Consequences of the Black Sea Slave Trade: Long-Run Development in Eastern Europe [*]

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Abstract

We investigate the developmental consequences of slave-raiding in Eastern Europe, the largest source of slaves in the early modern world after West Africa. Drawing on a wide-ranging new dataset, we estimate that at least 5 million people were enslaved from 735 locations across the region between the 15th and 18th centuries. We hypothesize that, over time, slave raids encouraged an economically advantageous process of defensive state-building linked to raided societies' resistance to and lack of integration into the slave trade. Using difference-in-differences and instrumental variables strategies, we find that exposure to raids is positively associated with long-run urban growth and related indicators of demographic and commercial development. Consistent with our posited mechanism, raided areas constructed more robust defensive infrastructures and attained higher levels of military, administrative, and fiscal capacity. Our findings suggest that the structure of slave production conditions its developmental legacies, cautioning against drawing generalizations from the African context.

Keywords: slavery, economic development, historical legacies, state-building, Eastern Europe, Black Sea, historical political economy

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Introduction

Between the 15th and 18th centuries, slave raiders from the Black Sea steppe captured millions of people across Eastern Europe, ravaging the southern borderlands of Poland, Lithuania, and Russia particularly intensely. Most captives were hauled to Crimea and exported to slave markets around the Ottoman Empire — from Constantinople to Cairo to Damascus — via an extensive network of merchants, gatekeepers, and watchmen. The remainder were sold locally or perished during the grueling march to Crimea. The upshot of these activities is a little-known fact: after West Africa, Eastern Europe was the largest source of slaves in the early modern world (Khodarkovsky 2002, 22).

Despite considerable interest in the socioeconomic legacies of slavery, relatively little is known about the scale, scope, or developmental consequences of the Black Sea slave trade. Eastern Europe's experience as a victim and perpetrator of slave-raiding remains strikingly absent from global historical narratives of the early modern era (Ostrowski 2016; Fisher 1999). Our understanding of how slavery influences long-run development is based almost exclusively on evidence from the transatlantic slave trade, which was dwarfed by its Black Sea counterpart until as late as the 18th century. In West Africa, demand from — and subsequently coercion by — European powers created incentives for rulers to adopt extractive institutions and social practices that maximized their capacity for (internal and external) slave production. An insecure and unpredictable economic environment ensued, with trade and investment stymied by pervasive violence, low levels of interpersonal trust, political instability, and ethnic fragmentation (Nunn 2008; Nunn and Wantchenkon 2011; Whatley and Gillezeau 2011; Green 2013; Obikili 2016; Fenske and Kala 2017).

In early modern Eastern Europe, demand for slaves from the expanding Ottoman Empire similarly encouraged some polities — principally the Crimean Khanate — to specialize in and organize their economies around slave-raiding. In major powers such as Russia and Poland-Lithuania, however, a wave of political consolidation in the late medieval period had brought an end to commercial slavery, reorienting economic activity toward the production of labor- and land-intensive commodities for export to Western Europe. As a result, these states neither participated in nor profited from the slave trade. To the contrary, they sought to stem population decline by building permanent fortifications, mobilizing armies, and investing in reconnaissance systems. These measures, in turn, required strengthening fiscal capacity and further centralizing administrative structures. Slave-raiding thus encouraged a process of defensive state-building that, we argue, stimulated sustained flows of labor and capital to exposed areas — flows that more than offset losses caused by slave raids. Our central claim is that, while bearing the brunt of short-term damage from the slave trade, raided locations came to enjoy enduring economic advantages that provided the basis for higher levels of development over the long run.

To test this hypothesis, we construct and analyze the most comprehensive dataset on slave raids in early modern Eastern Europe. Our dataset, which draws on a rich array of historical sources, reveals that the Black Sea slave trade was fueled by at least 2,750 raids on 735 locations spanning 14 contemporary countries over 324 years (1453-1777). At a minimum, 3.7 million people were enslaved in these incursions; using imputation methods to account for missing information on captives, we estimate that the true figure lies in the region of 5 million. This represents more than a quarter of Eastern Europe's estimated population in 1400, shortly before the onset of the slave trade. This is comparable to the proportion of Africa's preexisting population that was exported in one of its four early modern slave trades (just under one-third).

We begin our empirical investigation by examining the impact of slave raids on urban population growth, a common indicator of economic development in the pre-industrial era. Pursuing a difference-in-differences strategy, we find that raided urban settlements in Eastern Europe exhibited significantly faster population growth than non-raided settlements between the start of the Black Sea slave trade and the end of the 19th century. According to our baseline estimates, exposure to raids is associated with an average increase in settlement population of approximately one-fifth over the sample period. This relationship holds across various specifications, including the use of heterogeneity-robust event study estimators; interactive fixed effects capturing the time-varying effects of soil fertility and other geographical characteristics; continuous measures of raid intensity; grid cells as the unit of observation; and alternative sources of urban population data.

Next, we analyze a broader set of development indicators measured in the mid-19th century — around 75 years after the slave trade ended — for districts of the Russian and Austrian Empires. Lacking over-time variation in these outcomes, we seek to identify the effect of slave raids using an instrumental variables strategy that exploits natural topographical features affecting raiders' access to different parts of the Black Sea region. We observe a consistently positive relationship between district-level raid intensity and development outcomes, including market and manufacturing activity in Imperial Russia, house and farm density in Imperial Austria, and population in both contexts.

Finally, we turn our attention to mechanisms, providing several pieces of evidence linking exposure to slave raids to economically advantageous investments in defensive state-building. First, raiding activity predicts a rise both in the fiscal revenues of the Polish and Lithuanian treasuries and in the population of military encampments in the highly exposed region of Red Ruthenia. Second, raided areas of Poland-Lithuania constructed significantly more permanent fortifications, such as castles and defensive settlements, than non-raided areas. Third, a higher share of these fortifications were controlled by the crown or its representatives, implying that the state responded to raids by strengthening its "monopoly on violence". Finally, raid intensity is positively associated with the number of military and state officials deployed to Russian urban communities in the 17th century. Its relationship with the population of traders and artisans in these communities, by contrast, turns from negative in the 17th century to positive in the early 18th century, with earlier military and administrative presence also a positive predictor in the latter period. This pattern suggests that defensive investments against slave-raiding gradually paved the way for an expansion in local trade and production, further allaying possible concerns about reverse causality.

We contribute to several areas of research, beginning with the influential literature on the developmental impact of slave-raiding, which has focused predominantly on Africa (Nunn 2008; Nunn and Wantchenkon 2011; Whatley and Gillezeau 2011; Fenske and Kala 2017; Obikili 2016). Taken together, our findings point to the structure of slave production as a key determinant of how raiding activity influences long-run development. When targeted societies resist integration into transnational systems of slavery, exposure to raids may encourage rather than impede processes of defensive state-building that are critical to sustained economic growth. While the sources of variation in responses to external slave demand merit further investigation, our analysis suggests that integration is less likely when states possess higher preexisting levels of political centralization and lucrative alternative export opportunities.[1] Our results hence caution against generalizing inferences about slavery's economic effects drawn from the African context.[2] Rather, they imply that a comprehensive and balanced understanding of slavery's developmental consequences requires additional case studies covering a variety of other regions and historical eras. They thus underscore the value of a vibrant emerging research agenda that seeks to study slavery from a global — and explicitly comparative — perspective (Eltis and Engerman 2011; Witzenrath 2016; Sharman and Zarakol 2024).

Second, our conclusions speak to scholarship on the origins of state-building, which has until recently ignored slavery as an explanatory factor. Complementing agenda-setting research on the role of slaves in consolidating political authority in "consumer" states (Blaydes and Chaney 2013; Sharman and Zarakol 2024), our analysis shows that slave-raiding can promote administrative and fiscal centralization in "supplier" states. In doing so, it adds nuance to existing accounts of the evolution of state capacity in Eastern Europe, which have generally emphasized delays relative to Western Europe stemming from the absence of high-stakes military competition between major powers (Ertman 1997; Karaman and Pamuk 2013). If our findings are valid, slave raids may have served as a "substitute" for intense interstate warfare in stimulating state-building — albeit one whose consequences were less existential in nature and more concentrated in border regions. A similar point applies to the growth and development of urban centers, which have been attributed to the heavy costs of military conflict for rural populations in early modern Western Europe (Dincecco and Onorato 2017).

Third, we extend the growing body of systematic empirical research on the economic and political

[1] In Africa, traditionally low levels of centralization are believed to have impeded development (Michalopoulos and Papaioannou 2020) and weakened resistance to colonization (Hariri 2012). Their implications for how states responded to slave demand have received less attention, however.

[2] As Nunn (2008, 142) emphasizes, "Africa's slave trades were. . . unique because, unlike previous slave trades, individuals of the same or similar ethnicities enslaved one another." Note that even within Africa, responses to slave raids varied, with some states disintegrating amid internal strife (Obikili 2016) and others becoming more centralized — though typically no less brittle — as they expanded raiding operations (Sharman 2023).

legacies of unfree labor in Eastern Europe (Dower et al. 2018; Buggle and Nafziger 2021; Markevich and Zhuravskaya 2018; Lankina and Libman 2021). Most of this work has concentrated on serfdom — a less extreme form of dependence — with studies of slavery typically restricted to individual states and centuries (for exceptions, see Witzenrath 2016; Roşu 2022). The few attempts to provide an aggregate estimate of the size of the Black Sea slave trade rely, by necessity, on a mixture of extrapolation and educated conjecture (Kołodziejczyk 2006; Inalcik and Quataert 1994; Klein 2016).[3] To our knowledge, our dataset represents the only effort to comprehensively catalog slave raids in Eastern Europe at a precise geographical level. While not guaranteed to encompass every raid that occurred, it lays the foundation for a deeper and more wide-ranging understanding of Eastern European slavery — a historically significant phenomenon that has been largely overlooked by social scientists — than previously possible. Lastly, our conclusions challenge and complicate the assumption made by some historians of the region that the slave trade was overwhelmingly detrimental to its economic fortunes (Kołodziejczyk 2006; Khodarkovsky 2002), highlighting the importance of distinguishing the immediate impact of slave-raiding (which was almost certainly negative) from its long-run repercussions (which we find to be more favorable).

The Black Sea Slave Trade: An Overview

Origins and Organization

While slave-raiding in Eastern Europe dates back to antiquity, it remained limited and sporadic until the late medieval period. A series of devastating wars, culminating in Mongol invasions and the establishment of the Ulus of Jochi in the 13th century, led to a pervasive state of insecurity and deprivation in which the abduction and sale of children became common (Roşu 2022, 9).[4] The supply of slaves dramatically expanded in the mid-15th century with the disintegration of the Ulus of Jochi and the

[3] These estimates focus on Muscovy and Poland-Lithuania and exclude the 18th century, generally suggesting that between 1 million and 2.5 million people were enslaved in the two states before this point.

[4] The Ulus of Jochi is also known as the Golden Horde — a partial calque of the Russian *Zolotáya Ordá*, first used in the late 16th century — and the Kipchak Khanate.

fall of Constantinople, which reoriented Black Sea commerce toward the "economically thriving" — and thus labor-hungry — Ottoman Empire (Witzenrath 2022, 29). The Crimean Khanate, a powerful Tatar successor state to the Ulus of Jochi, was acquainted with agriculture but found slave-raiding more profitable for two reasons. First, only coastal districts of the Crimean peninsula were suitable for intense cultivation, and their yields "were insufficient to support the multitudinous warring layers" (Ivanics 2007, 193). Second, Crimean Tatars retained traditional nomadic skills and military know-how that enabled them to conduct rapid and destructive raids across the steppe. Ottoman control of the Black Sea and, from 1475, Crimea itself created a vast international market for Christian slaves — Muslims were prohibited from enslaving coreligionists — who came to play a central role in the empire's economy, military, and bureaucracy (Inalcik and Quataert 1994). The slave trade became a "cornerstone" of the Crimean economy, with captives outnumbering natives by between 2:1 and 3:1 (Kizilov 2007, 2).[5]

While seemingly chaotic, slave raids were highly organized. Most raiding expeditions were conducted either at harvest time or in winter — when frozen rivers and grassland could be more easily traversed on horseback — and were planned 3-4 weeks in advance (Kizilov 2007).[6] Raiding parties, ranging in size from several hundred to more than 100,000, typically followed one of four trails stretching from the northern edge of the Crimean peninsula deep into the Black Sea steppe.[7] By following these routes, raiders "always traveled between two major rivers, staying on the highest ground" (Beauplan 1660, 47) and thus avoiding natural barriers and detection by enemy settlements on river banks. Raiders would approach their target area furtively, often traveling on moonless nights and switching between trails to confuse enemy watchmen, while undertaking continuous reconnaissance patrols (Davies 2007). A fortified field camp would then be constructed, from which raiders fanned outward

[5]Some raids were conducted by other Tatar offshoots of the Ulus of Jochi, such as the Kazan Khanate, the Nogai Horde, and the Budjak Horde. Various (Christian) cossack groups in eastern Ukraine and southern Russia also engaged in raiding, albeit on a substantially smaller scale, given the weaker demand for slaves in these territories (Kravets and Ostapchuk 2022, 254).

[6]Raids occasionally took place during joint military campaigns with Ottoman, cossack, or Nogai forces, in which case they were organized in a more ad hoc fashion.

[7]These routes were known as the Woloski Trail, the Czarny Trail, the Kuczman (or Podole) Trail, and the Murawa Trail.

as far as 140km, setting buildings alight and conducting demonstrative executions to arouse panic and fear (Gliwa 2016). Renowned for their speed and mobility, Tatar cavalrymen commanded multiple horses each and deployed a combination of bows and arrows, sabers, spears, and rope to seize captives (up to 7 per soldier) (Kizilov 2020, 253).[8] Finally, the raiding party would reconvene and return to camp to divide up the spoils.

Captives were marched to Crimea in chains, with the ill and wounded frequently killed to avoid slowing down progress. Upon arrival, a small number were retained for ransom — generally nobility and high-ranking military officers — or domestic and agricultural work, while the rest were distributed to one of Crimea's many slave markets, the largest being the port of Caffa (modern Feodosia).[9] There, an assortment of handlers, gatekeepers, watchmen, and brokers categorized captives according to sex, age, and skill; assigned them to a storage facility; and, within a few days, sold them to a local merchant (Fisher 1999, 35).

The vast majority of purchased slaves were shipped via the Black Sea either to commercial centers across the Ottoman Empire, such as Bursa, Cairo, Constantinople, Damascus, and Edirne, or to smaller towns with slave markets, such as Haskovo, Nova Zagora, and Kazaluk in Bulgaria (Kołodziejczyk 2006). Approximately 70% of slaves sold in Caffa made the 10-day journey to Constantinople, where several thousand people — including a guild of 2,000 merchants based in the Grand Bazaar — made a living off the slave trade (Fisher 1999, 584). Male slaves usually ended up working in agriculture, construction, small craft production, or the military; female slaves were used mainly in domestic service, either as concubines of their owner or as servants of his legal wives (Lavrov 2015; Fisher 1999).

Scale and Scope: New Geocoded Data

Slave raids in early modern Eastern Europe are known to have occurred from the 15th to the 18th century and to have centered on Poland-Lithuania and Russia. The full extent of this complex system,

[8] Until the 19th century, the bow and arrow was superior to handheld firearms in accuracy and range but required considerable training and practice to wield effectively (Bemmann 2012; Ostrowski 2010).

[9] Other markets included Anapa, Bakhchysarai, Karasubazar (Bilohirsk), Kerç (Kerch), Gözleve (Yevpatoria), and Taman.

however, remains surprisingly unclear. To gain a better empirical understanding, we collected data on the timing, location, and yield of all Ottoman-era raids recorded in more than 500 primary and secondary sources, the most important of which are enumerated in Table A1 of Online Appendix A.

Our data-gathering process proceeded in four steps. First, we compiled an exhaustive list of raids mentioned in modern scholarship on the Black Sea slave trade in English, French, German, Hungarian, Polish, Russian, Turkish, and Ukrainian. Second, where possible, we consulted the original historical sources referenced in this research to verify dates and figures, acquire additional information (e.g., more precise locations, raiding party size, collateral damage), and check for unreported raids. While most of these sources take the form of chronicles compiled by monastic or court scribes, they range from property registers and treasury accounts to diplomatic documents and military lists. Third, to err on the side of caution, we excluded raids whose source has been questioned by historians or lacks clarity on whether captives were actually taken. Finally, we geocoded the remaining raids, which in some instances required matching historical and contemporary location names using archival maps.

In total, our dataset comprises 2,789 raids conducted between 1453 and 1777 in 735 locations spanning 14 contemporary countries: Belarus, Croatia, the Czech Republic, Estonia, Hungary, Lithuania, Moldova, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, and Ukraine. A total of 3.68 million people were captured in these incursions, according to our sources.[10] It is crucial to note, however, that information on captive numbers is missing for 52% of raids, implying a far higher true aggregate. Replacing missing values with the mean of observed ones (mean imputation) yields a total of 7.7 million captives. A more sophisticated multiple imputation model, which includes raid longitude, latitude, location type, year, and party size as predictors, provides a more conservative mean estimate of 5.06 million (with a range of 4.3-6.11 million).[11] We find the latter figure, which we discuss in detail in Online Appendix B, considerably more plausible, not only because it leverages predictive information in a statistically principled manner but also because raids that lack data on captives are likely to be smaller, on average.

[10] In the few instances where sources provide conflicting captive estimates for a given raid, we take the average.

[11] We employ the machine learning-based technique of multiple imputation with denoising autoencoders (MIDAS) (Lall and Robinson 2022), generating a total of 1,500 completed datasets using 75 combinations of key model parameters.

Based on demographic statistics from the History Database of the Global Environment (Klein Goldewijk et al. 2017), our imputed captives total amounts to 26.6% of Eastern Europe's population in 1400.[12] It is not possible to calculate this proportion in the case of Africa's early modern slave trades, for which scholars have only estimated the aggregate number of *exported* slaves. The latter figure — approximately 18 million (Nunn 2008) — represents 32.8% of Africa's population in 1400 (as per the History Database). As a high fraction of Eastern European slaves were exported to Ottoman lands (Kołodziejczyk 2006, 151), it seems reasonable to view the Black Sea slave trade as roughly comparable to its African counterparts in terms of overall demographic burden.

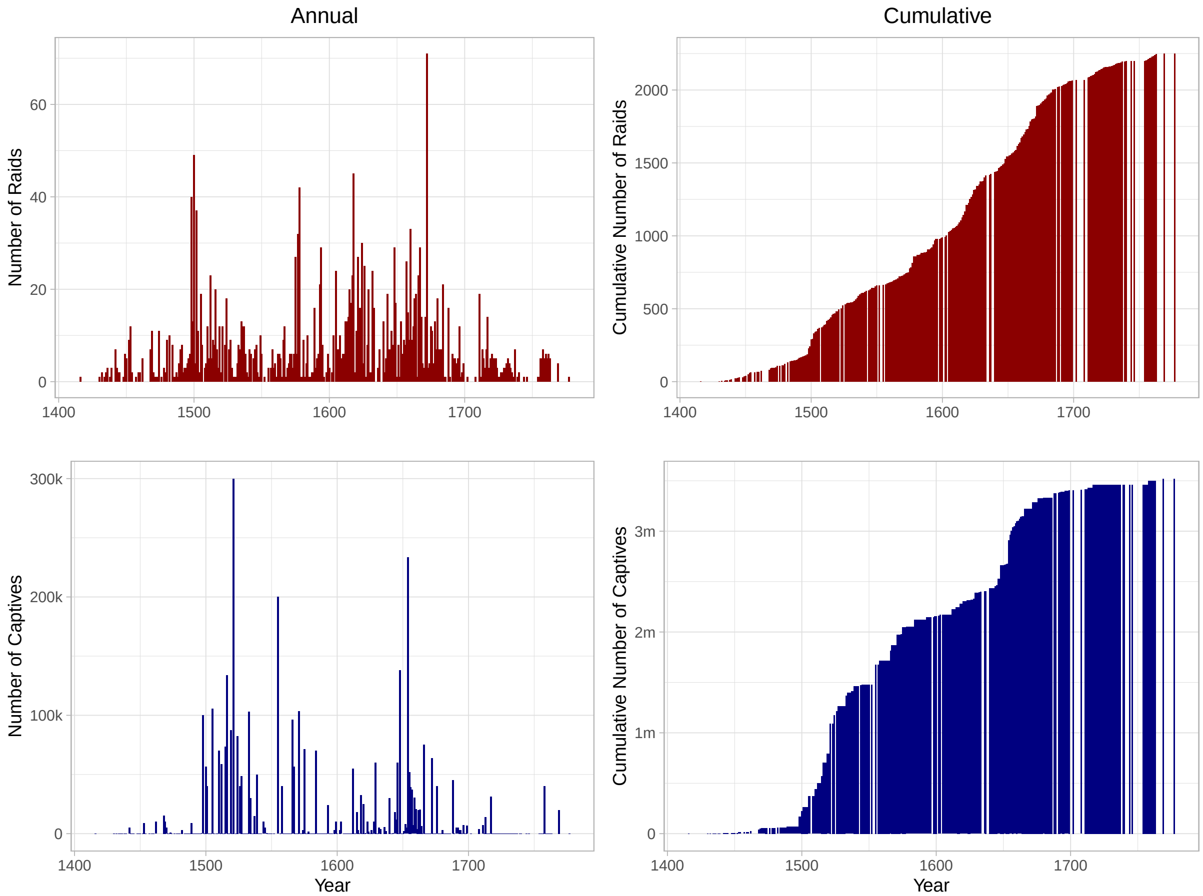
Two caveats about our dataset should be mentioned. First, it is unlikely to be complete. Some raids may not have been recorded by contemporaries (for instance, due to their small size or remote location), and not all archival material relating to the Black Sea slave trade may have been accessed by historians. While information about raids surely varies with location size and prominence, localities with fewer than 5,000 inhabitants constitute the bulk of our dataset, suggesting that our sources provide good coverage of minor settlements.[13] Second, neither raid nor captive numbers should be taken as exact. In addition to the problem of missing data, there is no guarantee that every historical source is accurate (though we have seen no evidence of systematic exaggeration or underreporting). For these reasons, it is prudent to treat our data as indicating approximate orders of magnitude rather than precise quantities.

