

Liberty, Fraternity, Equality and Industry: The Economic Consequences of the French Revolution*

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Abstract

The French Revolution of 1789 had a momentous impact on neighboring countries. The French Revolutionary armies during the 1790s invaded and controlled Belgium, the Netherlands, Italy, Switzerland, and parts of Germany, and Napoleon in the early 1800s extended the French control over these territories and also conquered Spain. Together with invasion came various radical institutional changes. Most notably, the French Revolution removed the legal and economic barriers that had protected the privileged (nobility, clergy, and urban oligarchies), established the principle of equality before the law, and led to a reorganization of the state. In this paper, we argue that the French Revolution can be considered an exogenously-imposed institutional change on neighboring countries and we study its impact on economic outcomes. We also use this experience to evaluate several central theses about institutions: (1) that they efficiently adapt to a society's characteristics, (2) that evolved institutions are inherently superior to those rationally designed, (3) that institutions must be 'appropriate' and cannot be 'transplanted', and (4) the Civil Code has adverse economic effects. Both at the country and the city level, the evidence suggests that areas that were occupied by the French and that underwent radical institutional reform experienced somewhat more rapid economic growth, urbanization and industrialization, especially after 1850, though in some specifications the results are not statistically significant and in some others, we find slight pre-existing trends. On the whole, the evidence is more consistent with the view that the institutional reforms brought about by the French Revolution had long-run beneficial effects and therefore militates against all four of the above theses. Our interpretation is that the Revolution destroyed (the institutional underpinnings of) the power of oligarchies and elites opposed to economic change, and combined with the arrival of new economic and industrial opportunities in the second half of the 19th century, helped pave the way for future economic growth.

Keywords: institutions, civil code, guilds, democracy, oligarchy, political economy.

JEL Numbers: I10, O40, J11.

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1 Introduction

In this paper we examine the economic impact of the French Revolution of 1789 on the rest of Europe. This is a particularly interesting episode to study for at least two reasons.

First, the French Revolution provides an ideal example of a large change in institutions during a critical period of European history, thus enabling us to investigate how the *ancien regime* of many European nations and cities at the end of the 18th century were (or were not) reformed, and how this affected the future growth potential of these economies. Before invasion by the French Revolutionary armies or Napoleon, much of Europe was dominated by large aristocratic landowners, the Church or by urban oligarchies and guilds; the peasants and workers had no equality before the law, and in many cases, peasants were still tied to the land by serfdom or were subject to quasi-feudal obligations; and the middle classes had no representation in the political process. Part of the stated mandate of the French Revolution was to change this political and economic system not only in France, but in all of Europe. In many cases there were indeed important steps in this direction, including the abolition of serfdom and aristocratic privileges in many areas of Europe, the confiscation of the lands of the Church, the removal of the power of the guilds, the abolition of sale of offices in the judiciary and bureaucracy, and the introduction of a legal code emphasizing equality before the law. A study of the effects of the French Revolution on neighboring countries and cities, therefore, gives us an opportunity to investigate whether these radical political, economic and legal reforms were effective and what their economic implications were in the decades that followed.

Second, the impact of the French Revolution on the institutions of the world and its legacy are still hotly debated, even though, to the best of our knowledge, a systematic empirical analysis of its consequences has never been undertaken. The debate on French Revolution started in its modern form by the pamphlet published by the conservative English philosopher Edmund Burke in 1790, entitled *Reflections on the Revolution in France*. In this pamphlet, Burke condemned the brutality, the interventionist spirit and the radicalism of the French Revolution. He argued that whilst the English Revolution of the previous century had emphasized liberty and rights for the propertied middle classes, who could productively participate in the political process, the French Revolution was bringing the worst elements of chaotic democracy, tyranny, and a destructive spirit, tearing down the established regime without a viable alternative to replace it. Consequently, Burke wrote:

“It is with infinite caution that any man should venture upon pulling down an edifice, which has answered in any tolerable degree for ages the common purposes of society, or on building it up again without having models and patterns of approved utility before his eyes.”

The conclusion Burke drew from these events was that the negative impacts of the French Revolution would be felt not only in France and not only in its immediate aftermath, but would potentially change the world for many more decades or even centuries to come.

On the other side, the positive reception of the French Revolution was as enthusiastic as Burke’s condemnation. Thomas Paine, in a book that would subsequently become a classic for the democratization movements of the 19th-century Europe, *The Rights of Man*, responded to Burke. The essence of Paine’s argument was closely related to the reforms brought about by the French Revolution; Paine hailed the French Revolution as the harbinger of freedom and equality before the law, a role that it achieved by demolishing the *ancien regime*.¹ Paine argued:

“man has no property in men; neither has any generation a property in the generations that have to follow.”

And he continued:

“It was ... against the despotic principles of the government, that the nation revolted. These principles had ... their origins ... in the original establishment, many centuries back; and they were become too deeply rooted to be removed, and the Augean stable of parasites and plunderers too abominably filthy to be cleansed, by anything short of a complete and universal revolution.”

According to Paine, the French Revolution was exactly the kind of radical institutional reform necessary to break the hold on land and people exercised by the *ancien regime*, which was not only morally abhorrent, but also the source of significant economic inefficiencies. The Revolution would therefore pave the way for modern freedoms and democratic institutions by removing serfdom, aristocratic privileges, the Church’s domination over politics and land, and the inequity before the law.

¹Interestingly, Paine was tried and convicted for treason in his native England, because of his response to Burke’s pamphlet and never returned back there, instead settling in the United States. He was also ostracized as too radical a thinker in America and died in poverty.

The debate between Burke and Paine has not been resolved by current research. Many economic historians, like Landes (1969, p. 142), view the French Revolution as “...a political roadblock...” to technological adoption for Continental countries, and conclude that as a consequence of the Revolution, “...the gap in technique [between the Continent and Britain] had widened, while most of the fundamental educational, economic, and social obstacles to imitation remained” (Landes, 1969, p. 147). Similarly, Buyst and Mokyr (1990, p. 64, 74) write: “it is our contention ... that the Dutch economy in the years of the French and Napoleonic Wars was another example of a small open commercial economy whose prosperity was disrupted by world events ... The French period ... [was] disastrous for the Dutch economy.” Crouzet’s (2001, p. 121) view is similar, noting “the French Revolution and the wars that followed greatly slowed the transfer of technology.” On the other hand, many other economic historians also agree with Mokyr’s assessments that “the Revolution’s long-term effect was to clear up the debris of the ancient regime on the Continent, thus assuring Europe’s ability eventually to follow Britain in revolutionizing its productive system” (1990, p. 259), and that “the French Revolution and Napoleon installed more forward looking governments in Europe” (1990, p. 253) (see also Crouzet, 2001, p. 122, Cameron, 1993, pp. 211-213). Even Landes, who generally emphasizes the negative effects of the Revolution, also mentions in passing that such institutional changes as the abolition of guilds were beneficial (1969, pp. 144-145).²

Perhaps more importantly, the debate between Burke and Paine persistently recurs in modern debates on the role of institutions and institutional change. A dominant paradigm in economics maintains that institutions efficiently adapt to the underlying characteristics of society (e.g., Demsetz, 1967). If this is true, then enforced institutional change will often reduce prosperity. The impact of the French Revolution on much of Europe is reminiscent of a quasi-natural experiment where institutions were changed in a way orthogonal to such underlying characteristics, and any beneficial effects of such institutional change would be evidence against this view. Second, following Hayek (1960), it is common to view institutions that have evolved over time as superior to those which are created by “rational design” or outside reform. Third, and related, many authors suggest that institutions must be “appropriate” and cannot be efficiently “transplanted” (e.g., Berkowitz, Pistor and Richard, 2003). Finally,

²Most historians of the French Revolution also view the institutional reforms imposed by the French Revolutionary armies and Napoleon as significant improvements relative to the situation at the time. See, for example, Rude (1964), Kisch (1962), Trebilcock (1981), Doyle (1989), or Grab (2003), though none of these works systematically investigates the economic consequences of the Revolution either in the short run or in the long run.

much recent research has suggested that French institutions, particularly the Civil Code transplanted throughout Europe so vigorously by Napoleon, has adverse effects for institutional and economic development (e.g., LaPorta et al., 1998). The imposition of French institutions and the Civil Code by the Revolution and Napoleon provides us with an opportunity to investigate these ideas.

We therefore investigate the economic and institutional implications of the French Revolution both to shed light on the Revolution’s long-run legacy and use this as a way of evaluating some important hypotheses about institutions and development. Our empirical approach is to study the impact of the French Revolution on countries and cities, conquered by the French Revolutionary armies and subsequently by Napoleon.³ These countries and cities did not choose the French institutions, but those institutions were *imposed* on them first by the Revolution.⁴ Therefore, to a first approximation, we can think of the imposition of the institutions of the French Revolution as an “exogenous treatment”.⁵

Territorial expansion by French Revolutionary armies had two major objectives. The first was defensive, especially, in response to the threat of Austrian or Prussian (or later English) attempts to topple the Revolutionary regime. The second was expansionary. This was partly because of resource needs of the French Republic, and partly because of the ideology of the French Revolution. As one of the early leaders of the Revolution, Marquis de Lafayette, argued, the Revolution was a template for institutional change for the rest of the world in general and for Europe in particular. In a speech delivered to the American Congress, Lafayette stated: “May this great monument, raised to Liberty, serve as a lesson to the oppressor, and an example to the oppressed!” (quoted in Paine). In addition, in the early 1790s, the French sought to establish France’s natural frontiers”.⁶

³Napoleon invaded and temporarily occupied most of western continental Europe, but in many places, his reign was limited and involved few important reforms. Below, we discuss different ways of treating areas briefly invaded by Napoleon.

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

⁵Naturally, the fact that these institutions were imposed by the French is not enough to make the treatment *econometrically exogenous*, and we also need that treated and untreated places were otherwise similar (e.g., on similar trajectories in terms of economic growth). Much of the empirical work below will investigate whether or not this is so.

⁶For example, the Revolutionary leader George Danton stated: “Les limites de la France sont marquees par la nature, nous les atteindrons des quatre coins de l’horizon, du cote du Rhin, du cote de l’Ocean, du cote des Alpes. La, doivent finir les bornes de notre republique.” (speech to National Convention, January 31, 1793; quoted in Blanning 1983, p. 2). Grab (2003, p. 1) summarizes these motives and arguments as: “The revolutionary governments justified the occupation of foreign lands, using the theory of ‘natural frontiers’ and

The Revolutionary armies, starting in the 1790s, invaded Belgium, the Netherlands, Switzerland, Italy and western parts of Germany. In all of these cases, they brought abrupt change in economic and legal institutions and the organization of the state. Where the Revolutionary armies started, Napoleon followed. He consolidated and to some extent expanded on the earlier gains, particularly by adding satellite states in Germany. As Grab (2003, p. xi) puts it: “Revolutionary France had initiated many of these changes and Napoleon exported them throughout Europe.” Napoleon himself saw the most important reform he introduced in the areas he controlled was the imposition of the Civil Code (*Code Napoleon*) (Lyons, 1994, p. 94).

The areas invaded by the French Revolutionary forces, with control and institutional change later consolidated by Napoleon, were previously under the control of rural oligarchies consisting of the aristocracy and the clergy, or of urban oligarchies consisting of long-established families and guilds. The French intervention largely destroyed these established oligarchies and the institutional underpinnings of their power, removed feudal privileges, and abolished guilds. For example, the decree of August 4th, 1789, abolished feudalism in France, removed aristocratic privileges (such as exemption from taxation), prohibited the sale of offices in the judiciary and bureaucracy and opened these positions to all citizens. The constitution of September 1791, in turn, removed a range of guild restrictions, and eliminated customs on goods transported within the country. These institutions were *forcibly* exported to other countries over the next 20 or so years. Napoleon’s preferred institutions were not identical to those of the early revolutionaries, but they were nonetheless related.⁷

Our empirical strategy to assess the long-run economic implications of the French Revolution is to classify countries and cities into “treated” and “untreated” depending on whether they were invaded by the Revolutionary armies and/or by Napoleon,⁸ and then look for potentially divergent the economic trajectories of these different areas using available data on urbanization, GDP and industrial production. One obvious difficulty is that the imposition of new institutions came together with French invasion, thus with the disruptions of war and sometimes the taxes that the French imposed in these new territories. In fact, much evidence

declaring their intention or liberating oppressed people from tyrannical regimes.”

⁷As discussed below, Napoleon was also much more likely to enter into alliances with local oligarchies, which is perhaps not surprising given that he ran France first as a dictator and then as an emperor, quite opposed to the original republican principles of the Revolution. At some level, whether institutional reforms undertaken under the auspices of the Revolution versus those of Napoleon were similar and which ones had more positive effect on economic outcomes are empirical questions. Our empirical results, if anything, suggest that the effects of reforms imposed by the French Revolutionary armies were, in the long run, more beneficial than those of Napoleon.

⁸We experiment with various different ways of classifying countries and cities briefly occupied by Napoleon.

suggests that the French invasion was often quite destructive and exploitative (see, for example, Blanning, 1983, 1986). Grab (2003, p. 1), for example, writes “...the French armies requisitioned provisions and imposed heavy war contributions of occupied regions, thereby alienating their populations.” Thus, the short-term impact of French invasion may have been negative, and in any case, should be viewed as the outcome of multiple factors, many of them related to the disruption of the war economy. It is therefore unlikely that these short-term changes could be informative about the impact of Revolution-imposed institutional changes. Moreover, it is improbable that the Revolution had a major effect on agriculture. For example, Hoffman (1996, p. 193) argues, for the French case, “The weight of the seigneurial system was often light, ..., and the village community was not the major obstacle to economic growth in agriculture,” and the same appears to have been the case in the Belgium, Netherlands, Switzerland, and the Rhineland, areas first conquered by the French Revolutionary armies (e.g., Blanning, 1983).

Instead, our working hypothesis is that the institutional changes brought about by the French Revolution should have encouraged industrialization and economic growth in later decades. As noted, this is line with the part of the economic history literature that has seen the institutional changes wrought by the Revolutionary armies as part of the prerequisites for economic growth. Even though in this period European countries were not much poorer than Britain, as argued in Engerman and Sokoloff (1997), Acemoglu, Johnson and Robinson (2002) and Acemoglu (2003), societies with and without oligarchic institutions may have significantly divergent economic fortunes when these institutional differences interact with new economic opportunities, such as industrialization. This is particularly likely to be the case since the traditional urban and rural oligarchies would have slowed down the adoption of new technologies by creating entry barriers (Acemoglu, 2003) or even would have attempted to block them (Acemoglu and Robinson, 2006b) in order to protect their economic and political rents. The age of industry for Continental Europe was the second half of the 19th century. This reasoning suggests that we may find a significant effect of the institutional reforms brought about by the French Revolution during the age of industry, that is, in the second half of the 19th century. For this reason, our main empirical strategy is to look for differences between treated and untreated countries or cities starting around 1850. We treat the decades before 1850 (depending on data set between 1750 and 1830) as pre-periods, useful to test for differential pre-existing trends between treated and untreated areas.

The empirical evidence, by and large, suggests that countries and cities that underwent the radical institutional reforms of the French Revolution grew faster between 1850 and 1913 than the untreated countries and cities. In the country-level dataset, areas invaded by the French were already richer to start with, but the gap opened up significantly after 1850 (and interestingly not much before 1850). In the German city level data, when we limit ourselves to the west of the Elbe to create a relatively homogeneous group of cities, those that underwent radical reform were no more prosperous before 1800 (as measured by log urban population of the cities), but started to grow faster around 1820s, and by 1850, they had overtaken the untreated cities.

This evidence has to be interpreted with caution for a number of reasons. First, the quality of the data available to us is not very high. Second (and perhaps relatedly) some specifications lead to imprecise and sometimes insignificant results. Third, our results are somewhat stronger when we focus on countries and cities conquered by the French Revolution than areas invaded by Napoleon. Fourth, in the city-level specifications, we cannot rule out pre-existing trends. And finally, the evidence does not enable us to distinguish between the effects of various subcomponents of the reforms imposed by the Revolution (e.g., abolition of serfdom vs. abolition of guilds, equality before the law vs. Civil Code).

Nevertheless, all in all, the evidence is very clear that the totality of the institutional reforms brought about by the French Revolution did not have any negative long-run effects, and our reading of the evidence suggests that these reforms, most likely, had significant beneficial effects on long-run economic growth. Even though the nature of the evidence does not allow us to distinguish which of the various reforms was the crucial one, it does support the idea that these institutional reforms created an environment conducive to economic growth, which, interacting with the arrival of new industrial opportunities in the second half of the 19th century, enabled these areas to achieve faster economic growth. It is also interesting to note that in this interpretation, the purpose of the institutional reforms of the French Revolution was not to foster industrialization per se, but it did achieve this objective as a by-product of its major goal of destroying the hold of the aristocracy, oligarchy, and the clergy on political and economic power.⁹

⁹It is unlikely that the reforms were made specifically to encourage industrial growth. 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. 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 story in the Rhineland, discussed below, but there is no evidence that the French changed

If robust, this evidence leads to four conclusions. Most immediate, our findings weigh on the side of the economic historians who have emphasized the positive effects of the Revolution; there is no evidence of a negative medium-run or long-run effect of institutions imposed by the French Revolution on neighboring countries or cities. The remaining conclusions illustrate the implications of this finding for current debates about institutions and development. First, this finding provides direct evidence against the thesis that institutions are efficiently adapted to the underlying characteristics of a society. The French Revolutionary armies imposed new institutions which led to improved economic performance. Second, it argues against the superiority of institutions which evolve rather than those that are created by rational design; this implies that institutions can be reformed and improved. Third and relatedly, it suggests that institutions can be transplanted with beneficial effects, even when they pay little heed to the existing status quo. Finally, the evidence provides no support for the notion that the Civil Code has deleterious effects, at least in comparison to the types of legal systems that it replaced. These findings are interesting for those who favor institutional reforms. They suggest these may be needed and feasible.

The rest of the paper is organized as follows. Section 2 provides a first glance at the evidence by visually depicting the broad patterns of differential growth between counties and cities whose institutions were changed by the French Revolution and Napoleon versus the rest. Section 3 provides an overview of the history of the French Revolution and the invasion of Europe by French Revolutionary armies and by Napoleon based on secondary sources. Section 4 discusses our data, both with regard to how we classify different countries and cities into treated and untreated groups, and also the nature of our outcome measures: industrial production, urbanization, and GDP. Section 5 provides country-level regression evidence investigating the pattern shown in Section 2 in greater detail, while Section 6 looks at the differences in the growth experience of treated and untreated German cities. Section 7 provides an interpretation for the empirical evidence provided in the paper in view of our reading of the history of the period, and Section 8 concludes.

2 The French Revolution and European Development at a Glance

In this section, we show the main patterns of divergent urbanization, industrial production per capita, and GDP per capita across countries and log urban population across cities treated and

institutions in the Rhineland specifically because they foresaw great potential in the manufacture of cloth.

untreated by the French Revolution (and Napoleon). In Sections 5 and 6, our first specification will consider countries and cities invaded by the French Revolutionary armies as treated, while our second specification adds areas controlled by Napoleon. In this section, for brevity, we only show the patterns for the second specification, which includes areas controlled by Napoleon (see Section 4 for more details).

