WORKING PAPER

DRAFTING THE GREAT ARMY

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Ennio E. Piano[1]
Louis Rouanet[2]

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JEL CLASSIFICATIONS: E02, E41, E65, N1

[1] Ennio E. Piano
ennio.piano@mtsu.edu
Political Economy Research Institute, Department of Economics and Finance, Jennings A. Jones College of Business, Middle Tennessee State University, Box 27, 1301, E. Main Street, Murfreesboro, TN 37132, USA

[2] Louis Rouanet
lrouanet@gmu.edu
Department of Economics,
George Mason University. 4400 University Drive, Fairfax, VA 22030, USA

Drafting the Great Army: Optimal conscription in Napoleonic France*

Louis Rouanet† Ennio E Piano‡

Abstract

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*We wish to thank Noel Johnson and Peter Leeson for helpful suggestions. Rouanet gratefully acknowledges the financial support of the Mercatus Center and the Institute for Humane Studies.

†Email: lrouanet@gmu.edu. Address: Department of Economics, George Mason University, MS 3G4, Fairfax, VA 22020, USA

‡Email: ennio.piano@mtsu.edu. Political Economy Research Institute, Department of Economics and Finance, Middle Tennessee State University, 1301 E Main Street, Murfreesboro, TN 37132, USA.

1 Introduction

The ability to mobilize large armies for the purposes of national defense and territorial expansion is a key feature of the modern state. Among the great powers of western Europe, average army size doubled between the 17th and the 18th century and had tripled again by the 19th (Onorato et al. 2014). The rise of the mass army coincided with a significant change in the state's recruitment strategies. Since the late middle ages, rulers had relied on a mixture of foreign and domestic professionals to man their armed forces. Figures like the Swiss pikeman, the Hungarian horseman, and the Catalunian crossbowman served in virtually every western European army throughout up until the nineteenth century, when "[s]tates altered the conduct of war by raising citizen armies and eschewing the use of mercenaries in practice or in law" (Avant 2000, 41).

Underlying the transformation of European armies was a combination of technological and economic forces. The "military revolution" (Parker 1996), and the introduction of gunpowder in particular, led to the rise of "military economies of scale" (Latzko 1993) which gave larger armies a significant advantage over smaller ones. Advances in transportation technology had a similar effect, as the cost of moving soldiers from one corner of Europe to another went down (Onorato et al. 2014). The increase in the optimal size of armies had economic consequences: smaller armies favor the employment of volunteers and mercenaries while larger ones favor that of conscripts (Lee & McKenzie 1992, Ross 1994).

Any military system that relies on the conscription for large swaths of the general public has one natural enemy: desertion. A deserter is any individual who, though legally compelled to serve in their nation's armed forces, escapes this obligation by going into hiding. Preventing desertion became a priority for the new military sys-

tem of the European nation-states. In this article, we analyze the case of Napoleonic France during the "First Empire" (1804-1814). In the aftermath of the revolution, the French government had instituted conscription to meet the growing defense needs of the new republic. This policy resulted in widespread desertion but it was only as Napoléon's expansionist ambitions grew in the early nineteenth century that desertion became endemic. To study the regime's response to threat desertion posed to its policy objectives, we develop a theoretical framework of optimal conscription policy. The basic intuition behind our framework is straightforward. Because the ability of the government to enforce a given conscription rate is constrained by local geographical characteristics, and these characteristics vary across regions, enforcement costs will also vary across the territory under its jurisdiction. A rational ruler will want to adjust the conscription rate to local circumstances: it will impose higher (lower) rates of conscription to regions with higher (lower) enforcement costs.

To substantiate our theoretical claims, we build a new dataset using archival information from the *Archives Nationales* in Paris. Our dataset contains departmental-level yearly data on desertion rates, conscription rates, enforcement efforts, and other military and administrative variables for the period between 1806 and 1810.[1] We combine these with a variety of measures of geographical characteristics, more prominently geocoded data on terrain ruggedness from Nunn & Puga (2012). The results of our empirical investigation provide strong evidence in favor of our interpretation. First, variation in terrain ruggedness predicts variation in desertion rates and proxies for enforcement costs across French departments. Second, more ruggedness predicts a department's higher nominal conscription rate. These results look even more ro-

[1]Departments were Napoleonic France's fundamental administrative unit below the national government. For the period under consideration, the borders of France extended over regions of Switzerland, Italy, Germany, and Belgium it had recently annexed over the previous decade.

bust once we look at qualitative evidence and historical sources. In particular, we show that high-ranked officials in the Napoleonic government took the variation in the prevalence of desertion across French regions explicitly into consideration in the design of recruitment policies. This is reflected in the development of conscription and desertion rates across French departments between 1806 and 1810. At the beginning of this period, the government demanded that each department contribute roughly the same share of its citizens to the nation's armed forces. By the last year for which we have data, the nominal conscription rates diverged significantly across departments. This change coincided with the halving of the country's desertion rate.

This article contributes to two strands of literature. First, it advances our understanding of the process of nation-building. Military institutions played a central role in the rise of effective states in western Europe (Tilly's 1992, Besley & Persson 2010, Gennaioli & Voth 2015, Geloso & Salter 2020). With respect to the development of the French state, recent work has focused on public finance institutions (Johnson & Koyama 2014*a*, White 1995) and legal capacity (Johnson & Koyama 2014*b*). Our article adds the key dimension of defense policy by focusing on France's transition to a conscription-based army during the First Empire.

Our second contribution is to the application of economic analysis to the study of defense policy and military institutions. Early work in this literature focused on the choice between a volunteer- and a draft-army (Lee & McKenzie 1992, Ross 1994), which identifies a trade-off between the dead-weight losses from financing a volunteer-army through taxation and the distortions effects of conscription on productivity. Mulligan & Shleifer (2005) explain the prevalence of conscription as the result of lower marginal administrative costs of the draft in countries with larger regulatory burdens on their economy. Others have extended economic analysis to the study of military tactics (Brennan & Tullock 1982), a ruler's choice of military technology

(Allen & Leeson 2015), and the employment of incentives to solve principal-agent problems on the battlefield (Allen 1998, 2002).

2 Historical background

2.1 Conscription and desertion in post-revolutionary France

Between 1792 and 1815, France was involved in seven large-scale wars against all major European powers. These wars had started as defensive efforts against the forces of the Ancien Regime, led by Austria, as they attempted to restore the French monarchy. However, by the end of its 'revolutionary wars' in 1802, France had adopted an expansionist policy that resulted in the annexation of new territories, including Belgium to the north-east, a few German principalities on its eastern border, the Duchy of Savoy and Genoa to the south-east, as well as Malta and Egypt overseas.

These military exploits required a drastic reform of the French military system. France introduced a standing army already by the end of the Middle Ages. This army consisted mostly of domestic volunteers and foreign professionals (Tozzi 2016). In 1688, at the beginning of the Nine Years' War, France experimented with conscription with the creation of a new armed force, the provincial militias, that were to assist the line army in battle. Conscription of the provincial militia was quite unpopular with the French subjects, so much so that one of the first policy changes introduced by the revolutionary government was its abolition (Gebelin 1882). The new regime was ostensibly opposed to the idea of a military draft as it was incompatible with the motivating ideology of the revolution that all men are free and equal.

As the facts of the new republic's military efforts (and its financial fundamentals) changed, so did government policy and its professed ideology. France's growing

defense needs led to the tripling of the size of its army, from 162,111 to just shy of 600,000 men, in just three years (Avril 1824). The same figure doubled again before 1794. Filling the ranks of such an army under a system of voluntary service proved unsustainable. Already in 1794, the government de facto drafted 300,000 volunteers from across the country (Forrest 1989, 26). In 1798, the regime had no choice but to formally reintroduced conscription with the Jourdan Law, which proclaimed that every Frenchman had a legal obligation to defend his country. The draft was to be administered as follows. Once the leadership of the army and the government had identified the necessary army size, each administrative unit called department was to contribute an equal share of its able-bodied population between 18 and 25 years of age (Forrest 1989, 32), selected by random lot to be handled by local officials at the communal or township level.

The administration of this system faced some obstacles. The process was slow and cumbersome and the lack of communication between Paris and the rest of the country led to confusion over the exact details of how the system was supposed to operate. Local governments lacked any degree of administrative capacity as well as the will and resources to enforce the law against their constituencies.[2] Potential conscripts took advantage of the system's weaknesses and loopholes to avoid military service. The law allowed for all sorts of exemptions. These included those for men in poor health, men below a certain height, married men, and so forth. Predictably, fraud was widespread. People would pretend, often with the assistance of complicit doctors, to be afflicted by all sorts of medical conditions to avoid being drafted.[3] Conscription resulted in a boom in marriages, as bachelors and their families rushed

[2]On the limited administrative capabilities of local governments in France, see see Johnson & Koyama (2014*b*). See also (Forrest 1989, 27, 37).

[3]See the discussion of the extent of conscription-related fraud during this period in Rouanet & Piano (2019).

to find single women (often widows) willing to get wed in exchange for money and in-kind payments (Pigeard 2000, 236).