With these qualifications in mind, the dataset opens a rich window on the scale, scope, and dynamics of slave-raiding in Eastern Europe. Figure 1 plots the annual and cumulative number of raids and (non-imputed) captives between 1400 and 1800. Raids were conducted fairly consistently throughout the period, particularly in the 16th and 17th centuries. Nevertheless, there are discernible peaks in the first decade of the 1500s (238 raids), the 1570s (151), 1610-1630 (419), and 1660-1680 (367). While more

[12] This does not entail that Eastern Europe's population would have been proportionally larger had slavery never occurred. In a Malthusian scenario, for instance, slave raids would have merely provided a check on excess population growth — an argument made in the African context by Malthus himself. Given the methodological challenges of estimating counterfactual demographic trends (see Price and Whatley 2022), we prefer to express the magnitude of the Black Sea slave trade in terms of preexisting population.

[13] Among larger settlements, we later show that there is no relationship between pre-slave trade population and exposure to raids.

FIGURE 1. Frequency of Slave Raids in Eastern Europe, 1453-1777

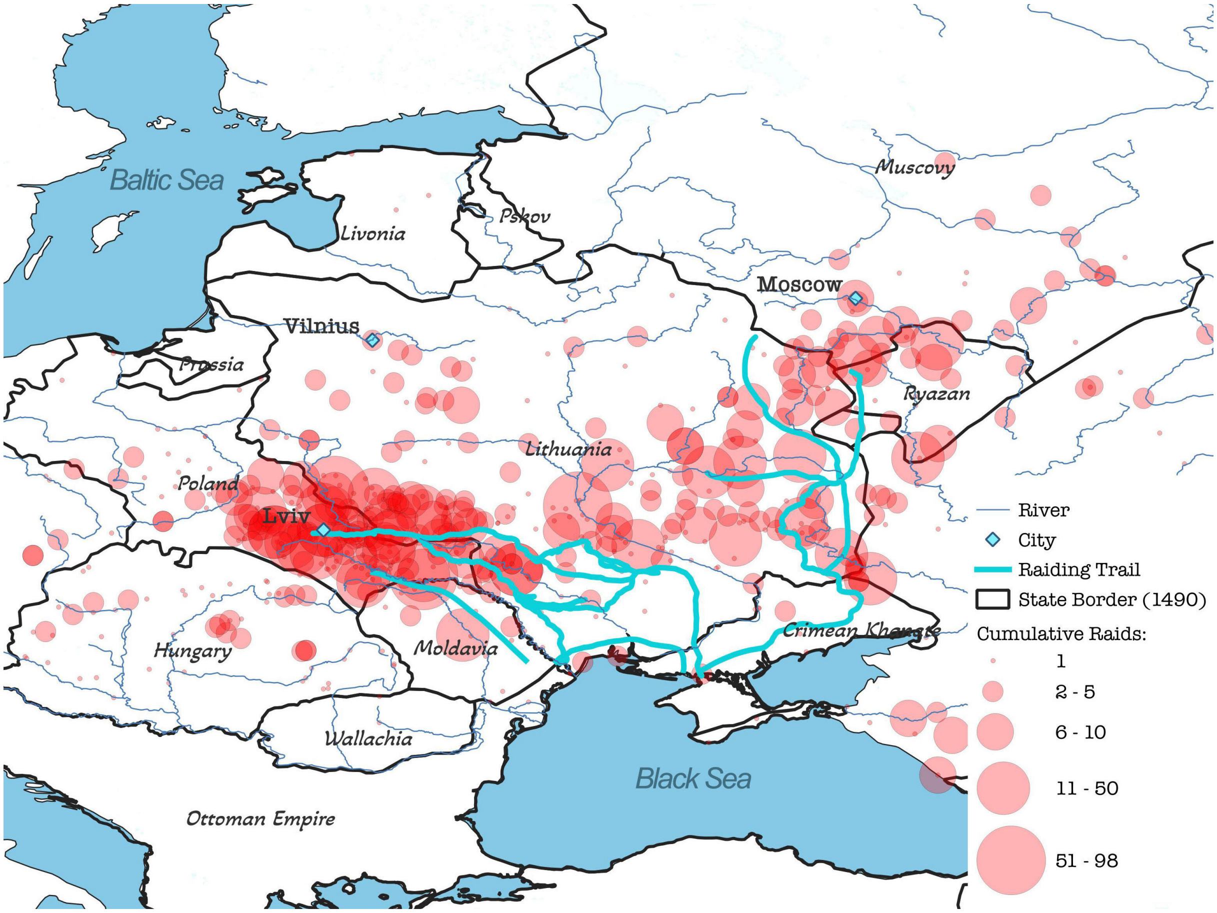


Notes: The left column displays the annual number of raids (top row) and captives (bottom row, in thousands); the right column shows the cumulative number of raids (top row) and captives (bottom row, in millions).

sparse due to missing data, captive numbers exhibit similar crests in the first half of the 16th century (1.34 million captives) and in the mid-17th century (0.67 million between 1650 and 1660). According to our imputation model, 4.79 million captives — 95% of the total — were taken by 1700. The number of Africans exported in the transatlantic slave trade by this date is estimated at 1.28 million (Slave Voyages 2021).

Despite the overall magnitude of the Black Sea slave trade, the dataset indicates that raids were typically modest in size. Among raids with information on captive numbers, the average yield is 1,321

FIGURE 2. Geographical Distribution of Slave Raids



Notes: This map displays the location of 2,789 slave raids in Eastern Europe between 1453 and 1777.

slaves, with 44% producing fewer than 1,000 slaves and only 13% generating 5,000 or more slaves.[14] In general, the largest raids were conducted during military campaigns led by the Crimean khan, the most famous example being Mehmed I Giray's 1521 invasion of southern Russia, when an army of up to 100,000 Tatars ravaged towns and villages up to the outskirts of Moscow, forcing Grand Prince Vasilii III to flee to Volokolamsk. Contemporaries estimated that hundreds of thousands of Russians were enslaved during the campaign.[15]

Figure 2 displays the geographical distribution of slave raids with state borders from the late 15th

[14] The distribution of captives per raid is consequently left-skewed, as shown in Figure A1 of Online Appendix A. This asymmetry would likely be even more pronounced if we were able to incorporate raids with missing captive numbers.

[15] Sigismund von Herberstein, a Carniolan diplomat who traveled extensively in Russia, placed the figure at more than 800,000 slaves, but this is generally viewed as a significant exaggeration (von Herberstein 1852, 65).

century.[16] Raids spanned the full extent of Eastern Europe, ranging longitudinally from the Black Sea to the Vyatka River basin (roughly 4,000km) and latitudinally from the Baltic Sea to the Caspian Sea (roughly 3,000km). Even so, they were heavily concentrated in two areas: the stretch of western Ukraine and southeastern Poland ruled by the Crown of Poland and the Grand Duchy of Lithuania until 1569 and by the Polish-Lithuanian Commonwealth thereafter (71% of all raids); and southern Russia, which was ruled by Muscovy, later known as the Tsardom of Russia (20%).[17] Not by coincidence, these areas are directly intersected by the four major trails followed by raiding expeditions (indicated by thick lines).[18] In terms of contemporary borders (see Figure A2 in Online Appendix A), 60% of raids took place in Ukraine, 20% in Russia, 12% in Poland, 3% in Romania, 3% in Belarus, 1% in Hungary, and less than 0.5% in the remaining eight countries listed above.

From Slave-Raiding to State-Building

While few societies throughout history have been spared the ravages of slave-raiding, responses to external demand for enslaved labor have varied widely. In West Africa, slaves were commonly used but rarely exported before the 17th century, with demand coming primarily from domestic producers of gold, copper, salt, and other mined resources (Inikori 2011). European conquest of the New World radically altered this pattern, creating massive demand for cheap manpower to fuel plantation and mining economies across the Americas. The resulting spike in the price of slaves and decline in the value of precious metals significantly raised "the returns to slave raiding for export, relative to other economic activities" (Sharman 2023, 498). Responding to these incentives, many West African states began to specialize in slave-raiding, taking advantage of — and often becoming dependent upon —

[16] Borders are from *Ocherki Istorii SSSR* (Kopanev 1957), a historical encyclopedia whose contents we digitized and georeferenced. For a more expansive map of sovereign territories in Eurasia, see Figure A3 in Online Appendix A.

[17] The remaining 9% of raids were spread across nine states, including Hungary-Bohemia, Wallachia, and the Ottoman Empire. The five most raided locations were Kamianets-Podilskyi (108 raids), Vinnytsia (95), Volodymyr (87), Zhytomyr (84), and Lviv (65).

[18] We reconstruct the trails using shapefiles provided by Polczynski and Polczynski (2018), adding missing trails (the Woloski Trail) and branches (of the Murawa and Czarny Trails) from a variety of historical maps and descriptive accounts (Novoselskiy 1948; Horn 1962; Rzepa 1963; Zaporiz'kyi Natsional'nyi Universytet 2006).

European weapons and gunpowder technology (Nunn 2008, 142-143).[19]

For several centuries following the fall of Rome, parts of Europe experienced similar pressures, as "a slave trade from the less developed north, west, and east sent a stream of slaves drawn from various European peoples to the more prosperous areas of the south and the Mediterranean" (Eltis and Engerman 2011, 19). In Latin Europe, slave-raiding ended in the 10th and 11th centuries with the emergence of proto-states capable of controlling their borders and regulating trade (Fynn-Paul 2018, 573). In Northern and Eastern Europe, where political centralization proceeded more slowly, slavery flourished until the late medieval period. Poland's *Piast* dynasty captured and sold slaves of East Slavic origin up to the 14th century (Hellie 1982, 696), when it unified governance and legal structures and began exporting agricultural commodities such as wheat, millet, and rye to Western Europe. Further east, slave-raiding was "drastically curtailed with the consolidation of the Muscovite state at the end of the fifteenth century" (Hellie 1982, 22), which started supplying Western Europe with timber, furs, salt, flax, and hemp. The gradual emergence of no-slaving zones in these states was thus intimately related to the expansion and centralization of political authority (Witzenrath 2022, 41-42).

By the time Ottoman demand for slaves expanded, much of Eastern Europe was governed by relatively large and consolidated states whose economic prospects were increasingly tied to trade in labor- and land-intensive commodities with Western Europe. Rather than adapting to and participating in the slave trade, such powers sought to thwart Tatar incursions and stem population losses — a difference with critical implications for how they allocated material, administrative, and military resources.[20] As Witzenrath (2022, 4) observes, "Periodic destructions and the constant drain of manpower made the capacity to stem the flow [of slaves] the inescapable rationale for any power which sought to establish itself in Eastern Europe." To ensure their internal security and territorial integrity, raided states embarked upon an ambitious program of defensive state-building involving the construction of permanent fortifications, the mobilization of armed forces, and the consolidation of bureau-

[19] This trend was compounded by the absence of a meaningful agricultural surplus for export, a consequence of poor tropical soil quality as well as technological limitations, most notably the delayed adoption of the wheel and the plough (Goody 1971).

[20] On the importance of political centralization for resisting external threats, see Hariri (2012).

cratic and fiscal capacity. This strategy, we argue, entailed far-reaching developmental consequences.

Beginning in the early 16th century, Muscovite Russia erected a string of garrison towns connected by abatises (*zaseka*) along its southern perimeter, which supported reconnaissance patrols, signaling, and other defensive maneuvers by the frontier field army. The Bereg Line was built along a vulnerable 250km stretch of the Oka River between Kolomna and Kaluga, followed soon by the 1,000km Abatis (Tula) Line, the 800km Belgorod Line, and the 530km Izium Line (see Figure A12, Online Appendix A). The Military Chancellery enlisted thousands of soldiers and cossack mercenaries to man the new garrisons; bolstered their ranks with "foreign formations" trained with Western European tactics and weaponry; and, in the mid-17th century, introduced a centralized system of Military-Administrative Regions to coordinate these forces (Davies 2007, 93).[21] To feed the burgeoning army and facilitate communication with Moscow, an extensive network of granaries (managed by a national Grain Chancery), roads, and coach stations was constructed over the subsequent decades. Owing to these efforts, Russia's southern frontier became ever more difficult — and eventually impossible — to permeate, facilitating further settlement and, during the 18th century, territorial expansion all the way to the Black Sea (Crimea was annexed in 1783) (Witzenrath 2016).[22]

Investments in defensive infrastructure required the development of new fiscal instruments. In the late 15th century, Muscovy instituted the *pomest'e* system, under which the nobility and gentry were granted land — typically in exchange for military service — from which they directly collected rents. An array of raid-related taxes followed in the 16th and 17th centuries, including construction duties, fortification officials' fees, and levies specifically for financing dragoons, infantrymen, musketeers, watchmen, and captive ransoms (Khodarkovsky 2002, 22). These were supplemented by an in-kind grain tax supporting a centrally directed food supply system that sustained border armies during campaigns, delivered emergency supplies to garrison towns, and paid cossack salaries. During the 16th century alone, financial obligations to the Russian state increased sixfold, adjusting for inflation (Zlot-

[21]This was not the only administrative innovation pioneered in the south. The powerful office of military governor (*voevoda*), for instance, was inaugurated in border towns and fortresses in the late 16th century.

[22]In an interesting contrast, Russia also expanded into resource-rich Siberia in the 16th century, yet here needed little defensive investment to suppress the indigenous population. Consequently, as Kollman (2017, 65) notes, "Russia's administrative authority [in Siberia] was skeletal."

nik 1979, 253-254). In 1679, Russia's increasingly complex fiscal apparatus was consolidated through the introduction of a simplified direct tax. The next year, a national exchequer (*Bolshaia Kazna*) was established, laying the foundations for the first state budget (Stevens 1995, 84).

Poland-Lithuania likewise invested heavily in arming and fortifying its southeastern periphery. A mercenary army (*obrona potoczna*) was deployed to the area as early as 1479. Three decades later, Sigismund I centralized military and administrative authority by issuing an ordinance for the state's "common defense" by a front guard tasked with monitoring the border and a larger infantry unit charged with halting incursions (Adamczyk 2004, 38-39). In 1563, the legislature, or *Sejm*, mobilized a standing "quarter army" (*wojsko kwarciane*) with a sizable cavalry component to lead the defensive effort. This force was augmented by peasant infantry, county militias, private armies, the crown's royal guard, and cossack formations. After the Khmelnytsky Uprising in the mid-17th century, when cossacks revolted against Poland-Lithuania in alliance with the Crimean Khanate, the quarter army was merged with provincial supplementary forces to form a permanent mercenary army (*wojsko komputowe*).[23] The *Sejm* took several steps to consolidate this growing defensive machinery, including requiring private castles (1590) and cities (1620) to maintain garrisons and expanding the authority of state hetmans (military commanders) over the former. As major landowners sometimes resisted these centralizing dictates, efforts to create a system of interlinked state forts across the border zone never came to fruition (Adamczyk 2004, 45).[24] Nonetheless, this region grew so densely fortified that it came to be known as a "bastion" against Islamic invaders.

As in Muscovy, defensive investments went hand-in-hand with an expansion in Poland-Lithuania's fiscal capacity. The mercenary army was initially funded by loans secured against royal properties, boosting the monarchy's efforts to regain control of crown land (Frost 2015, 364-365). The quarter army derived its name from the *kwarta* tax — a 20% levy on income from crown lands instituted by

[23]This was one of a series of cossack rebellions triggered by the Polish nobility's growing control over land and the peasantry between the 16th and 18th centuries (Kumke 1993). Nor were cossacks reliable allies for the Ottoman Empire, regularly raiding the Crimean Khanate and other vassal states (as noted earlier).

[24]Despite such opposition, military, administrative, and fiscal consolidation helped to integrate Poland-Lithuania's diverse population into a coherent political and social structure in ways that are often overlooked by global historical overviews (Friedrich and Pendzich 2009; Frost 2015).

the *Sejm* in 1563 — that sustained it. This tax, which remained in place for 225 years, led to the establishment of a public treasury for financing regular army units in Rawa Mazowiecka in 1569.[25] In addition, the *Sejm* routinely approved one-off levies for defensive purposes. Poland's first poll tax, introduced in 1498 and levied on all citizens (including the clergy and nobility), was a direct response to slave raids (Guzowski and Sowina 2023, 362). Sigismund I imposed extraordinary taxes to pay for the mercenary army no less than 30 times during his reign (1505-1548) (Filipczak-Kocur 1999, 452). Another notable example came after a vicious wave of raids unleashed by Poland-Lithuania's defeat by a Tatar-Ottoman army in the 1620 Battle of Cecora, when the *Sejm* approved a tax hike large enough to raise a 60,000-strong standing army (Adamczyk 2004, 24). Together with mandatory labor, tax revenues also supported the construction of urban and rural fortifications. The proceeds of local commercial taxes, for instance, were allocated to the restoration or maintenance of defensive walls in Lviv in 1494, in Kazimierz in 1504, and in Szydłowiec in 1519 (Mikuła 2020).

Pathways to Economic Development

We posit that, while primarily motivated by security considerations, investments in defensive state-building stimulated long-run development in raided areas through three mutually reinforcing processes: (1) the reallocation of human and financial resources from less vulnerable regions; (2) the proliferation and expansion of urban settlements; and (3) the emergence of a more secure and predictable environment for economic activity.

First, the inward flow of labor and capital to construct defense lines, fortresses, and city walls boosted local demand for goods and services. In Poland-Lithuania's southeastern provinces, an average of 12,000 people per year joined military camps during the first half of the 16th century (Łopatecki and Bołdyrew 2024, 17). This influx prompted an expansion of "urban infrastructure — primarily merchants, transport companies, and artisans' workshops to provide supplies and luxury goods to the soldiers," bringing about a "redistribution of wealth from taxes collected throughout the coun-

[25] In 1633, another quarter of the royal domain was allocated to military expenditures, amounting to a 40% tax rate.

try" (Łopatecki and Bołdyrew 2024, 31-33). Muscovy's defensive effort involved even larger population transfers. Some 50,000 infantrymen worked on the Izium Line alone, for instance, and almost 200,000 combatants were mobilized in campaigns against the Crimean Khanate later in the 17th century (Davies 2007, 171-179). Gentry from western and northern Russia and cossacks from the Pontic-Caspian steppe were lured south with the promise of landed estates and grain, while large numbers of peasants and servitors were forcibly moved (Kollman 2017). Even serfs were encouraged to join garrisons, whose commanders were instructed to retain — not return — enrolling fugitives (Stevens 1995, 26). As a result of these measures, military and economic migration to raided areas more than compensated for losses caused by slave raids.