Data on economic activity in this period are far from complete, but we have information at the country-level on urbanization (from Bairoch, 1988), GDP per capita (Maddison, 2003), on industrialization (from Bairoch, 1982), as well as information on city populations (from Bairoch, Batou and Chevre, 1988). As argued in Acemoglu, Johnson and Robinson (2002 and 2005a), the urbanization rate (percent of population living in towns with at least 5,000 inhabitants) is potentially the best available measure of economic prosperity in the pre-modern period, since it was related both to agricultural productivity and to industrialization, the two major determinants of economic growth during this time period, and there is fairly good data on urbanization throughout Europe. We use Maddison’s (2003) GDP per capita estimates, which are often educated guesses, as a check on the urbanization numbers. Although Bairoch and Maddison’s numbers generally agree, there is some disagreement about the pace of economic progress in Italy, which we discussed in greater detail in Section 4. Finally, we use data from Bairoch (1982) on industrial output per capita. Although these data are also no more than educated guesses, they are informative for our purposes, since, in our hypothesis, industrialization is the main channel of influence of the changes in institutions.

In addition to these country-level and city-level data, we have gathered information on which countries and cities were invaded by the French Revolutionary armies and occupied by Napoleon from various historical sources as discussed in Section 4 and the Data Appendix. Our basic coding classifies all countries and cities invaded by the French Revolutionary armies and those occupied by Napoleon for an extended period as those having undergone radical institutional change, and refer to those as “treated”.¹⁰ We refer to the rest as “untreated”. Leaving a detailed discussion of the construction of the data and some of the difficulties with classifying counties and cities to that section, here we simply show the major patterns.

Figure 1A shows the evolution of urbanization rate (percent of population living in towns with at least 5,000 inhabitants) between treated and untreated countries. Already in 1750, the treated countries, Belgium, the Netherlands, Switzerland, Germany, and Spain have higher

¹⁰In the regression analysis in Section 5, we report results with the treated group being those invaded by the French Revolutionary armies as well as those invaded by the French Revolutionary armies and by Napoleon.

urbanization rate according to Bairoch (1988) than the untreated group, which includes Austria, Britain, the Czech country, Ireland, Hungary, Portugal, Scandinavia and the whole of Eastern Europe, but this gap widens significantly between 1800 and 1850. By 1913, there is a large difference in the urbanization rates between treated and untreated countries. The untreated sample includes fairly heterogeneous countries, at one extreme, Britain, which was the institutional and industrial leader of Europe at the time,¹¹ and at the other, Eastern Europe, which was relatively backward.¹² As an attempt to focus on a more homogeneous sample, Figure 1B looks at the behavior of the urbanization rate among Western European countries only (excluding Britain). The pattern is similar to that in Figure 1A and shows a significant divergence starting between 1800 and 1850, and significantly widening by 1913. These figures provide the strongest evidence that we have for a beneficial long-run effect of the institutions imposed by the French Revolution on prosperity.

Figures 2A-2C show the differential evolution of the level and log of GDP per capita between 1500 and 1900 (more specifically, for the dates we have data from Maddison, 2003, which are 1500, 1600, 1700, 1820, 1870, 1890 and 1900). Figure 2A is for the level of GDP per capita and is also encouraging for the thesis that the institutional reforms imposed by the French Revolution had a positive effect on long-run growth. There seems to be no pre-trend before 1820, and a significant gap opens up starting in 1850. Since treated and untreated groups start with different levels, proportional growth might make the interpretation of the pattern in Figure 2A difficult, so in Figure 2B we show the same pattern for log GDP per capita. In this case, the changes are less marked (and in the regression analysis, they will sometimes be insignificant). Nevertheless, the figures suggest that the proportional growth rates of GDP per capita between treated and untreated groups are essentially identical, or slightly faster for the untreated group, until 1820, and thereafter, the treated group shows faster growth. Figure 2C shows the same pattern for log GDP per capita for Western Europe (without the UK).

Finally, in Figures 3A-3C we look at Bairoch's (1982) estimates of industrial production per capita. Figure 3A is for the level of industrial production per capita for the whole sample, and

¹¹ Britain was the frontier industrial country throughout this period, and, as argued in Acemoglu, Johnson and Robinson (2005a), the combination of Atlantic trade and pre-existing institutions in Britain led to a political regime highly supportive of industrialization. Therefore, Britain was not part of the potential group of countries in the hold of an anti-industry landed or urban oligarchy.

¹² Throughout this paper we take Eastern Europe to be those territories with capitals to the east of Vienna, i.e., the Czech country is included in Western Europe but Hungary is in Eastern Europe. All of Scandinavia is part of Western Europe. This east-west division is a somewhat crude way to drop the (eastern) areas where forms of feudalism were stronger in 1789.

shows a big divergence between treated and untreated countries starting from 1830, though now there is a slight pre-trend up to 1830.¹³ Figure 3B again looks at log changes and confirms the same picture, with a slight pretend between 1830 and a significant differential growth gap after 1830. Figure 3C shows the same pattern for log industrial production per capita for Western Europe (without UK).

The patterns in these three figures suggest that the radical institutional changes imposed by the French Revolution and Napoleon may have led to significantly more rapid urbanization, economic growth and industrialization. We interpret this evidence as suggestive, but not conclusive, that the institutional changes imposed by the French Revolution and Napoleon had a beneficial effect, especially starting towards the second half of the 19th century. We will see in Section 5 that these patterns are generally robust, though there are also specifications in which they lose statistical significance. Another reason why we do not consider this evidence as conclusive is that there were marked differences in the level of urbanization, GDP per capita and industrialization per capita between treated and untreated places. This prompts us to look in greater detail to the effect of the French Revolution within Germany, where some cities were affected by the French Revolution early on and radically, while others did not undergo similar institutional changes for a variety of reasons (see Sections 3 and 4).

To gauge the level of prosperity of a city, we follow the strategy in Acemoglu, Johnson and Robinson (2005a) and use the logarithm of population in a city as a proxy for its prosperity (see Section 4 for details). In the case of Germany, our baseline specification limits the sample to cities to the west of the Elbe, since the east of this river was possibly more backward at the time (see, for example, Blum, 1978). Figure 4A shows the patterns in this case. We now see that treated cities start with lower log urban population in 1700 and remain below the untreated cities until 1818 (though showing somewhat faster growth between 1700 and 1800 and slower growth between 1800 and 1818).¹⁴ From 1850 onwards, the treated have higher average log urban population and appear to be more prosperous. Figure 4B shows the same pattern for

¹³Whether 1830 should be considered as a treatment or a pre-treatment here is unclear in theory, since it is before the second half of the 19th century, though some industrialization was already underway in much of Europe around that time and the immediate disruptive effects of French invasion were long gone by this date.

¹⁴The treated cities in these graphs are those that were under the control of Napoleon. These were in the area of northern Germany annexed to France (including Hamburg, Bremen and Lubeck), the Rhineland (also annexed to France), and the duchies or kingdoms of Frankfurt, Nassau, Hesse-Darmstadt, Berg, and Westphalia. The precise degree of French control over Frankfurt is controversial, and in our regression analysis we confirm that our results remain essentially unchanged if these are coded as untreated or dropped from the analysis. Moreover, as noted above, we experiment both with using cities west of the Elbe and all German cities as the untreated group.

the whole of Germany. In the case of Germany, there is more controversy about which cities were most affected by the French Revolution and Napoleon, both because the brief occupation by Napoleon of certain cities, the creation of satellite republics, and defensive modernization in Prussia. For this reason, in Section 6, we experiment with a number of different codings and robustness checks, which generally indicate that the patterns shown in Figure 4 are robust.

Overall, the city-level evidence has both advantages and disadvantages. Contrary to the country-level evidence, the treated group starts below the untreated, and by 1913 (in fact by 1850) has overtaken the untreated cities—thus displaying a pattern of “reversal”. However, there is also differential growth before the treatment in the city-level data (a pattern which we did not find much evidence for in the country-level figures). On balance, our interpretation is that at the city-level, as in the country level, the institutional changes induced by the French Revolution, by removing the grip of the aristocracy, clergy and the guilds, had a beneficial effect on economic growth, but the presence of pre-existing trends make it impossible for us to be completely confident that this is the case.

3 The Effect of the French Revolution on Europe

In this section, we provide a brief history of the French Revolution and the situation in various neighboring countries and cities before the Revolution. We also recount how expansion by the French Revolutionary armies and later by Napoleon affected these areas.

3.1 Brief History of French Revolution¹⁵

By the standards of its day, the France of 1789 was prosperous and peaceful. In the subsequent two decades, however, it experienced perhaps the most momentous events of the modern era, with a revolution that would transform not only France but the entire continent of Europe.

The French monarchy had acquired a considerable amount of political power, particularly under Louis XIV, while economic and political rights were highly unequally distributed. Many economic privileges remained from medieval times (e.g., exemption from central government taxation and the right to impose local dues, taxes and tariffs). At the same time, peasants and wage earners, by and large, lived in relative poverty.

Although the monarchy and the *First Estate* (the nobility), and to a large extent the *Second Estate* (the clergy), lived in relative luxury and prosperity, the state had been pressed

¹⁵This section draws heavily on Doyle (1989), Palmer (1971) and Rude (1988).

for income for a long time, with the fiscal crisis becoming more serious towards the end of the 18th century. A number of significant figures attempted to balance the royal budget by restructuring the debt and increasing taxes, and among them were included Jacques Turgot, the famous economist of the time, Jacques Necker, who would also play an important role after the revolution, and Charles Alexandre de Calonne, but none succeeded. Calonne, as part of his strategy, convinced the King Louis XVI to summon the *Assembly of Notables*, which was supposed to endorse a set of fiscal reforms. And yet, this assembly concluded that only a representative body, the *Estates-General*, including all three estates (the nobility, the clergy and the rest), would be able to endorse such reforms. The *Estates-General*, which was last convened in 1614, were gathered in 1789, with Necker again in charge of France's finances. However, from the beginning, the *Estates-General* was marred by irreconcilable differences, especially about how many votes the *Third Estate* should possess. The bourgeoisie, consisting of professionals, merchants and artisans, was the main group represented in the *Third Estate*, and by now, it was demanding more power. The meeting of the *Estates-General* in Versailles on May 5, 1789 thus ended without a successful resolution, except the decision to convene a more powerful body, the *National Assembly*.

The *National Assembly*, however, led to further radicalization of the *Third Estate*, which demanded more say in the proceedings and greater rights in general. Their domination, with some support from the clergy and nobility, but most significantly from non-noble and non-clergy all over the country, led to the reconstitution of the assembly as the *National Constituent Assembly* on July 9. The mood in the country and especially in Paris was becoming more radical. In reaction, the conservative circles around the King convinced him to sack Necker. This led to further protests in the streets, with provocation convincing the populace that a royal coup was underway. The outcome was the famous storming of the Bastille on July 14, 1789. From this point onwards, the Revolution had started. Necker was reinstated and the revolutionary Marquis de Lafayette was put in charge of the National Guard of Paris.

More remarkable events were to follow from the *National Constituent Assembly*, with its newfound confidence. On August 4, 1789, it abolished feudalism, and together with it all of the special privileges and rights of the *First* and *Second Estates*. This was followed by the abolition of the Church's authority to levy special taxes, and later turning the clergy into employees of the state, thus starting the process of the separation of church and state.

Nevertheless, *National Constituent Assembly* did not manage to solve the French fiscal

problems, and this led to further radicalization and fractionalization within the assembly. The first step was the formation of local clubs, most notably the *Jacobin club*, which would later take control of the revolution. At the same time, the nobles were turning against the Revolution in greater numbers, either fleeing the country (the *émigré's*) or encouraging the King to break with the assembly and take action, either by himself or with the help of foreign powers, such as Austria (the Queen Marie Antoinette's native country). *National Constituent Assembly* finally managed to pass a constitution on September 29, 1791, turning France into a constitutional monarchy, essentially a regime in which the King had little role. This constitution also removed the major power of the guilds in the cities, creating a much more level playing field as far as most occupations and industries were concerned.

The pace of institutional change was set further by war between France and Austria (and its allies), which was viewed as the counter-revolutionary force, harboring the *émigré's* that had fled from the revolution and ultimately waiting for the opportune moment to declare war against the new French Republic. Fueled by the radicalism of the masses (the *sans-culottes*) in the streets whose aspirations had been raised by the Revolution and the process of war, this process culminated in the execution of Louis XVI, Marie Antoinette and then later to the period of *Terror*, which would witness the execution of many of the leaders of the Revolution itself, including Brissot, Danton, Desmoulins, Sabre, Chabot, Robespierre, Saint-Just.

The execution of Robespierre and Saint-Just in July 1794 signaled the end of the *Terror*, and there followed a phase of relative stability, first in the form of collective government under the Directory between 1795 and 1799, and then with more concentrated power in the form of a three person Consulate, consisting of Ducos, Sieyes and Napoleon Bonaparte. Already during the directory, the young general Napoleon Bonaparte had become famous for his military successes and also for his statesmanship in ensuing negotiations. His influence was only to grow after 1799. The Consulate soon became the personal rule by Napoleon, who initially had himself elected First Consul in November 1799 with the famous coup of the 18th of Brumaire and then had himself declared emperor in 1804. The years between 1799 and the end of Napoleon's reign, 1815, witnessed a series of great victories, including those at Austerlitz, Jena-Auerstadt, and Wagram, bringing continental Europe to its knees. They also allowed Napoleon to impose his will (and his legal Code) across a wide swath of territory.

3.2 Europe Before the Revolution

Before the age of 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, with explicit or implicit entry barriers.

By the end of the eighteenth century, feudalism in its most rigid form was abolished in many parts of Europe, but a lot of its remnants remained. The most important aspect of feudalism, serfdom—the system through which peasants are tied to the land and cannot sell their labor in free markets or engage in other occupations without the permission of landowners—still continued in parts of Europe, especially in the East, while it was replaced by various forms of taxes and tributes to landowners in other areas, which could nonetheless be quite onerous. Even in the west of Europe, however, quasi-feudal arrangements were quite common. For example, in the Rhineland, the first area in Germany to come under French control, a form of serfdom was still practiced. Blanning (1983, pp. 20-21) describes this as: “In some areas [of the Rhineland], where an attenuated version of serfdom still lingered, the peasant was also subject to restrictions on his movement”. Grab (2003, p. 86) states: “Their conditions were worse east of the Elbe where serfdom still prevailed. But even in many western regions where serfdom had declined and peasants were freer and better off, they were often still subject to landlords to whom they owed seigneurial fees and labor obligations. In addition they had to pay taxes and support their parishes and village communities.”

Even when serfdom in its classic form was absent, 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 by the state, and as noted above, enjoyed the right of taxation of the peasants under their control. Lenger (2004, p. 92), for example, describes this as: “besides the original obligations to provide services and dues to the lord the agricultural labor force was also burdened with personal servitude”. He continues:

“In the small territory of Nassau-Usingen around 1800 there were no less than 230 different payments, dues, and services that the peasants living there had to provide to the lords. Dues included ... the ‘blood tithe’ to be paid after an animal was slaughtered, a ‘bee tithe’, a ‘wax tithe’ .. as well as large fees owed to the lord whenever a piece of property changed hands.” (Lenger, 2004, p. 96).

Moreover, in places where some form of seigneurial privilege remained, it was usual for nobility

and clergy to be subject to different laws and courts. The principle of equality before the law was quite alien (or even revolutionary) in most of Europe in 1789.

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, but also indirectly restricting adoption of new technologies. The guilds are commonly blamed for the lack of adoption of new technologies throughout Europe. For example, Cipolla (1970) argues that the guilds stopped innovation in Italy, in particular they forbid the production of exactly the type of lower quality goods that were taking their markets. In Venice (p. 206) “for almost the whole of the 17th century, the statutes of the guild prevented cloth from being made of the English and Dutch type, which had had so much success on the international markets. Moreover, the guild statutes not only demanded the production of a traditional type of goods, but also prevented the adoption of new methods of making these old products.” Braudel (1992, p. 136) discussing Venice also argues that decline began “when the prosperity of the [guilds]... faced with the competition from northern cloth, was compromised by the high wages which its artisans refused to forego” and Rapp (1976) makes similar points. Kisch (1989) argues the same point for Rhineland, in particular, for the major cities of Cologne and Aachen, where the adoption of new textile (spinning and weaving) machines were significantly delayed because of guild restrictions. 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. Berne, for example, was controlled by 68 families (Grab, 2003), while Florence is famous for its (competing) oligarchs.

3.3 Under the Republic

Despite the fact that the French Revolution was immediately seen as threatening to Europe’s elite, war, the so-called War of the First Coalition, did not break out until 1792.¹⁶ Contrary to almost everyone’s expectations, after some early defeats, the armies of the new Republic were victorious in an initially defensive war. There were serious organizational problems to overcome, but particularly after the introduction of mass conscription (the *levée en masse*) in August 1793, the French had a military advantage than verged on supremacy (even before it was combined with Napoleon’s generalship).

¹⁶The initial reaction in European capitals was amazement but there was no perceived need to intervene. This changed with the execution of Louis XVI. See Doyle (1989) for general background and Blanning (1986) for a more detailed treatment. Esdaile (1995, 2001) and Ellis (2003) are succinct overviews of all of the wars from 1792 to 1815, while the series of Blanning (1996) and Gates (1997) provide more details.

Initial military success encouraged the Republic's leadership to expand France's borders, with an eye towards creating an effective buffer between the new Republic and the hostile monarchs of Prussia and Austria. The French quickly seized the Austrian Netherlands (roughly today's Belgium) and the Netherlands (where ice famously allowed French cavalry to capture a large part of the Dutch navy). The French also gained effective control over much of modern-day Switzerland. In all three places, French had strong control through the 1790s.

Germany was initially hotly contested (with Prussia reclaiming control in 1793). But by 1795 the French had firm control over the Rhineland (the west or left bank of the Rhine), and the Prussians were forced to recognize this fact under the Treaty of Basle.¹⁷ Between 1795 and 1802, the French firmly held the Rhineland, but not any other part of Germany. In 1802 the Rhineland was officially incorporated into France.

Italy remained the main seat of war in the second half the 1790s, with the Austrians as the main opponents. Savoy was annexed by France in 1792, and a stalemate was reached until Napoleon's invasion in April 1796. In his first major continental campaign, by early 1797 Napoleon had swept up almost all of Northern Italy, except for Venice (which was taken by the Austrians). The Treaty of Campo Formio, signed with the Austrians in October 1797, ended the War of the First Coalition and recognized a number of French-controlled republics in Northern Italy.

However, the French continued to expand their control over Italy even after this treaty. In March 1798 the French invaded the Papal States and established the Roman Republic. Piedmont was occupied in December 1798. In January 1799, Naples was conquered and the Parthenopean Republic created.¹⁸ With the exception of Venice (still Austrian), the French now controlled the entire Italian peninsular either directly (Savoy) or through satellite republics (Cisalpine, Ligurian, Roman, and Parthenopean). There was further back-and-forth in the War of the Second Coalition (1798-1801), but this ended with the French essentially remaining in control. By 1802, the French commanded all of Italy except the Papal States, Naples, and Venice.

¹⁷Part of the broader 1795 Peace of Basle with Prussia, Spain, and Hessen-Kassel.

¹⁸The Parthenopean Republic was short-lived, but the French were soon back and—under Napoleon—seem to have had a great impact on some institutions in the south of Italy, on which see Davis (1991, 2003) or Gregory (2001).

3.4 Institutional Changes Induced by the Revolutionary Armies

Many of the most radical institutional changes were undertaken during the invasion of the French Revolutionary armies. This included the abolition of all the remaining vestiges of serfdom and quasi-feudal land relations, the hold of the clergy over economic and political power, the domination of the guilds in urban areas, and legal changes establishing equality before the law.