Most significant among these obstacles to the smooth operation of the draft system was desertion. At the margin, a drafted man going into hiding could not have a large negative impact on the country's military efforts. However, the French generals soon realized that the system could not operate effectively if large numbers dodged the draft altogether and soldiers abandoned their 'brothers in arms' on the battlefield. Desertion was already endemic within a few years of the introduction of the Jourdan Law, as the leadership of the army complained that 200,000 draftees had abandoned their ranks (Forrest 1989, 169). The problem became more severe as the new Napoleonic Empire raised the Great Army to launch its conquest of the European continent. Within ten years, Napoleon would extend France's (direct and indirect) authority to most of western Europe. As the fronts of the Napoleonic wars multiplied over this period and the deaths of soldiers piled up so did the army's demand for new 'blood'. At the eve of the Russian campaign, eight out of every ten men of conscription age had been drafted into the military. Under these circumstances, desertion posed an essential threat to France's hegemony over Europe.[4]

In post-revolutionary France, desertion took one of three forms. First, a potential conscript may not show up to the draft-lottery in his hometown. Second, once selected for military service, he may go into hiding before he had joined the assigned battalion. Finally, he may take off after having joined the battalion. The government distinguished between these categories and treated them differently as a matter of law. Men in the first two categories were known as draft-dodgers and their punishment, if caught, was less severe than that of those who deserted while employed abroad (Piano & Rouanet 2019). Overall, most men deserted during the

[4]The French government was well aware of this (Forrest 1989, 169-170).

earliest days of service, just before they were expected to leave their homes to join their assigned battalion (Forrest 1989, 65).

Having avoided military service, temporarily at least, a deserter or draft-dodger faced two options. He could go into hiding somewhere near his hometown or he could try to make his way to a major urban area. Both options provided him with the necessary conditions to survive as a fugitive. The former proved attractive to many. As long as they did not cause too much trouble, local communities were generally quite sympathetic to the plight of deserters. The latter could count on their families for economic and moral support and in some circumstances would be able to keep on living with them as the local authorities willingly turned a blind eye, especially in the most rural regions of the country. On the other hand, large cities offered deserters the benefit of anonymity and some potential for employment.[5]

Those deserters who had to abandon their homes were forced to find ways to sustain themselves economically. The countryside offered plenty of opportunities. Agricultural work was one popular option, especially during harvesting season. From the point of view of the deserter, this employment was a much needed source of income that required little skill. Due to the seasonal nature of this line of work, the deserter could move from plot of land to plot of land and from department to department, lowering the risk of being identified by public enforcement. Moreover, most workers were domestic immigrants from other regions of France, making it even harder for the police to check documents and tell deserters from other seasonal workers (Forrest 1989, 110).

From the point of view of the landowner, deserters constituted relatively cheap labor and, since the law did not require them to check the documents of temporary workers, they were not risking much by employing these fugitives. Deserters were

[5]See the discussion in (Forrest 1989, 79-80, 120).

popular employees in all sorts of manual labor due to their convenient price-tag. They worked as masons, quarrymen, woodcutters, and factory workers (Forrest 1989, 112). Many deserters opted for less legitimate forms of employment. Already a fugitive, a deserter faced a lower marginal cost to criminal activities. The smuggling business was a remunerative option and a very popular one in border departments (Forrest 1989, 121). Local communities generally tolerated smuggling by deserters. However, over time, the latter became "indistinguishable from the ordinary brigand bands that caused so much havoc in the French provinces [in the aftermath of the revolution]."[6]

2.2 Determinants of desertion before and during the Empire

Forrest (1989) provides the most comprehensive treatment of the history of desertion in France during the revolutionary and Napoleonic periods. He identifies a series of potential causes behind the rise of desertion over this period. These include ideological, social, economic, and social factors. He argues that ideology may have influenced both the distribution of desertion across different regions and its variation over time. For example, desertion seems to have been less prominent in the early years of mandatory military service as revolutionary ideas motivated the youth of France to be more accepting of this obligation. However, this enthusiasm did not last for long, as even traditionally more patriotic towns and departments saw the number of volunteers fall and that of deserters rise (Forrest 1989, 25, 80). In the countryside, local culture appears to have encouraged desertion or, at least, failed to discourage it. Economic and other social forces seem to have mattered, too. For example, desertion tended to be more of a rural phenomenon than an urban one, even though many deserters ended up gravitating towards the country's major urban

[6](Forrest 1989, 124).

centers (Forrest 1989, 79-80).

Finally, Forrest lists geographic factors as an influence behind the relative prevalence of desertion: "Mountains, dispersed habitation, upland pasture, rocks and caves, treacherous marshlands familiar only to the local population, smugglers' hill tracks that were part of a very private village connaissance all offered escape and evasion" (Forrest 1989, 81). This was clearly recognized by national and local authorities alike. For example, the prefect of Lozére, in a report to the minister of war on the conscription efforts for year XIII, attributed "the little success of the levy" to the geographical characteristics of its territories, "with its mountains, its gorges, its woods and the thoughness of the climate which ... offer conscripts almost certain means to escape the searches and pursuits of the *gendarmerie*."[7] The same was true for those departments sharing a border with France's neighbors. It was impossible for either the local or the national government to police Spanish and Italian frontiers to the south and the German and Belgian ones to the east, thus providing willing deserters "with irresistible opportunities" (Forrest 1989, 84). In February 1803, the prefect of Ariége, in a letter to the minister of the interior, for instance, claim that Ariége's "proximity to Spain where young men are received for farm works ... make the pursuits which are directed against them by the civil authority and the gendarmerie useless."[8] This problem was magnified by the fact that, historically, the French state had limited administrative and law-enforcement capabilities the further one moved away from Paris (Forrest 1989, 83).

The government's response to these circumstances was twofold. First, it took a variety of actions aimed at preventing desertion. One important reform consisted in the transfer of the administration of the system and its enforcement from officials

[7] *Archives Nationales*, F/9/209. n.1317.
[8] F/9/158, n.637.

to the central government (Forrest 1989, 192-193). Recruitment procedures were to be handled by local prefects, appointed by Paris, and the national *conseil de recrutement*. The reform also streamlined the chain of command in an attempt to reduce confusion and minimize the effect of local circumstances. The punishment for deserters became more severe and the enforcement stricter during the empire (Forrest 1989, 105). Napoleon entrusted the bulk of these efforts to military bodies. Most important among these was the *gendarmerie*, France's military police, which was increasingly responsible for hunting down deserters (Forrest 1989, 201). Often the government would rely on actual military battalions for the same task (Forrest 1989, 211). Over time, these efforts produced results. In 1810, the government had launched a series of "great operations" to eliminate this plague and within two years the military had arrested over 60,000 deserters (Forrest 1989, 212).

While ultimately effective, this long-run response could do little to address the short-run need of the army during the early years of the Napoleonic campaigns. The army needed soldiers, and they needed them now. Theoretically, departments were to share in equal parts the burden of military obligation. In 1800, a French official calculated that the country's defense needs were such that it had to draft 1 every 805 citizens. And so, each department was to send a contingent 1/805th the size of their population (Forrest 1989, 39). However, this principle was such in paper only. The reality was that some departments bore a much larger share of the burden than others. For example, in 1808, when the country drafted almost one-percent of its population to support its military efforts all around the continent, departments like Yonne, less than 100 miles from Paris, were supplying the French army with twice as many soldiers per capita than mountainous departments like the Rhone in the east and the Hautes-Pyrenees in the south (Forrest 1989, 40). The population of the targeted departments were not happy with the situation, which they perceived

a violation of the most basic principles of equity. However, as the Napoleonic wars went on, "the government became more and more desperate in its quest for able-bodied men for the battalions, it showed less concern for equity and geographical spread" (Forrest 1989, 40).

3 Optimal conscription

Consider the problem of a rational ruler who must raise an army of size X from a population of size N, where X is so large as to make reliance on volunteers incompatible with its fiscal constraints.[9] A volunteer army being off-the-table, our ruler must rely on conscription. An army of size C requires a conscription rate x where $x = X/N$. The ruler's subject population consists of identical agents distributed homogeneously across d regional departments. Thus, each department has the same population N/d. While identical in size and population, these departments will vary on a variety of margins. Our analysis focuses on variation in geographical and environmental characteristics and its effect on the ruler's ability to enforce conscription across all departments.

Equation (1) gives the ruler's value function for a given rate of conscription.

$$V = \sum_{i=1}^{i=d} (bx_i - c_i x_i^{1/a}) \tag{1}$$

where x_i is the conscription rate in department i and $i \in (1,\ 2,\ ...,\ d)$. Sine x_i indicates a share of the department's population, $x_i \in [0, 1]$. The ruler's total benefits are given by the sum of the benefits of conscription across all departments, where these are linear in the conscription rate. b measures the benefits to the ruler of increas-

[9] See the discussion in Ross (1994).

ing the rate of desertion across all departments and reflects the urgency of drafting more men due to an increase in the optimal army size. A threat of foreign invasion or newly discovered opportunities for territorial expansion would both increase the value of b. Thus, b is strictly positive and—since we assume that individuals are identical regardless of where they come from—it does not vary across departments.