Second, defensive state-building encouraged the formation and growth of urban communities, expanding markets for agricultural products, facilitating specialization, and creating hubs for trade and investment. In Muscovy, 79 garrison towns were founded in Belgorod and Sevsk — the provinces most exposed to raids — by the late 17th century. In Red Ruthenia, a heavily raided region of south-eastern Poland, the number of urban settlements doubled between 1500 and 1650 (Bogucka and Samsonowicz 1986, 17). While these settlements were established for defensive purposes, many of them soon acquired commercial significance.[26] For instance, the fortress of Voronezh, constructed in 1585 to monitor the Oka-Don plain for incursions, became the largest city and trading post in southern Russia during the 17th century. It was not only new settlements that prospered. Tula, founded in 1381 and subsequently integrated into the Abatis Line, became a renowned center of metalworking and arms production for the Russian army, by the late 18th century boasting a population of 25,000 and also producing samovars, hats, gloves, silk, rope, and tiles (Kollman 2017, 383). A striking case is Kyiv, which was sacked by slave raiders so frequently and thoroughly in the 15th and 16th centuries that it remained "practically empty" for decades (Subtelny 2009, 83). An intensive fortification effort led by Poland-Lithuania and (from the mid-17th century) Muscovy[27] dramatically reversed the city's

[26] Not all of them continued to grow after their defensive functions ended, however. Some of the garrison towns were leveled during the second half of the 18th century.

[27] Famously, Muscovy's early fortification works were spearheaded by Patrick Gordon, a military engineer of Scottish descent who ascended the ranks of the Russian army to become commander of the Kyiv garrison (Gordon 2014 [1859]).

fortunes over the next 300 years, boosting its population from less than 10,000 to almost a quarter of a million as it morphed into an "administrative, military, commercial, and cultural center" (Subtelny 2009, 185).[28]

Finally, improvements in defensive capacity strengthened the state's monopoly on violence, enhancing security — and hence the returns to economic activity — in vulnerable areas. In addition to raids, southern borderlands were plagued by recurrent robberies, extortion, and assaults — frequently by cossacks — hampering commerce, finance, and institution-building (Osipian 2020). The state's growing presence in these territories, combined with the recruitment of cossacks into military service, gradually curbed lawlessness and marginalized banditry and freebooting (Kumke 1993). In Muscovy, garrisoned troops not only protected settlements from raids but also actively monitored Don Cossacks to suppress illicit activity (Davies 2007, 198–199). In Poland-Lithuania, the crown army and Registered Cossacks were tasked with preventing raids by independent cossacks as well as Tatars (Osipian 2020). While cossacks continued to periodically challenge state authority, the reduced incidence and threat of violence in raided territories created a safer and more stable climate for trade and investment.

The preceding discussion suggests that the developmental consequences of slave-raiding in early modern Eastern Europe may be better understood by analogy with interstate warfare in contemporary Western Europe than with reference to the transatlantic slave trade. Wars inflicted immediate economic damage on Western European states, reducing populations, fueling epidemics, and destroying capital stock. Over a longer time span, however, they set in motion a sustained process of state-building — Tilly's (1990) famous "war made the state" thesis — that is widely viewed as instrumental in the region's subsequent economic ascent.[29] Faced with cutthroat military competition, bellicist theories contend, rulers centralized coercive structures, consolidated fiscal systems, and professionalized bureaucratic institutions. Enhanced state capacity, in turn, accelerated economic growth by expanding

[28] It is also worth noting that urbanization generated positive economic spillovers for nearby rural areas. In Poland-Lithuania, Biłous (2016, 207) observes that new towns increased "the economic potential of estates" and deepened "economic, social, and religious ties" between urban and rural populations.

[29] War was by no means the only driving force behind state-building. Grzymała-Busse (2023), for instance, highlights the role of the medieval Catholic Church in providing templates for governing institutions and laws across Europe.

the provision of public goods critical to the effective functioning of markets, such as the rule of law, security, and basic infrastructure (Johnson and Koyama 2017; Besley and Persson 2010). Before wars built states, moreover, they built cities. Dincecco and Onorato (2017) highlight how the vulnerability of rural populations to conflict drove migration to increasingly fortified urban settlements from the medieval period onward, which fueled development by strengthening self-governance and property rights protection and encouraging technological innovation, human capital accumulation, and economic agglomeration.

At the same time, it is important to recognize the limits of the "war made the state and city" analogy. First, early modern Eastern Europe was dominated by a small number of sizable polities whose existence was not threatened by slave-raiding. Tatars sought to neither conquer nor occupy territory, lacking the numbers and firepower necessary to succeed in conventional battle (Gliwa 2016). Bellicist theories suggest that "raiding wars" are unlikely to deliver a strong stimulus to state-building, though evidence for this implication has largely been confined to Sub-Saharan Africa (e.g., Dincecco, Fenske, and Onorato 2019). Second, population mobility and urban autonomy were comparatively limited in Eastern Europe. The institutionalization of serfdom — eradicated in Western Europe following the Black Death — bound peasants to hereditary plots of land, and most cities were legally private entities owned by noblemen, the church, or the monarch, to whose needs they were subordinated (Bogucka 1996, 325; Kollman 2017, 238).[30] Rather than fostering urban self-governance, slave raids strengthened the state's incentives to dominate and extract tax revenues from cities, ends to which the deployment of military forces served as a key means. As a result of these differences, the stimulus to state-building, urbanization, and long-run development delivered by slave-raiding in Eastern Europe exhibited a more localized and "top-down" character than that provided by interstate warfare in Western Europe.

[30] For instance, Muscovy restricted the mobility of urban residents in 1591 — and further in 1649 — to facilitate taxation.

Slave Raids and Urban Population Growth

We begin our empirical investigation by examining the relationship between exposure to slave raids and urban population growth in Eastern Europe. We focus on this outcome for three reasons. First, as cities have historically depended on high levels of agricultural productivity and economic specialization, their size is widely considered a key indicator of development in the early modern period (De Long and Shleifer 1993). Second, it is the only such indicator on which data are available for the whole of Eastern Europe before, during, and after the Black Sea slave trade. Third, it provides a direct test of our claim that defensive state-building encouraged the expansion of urban communities in raided areas.

Data and Empirical Strategy

Our analysis combines the compendium of slave raids introduced earlier with the European Urban Population, 700-2000 database compiled by Buringh (2021). The latter source, which updates and expands Bairoch, Batou, and Pierre's (1988) seminal population tables using recent archaeological and demographic research, records the number of inhabitants (in thousands) in 550 urban settlements across 23 Eastern European countries — 23% of which were raided at least once — at one-century intervals from 700 to 1500 and at half-century intervals from 1500 to 2000.[31] Bairoch, Batou, and Pierre include all settlements with 5,000 or more inhabitants at some point between 800 and 1800; Buringh adds those with at least 1,000 inhabitants in 700, at least 100,000 inhabitants in 2000, and capital city status in 2000.[32] While its relatively infrequent reporting intervals inhibit our ability to detect short-run population losses caused by raids, the database paints a reasonably comprehensive and precise picture of European urban demographic trends over the long run.

Figure 3 plots the average population of raided settlements and non-raided settlements between

[31] We follow the United Nations Regional Group demarcation of Eastern Europe. Around one-fifth of raided locations feature in the sample.

[32] Settlements do not drop out of the dataset if their population falls to 0.

1100 and 1900 (leaving at least a century before and after the slave trade). Over the three centuries preceding the slave trade, population evolved similarly in the two types of settlements, whose means are indistinguishable in a two-sample t-test. Once the slave trade begins, however, raided settlements exhibit consistently faster population growth than non-raided settlements, with the difference in means becoming statistically significant at the 10% level in 1650 and at the 5% level in 1750. By 1900, the mean population of raided settlements (57,242) was almost twice as large as that of non-raided settlements (31,670). Descriptive trends thus furnish initial plausibility for our expectations.

To analyze the impact of exposure to raids on settlement population, we adopt a difference-in-differences strategy that compares the average change in the population of raided and non-raided settlements after the onset of raids. Our baseline specification can be expressed as:

$$\log(P_{st}) = \alpha + \beta R_{st} + \gamma_s + \delta_t + \varepsilon_{st} \quad (1)$$

where P_{st}, the outcome variable, is the population of settlement s (in thousands) in period t;[33] R_{st}, the treatment variable, is an indicator for whether s has been raided as of t; and γ_s and δ_t denote settlement and period fixed effects, respectively.[34] We cluster heteroskedasticity-robust standard errors at the settlement level. To examine how the treatment effect evolves over time, we additionally estimate a "dynamic" version of Equation 1 that interacts R_{st} with δ_t, including leads of R_{st} during the pretreatment phase (one lead for every period before 1500) as a placebo test (Sun and Abraham 2021).[35]

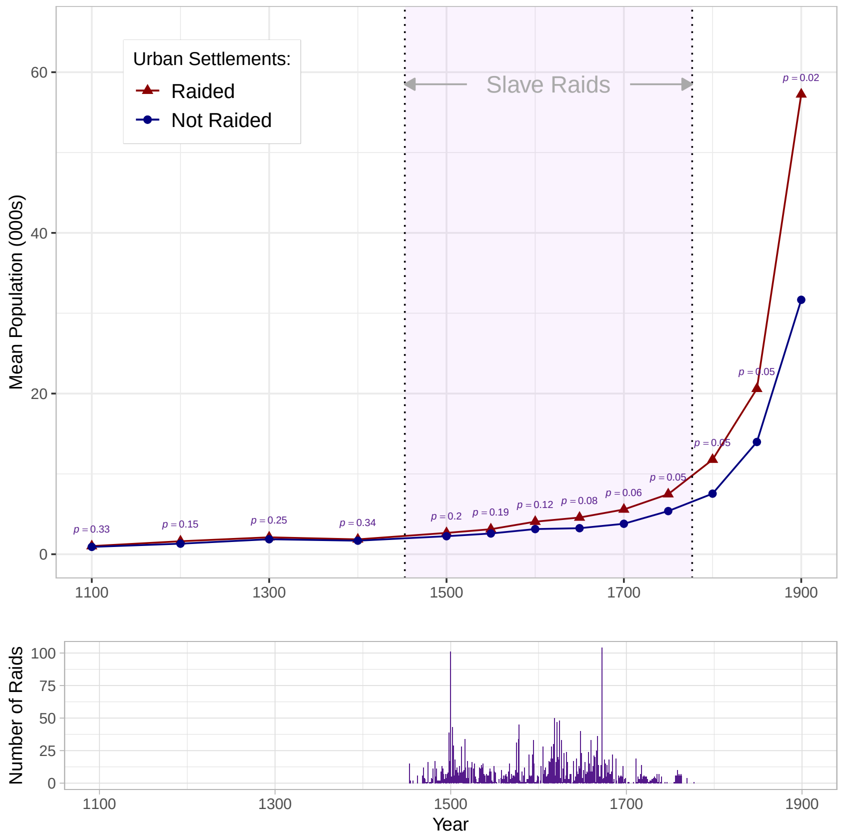
Provided that the population of raided and non-raided settlements would have followed the same trajectory in the absence of the slave trade, β in Equation 1 identifies the average effect of raid exposure on settlement population during the sample period. While Figure 3 is consistent with this pattern, a visual comparison of outcome means for treated and untreated units does not shed direct light on the

[33] We employ a logarithmic scale both due to skewness in the data and because we are primarily interested in proportional (rather than absolute) differences in population growth between raided and non-raided settlements (McConnell 2024).

[34] Summary statistics for all variables in the analysis are presented in Table A2, Online Appendix C.

[35] We omit the first period (i.e., 1100) to avoid perfect multicollinearity.

FIGURE 3. Mean Population of Raided and Non-Raided Settlements in Eastern Europe, 1100-1900



Notes: Mean population (in thousands) of raided and non-raided urban settlements in Eastern Europe between 1100 and 1900; *p*-values are from a two-sample *t*-test of the difference in means between the two sets of settlements. The lower panel displays the total number of raids per year.

parallel trends assumption because it fails to account for potentially confounding variables.[36] Building on a growing methodological literature (Roth et al. 2023), we instead assess the plausibility of this assumption through an event study specification that analyzes the treatment effect's evolution before and after initial exposure to raids:

$$\log(P_{st}) = \alpha + \sum_{j=-8}^{8} \beta_j D_{s,t-j} + \gamma_s + \delta_t + \varepsilon_{st} \qquad (2)$$

where $D_{s,t-j}$ is an indicator for period j relative to the first raid on settlement s as of period t (meaning

[36] Moreover, in contrast to Equation 1, Figure 3 employs a non-logarithmic population scale.

that this raid occurred j periods before t).[37] Following common practice, we specify the period before the first raid as the reference for estimating treatment effects (by setting β_{-1} to 0). To avoid inferential problems arising from treatment effect heterogeneity, we supplement this specification with three alternative event study estimators that exclude potentially problematic comparisons between already-treated units: Sun and Abraham's (2021) interaction-weighted estimator, which compares treated units with never-treated or last-to-be-treated units; Liu, Wang, and Xu's (2024) imputation-based estimator, which imputes counterfactual outcomes for treated units; and Callaway and Sant'Anna's (2021) doubly-robust estimator, which specifies never-treated or not-yet-treated units as the comparison group. In all models, robust standard errors remain clustered by settlement.

Results

Column 1 of Table 1 reports the estimated treatment effect from the baseline difference-in-differences specification (β in Equation 1). Consistent with a raid-induced boost in urban population, the coefficient on the treatment indicator is positive and statistically significant at the 1% level. Exponentiating this coefficient indicates that, on average, exposure to raids is associated with a 20.2% increase in population between 1500 and 1900.

Estimates from the dynamic difference-in-differences specification are displayed in the left panel of Figure 4 (with 95% confidence intervals). After remaining small and nonsignificant throughout the pretreatment phase, the coefficient on treatment indicator rises sharply during the first 150 years of the slave trade, attaining significance at the 5% level from 1600 onward. It then remains stable for the rest of the slave trade, before surging once more in the 19th century.[38] Exposure to raids is associated with growth in urban population of 5% ($p = 0.54$) by 1500, 14% by 1700 ($p = 0.02$), and 44% ($p = 0.00$) by 1900.

The right panel of Figure 4 presents the event study estimates, as computed by the two-way fixed

[37] As the maximum number of periods between the first raid and 1900 is eight, we vary j between -8 and 8.

[38] The slight dip in 1650 may be related to Russia's Time of Troubles, an era of political and social crisis in the early 17th century characterized by civil war, widespread famine, and foreign invasions.

TABLE 1. SLAVE RAIDS AND URBAN POPULATION GROWTH: DIFFERENCE-IN-DIFFERENCES ESTIMATES

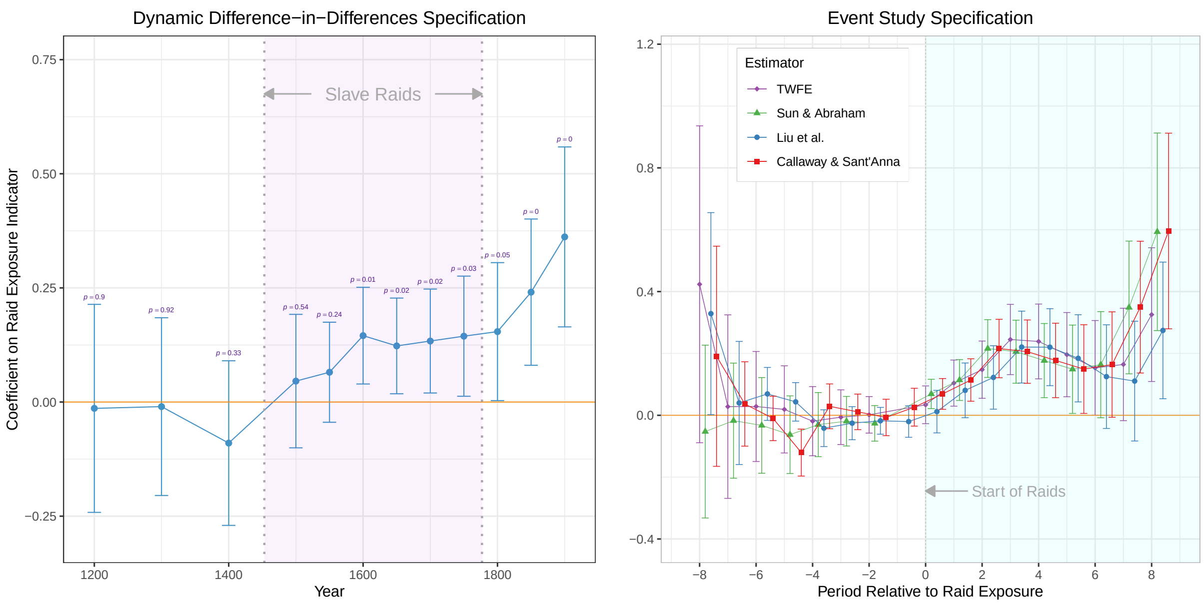
	Outcome: Log Settlement Population (Mean = 1.243)					
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure to Raids	0.184***	0.133***	0.165***	0.179***	0.170***	0.214***
	(0.056)	(0.048)	(0.064)	(0.062)	(0.056)	(0.063)
	[0.080]	[0.071]	[0.058]	[0.080]	[0.078]	[0.091]
N	7,149	5,500	7,149	7,149	7,149	7,149
R^2	0.794	0.792	0.820	0.812	0.797	0.825
Sample Timeframe	1100-1900	1100-1777	1100-1900	1100-1900	1100-1900	1100-1900
Settlement FEs	✓	✓	✓	✓	✓	✓
Period FEs	✓	✓	✓	✓	✓	✓
Period × Longitude FEs	✗	✗	✓	✗	✗	✗
Period × Latitude FEs	✗	✗	✗	✓	✗	✗
Period × Soil Fertility FEs	✗	✗	✗	✗	✓	✗
Period × State FEs	✗	✗	✗	✗	✗	✓

Notes: Difference-in-differences estimates of the impact of exposure to slave raids on the logged population (in thousands) of 550 Eastern European urban settlements over 13 periods between 1100 and 1900. Robust standard errors, clustered by settlement, in parentheses; Conley standard errors (cutoff = 500km) in brackets. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

effects (Equation 2), Sun and Abraham, Liu, Wang, and Xu, and Callaway and Sant'Anna estimators. With every approach, there is clear support for the parallel trends assumption: the coefficient on the treatment time indicator ($D_{s,t-j}$) is statistically indistinguishable from 0 in every period before the onset of raids. During the treatment phase, it evolves in a similar manner to the left panel's difference-in-differences term, growing briskly in the first three periods, leveling off over the next three periods, and then increasing again. According to the two-way fixed effects estimates, settlement population rises by 3% in the (50- or 100-year) period in which raids first occur, 16% in the third period, 27% in the fifth period, and 38% in the eighth period.[39]

[39] Figure A5 documents comparable results with Imai, Kim, and Wang's (2023) matching estimator, which pairs treated and untreated units with alike treatment and outcome histories. We exclude these results from the right panel of Figure 4 because the estimator only permits a few pre- and post-treatment periods.

FIGURE 4. Urban Population Analysis: Evolution of Treatment Effect Over Time



Notes: Dynamic difference-in-differences (left panel) and event study (right panel) estimates of the impact of exposure to slave raids on the logged population (in thousands) of 550 Eastern European urban settlements over 13 periods between 1100 and 1900. All models include settlement and period fixed effects. Bars represent 95% confidence intervals based on robust standard errors clustered by settlement.

Robustness

The baseline results are robust to several alternative specifications, estimates from which are reported in either Table 1 or Online Appendix C. First, we experiment with different timeframes for the analysis. The coefficient on raid exposure remains positive and highly significant when we restrict the treatment phase to the slave trade (column 2, Table 1). The same is true when we vary the sample's start date between 900 and 1300 (at 100-year intervals) and its end date between 1650 and 1950 (at 50-year intervals) (Table A3).

Second, one might worry that there are time-varying, location-specific factors that affect both raid exposure and urban population growth. One plausible candidate is regular military conflict, which occurred throughout the slave trade (though rarely coincided with raids). Table A4 shows that controlling for the cumulative number of conflicts during the slave trade within various radii of a settlement — measured by the Historical Conflict Event Dataset (Miller and Bakar 2023) — makes little difference to the results. Another possibility is that, due to their geographical position and high level of soil fertility, settlements nearer the Black Sea were more likely to benefit from trade and productive agriculture once Russia annexed them and heavy plows were adopted in the 18th century (Moon 2013).[40] As documented in columns 3-6 of Table 1, however, the findings remain intact when we interact the period fixed effects with a settlement's (1) longitude, (2) latitude, (3) soil fertility,[41] and (4) state in 1400.[42] They also survive restricting the sample to settlements within the 1400 borders of Russia, Poland, and Lithuania, which exclude most of the highly fertile Black Earth region (Table A5).