In Belgium (approximately the Austrian Netherlands - Liège area was under an independent Bishop) “The clergy and the nobility, the two upper estates, enjoyed many privileges and possessed considerable wealth and political power... Urban guilds and corporations, the dominant element in the Third Estate, also possessed important privileges and controlled the towns” (Grab 2003, p. 75). The Estates General did not meet between 1634 and 1790. After some upheaval, France annexed Belgium in 1795 and ruled for 20 years. Equality before the law was established and seigneurial rights, the tithe, noble privileges, and the guilds were abolished; in fact, from December 1796, any new French legislation became applicable in Belgium (Grab 2003, p. 78).

In the Netherlands (or United Provinces), the existing institutions were more those of entrenched urban oligarchies in the various cities. These oligarchies were effectively expropriated by the French and, after considerable upheaval, the Batavian Republic was established along French lines (Grab, 2003, Chapter 4).

In Switzerland, the situation was similar to the Netherlands. Before 1789, “Feudal privileges persisted in many rural communities. Peasants owed the Church and landlords tithe, seigneurial fees, and labor services. Many Swiss lacked the freedom to settle where they wanted to or choose the occupation they desired,” (Grab 2003, p. 113). With the coming of Revolutionary armies, existing oligarchs were dispossessed or forced to cede power, and feudal privileges largely disappeared.

In Germany, the only real changes during this period were in the Rhineland (West Bank of the Rhine). 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, Grab, 2003), the importance of the revolutionary reforms in Rhineland is not in question. Even a critic of the French, such as Blanning (1983), admits the significant institutional reforms undertaken by the French in the Rhineland. These reforms are discussed in greater detail in subsection 3.7

below.

In Italy, several new Republics were established with French-style constitutions, parliaments (on a property-based franchise), and more efficient systems of administration. Extensive aristocratic privileges were abolished and the notion of equality before the law was introduced in earnest for the first time (see Doyle, 1989, Chapter 15, Grab, 2003, Chapter 10, Broers, 1997, 2005).

3.5 Napoleon At the Helm

Napoleon's institutional legacy outside of France is complicated because what he tried to achieve varied across countries in general, and in the case of Germany in particular. At least in some places there was a genuine attempt to continue and deepen the reforms brought by the Revolution.¹⁹ In many cases, what Napoleon could achieve was a function of how firm his grip was over a particular area. For example, Grab writes (2003, p. 25): "The duration of Napoleonic domination also affected implementation of the reforms. The length of French domination throughout the Empire was uneven, ranging from several months in Portugal to close to 20 years in Belgium, Lombardy, and the Rhineland." Moreover, Napoleon's objective was not always to improve the institutions per se, but "to maximize revenues and recruit men more efficiently" Grab (2003, p. x), which, nonetheless, encouraged Napoleon to undertake broad reforms in the areas he occupied.

Overall, the consensus amongst modern historians seems to be that the Napoleonic reforms had significant and important impacts, though there is some disagreement on this point. Many historians believe that a key beneficial aspect of Napoleon's rule was the creation of an efficient, centralized bureaucratic state (e.g., Laven and Riall, 2000). Napoleonic tax collection and policing were much better organized than anything previously seen.

"On a European level, the main significance of the Napoleonic rule lay in marking the transition from the *ancien régime* to the modern era. Napoleon was a forerunner of change, launching reform policies that paved the way for the long process of modernization of European states and societies. In the context of 19th century Europe, modernization meant a number of elements: centralized states with professional bureaucracies based on merit; uniform taxation; conscripted national armies; a state police force; the end of the privileged position of the nobility and its

¹⁹Our view here builds on Grab (2003), as well as Connolly (1965) and Woolf (1991).

monopoly over power; secularization through the reduction of Church power and its subjugation to the State; the political and social advance of the bourgeoisie ..; legal equality; property rights; dissolution of the seigneurial system; the formation of national markets .. Despite the fact that Napoleonic reform policies in Europe fell short of the stated goals .. Napoleon succeeded in replacing a great deal of the traditional structure with new laws and institutions in many of his subject states, thereby facilitating their passage into the modern period” (Grab, 2003, p. 20).

Nevertheless, as Grab himself notes, Napoleon was “Janus faced”—undermining his reforms by his complicity to the rule of the local oligarchs. He writes:

“Paradoxically, Napoleon himself sometimes undermined his own reform policies ... In a number of states he compromised with conservative elites, allowing them to preserve their privileges as long as they recognized his supreme position” (Grab, 2003, p. 23).

For instance, “He allowed the Polish nobility to continue its control over the peasants, contradicting the new Constitution and Code Napoleon” (p. 23). Many authors point to different aspects of the reforms which were contradictory. In many instances, Napoleon tried to co-opt existing elites. Land that was taken from princes or the Church was distributed as donations to the favored.

3.6 Institutional Changes Induced by Napoleon

The Janus-faced nature of Napoleon and his reforms implies that the implications of these reforms vary from place to place. In the Netherlands, Belgium, and Switzerland, Napoleon consolidated the changes brought by the Revolution, with an emphasis on establishing (his) legal code and a downplaying of any move towards democracy. Some of the old elite crept back into influential positions, but for the most part these societies became more like France—relatively centralized states that were professionally-run and able to collect taxes.²⁰

Napoleon’s impact on Spain is controversial. Napoleon acquired nominal control over Spain quite late (1808) and from that time on he had considerable distractions in the form of almost continual major wars. The *Code Napoleon* was supposedly introduced, but it is unclear whether

²⁰Napoleon also briefly invaded Portugal, but the French presence did not last long, partly due to British intervention. We therefore treat Portugal as part of the control group, along with Austria (where Napoleon also had military victories but never tried impose institutions).

it was ever properly implemented. There was also considerable popular resistance, abetted by the British directly and through their base in Portugal, and by 1812 the French had lost effective control south of the Pyrenees.

In Italy, the *Code Napoleon* was implemented in the North but there were also profound changes in the South. Davis (1991, p. 134), the main expert on the French legacy in Southern Italy argues that:²¹

“For all its brevity, the decade of French rule was one of intensive administrative and juridicial reforms and the speed with which the French administrators set about dismantling the Ancien Régime state was remarkable .. The central clutch of reforms – the abolition of feudalism, the reorganization of the central and peripheral administrative institutions of the state, the restructuring of the financial administration and taxation- was pushed through in the first months of the occupation.”

3.7 Institutional Reforms Within Germany

In our city-level analysis, we examine variation within Germany. As with the country level analysis, it is important to distinguish between what was done by the Revolutionary armies and what was established by Napoleon.

As noted above, there were significant differences in the extent of feudalism to the East of the Elbe and Saale rivers and those to the West. The area to the east was subject to the “second serfdom” (for example, Blum, 1957), which appears to have been much more onerous than the remnants of the serfdom to the west of this line (see, for example, the discussion in subsection 3.2). This makes the cities to the east and west difficult to compare, and in our base specification we limit the sample to cities to the west of the Elbe.

Also as discussed above, the Rhineland was the only area controlled by the Revolutionary armies, and underwent considerable institutional reform during the period of French occupation. Most significantly, in 1798 the seigneurial regime and the guilds were abolished (Blanning, 1983, p. 137 and 155), and this paved the way to a relatively free labor market. The freeing

²¹We are still working on the details of the Italian case. For example, Murat (one of Napoleon’s favorite generals, who ran the Kingdom of Naples for a while) rid the South of feudalism without legislating compensation. This is impressive, even in comparison, say, with Germany (Grab, 2003, p. 167). Peasants were freed from labor obligations to the lords (Gregory, 2001, Chapter 6 notes that there was unpaid personal service in the South—a key element of feudalism—and this apparently stopped). However, the same sources indicate the peasants did not become better off because barons managed to acquire most of the Church and common land that was sold off. This is much like the Prussian case where one of the legacy of the 1806 reforms was that it allowed large landowners to massively expand their own private holdings.

of labor was a major reform and meant that master artisans could (and did) set up their shops whenever possible (Diefendorf 1980, p. 164). Equally important were the legal changes. For example, the French created the first commercial court in Aachen in 1794, and followed with similar courts elsewhere in the Rhineland (Diefendorf 1980, pp. 159-160), which were to play an important role in the creation of commercial and industrial businesses in the years to follow. Another reason for why the reforms in the Rhineland were fundamentally deep-rooted was that, all in all, this was the area of Germany that the French rule lasted longest, essentially for 20 years. This enabled what was started by the French Revolution to be consolidated during the later period. For example, Kisch (1989, p. 212) describes this as: “When the many strands of commercial legislation were subsequently consolidated in the Code Napoleon, 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 consequence of all of these changes was the transformation of the Rhineland from an oligarchy-dominated area to one open to new business and new entrants. Instead of the traditional oligarchy, in 1810 merchants/manufacturers comprised about half the members of Conseil General (municipal administrations) in leading Rhineland towns (Diefendorf 1980, p. 115), and business people were also well represented in the higher department-level Conseil General. Overall, the historical evidence seems to indicate that the French Revolution had a major effect on the political, legal and economic institutions on the Rhineland.

In contrast to the Revolutionary armies whose control in Germany was limited to the Rhineland, Napoleon constructed a string of satellite buffer states on France’s eastern border. There were several iterations, but the big break point followed the Peace of Lunéville (February 1801), with a massive reorganization of the territories that comprised the Holy Roman Empire (roughly Austria and Germany in its 1914 borders). Much of the astonishing variety of the Empire disappeared—112 independent estates, 66 ecclesiastical territories and 421 free imperial cities vanished and were consolidated into a larger cluster of kingdoms, principalities, and duchies. The main beneficiaries were the Grand Duchy of Baden and the kingdoms of Württemberg and Bavaria (all on or close to the right bank of the Rhine). Napoleon brought these all together in 1806 in the Rheinbund (known in English as the Confederation of the Rhine). There was a further reduction to fewer than 40 states (Grab, 2003, pp. 89-90). Initially, in 1806 only 16 states joined the Rheinbund, this expanded to 39 in 1808 (see Schmitt, 1983).

During this period Napoleon also took over parts of Northern Germany including in December 1810 the annexation of Hamburg, Lübeck and Bremen (Hanseatic cities). The Duchy of Berg was formed in March 1806, the Kingdom of Westphalia in August 1807, and the Duchy of Frankfurt in February 1810. These were run by the French and were formed out of states merged together by Napoleon. This was the state of affairs, roughly, until the collapse following Napoleon’s invasion of Russia.

Reforms certainly took place in these areas. For example, Connelly (1965) notes that in the constitution of Westphalia (a reconstituted satellite state) which was issued at Fontainebleau on November 15 1807:

“The king’s subjects were guaranteed equality before the law and religious liberty; serfdom and feudal rights were abolished; noble titles were affirmed, but were to command no special rights, privileges or offices. Taxes were to fall equally on all classes in all parts of the kingdom. Provision was made for a ministry, council of state, and a parliament of one hundred (seventy landowners, fifteen merchants and manufacturers, fifteen savants and distinguished citizens) ... Effective January 1, 1808, the *Code Napoléon* was to be the civil law. The judiciary was to be ‘independent’ but was appointed by the king, who could review his appointments every five years.” Connelly (1965, p. 184)

He later notes (p. 189) that “all vestiges of feudal law, together with seigniorial and church courts, disappeared in the first months of 1808” and

“All men were equal before the law and eligible for office.”

Although the political changes were not implemented (the parliament hardly met), the economic changes were profound and—in this case and in many others—largely irreversible.²²

4 Data

In this section, we describe the four types of data we use for our empirical analysis. These are country-level and city-level economic outcome variables, already discussed briefly in Section 2,

²²Although the historical evidence indicates that the reforms undertaken by the French were “irreversible” or at the very least “not reversed”, exactly why this is the case is not always clear. We return to this issue in Section 7.

and our coding based on the discussion in Section 3 of which countries and which cities within Germany were treated. In all cases, further details are contained in the Data Appendix.

4.1 Country-Level Outcome Variables

We use three data series to measure economic development across countries. Our first measure of national prosperity is the urbanization rate of a country, measured as the percent of the population living in cities with more than 5,000 inhabitants. Bairoch (1988, Chapter 1) and de Vries (1976, p. 164) argue that only areas with high agricultural productivity and a developed transportation network could support large urban populations. In addition, in Acemoglu, Johnson and Robinson (2002a and 2005a) we presented evidence that both in the time-series and the cross-section there is a close association between urbanization and income per capita before as well as after industrialization. As in our previous work, we take urbanization as the best available proxy for GDP per capita, recognizing that at this phase in European development it likely picks up the growth of industrial activity based in cities. The reason for choosing urbanization as our based measure is that the estimates of urbanization for European countries from Bairoch (1988) are fairly reliable, and also the use of urbanization rate as a proxy for economic prosperity creates a continuity between our country-level analysis and the city-level analysis, which will rely on the urban population of the cities.

Second, we use estimates of GDP per capita from Maddison (2003). The numbers before 1820 are educated guesses by Maddison, but are generally viewed to be informative about the ranking of the countries in terms of their prosperity. These estimates start in 1500, and are available for 1600, 1700, 1820, and then more frequently. We use the results with the GDP per capita estimates as a check on our urbanization rate results. Nevertheless, there is a major discrepancy between Bairoch’s urbanization numbers and Maddison’s estimates of GDP per capita, which involves Italy. While both Maddison and Bairoch agree that Italy industrialized during the 19th century, they disagree on the exact extent. Bairoch has urbanization in 1850 of 23%, rising to 40% in 1900 (which put Italy between Spain and the Netherlands, and ahead of Switzerland). Bairoch’s (1982) industrial production per capita data show a matching increase (and little change before 1860). In contrast, Maddison’s GDP series for Italy shows less change in the 19th century, rising from \$1350 in 1850 to \$1785 in 1900. A major part of the discrepancy between Maddison and Bairoch lies in the fact that, in constructing his average for the entire country, Maddison puts high weight on two relatively slow-growing parts of Italy that joined

the union only after 1860: Venice and the Papal States, depressing is growth estimates for Italy.²³ For this reason, we trust Bairoch’s (1988) urbanization numbers more, and in any case, report all of our results with and without Italy, to make sure that the discrepancy over Italy should have no effect on the results.

Finally, we use data on industrial production per capita from Bairoch (1982). These numbers are probably the most problematic, since there was no way of measuring industrial production in a systematic way. Nevertheless, since our hypothesis emphasizes the industrialization channel, we find it useful to look at these numbers both as a check on the results with urbanization rate and GDP per capita and also as a way of understanding the mechanism through which changes in institutions may have affected the growth potential of different countries.

4.2 Urbanization Data for German Cities

To measure differential performance within Germany, we use the city level population data from Bairoch, Batou and Chèvre (1988). The complete dataset has information on all 2,200 European cities which had, at some time between 800 and 1800, 5,000 or more inhabitants; there are data on around 240 German cities for the time period we are investigating.²⁴ The Bairoch et al dataset stops in 1850 and does not have information on city size between 1800 and 1850. For this reason, we augment it with estimates from Lahmeyer (2005) and Mitchell (1981). We use Lahmeyer for 1818, 1871, and 1910. We use Mitchell to confirm Lahmeyer’s data and to fill any gaps. Both Lahmeyer and Mitchell have the disadvantage of covering cities that became larger, with an obvious selection bias.²⁵ In future work, we plan to extend the full Bairoch, Batou, and Chevre data through 1900/1910. For now, as the robustness checks, we also show results just using the Bairoch et al. data

²³Interestingly, both these parts had little treatment from the French Revolution—Venice was almost continually under Austrian control, although Napoleon did manage to plunder some of its art treasures, and the Papal States were taken very late into the Empire (part of a belated attempt to make the Continental Blockade effectively), with no attempt to improve their institutions.

²⁴These data begin in 800, and there are estimates for every 100 years until 1700, then for every 50 years through 1850. However, Bairoch, Batou and Chèvre (1988) emphasize that estimates before 1300 are rough and less reliable (and they skip the year 1100 due to lack of information). These data were used previously by De Long and Shleifer (1993).

²⁵Our analysis so far indicates we are missing data for a number of smaller cities in the Ruhr that grew rapidly between 1850 and 1900. The entire Ruhr area is in our Napoleon treated region (although not in our revolutionary armies treated region.)

4.3 Cross-Country Institutional Reforms

The history reviewed in Section 3 suggests two ways to code where the French Revolution had impact. The first and perhaps most appealing coding constitutes the set of countries (or cities, when we look at variation within Germany) that the French controlled during the revolutionary period, until the dictatorship of Napoleon. This constitutes the area where the French Revolution genuinely forced radical reforms, as opposed to the more ambiguous reforms imposed by Napoleon, which were, in any case, not always implemented.²⁶ For example, in the case of Switzerland after 1803, Napoleon reached an accommodation with the old elite that essentially allowed them to return to power (Grab 2003, p. 117). Elsewhere,

“even where the Code Napoléon was promulgated there continued to be territories in which the process of abolishing aspects of feudalism and seigneurial privilege was at best gradual, at worst moribund. Sometimes there was a lack of officials keen to enforce the legislation; sometimes compromise seemed the best way on ensuring the loyalty of the elite of landowners, especially in those areas of central and eastern Europe where feudalism seemed more deeply rooted than it had been in France in 1789. In the Grand Duchy of Warsaw regardless of the introduction of the Napoleonic Code, the position of the peasant remained largely unchanged ... In parts of the Confederation of the Rhine many landowners ignored or circumvented the code so as to hang on to their traditional dues and their rights of labor. Yet on the left bank of the Rhine, in the departments annexed to France during the revolutionary decade, the Code became firmly entrenched. Indeed, it was so well entrenched that, after 1815, the Rhenish elite successfully preserved the Code and resisted attempts of their new Prussian masters to introduce the Prussian Allgemeines Landrecht.” (Emsley, 2003, pp. 62-63)

This motivates our first coding, limiting the treated areas to those invaded by the French revolutionary armies, thus the Netherlands, Belgium, Germany, Switzerland, and Italy.

²⁶This was partly because Napoleon controlled these territories for a relatively short period of time, which, as noted above, limited what he could achieve, and also in part because he had other priorities, such as raising revenue for his wars. In any case, whatever that reason, there was a considerable degree of backsliding over the planned or purported reforms.

The second coding, on the other hand, includes countries occupied by Napoleon, which adds Spain.²⁷ The untreated countries are all those in Europe for which we have data, including England/Britain, Portugal, Austria, the Czech country, Ireland, Hungary, Scandinavia and Eastern Europe.²⁸

4.4 The Impact of the French Revolution on German Cities

In terms of within Germany impact, the Revolutionary armies only conquered the Rhineland during the 1790s. Therefore, with the same reasoning as above, our baseline coding only includes the Rhineland. As noted above, to create a comparable set of untreated cities, we compare the Rhineland to other cities to the west of the Elbe.

Our second coding includes cities in satellite states controlled or created by Napoleon. Napoleon's policies within Germany were quite varied, including the distinction between annexed lands (incorporated into friends), conquered lands and allied lands. We code places as treated by Napoleon if they fall in the category of annexed and conquered lands, or if they were ruled through appointing the ruler (e.g., his son or a general).²⁹ The cities added to the treatment group in this second coding are therefore those in the states of Westphalia, Berg, Hesse-Darmstadt, Nassau, and the Grand Duchy of Frankfurt.³⁰ In addition, an area of north-west Germany through to Luebeck was annexed into France, along with some smaller border cities, and are thus added to the treatment group.³¹ The Rhineland was also part of France

²⁷The extent to which important or institutional reforms were imposed in Spain is questionable, since it was ruled by Napoleon's cousin, in alliance with the existing oligarchy.

In addition, Poland could also be coded as controlled by Napoleon, albeit briefly. But we do not have data on Poland, as it did not exist as an independent country during the 19th century.

²⁸The precise availability for various East European countries varies; see the data appendix for more detail.