The system's total cost is given by the sum of all department-level cost functions of the form $c_i x_i^{1/a}$, where $a,\ c_i \in (0,\ 1)$. c_i is a shift parameter that measures the effects (direct and indirect) of geographical and environmental factors on the ruler's cost of administrating conscription in a given department. Since these characteristics vary across departments, so will c_i. Underlying this discussion is the relationship between conscription, environmental characteristics, and desertion. The higher the conscription rate, the more individuals will desert their legal obligation to serve in the national army. The costs of administrating a system of conscription will be linked to the subjects' ability to evade their military obligation. Geography can enable desertion via its effect on the ruler's own ability to catch deserters. Thus, the total cost of administrating conscription in department i are increasing in the department-specific geographical characteristics and in the ruler's choice of the conscription rate in the same department or $\frac{\partial TC_i}{\partial x_i} > 0$, $\frac{\partial TC_i}{\partial c_i} > 0$.

If the ruler wishes to maximize the value of V, it must choose $x_i^* \ \forall\ i \in (1,\ 2,\ ...,\ d)$ subject to the constraint that the sum of all department-level contingents must equal the (exogenously determined) optimal army size or $\sum_{i=1}^{i=d} x_i \frac{N}{d} = X$. The ruler's equimarginal principle yields equation (2):

$$b = \frac{1}{a} c_i x_i^{\frac{1-a}{a}} \tag{2}$$

Solving for x_i^*:

$$x_i^* = \left(\frac{ba}{c_i}\right)^{\frac{a}{1-a}} \tag{3}$$

From equation (3), we derive the following propositions.

Proposition 1: In a country with varying geographical characteristics, the optimal conscription rate won't be the same across all departments or $x_i \neq x_j$ for any $i,\ j \in (1,\ 2,\ ...,\ d)$ where $i \neq j$.

Proof: The proof to this proposition is straightforward. Let the ruler set the conscription rate for all departments at $\bar{x}$, where $\bar{x} = \frac{X}{N}$. Thus, each department contributes exactly the same share of its population to the manning of the national army. Consider now two departments, i and j, where $c_i \neq c_j$. Per equation (3), to be optimal, the choice of $\bar{x}$ requires that equation (4) be satisfied:

$$\bar{x} = \left(\frac{ba}{c_i}\right)^{\frac{a}{1-a}} = \left(\frac{ba}{c_j}\right)^{\frac{a}{1-a}} \tag{4}$$

However, $c_i \neq c_j$ means that $\left(\frac{ba}{c_i}\right)^{\frac{a}{1-a}} \neq \left(\frac{ba}{c_j}\right)^{\frac{a}{1-a}}$, and the ruler will set $x_i \neq x_j$.

Proposition 2: The optimal conscription rate in every department is increasing in the marginal benefit of conscription.

Proof: Equation (5) gives the value of the effect of a change in the marginal benefit of conscription on the optimal desertion rate in department i.

$$\frac{\partial x_i^*}{\partial b} = \frac{a^2\left(\frac{ba}{c_i}\right)^{\frac{2a-1}{1-a}}}{c(1-a)} > 0 \tag{5}$$

Since $a,\ b,\ c_i \in (0,1)$, equation (5) shows that an increase in b positively affects the ruler's choice of the conscription rate in department i. When the benefits of increasing the conscription rate increase—for example, due to an unexpected threat of foreign invasion—the ruler will want to draft more men across the board, bumping up the rate of conscription in every department.

Proposition 3: The optimal conscription rate is decreasing in the shift parameter c_i.

Proof: To prove proposition 3, we look at the partial effect of a change in c_i on the optimal rate of conscription in department i. This is given by equation (6).

$$\frac{\partial x_i^*}{\partial c_i} = -\frac{ba^2}{(1-a)c^2}\left(\frac{ba}{c}\right)^{\frac{2a-1}{1-a}} < 0 \tag{6}$$

Since s, b and c_i are strictly larger than 0 and strictly smaller than 1, the partial effect of c_i on x_i^* is negative.

4 Empirical strategy

Our theoretical discussion points to a causal relationship between the costs of administrative conscription and a ruler's optimal conscription rate. Key to our analysis is the claim that geographical characteristics influence predictably the ruler's calculus via their effect on the cost of enforcing conscription and preventing desertion. Our first step is to establish empirically the nexus between environmental and geographical characteristics on the one hand and desertion rates on the other.

We begin by estimating the OLS model in equation (7):

$$Y_{i,t} = \beta * Ruggedness_i + C_i^{'} + \delta_t + \zeta_i + \epsilon_i \tag{7}$$

where $Y_{i,t}$ is the desertion rate for department i at time t. The desertion rate is defined as the number of men who failed to fulfill their legal obligation to join the army over the number of men who both joined and failed to join the army. Our main independent variable is *Ruggedness*, with β measuring the average treatment effect of terrain ruggedness on the desertion rate. $C_i^{'}$ is a vector of geographic and economic variables (distance from Paris, average distance to the designated army corp, distance from border, proximity to the sea) as well as variables about urbanization, tax capacity and infrastructures. δ_t and ζ_i are time and region fixed effects respectively. Region fixed effects are either controlling for variation between Italian, Belgian, German and French departments or between each military division.

Our second step is to provide evidence on the main implication of our model: that departments with lower costs of enforcing conscription will bear a larger share of the country's defense needs. To this end, we use the following specification:

$$Z_{i,t} = \beta * Ruggedness_i + C_i^{'} + \delta_t + \zeta_i + \epsilon_i \tag{8}$$

where $Z_{i,t}$ is the nominal conscription rate for department i at time t.

Using these two specifications, we provide evidence a) that the French government explicitly considered the enforcement costs of conscription when setting policy and b) that growing awareness of systematic regional variation in desertion rates led to a reapportionment of the military burden on departments with lower enforcement costs.

5 Data

To provide empirical support for our model's implications, we leverage novel archival evidence from the *Archives Nationales* in Paris.[10] The information was originally collected by Jean-Gerard Lacuée, Napoléon's minister of military affairs during the Empire. As part of his responsibilities, Lacuée gathered data on the phenomenon of desertion in France and the foreign territories under its control. This novel data-set contains information about desertion rates, conscription rates, replacement rates, and the number of draftees deemed unfit to serve across the Empire's 110 departments for every year between 1806 and 1810. These figures include departments from territories that had just been annexed by French from neighboring Italy, Switzerland, Germany, and Belgium.[11] Figure 1 shows the pattern of geographical variation in desertion rates in the France Empire over the entire period based on Lacuée's data. The red borders delineate each military division.

During Napoléon's rule, the French legal code distinguished between two categories of desertion. The first category included individuals that, once drafted, failed to show up at the assigned battalion before the deadline. The second category regarded individuals who abandoned their fellow soldiers after having joined the assigned battalion. Unfortunately, Lacuée's data provides figures only for individuals from the former category, which was often referred to as draft-dodgers.

Our preferred measure for geographic factors affecting conscription-enforcement costs is terrain ruggedness from Nunn & Puga (2012). Akin to the latter's argument that this variable affected the ability of European colonists to capture slaves in West Africa, we claim that ruggedness constrained the French government's efforts to

[10] AF/IV/1124.

[11] See the appendix for a more detailed discussion of these variables.

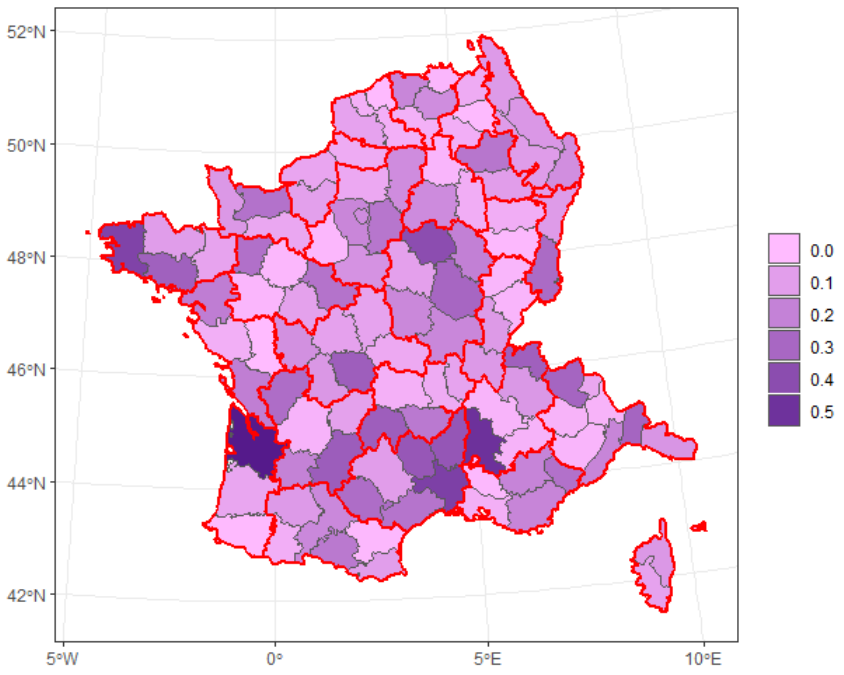


Figure 1: Desertion rate from 1806 to 1810 by department.

eradicate desertion. Figure 2 shows the variation of terrain ruggedness in the French Empire. Additionally, we use georeferenced data to generate department-level data for another set of geographical variables: distance to the border with a foreign country. Border_Spain_100, Border_Germany_100, and Border_Italy_100 measure the percentage of a department's territory falling within 100 kms from the Empire's border with Spain, Germany and Belgium, and Italy respectively.