Third, to address the possibility that unobserved heterogeneity is correlated across proximate settlements, we re-estimate the models in Table 1 with Conley standard errors, setting a distance cutoff of 500km (see bracketed estimates). Fourth, we cluster standard errors by state in 1490 instead of by settlement (Table A5). Fifth, rather than the conquest of Constantinople, we treat the dissolution of the Ulus of Jochi in 1502 as the starting point of the early modern Black Sea slave trade (Table A5).

Finally, the results could reflect raid-induced migration from small towns and villages that are not covered by the European Urban Population database to the more populous settlements that do feature. While this possibility cannot be ruled out, one would not expect people fleeing raids to move disproportionately to *other* raided settlements — unless such settlements were in the process of fortifying themselves, in which case this pattern could be considered evidence for our hypothesized defensive state-building mechanism. Moreover, within the European Urban Population sample, there is no evidence that larger raided settlements enjoyed faster population growth than smaller ones during the slave trade. As shown in Table A6, when we interact the treatment indicator with the logarithm of a settlement's population in 1400, the coefficient on the resulting term is small, negative, and non-significant. Nor, Table A7 indicates, were larger settlements more likely to be raided in the first place:

[40] Since we observe a positive treatment effect well *before* the 18th century, however, this could only provide a partial explanation for our findings. Note also that, as shown in Figure A8 of Online Appendix E, there is little overlap between raiding trails and historical road or river networks in the Black Sea region.

[41] Following Dower et al.'s (2018) methodology, we use geocoded data from the Food and Agriculture Organization to measure the proportion of six highly fertile soil types (chernozem, greyzem, histosol, kastanozem, phaeozem, and vertisol) within a 5km radius of a settlement.

[42] State borders in 1400 are from the Euratlas Historical Political Boundaries of Europe database (Nüssli 2016); a few inaccuracies in the southern Black Sea region and northeastern Russia are corrected. We round longitude, latitude, and soil fertility to the nearest integer to ensure sufficient statistical power.

controlling for period fixed effects, population in 1400 is a weak predictor of exposure to raids.

Extensions

Analyzing Raid Intensity As well as discrete exposure to slave raids, we might wonder how differences in raid intensity impacts a settlement's population. To explore this question, we convert Equation 1 to a continuous difference-in-differences specification by replacing R_{st} with the logarithm of cumulative (1) raids on and (2) captives taken from settlement s in period t.[43] The results, presented in columns 1 and 2 of Table 2, indicate that settlement population rises with both continuous treatments. For every 1% increment in cumulative raids and captives, population grows by 0.1% and 0.03%, respectively.

A related question is whether the treatment effect *varies* with raid intensity. In column 3 of Table 2, we convert R_{st} into a series of indicators for whether settlement s has been raided once, 2-5 times, 6-10 times, and more than 10 times as of period t. The treatment effect only falls short of significance for settlements raided once. No clear pattern emerges at higher levels of raid intensity: the coefficients on the indicators for 2-5 raids, 6-10 raids, and more than 10 raids are essentially identical, implying an average population boost of approximately 25%.

Grid Cell Analysis An alternative strategy for addressing concerns about using urban settlements as the unit of observation is to reformat the European Urban Population data within a two-dimensional grid of square polygon cells, which are fixed in time and space and hence exogenous to features of interest. We overlay Eastern Europe with the PRIO-GRID (Tollefsen, Strand, and Buhaug 2012), a vector grid network with a resolution of $0.5° \times 0.5°$ (roughly 50km$\times$50km at the equator), creating a grid-cell-period-level dataset containing 3,905 cells and 74,195 observations. We then adapt Equation 1 to the grid cell level, regressing the logarithm of grid cell g's total urban population in period t (P_{gt}) on an

[43] Difference-in-differences estimators with continuous treatment variables are an active area of research, and there is no clear consensus about the optimal implementation strategy. In Figure A6, we show that the difference between observed and imputed counterfactual values of the outcome variable for treated units — as estimated with Liu, Wang, and Xu's (2024) fixed effects counterfactual estimator — is positively related to our continuous treatments, providing evidence for the "strong parallel trends" assumption highlighted by Callaway, Goodman-Bacon, and Sant'Anna (2024).

TABLE 2. Urban Population Analysis: Variation in Raid Intensity

	Outcome: Log Settlement Population (Mean = 1.243)		
	(1)	(2)	(3)
Log Cumulative Raids	0.104***		
	(0.033)		
	[0.031]		
Log Cumulative Captives		0.028***	
		(0.008)	
		[0.010]	
Raided Once			0.106
			(0.112)
			[0.112]
Raided 2-5 Times			0.223***
			(0.073)
			[0.073]
Raided 6-10 Times			0.224*
			(0.123)
			[0.123]
Raided > 10 Times			0.220***
			(0.060)
			[0.060]
N	7,149	7,149	7,149
R^2	0.794	0.794	0.794
Settlement FEs	✓	✓	✓
Period FEs	✓	✓	✓

Notes: Difference-in-differences estimates of the impact of logged cumulative slave raids (column 1), logged cumulative captives (column 2), and exposure to varying numbers of raids (column 3) on the logged population (in thousands) of 550 Eastern European urban settlements observed over 13 periods between 1100 and 1900. Robust standard errors, clustered by settlement, in parentheses; Conley standard errors (cutoff = 500km) in brackets. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

indicator for whether g has been raided as of t (R_{gt}) plus grid cell (ω_g) and period (δ_t) fixed effects.[44] The results, shown in Table A8, are consistent with the settlement-level findings, indicating that raid exposure was accompanied by a 59.9% rise in a grid cell's urban population.

The gridded data format allows us to explore two additional issues of interest. The first is whether, as our argument suggests, slave-raiding led to the establishment of new towns and cities. To address this question, we replace P_{gt} with the number of urban settlements in g as of period t with (1) any inhabitants, (2) at least 5,000 inhabitants, and (3) at least 10,000 inhabitants. The treatment effect is positive and significant for all three outcomes (Table A8). Second, did the demographic impact of

[44] Robust standard errors are clustered by grid cell.

raids "spill over" to nearby settlements, whether due to migration, trade, or economic agglomeration? When we add the lagged mean of R_{gt} across all grid cells within 0.5°, 1°, and 2° of g's latitude and longitude as regressors, the coefficients on these terms are large, positive, and significant at the 1% level, providing strong evidence of spillover effects (Table A9).

Alternative Data Sources Finally, the findings are robust to the use of two alternative sources of time-series data on urban population, one covering the whole of Europe (Table A10) and the other focusing on East-Central Europe (Table A11). The first is the Database of City Populations from around the World over Time (Biguzzi 2020), which has a comparable geographical and temporal scope to the European Urban Population database but includes 119 fewer settlements in Eastern Europe and lacks detailed documentation on sourcing and methodology (or an associated peer-reviewed article). The second is Miller's (2008) dataset on the population of 95 cities in the Lands of the Bohemian Crown, the Poland-Lithuanian Commonwealth, and the Kingdom of Hungary, which is measured at four points between 1500 and 1650.[45]

Long-Run Development in Imperial Russia and Austria

The second stage of our empirical investigation considers a wider set of development outcomes available for districts of the Russian and Austrian Empires — which encompass the majority of raided locations — in the mid-19th century. While interpretation of this examination is complicated by the temporal gap between the onset of slave raids and the measurement of these indicators — during which major political and economic changes occurred — it allows for a more comprehensive evaluation of the Black Sea slave trade's developmental legacies.

[45] Since this dataset begins after the onset of the slave trade, we employ the continuous versions of our treatment.

Identification Strategy

In the absence of time-series data on our district-level development outcomes, a major inferential challenge is the possibility that the location of slave raids could be endogenous to omitted determinants of development — or to development itself. It should be noted, however, that neither our urban population analysis nor historical accounts suggest that prosperous locations were a more attractive target for raids; on the contrary, raiders were known to favor poor rural areas with weak defenses (Gliwa 2021, 197).

To address potential endogeneity in the geographical distribution of raids, we pursue an instrumental variables strategy that leverages natural topographical features affecting districts' accessibility from the Crimean peninsula. Our approach is motivated by the observation that the four major trails used to conduct raids closely follow the boundaries between watershed zones — areas of highest elevation around lakes and river segments — enabling raiders to avoid deep ravines, marshland, steep slopes, and river crossings as well as discovery by enemy watchmen. A district's proximity to watershed boundary lines should thus predict its accessibility to raiders with comparable precision to its distance from raiding trails. Since watershed zones solely reflect characteristics of the steppe terrain, however, they are more plausibly exogenous to long-run development and its correlates. We thus instrument a district's exposure to raids with its minimum distance to Perekop or Akkerman — the typical starting points for raiding expeditions from the northern Black Sea coast — along a watershed boundary.[46]

A key threat to the exclusion restriction is the potential for our instrument to impact development directly, for instance, because watershed boundaries overlap with historical trade routes connecting to the Black Sea coast or because proximity to Crimea correlates with soil fertility and favorable climatic conditions (Moon 2013). There is no historical evidence to suggest that watershed boundaries served as conduits for trade; nor does this possibility seem likely, given that goods were usually transported via rivers, proximity to which we control for in our instrumental variables specification.[47] We also account

[46] We discuss the logic behind the instrument in more detail in Online Appendix D.

[47] As noted earlier, moreover, raiding trails do not closely track rivers or historical roads in the Black Sea region (see Figure A8, Online Appendix E).

for terrain ruggedness, soil fertility, temperature, and other climatic and topographical characteristics influencing agricultural potential. Our identifying assumption is that, conditional on these natural features, a district's proximity to Perekop and Akkerman via the watershed boundary network only affects its long-run development through its exposure to raids.

As an alternative approach, we follow Blaydes and Paik (2021) and Matranga and Natkhov (2022) by instrumenting raid exposure with distance to the geographically most efficient routes — or "least-cost paths" — between the starting points (Akkerman and Perekop) and destinations (Lviv and Moscow) of each raiding trail. As detailed in Online Appendix E, we construct nine such paths using an algorithm that minimizes cumulative resistance to the flow of water from one endpoint to the other, which generally increases with terrain gradient and decreases with elevation.[48] The advantage of this strategy is that least-cost paths provide a slightly closer approximation to raiding trails — which are less convoluted than watershed boundaries — increasing the instrument's predictive power.

We implement these approaches using a two-stage least squares (2SLS) estimator. The first stage models a district's aggregate exposure to raids as a function of the instrument plus a battery of controls:

$$\log(R_d) = \varphi_0 + \varphi_1 L_d + \varphi_{\mathbf{X}} \mathbf{X}'_d + \varepsilon_d \tag{3}$$

where R_d is the cumulative number of raids on district d over the course of the slave trade; L_d is d's minimum kilometer distance either to Crimea via watershed boundaries (main instrument) or to one of our nine least-cost paths (alternative instrument); and $\mathbf{X}'_d$ is a vector of district-level controls described below. In the second stage, we regress a given development outcome on predicted values of R_d and the same set of controls:

$$Y_d = \alpha + \beta \widehat{\log(R_d)} + \psi_{\mathbf{X}} \mathbf{X}'_d + \gamma_s + \varepsilon_{sd}. \tag{4}$$

If the exclusion restriction holds, β captures the average change in Y_d resulting from a 1% increase in

[48] To prevent bias from endogeneity in the location of destination points, we exclude districts containing these locations from the analysis.

cumulative raids on a district due to the topographical characteristics captured by the instrument.

Analysis of Imperial Russian Districts

We first apply our instrumental variables strategy to districts (*uezdy*) of Imperial Russia, which are mapped in Figure 5.[49] Drawing on data collected from imperial statistical volumes and administrative records by Dower et al. (2018), we construct three sets of outcome variables: (1) population, logged urban (1863) and per km^2 (1897); (2) the number of markets (1867), logged and per km^2; and (3) the number of factories (1867), logged and per km^2. In both estimation stages, we control for several variables critical to the plausibility of the exclusion restriction: mean terrain ruggedness, computed with raster data from Shaver, Carter, and Shawa (2019); average annual precipitation and temperature seasonality, from the WorldClim 2 dataset (Fick and Hijmans 2017); straight-line distance to the nearest river and coastline; soil fertility, as operationalized in the urban population analysis; the logarithm of urban population in 1400 (a proxy for pre-slave trade development), calculated using the European Urban Population data; the number of military conflicts during the slave trade, measured with the Historical Conflict Event Dataset; the logarithm of land area (in km^2); and distance to Moscow. Since some districts previously lay outside Muscovite territory, we specify state fixed effects with 1490 borders.[50]

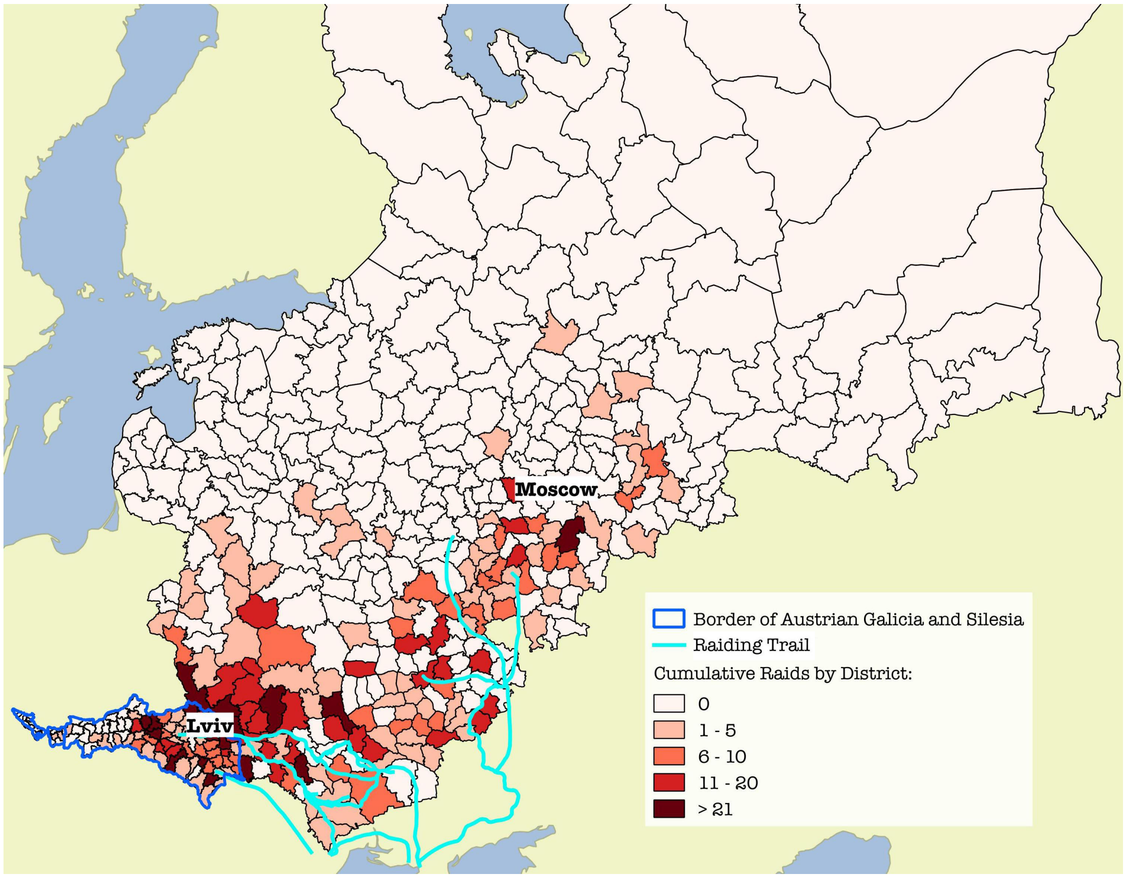
Panel A in Table 3 reports second-stage 2SLS estimates and first-stage F-statistics (bottom row). As indicated by the latter, a district's minimum distance to Perekop and Akkerman along a watershed boundary is a strong predictor of its exposure to raids. In the second stage, the coefficient on cumulative raids is positive for all six development outcomes and statistically significant for five. A 1% rise in aggregate raids is associated with 0.5% more urban inhabitants, 0.4% more markets, and 0.2% more factories. This translates into an additional 22 inhabitants, 0.01 markets, and 0.1 factories per 100km^2.

In Online Appendix E, we confirm that estimating Equation 4 using observed rather than pre-

[49] We exclude districts that were either under Ottoman control during the Black Sea slave trade or outside a sovereign state at its onset.

[50] Table A13 in Online Appendix E presents summary statistics for the dataset.

FIGURE 5. Distribution of Slave Raids in Imperial Russia and Austrian Galicia and Silesia



Notes: Cumulative slave raids on locations within mid-19th century districts of (1) the Russian Empire, excluding Tatar khanates and territories under Ottoman control during the Black Sea slave trade, and (2) Austrian Galicia and Silesia.

dicted values of cumulative raids — that is, substituting OLS for 2SLS — does not materially alter the results (panel A, Table A16). In addition, we demonstrate robustness to our alternative instrument, distance to nine least-cost paths from Akkerman and Perekop to Moscow and Lviv.

Analysis of Austrian Galicia and Silesia

Another part of Eastern Europe for which rich local development data from the mid-19th century have recently become available is the southern strip of the Polish-Lithuanian Commonwealth annexed by the Austrian Empire in the 18th century. This relatively small and homogeneous area comprised the

TABLE 3. Slave Raids and Development Outcomes in Imperial Russia and Austria: Instrumental Variables Estimates

Panel A: Russian Empire, 1863-1897						
Outcome:	Population		Markets		Factories	
	Log Urban	Per km^2	Log Total	Per km^2	Log Total	Per km^2
	(1)	(2)	(3)	(4)	(5)	(6)
Log Cumulative Raids	0.501***	22.704***	0.420*	0.001*	0.217	0.010**
(Instrumented)	(0.188)	(6.286)	(0.254)	(0.001)	(0.285)	(0.004)
	[0.264]	[11.907]	[0.420]	[0.002]	[0.420]	[0.007]
N	356	370	360	360	361	361
R^2	0.305	0.311	0.050	0.290	0.248	0.072
Mean Outcome Variable	8.751	43.204	2.125	0.003	2.361	0.006
First-Stage F-Statistic	27.856	32.373	27.348	27.348	27.639	27.639
District-Level Controls	✓	✓	✓	✓	✓	✓
State FEs	✓	✓	✓	✓	✓	✓
Panel B: Austrian Galicia and Silesia, 1836-1869						
Outcome:	Population		Houses		Farm Structures	
	Log Total	Per km^2	Log Total	Per km^2	Log Total	Per km^2
	(7)	(8)	(9)	(10)	(11)	(12)
Log Cumulative Raids	0.362***	681.099***	0.253**	20.074***	0.037	15.582***
(Instrumented)	(0.132)	(231.313)	(0.100)	(6.493)	(0.072)	(5.409)
	[0.115]	[166.521]	[0.098]	[6.646]	[0.057]	[3.986]
N	99	99	99	99	99	99
R^2	0.555	0.195	0.790	0.203	0.896	0.331
Mean Outcome	10.813	191.673	8.930	15.293	9.277	20.018
First-Stage F-Statistic	15.961	15.961	15.961	15.961	15.961	15.961
District-Level Controls	✓	✓	✓	✓	✓	✓

Notes: 2SLS estimates of the impact of slave raids, instrumented by to minimum distance to Perekop and Akkerman along a watershed boundary line, on district-level development outcomes in mid-19th century Russia (panel A) and Austrian Galicia and Silesia (panel B). All models control for urban population in 1400, land area, distance to the nearest river and coastline, soil fertility, terrain ruggedness, and cumulative military conflicts in 1453-1777; in Panel A, temperature seasonality, precipitation, and distance to Moscow are also included. Robust standard errors in parentheses; Conley standard errors (cutoff = 500km in panel A, 250km in panel B) in brackets. For full first- and second-stage results, see Tables A15-A17 in Online Appendix E. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Polish regions of Galicia and Silesia, whose 99 districts (*Kreise*) varied markedly in their exposure to slave raids (see Figure 5).

Using geocoded data gathered from censuses, historical maps, and satellite images by Kaim et al. (2021), we construct six outcome variables measuring the number and density of a district's inhabitants (1857-1869), houses (1840-1863), and farm structures (1840-1863). Following our earlier identification strategy, we regress these measures on the logarithm of cumulative slave raids on a district instrumented by its minimum distance to Akkerman or Perekop via a watershed boundary line. In both stages of the 2SLS specification, we include a similar set of controls to the Imperial Russia analysis.[51]

The results are presented in Panel B of Table 3. The first-stage F-statistics (bottom row) again confirm that the instrument strongly predicts raid exposure. The second-stage estimates reveal a consistently positive treatment effect that reaches statistical significance for five of the six development outcomes. A 1% increment in cumulative raids raises a district's population by 0.36%, its housing stock by 0.25%, and its number of farm structures by 0.04%; per 100km^2, this amounts to 681 more inhabitants, 20 more houses, and 16 more farm structures.