²⁹Napoleon liked to reshuffle rulers as his needs changed, but Berg was ruled by Murat (one of Napoleon's top generals and his brother-in-law) when it first came under French control and Westphalia was ruled by Napoleon's younger brother Jerome. When Murat moved on to become King of Naples, he was replaced by Napoleon's four-year-old nephew. The cities of Hamburg, Lubeck and Bremen, with associated hinterland, were annexed to France in 1810 (as part of Napoleon's attempt to enforce the Continental Blockade against trade with England.) The Rhineland was annexed to France in the 1790s.

³⁰Westphalia and Berg were definitely controlled by Napoleon's family members. In Frankfurt, Napoleon's representative was in control (Grab 2003, p. 103). Hesse-Darmstadt and Nassau received territory from Napoleon; their rulers were his close allies and did his bidding in terms of institutional changes (Grab 2003, pp. 106-7.) The extent of Napoleonic control over Baden is more controversial, but nothing significant in our results changes if we alter the coding for this state to untreated.

³¹Roughly speaking, these satellites form a band generally 50-100 miles across, running along the Rhine for most of its length. Towards the north, in what was then Westphalia, the band is much wider and reaches up towards Hamburg, and touches the Elbe (the area of Germany to the north of Westphalia was annexed directly into France). Essentially, Napoleon created a buffer of compliant states run under his close control and implementing the institutional changes that he dictated.

through the Napoleonic period, and therefore remains in the treated category.

In all of these areas, Napoleon introduced a number of reforms, but he also allowed a remarkable continuity in the identity of the elites under Napoleon. For example, Grab (2003, p. 101) writes:

“Westphalia made the greatest progress among the Confederation’s states toward becoming a society of equal citizens.” [But] “As in the other Napoleonic satellites, however, the Westphalian nobility remained the dominant class. ... Seignorial relations persisted in the Westphalian countryside, which exposed the contradictions of the Napoleonic system in that German ‘model state’.”

This assessment motivates our coding in which occupation by the French Revolutionary armies is the baseline treatment, while occupation by Napoleon is the second treatment. In addition, as noted above, our base specification, the sample comprises only cities to the west of the Elbe/Saale rivers—this is based on the evidence that there were similar initial institutions (with only weak remnants of feudalism) in this area.

4.5 Timing the Impact of the French Revolution

The Revolutionary/Napoleonic period ended in 1815 with the Congress of Vienna. In principle, the positive or negative effects of French occupation can be felt as early as 1800. However, it would be naïve to expect a positive effect around 1800, since the immediate effect of the French occupation, as emphasized above, was chaos and heavy taxation.

Instead, we are more interested in the medium-run or long-run effects of institutional changes brought by the French Revolution. In particular, our hypothesis is that the beneficial effects of institutions abolishing the remnants of feudalism and removing the oligarchic grip of the nobility and the guilds should be felt once new technological opportunities create a group of potential new entrepreneurs ready to take advantage of the new institutional environment. Therefore, our hypothesis suggests we should look for positive effects quite a bit later than 1815, most likely towards the second half of the 19th century, when the process of industrialization was truly underway throughout the world.³²

³²To get a sense of the rapid advent of industrialization over this time period, note that in 1825 Britain had a grand total of 25 miles of railway line, while in 1840 it had over 2,000 miles, and in 1850 it had nearly 10,000 miles (Mitchell 1981, p. 610)

5 Cross-Country Regression Evidence

In this section, we investigate the patterns shown in Figures 1-3 using regression analysis. As in Section 2, our basic outcome variables are urbanization rates, log GDP per capita and log industrial output per capita. Recall also that in all cases we have a panel data set, but with time periods unevenly spread (e.g., from Madison, 2002, we have income per capita for 1500, 1600, 1700, 1820, 1850, 1870, 1890 and 1900).³³ Finally, as described in the previous section, we have a classification of countries into treated and untreated categories. Our basic regression model is as follows:

$$y_{jt} = d_t + \delta_j + \sum_{t \in \mathcal{T}} \alpha_t \cdot I_j + \mathbf{X}_{jt}' \cdot \boldsymbol{\gamma} + \varepsilon_{jt}, \quad (1)$$

where y_{jt} is the outcome variable (urbanization, log GDP per capita or log industrial output per capita) in country j at time t , the d_t 's denote a full set of time effects, the δ_j 's denote a full set of country 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 for us is the dummy I_j , which takes the value of 1 for countries treated by the French Revolution and Napoleon, and zero otherwise. The term $\sum_{t \in \mathcal{T}} \alpha_t \cdot I_j$ therefore estimates a potentially differential growth effect for every time period in the set $\mathcal{T}$, for example, a differential growth for every year after 1800. The reason for writing this equation in this way, with a general $\mathcal{T}$ set, is that we will vary which years are included in the “post” category, to investigate whether there are pre-existing trends in any of the variables we are looking at.

An alternative way of writing equation (1) may be more useful:

$$y_{jt} = d_t + \delta_j + \sum_{t \in \mathcal{T}^{post}} \alpha_t \cdot I_j + \sum_{t \in \mathcal{T}^{pre}} \alpha_t \cdot I_j + \mathbf{X}_{jt}' \cdot \boldsymbol{\gamma} + \varepsilon_{jt}, \quad (2)$$

where $\mathcal{T}^{post}$ and $\mathcal{T}^{pre}$ are two disjoint sets of dates. The dates in $\mathcal{T}^{post}$ are post-treatment, while those in $\mathcal{T}^{pre}$ are just before treatment, thus their inclusion will be our check for pre-existing trends.

Throughout the paper, all standard errors are robust and allow for an arbitrary variance-covariance matrix at the country (or below at the city) level to allow for potential serial correlation in the residual error term (see Wooldridge, 2002, Chapter 7).³⁴

³³The industrial production and urbanization datasets are balanced, and the GDP per capita dataset is almost balanced (missing data for a couple of years for Russia). See the Data Appendix for more detail.

³⁴The Huber-White standard errors are smaller in all cases, so the fully robust variance-covariance matrix

5.1 Main Results: Urbanization

We start in Table 2 with our preferred measure of prosperity in the 19th century, urbanization rates, as the dependent variable, y_{jt} . The top panel defines the treated group as our baseline, those invaded by the Revolutionary armies, while the bottom panel adds Spain, the only additional area controlled by Napoleon for which we have data. The set $\mathcal{T}^{post}$ includes the treatment years 1850 and 1913, with 1300, 1500, 1700, 1750, and 1800 as the omitted years. Columns 1 and 2 are for the base sample which includes Eastern Europe and Britain. In column 1, both the interaction terms from 1850 onwards are positive, and the interaction with 1913 is significant at less than 1%. The F-test at the bottom of the panel comfortably rejects the hypothesis all of the interaction terms in the set $\mathcal{T}^{post}$, i.e., all of the $\{\alpha_t\}_{t \in \mathcal{T}^{post}}$ ’s are equal to zero. This shows there is significant differential growth in urbanization in the treated countries relative to the untreated. The numerical values of the coefficients are also economically large. For example α_{1913} is estimated to be 0.16 with a fully robust standard error of 0.05, which implies that by 1913, there was approximately 16 percent points more urbanization (i.e., an urbanization rate higher by 0.16) in the treated countries compared with nontreated countries.

Column 2 adds the interaction with 1750 and 1800 (i.e., it adds the set $\mathcal{T}^{pre}$ including the dates 1750 and 1800 to the post-treatment years), which is useful as a specification check. Since 1800 is too early for the institutional changes brought by the French Revolution to have any impact on industrial production (and there were relatively few new industrial technologies available at that date), both of these terms should be interpreted as a test for pre-existing trends. Interestingly, both interaction terms are negative and numerically quite small. For example, α_{1750} is estimated to be -0.007 (standard error = 0.04) and α_{1800} is -0.018 (standard error = 0.04), while the interaction terms for 1850 and 1913 are hardly affected. These regressions therefore reiterate the pattern shown in Figures 1A and 1B of a significant increase in urbanization among the treated countries, with no evidence of a pre-existing differential trend between treated and untreated countries before 1850.

As noted in Section 4, there is disagreement between Bairoch’s and Maddison’s data on the growth of Italy. It is therefore important to see whether the results are robust to the exclusion of this country. Columns 3 and 4 repeat the same regressions, but now excluding Italy. The results are very similar; now α_{1913} is estimated to be 0.13 (standard error = 0.04), and there

makes our inference considerably more conservative, and turn some otherwise statistically significant results to insignificant.

is again no evidence of pre-existing trends. The F-tests at the bottom of these columns again comfortably reject the hypothesis that the interaction terms measuring the differential growth of the treated area in the post-treatment period are equal to zero.

Columns 5 and 6 exclude the UK (Britain) from the sample. As discussed in Section 2, Britain already had the most developed institutions and the most industrialized economy in Europe, so it may not be a very good comparison (either because the rest of Europe might be catching up to the UK or because the UK might be on a different growth trajectory). In any case, the results in columns 5 and 6 in both panels are very similar to those with the UK in columns 1 and 2. For example, now α_{1913} is estimated to be 0.19 (standard error = 0.04) without the pre-treatment years and 0.18 with the pre-treatment years, again with all the pre-treatment years having negative, very small and insignificant coefficients.

In the same way that Britain may not be a good control group for the treated countries because it is “too” industrialized, Eastern Europe may also be a bad control group because it is relatively backward. Therefore, columns 7 and 8 exclude both Eastern Europe and Britain. The pattern is now very similar to those in columns 1 and 2, for example, with an estimate of α_{1913} equal to 0.16 (standard error = 0.04), and no evidence of pre-existing trends. Once again, the F-test comfortably rejects the hypothesis that the interaction terms in the set $\mathcal{T}^{post}$ are equal to zero.

The bottom panel of Table 2 repeats the same regressions for areas controlled by Napoleon instead of countries occupied by the Revolutionary armies. The results are very similar to those in the top panel. For example, in the baselines specification, α_{1913} is estimated to be 0.16 (standard error = 0.04), and column 2 shows no evidence of pre-existing trends. The F-tests at the bottom of these columns again comfortably reject the hypothesis that the interaction terms in the set $\mathcal{T}^{post}$ are equal to zero. The results in the remaining columns are also similar to those in the top panel.

Overall, this evidence shows that countries conquered by the Revolutionary armies or Napoleon show no differential trend in prosperity before 1850, but significant differential growth after 1850.

5.2 Results with GDP Per Capita

Table 3 repeats the same regressions as in Table 2 but using log GDP per capita from Maddison (2003) as the dependent variable y_{jt} , and is thus a check on the results using urbanization rates.

Now, the post-treatment years (the set $\mathcal{T}^{post}$) are 1850 and after (that is, 1870, 1890 and 1900), and the specification test will use 1700 and 1820 as the pre-treatment dates (even though there may already be some effect in 1820, we expect this to be very limited). Again, the top panel refers to the treatment defined by occupation by the French Revolutionary armies, and the bottom panel is for Napoleon.

In column 1, none of the individual coefficients, $\{\alpha_t\}_{t \in \mathcal{T}^{post}}$'s, are individually significant, and they are jointly significant at 7%. Adding 1700 and 1820 does not affect this pattern.

Columns 3 and 4 show that the pattern of insignificant results is driven by the Maddison's estimates for Italy, which, as discussed above, may be unreliable. Once Italy is excluded, the numbers are very similar to those in Table 2 using urbanization. For example, in column 3 α_{1900} is estimated to be a 0.30 (standard error = 0.14), which implies that by 1900 the treated countries were about 30% richer than those that were untreated. The F-test at the bottom shows that the hypothesis that $\{\alpha_t\}_{t \in \mathcal{T}^{post}}$'s are equal to zero is rejected at less than 1%. In column 4, the interactions with 1700 and 1820 are added for pre-specification tests. These estimates are positive and sometimes substantial, but insignificant.

The rest of the table is similar to Table 2, and confirms the pattern shown in columns 1-4.

Overall, the results with GDP per capita are consistent with the urbanization results, but also markedly weaker. First, with Maddison's Italy estimates included, the coefficient estimates are statistically insignificant. Second, the pre-existing trend terms are positive and not always small, though always statistically insignificant.

5.3 Results with Industrial Production Per Capita

In Table 4, we turn to log industrial output per capita, which is both a check on the results of Tables 2 and 3, and also an investigation of the mechanism through which the institutional reforms of the French Revolution may have impacted the future growth of neighboring countries. In this case, there is more of a question mark as to what the set $\mathcal{T}^{post}$ should include, since we have data for the years 1830 and 1860 (it always includes 1880, 1900 and 1913, with 1800 and 1750 as the omitted years). One possibility is to consider only the second half of the 19th century as the post-treatment date as we did with the other data. But 1830 might be already late enough to see some effect. Therefore, we experiment with both possibilities, and in all cases at the bottom of the table we report p-values from F-tests for both 1830-1913 and 1860-1913.

The top panel is again for conquest by the Revolutionary armies, and the bottom panel is for Napoleon. Column 1 shows the effect of treatment on log industrial production starting in 1830. All of the coefficients are positive, but none of them are significant at less than 5%. The estimates for both α_{1900} and α_{1913} are reasonably large, 0.50 and 0.59, and are significant at 10%. The F-test at the bottom shows that hypothesis that $\{\alpha_t\}_{t \in \mathcal{T}^{post}}$'s are equal to zero can be rejected at 8% when 1830 is included in $\mathcal{T}^{post}$ and at 5% when $\mathcal{T}^{post}$ starts with 1860. Column 2 adds the interaction with 1800, which is positive but small and insignificant. This additional interaction has no effect on the pattern of coefficients or the joint significance of the interaction terms.

Columns 3 and 4 again show the results without Italy, while columns 5 and 6 show the results without UK. Without the UK, the estimates are somewhat larger and statistically more significant. For example, α_{1913} is now estimated at 0.66 (standard error= 0.32), which is significant at 5%, and the hypothesis that $\{\alpha_t\}_{t \in \mathcal{T}^{post}}$'s are equal to zero can be rejected at 1% when 1830 is included in $\mathcal{T}^{post}$ and at 3% when $\mathcal{T}^{post}$ starts with 1860.

Columns 7 and 8 look at the sample without Eastern Europe and the UK. The magnitudes are very similar to those in columns 1-6, but the estimates are no longer statistically significant, and the F-tests fail to reject hypothesis that $\{\alpha_t\}_{t \in \mathcal{T}^{post}}$'s are equal to zero had conventional significance levels.

The bottom panel shows the results for the areas controlled by Napoleon, which are quantitatively similar to those in the top panel, but are on the whole less significant. For example, none of the estimates for the base sample are statistically significant at 10% or less, and only the F-tests for 1830-1913 in samples without Italy or without the UK reject the hypothesis that all $\{\alpha_t\}_{t \in \mathcal{T}^{post}}$'s are equal to zero at 10% or less.

Overall, we interpret these results as broadly similar to, though markedly weaker than, the urbanization results (especially in the samples without Eastern Europe and the United Kingdom and in the case where treatment is defined by Napoleon's occupation, the differences between treated and untreated countries are no longer statistically significant). There is very little evidence for pre-existing trends, and all of the estimates are always positive and significant about half of the time.

5.4 Robustness

Table 5 looks at the robustness of our urbanization results, which showed the most consistent pattern of divergence between treated and untreated countries. Five different sets of robustness exercises are reported, once again in two panels corresponding to the treatment groups defined by invasion by the Revolutionary armies or occupation by Napoleon.

First, we include in the covariates vector $\mathbf{X}_{jt}$ a full set of interactions between initial y_{jt} and the full set of year dummies (i.e., $\sum_t \eta_t \cdot y_{jt_0}$ where t_0 is the initial date in the sample). This is a very flexible (and demanding) way of controlling for any pre-existing trends and any pattern of mean reversion. The initial date for this exercise is either 1300 or 1500, and the results are reported in columns 1 and 2. Remarkably, this check has little effect on our estimates; α_{1913} is estimated at 0.13 (standard error= 0.04) with interactions starting from 1300 and at 0.12 (standard error 0.05) with interactions starting from 1500, though in all cases the interactions between initial urbanization and the year dummies are also statistically significant.

In column 3, we include a full set of interactions between year dummies and latitude (i.e., $\sum_t \eta_t \cdot \text{latitude}_j$), as a check for certain geographic characteristics that may potentially cause differential growth across countries. This also has little effect on our estimates, for example α_{1913} again remains at 0.13 (standard errors =0.04). The latitude times year interactions are themselves significant at 4%. In column 4, we include a full set of interactions between year dummies and an indicator for predominantly Protestant countries.³⁵ This is an important control, since some influential social scientists have argued for the importance of the Protestant work ethic in causing or at least facilitating industrialization (e.g., Weber, 1905, Landes, 1998). Interestingly, there is no evidence of differential growth of protestant countries, and these time interactions are jointly insignificant and have little effect on our estimates.

Finally, in column 5 we estimate a more structured specification, where rather than allowing each year in the set $\mathcal{T}$ to have a different coefficient, we impose a post-treatment effect that takes a linear growth form. In particular, the estimates in Table 2 show that the differential growth between treated and untreated countries is expanding over time. A natural conjecture might be that this is going to be well captured by a differential linear trend. For this reason, we estimate the model

$$y_{jt} = d_t + \delta_j + \beta \sum_{t \in \mathcal{T}^{post}} (t - t_1) \cdot I_j + \mathbf{X}_{jt}' \cdot \boldsymbol{\gamma} + \varepsilon_{jt}, \quad (3)$$

³⁵The Protestant countries in our sample are Germany, Netherlands, England, Switzerland, the Czech country, and all countries in Scandinavia. See the Data Appendix for details.

where $t_1 + 1$ is the first treatment year, which depends on the outcome variable in question. For urbanization, since our first treatment here is 1850, t_1 is taken to be 1849. This model leads to an estimate of β equal to 0.0019 (recall that the coefficient in the table is multiplied by 1000). This estimate indicates that treated countries experienced an increase in urbanization of about 1 percentage point every 10 years during the treatment era, which is a large effect, but is broadly comparable to the estimates for α_{1850} and α_{1913} in Table 2.

The bottom panel shows the same results for areas under Napoleon’s control. The pattern is very similar to those in the top panel and to those in Table 2.

Overall, we conclude that there is a robust effect of the change in institutions imposed by the French Revolution or by Napoleon on the urbanization patterns of treated countries. This indicates that the institutional changes, interacting with the opportunities to industrialize, had a major economic effect. Nevertheless, the evidence is suggestive rather than conclusive, since the results with log GDP per capita and log industrial production per capita were somewhat weaker, and as Figures 1-3 show, there were already level differences between treated and untreated countries before the French intervention (though no evidence of differential trends).

6 German City-Level Regression Evidence

The country-level analysis indicates that countries where the French Revolution imposed radical institutional reforms, such as the abolition of feudal land relations, the power of the church and the guilds, experienced significantly faster growth in the second half of the 19th century. Nevertheless, this analysis was limited to 23 countries, each with a different history and idiosyncratic features. Although the institutions of the French Revolution were *exogenously* imposed on these countries, this does not make our key right hand side variable econometrically exogenous, since these countries could have systematically grown at different rates even in the absence of the French intervention. Ultimately, other factors may have been responsible for the divergence of economic fortunes among the treated and untreated countries within Europe. This concern is heightened by the fact that, as shown in Figures 1-3, the treated countries were on average richer and more prosperous before the arrival of the French Revolution. This and the fact that the results with log GDP per capita are not significant (unless we exclude Madison’s estimates for Italy) make us cautious in interpreting the above patterns as the causal effect of the radical institutional reforms of the French Revolution, and encourage us to look at within Germany differences.

