we have more instruments than endogenous variables, we can perform an overidentification test for all of these interactions being jointly valid instruments. Econometrically, this is just a standard overidentification test. Economically, it amounts to testing whether we can reject the hypothesis that the effects of the post-1800 time interactions with French occupation work primarily or solely through the reforms index (and thus through the institutional changes that the French imposed). To perform the overidentification test, we use the Huber-White variance-covariance matrix without clustering, since this corresponds to smaller standard errors and thus stacks the cards against our hypothesis. The p-value of the overidentification (F-)test reported at the bottom shows that we comfortably fail to reject the above-mentioned hypothesis. This gives some support to our interpretation that French occupation impacted urbanization in German polities in the second half of the nineteenth century mainly through the institutional reforms that it imposed.

Column 3 estimates the same model as in column 1, now in an unweighted regression. The 2SLS estimate is now smaller, 0.204, with a larger standard error, and is thus significant only at 10 percent. In columns 4 and 5, we include polities to the east of the Elbe, and the 2SLS coefficient estimates are very similar to the corresponding estimates of columns 1 and 3.

Overall the results in this section are broadly consistent with our interpretation that occupation by the French induced significant institutional reforms and that these reforms paved the way for more rapid economic development, particularly in the second half of the nineteenth century.

V. Concluding Remarks

The French Revolution of 1789 started a complex process involving, among other things, radical institutional changes. This process of change did not stop at the

French borders: the French revolutionary armies, and later Napoleon, invaded and controlled large parts of Europe, including areas of Germany, where they undertook essentially the same radical political, legal, and economic reforms as in France. However, invasion also came with chaos and the exploitation of the occupied territories. This article is an attempt to gauge the long-run consequences of the French Revolution, considering the radical institutional reforms imposed on neighboring countries as a quasi-natural experiment.

We find no evidence that areas that were under French occupation experienced less rapid development. On the contrary, all of our evidence points to more rapid economic growth as proxied by urbanization in areas that underwent the radical institutional reforms brought by the French Revolution, especially after 1850. We also presented additional evidence suggesting that the primary channel of influence of French occupation was likely to have been the institutional reforms of the Revolution. These findings are interesting not only because they provide a historical appraisal of the economic impact of the French Revolution, but more importantly because of their implications about the consequences of radical institutional reform. Scholars have disagreed on the effectiveness of externally imposed radical institutional changes. The French Revolution is a clear example of a large-scale, radical and "designed" institutional change. In this light, our findings support the centrality of institutional differences for comparative economic development. More important, the results are inconsistent with the view that externally imposed, radical, and "Big Bang" style reforms can never be successful. On the contrary, the evidence supports our hypothesis that the institutions of the *ancien régime*, in particular feudal land and labor relations, urban oligarchies and guilds, and lack of equality before the law, impeded prosperity, and that the radical institutional reforms that removed these barriers paved the way for industrialization and economic growth.

Naturally, all of these findings have to be interpreted with caution for several reasons. First, the evidence we present is fairly clear that institutional changes imposed by the French Revolution did not have any negative effects, but the positive effects are significant only in some specifications. Second, our analysis was limited to the available historical data. Third, results from one historical episode cannot always be extrapolated to other eras.[19] Nevertheless, it is noteworthy that our findings do suggest that radical institutional reforms can have long-run beneficial consequences, at least in certain historical contexts. This conclusion, if valid, raises the question: why did they work when other externally imposed reforms often fail? One possibility is that this was because the reforms were much more radical than is typically the case.[20] The French reformed simultaneously in many dimensions and weakened the powers of local elites, making a return to the status quo ante largely impossible. Even when some prerevolution elites returned to power after 1815, there was a permanent change in the political equilibrium. This scope and radicalism of the French reforms are common with the postwar reform experiences in Germany and Japan and stand

[19] Moreover, even if the imposition of French institutions did spur long-run growth, this would not mean that they were "welfare enhancing" since they were imposed by force, they entailed various short-run and medium-run costs, and, most importantly, French occupation created major distractions and human suffering.

[20] See Acemoglu and Robinson (2008) for a model in which limited reforms can be counterproductive.

in contrast with many other, less successful reform experiences.[21] Nevertheless, we are not able to provide any evidence that this is the correct interpretation of the historical events surrounding the French Revolution, and we view a more detailed investigation of when and how externally imposed institutional reforms could be effective and contribute to economic development as an interesting area for future theoretical and empirical work.