We also collect data for an array of controls to remove the effect of potential confounding variables. These include measures for urbanization, proximity to the ocean, tax-revenues per capita, distance from Paris, the number of military relays in 1795, and the pervasiveness of national postal services across departments. The

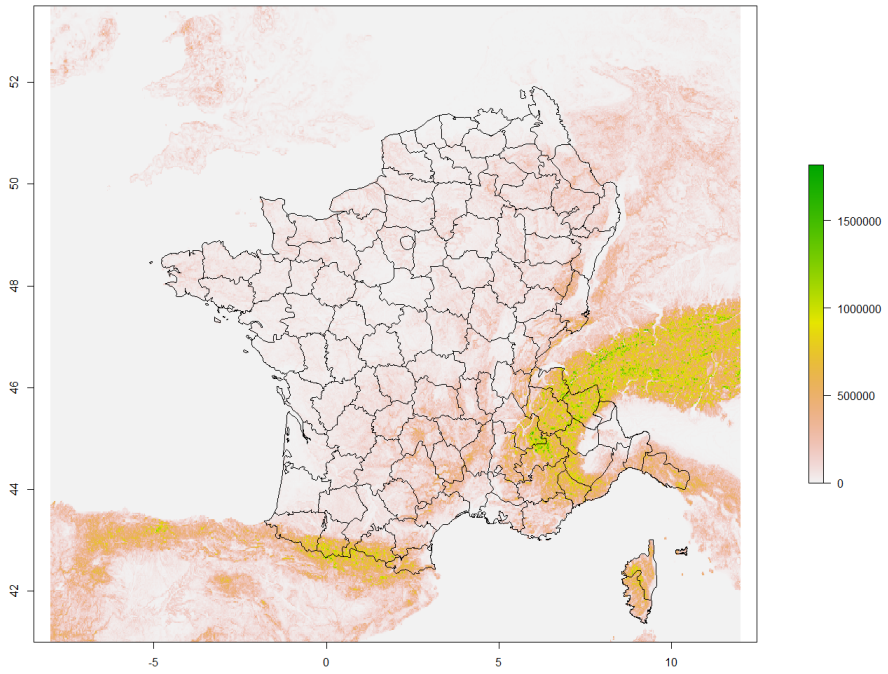


Figure 2: Ruggedness.

rationale behind these controls are as follows. First, lacking systematic evidence for GDP per capita at the department level, we rely on urbanization rate as a proxy. Tax-revenues per capita, pervasiveness of the national postal system, and distance from Paris serve as (imperfect) measures of administrative capacity. The latter could be negatively correlated with ruggedness, in which case the effect on desertion attributed to our main geographical variable may be over-estimated. We also use the prior presence of military relays. While endogenous to the system of conscription, the

presence of a military relay may have affected the central government's enforcement costs. This is because the military would eventually be in charge of the fight against conscription.

Table 6 in the Appendix provides summary statistics for all our variables while Table 7 indicates the sources and describe in detail each of these variables.

6 Results

6.1 The geography of desertion

Table 1 reports the results of our OLS specifications on the effect of geography on desertion rates across departments, with robust and Conley standard errors. Failure to take account of unobserved factors might cause us to erroneously assign a causal role to geographical variables for the increase in desertion. We control for these potential sources of bias using region and year fixed effects. We include military division fixed effects. A military division was an administrative unit that covered an average of five departments and were involved in conscription operations.[12]

The coefficients are large, positive and statistically significant for all specifications. A one standard deviation increase in ruggedness predicts an increase in the desertion rate of 2.2 to 4.1 percentage points. An increase in ruggedness from the 25th to the 75th percentile of the distribution is predicted to increase the desertion rate by 2.7 to 5.1 percentage points. This effect is large as the average desertion rate over the all period from 1806 to 1810 was of 14.9%.

The evidence with respect to the effect of proximity to the border is weaker but

[12]Military divisions were created by the law of October 8, 1793 to help with respect to the conscription of 40,000 cavalrymen. For a detailed account of the different functions of these military governments, see de Halle (1803). The borders of military divisions are shown in figure 1 in red.

consistent with the expectation that distance from a foreign country may affect one's ability to desert. All but one coefficient in column (2) suggest a positive relationship between distance to the border and desertion, even though only distance to the German border shows to be systematically statistically significant.

Column (1) provides the coefficients for the baseline specification. Column (2) includes geographical controls while column (3) adds variables controlling for economic outcomes, administrative capacity and the "incorporation rate"—i.e. the portion of the local population that actually joined the army.[13] In column (4), we control for one of the main substitute for desertion: military replacement. Military replacement gave conscripts the ability to hire another man to serve in the army in their stead. During the Napoleonic period, conscripts could be replaced only if the replacement were living in the same department as they did (Rouanet & Piano 2019).[14] Our results, based on the years 1806 to 1809,[15] do not find any significant relationship between the replacement rate and desertion while our main independent variable remains significant.

Column (5) reports the results for our preferred specification. This include controls from column (2) with the addition of "military relay" measuring the number of military relay per kilometer square in 1795. Although using this variable restricts the sample to 83 departments, it controls for an important variable: previous investment in military infrastructure.[16] The coefficient on "military relay" is negative as

[13]Some local administrations failed to send the required number of men. This may lead to downward bias, especially if local officials drafted the least likely to desert individuals first.

[14]See the report to Napoleon dated April 5, 1806 by préfet of the Department of Lozère who proposed to deregulate the replacement market to fight desertion in "the departments where the success of conscription meets obstacles." (Archives Nationales, F/9/209).

[15]We could not find the data for 1810.

[16]Compared to using the restricted sample in column (3), the ruggedness coefficient increases slightly from .40 to 0.42 once we include the ""military relay" variable.

Table 1: Geography and desertion.

Note: This table displays the results of the cross-sectional regression of desertion rate on geographical characteristics. *Desertion rate* is defined as the proportion of young men having joined the army who purposefully escape the conscription authorities. Controls are described in Appendix. We report robust standard errors in parenthesis and Conley in brackets. Conley standard errors are computed using the Stata code provided by (Hsiang 2010), and assuming a correlation range of 100 kilometers and a linearly declining spatial weighing kernel. Different threshold are used in the robustness.

Desertion rate	(1)	(2)	(3)	(4)	(5)
ruggedness	0.22786	0.32976	0.27187	0.28079	0.42009
	(0.06457)***	(0.06558)***	(0.06013)***	(0.06732)***	(0.08223)***
	[0.11377]**	[0.11724]***	[0.09993]***	[0.11175]***	[0.12098]***
Border_Spain_100		-0.05484	0.03858	0.06239	0.05878
		(0.05268)	(0.05186)	(0.03748)*	(0.05576)
		[0.05824]	[0.05366]	[0.05784]	[0.06089]
Border_Italy_100		0.07756	0.00934	0.02338	0.07566
		(0.02791)***	(0.02314)	(0.02544)	(0.03264)**
		[0.05410]	[0.03475]	[0.03619]	[0.05003]
Border_Germamy_100		0.12278	0.16280	0.16568	0.24268
		(0.03034)***	(0.02888)***	(0.03627)***	(0.07262)***
		[0.04425]***	[0.03585]***	[0.04151]***	[0.13338]*
replacement rate				0.26693	
				(0.17126)	
				[0.17206]	
military relay					-23.40661
					(7.04793)***
					[12.52681]*
Incorporation rate	NO	NO	YES	YES	YES
Urbanization	NO	NO	YES	YES	YES
Tax per capita	NO	NO	YES	YES	YES
Maritime	NO	YES	YES	YES	YES
Distance from Paris	NO	YES	YES	YES	YES
Year F.E.	YES	YES	YES	YES	YES
Military divisions F.E.	YES	YES	YES	YES	YES
Observations	554	554	539	432	415
R-squared	0.56076	0.59378	0.63213	0.65251	0.71011

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

expected and significant at the 10% level with Conley standard errors.[17]

[17]One potential issue is that military infrastructure is endogenous to desertion. To address this

6.2 Enforcement technology

During the Napoleonic period, the central government entrusted its efforts against desertion onto the gendarmerie, the French military-police force. Gendarmes "assisted the subprefects in conducting the ballots [... and] escorted the conscripts to their muster points and pursued refractory conscripts and deserters" (Emsley 1999, 70). They could perform these tasks either on foot or on horseback. Mounted gendarmes were more effective at these tasks as they could cover a larger territory in less time than their counterpart on foot. However, the nature of the terrain could make the use of horses altogether uneconomical (Emsley 1999, 34). Already in 1800, Napoléon (then chief executive of the Consulate) instructed his secretary of state to rely on gendarmes on foot in more mountainous regions (Emsley 1999, 57).