6.1 Baseline Results

To further investigate the potential effects of the institutional reforms, we next turn to an analysis of the impact of French occupation (and institutional reform) on German cities. As noted above, for this purpose, we use data on the population of individual cities compiled by Bairoch, Batou and Chèvre (1988) for the years 1700, 1750, 1800 and 1850 combined with data from Lahmeyer for 1818, 1871, and 1910.³⁶ Our base sample is German cities to the west of the Elbe and Saale rivers. As discussed in subsection 3.7, while there was considerable variation in feudalism within Germany, there seems to be general agreement that serfdom was not widespread in this area, though many remnants of feudalism still persisted (Blum, 1957). Therefore, cities to the west of the Elbe provide us with that fairly homogeneous set of cities to gauge the effect of the institutional reforms brought about by the French Revolution. As an alternative, we use all of Germany as the untreated group, or simply Saxony and Mecklenburg as the control group.³⁷ Cities in the latter two states have the advantage of being roughly comparable to be treated cities, and having been least affected by the French Revolution and Napoleon.

Finally, as also noted above, we again used two codings, one classifying only the Rhineland, the area conquered by the French Revolutionary armies, as treated, and the second adding the cities controlled by Napoleon to the treated category.

Our estimating equations are very similar to (1) and (3), and are given by

$$u_{it} = d_t + \delta_i + \sum_{t \in \mathcal{T}} \alpha_t \cdot I_i + \mathbf{X}'_{it} \cdot \boldsymbol{\gamma} + \varepsilon_{it}, \quad (4)$$

and

$$u_{it} = d_t + \delta_i + \sum_{t \in \mathcal{T}^{post}} \alpha_t \cdot I_i + \sum_{t \in \mathcal{T}^{pre}} \alpha_t \cdot I_i + \mathbf{X}'_{it} \cdot \boldsymbol{\gamma} + \varepsilon_{it}, \quad (5)$$

where u_{it} is the log of urban population in city i at time t , which is our measure of city-level prosperity. The rest of the variables are similarly defined to those in equations (1) and (3): the d_t 's denote a full set of time effects, the δ_i 's denote a full set of city effects, $\mathbf{X}_{it}$ is a vector of other covariates, and ε_{it} is the error term. The dummy I_i denotes the treatment status and takes the value of 1 for cities treated by the French Revolution and Napoleon, and zero

³⁶We also use the relevant data in Mitchell (1981) both to check Lahmeyer and to fill all possible gaps in the dataset.

³⁷The historical record suggests that in neither Saxony nor Mecklenburg were there institutional reforms (e.g., Schmitt, 1983).

otherwise. In the baseline specification, I_i takes the value 1 for cities in the Rhineland. The term $\sum_{t \in \mathcal{T}} \alpha_t \cdot I_i$ in (4) therefore again estimates a potentially differential growth effect for every time period in the set $\mathcal{T}$, for example, a differential growth effect for every year after 1800.

Our baseline sample uses the extended dataset (Bairoch et al., Lahmeyer, and Mitchell) so consists of the years 1700, 1750, 1800, 1818, 1850, 1871, and 1910. We take the set $\mathcal{T}^{post}$ to consist of the years 1850, 1871, and 1910, and the pre-treatment specifications are conducted by considering the set $\mathcal{T}^{pre}$ consisting of 1800 and 1818. In all cases, 1700 and 1750 are in the omitted category.

The estimates of (4) and (5) using our baseline sample are given in Table 6. The top panel is again for conquest by Revolutionary armies, which in the context of Germany means the Rhineland, while the bottom panel includes all areas controlled by Napoleon (as defined in Section 4).

Column 1 shows an estimate of α_{1850} equal to 0.27 (standard error= 0.09), which is significant at 5%, and shows that the urban population in the Rhineland increased by about 27% more relative to other areas to the west of the Elbe. However, the differential growth is lower in 1871 and 1900 than the estimate for 1850 (respectively, 0.07 and 0.15 compared to 0.27). This may be partly because of the differences between the Bairoch et al. and Lahmeyer datasets, or because the rest of Germany caught up with the Rhineland. In any case, the F-test at the bottom for joint significance of all three coefficients rejects at less than 1%.

In column 2, we add interactions with 1800 and 1818 as pre-specification checks. The pattern of the post-1850 interactions is similar, while the 1800 interaction is positive and insignificant and the 1818 interaction is negative and insignificant. Overall, there appears to be no evidence for pre-existing trend in these data.

We find the same pattern in columns 3 and 4 when we look at all of Germany, and in columns 5 and 6 when we look at Saxony and Mecklenburg; once again, α_{1850} is large and significant, but this effect disappears later on. With Saxony and Mecklenburg as the control group, there is also evidence of pre-existing trends.

The bottom panel looks at cities occupied by Napoleon. Now the pattern is somewhat more encouraging in column 1; α_{1850} is estimated to be 0.16 (standard error= 0.07), while α_{1871} at 0.29 and α_{1900} at 0.26 are larger than in 1850. However, now there is more evidence of pre-existing trends. The results in the other columns are similar.

Overall, the evidence is not conclusive. Treated cities always appear to have grown faster than the untreated cities in the entire post-treatment period, but the growth pattern is uneven, and there is some evidence for pre-existing trends.

6.2 Robustness

Table 7 investigates the robustness of the results in Table 6 with the same type of controls we used for the country-level data. Again the top panel is for the Rhineland, while the bottom panel is for cities controlled by Napoleon.

Column 1 includes a full set of time interactions with the initial (log) city population as a flexible check for mean reversion and differential trends. Although these interactions are significant, in our base sample they have little effect on the estimates of α_{1850} , α_{1871} and α_{1900} . Column 2 includes a full set of time interactions with latitude. These interactions themselves are insignificant, and they have no effect on the estimates. Column 3 includes a full set of interactions with a dummy for whether the city’s predominant religion was Protestantism.³⁸ These interactions are themselves significant (with a positive coefficient on the Protestant dummy), but again have little effect on the estimates of α_{1850} , α_{1871} and α_{1900} .

The next three columns repeat these regressions for the whole of Germany, with fairly similar results to those in columns 1-3 (and to those in Table 6).

The bottom panel shows results for cities controlled by Napoleon, which are somewhat weaker. Now when the controls for the full set of latitude times year and Catholic times year interactions are included, the treatment effects are no longer jointly significant at 5% or less (though in most cases the magnitude is similar to the corresponding coefficient in Table 6).

Finally, Table 8 shows the same results limiting the sample only to the Bairoch et al. data. Given the patterns in Table 6, the results in this table are not surprising. There is a statistically significant differential effect at 1850, but also some evidence for differential trends. The main difference from Table 6 is that now the results with the second coding, Napoleon-controlled cities, are weaker rather than being stronger compared with the baseline coding.

Overall, the city level evidence is mixed. In all cases, cities that underwent radical institutional reform under the French Revolutionary armies or Napoleon show faster population growth than the untreated cities (either to the west of the Elbe or in the whole of Germany),

³⁸We coded cities in states that were officially Catholic (Bavaria and other Southern states where the monarch was Catholic and/or the state was officially Catholic) as non-Protestant. We are currently looking for further information on additional isolated Catholic German cities. See the Data Appendix for further details.

but the time pattern of these effects is not always what we had expected, with a larger impact in 1850 than later, and in most cases there is some evidence of pre-existing trends.

7 Interpretation

The evidence presented in the previous two sections shows that there was differential growth of areas that underwent radical institutional change under French influence relative to untreated areas, though both the country-level and the city-level results are not totally conclusive (there is some evidence of pre-existing trends in the city-level data, and in the country-level data, the results are highly robust only with urbanization, while they are less significant with GDP per capita and industrial production per capita). Nevertheless, given the data quality, we interpret the evidence as suggestive of a positive long-run effect of the institutional changes brought by the French Revolution.

7.1 Towards a Framework

We now provide an interpretation for the potential positive effect of institutional reforms imposed by the French Revolution, and also discuss alternative interpretations.

Let us first discuss and discard two hypotheses, which are a priori unattractive and also not supported by the data. One of these would expect immediate positive, and the other immediate negative, effects of the French intervention. We find these hypotheses, especially the one expecting an immediate positive effect, unappealing, since the imposition of new institutions by the French came simultaneously with war, disruption, French occupation and sometimes quite onerous taxes imposed by the French for the financing of their war effort. Under these circumstances, it would be surprising to find a positive effect from the French intervention immediately or shortly after the occupation.

An immediate negative effect, on the other hand, may be possible, precisely because of the disruption, though again throughout this period, wars were commonplace, so the disruption of war was a continuing presence for all of our sample.

Our hypothesis, instead, expects no immediate effect from the institutional changes imposed by the French Revolution. What the French Revolution did was to abolish the hold of the oligarchies (nobility, clergy and the guilds) on economic and political power. But as noted by Hoffman (1996) in the context of France, it is not clear that the abolition of the existing quasi-feudal relations would have led to a major change in agricultural productivity in any case.

The situation is very different, however, when we consider new economic, especially industrial, opportunities.

The framework in Acemoglu (2003) is a useful starting point in this case. Acemoglu (2003) emphasizes that oligarchic structures can achieve high levels of output with technologies that do not require much selection, churning or creative destruction, but are likely to be a major barrier to economic growth when entry by new and more productive entrepreneurs is important. The empirical work in Acemoglu, Johnson and Robinson (2002) on economic growth and industrialization among the former European colonies and the contrast between Northeastern United States and the Caribbean colonies between the 17th and 19th centuries (Engerman and Sokoloff, 1997) are consistent with this framework. The evidence in these cases suggests that institutional differences had a major effect in the age of industrialization, and a much more limited effect before. For example, the Caribbean colonies of European powers, based on highly repressive political regimes, slavery and plantation agriculture were among the richest places in the world in the 17th and 18th centuries, but quickly fell behind Northeastern United States in the 19th century, precisely because the latter economy achieved a very rapid rate of industrialization. This expansion of industry was brought about not by the existing land owners or elites, but by a new class of merchants, entrepreneurs, and innovators, who could enter into every area of the economy because the democratic political institutions of the United States did not place significant entry barriers against newcomers.

The same reasoning applied to Europe suggests that institutional changes should have their most major effect when interacting with new economic, especially industrial, opportunities. For continental Europe, this meant the second half of the 19th century, when both the industrialization process became more rapid at the world level and the advances already achieved in Britain started spreading to the rest of Europe. Accordingly, the framework suggests that countries dominated by the traditional oligarchy would be slow to take advantage of industrial opportunities, and in some situations, the traditional elites might even actively block industrialization and new opportunities. In fact, that this was the attitude of the landed elites in Austria-Hungary and Russia is well-documented (see Acemoglu and Robinson, 2006b and the references therein). The absolutist monarchies of these countries feared that promoting industrialization would undermine their political power. In Russia, during the reign of Nikolai I between 1825 and 1855 only one railway line was built, and this was simply to allow the court to travel between Moscow and St. Petersburg. Economic growth and the set of institutions

that would have facilitated it were opposed since, as Mosse (1992, p. 146) puts it: “it was understood that industrial development might lead to social and political change.” Gregory (1991, p. 74) sums up this situation as: “... the Russian state feared that industrialization and modernization would concentrate revolution minded workers in cities, railways would give them mobility, and education would create opposition to the monarchy.” The same was true for Emperor Francis in Austria-Hungary, where the existing economic system essentially blocked all economic progress for much of the 19th-century. Consequently, “these living forces of the traditional economic system were the greatest barrier to development. Their chief supporter was ... Emperor Francis. He knew that the advances in the techniques of production threatened the life of the old order of which he was so determined a protector. Because of his unique position as final arbiter of all proposals for change he could stem the flood for a time. Thus when plans for the construction of a steam railroad were put before him, he refused to give consent to their execution ‘lest revolution might come into the country’” (Blum, 1943, p. 26).

In contrast, in areas where the French Revolution imposed radical reforms, including the abolition of the remnants of feudalism, the reduction in the power of the clergy, the elimination of the guilds’ entry barriers for proto-industrial activities, and perhaps most importantly, the creation of equality before the law for all citizens, the slate was cleaned for taking advantage of new economic opportunities.

Therefore, this framework leads to our basic hypothesis that the radical institutional reforms imposed by the French Revolution should have their effects when interacted with the new economic opportunities of the second half of the 19th century. In this light, the interpretation of the results presented above is clear: the empirical patterns confirm the effect of institutions when interacting with the new economic opportunities and confirm the basic insights of the framework.

7.2 Alternative Perspectives

Naturally, alternative interpretations are possible. Many of these were tested in our robustness tables, and did not receive much support from the data. For example, the patterns documented in Tables 2 and 6 do not appear to be driven by some type of mean reversion or differential growth on the basis of initial level of urbanization or urban population, nor do they appear to be explained by differential effects of geography (as captured by latitude) and religion (as proxied by Protestantism).

The most important alternative hypothesis is that, for other reasons, treated and untreated areas were on differential growth trends, and these latent differential trends account for the patterns documented in our empirical work. The lack of pre-existing trends in the country-level results bodes against this interpretation, but it does not entirely dismiss it. The reason is that, if the second half of the 19th century is the age of industry, it is possible that latent differences between treated and untreated areas should have exhibited themselves during this time period. Although such an interpretation is theoretically possible, it is also essentially impossible to test empirically unless the latent variables are specified.

One possibility could be coal reserves which would enable rapid industrialization. Presence of coal reserves would have little effect before the second half of the 19th century, but may play a crucial role thereafter. If coal reserves differed significantly between treated and untreated areas, this could be an alternative explanation. Nevertheless, we find no evidence that this has been the case.

In contrast to the country-level evidence, the city-level results show some evidence for pre-existing trends. This is potentially concerning for us, and suggests that we need to look in greater detail for potential omitted factors in the within Germany analysis. Part of the reason for the more complex pattern from the within Germany analysis may be that even the “untreated” cities in Germany were affected by the French Revolution, because of brief occupation by Napoleon or because of defensive modernization—to be able to cope with the French assault—as in Prussia. This is a topic we would like to investigate in greater detail in future.

7.3 Within Germany Differences

Let us now use our framework to think about how changes brought by the Revolution and Napoleon had a major economic impact in the Rhineland. Institutions changed profoundly in many parts of Germany, but as discussed above, the greatest impact was in the Rhineland, which was conquered by the Revolutionary armies and remained under French control for 20 years.³⁹ “The Rhineland, more than any other part of German-speaking Europe, experienced

³⁹There is controversy about where the real changes were greater. Simms (2004, pp. 32-33) notes that “Perhaps the most radical changes took place in the newly created ‘model’ and satellite states under more or less direct French control. In the Grand Duchy of Berg, created in 1806 and ruled by Napoleon’s brother-in-law Joaquim Murat, all subjects were made equal before the law and the Code Napoléon and the French Code Pénal were introduced. Similar measures were undertaken in the Kingdom of Westphalia, which was ruled by Napoleon’s brother Jerome . . . But the newly inflated states . . . were not far behind. Here reformers such as Max Montgelas in Bavaria or Sigismund von Reitzenstein in Baden drew on familiar models of reform . . . enriched by

the full impact of the forces unleashed by the French Revolution of 1789. Its legacy, as subsequently institutionalized and codified by Napoleon, lasted for a surprisingly long time in this region. The Napoleonic civil codes survived in the Prussian Rheinprovinz until 1900” Rowe (1999, p. 643).⁴⁰

Of these changes, probably the abolition of guilds was the most significant. “When the French first arrived, cotton manufacturing ... was confined to small concerns in Rheydt and Gladbach. By the time they left, it had multiplied both in scope and volume ... Symbolic was the establishment of a spinning-jenny in Cologne in 1797, which evoked the agonized and predictable complaint from the guilds that the new machine could spin as much yarn as all the human spinners in the city put together. Under the old regime their opposition would have been decisive, but in the bracing new climate of *laissez-faire*, it was the guilds themselves that perished” Blanning (1983, p. 149). Blanning continues (pp. 149-150): “The same pattern was repeated in several towns of the Roër department, most notably in Aachen, where the liberation of business enterprise from the restrictive practices of the guilds also led to a textile boom.”

Kisch (1989, p. 20) confirms this:⁴¹

Apart from the accidental happenings ... there were those measures to be accounted for, which, once enacted by the French authorities, strengthened the region’s institutions of capitalist growth for decades to come. The final removal of guild regulations that thus far had acted as a stranglehold on the economic advance of the imperial cities, was one of those progressive edicts. No less salutary for the future of Cologne and Aachen was the elimination of the social and economic disabilities which, throughout most of the 18th century, had stymied the activities of non-Catholics—namely, Protestants and Jews.

the French example ... Between 1800 and 1805 most Rheinbund states introduced religious equality before the law, largely standardized taxation and conscription, religious toleration (at least of Christians), the abolition of internal customs dues, bureaucratic rationality ... The corporate assemblies – or ‘estates’ – which so constrained 18th century princes were dissolved with French connivance; the expropriated imperial knights and counts .. lost their autonomous political status.” However, there is also substantial anecdotal evidence to indicate that in the Rheinbund many reforms were more nominal than real (e.g., Schmitt, 1983). “As for the rulers of the pays allies in the Confederation of the Rhine, many of them failed to introduce any reforms, while others tended to adopt only part.” (Grab, 2003, p. 25).

⁴⁰Sperber (1989, p. 200) writes, “Of all the regions of Central Europe, the Rhineland was the one most affected by the French Revolution.”

⁴¹Kisch (1989) also discusses the disruptive impacts on the Rhineland of the wars and the expulsion from traditional markets, as well as the positive market effects on the textile industry which came from incorporation into France after 1802—a market with no competition from the British.

Another momentous event of this revolutionary age was the confiscation of church lands and their subsequent method of redistribution. At the time, the French authorities were hard pressed for revenue and consequently decided to dispose of the extensive *morte main* quickly and in large units. Under the circumstances, only well-to-do peasants and particularly rich merchants and manufacturers with cash in hand were in a position to avail themselves of the favorable terms... the consequences of these dealings proved to be far-reaching. There came to be a dramatic shift of wealth and income in favor of the property-owning bourgeoisie .. the holdings became collateral for credit with which to finance the expansion and modernization of their plants, which in turn was to herald the local advent of the industrial revolution.

This argument is reminiscent of Tawney's (1941) argument that the dissolution of the monasteries under Henry VIII, and the subsequent sale of land, helped strengthen the gentry (non-noble landowners) and shifted the balance of economic power in a way that, over time, undermined the political basis of absolute rule.

Kisch also discusses the favorable effects of abolishing aristocratic privileges: "The culmination of all these reforms was the introduction of the code Napoleon. It is generally recognized that Napoleon's brainchild brought to this region and its inhabitants an up-to-date legal system conspicuous for its favoring capitalist property and entrepreneurial initiative. If industrial development under free enterprise required a propitious setting, this was certainly the proper framework. The Rhinelanders were never in doubt about the benefits that were being conferred upon them and they staunchly defended the Civil Code when their Prussian masters later considered dismantling it" (1989, pp. 20-21).⁴²

This also gives us a potential reason for why the reforms of the French Revolution were not reversed, or perhaps were not even reversible. As Emsley (2003, pp. 62-63) argues:

"Yet on the left bank of the Rhine, in the departments annexed to France during the revolutionary decade, the Code became firmly entrenched. Indeed, it was so well entrenched that, after 1815, the Rhenish elite successfully preserved the Code and resisted attempts of their new Prussian masters to introduce the Prussian *Allgemeines Landrecht*."

⁴²See Sperber (1989) and (1991) for details on the Rhinelanders tried (and succeeded for a long while) to hold onto the Code Napoleon and other progressive aspects of the French legacy.