Once more, the results are robust both to using observed rather than predicted values of the treatment variable (panel B, Table A16) and to instrumenting cumulative raids with minimum distance to a least-cost path (panel B, Table A19).

The Defensive State-Building Mechanism

What explains the positive association between exposure to slave raids and long-run development in Eastern Europe? This section presents a selection of additional, more systematic evidence for our argument that raids stimulated economic growth by incentivizing states to strengthen defensive capacity in targeted areas — both by deploying military forces and by constructing permanent fortifications — and, to this end, consolidating fiscal and administrative capacity. Statistical results not reported in this section can be found in Online Appendix F.

Poland-Lithuania We begin by examining how military deployments and fiscal revenues responded to raiding activity in Poland-Lithuania. Drawing on data from the first half of the 16th century assembled by Łopatecki and Bołdyrew (2024), Table A20 shows that the number of military servicemen stationed in Red Ruthenia rose by around two-thirds, on average, in years after the region was subjected to raids. A similar pattern characterizes the size of tax collections by the Polish and Lithuanian treasuries between 1588 and 1647 — as recorded by Filipczak-Kocur (2006) — following raids on the

[51] Climatic variables are omitted due to the small size (and hence narrow latitudinal range) of Galicia and Silesia. For summary statistics, see Table A14 in Online Appendix E.

TABLE 4. Slave Raids, Fortification Construction, and Castle Ownership in Poland-Lithuania: Difference-in-Differences Estimates

Panel A: Fortification Construction, 1100-1800					
Outcome (per Grid Cell):	No. Major Castles (1)	No. Small Castles (2)	No. Fortified Towns (3)	No. Fortified Villages (4)	No. Fortified Churches (5)
Exposure to Raids	1.381***	0.508***	0.897***	0.049***	0.341***
	(0.151)	(0.102)	(0.101)	(0.015)	(0.064)
	[0.232]	[0.153]	[0.200]	[0.003]	[0.094]
N	9,180	9,180	9,180	9,180	9,180
R^2	0.564	0.442	0.514	0.381	0.503
Mean Outcome Variable	0.262	0.088	0.166	0.008	0.066
Panel B: Castle Ownership, 1300-1800					
Outcome (per Grid Cell):	No. Castles Controlled by Crown (6)	No. Castles Controlled by Crown/Reps. (7)	No. Non-Crown Castles (8)	Share Castles Controlled by Crown (9)	Share Castles Controlled by Crown/Reps. (10)
Exposure to Raids	0.047***	0.042**	0.030	0.050**	0.045**
	(0.018)	(0.019)	(0.034)	(0.022)	(0.022)
	[0.031]	[0.029]	[0.013]	[0.037]	[0.035]
N	5,896	5,896	5,896	5,896	5,896
R^2	0.709	0.740	0.769	0.472	0.535
Mean Outcome Variable	0.084	0.111	0.197	0.069	0.088
Log Cumulative Battles	✓	✓	✓	✓	✓
Grid Cell FEs	✓	✓	✓	✓	✓
Period FEs	✓	✓	✓	✓	✓

Notes: Difference-in-differences estimates of the impact of exposure to slave raids on the construction of fortifications (panel A) and various measures of castle ownership (panel B) in Poland-Lithuania at the grid cell (0.5×0.5)° level. The sample comprises southern provinces from 1100 to 1800 in panel A and central and western provinces from 1300 to 1800 in panel B. Robust standard errors, clustered by grid cell, in parentheses; Conley standard errors (distance cutoff = 500km) in brackets. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

state.[52]

Second, digitizing and geocoding data gathered by Adamczyk (2004), we analyze the impact of raid exposure on the construction of five types of permanent fortifications — major castles, minor castles, fortified towns, fortified villages, and fortified churches — in southern provinces Poland-Lithuania (mapped in Figure A11). As available construction dates are imprecise, we compute the density of each type of fortification per grid cell g at 50-year intervals between 1100 and 1800, focusing on the approximately rectangular (2,000km×1,500km) polygon studied by Adamczyk.[53] We regress these

[52] Both analyses control for the occurrence of military conflict and a linear time trend.

[53] Where possible, we supplement dates provided by Adamczyk with information from historical sources on raids in Poland-Lithuania (see Table A1, Online Appendix A).

measures on R_{gt} plus the logarithm of cumulative battles in g in t, grid cell fixed effects (ω_g), and period fixed effects (δ_t). As reported in panel A of Table 4, raid exposure is positively and significantly related to the density of all five fortification types. On average, raided grid cells saw the construction of 1.38 more major castles, 0.51 more small castles, 0.9 more fortified towns, 0.05 more fortified villages, and 0.34 more fortified churches over the sample period.[54]

Third, we adopt a similar strategy to investigate whether states were more successful in establishing a monopoly on violence in raided areas, drawing on records of castle ownership in central and western Poland-Lithuania from the CASTLES dataset Cappelen and Hariri (2022, 2024). For each grid cell in each half-century between 1300 and 1800, we measure the density and share of castles controlled by the crown and its representatives, which we regress on the same variables as in the previous analysis.[55] Panel B of Table 4 indicates that these outcomes exhibit a statistically significant rise in grid cells exposed to raids. Consistent with this finding, raid exposure has a positive but nonsignificant association with the density of castles controlled by non-crown actors, such as the nobility, the church, and external monarchs (column 8).[56]

Russia Next, we shift our focus to the Tsardom of Russia to study how slave-raiding impacted military and commercial activity in urban communities with the right to conduct commerce or industry (*posady*) (see Figure A13 for a map). Digitizing and geocoding census statistics recorded at four intervals between 1646 and 1722 by Vodarskii (1966), we measure five outcomes: the logarithm of military and state servicemen (*sluzhilye*) at (1) the household (*dvor*) level in 1650 and (2) the individual level in 1678-1679;[57] and the logarithm of tax-paying traders and artisans (*posadkie*) at the household level in (3) 1646 and (4) 1678-1679 and (5) 1722.[58] Extending the instrumental variables strategy employed in the

[54] As reported in Table A21, these estimates remain similar when we limit the analysis to different subsets of Adamczyk's map and to earlier periods of the slave trade.

[55] We begin this analysis in 1300 because the CASTLES dataset contains few observations in the area of interest before this date. Note that the dataset excludes parts of Poland-Lithuania that are currently outside the European Union.

[56] As with panel A, these results are robust to a variety of temporal and geographical modifications to the sample (see Table A22).

[57] The *dvor*, the basic unit of taxation in Muscovite Russia, was understood to encompass one property, including owners and servants.

[58] For summary statistics, see Table A23.

TABLE 5. Slave Raids, Defensive State Capacity, and Commercial Activity in Russian Urban Communities: Instrumental Variables Estimates

Outcome:	Log Military/State Officials		Log Traders and Artisans		
	Households (1650)	Individuals (1678-79)	Households (1646)	Households (1678-79)	Households (1722)
	(1)	(2)	(3)	(4)	(5)
Log Cumulative Raids by 1646	0.599*		-0.757**		
(Instrumented)	(0.354)		(0.370)		
	[0.315]		[0.364]		
Log Cumulative Raids by 1670		1.377***		-0.400	0.065
(Instrumented)		(0.322)		(0.252)	(0.238)
		[0.427]		[0.226]	[0.213]
N	108	110	133	157	175
R^2	0.372	0.272	0.098	0.116	0.285
First-Stage F-Statistic	39.129	58.803	37.632	66.332	64.772
Mean Outcome Variable	4.857	5.045	4.644	4.806	6.209
Community-Level Controls	✓	✓	✓	✓	✓
Within Muscovy (1490 Borders)	✓	✓	✓	✓	✓

Notes: 2SLS estimates of the impact of slave raids, instrumented by minimum distance to Perekop and Akkerman along a watershed boundary line, on the population of military servicemen, state officials, and traders and artisans in Russian urban communities (*posady*) between 1646 and 1722. All models control for minimum distance to a river and to a coastline, date of founding or first mention, soil fertility, distance to Moscow, and inclusion in Muscovy's 1490 borders. Robust standard errors in parentheses; Conley standard errors (distance cutoff = 500km) in brackets. For full results, see Table A24, Online Appendix F. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

previous section, we find that the cumulative number of raids on an urban community is positively associated with its population of military and state officials but negatively associated with its population of traders and artisans (see Table 5). Interestingly, however, the latter relationship is reversed by the early 18th century, with the coefficient on the instrumented raids treatment becoming positive but not significant.[59]

The urban communities data also allow us to probe our argument's implication that strengthening defensive capacity promoted development by fostering a more secure environment for economic activity. Table A26 reveals that, holding constant population size and the controls from Table 5, communities with larger contingents of military and state servicemen in the 17th century contained significantly more traders and artisans in 1722. In other words, exposure to raids appears to have bolstered military presence *before* fueling an expansion in commercial activity at the local level.

[59]The results are substantively unchanged by conducting the analysis with OLS rather than 2SLS (Table A25).

Additional Evidence on Earnings Finally, our argument suggests that investments in defensive capacity contributed to development by boosting demand for goods and services in raided localities. Partial evidence for this channel is provided by annual data on earnings by building craftsmen and laborers — an important part of the early modern workforce — in eight Central and Eastern European cities between 1393 and 1913 compiled by Allen (2001). According to difference-in-differences estimates presented in Table A27, exposure to raids is positively and significantly related to the mean daily real wage received by these workers as well as to their distance from the poverty line (based on the cost of a representative basket of goods).[60]

Conclusion

Despite its massive human toll and profound impact on the political and economic organization of a major geographical region over more than three centuries, the early modern Black Sea slave trade has received scant attention from social scientists. This is particularly surprising in light of its structural differences from the transatlantic slave trade, the main source of existing knowledge of how slave-raiding influences long-run development: raided states in Eastern Europe sought to neither integrate into nor gain advantage from the slave trade, suppressing slavery within their borders while pursuing alternative export opportunities that made intensive use of labor. We have argued that these differences fundamentally altered how Eastern European rulers and elites responded to raids, incentivizing them to curtail population losses and secure their borders through a strategy of defensive state-building that, over the long run, created favorable conditions for trade, investment, and settlement in affected areas.

We have sought to evaluate this hypothesis by assembling and examining the most comprehensive dataset on early modern slave raids in Eastern Europe. As well as painting a more precise geographical, temporal, and demographic picture of Eastern European slavery, our data revealed a strong positive association between exposure to raids and a host of long-run development outcomes. Using a

[60] In line with this finding, we observe a positive association between raid exposure and the price of a broad basket of consumer goods in six Polish cities between 1501 and 1776 (Table A28), data on which come from Malinowski (2016).

difference-in-differences design, we began by showing that raided urban settlements were characterized by faster population growth than non-raided settlements during and after the slave trade. Leveraging a spatial instrumental variables strategy, we then found that more intensely raided districts of the Russian and Austrian Empires performed better on several additional development indicators from the mid-19th century, including market, factory, building, and population density. Lastly, we probed the plausibility of our posited defensive state-building mechanism. In Poland-Lithuania, we provided evidence that raid exposure boosted military deployments, fiscal revenues, fortification construction, and the state's monopoly on violence, as proxied by its ownership of castles. In Russia, meanwhile, we observed a stronger military and administrative presence in raided urban communities in the 17th century, which, in turn, predicted higher levels of commercial activity in the early 18th century.

The implications of our findings extend beyond Eastern Europe — and indeed West Africa. Transnational systems of commercial slavery have, at some point in history, operated in almost every corner of the globe (Sharman and Zarakol 2024). The Eastern European case suggests that the developmental consequences of such systems are contingent upon the structure of slave markets, in particular the extent to which raiding-based supply chains are supported by and embedded in local economic and social institutions. Even setting aside the transatlantic and Black Sea slave trades, structures of slave production have varied widely across regions and over time. In the early modern era, for example, slaves were procured from the Mediterranean basin, North Africa, and Central Asia, which often resisted and pursued defensive strategies against raiding activity, as well as from East Africa and Southeast Asia, where many local economies were built upon and sustained by slavery (Eltis and Engerman 2011). We believe that a systematic investigation of slave production systems in these and other raided societies could yield important insights into the determinants of long-run differences in development, state capacity, and other significant political and economic outcomes.

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Online Appendices for:
Consequences of the Black Sea Slave Trade: Long-Run Development in Eastern Europe

May 7, 2025

Contents

A Slave Raids Dataset

A.1 Main Sources

TABLE A1. Main Data Sources for Slave Raids Dataset

Author	Title	Translation	Year	Source Type	Language	Coverage	Publication Information
Adamczyk, Jan L.	Fortyfikacje stałe na polskim przedmurzu od połowy XV do końca XVII wieku	Permanent Fortifications on the Polish Outskirts from the Mid-15th to the End of the 17th Century	2004	Secondary	Polish	C15-C17	Kielce: Wydawnictwo Politechniki Świętokrzyskiej
Alekberli, Mamedkesir A.	Борьба украинского народа против турецко-татарской агрессии во второй половине XVI - первой половине XVII веков	The Struggle of the Ukrainian People against the Turkish-Tatar Aggression in the Second Half of the 16th Century - First Half of the 17th Century	1961	Secondary	Russian	C16-C17	Saratov
Alekseev, Yuri G.	Освобождение Руси от ордынского ига.	The Liberation of Rus' from the Yoke of the Golden Horde	1989	Secondary	Russian	C15	Leningrad: Nauka
Alishev, Salyam H.	Болгаро-казанские и золотоордынские отношения в XIII–XVI вв	The Volga Bulgars' Relations with the Kazan Khanate and Golden Horde in the 13th-16th Centuries	2009	Secondary	Russian	C15-C16	Kazan: Tatarskoe Knijnoe Izdatelstvo
Alishev, Salyam H.	Казань и Москва: межгосударственные отношения в XV - XVI вв	Kazan and Moscow: Interstate Relations of the 15th–16th Centuries	1995	Secondary	Russian	C15-C16	Kazan: Tatarskoe knizhnoe Publ.
Andreev, Alexander	История Крыма: краткое описание прошлого Крымского полуострова	History of Crimea: A Brief Description of the Past of the Crimean Peninsula	1997	Secondary	Russian	C15-C18	Moscow: Interregional Center for Industrial Informatics of Gosatomnadzor of Russia
Antonovych, Volodymyr B.	История Галицкой Руси	History of Galician Russia	1879-1880	Secondary	Russian	C15-C18	Kyiv
Bagalei, Dmitry I.	Очерки из истории колонизации и быта степной окраины Московского государства	Essays on the History of Colonization and the Life on the Steppe Outskirts of Muscovy	1886	Secondary	Russian	C17	Moscow: Imperial Society of Russian History and Antiquities
Baiov, Alexey K.	Русская армия в царствование императрицы Анны Иоанновны. Война России с Турцией в 1736-1739гг.	The Russian Army in the Reign of Empress Anna Ioannovna: The War between Russia and Turkey, 1736-1739	1906	Secondary	Russian	C18	St. Petersburg
Baranowski, Bohdan	Chłop polski w walce z Tatarami	Polish Peasants in the Fight against the Tatars	1952	Secondary	Polish	C15-C16	Warsaw: Ludowa Spółdzielnia Wydawnicza
Baranowski, Bohdan	Polska a Tatarszczyzna w latach 1624–1629	Poland and the Tatar Region in the Years 1624–1629	1948	Secondary	Polish	C17	Łódź: Łódzkie Towarzystwo Naukowe
Bazak, Jacek	Wspomnienia Kasi Kolasy jako przyczynek do opisu najazdu tatarskiego podczas wojny polsko-tureckiej w 1672 roku	Memoires of Kasia Kolasa As A Contribution to the Description of the Tartar Invasion during the Polish-Turkish War in 1672	2005	Primary: memoir	Polish	C17	Rocznik Stowarzyszenia Miłośników Jarosławia [Yearbook of the Enthusiasts Association of Jarosław] 16: 35–47
Benningsen, Aleksander et al. (eds.)	Le Khanat de Crimée dans les Archives du Musée du Palais de Topkapı	The Crimean Khanate in the Archives of the Topkapı Palace Museum	1978	Primary: diplomatic documents	French (trans.)	C15-C18	Paris: Mouton
Berezhkov, Mikhail N.	Русские пленники и невольники в Крыму	Russian Captives and Slaves in the Crimea	1888	Secondary	Russian	C16	In: *Тр. VI Археол. съезда в Одессе*, 2: 342-372
Bespalov, Roman A.	Хан Улу-Мухаммед и государства Восточной Европы: от Белёва до Казани (1437-1445)	Khan Ulu-Muhammad and the States of Eastern Europe: From Belev to Kazan (1437–1445)	2012	Secondary	Russian	C15	*Золотоордынская цивилизация* 5: 53–70
Bielski, Marcin	Kronika polska Marcina Bielskiego	Marcin Bielski's Polish Chronicle	1597	Primary: chronicle	Polish	C15-C16	Kraków

Bielski, Marcin and Joachim Bielski	Dalszy ciąg Kroniki polskiej, zawierającéjdzieje od 1587 do 1598 r.	Continuation of the Polish Chronicle, Containing Stories from 1587 to 1598	1851	Primary: chronicle	Polish	C16	Warsaw
Bilous, Natalia	Kyiv naprykintsi XV – u pershiy polovyni XVII st. Mis'ka vlada I samovryaduvannya	Kyiv at the End of the 15th Century- First Half of the 17th Century: City Government and Self-Government	2008	Secondary	Ukrainian	C15-C18	Kyiv: Kyiv-Mohyla Academy Publishing House
Bobrov, Leonid A.	Тактическое искусство крымских татар и ногаев конца XV – середины XVII вв.	Tactical Art of the Crimean Tatars and Nogais of the Late 15th - Mid-17th Centuries	2016	Secondary	Russian	C15-C17	История военного дела: исследования и источники, Special Issue 5 (2): 210-388
Bobrovsky, Pavel O.	История 13-го Лейб-Гренадерского Эриванского Его Величества полка за 250 лет	History of His Majesty's 13 Life Grenadier Yerevan Regiment for 250 Years	1892-8	Secondary	Russian	C18	St. Petersburg
Borisov, Nikolay	Иван III	Ivan III	2006	Secondary	Russian	C15-C16	Moscow: Molodaya Gvardiya
Broniovius, Martinus	Tartariae Descriptio	Description of Tartary	1595	Primary: travelogue	Latin	C16	Cologne
Broniovius, Martinus	Opisanie Kryma	Description of Crimea	1867	Primary: travelogue	Latin	C16	*Zapiski Odesskogo obščestva istorii i drevnostej* 6: 333–367
Bylinski, Janusz	Naiazd Tatarski na Wołyń w 1593 roku na tle innuch najazdów wo XVI wieku	The Tatar Invasion of Volhynia in 1593 against the Background of Other Invasions in the 16th Century	2001	Secondary	Polish	C1593	In: *Aere Perennius: Profesorowi Gerardowi Labudzie dnia 28 XII 2001 roku w hołdzie*, eds. Marceli Kosman and Antoni Czubiński, Poznań, pp. 115-129
Çelebi, Evliya	Seyahatname	Travel Book	1896-1935	Primary: travelogue	Turkish	C17	Istanbul
Čerkas, Borys	Ukrajina v polityčnyx vidnosynax Velykoho knjazivstva Lytovs'koho z Kryms'kym xanatom (1515-1540)	Ukraine in the Political Relations of the Grand Duchy of Lithuania with the Crimean Khanate	2006	Secondary	Ukrainian	C16	Kyiv
Czapliński, Władysław	Sprawa najazdów tatarskich na Polskę w pierwszej połowie XVII w.	The Case of the Tatar Invasions of Poland in the First Half of the 17th century	1963	Secondary	Polish	C17	*Kwartalnik Historyczny* 70 (3): 713-720
Czołowski, Aleksander	Polska a Tatarszczyzną Stan badań i dezydyraty	Poland and the Tatar Region: The State of Research and Desiderata	1925	Secondary	Polish	C15-C18	In: *Memoirs of the 4th Congress of Polish Historians in Poznań*, December 6-8 , Vol. I, Lviv
Czołowski, Aleksander	Najazd Tatarów na Lwów w 1695 r.	Tatar Invasion of Lviv in 1695	1902	Secondary	Polish	C17	Lviv: Drukarnia Narodowa
Davies, Brian L.	Warfare, State and Society on the Black Sea Steppe 1500-1700		2007	Secondary	English	C16-C18	Abingdon: Routledge
de Hurmuzaki, Budoxiu	Documente privitore la istoria românilor	Documents Regarding the History of the Romanians	1891-1897	Primary: legal & diplomatic documents	Romanian	C15-C18	Bucharest
de Beauplan, Guillaume L.V.	Description d'Ukranie	Description of Ukraine	2002 [C17]	Primary: travelogue	French	C16	L'Harmattan
de Peyssonel, Charles	An Appendix to the Memoires of Baron de Tott		1786	Primary: memoir	English (trans.)	C18	London
de Tott, François	Memoirs of Baron de Tott, Including the State of the Turkish Empire and the Crimea, during the Late War with Russia		1786	Primary: memoir	English (trans.)	C18	London: G. G. J. and J. Robinson
Deák, Farkas	Okiratok a török-tatár rabok történetéhez	Documents on the History of Turkish-Tatar Prisoners	1886	Primary: military records	Hungarian	C17	*Történelmi Tár* 3 (9): 110-126
Długosz, Jan	Liber Beneficiorum Dioecesis Cracoviensis	Book of Benefice of the Diocese of Cracow	1863 [C15]	Primary: property register	Latin	C15	Cracow
Długosz, Jan	Historiae Polonicae Libri XII	Polish Histories in Twelve Books	1711-12	Primary: chronicle	Latin	C15	Leipzig: Sumptibus Ioannis Ludovici Gleditschii