We use information from de Halle (1803) for 1802 to build a new data-set on the relative prevalence of mounted gendarmes across French departments. If our claim that environmental characteristics affect desertion rates by altering the central state's enforcement costs, we should find a negative relationship between our measure of these characteristics and our proxy for enforcement costs—the ratio of mounted gendarmes employed in a given department. The results in table 2 support this prediction.

Column (1) gives our baseline specification, controls for proximity to the coast and the border as well as for urbanization are added in column (2). We control for whether a department is situated in what was either France, Belgium, Italy or Germany before

issue, we run the regression in column (5) using the average number of postal offices per kilometer square instead of "military relay." The establishment of postal offices is unlikely to be caused by conscription while it may face similar geographical constraints. The results are virtually the same, with the ruggedness coefficient being equal to 0.415 instead of 0.419. This regression is available on demand. The correlation coefficient between military relay and postal offices density is strongly positive 0.59.

Table 2: Geography and the choice of enforcement technology

Note: This table displays the results of the cross-sectional regression of the relative share of mounted brigades over unmounted ones deployed in a department on the latter's geographical characteristics. The variables are described in the appendix. We report robust standard errors in parenthesis and Conley standard errors (100km) in brackets.

Ratio of mounted vs. footed gendarmerie brigades	(1)	(2)	(3)
ruggedness	-15.34629	-20.48023	-23.98653
	(4.96860)***	(7.01260)***	(8.98731)***
	[5.08838]***	[7.14999]***	[9.52386]**
Border_Italy_100		-4.25823	-4.34656
		(2.47658)*	(3.88752)
		[2.28241]*	[3.13272]
Border_Spain_100		-1.47452	-1.01463
		(1.70490)	(1.89082)
		[1.63999]	[1.67009]
Border_Germamy_100		-0.12047	-1.15639
		(2.73709)	(3.59703)
		[2.79778]	[3.17252]
Maritime	NO	YES	YES
Urbanization	NO	YES	YES
Road density	NO	NO	YES
Country F.E.	YES	YES	NO
Observations	103	103	81
R-squared	0.09915	0.14807	0.15638

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1795 (Country F.E.). Because the gendarmerie was in charge of maintaining safety on roads (Emsley 1999, Forrest 1989), one confounding factor could be the diverging importance of communication infrastructure across departments. Column (3) add the "road density" variable which controls for the average length of roads per squared kilometer. The coefficients of terrain ruggedness on the ratio of mounted brigades over unmounted one are large and significant, with a one standard deviation in ruggedness decreasing this ratio by 1.48 to 2.3 (for comparison, the average ratio of

mounted on foot gendarmerie brigades is 7.1).

6.3 Enforcement costs and conscription

Having established that geography and other environmental factors affected the state's enforcement costs and the rate of desertion across departments, we now provide evidence that they affected the government's conscription policy. We begin by investigating the relationship between ruggedness and the variation of the nominal conscription rate across departments.

Table 3 reports the results of three specifications. The effect of ruggedness on nominal conscription rates is consistently negative as predicted by our theory. The effect of proximity to the border, on the other hand, is more ambiguous. Columns (2) and (3) include controls for whether a department is coastal or not, for the department-level urbanization rate and for the exemption rate from military service (that is the percentage of conscripts deemed unfit to be drafted). We should expect that conscription will be more expensive to organize when more people are unfit for military service. For instance, a higher rate of individuals in poor health may increase the administrative costs of conscription. In line with our theory a larger rate of exemption from military service significantly decreased the state's demand for soldiers. The coefficients for the "Maritime" and "Urbanization" variables are both significant and negative, suggesting that economic forces may have affected the State's demand for soldiers. As for coastal departments, Forrest (1989) argues that ship owners successfully lobbied the government to reduce the burden of conscription on the naval industry. We also include year fixed effects and country fixed effects for all column except (3) as the sample is restricted to French department because of the

inclusion of "military relay" variable.[18] The results to our preferred specification are given in column (3) which adds a control for "military relay". This variable's positive (and large) coefficient suggests that past investment in military infrastructure may have significantly impacted the State's conscription choices.[19]

To complement these results, we rely on the historical record on the setting of conscription policy during the Empire. Lacuée, Napoléon's minister of war and the source of our data on desertion and conscription during the period, was himself responsible for the administration of the conscription efforts. In this capacity, he proposed the following strategy in a report to the Emperor.[20] First, the government was to calculate the number of men necessary to fulfill the country's military needs. Based on this figure, it will then estimate the number of new draftees for that year. This would give a national conscription rate, which would then be used as the baseline to calculate each department's rate, in conjunction with Lacuée's own classification of departments into five categories. Category 1 departments were to contribute an additional 33% of its men to the national average. Category 2 ones where to contribute an additional 20%. Those in category 3 where assigned exactly the national average, while departments in categories 4 and 5 were assigned 20% and 33% fewer conscripts respectively.

Lacuée's classification was explicitly based on the central government's experience with the implementation of its nominal conscription rates across the Empire. Departments in category 1 had proven less averse to the conscription system than

[18]The sign of the ruggedness coefficient with 'military divisions' fixed effects instead of "Country" fixed effects remains the same in all columns while the p-values with Conley standard errors become equal to 0.029 and 0.000 in specification (2) and (3) of Table 3. Including "military divisions" fixed effects however lead the ruggedness coefficient in column (1) to be insignificant.

[19]As in column (5) of Table 1, we replace "military relay" by the average number of postal offices per kilometer square. The results are unchanged and the impact of postal office density is both positive and barely fails the 5% significance threshold with Conley standard errors (p=0.053).

[20]Report of April 6, 1809, *Archives Nationales*, AF/IV/1124.

Table 3: Geography and conscription.

Note: This table displays the results of the cross-sectional regression of portion of the population drafted on geographical characteristics. Variables are described in Appendix. We report robust standard errors in parenthesis and Conley standard errors (100km) in brackets.

Population drafted	(1)	(2)	(3)
ruggedness	-0.00052	-0.00060	-0.00103
	(0.00013)***	(0.00012)***	(0.00013)***
	[0.00024]**	[0.00021]***	[0.00021]***
Exemption		-0.00209	-0.00222
		(0.00015)***	(0.00014)***
		[0.00020]***	[0.00019]***
Maritime		-0.00021	-0.00025
		(0.00003)***	(0.00003)***
		[0.00005]***	[0.00005]***
Urbanization		-0.00077	-0.00113
		(0.00012)***	(0.00009)***
		[0.00017]***	[0.00014]***
Border_Italy_100		0.00002	-0.00015
		(0.00007)	(0.00008)*
		[0.00007]	[0.0009]*
Border_Spain_100		-0.00027	-0.00028
		(0.00005)***	(0.00005)***
		[0.00007]***	[0.00006]***
Border_Germamy_100		0.00013	0.00014
		(0.00005)***	(0.00007)**
		[0.00006]**	[0.00009]
military relay			0.05446
			(0.01415)***
			[0.02076]***
Country F.E.	YES	YES	NO
Year F.E.	YES	YES	YES
Observations	555	555	415
R-squared	0.10539	0.45227	0.52844
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

those in category 2, and so on, with category 5 departments being perceived as the most likely to defy the conscription efforts. In table 4, we show the results of four specifications that investigate the relationship between geographical characteristics of a department and the probability that a department was classified by Lacuée's

as more averse to conscription than the average department—that is, that Lacuée classifies this deportment as falling in either category 4 or category 5. The results are large, significant, and consistent across all specifications. In particular, coefficients on terrain ruggedness are always positive and significant at the 1% level. A department's proximity with the Spanish border is positively and significantly correlated with having being identified as more averse to conscription by France's minister of war. An interesting result is that of the coefficient on our measure of proximity to Germany shows up as significant but consistently negative. This puzzle is possibly explained by the fact that, by the time of Lacuée's writing, contrary to Spain, Napoléon had take control of the German territories beyond the French border all the way to Bavaria. In other words, there was nowhere for one to hide.

Figure 3: The probability of belonging to classes 4 & 5 by ruggedness levels.

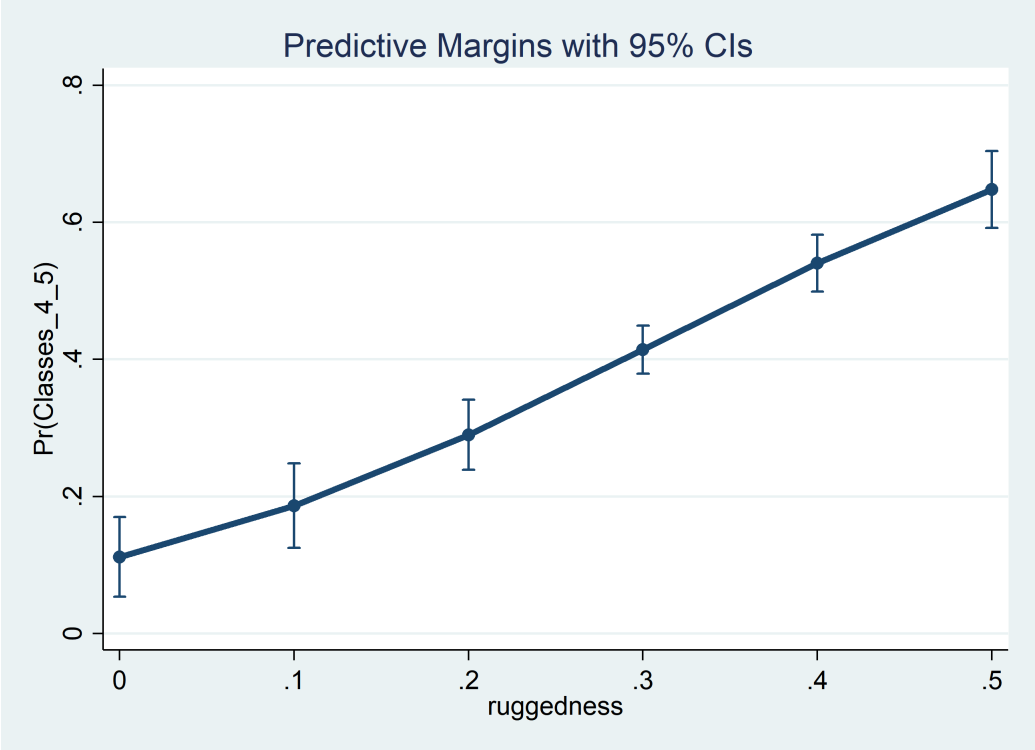


Table 4: Logistic regression of Lacuée classification choice.