The reason for this is similar to the argument in Acemoglu, Johnson and Robinson (2005a) that once a nascent social group becomes sufficiently rich and powerful, it will have greater ability to impose its political wishes in the political sphere. In Acemoglu, Johnson and Robinson (2005a), the nascent social group was the new group of merchants previously not allied with the crown in Britain and the Netherlands. Once they became enriched by Atlantic trade, they gained further political power, and eventually managed to change the institutions from absolutism to constitutional monarchy, much more respectful of their property rights. In the case of the Rhineland, the social group in question is again a new class of entrepreneurs, which became enriched and strengthened by the new rules (economic institutions) imposed by the French Revolution. Once this social group gained some political power, they were likely to be a formidable barrier against attempts to undo the economic institutions. Our conjecture is that this social group played a key role in the persistence of the institutions introduced by the French Revolution. Simms (2004, p. 39) sums this up as:

“In western and southern Germany there was no going back to the feudal status quo ante. The Prussian bureaucrats arriving in the newly acquired Rhine Province in 1815 found a population determined to hold onto the French law .. In southern Germany the old corporate representations had permanently given way to parliaments whose lower houses were largely elected on the basis of a property franchise; and by 1820 all southern German states had constitutions guaranteeing freedom of conscience and equality before the law ... The genie of the reform movement—freedom of movement, the standardization of taxation, the abolition of guilds—could not be put back in the bottle.”

8 Conclusion

The French Revolution of 1789 had a momentous impact on France and its neighboring countries. The Revolution violently toppled the established regime, and started a complex process, involving both the infamous French *Terror* and also radical institutional changes, including the abolition of the remnants of feudalism in agriculture, the reduction of the power of the nobility and the clergy, the abolition of guilds and internal tariffs, the establishment of equality before the law for all citizens and the reorganization of the state.

More importantly for the focus of this paper, the French Revolutionary armies, and later Napoleon, invaded and controlled Belgium, the Netherlands, Italy, Switzerland, and parts of

Germany. In all of these places, the Revolution undertook essentially the same radical political, legal, and economic reforms as in France. However, invasion by the French Revolutionary armies (and later by Napoleon) also came with chaos and the exploitation of the occupied territories (creating substantial resentment in many areas, particularly in Germany).

Despite the very large literature on the causes and consequences of the French Revolution, there has been little investigation into the long-run implications of institutional changes brought about by the French Revolution. This paper is an attempt in this direction and it exploits the imposition of institutions by French armies on neighboring countries as a quasi-natural experiment.

The evidence suggests that both at the country and at the city-level, areas that underwent institutional reforms of the French Revolution, undermining the power of rural and urban oligarchies, experienced more rapid economic growth, urbanization, and industrialization, especially after 1850. This pattern is fairly robust when we look at cross-country data on urbanization, though less robust with GDP per capita or industrial production per capita. We also find the same pattern exploiting the differential population growth of cities that underwent institutional reform under French Revolutionary armies or under Napoleon, though in this case, there is some evidence of pre-existing trends that make us less confident of the impact of the Revolution-induced institutional reforms.

These findings are interesting for the debate amongst economic historians about the impact of the Revolution and also have implications for important debates surrounding the role of institutions in society. First, contrary to the assertions of many economists, it contradicts the idea that institutions efficiently adapt to a society's characteristics. If this were true an exogenous change in institutions would not promote prosperity. Second, it provides no support to the hypothesis, going back to Burke and Hayek, that institutions which evolve 'naturally' are intrinsically superior to those that are rationally designed. Third, it shows that institutions can be transplanted in ways that are not tailored to local characteristics. It is hard to think of the institutions imposed by French armies as 'appropriate' but the evidence we have presented here nevertheless shows that they probably led to more rapid economic growth. Finally, the evidence shows that the imposition of the French Civil Code, had positive effects, at least relative to the pre-existing legal institutions. Given recent debates on the adverse effects of the Civil Code this finding might be regarded as surprising.

The possible positive evidence is consistent with our starting hypothesis. In particular, we

hypothesized that the radical institutional reforms brought about by the French Revolution should have had long-run beneficial effects because they destroyed the power of oligarchies and elites opposed to economic change. This combined with the arrival of new economic and industrial opportunities in the second half of the 19th century likely paved the way for rapid growth in areas benefiting from these institutional reforms. The evidence we present is broadly consistent with this pattern, but much more detailed investigations are necessary to show the robustness of our results and also check the mechanisms and our interpretation. Nevertheless, it also has to be emphasized that the evidence we present is not absolutely conclusive and more research remains to be done to understand the long-run economic implications of the French Revolution and other major episodes of institutional change.

9 Data Appendix

To be completed

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Table 1

	Whole Sample	Conquest by		Controlled by	
		Revolutionary Armies		Napoleon	
		Treated	Untreated	Treated	Untreated
<i>Country Level Variables</i>					
Urbanization	0.13 (0.11)	0.22 (0.14)	0.11 (0.08)	0.22 (0.14)	0.10 (0.08)
GDP per capita	6.98 (0.54)	7.35 (0.52)	6.88 (0.49)	7.29 (0.51)	6.87 (0.50)
Industrial production per capi	3.12 (1.23)	3.50 (1.21)	3.00 (1.22)	4.00 (1.18)	3.00 (1.24)
<i>City Level Variable</i>					
City Population	2.58 (1.21)	2.62 (1.18)	2.57 (1.21)	2.61 (1.20)	2.55 (2.21)

Mean values; standard deviation in parentheses

Table 2
Country Level Impact of French Revolution: Urbanization

	Dependent variable is urbanization (percent of population in cities)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1300-1913							
	Balanced panel, unweighted							
	Base Sample	Base Sample, without Italy		Base Sample, without UK		Western Europe, without UK		
<i>Panel A: Impact of French Revolution is Conquest by Revolutionary Armies</i>								
French Revolution x 1750		-0.007 (0.04)		-0.007 (0.05)		-0.002 (0.04)		-0.003 (0.04)
French Revolution x 1800		-0.018 (0.04)		-0.02 (0.05)		-0.01 (0.04)		-0.01 (0.04)
French Revolution x 1850	0.02 (0.02)	0.02 (0.03)	0.026 (0.017)	0.02 (0.03)	0.035 (0.01)	0.033 (0.02)	0.032 (0.016)	0.03 (0.03)
French Revolution x 1913	0.16 (0.05)	0.15 (0.05)	0.13 (0.04)	0.13 (0.04)	0.19 (0.04)	0.18 (0.04)	0.16 (0.04)	0.16 (0.04)
p-value for test joint significance interactions 1850-1913	[0.01]	[0.01]	[0.004]	[0.003]	[0.00]	[0.00]	[0.005]	[0.01]
<i>Panel B: Impact of French Revolution is Controlled by Napoleon</i>								
French Revolution x 1750		-0.006 (0.03)		-0.007 (0.04)		-0.001 (0.03)		-0.002 (0.03)
French Revolution x 1800		-0.017 (0.03)		-0.018 (0.04)		-0.01 (0.03)		-0.009 (0.03)
French Revolution x 1850	0.02 (0.02)	0.01 (0.03)	0.02 (0.02)	0.01 (0.03)	0.03 (0.01)	0.029 (0.02)	0.030 (0.02)	0.02 (0.02)
French Revolution x 1913	0.16 (0.05)	0.15 (0.05)	0.13 (0.04)	0.13 (0.04)	0.19 (0.03)	0.18 (0.03)	0.17 (0.04)	0.17 (0.04)
p-value for test joint significance interactions 1850-1913	[0.004]	[0.004]	[0.001]	[0.001]	[0.00]	[0.00]	[0.002]	[0.01]
Number of Countries	23	23	22	22	22	22	14	14
Number of Observations	161	161	152	152	154	154	98	98

Country level data; all regressions have full set of country and year dummies. Robust standard errors, clustered by country. Base sample is all West and East European countries for which we have data (except France). Countries conquered by Revolutionary armies are: Belgium, Germany, Italy, Netherlands, and Switlerland. Countries controlled by Napoleon are same plus Spain. Data are for 1300, 1400, 1500, 1600, 1700, 1750, 1800, 1850, and 1913, from Bairoch (1988); cities need population of at least 5,000 to enter dataset.

Table 3
Country Level Impact of French Revolution: GDP per capita

	Dependent variable is log GDP per capita							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1500-1900							
	Unbalanced panel, unweighted							
	Base Sample		Base Sample, without Italy		Base Sample, without UK		Western Europe, without UK	
<i>Panel A: Impact of French Revolution is Conquest by Revolutionary Armies</i>								
French Revolution x 1700		0.08 (0.13)		0.16 (0.13)		0.10 (0.13)		0.07 (0.13)
French Revolution x 1820		-0.002 (0.10)		0.08 (0.06)		0.02 (0.10)		-0.03 (0.11)
French Revolution x 1850	0.05 (0.08)	0.07 (0.12)	0.12 (0.04)	0.18 (0.06)	0.07 (0.08)	0.10 (0.12)	0.07 (0.09)	0.08 (0.13)
French Revolution x 1870	0.17 (0.13)	0.19 (0.16)	0.28 (0.08)	0.34 (0.07)	0.2 (0.12)	0.23 (0.16)	0.18 (0.14)	0.19 (0.17)
French Revolution x 1890	0.16 (0.17)	0.18 (0.20)	0.30 (0.12)	0.36 (0.10)	0.19 (0.17)	0.22 (0.20)	0.18 (0.18)	0.19 (0.21)
French Revolution x 1900	0.14 (0.19)	0.16 (0.22)	0.30 (0.14)	0.35 (0.12)	0.17 (0.19)	0.20 (0.22)	0.15 (0.21)	0.16 (0.23)
p-value for joint post-revolution tests using all interactions 1850-1900	[0.07]	[0.07]	[0.01]	[0.0003]	[0.03]	[0.03]	[0.13]	[0.13]
<i>Panel B: Impact of French Revolution is Controlled by Napoleon</i>								
French Revolution x 1700		0.05 (0.11)		0.11 (0.11)		0.07 (0.11)		0.03 (0.11)
French Revolution x 1820		-0.016 (0.09)		0.05 (0.06)		0.007 (0.09)		-0.06 (0.09)
French Revolution x 1850	0.002 (0.08)	0.01 (0.12)	0.05 (0.07)	0.09 (0.10)	0.02 (0.08)	0.04 (0.11)	0.01 (0.09)	0.01 (0.13)
French Revolution x 1870	0.10 (0.13)	0.11 (0.16)	0.17 (0.12)	0.21 (0.13)	0.136 (0.12)	0.16 (0.15)	0.098 (0.13)	0.09 (0.16)
French Revolution x 1890	0.10 (0.15)	0.11 (0.18)	0.20 (0.13)	0.24 (0.14)	0.13 (0.15)	0.15 (0.18)	0.12 (0.17)	0.11 (0.20)
French Revolution x 1900	0.08 (0.17)	0.08 (0.20)	0.18 (0.15)	0.22 (0.16)	0.11 (0.17)	0.12 (0.19)	0.08 (0.19)	0.07 (0.21)
p-value for joint post-revolution tests using all interactions 1850-1900	[0.03]	[0.08]	[0.07]	[0.13]	[0.03]	[0.08]	[0.07]	[0.06]
Number of Countries	22	22	21	21	21	21	14	14
Number of Observations	174	174	166	166	166	166	112	112

Country level data; all regressions have full set of country and year dummies. Robust standard errors, clustered by country. Base sample is all West and East European countries for which we have data (except France). Countries conquered by Revolutionary armies are: Belgium, Germany, Italy, Netherlands, and Switzerland. Countries controlled by Napoleon are same plus Spain. Data are for 1500, 1600, 1700, 1820, 1850, 1870, 1890 and 1900, from Maddison (2003).

Table 4
Country Level Impact of French Revolution: Industrial Production

	Dependent variable is log industrial production per capita							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1750-1913							
	Balanced panel, unweighted							
	Base Sample		Base Sample, without Italy		Base Sample, without UK		Western Europe, without UK	
<i>Panel A: Impact of French Revolution is Conquest by Revolutionary Armies</i>								
French Revolution x 1800		0.05 (0.08)		0.08 (0.09)		0.08 (0.07)		0.08 (0.08)
French Revolution x 1830	0.13 (0.14)	0.15 (0.18)	0.19 (0.16)	0.22 (0.20)	0.17 (0.13)	0.21 (0.17)	0.18 (0.14)	0.21 (0.18)
French Revolution x 1860	0.27 (0.24)	0.29 (0.27)	0.37 (0.25)	0.41 (0.29)	0.35 (0.22)	0.39 (0.25)	0.32 (0.23)	0.36 (0.26)
French Revolution x 1880	0.33 (0.29)	0.36 (0.32)	0.48 (0.29)	0.52 (0.32)	0.42 (0.27)	0.46 (0.30)	0.38 (0.29)	0.41 (0.32)
French Revolution x 1900	0.50 (0.31)	0.53 (0.34)	0.68 (0.29)	0.72 (0.33)	0.58 (0.30)	0.62 (0.33)	0.53 (0.33)	0.56 (0.36)
French Revolution x 1913	0.59 (0.33)	0.62 (0.35)	0.76 (0.33)	0.80 (0.36)	0.66 (0.32)	0.70 (0.35)	0.62 (0.36)	0.65 (0.39)
p-values for test joint significance								
1) interactions 1830-1913	[0.08]	[0.09]	[0.10]	[0.10]	[0.01]	[0.01]	[0.26]	[0.28]
2) interactions 1860-1913	[0.05]	[0.06]	[0.08]	[0.10]	[0.03]	[0.04]	[0.19]	[0.23]
<i>Panel B: Impact of French Revolution is Controlled by Napoleon</i>								
French Revolution x 1800		0.03 (0.07)		0.05 (0.08)		0.07 (0.06)		0.06 (0.07)
French Revolution x 1830	0.11 (0.12)	0.13 (0.16)	0.16 (0.13)	0.18 (0.17)	0.16 (0.12)	0.19 (0.14)	0.17 (0.12)	0.20 (0.15)
French Revolution x 1860	0.24 (0.21)	0.25 (0.25)	0.32 (0.22)	0.34 (0.26)	0.33 (0.19)	0.36 (0.21)	0.31 (0.20)	0.33 (0.23)
French Revolution x 1880	0.28 (0.26)	0.3 (0.29)	0.39 (0.27)	0.42 (0.30)	0.38 (0.24)	0.41 (0.27)	0.33 (0.27)	0.36 (0.29)
French Revolution x 1900	0.42 (0.29)	0.44 (0.31)	0.55 (0.29)	0.58 (0.32)	0.51 (0.27)	0.54 (0.30)	0.45 (0.31)	0.48 (0.34)
French Revolution x 1913	0.47 (0.31)	0.49 (0.34)	0.58 (0.34)	0.60 (0.36)	0.54 (0.31)	0.57 (0.33)	0.49 (0.36)	0.52 (0.39)
p-values for test joint significance								
1) interactions 1830-1913	[0.20]	[0.20]	[0.10]	[0.09]	[0.01]	[0.01]	[0.25]	[0.26]
2) interactions 1860-1913	[0.20]	[0.26]	[0.17]	[0.23]	[0.07]	[0.12]	[0.22]	[0.31]
Number of Countries	20	20	19	19	19	19	13	13
Number of Observations	140	140	133	133	133	133	91	91

Country level data; all regressions have full set of country and year dummies. Robust standard errors, clustered by country. Base sample is all West and East European countries for which we have data (except France). Countries conquered by Revolutionary armies are: Belgium, Germany, Italy, Netherlands, and Switerland. Countries controlled by Napoleon are same plus Spain. Data are for 1750, 1800, 1830, 1860, 1880, 1900 and 1913, from Bairoch (1982).

Table 5
Country Level Impact of French Revolution: Robustness Checks

	Dependent variable is urbanization (percent of population in cities)				
	(1)	(2)	(3)	(4)	(5)
	1300-1913	1500-1913	1300-1913		
	Balanced panel, unweighted				
	Base Sample				
<i>Panel A: Impact of French Revolution is Conquest by Revolutionary Armies</i>					
French Revolution x 1850	0.036 (0.015)	0.02 (0.01)	0.02 (0.02)	0.02 (0.02)	
French Revolution x 1913	0.13 (0.04)	0.12 (0.05)	0.13 (0.04)	0.12 (0.05)	
p-values for test joint significance	[0.001]	[0.05]	[0.003]	[0.04]	
p-values for test joint significance					
1) urbanization in 1300 x year	[0.001]				
2) urbanization in 1500 x year		[0.00]			
3) latitude x year			[0.04]		
4) Protestant x year				[0.3]	
French Revolution x post x linear trend					1.89 (0.58)
<i>Panel B: Impact of French Revolution is Controlled by Napoleon</i>					
French Revolution x 1850	0.03 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	
French Revolution x 1913	0.16 (0.04)	0.14 (0.04)	0.15 (0.03)	0.13 (0.04)	
p-values for test joint significance	[0.0001]	[0.001]	[0.0001]	[0.003]	
p-values for test joint significance					
1) urbanization in 1300 x year	[0.0002]				
2) urbanization in 1500 x year		[0.00]			
3) latitude x year			[0.02]		
4) Protestant x year				[0.02]	
French Revolution x post x linear trend					1.95 (0.58)
Number of Countries	23	23	23	23	23
Number of Observations	159	136	159	159	159

Country level data; all regressions have full set of country and year dummies. Robust standard errors, clustered by country. Base sample is all West and East European countries for which we have data (except France). Countries conquered by Revolutionary armies are: Belgium, Germany, Italy, Netherlands, and Switzerland. Countries controlled by Napoleon are same plus Spain. Data are for 1300, 1400, 1500, 1600, 1700, 1750, 1800, 1850, and 1913, from Bairoch (1988); cities need population of at least 5,000 to enter dataset. In columns 5 and 10, the coefficients are multiplied by 1000 to make them easier to display.

Table 6
City Level Impact of French Revolution in Germany: Extended Dataset

	Dependent variable is log city population					
	(1)	(2)	(3)	(4)	(5)	(6)
	1700-1910					
	Unbalanced panel, unweighted regressions					
	Base Sample		All of Germany		Saxony and Mecklenberg as control group	
<i>Panel A: French Revolution Impact is Conquest by Revolutionary Armies</i>						
Affected by French Revolution		0.12		0.11		0.23
x 1800 year dummy		(0.11)		(0.11)		(0.11)
Affected by French Revolution		-0.03		-0.02		0.20
x 1818 year dummy		(0.15)		(0.14)		(0.15)
Affected by French Revolution	0.27	0.30	0.24	0.27	0.21	0.32
x 1850 year dummy	(0.09)	(0.13)	(0.09)	(0.13)	(0.10)	(0.13)
Affected by French Revolution	0.07	0.09	0.02	0.05	-0.01	0.10
x 1871 year dummy	(0.29)	(0.33)	(0.29)	(0.33)	(0.33)	(0.37)
Affected by French Revolution	0.15	0.18	0.11	0.14	0.14	0.25
x 1900 year dummy	(0.16)	(0.19)	(0.15)	(0.19)	(0.18)	(0.21)
p-value for test joint significance interactions 1850-1900	[0.001]	[0.001]	[0.002]	[0.001]	[0.04]	[0.004]
<i>Panel B: French Revolution Impact is Controlled by Napoleon</i>						
Affected by French Revolution		0.17		0.12		0.18
x 1800 year dummy		(0.08)		(0.07)		(0.08)
Affected by French Revolution		0.09		0.10		0.25
x 1818 year dummy		(0.14)		(0.11)		(0.10)
Affected by French Revolution	0.16	0.25	0.07	0.14	0.03	0.14
x 1850 year dummy	(0.07)	(0.10)	(0.06)	(0.08)	(0.07)	(0.09)
Affected by French Revolution	0.29	0.37	0.08	0.14	-0.02	0.09
x 1871 year dummy	(0.19)	(0.21)	(0.18)	(0.19)	0.22	(0.23)
Affected by French Revolution	0.26	0.33	0.10	0.16	0.09	0.19
x 1900 year dummy	(0.13)	(0.15)	(0.12)	(0.14)	(0.14)	(0.15)
p-value for test joint significance interactions 1850-1900	[0.08]	[0.08]	[0.66]	[0.43]	[0.90]	[0.44]
Number of Cities	186	186	240	240	348	348
Number of Observations	860	860	1102	1102	74	74

City level data; all regressions have full set of city and year dummies; robust standard errors; base sample data are for 1700, 1750, 1800, 1818, 1850, 1871, and 1900. Base sample is Germany west of the Elbe and Saale rivers. Control group is all cities without indicated impact. Urban population from Bairoch, Batou and Chevre (for 1600, 1700, 1750, 1800, and 1850); from Lahmeyer for 1818, 1871, and 1900, with all available data from Mitchell. Cities are those within present day borders of Germany (from Bairoch dataset). Cities conquered by Revolutionary armies are the West Bank of the Rhine; additional cities controlled by Napoleon are satellite states on East Bank of Rhine, plus area in northern Germany annexed to France.