Data Description

Variable	Description—Source
Distance to Paris	Great circle distance from a territory's capital to Paris—own calculation, based on latitude and longitude data.
Latitude	Latitude in degrees of a territory's capital—Wikipedia.
Longitude	Longitude in degrees of a territory's capital—Wikipedia.
Number of prerevolutionary territories	Number of territories of the Holy Roman Empire (immediate to the Emperor) existing prior to the invasion of French Revolutionary armies and the dissolution of the Empire through the *Reichsdeputationshauptschluss*—see online Appendix C.
Share agriculture	Share of total population (in percent) whose primary employment is in the agricultural sector—Frank (1994)
Share industry	Share of total population (in percent) whose primary employment is in the industrial and manufacturing sector—Frank (1994)
Share Protestant	Approximate share of the population of Protestant (Lutheran/Calvinist) faith around 1800—own projection, based on nineteenth century census data. Cf. also online Appendix B.
Urbanization rate	Percent of total population living in cities above 5,000 inhabitants—see online Appendix B.
Years French presence	Years of presence of French troops or rule by French-appointed rulers—Grab (2003).

REFERENCES

Acemoglu, Daron. 2008. "Oligarchic versus Democratic Societies." *Journal of the European Economic Association*, 6(1): 1–44.

Acemoglu, Daron, and James A. Robinson. 2008. "Persistence of Power, Elites, and Institutions." *American Economic Review*, 98(1): 267–93.

Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2002. "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution." *Quarterly Journal of Economics*, 117(4): 1231–94.

Acemoglu, Daron, Davide Cantoni, Simon Johnson, and James A. Robinson. 2009. "The Consequences of Radical Reform: The French Revolution." National Bureau of Economic Research Working Paper 14831.

Acemoglu, Daron, Davide Cantoni, Simon Johnson, and James Alan Robinson. 2011. "The Consequences of Radical Reform: The French Revolution: Dataset." *American Economic Review*. http://www.aeaweb.org/articles.php?doi=10.1257/aer.101.7.3286.

[21] Our results also have some relevance to the literature on the role of culture in economic development and on the interactions between culture and institutions (e.g., Lawrence E. Harrison and Samuel P. Huntington 2000; Avner Greif 2006; Guido Tabellini 2010). In this context, the relatively successful transplantation of French institutions on several German polities with different histories, cultures and traditions also suggests that differences in culture do not create immutable barriers against institutional reform.