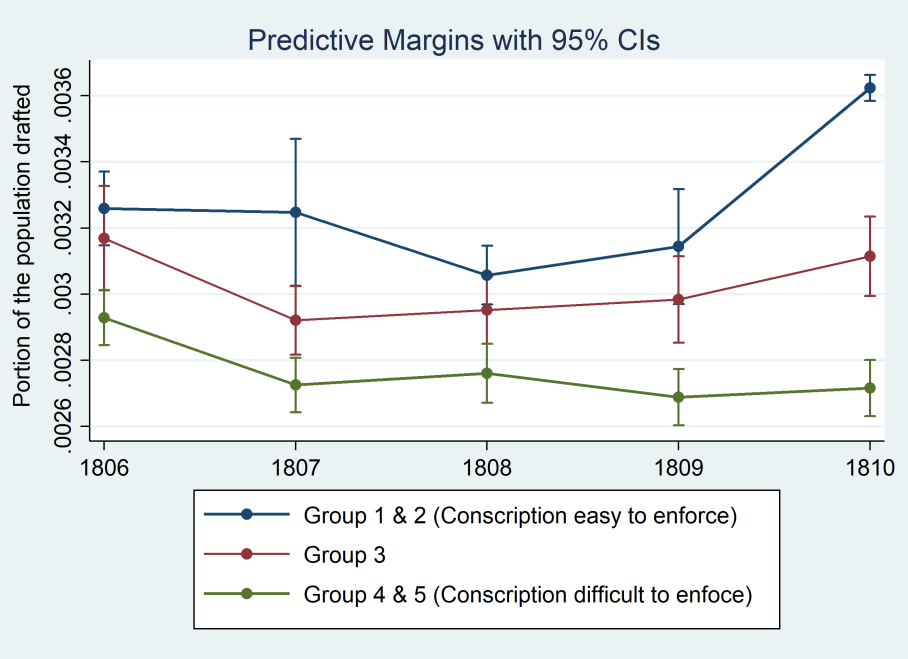
Note: This table displays the logistic regression of *Classes4&5* on geographic variables. *Classes4&5* is a categorical variable equal to 1 when a department is part of classes 4 and 5 and equal to 0 otherwise. We report robust standard errors in parenthesis.

Classes 4&5	(1)	(2)	(3)	(4)
ruggedness	5.18402***	8.72240***	9.35070***	8.84751***
	(1.99554)	(2.89004)	(3.16809)	(3.23482)
Border_Spain_100		2.74903*	4.24012***	4.17338***
		(1.61415)	(1.59807)	(1.56405)
Border_Italy_100		1.19867	-0.01776	6.30162**
		(0.97713)	(0.97137)	(2.83602)
Border_Germamy_100		-6.09633**	-4.46141**	-10.83916***
		(2.87075)	(1.93303)	(3.91778)
Maritime		1.05683*	1.51344**	1.69056**
		(0.57874)	(0.65419)	(0.75393)
Urbanization		2.43687	4.16213*	4.01326*
		(1.91385)	(2.13461)	(2.08520)
Exemption			13.89084***	15.18583***
			(4.53941)	(4.61045)
Country F.E.				YES
Observations	111	111	111	98
Pseudo R-squared	0.0412	0.2961	0.4163	0.4153
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

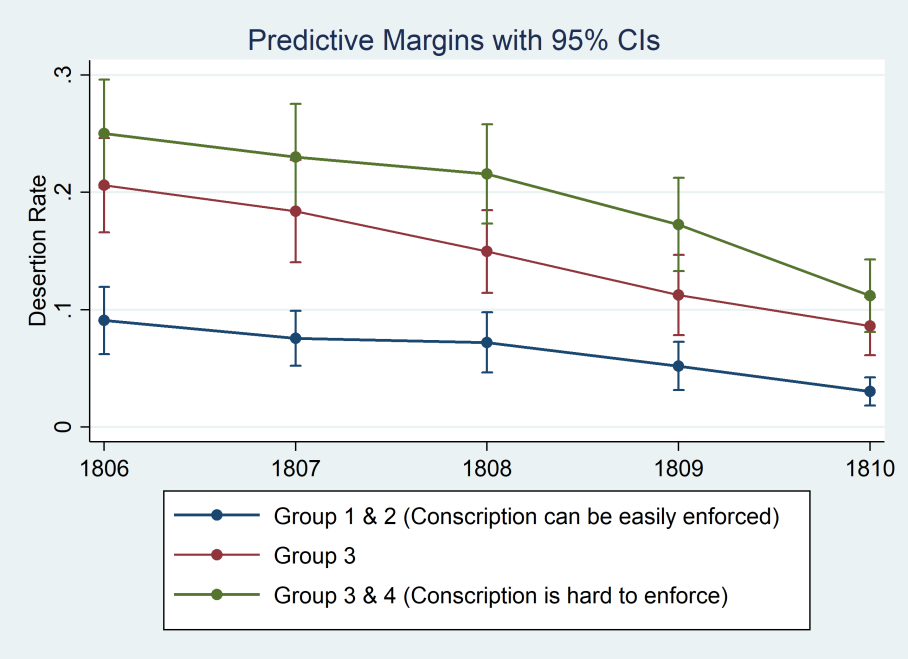
Figure 3 provides a graphical representation of the results from table 4. The upward-sloping curve shows a positive relationship between a department's average terrain ruggedness and the probability that Lacuée classifies that department as above average in its ability to defy the central government's conscription efforts.[21]

In Figure 4(a), we show the chronological breakdown for the nominal conscription rate across departments. We divide these in three groups, collapsing Lacuée's

[21]The predicted probability in Figure 3 has been calculated by assuming that all other independent variables are at their average level.



((a)) Conscription intensity and Lacuée's classification



((b)) Desertion rates and Lacuée's classification

Figure 4: Higher desertion meant fewer men drafted

categories 1 and 2 in one class ("conscription easy to enforce") and categories 4 and 5 in another ("conscription hard to enforce"). The figure shows a pattern in which departments from all three classes started with the same approximate nominal conscription rate. Over time, those departments where conscription was relatively easy to enforce saw their rate go up while departments where conscription was relatively hard to enforce saw their rate go down. Panel (b) follows the behavior of the desertion rate across our three classes over the same time period. The figure provides evidence that the desertion rate fell throughout the Empire between 1806 and 1810. The adjustment in the nominal conscription rate for departments where conscription was hardest to enforce coincided with a drastic fall in their desertion rate, from a fourth of all conscripts in 1806 to just upwards of ten percent in 1810.

7 Alternative hypotheses and robustness checks

7.1 Buffers

The desertion rate in any given department may be affected by the geographical and environmental characteristics of the neighboring departments. To account for this possibility, we create buffers 30 km deep around each department and then calculate average terrain ruggedness for these modified polygons, which are shown in figure 5.

Tables 8, 9 and 10 in the appendix reproduce the results from tables 1, 3 and 2) respectively, with the inclusion of buffers. In each case, and with some exceptions, coefficients tend to be bigger. For instance, a one standard deviation increase in our modified measure of ruggedness predicts an increase of the desertion rate between 1.9 an 6.0 points compared with 2.2 to 4.1 in table 1. Similarly, the effect of a one standard deviation increase in terrain ruggedness on conscription is 22.7% higher with

Figure 5: Departments' polygons with 30 km buffers.

our modified measure of ruggedness in our favored specification (compare column (3) from tables 3 and 9). These results suggest that accounting for geographical characteristics of the surrounding region strengthens our findings.

7.2 Accounting for spatial dependence

We have so far found large and highly significant results. Yet, the spatial distribution of ruggedness and desertion is geographically clustered, which may lead us to mistakenly interpret results as strong and robust although spurious in nature. If both the dependent and the independent variable are spatially correlated, the standard error of the coefficient will not be adjusted for the fact that close observations are naturally more likely to possess the same attributes, hence resulting in inflated t-stats.