Table 7

City Level Impact of French Revolution in Germany: robustness checks using Extended Dataset

	Dependent variable is log city population					
	(1)	(2)	(3)	(4)	(5)	(6)
	1700-1850					
	Unweighted regressions; unbalanced panel					
	Base Sample			All of Germany		
<i>Panel A: French Revolution Impact is Occupied by Revolutionary Armies (West Bank of Rhine)</i>						
Affected by French Revolution	0.32	0.23	0.28	0.3	0.2	0.26
x 1850 year dummy	(0.11)	(0.09)	(0.09)	(0.11)	(0.09)	(0.09)
Affected by French Revolution	0.17	-0.02	0.07	0.09	-0.05	0.04
x 1871 year dummy	(0.22)	(0.30)	(0.29)	(0.24)	(0.29)	(0.28)
Affected by French Revolution	0.14	0.11	0.13	0.13	0.08	0.10
x 1900 year dummy	(0.20)	(0.16)	(0.16)	(0.19)	(0.15)	(0.15)
p-value for test of joint significance 1850-1900	[0.001]	[0.01]	[0.001]	[0.0004]	[0.01]	[0.001]
Initial city population x year dummies	[0.001]			[0.01]		
Protestant x year dummies		[0.002]			[0.01]	
Latitude x year dummies			[0.17]			[0.01]
<i>Panel B: French Revolution Impact is Controlled by Napoleon</i>						
Affected by French Revolution	0.29	0.05	0.19	0.17	-0.001	0.06
x 1850 year dummy	(0.08)	(0.07)	(0.08)	(0.07)	(0.06)	(0.06)
Affected by French Revolution	0.19	0.006	0.39	-0.03	-0.097	0.02
x 1871 year dummy	(0.16)	(0.13)	(0.30)	(0.15)	(0.18)	(0.20)
Affected by French Revolution	0.33	0.20	0.34	0.22	0.05	0.11
x 1900 year dummy	(0.15)	(0.15)	(0.16)	(0.13)	(0.13)	(0.12)
p-value for test of joint significance 1850-1900	[0.004]	[0.52]	[0.07]	[0.05]	[0.86]	[0.68]
Initial city population x year dummies	[0.03]			[0.005]		
Protestant x year dummies		[0.002]			[0.006]	
Latitude x year dummies			[0.19]			[0.03]
Number of Observations	771	771	771	904	904	904
Number of Cities	240	240	240	240	240	240

City level data; all regressions have full set of city and year dummies; robust standard errors; base sample data are for 1700, 1750, 1800, 1818, 1850, 1871, and 1900. Base sample is Germany west of the Elbe and Saale rivers. Control group is all cities without indicated impact. Urban population from Bairoch, Batou and Chevre (for 1600, 1700, 1750, 1800, and 1850); from Lahmeyer for 1818, 1871, and 1900, with all available data from Mitchell. Cities are those within present day borders of Germany (from Bairoch dataset). Cities conquered by Revolutionary armies are the West Bank of the Rhine; additional cities controlled by Napoleon are satellite states on East Bank of Rhine, plus area in northern Germany annexed to France.

Table 8
City Level Impact of French Revolution in Germany: Bairoch Dataset

	Dependent variable is log urban population					
	(1)	(2)	(3)	(4)	(5)	(6)
	1700-1850					
	Unbalanced panel, unweighted					
	Base Sample		All of Germany		Saxony and Mecklenberg as control group	
<i>Panel A: French Revolution Impact is Occupied by Revolutionary Armies (West Bank of Rhine)</i>						
French Revolution x 1750		0.13 (0.15)		0.10 (0.14)		0.1 (0.16)
French Revolution x 1800		0.20 (0.18)		0.18 (0.17)		0.29 (0.18)
French Revolution x 1850	0.25 (0.11)	0.38 (0.21)	0.22 (0.10)	0.33 (0.20)	0.23 (0.11)	0.38 (0.21)
Number of Cities	186	186	240	240	74	74
Number of Observations	595	595	771	771	245	245
<i>Panel B: French Revolution Impact is Controlled by Napoleon</i>						
French Revolution x 1750		0.07 (0.10)		0.024 (0.10)		0.01 (0.11)
French Revolution x 1800		0.23 (0.12)		0.14 (0.11)		0.20 (0.11)
French Revolution x 1850	0.17 (0.08)	0.30 (0.14)	0.09 (0.07)	0.16 (0.12)	0.06 (0.07)	0.16 (0.12)
Number of Cities	189	189	245	245	181	181
Number of Observations	606	606	788	788	581	581

City level data; all regressions have full set of city and year dummies; robust standard errors, clustered by city. Data are for 1700, 1750, 1800, and 1850; from Bairoch, Batou and Chevre. Base sample is Germany west of the Elbe and Saale rivers. Control group is all cities without indicated impact. Urban population from Bairoch, Batou and Chevre (for 1600, 1700, 1750, 1800, and 1850); from Lahmeyer for 1818, 1871, and 1900, with all available data from Mitchell. Cities are those within present day borders of Germany (from Bairoch dataset). Cities conquered by Revolutionary armies are the West Bank of the Rhine; additional cities controlled by Napoleon are satellite states on East Bank of Rhine, plus area in northern Germany annexed to France.