Dziubiński, Andrzej	Stosunki dyplomatyczne polsko-tureckie w latach 1500–1572 w kontekście międzynarodowym	Polish-Turkish Diplomatic Relations in the Years 1500–1572 in the International Context	2005	Secondary	Polish	C16	Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego
Dziubiński, Andrzej	Handel niewolnikami polskimi i ruskimi w Turcji w XVI wieku i jego organizacja	Trade in Polish and Russian Slaves in Turkey in the 16th Century and its Organization	1963	Secondary	Polish	C16	*Zeszyty Historyczne Uniwersytetu Warszawskiego* 3: 36-49
Ernst, Nikolaus	Die Beziehungen Moskaus zu den Tataren der Krym unter Ivan III. und Vasilij III., 1474-1519	Moscow's Relations with the Tatars of Crimea under Ivan III and Vasily III, 1474-1519	1911	Secondary	German	C15-C16	PhD Dissertation, Friedrich-Wilhelms-Universität zu Berlin
Fisher, Alan W.	Muscovy and the Black Sea Slave Trade		1972	Secondary	English	C15-C17	Canadian-American Slavic Studies 6 (4): 575-594
Galenko, Oleksandr I.	Про татарські набіги на українські землі	About Tatar Raids on Ukrainian Lands	2003	Secondary	Ukranian	C15-C18	*Український історичний журнал* 6: 52-68
Gawęda, Marcin	Wojskowość tatarska w XVII wieku	Tatar Military in the 17th Century	2009	Secondary	Polish	C17	*Rocznik Przemyski* 45 (1): 121–44
Ghimpu, Vlad	Biserici şi mănăstiri medievale în Basarabia	Medieval Churches and Monasteries in Bessarabia	2000	Secondary	Romanian	C16	Chişinău: Editura Tyragetia
Gliwa, Andrzej	Kraina upartych niepogód: Zniszczenia woienne na obszarze ziemi przemyskiej w XVII wieku	The Land of Stubborn Weather: War Damage in the Area of Przemyśl in the 17th Century	2013	Secondary	Polish	C17	Przemyśl
Gliwa, Andrzej	How Captives Were Taken: The Making of Tatar Slaving Raids in the Early Modern Period		2022	Secondary	English	C15-C18	In: *Slavery in the Black Sea Region, c.900-1900: Forms of Unfreedom at the Intersection between Christianity and Islam*, ed. Felicia Roşu, Leiden: Brill
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Guagnini, Alexander	Sarmatiae Europeae descriptio	Description of European Sarmatia	1578	Primary: description	Latin	C16	Kraków
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Smirnov, Aleksej P.	Проблемы истории северного Причерноморья в античную эпоху	Problems of the History of the Northern Black Sea Region in Antiquity	1959	Secondary	Russian	C15-C18	Moscow: Izdatel’stvo Akademii Nauk SSSR

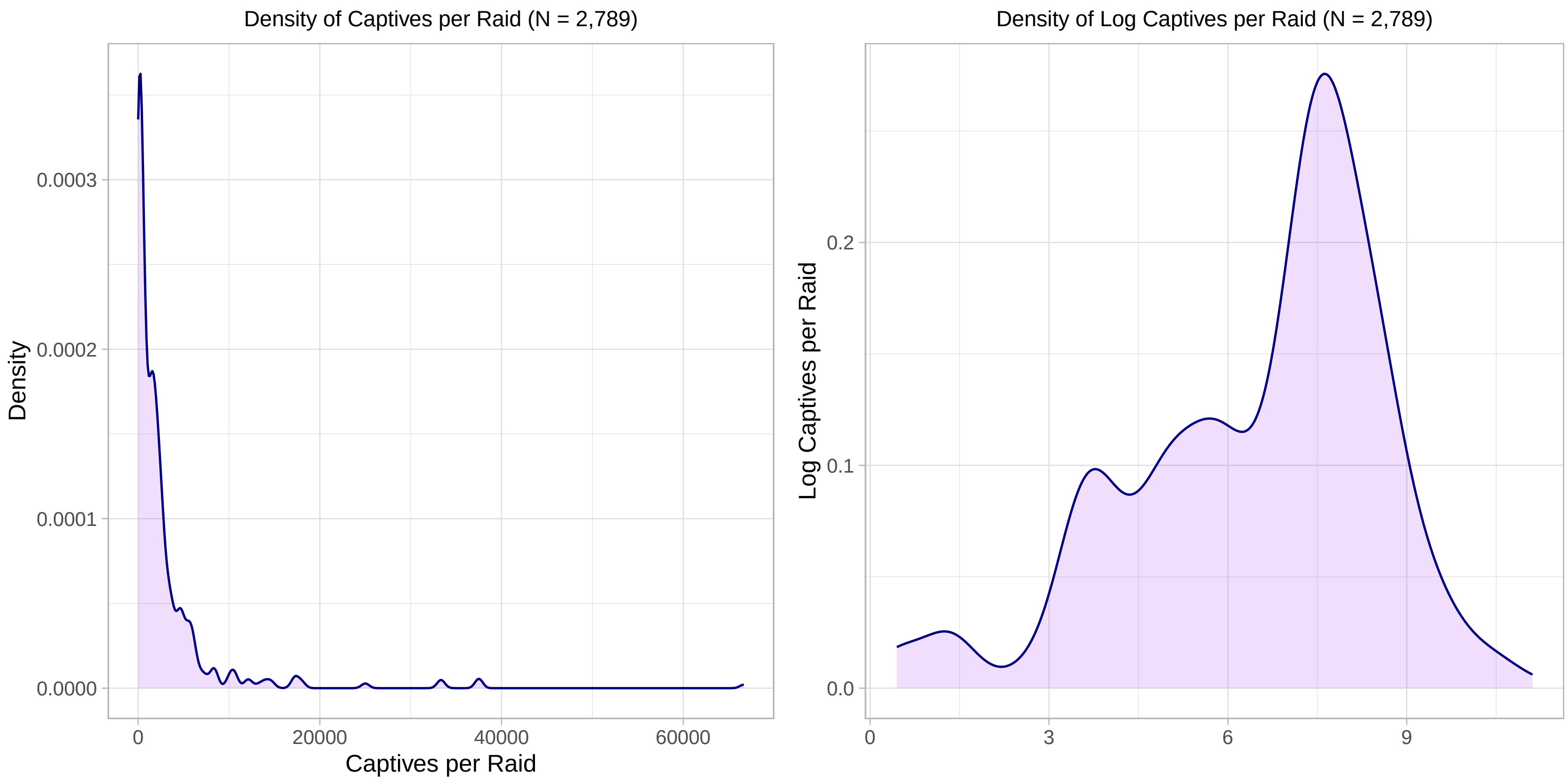
Smirnov, Vasily D.	Крымское ханство под верховенством Оттоманской Порты до начала XVIII века	Crimean Khanate under the Rule of the Ottoman Port until the Beginning of the 17th Century	1887	Secondary	Russian	C16-C17	St. Petersburg: University Printing House
Sofonovych, Feodosiï	Khronika z litopystsiv starodavnikh	Chronicle of Ancient Chroniclers	1992 [C17]	Primary: chronicle	Ukranian	C16-C17	Kiev: Naukova dumka
Spuler, Bertold	Die Goldene Horde: die Mongolen in Russland, 1203-1502	The Golden Horde: The Mongols in Russia, 1203-1502	1965	Secondary	German	C15-C16	Wiesbaden: Otto Harrassowitz
Stołecki, Kazimierz	Tatarskie najazdy - obrazy zapisane w starych ksiêgach	Tatar Invasions: Images Recorded in Old Books	2010	Secondary	Polish	C16	*Nestor: Czasopismo Artystyczne* 2 (12): 9-14
Storozhenko, Andrei V.	Стефан Баторий и днепровские козаки	Stefan Batory and the Dnieper Cossacks	1904	Secondary	Russian	C16	Kyiv: Printing house of G.L. Frontskevich
Stryjkowski, Maciej	Kronika polska, litewska, źmódzka i wszystkiej Rusi	Chronicle of Poland, Lithuania, Samogitia, and all of Ruthenia	1582	Primary: chronicle	Polish	C15-C16	Königsberg
Stryjkowski, Maciej	O początkach, wywodach, dzielnościach, sprawach rycerskich i domowych sławnego narodu litewskiego, żemojdzkiego i ruskiego	About the Beginnings, Arguments, Bravery, Knightly, and Domestic Matters of the Famous Lithuanian, Zemojdy, and Ruthenian Nation	1978 [C16]	Primary: chronicle	Polish	C15-C16	Warsaw
Sulimierski, Filip et al.	Słownik Geograficzny Królestwa Polskiego and innych dząeczy słowiańskich	Geographical Dictionary of the Kingdom of Poland and Other Slavic Nations	1880-1902	Secondary	Polish	C15-C18	Warsaw
Tafur, Pero	Andanças É Viajes De Pero Tafur Por Diversas Partes Del Mundo Avidos (1435-1439)	Adventures and Travels of Pero Tafur through Various Parts of the World (1435-1439)	1874 [C15]	Primary: travelogue	Ukranian	C15	Madrid
Tankov, Anatoliï A.	Историческая летопись Курского дворянства	Historical Chronicle of the Kursk Nobility	1913	Secondary	Russian	C17	Moscow
Tankov, Anatoly A.	Историческая летопись курского дворянства	Historical Chronicle of the Kursk Nobility	1913	Secondary	Russian	C16-C17	Moscow
Tepkeev, Vladimir T.	Взаимоотношения калмыцкого ханства и кубанской орды в 1712–1715 гг.	Relations between the Kalmyk Khanate and the Kuban Horde in 1712-1715	2018	Secondary	Russian	C18	*Magna Adsurgit: Historia Studiorum* 2: 15-34.
Timov, Ivan	Хронологія перших татарських і турецьких набігів на землі Руського воєводства у XV ст.	Chronology of the First Tatar and Turkish Raids on the Lands of the Russian Voivodeship in the 15th Century	2013	Secondary	Russian	C15	*Чорноморський літопис* 7: 60-71
Toropitsyn, Ilya V.	Набеги кубанских татар на Россию в 1715 г	The Raids of the Kuban Tatars on Russia in 1715	2008	Secondary	Russian	C18	*Kozats'ka Spadshchina* 4: 72-78
Unknown	Супрасльская летопись	Supraśl Chronicle	1980 [C16]	Primary: chronicle	Russian	C15-C16	Vol. 35, Complete Collection of Russian Chronicles, Moscow
Unknown	Слуцкая летопись	Slutsk Chronicle	1980 [C16]	Primary: chronicle	Russian	C15	Vol. 35, Complete Collection of Russian Chronicles, Moscow
Unknown	Московско-Академическая летопись	Moscow Academic Chronicle	1927 [C16]	Primary: chronicle	Russian	C15	Vol. 1, Complete Collection of Russian Chronicles, Moscow
Unknown	Acta kościola farnego ostrogskiego	Record of the Parish Church in Ostrogski	1934 [C17]	Primary: church records	Polish	C16	Rocznik wołyński, Równe
Unknown	Kronika Kościoła Famego Ostrogskiego	Chronicle of the Parish Church in Ostrogski	1621	Primary: chronicle	Polish	C15-C16	Provincial State Archives in Cracow, Sec. I, Sanguszko Archive
Unknown	Skarbiec diplomatów papieskich, cesarskich, królewskich, książęcych, uchwał narodowych, postanowień różnych władz i urzędów do wyjaśnienia dziejów Litwy, Rusi Litewskiej i ościennych krajów	Treasury of Papal, Imperial, Royal, and Ducal Diplomats, National Resolutions, Decisions of Various Authorities and Offices To Explain the History of Lithuania, Lithuanian Ruthenia, and Neighboring Countries	1862	Primary: diplomatic documents	Polish	C15-C16	Wilno
Unknown	Летопись Рачинского	Chronicle of Rachinsky	1980	Primary: chronicle	Russian	C15-C16	Vol. 35, Complete Collection of Russian Chronicles, Moscow

Unknown	Гу́стынская ле́топись	Gustyn Chronicle	2003 [C17]	Primary: chronicle	Russian	C16	Vol. 40, Complete Collection of Russian Chronicles, St. Petersburg
Unknown	Львовская летопись	Lviv Chronicle	1910-1914	Primary: chronicle	Russian	C15-C17	Vol. 20, Complete Collection of Russian Chronicles, St. Petersburg
Unknown	Острожский летописец	Ostroh Chronicle	2009	Primary: chronicle	Ukrainian	C16-C17	Kyiv
Unknown	Белору́сско-лито́вские ле́тописи	Western Russian Chronicles	1907	Primary: chronicle	Russian	C15-C16	Vol. 17, Complete Collection of Russian Chronicles, St. Petersburg
Unknown	Ольшевская летопись	Olshevo Chronicle	1980	Primary: chronicle	Russian	C15-C16	Vol. 35, Complete Collection of Russian Chronicles, Moscow
Unknown	Румянцевская летопись	Rumyantsev Chronicle	1980	Primary: chronicle	Russian	C15-C16	Vol. 35, Complete Collection of Russian Chronicles, Moscow
Unknown	Евреиновская летопись	Jewish Chronicle	1980	Primary: chronicle	Russian	C15-C16	Vol. 35, Complete Collection of Russian Chronicles, Moscow
Unknown	Никоновская летопись	Nikon Chronicle	1904-06	Primary: chronicle	Russian	C15-C16	Vol. 13, Complete Collection of Russian Chronicles, St. Petersburg
Unknown	Akty, otnosyashchiyesya k istorii Yuzhnoy i Zapadnoy Rossii	Acts Relating to the History of Southern and Western Russia	1863-1892	Primary: diplomatic, legal documents	Russian	C15-C16	St. Petersburg: Archaeographic Commission
Unknown	Lietuvos Metriką	Lithuanian Metrics	1846-1915	Primary: legal documents	Lithuanian, Latin, Polish	C15-C16	Vilnius
Unknown	Zherela do istoriyi Ukrayiny-Rusy	Sources for the History of Ukraine-Russia	1895-1924	Primary: chronicle	Ukranian	C16-C18	Lviv
Unknown	Черниговская летопись	Chernigov Chronicle	1856	Primary: chronicle	Ukranian	C16-C18	Kiev
Unknown	Mezhigorskaya letopis'	Mezhigorsk Chronicle	1888	Primary: chronicle	Ukrainian	C17	Kyiv
Unknown	Иоасафовская летопись	Joasaph Chronicle	1957 [C16]	Primary: chronicle	Russian	C15-C16	Moscow
Unknown	Симеоновская летопись	Simeon Chronicle	1913 [C15]	Primary: chronicle	Russian	C15	St. Petersburg
Unknown	Лицевой летописный свод	Illustrated Chronicle of Ivan the Terrible	2008 [C16]	Primary: chronicle	Russian	C15-C16	Moscow
Unknown	Вологодско-Пермская летопись	Vologda-Perm Chronicle	1959 [C16]	Primary: chronicle	Russian	C15-C16	Vol. 26, Complete Collection of Russian Chronicles, Moscow
Unknown	Воскресенская летопись	Resurrection Chronicle	1998 [C16]	Primary: chronicle	Russian	C15-C16	Vol. 7, Complete Collection of Russian Chronicles, Ryazan
Unknown	Новгородская и Псковская летописи	Novgorod and Pskov chronicles	1848 [C17]	Primary: chronicle	Russian	C15-C16	Vol. 4, Complete Collection of Russian Chronicles, St. Petersburg
Unknown	Хроника литовская и жмойтская	Lithuanian and Zemoit Chronicle	1975	Primary: chronicle	Russian	C15-C16	Vol. 32, Complete Collection of Russian Chronicles, Moscow
Unknown	Белорусско-литовские летописи	Belorussian-Lithuanian Chronicles	1980	Primary: chronicle	Russian	C15	Vol. 35, Complete Collection of Russian Chronicles, Moscow
Unknown	Славяно-молдавские летописи XV-XVI вв.	Slavic-Moldovan Chronicles of the 15th–16th centuries	1976	Primary: chronicle	Russian	C15-C16	Moscow: Nauka
Unknown	Густынская летопись	Gustyn Chronicle	2003	Primary: chronicle	Russian	C15-C16	Vol. 40, Complete Collection of Russian Chronicles, St. Petersburg

Unknown	Ермолинская летопись	Ermolin Chronicle	1910	Primary: chronicle	Russian	C15	Vol. 23, Complete Collection of Russian Chronicles, St. Petersburg
Unknown	Літописець Дворецьких	Dvoretsky Chronicle	1984	Primary: chronicle	Ukranian	C17	In *Летописи и хроники*, ed. Victor I. Buganov, pp. 219-234, Moscow: Nauka
Unknown	Софийская вторая летопись	Second Sofia Chronicle	1853	Primary: chronicle	Russian	C17-C18	Vol. 6, Complete Collection of Russian Chronicles, St. Petersburg
Unknown	Холмогорская летопись	Kholmogory Chronicle	1977	Primary: chronicle	Russian	C15-C16	Vol. 33, Complete Collection of Russian Chronicles, Leningrad
Unknown	Хроника Быховца	Bykhovets Chronicle	1975	Primary: chronicle	Russian	C15-C16	Vol. 17, Complete Collection of Russian Chronicles, St. Petersburg
Unknown	Летописец начала царства царя и великого князя Ивана Васильевича; Александро-Невская летопись; Лебедевская летопись	Chronicle of the Beginning of the Kingdom; Alexander Nevsky Chronicle; Lebedev Chronicle	1965	Primary: chronicle	Russian	C16	Vol. 29, Complete Collection of Russian Chronicles, Moscow
Unknown	Rákóczi eposz	Rákóczi Epic	1988	Primary: chronicle	Hungarian	C17	Budapest
Ureche, Grigore	Letopisețul Ţării Moldovei	Chronicle of the Land of Moldavia	1845-1852 [C17]	Primary: chronicle	Romanian	C15-C16	Iasi
Various	Архив Юго-Западной России	Archive of Southwestern Russia	1859-1914	Primary: legal documents	Ukrainian	C15-C18	Kyiv
Various	Акты Западной России	Acts of Western Russia	1846-1853	Primary: legal documents	Russian	C15-C17	St. Petersburg
Various	Acta Tomiciana	Tomician Acts	1852-1999	Primary: diplomatic, legal documents	Latin, Polish, German	C15-C16	Poznań
Various	Сборник летописей, относящихся к истории Южной и Западной Руси	Collection of Chronicles Relating to the History of Southern and Western Rus'	1888	Primary: chronicle	Ukranian	C15-C16	Kyiv
Various	Kniga posol'skaya Metriki Velikogo knyazhe-stva Litovskogo	The Ambassador's Book of Metrics of the Grand Duchy of Lithuania	1843	Primary: diplomatic documents	Russian	C15-C16	Moscow
Various	Archiwum książąt Lubartowiczów Sanguszków w Sławucie	Archives of the Lubartowicz Sanguszko Princes in Sławuta	1887	Primary: diplomatic documents	Polish	C15-C16	Lviv
Various	Źródła dziejowe	Historical Sources	1876-1915	Primary: accounts, property registers, inspection records	Polish	C16-C17	Warsaw
Various	Katalog dokumentów tureckich : dokumenty do dziejów Polski i krajów ościennych w latach 1455-1672	Catalog of Turkish Documents: Documents on the History of Poland and Neighboring Countries in the Years 1455-1672	1959	Primary: miscellaneous documents	Polish	C15-C17	Warsaw: National Scientific Publishing House
Various	Listy polskie XVI wieku, T. 1: Listy z lat 1525-1548	Polish Letters of the 16th Century, Vol. 1: Letters from the Years 1525-1548	1998	Primary: letters	Polish	C16	Kraków: Polskiej Akademii Umiejętności
Various	Сборник Императорского Русского Исторического Общества	Collection of the Imperial Russian Historical Society	1867-1916	Primary: diplomatic documents	Russian	C15-C18	St. Petersburg