Arellano, Manuel, and Stephen Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." Review of Economic Studies, 58(2): 277–97.
Bairoch, Paul. 1988. *Cities and Economic Development: From the Dawn of History to the Present*. Translated by Christopher Braider. Chicago: University of Chicago Press.
Bairoch, Paul, Jean Batou, and Pierre Chevre. 1988. The Population of European Cities, 800–1850: Data Bank and Short Summary of Results. Geneva: Librarie Droz.
Berkowitz, Daniel, Katharina Pistor, and Jean-Francois Richard. 2003a. "Economic Development, Legality, and the Transplant Effect." European Economic Review, 47(1): 165–95.
Berkowitz, Daniel, Katharina Pistor, and Jean-Francois Richard. 2003b. "The Transplant Effect." American Journal of Comparative Law, 51(1): 163–203.
Blanning, Timothy C. W. 1983. *The French Revolution in Germany: Occupation and Resistance in the Rhineland, 1792–1802.* Oxford: Oxford University Press.
Blanning, Timothy C. W. 1986. *The Origins of the French Revolutionary Wars.* London: Longman.
Blanning, Timothy C. W. 1996. *The French Revolutionary Wars, 1787–1802.* New York: St. Martin's Press.
Blum, Jerome. 1978. *The End of the Old Order in Rural Europe.* Princeton, NJ: Princeton University Press.
Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller. 2008. "Bootstrap-Based Improvements for Inference with Clustered Errors." Review of Economics and Statistics, 90(3): 414–27.
Connelly, Owen. 1965. *Napoleon's Satellite Kingdoms.* New York: Free Press.
de Vries, Jan. 1984. *European Urbanization, 1500–1800.* Cambridge, MA: Harvard University Press.
Diefendorf, Jeffry. 1980. *Businessmen and Politics in the Rhineland, 1789–1834.* Princeton, NJ: Princeton University Press.
Doyle, William. 1989. *The Oxford History of the French Revolution.* Oxford: Oxford University Press.
Ellis, Geoffrey. 2003. *The Napoleonic Empire.* New York: Palgrave Macmillan.
Engerman, Stanley L., and Kenneth L. Sokoloff. 1997. "Factor Endowments, Institutions, and Differential Paths of Growth among New World Economies: A View from Economic Historians of the United States." In How Latin America Fell behind: Essays on the Economic Histories of Brazil and Mexico, 1800–1914, ed. Stephen Haber, 260–304. Stanford, CA: Stanford University Press.
Epstein, Stephan R. 1998. "Craft Guilds, Apprenticeship, and Technological Change in Preindustrial Europe." Journal of Economic History, 58(3): 684–713.
Esdaile, Charles J. 1996. *The Wars of Napoleon.* New York: Longman.
Esdaile, Charles J. 2001. *The French Wars, 1792–1815.* New York: Routledge.
Fisher, Herbert A. L. 1903. *Studies in Napoleonic Statesmanship: Germany.* Oxford: Clarendon Press.
Frank, Harald. 1994. *Regionale Entwicklungsdisparitten im Deutschen Industrialisierungsprozess 1849–1939: Eine Empirisch-analytische Untersuchung.* Muenster: Lit.
Gates, David. 1997. *The Napoleonic Wars, 1803–1815.* New York: Edward Arnold Publishers.
Grab, Alexander. 2003. *Napoleon and the Transformation of Europe.* New York: Palgrave Macmillan.
Greif, Avner. 2006. *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*. Cambridge: Cambridge University Press.
Harrison, Lawrence E., and Samuel P. Huntington. 2000. *Culture Matters.* New York: Basic Books.
Hayek, Friedrich. 1960. *The Constitution of Liberty.* Chicago: Chicago University Press.
Kisch, Herbert. 1989. *From Domestic Manufacture to Industrial Revolution: The Case of the Rhineland Textile Districts.* Oxford: Oxford University Press.
Landes, David. 1969. *The Unbound Prometheus.* Cambridge: Cambridge University Press.
La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny. 1998. "Law and Finance." Journal of Political Economy, 106(6): 1113–55.
Lindberg, Erik. 2009. "Club Goods and Inefficient Institutions: Why Danzig and Lübeck Failed in the Early Modern Period." Economic History Review, 62(3): 604–28.
Lyons, Martyn. 1994. *Napoleon Bonaparte and the Legacy of the French Revolution.* New York: St. Martin's Press.
Mokyr, Joel. 2003. "Industrial Revolution." In Oxford Encyclopedia of Economic History, ed. Joel Mokyr. Oxford: Oxford University Press.
Ogilvie, Sheilagh. 2004. "Guilds, Efficiency, and Social Capital: Evidence from German Proto-industry." Economic History Review, 57(2): 286–333.
Ogilvie, Sheilagh. 2007. "Can We Rehabilitate the Guilds? A Sceptical Re-Appraisal." University of Cambridge Working Paper in Economics 2007.
Olson, Mancur. 1982. *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities.* New Haven, CT: Yale University Press.
Palmer, Robert R. 1959. *The Age of Democratic Revolution. Vol. I: The Challenge.* Princeton, NJ: Princeton University Press.

Palmer, Robert R. 1964. *The Age of Democratic Revolution. Vol. II: The Struggle.* Princeton, NJ: Princeton University Press.

Rodrik, Dani. 2007. *One Economics, Many Recipes: Globalization, Institutions, and Economic Growth.* Princeton, NJ: Princeton University Press.

Rudé, Georges. 1988. *The French Revolution:* Its Causes, Its History and Its Legacy After 200 Years. New York: Grove Press.

Tabellini, Guido. 2010. "Culture and Institutions: Economic Development in the Regions of Europe." Journal of the European Economic Association, 8(4): 677–716.

Wooldridge, Jeffrey. 2002. Econometric Analysis of Cross Section and Panel Data. Cambridge, MA: MIT Press.

Woolf, Stuart. 1991. *Napoleon's Integration of Europe.* New York: Routledge.