Figure 1A: Urbanization in Europe, 1300-1913

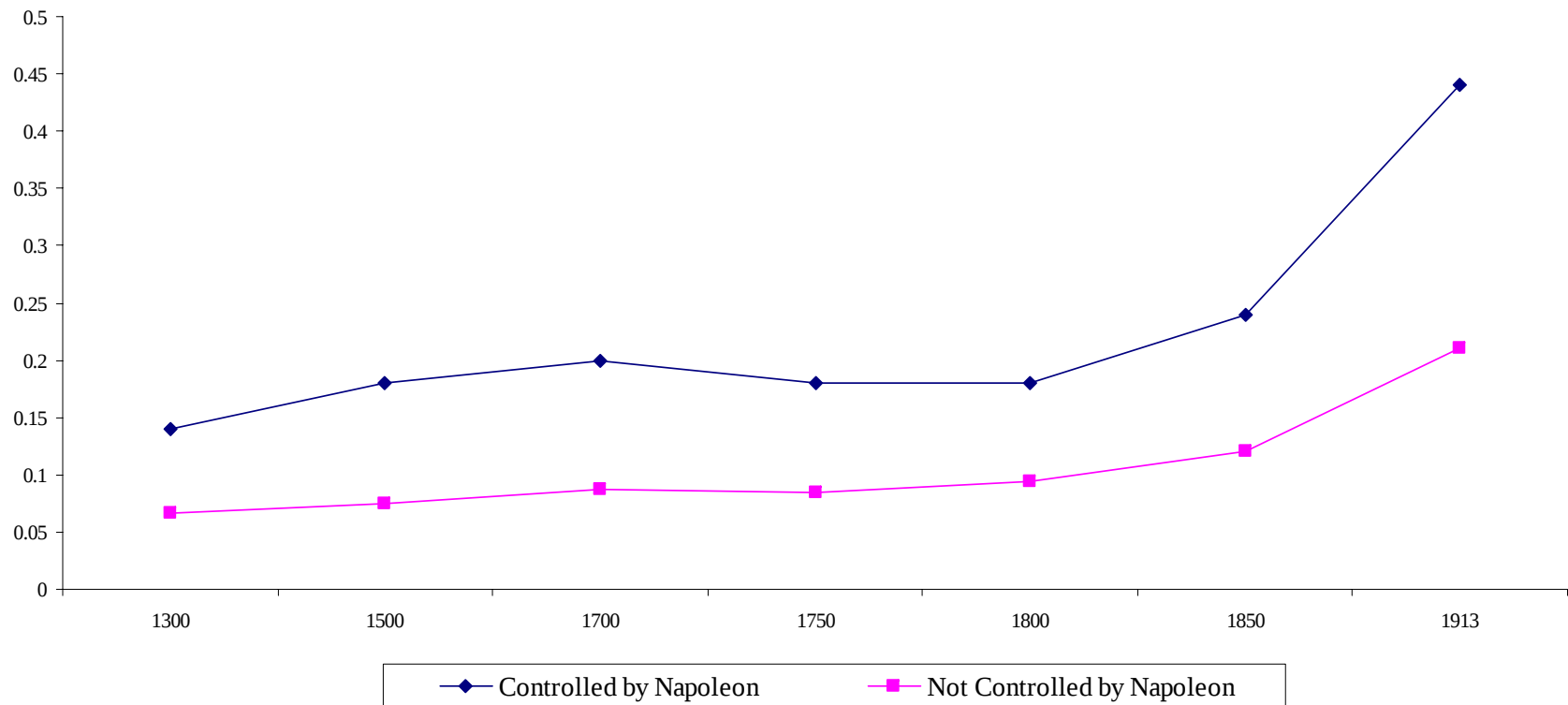


Figure 1B: Urbanization in Western Europe, 1300-1913

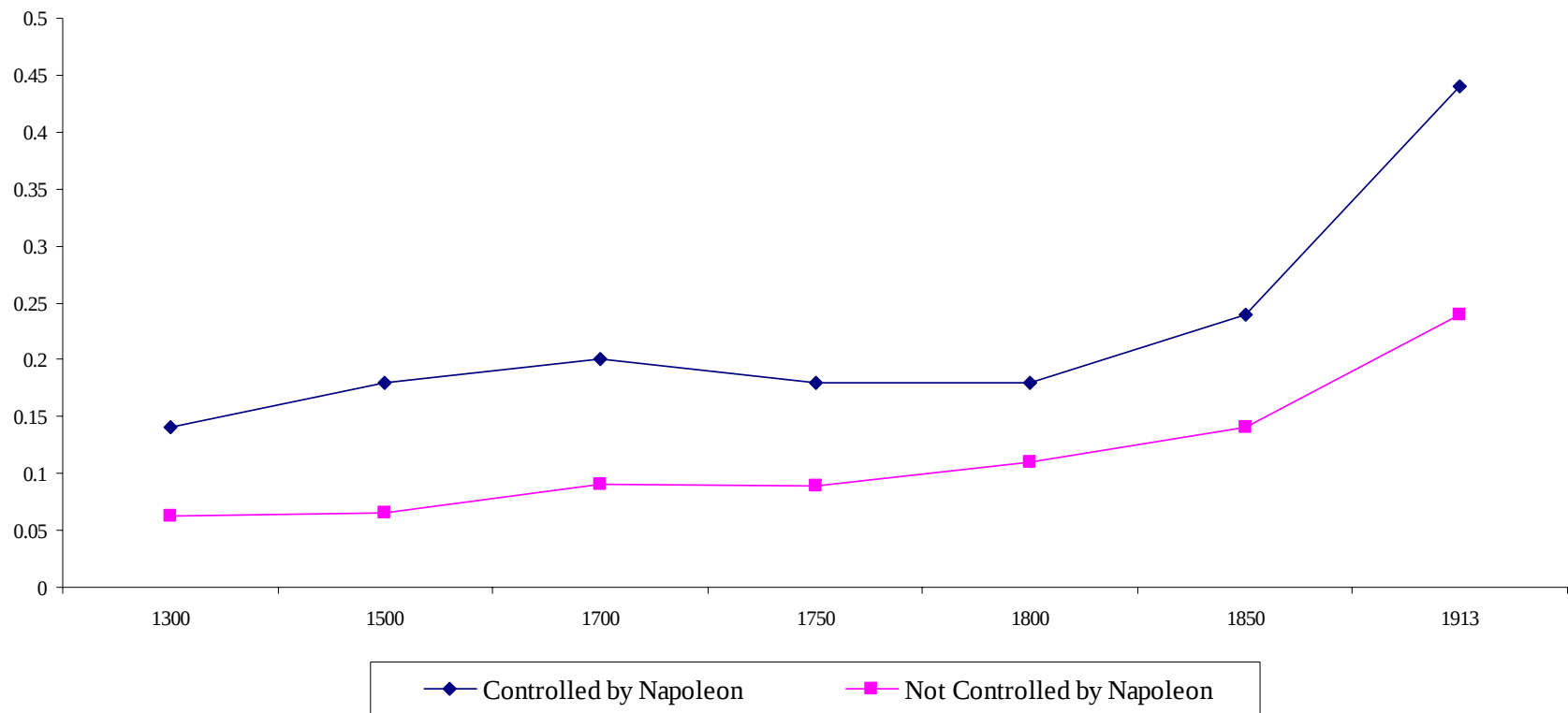


Figure 2A: GDP per capita in Europe, 1500-1900

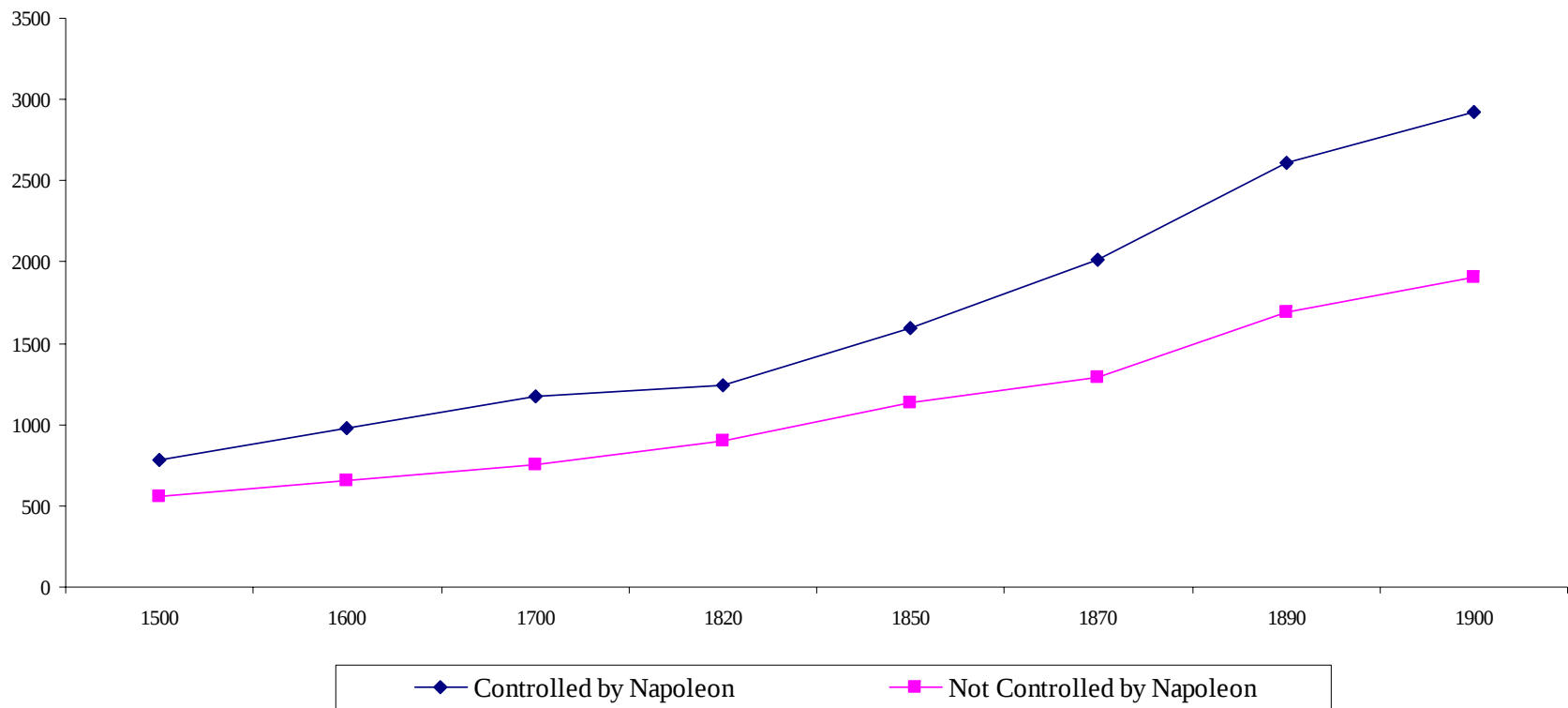


Figure 2B: Log GDP per capita in Europe, 1500-1900

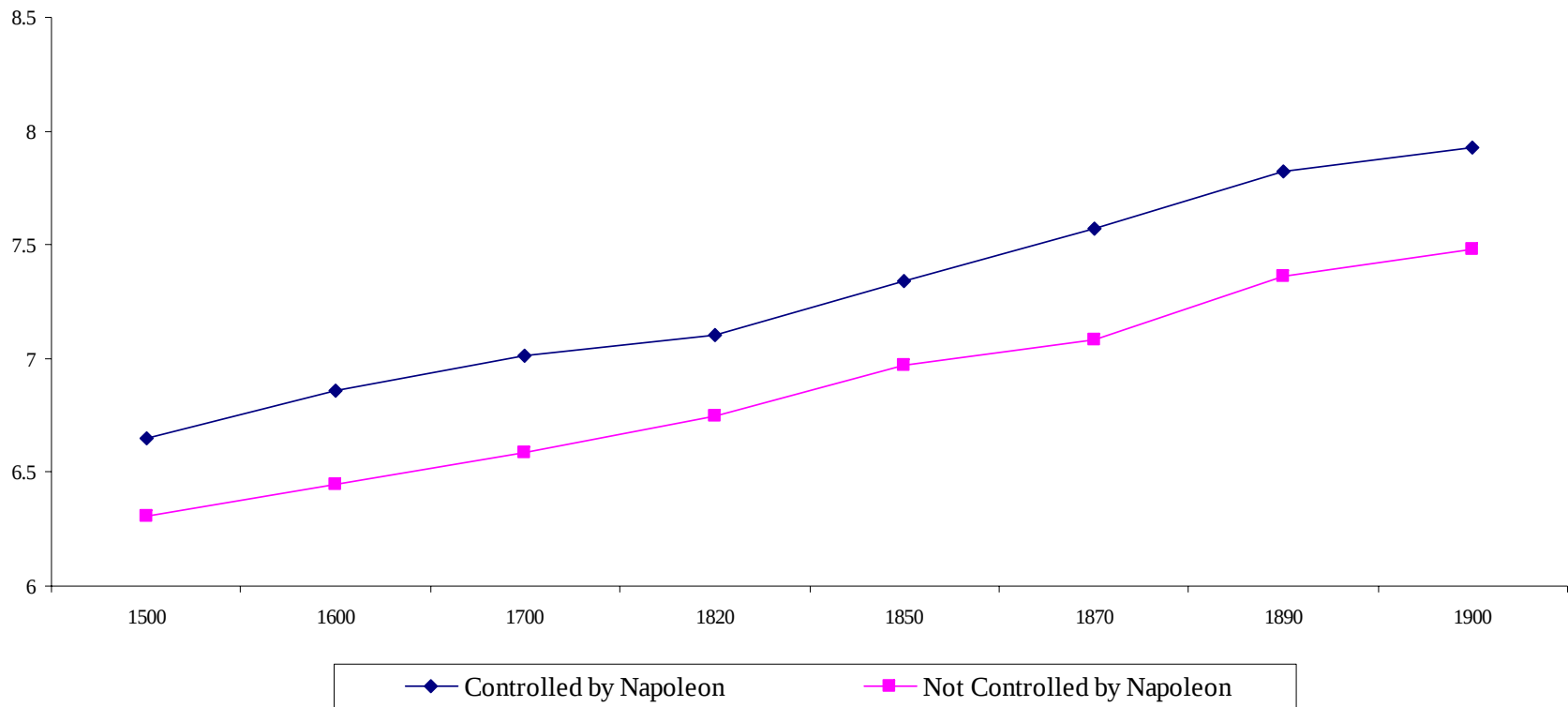


Figure 2C: Log GDP per capita in Western Europe, 1500-1900

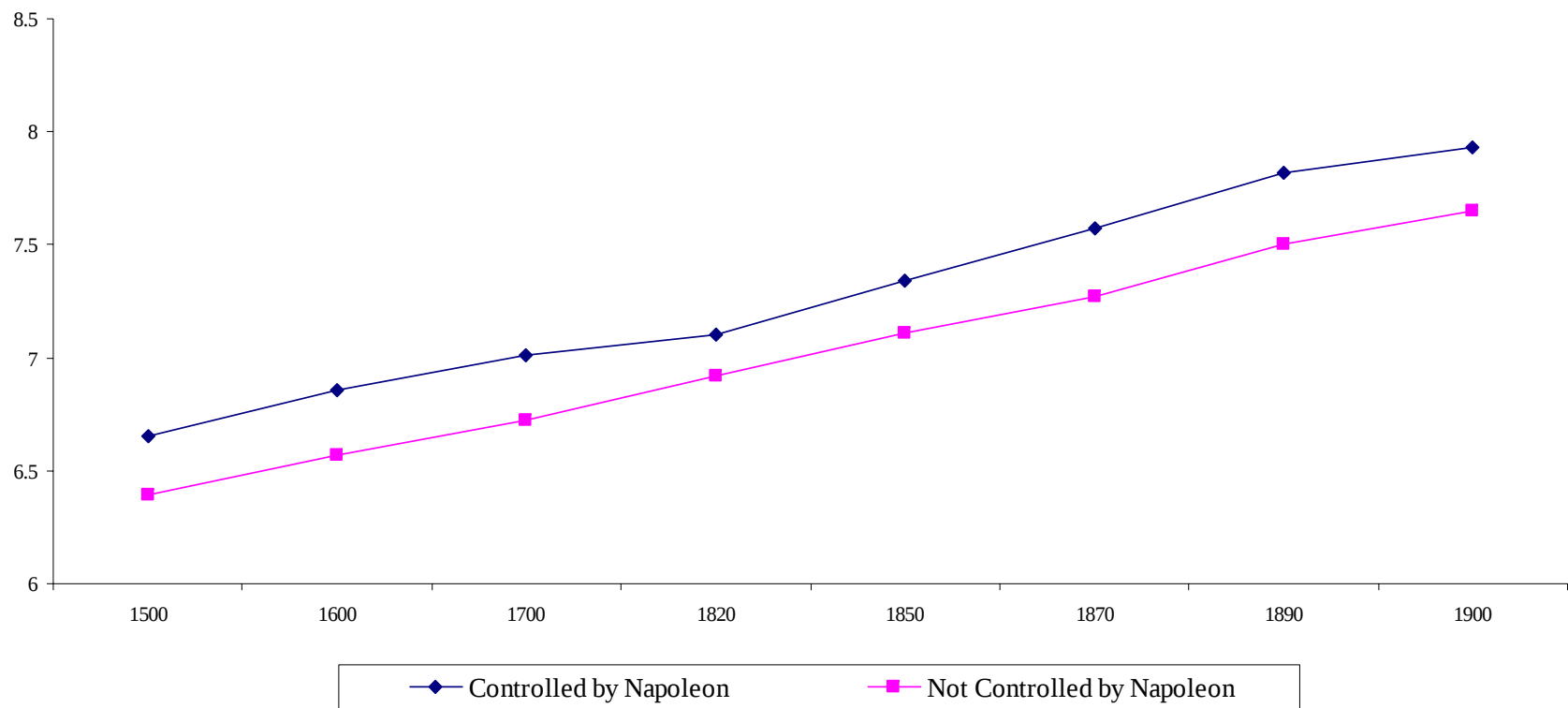


Figure 3A: Industrial Production per capita in Europe, 1750-1913

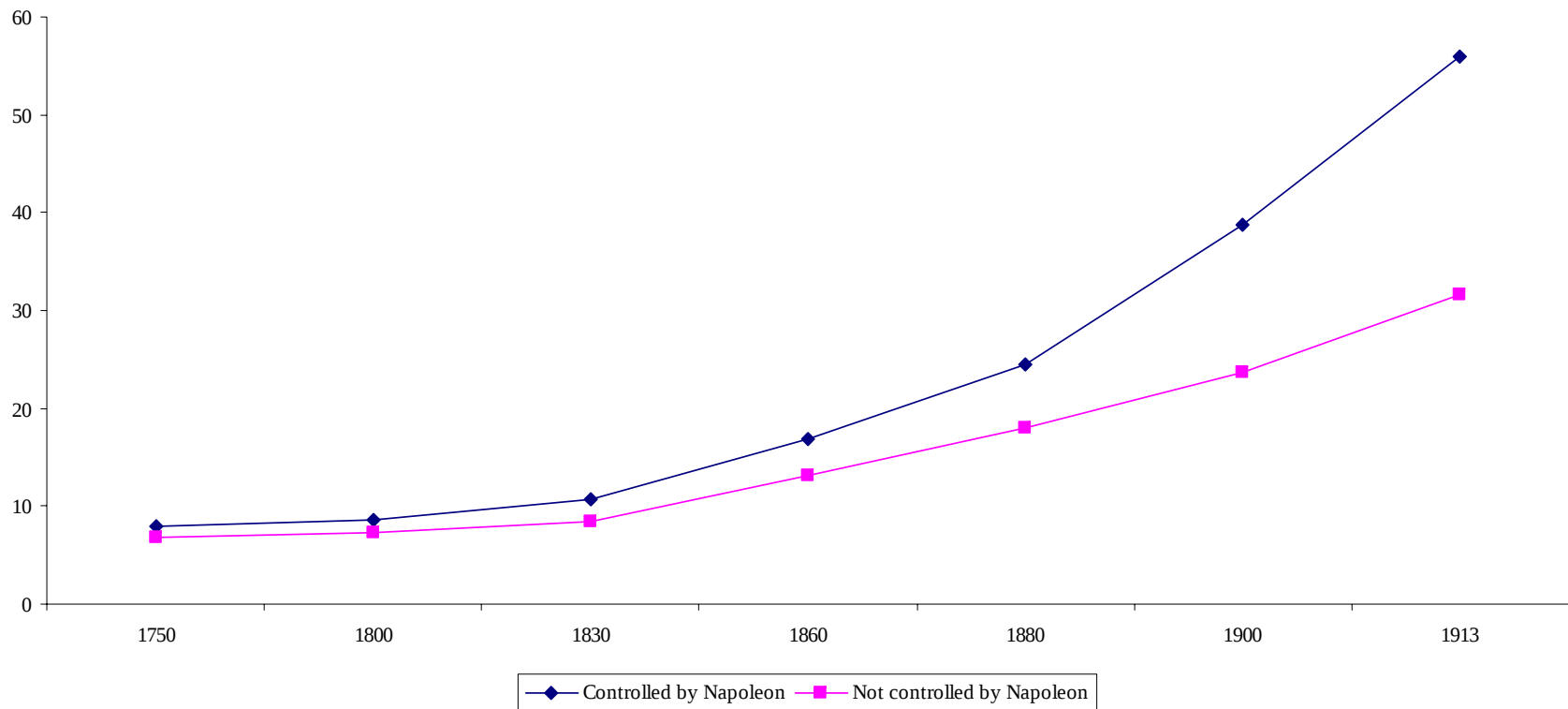


Figure 3B: Log Industrial Production per capita in Europe, 1750-1913

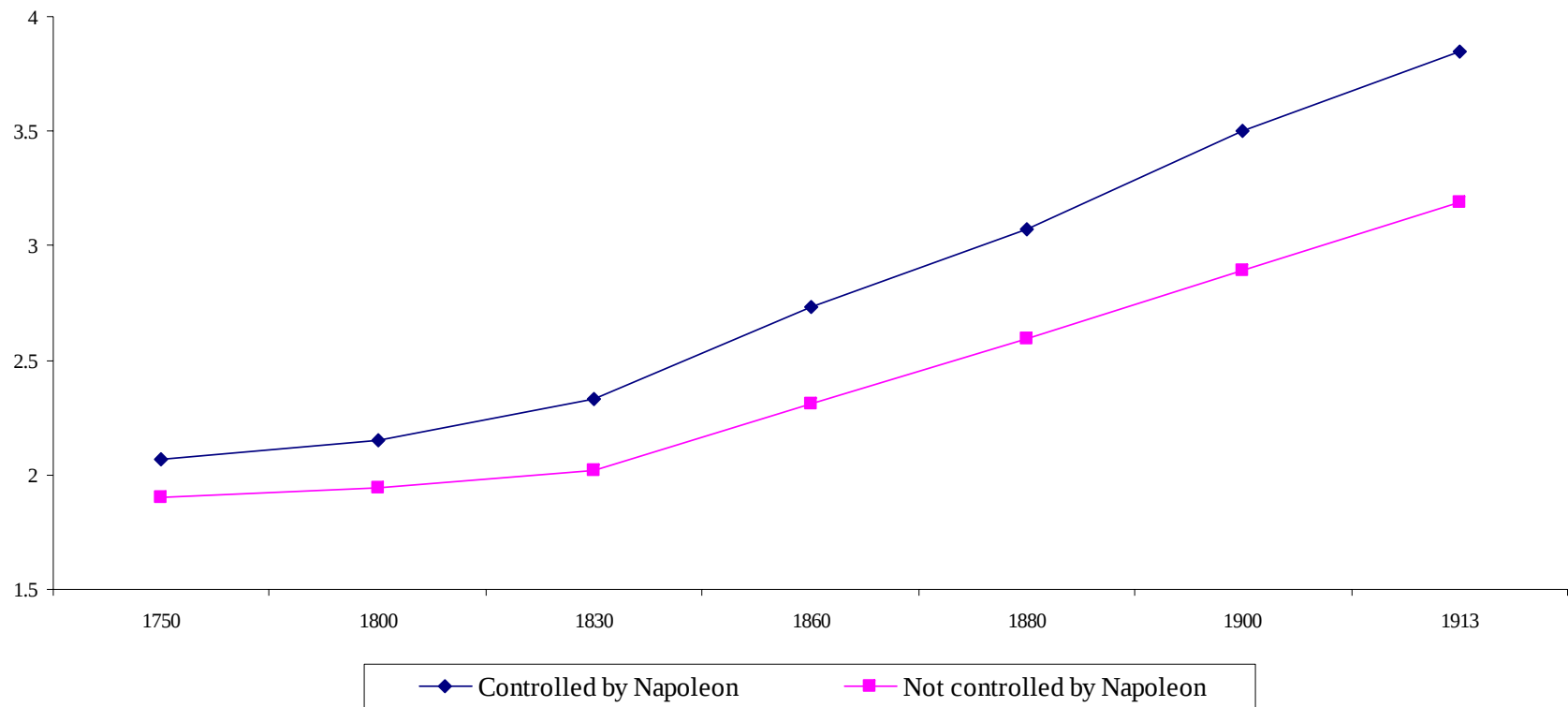


Figure 3C: Log Industrial Production per capita, Western Europe, 1750-1913

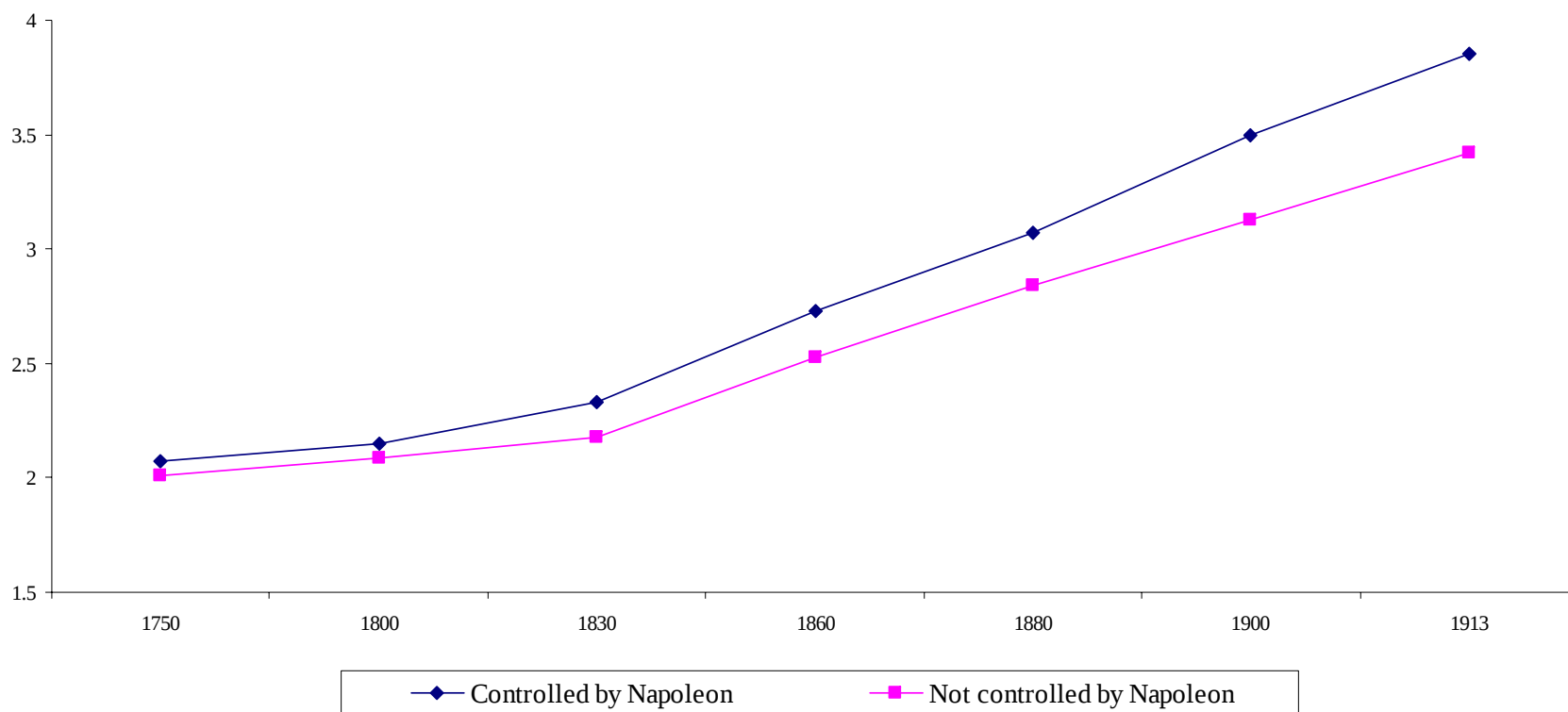


Figure 4A: Log urban population in Germany (West of Elbe), 1700-1900

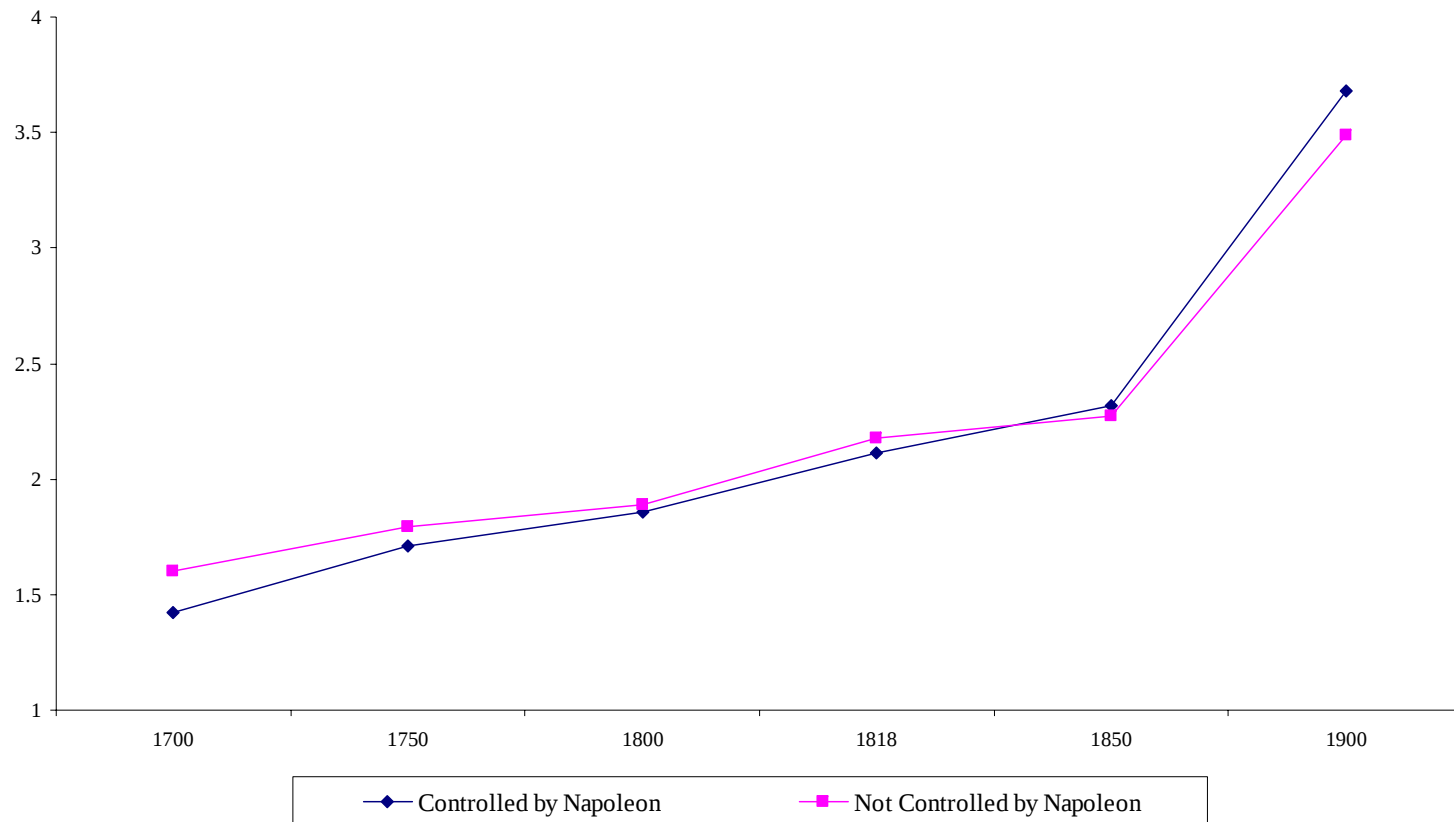


Figure 4B: Log urban population in all Germany, 1700-1900