Various	Źródła dziejowe	Historical Sources	1876-1915	Primary: legal & diplomatic documents	Polish	C16-C17	Warsaw
Vinogradov, Aleksandr V.	Russko-krymskie otnošenija: 50-e-vtoraja polovina 70-x godov XVI veka	Russian-Crimean Relations: 1650s-Second Half of the 1670s	2007	Secondary	Russian	C17	Moscow: Institute of Russian History
Volkov, Vladimir A.	Voyny i voyska Moskovskogo gosudarstva (konets XV — pervaya polovina XVII vv.)	Wars and Troops of the Muscovite State (End of the 15th - First Half of the 17th Centuries)	2004	Secondary	Russian	C15-C17	Moscow: Eksmo
Volodymyrsky-Budanov, Mikhail F.	Население Юго-Западной России от половины XV в. до Люблинской унии	The Population of Southwestern Russia from the Second Half of the 15th Century to the Union of Lublin	1891	Secondary	Russian	C15-C16	Kyiv
von Engel, Johann Christian	Geschichte der Ukraine und der ukrainischen Cosaken: wie auch der Königreiche Halitsch und Wladimir	History of Ukraine and the Ukrainian Cossacks As Well As the Kingdoms of Halych and Vladimir	1796	Secondary	German	C15-C18	Halle: Johann Jacob Gebauer
von Herberstein, Sigismund	Rerum Moscoviticarum Commentarii	Notes on Muscovite Affairs	1851-1852	Primary: travelogue	English (trans.)	C15-C16	London: Hakluite Society
Von Manstein, Christof H.	Contemporary Memoirs of Russia from the Year 1727 to 1744		1856	Primary: memoir	English (trans.)	C18	London: Longman, Brown, Green, and Longmans
Voronchuk, Iryna O.	Naselennya Volyni v XVI - pershiy polovyni XVII st.: rodyna, domohospodar - stvo, demohrafichni chynnyky	The Population of Volyn from the 16th Century to the First Half of the 19th Century: Family, Household, Demographic Factors	2012	Secondary	Ukranian	C15-C17	Kyiv
Wagner, Marek	W cieniu szukamy jasności chwały : studia z dziejów panowania Jana III Sobieskiego (1684-1696)	In the Shadow We Seek the Brightness of Glory: Studies of the History of the Reign of John III Sobieski (1684-1696)	2002	Secondary	Polish	C17	Siedlce: Wydawnictwo Akademii Podlaskiej
Walawender, Antoni	Kronika klęsk elementarnych w Polsce i w krajach sąsiednich w latach 1450-1586	A Chronicle of Elemental Disasters in Poland and Neighboring Countries in the Years 1450-1586	1932	Secondary	Polish	C15-C16	Lviv
Wapowski, Bernard	Kroniki Bernarda Wapowskiego z Radochoniec	Chronicles of Bernard Wapowski from Radochoniec	1874	Primary: chronicle	Polish	C15-C16	Kraków
Wapowski, Bernard	Dzieje Korony Polskiéj i Wielkiego Księstwa Litewskiego od roku 1380 do 1535	The History of the Polish Crown and the Grand Duchy of Lithuania from 1380 to 1535	1848	Secondary	Polish	C15-C16	Wilno: T. Glücksberg
Winiarz, Alojzy	Ziemia sanocka w latach 1463-1552	Sanok in the Years 1463-1552	1896	Secondary	Polish	C15-C16	*Kwartalnik Historyczny* 10 (2): 286-306
Witsen, Nicolaes	Noord en Oost Tartarye	North and East Tartary	1705	Primary: memoir	Dutch	C17	Amsterdam
Wójcik, Zbigniew	Mediacja tatarska między Polską a Turcją w roku 1672	Tatar Mediation between Poland and Turkey in 1672	1962	Secondary	Polish	C17	*Przegląd Historyczny* 53 (1): 32–50.
Yağcı, Zübeyde G.	Yüzyılda Kırım'da Köle Ticareti	Slave Trade in Crımea Durıng the 16th Century	2006	Secondary	Turkish	C16	*Karadeniz Araştırmaları* 8: 12-30
Yakobson, Anatoly L.	Средневековой Крым: Очерки истории и истории материальной культуры	Medieval Crimea: Essays on History and the History of Material Culture	1964	Secondary	Russian	C15-C18	Moscow-Leningrad
Zenchenko, Yury P.	Южное российское порубежье в конце XVI-начале XVII в	Southern Russian Border at the End of the 16th Century - Beginning of the 17th Century	2008	Secondary	Russian	C16-C17	Moscow: Pamyatniki istoricheskoy mysli
Zgorniak, Marian	Wojskowość polska w dobie wojen tureckich drugiej połowy XVII wieku	Polish Military in the Era of Turkish Wars, Second Half of the Seventeenth Century	1985	Secondary	Polish	C17	Wrocław: Zakład Narodowy im. Ossolińskich
Zimorovich, Bartolomey	Тройнói Львов	Leopolis Triplex	2002 [C16]	Primary: chronicle	Russian (trans.)	C15-C16	Lviv: Center for Europe
Zubrytsky, Denis	Критико-историческая повесть временных лет Червонной или Галицкой Руси	Critical-Historical Tale of the Bygone Years of Red or Galician Rus	1845	Secondary	Russian	C15	Moscow
Zubrytsky, Denis	Kronika miasta Lwowa	Chronicle of the City of Lviv	1844	Primary: chronicle	Polish	C15-C18	Lviv

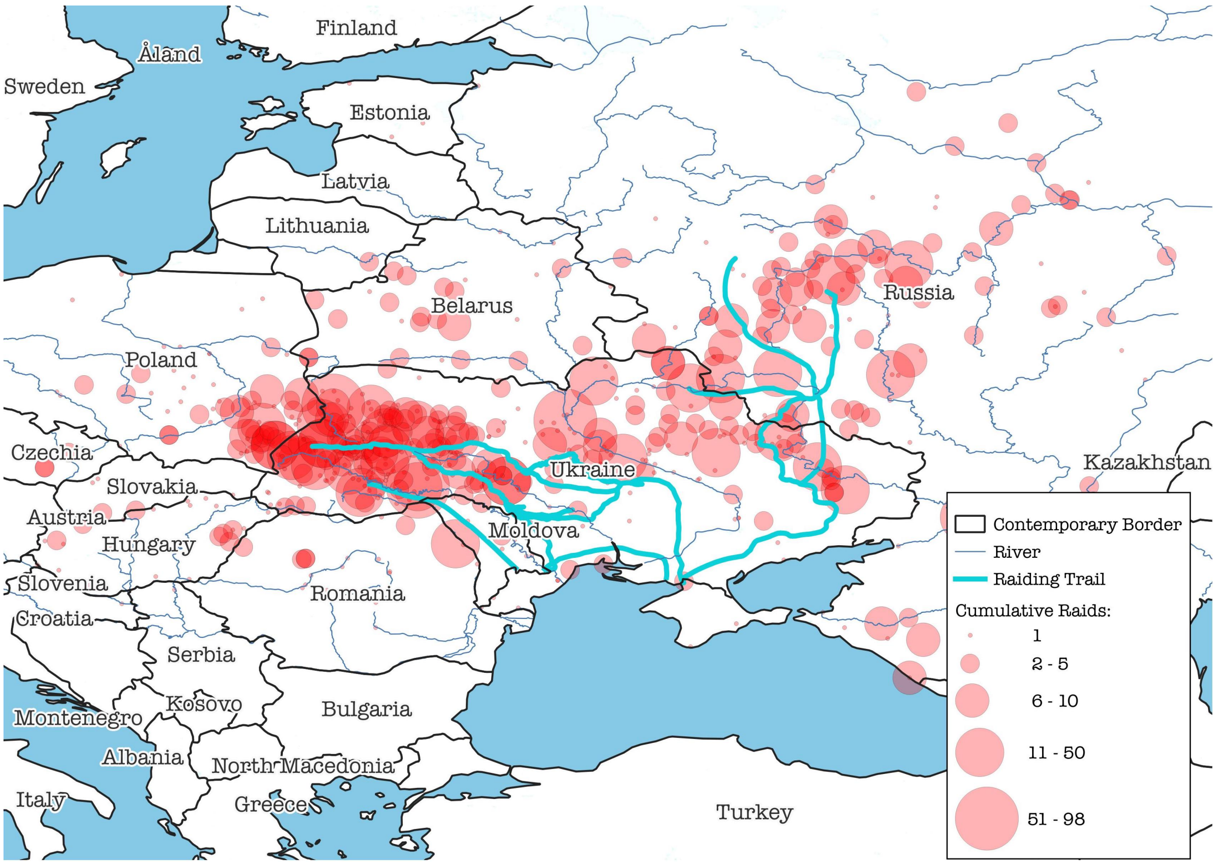
FIGURE A1. DISTRIBUTION OF CAPTIVES PER SLAVE RAID



Notes: This figure plots the density of captives — absolute (left panel) and logged (right panel) — per slave raid in early modern Eastern Europe. Between 1453 and 1777, 2,789 raids were carried out in 735 unique locations (mostly villages, towns, cities, and fortress areas) across the region.

A.2 Additional Maps

FIGURE A2. GEOGRAPHICAL DISTRIBUTION OF SLAVE RAIDS WITH MODERN STATE BORDERS



Notes: This map displays the location of slave raids in the Black Sea region between 1453 and 1777 with current state borders. The raids span 14 contemporary countries: Belarus, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Moldova, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, and Ukraine.

FIGURE A3. State Borders in Eastern Europe, 1490

Notes: This map displays state borders in Eastern Europe circa 1490 based on maps printed in *Ocherki Istorii SSSR: Konets XV-Nachalo XVII vv.* (Kopanev 1957), digitized and georeferenced by the authors. Major cities are also indicated. For the Kazan Khanate, Astrakhan Khanate, Nogai Horde, and Great Horde, borders were fluid and cannot be precisely delineated. Border between Lithuania and Crimean Khanate was contested.

B Estimating Total Captives

This appendix describes our imputation-based strategy for estimating the total number of people enslaved during the early modern Black Sea slave trade. We impute missing captives data for all observations in our raids dataset — 53% of which lack such information — using the machine learning-based method of multiple imputation with denoising autoencoders (MIDAS) (Lall and Robinson 2022, 2023).[1] MIDAS makes use of denoising autoencoders, a type of unsupervised neural network designed to reduce dimensionality by corrupting a random subset of observed values and attempting to reconstruct them via a series of nested nonlinear transformations. These networks are repurposed to treat missing values as an additional portion of corrupted data and to draw imputations from a model trained to minimize the reconstruction error on the originally observed portion. MIDAS offers two advantages over related approaches. First, as a form of multiple — rather than single — imputation, it preserves relationships within the observed data while representing uncertainty about the correct imputation model (Lall 2016). Second, by leveraging the ability of deep neural networks to learn highly complex relationships between variables, it delivers state-of-the-art imputation performance in terms of accuracy and speed.

The MIDAS workflow comprises four steps:

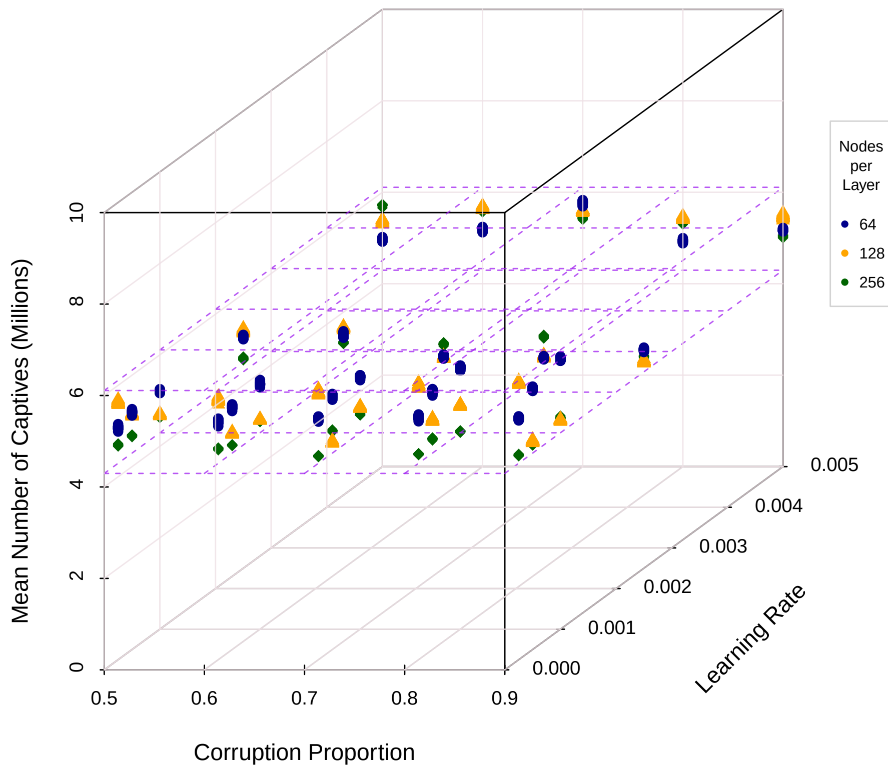
1. *Preprocessing*. We prepare the raids dataset for imputation by removing nonessential indices and other variables that provide no new information, logging skewed variables to improve their predictive power, and "one-hot encoding" categorical variables (i.e., converting them to separate indicator variables for each unique class). The preprocessed dataset includes the following raid-year-level variables: year, number of captives (the variable of interest), raiding party size, logged raiding party size, location longitude, location latitude, and one-hot-encoded versions of location, location country, and location type (e.g., village, town, city).

2. *Initialization*. We initialize a MIDAS neural network, which requires specifying three key "hyperparameters":[2] the layer structure, that is, the number of hidden network layers and the number of nodes in each layer; the proportion of observed values in the input dataset that are corrupted; and the learning rate, which controls the size of the adjustment made to weights and biases during training. As there is no way of knowing the optimal imputation model, we experiment with a variety of hyperparameter choices suggested by Lall and Robinson (2023): two-layer networks with 256, 128, and 64 nodes per layer; corruption proportions of 0.5, 0.6, 0.7,

[1] We implement MIDAS using the `Python` package **MIDASpy**, which allows for greater flexibility in customizing parameters than its `R` counterpart, **rMIDAS** (Lall and Robinson 2023, 17).

[2] Hyperparameters are features of neural networks that are manually specified by the analyst rather than learned during training.

FIGURE A4. Estimated Total Slaves with Varying Imputation Models



Notes: This figure plots the number of captives (y-axis) in 1,500 completed versions of our raids dataset generated by the **MIDASpy** package in Python, which implements the neural network-based method of multiple imputation with denoising autoencoders (MIDAS). Following Lall and Robinson's (2023) guidelines, we vary three key hyperparameters in the **MIDASpy** algorithm: (1) the number of nodes in the neural network's two hidden layers (distinguished by color); (2) the proportion of input values that are stochastically corrupted (x-axis); and (3) the size of the adjustment made to weights during training (z-axis). The dotted horizontal planes indicate the minimum and maximum number of captives in the completed datasets. The imputation model includes raid date, location, location type, and raiding party size.

0.8 and 0.9; and learning rates of 0.0005, 0.0025, 0.001, 0.0025, and 0.005.[3]

3. *Building and training*. We build and train the MIDAS model. To determine the length of the training process, we employ the diagnostic tool of "overimputation" (Lall and Robinson 2023, 23-26), which involves omitting random observed values, generating multiple imputations for each one, and assessing the accuracy of these imputations. Regardless of our hyperparameter choices, imputation error declines sharply over the first 25 training "epochs" — complete passes through the MIDAS network — but little thereafter. Accordingly, we train the imputation

[3]As the preprocessed dataset is medium-sized, a larger number of hidden layers is not necessary (and could result in overfitting).

model for 25 epochs.

4. *Imputation*. Finally, we draw imputed values from the trained imputation model, producing 20 "completed" versions of the raids dataset (in which all values are observed) with each combination of hyperparameters.

Figure A4 displays the number of captives in all 1,500 completed datasets yielded by the 75 combinations of layer structures, corruption proportions, and learning rates discussed earlier. The estimates range from 4.3 million to 6.11 million (indicated by the dotted horizontal planes), with 53% exceeding 5 million and 93% exceeding 4.5 million. The overall mean is 5.06 million; the standard deviation is 0.45 million. Consistent with a roughly normal distribution, 57% of estimates lie within one standard deviation of the overall mean and 98% within two standard deviations. Using a 95% confidence standard, the range of estimates is 4.16-5.96 million. As noted in the main text, mean imputation yields a significantly higher — and, in our view, less plausible — figure of 7.76 million.

In general, captive estimates are larger when the number of nodes per hidden layer is smaller, the corruption proportion is lower, and the learning rate is higher. However, these differences are modest in size. The gap between the estimates produced by the highest and lowest numbers of nodes, corruption proportions, and learning rates is 0.46 million, 0.04 million, and 0.42 million, respectively, which represent 1.03, 0.08, and 0.93 standard deviations. In other words, the imputation results do not exhibit high levels of sensitivity to MIDAS network hyperparameters, giving us greater confidence in their robustness.

C Urban Population Analysis

C.1 Summary Statistics

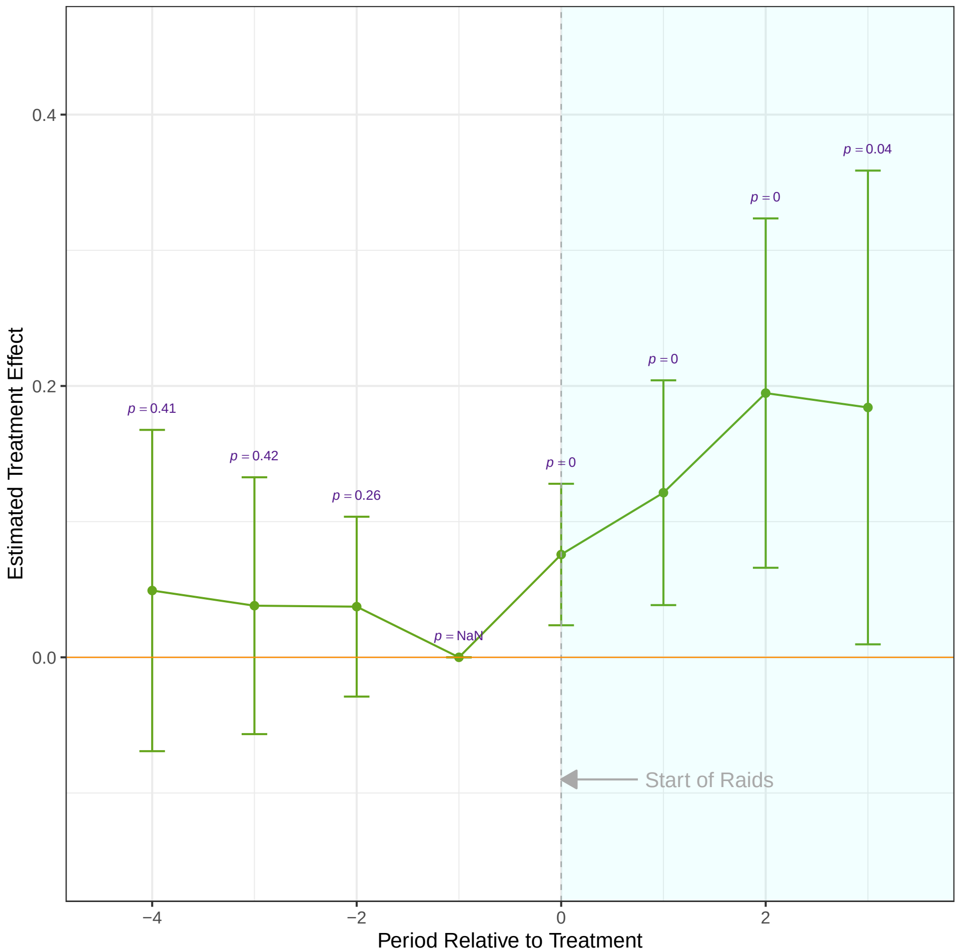
TABLE A2. Summary Statistics for Urban Population Analysis

	N	Mean	St. Dev.	Min	Max
Panel A: 1100-1900 Sample					
Log Settlement Population (P_{st})	7,149	1.243	1.074	0.000	7.258
Exposure to Raids (R_{st})	7,150	0.126	0.332	0	1
Log Cumulative Raids	7,150	0.192	0.587	0.000	4.443
Log Cumulative Captives	7,150	0.764	2.451	0.000	11.648
Raided Once	7,150	0.038	0.191	0	1
Raided 2-5 Times	7,150	0.051	0.219	0	1
Raided 6-10 Times	7,150	0.021	0.144	0	1
Raided > 10 Times	7,150	0.016	0.127	0	1
Panel B: 1100-1777 Sample					
Log Settlement Population (P_{st})	5,500	0.907	0.815	0.000	4.875
Raids Indicator (R_{st})	5,500	0.094	0.292	0	1

Notes: This table reports summary statistics for the samples used in our baseline and continuous difference-in-differences analyses of the impact of slave raids on the population of European urban settlements between 1100 and 1900 (Tables 1 and 2). Population is recorded in thousands prior to logarithmic transformation.