The issue of spatial dependence has generally been dealt with by reporting ad-

justed standard errors (Conley 1999). So far, we have reported Conley standard errors with a 100km cutoff value. However, Kelly (2019) demonstrates that the use of Conley standard errors can be unsatisfactory due to too low cutoff values. To avoid this problem, we report Conley standard errors for our main regressions (Tables 1, 3 and 2) when doubling the cutoff value to 200km (see Tables 11, 12 and 13 in the appendix). Although the standard errors become somewhat bigger, our results remain statistically significant, suggesting that they are robust to a change in the correlation range.

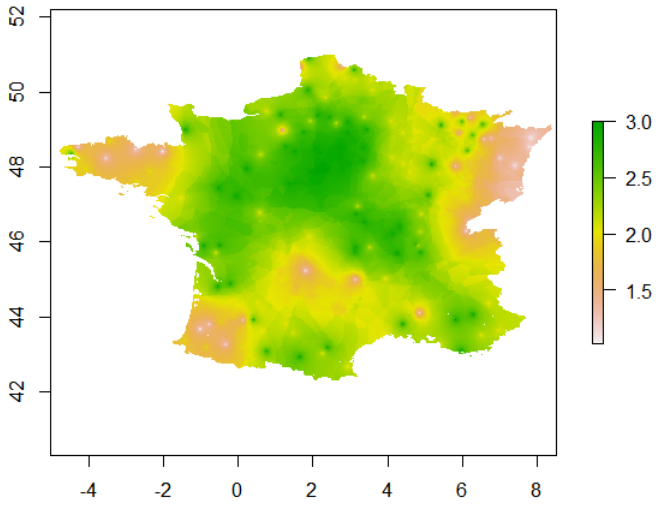
7.3 National Identity

The existing historiography on the pervasiveness of desertion in Napoleonic France identifies one main alternative explanation for the variation in desertion rates across the country: culture (Forrest 1989). As the reaction to the revolution made clear, the country was all but a homogeneous entity when it came to the religious sensibility of the population, its attachment to revolutionary ideals, and to national identity. Variation over these cultural traits may affect the propensity to desert of the population across departments. For example, departments with stronger popular support for the regime or with a more ardent sense of French national identity may see lower ex-ante desertion rates. Because national identity could be negatively correlated to ruggedness on the one hand and conscription choice and desertion on the other, not controlling for national identity could lead us to overestimate the effect of ruggedness.

To test for the national identity hypothesis, we rely on data from Johnson (2015), who draws from Hyslop (1934), on the regional identification of the population with the French Crown or the French State on the eve of the revolution. In preparation to the Estates Generals of 1789, the capital of each French district was to collect

grievances from the local population and communicate them to the national assembly. This resulted in a collection of documents known as *Cahiers de Doléances*.

Based on these documents, Hyslop (1934) creates an index for national identity across French localities, which Johnson (2015) codes as having values of 3 for localities with strong patriotism, 2 for those with mixed loyalties, 1 for those with strong local identities, and "missing" for those presenting no significant loyalties, either their local identity or to the Crown. Following Johnson (2015), we spatially interpolate the 150 observations for city-level measures of national identity. We show the results in figure 6. We then create a new variable for the average measure of national identity at the departmental level and add it to the specifications of tables 1 and 3.



Note: Greener colors represents greater identification in the *Cahiers* by the Third Estate with either the 'King' or 'France' according to Hyslop (1934). Each grid point in the map was assigned a value based on the inverse-weighted distance of surrounding 12 cities that sent in Cahiers (exponent of distance used is 1).

Figure 6: National identity across France in 1788.

Tables 14 and 15 in the appendix report the results. The coefficient of "identity" is significant across all specifications, but the "ruggedness" variable remains significant

at the 1% level throughout. We also find some evidence that the central government demanded more soldiers in regions which identified more strongly as French (table 15). Yet our main independent variables remain significant at the 1% level.

7.4 The allocation of soldiers

One worry with our results may be that draftees from mountainous regions were sent to different destinations or army battalions and therefore faced different payoffs when deciding whether to dodge the draft or not, in which case our main results may be spurious. For instance, draftees in relatively more rugged regions may have to travel longer to join their units, hence giving them additional opportunities to desert. Similarly, those drafted into cavalry and artillery regiments may have been received higher compensation and were therefore less likely to desert, while people in mountainous departments are less likely to be assigned to the cavalry due to the latter's height requirements. Hence we may be spuriously attributing to ruggedness the effects of these correlates.

The documents compiled by Lacuée (AF/IV/1124) do not include detailed information about the destination of draftees. We could find data on this for year 1810 from another source, the *Etats des départemens Qui doivent fournir les Conscrits de 1810 et des Corps qui les recoivent*. This document identifies the number of soldiers allocated to each regiment as well as the latter's location.

From this data, we calculate the geographic distance between the capital of each department and regiment location. We then calculate the average geographic distance conscripts from each departments had to travel (see variable "Distance" in Table 5). We also calculate the percentage of conscripts allocated to the infantry, cavalry and artillery. Our results in table 5 seem to suggest that the effect of 'ruggedness'

on desertion rate is robust to the introduction of controls with respect to the allocation of soldiers. The same can be said about nominal conscription rates when we reproduce table 3 while including "Distance", "Percentge Cavalry", and "Percentage Artillery".[22]

Table 5: Desertion and the allocation of soldiers in 1810.

Desertion rate 1810	(1)	(2)	(3)	(4)
ruggedness	0.23675	0.23252	0.24024	0.25411
	(0.10518)**	(0.11927)*	(0.10055)**	(0.13358)*
	[0.11545]**	[0.11331]**	[0.10028]**	[0.12476]**
Distance		0.00009	0.00010	0.00004
		(0.00008)	(0.00008)	(0.00010)
		[0.00007]	[0.00007]	[0.00009]
Percentage Cavalry		-0.14581	-0.20396	0.06888
		(0.08807)	(0.08406)**	(0.13725)
		[0.08790]	[0.08315]**	[0.11981]
Percentage Artillery		0.43780	0.11550	-0.15985
		(0.81184)	(0.71934)	(0.78499)
		[0.76652]	[0.71845]	[0.78552]
Military Relay	NO	NO	NO	YES
Urbanization	NO	NO	YES	YES
Tax per Capita	NO	NO	YES	YES
Border Spain 100	NO	YES	YES	YES
Border Italy 100	NO	YES	YES	YES
Border Germany 100	NO	YES	YES	YES
Incorporated	NO	YES	YES	YES
Distance from Paris	NO	YES	YES	YES
Maritime	NO	YES	YES	YES
Country F.E.	YES	YES	YES	NO
Observations	110	110	107	83
R-squared	0.13131	0.25310	0.30137	0.33498

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[22]These regressions are available upon request.

8 Conclusion

This article develops a theoretical framework for the study of optimal conscription. We argue that, in devising their conscription policy, rulers will take into consideration administrative and enforcement costs. Conscription rates across the regions under a ruler's jurisdiction will reflect local variations in the costs of deterring desertion. Our framework finds strong supporting evidence in the experience of the French government with the administration of large-scale conscription during the Napoleonic Empire. Using an original data-set based on archival evidence on desertion and conscription over this period, we show that a department's geographical characteristics (a major determinant of enforcement costs) predicts its desertion and its conscription rates. We also provide qualitative evidence from historical sources that members of the Napoleonic regime were aware of the varying propensity of local populations to evade their military obligation. The sources confirm that this information influenced the decision-making process behind the administration of conscription in France.

The combination of our theoretical argument and empirical results point to an important dimension of political decision-making and policy-implementation: The public's response to government action is a major constraint on its ability to achieve its policy objectives. Even when public administrators are guided, in devising public policy, by the principles of equity and fairness, they will see their efforts frustrated if they do not account for the public's ability to respond strategically to their enforcement and implementation.

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9 Appendix

9.1 Descriptive statistics

Table 6: Summary statistics.

VARIABLES	Observations	Mean	Std. Dev.	Minimum	Maximum
Desertion rate	555	0.14	0.13	0	0.65
ruggedness	555	0.31	0.097	0.044	0.513
ruggednessb	555	0.30	0.084	0.081	0.482
Border_Spain_100	555	0.06	0.22	0	1
Border_Italy_100	555	0.11	0.29	0	1
Border_Germany_100	555	0.19	0.36	0	1
replacement_rate	444	0.049	0.045	0	0.613
MilitaryRelay	405	0.043	0.016	0.01	0.079
PosteDensity	405	0.052	0.034	0	0.161
Incorporated	555	0.94	0.13	0	1.33
Urbanization	555	0.127	0.103	0	0.843
Maritime	555	0.26	0.44	0	1
Tax per capita	540	8.87	3.20	1	17.32
Distance to Paris	555	393.6	209.1	0	1066.3
Exemption	555	0.54	0.092	0.229	0.775
Distance	111	384.74	137.10	139.46	876.85
Pencentage Cavalry	111	0.105	0.137	0	0.639
Percentage Artillery	111	0.020	0.011	0	0.049
Mounted vs. footed gendarmerie brigades	103	7.09	6.52	0.2	36
Identity	87	2.24	0.32	1.40	2.91

9.2 Data Appendix

Table 7: Data appendix

VARIABLES	Source	Description
Desertion rate	Archives Nationales, AF/IV/1124, n°1 and n°9.	The desertion rate was defined as the proportion of people picked by lot who dodged the draft. Desertion rate = (Number of draft dodgers + Number of conscripts having deserted on their way to their units) / (Contingent + Number of draft dodgers + Number of conscripts having deserted on their way to their units).
Incorporated	Archives Nationales, AF/IV/1124, n°1.	"Incorporated" measures the portion of the contingent who joined the ranks of the army (*arrivés aux drapeaux*).
Reformed	Archives Nationales, AF/IV/1124, n°1.	"Reformed" measures the portion of young men in each cohort declared unfit for military service (*reformed*).
Ruggedness	(Nunn & Puga 2012, Nüssli 2012, Poirson 1808).	We extracted the average terrain ruggedness by department polygons. The department polygons were partly contained in *Euratlas*. The Italian departments were missing. We georeferenced the Italian departments using the map of the French empire published by Poirson (1808).
Ruggednessb	(Nunn & Puga 2012, Nüssli 2012, Poirson 1808).	We extracted the average terrain ruggedness for each department adding a 30 km buffer around department borders.
Border_Spain_100	(Nüssli 2012).	This variable measures the percentage of each department' area which is less than 100 km away from the Spanish border.

Border_Italy_100	(Nüssli 2012).	This variable measures the percentage of each department' area which is less than 100 km away from the Italian border. The Italian border starts from Geneva and end on the Tyrrhenian sea.
Border_Germany_100	(Nüssli 2012).	This variable measures the percentage of each department' area which is less than 100 km away from the German border. The German border starts from Geneva and end on the North sea.
Replacement rate	Archives Nationales, AF/IV/1124, p.198-215.	This variable is calculated by dividing the number of replacement by the contingent for each department and each year between 1806 and 1809.
MilitaryRelay	(Arbellot et al. 1985).	This variable measures the number of military relays per square kilometer in 1795. Those relays enabled to host troops during their travel. The area of each department was calculated using the st_area command in R.
PosteDensity	(Arbellot et al. 1985).	This variable measures the number of postal offices per kilometer squared.
Urbanization	(Bairoch et al. 1988) and Archives Nationales, AF/IV/1124, *Rapport a sa Majesté impériale et Royale.* April 6, 1809.	We georeferenced the cities found in Bairoch et al. (1988) and then extracted the population of cities above 5 000 inhabitants for each department. We then divide the number of people living in a city bigger than 5 000 inhabitants divided by the total population to get our variable "Urbanization."
Maritime	(Poirson 1808).	This variable is equal to 1 when a department is adjacent to the sea and equal to 0 otherwise.
Tax per capita	(Peuchet 1805).	We use the data on direct taxes for Year 11 (1802-1803) given by Peuchet (1805).

Distance to Paris	Wikipedia.	We calculated the geographic distance between each department's capital and Paris. We used Wikipedia to find the longitude and latitude of each city. The geographic distance, in kilometers, was then calculated using the "getdistance" function in Excel.
Distance	*État des départements qui doivent fournir les Conscripts de 1810.* Archives nationales, AF/IV/1124. Wikipedia.	We calculated the geographic distance between each department's capital and the military depots conscripts had to go to. Cities were georeferenced using the longitudes and latitudes found on Wikipedia. "Distance" represents the average geographic distance (calculated with the "getdistance" function in Excel), in kilometers, that conscripts had to travel to join the ranks in 1810.
Percentage Cavalry	*État des départements qui doivent fournir les Conscripts de 1810.* Archives nationales, AF/IV/1124.	This variable measures the percentage of conscripts being allocated to a cavalry unit in 1810.
Percentage Artillery	*État des départements qui doivent fournir les Conscripts de 1810.* Archives nationales, AF/IV/1124.	This variable measures the percentage of conscripts being allocated to an artillery unit in 1810.
Identity	(Hyslop 1934, Johnson 2015)	The data was coded following Johnson (2015)'s methodology and then spatially interpolated using R. Each grid point in the map was assigned a value based on the inverse-weighted distance of surrounding 12 cities that sent in Cahiers (exponent of distance used is 1).
Mounted vs. footed gendarmerie brigades	(de Halle 1803)	The number of horsed gendarmerie grigades in each department was divided by the number of gendarmerie brigades on foot.

9.3 Buffers, 30km

Table 8: Desertion and ruggedness with 30 km buffers.

Note: This table as well as the following two tables display the same results as in Table 1, 3 and 2. We draw a buffer of 30 km around each department and assign the average terrain ruggedness to the department if it falls within either the department itself or the buffer.

Desertion rate	(1)	(2)	(3)	(4)	(5)
ruggednessb	0.22946	0.36058	0.42321	0.42805	0.71513
	(0.08732)***	(0.09046)***	(0.08887)***	(0.10393)***	(0.12316)***
	[0.16349]	[0.17092]**	[0.17182]**	[0.19009]**	[0.21370]***
Same Controls					
as in Table 1	YES	YES	YES	YES	YES
Observations	554	554	539	432	415
R-squared	0.55532	0.58543	0.63690	0.65633	0.71975
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 9: Geography and conscription with 30km buffers.

Population drafted	(1)	(2)	(3)
ruggednessb	-0.00072	-0.00044	-0.00146
	(0.00018)***	(0.00019)**	(0.00017)***
	[0.00031]**	[0.00035]	[0.00025]***
Same Controls			
as in Table 3	YES	YES	YES
Observations	555	555	415
R-squared	0.12687	0.48106	0.62194
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 10: Geography and enforcement technology with 30km buffers.

Ratio of mounted vs. footed gendarmerie brigades	(1)	(2)	(3)
ruggedness	-18.58758	-24.04681	-35.53974
	(7.28351)**	(10.70623)**	(14.12376)**
	[7.88031]**	[11.00029]**	[15.39092]**
Same Controls			
as in Table 2	YES	YES	YES
Observations	103	103	81
R-squared	0.09842	0.14330	0.18006
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

9.4 Conley standard errors: 200 km

Table 11: Geography and desertion with CSEs.

Note: This table displays the same results as in Table 1. We report Conley standard errors in brackets with a threshold of 200km instead of 100 km.

Desertion rate	(1)	(2)	(3)	(4)	(5)
ruggedness	0.22786*	0.32976**	0.27368**	0.28265**	0.41997***
	[0.13294]	[0.13372]	[0.11913]	[0.13852]	[0.13044]
Same Controls					
as in Table 1	YES	YES	YES	YES	YES
Observations	554	554	539	432	415
R-squared	0.56076	0.59378	0.63213	0.65251	0.71011
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 12: Geography and conscription with CSEs.

Note: This table displays the same results as in Table 3. We report Conley standard errors in brackets with a threshold of 200km instead of 100 km.

Population drafted	(1)	(2)	(3)
ruggedness	-0.00052*	-0.00060**	-0.00103***
	[0.00029]	[0.00028]	[0.00023]
Same Controls			
as in Table 3	YES	YES	YES
Observations	555	555	415
R-squared	0.12204	0.49299	0.61275
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 13: Geography and enforcement technology with CSEs.

Note: This table displays the same results as in Table 2. We report Conley standard errors in brackets with a threshold of 200km instead of 100 km.

Ratio of mounted vs. footed gendarmerie brigades	(1)	(2)	(3)
ruggedness	-15.34629***	-20.48023***	-23.98653**
	[5.30000]	[7.49700]	[9.49574]
Same Controls			
as in Table 2	YES	YES	YES
Observations	103	103	81
R-squared	0.09915	0.14807	0.15638
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

9.5 National identity

Table 14: Identity and desertion.

Note: We report robust standard errors in parenthesis and Conley standard errors (100km) in brackets.

Desertion rate	(1)	(2)	(3)	(4)	(5)
identity	-0.10091	-0.01797	-0.00771	-0.01831	-0.01625
	(0.03643)***	(0.04483)	(0.04174)	(0.04707)	(0.04416)
	[0.07542]	[0.08821]	[0.07642]	[0.08041]	[0.07870]
ruggedness		0.34192	0.37633	0.43821	0.39569
		(0.08947)***	(0.09142)***	(0.09707)***	(0.09496)***
		[0.13339]**	[0.12634]***	[0.13911]***	[0.12883]***
Same Controls as in Table 1	YES	YES	YES	YES	YES
Observations	430	430	430	344	410
R-squared	0.64212	0.67874	0.69871	0.73617	0.71167

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 15: Identity and conscription.

Note: We report robust standard errors in parenthesis and Conley standard errors (100km) in brackets.

Population drafted	(1)	(2)	(3)
identity	0.00002	0.00017	0.00017
	(0.00006)	(0.00006)***	(0.00006)***
	[0.00013]	[0.00008]**	[0.00008]*
ruggedness		-0.00072	-0.00075
		(0.00017)***	(0.00017)***
		[0.00025]***	[0.00024]***
Exemption		-0.00232	-0.00226
		(0.00013)***	(0.00014)***
		[0.00019]***	[0.00019]***
Same Controls as in Table 3	YES	YES	YES
Observations	430	430	410
R-squared	0.07761	0.59516	0.61445
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			