C.2 Robustness

FIGURE A5. Event Study with Matching Estimator



Notes: This figure presents event study estimates of the impact of slave raids on the population of Eastern European urban settlements between 1100 and 1900 (at the settlement-period level) computed with Imai, Kim, and Wang's (2023) matching estimator, which matches treated units to untreated units with similar treatment and outcome histories. The outcome variable is the logarithm of a settlement's population in thousands; the treatment variable is an indicator for the period relative to the first raid on a settlement. The sample comprises 550 settlements observed over 13 periods of 50 or 100 years (N = 7,149). Bars represent 95% confidence intervals based on weighted bootstrapped standard errors clustered by settlement.

TABLE A3. Urban Population Analysis with Varying Timeframes

Panel A: Alternative Start Dates, Outcome: Log Settlement Population				
Start Date:	900	1000	1200	1300
	(1)	(2)	(3)	(4)
Exposure to Raids	0.223***	0.205***	0.182***	0.203***
	(0.057)	(0.056)	(0.055)	(0.055)
N	8,249	7,699	6,599	6,049
R^2	0.784	0.789	0.801	0.809
Mean Outcome Variable	1.110	1.174	1.314	1.384
Panel B: Alternative End Dates, Outcome: Log Settlement Population				
End Date:	1650	1750	1850	1950
	(5)	(6)	(7)	(8)
Exposure to Raids	0.093*	0.133***	0.157***	0.187***
	(0.050)	(0.048)	(0.053)	(0.060)
N	4,400	5,500	6,600	7,698
R^2	0.808	0.792	0.783	0.801
Mean Outcome Variable	1.833	2.157	1.102	1.422
Settlement FEs	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓

Notes: This table examines whether our baseline difference-in-differences estimate of the impact of slave raids on the population of Eastern European urban settlements is sensitive to alternative sample timeframes. Robust standard errors, clustered by settlement, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A4. Urban Population Analysis Controlling for Military Conflicts

	Outcome: Log Settlement Population (Mean = 1.208)				
	(1)	(2)	(3)	(4)	(5)
Exposure to Raids	0.231***	0.223***	0.226***	0.222***	0.221***
	(0.056)	(0.056)	(0.056)	(0.057)	(0.057)
N	6,600	6,600	6,600	6,600	6,600
R^2	0.792	0.792	0.791	0.791	0.791
Settlement FEs	✓	✓	✓	✓	✓
Period FEs	✓	✓	✓	✓	✓

Notes: This table examines whether our baseline difference-in-differences estimate of the impact of slave raids on the population of Eastern European urban settlements is robust to controlling for the cumulative number of military conflicts since the start of the slave trade within a specified radius (indicated in the table). Data on the latter come from the Historical Conflict Event Dataset (Miller and Bakar 2023). Robust standard errors, clustered by settlement, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A5. Urban Population Analysis with Alternative Sample, Standard Errors, and Slave Trade Start Date

Outcome: Log Settlement Pop.	(1)	(2)	(3)
Exposure to Raids	0.194**	0.222**	0.157***
	(0.089)	(0.093)	(0.047)
N	1,612	6,590	7,149
R^2	0.802	0.799	0.794
Mean Outcome Variable	1.242	1.262	1.243
Sample	Russia, Poland, Lithuania in 1400	Eastern Europe	Eastern Europe
SE Cluster	Settlement	State in 1400	Settlement
Slave Trade Start Date	1453	1453	1502
Settlement FEs	✓	✓	✓
Period FEs	✓	✓	✓

Notes: This table examines whether our baseline difference-in-differences estimate of the impact of slave raids on the population of Eastern European urban settlements is robust to (1) restricting the sample to settlements within the 1400 borders of Russia, Poland, and Lithuania; (2) clustering robust standard errors by state in 1400; and (3) treating 1502 — the dissolution of the Ulus of Jochi — as the start date of the early modern Black Sea slave trade. Robust standard errors, clustered by state in 1400 or settlement, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A6. Urban Population Analysis: Heterogeneity by Initial Settlement Population

Outcome: Log Settlement Pop.	(1)
Exposure to Raids	0.262***
	(0.101)
Exposure to Raids × Population in 1400	-0.035
	(0.139)
N	7,149
R^2	0.683
Mean Outcome Variable	1.243
Year FEs	✓

Notes: This table examines whether our baseline difference-in-differences estimate of the impact of slave raids on the population of Eastern European urban settlements varies with pre-slave trade population. Robust standard errors, clustered by settlement, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A7. Urban Population Analysis: Initial Population and Exposure to Raids

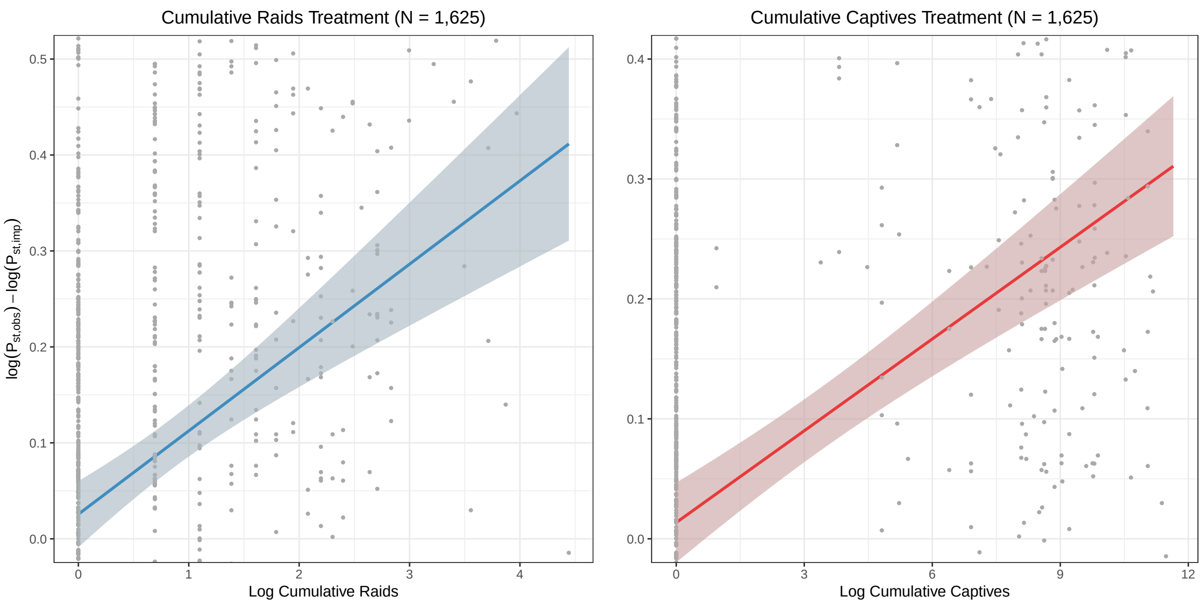
Outcome: Exposure to Raids	(1)	(2)
Population in 1400	0.001	
	(0.003)	
Log Population in 1400		0.016
		(0.015)
N	7,150	7,150
R^2	0.086	0.087
Mean Outcome Variable	0.126	0.126
Year FEs	✓	✓

Notes: This table examines the relationship between the population of Eastern European urban settlements in 1400 and their subsequent exposure to slave raids over 13 periods between 1100 and 1900. The outcome variable is an indicator for whether a settlement has been raided; the treatment variable is a settlement's population in 1400 (logged in column 2). Robust standard errors, clustered by settlement, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

C.3 Extensions

C.3.1 Continuous Treatment

FIGURE A6. Relationship between Continuous Treatment Variables and Observed-Counterfactual Outcome Differences



Notes: This figure probes the plausibility of the "strong parallel trends" assumption (Callaway, Goodman-Bacon, and Sant'Anna 2024) in our continuous difference-in-differences analysis of the impact of slave raids on the population of Eastern European urban settlements (at the settlement-period level). The *x*-axis measures the logarithm of cumulative raids on a settlement in the left panel and the logarithm of cumulative captives taken from a settlement in the right panel. The *y*-axis measures the difference between observed and imputed counterfactual values of the logarithm of settlement population, as computed by Liu, Wang, and Xu's (2024) fixed effects counterfactual estimator. The sample comprises 125 raided Eastern European settlements observed over 13 periods of 50 or 100 years between 1100 and 1900 (N = 1,625). Each panel displays a regression line with 95% confidence intervals.

C.3.2 Grid Cell Analysis

TABLE A8. Urban Population Analysis at Grid Cell Level

Outcome (per Grid Cell):	*Log Population* (1)	*# Settlements (All)* (2)	*# Settlements with 5K Pop.* (3)	*# Settlements with 10K Pop.* (4)
Exposure to Raids	0.270***	0.111***	0.175***	0.104***
	(0.031)	(0.016)	(0.018)	(0.013)
N	39,050	50,765	50,765	50,765
R^2	0.862	0.896	0.503	0.385
Mean Outcome Variable	0.128	0.101	0.040	0.021
Settlement FEs	✓	✓	✓	✓
Period FEs	✓	✓	✓	✓

Notes: This table presents difference-in-differences estimates of the impact of slave raids on urban population in Eastern Europe at the grid cell level. The sample comprises 3,905 grid cells measuring 0.5°×0.5° (roughly 50km×50km at the equator) observed over 13 periods of 50 or 100 years between 1100 and 1900. The vector grid network comes from the PRIO-GRID dataset (Tollefsen, Strand, and Buhaug 2012). Robust standard errors, clustered by grid cell, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A9. Analysis of Urban Population Spillovers at Grid Cell Level

	Outcome: Log Grid Cell Population (1)	(2)	(3)
Exposure to Raids	0.092***	0.099***	0.062***
	(0.018)	(0.020)	(0.014)
Lagged Mean Exposure in Proximate Cells (0.5°)	0.065***		
	(0.023)		
Lagged Mean Exposure in Proximate Cells (1°)		0.252***	
		(0.035)	
Lagged Mean Exposure in Proximate Cells (2°)			0.168***
			(0.023)
N	50,739	50,765	50,765
R^2	0.896	0.509	0.389
Mean Outcome Variable	0.101	0.040	0.021
Settlement FEs	✓	✓	✓
Period FEs	✓	✓	✓

Notes: This table explores whether the impact of slave raids on urban population in Eastern Europe "spills over" to proximate areas at the grid cell level. The treatment variable is the mean value of a lagged raid exposure indicator across grid cells within 0.5° (column 1), 1° (column 2), and 2° (column 3) of a given unit's latitude and longitude. The sample comprises 3,905 0.5°×0.5° grid cells observed over 13 periods of 50 or 100 years between 1100 and 1900. The vector grid network comes from the PRIO-GRID dataset (Tollefsen, Strand, and Buhaug 2012). Robust standard errors, clustered by grid cell, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

C.3.3 Alternative Data Sources

TABLE A10. Urban Population Analysis Using Database of City Populations

	Outcome: Log Settlement Population	
	(1)	(2)
Exposure to Raids	1.243**	1.016**
	(0.492)	(0.435)
Sample Period	1100-1900	1100-1777
N	2,562	1,541
R^2	0.730	0.799
Mean Outcome Variable	7.364	6.174
City FEs	✓	✓
Period FEs	✓	✓

Notes: This table examines whether our baseline difference-in-difference estimates of the impact of slave raids on the population of Eastern European urban settlements are robust to measuring the latter using the Database of City Populations around the World over Time (Biguzzi 2020). The sample comprises 431 Eastern European settlements observed over 11 periods from 1100 to 1900. Robust standard errors, clustered by city, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A11. Urban Population Analysis Using Database of City Populations

	Outcome: Log Settlement Population	
	(1)	(2)
Log Cumulative Raids	0.455***	
	(0.154)	
Log Cumulative Captives		0.092**
		(0.045)
N	231	231
R^2	0.915	0.912
Mean Outcome Variable	8.329	8.329
City FEs	✓	✓
Period FEs	✓	✓

Notes: This table examines the relationship between exposure to slave raids and the population of East-Central European cities, as recorded by Miller (2008). The sample comprises 95 cities in the Lands of the Bohemian Crown, the Poland-Lithuanian Commonwealth, and the Kingdom of Hungary observed over four periods between 1500 and 1650. Robust standard errors, clustered by city, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

D Instrumental Variables Strategy

D.1 Watershed Boundary Instrument

As emphasized by historical sources (and illustrated in Figure A9) slave raiders typically followed the boundaries of watershed zones — elevated areas of land from which water drains to a common outlet, such as a river, lake, or ocean — to reach target destinations (Gloger 1900, 256-259). In the words of Guillaume Le Vasseur de Beauplan (1600-1673), a French engineer and cartographer who served in the Polish-Lithuanian army and built fortifications in Ukraine: "[T]he Tatars would enter the borderlands following a specific route — always traveling between two major rivers, staying on the highest ground" (Beauplan 1660, 48). Figure A7 reproduces an illustration of this strategy from *Description d'Ukranie*, Beauplan's influential 1660 account of Ukraine's geography, history, and ethnography.

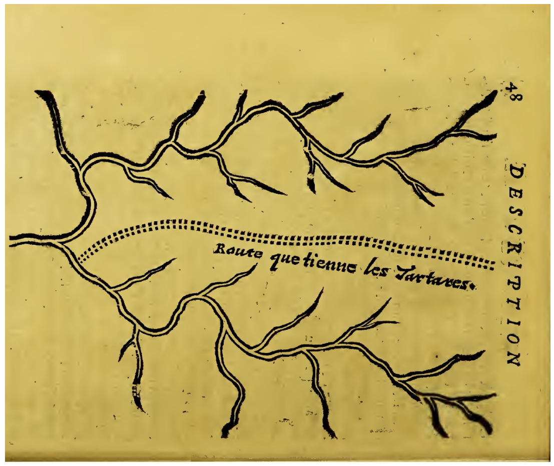
The main motivation for tracking watershed boundaries was their relatively dry and firm ground, which reduced the risk of obstruction by marshland, river crossings, deep ravines, steep slopes, and other natural barriers. In addition, these areas were less likely to be monitored by enemy watchmen — towns were usually located on river junctions for defensive and commercial reasons (Kollman 2017, 235) — and provided easily access shelter and grassland (Davies 2007, 21).

As a result of these features, both watershed boundaries and raiding trails deviated from established trade routes in the Black Sea region, which were based primarily on rivers such as the Dniepr, the Southern Bug, and the Volga (see Witzenrath 2022, xi-xii) — the most efficient means of transportation in the early modern era. Similarly, overland roads initially shadowed rivers for ease and security of travel as well as proximity to ports and markets. This pattern is depicted in the right panel of Figure A8 for the Poland-Lithuanian Commonwealth, which we generated by digitizing road networks mapped by Rzepa (1963).

Raiders' preference for traveling between watershed zones is also evident in the left panel of Figure A8, which charts the four major raiding trails — the Murawa, Kuczman, Woloski, and Czarny Trails —in relation to rivers.[4] The Murawa Trail, the principal route used to raid Muscovy, originated in Perekop and snaked northeast through the steppe, following the boundary of the Dnieper and Don river basins (various branches are situated between smaller tributaries of these rivers). The Czarny Trail meandered from Perekop to the outskirts of Lviv amid the Dnieper and Southern Bug river basins, tracing the rivers' tributary networks (Dziubiński 1996, 55). The Kuczman (or Podole) trail extended northwest from Akkerman between the watersheds of the Southern Bug and Dniester rivers, crossing

[4] We supplement shapefiles created by Polczynski and Polczynski (2018), who rely on fifteen Beauplan maps from the mid-17th century, with additional trails (the Woloski Trail) and branches (of the Murawa and Czarny Trails) digitized from a variety of historical maps and descriptive accounts (Novoselskiy 1948; Horn 1962; Rzepa 1963; Zaporiz'kyi Natsional'nyi Universytet 2006).

FIGURE A7. Contemporary Illustration of Tatar Invasion Route



Notes: Drawing of a typical Tatar invasion route by Guillaume Le Vasseur de Beauplan, a French cartographer employed in the Polish-Lithuanian army in the first half of the 17th century (Beauplan 1660, 48).

the former at a shallow ford before merging with the Czarny Trail. Lastly, the Woloski Trail, which extended from Perekop to near Lviv, traversed land flanked by the watersheds around the Prut and Dniester river basins.

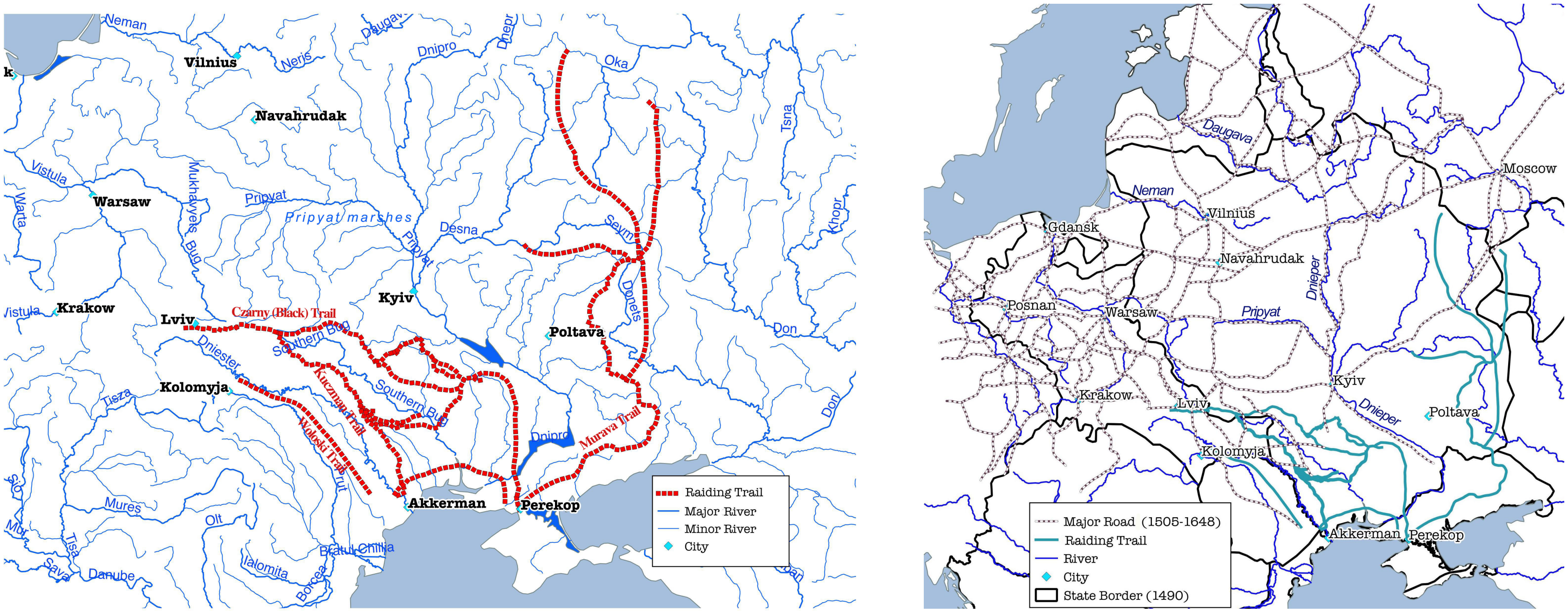
The conspicuous absence of trails north of Kyiv was likely a consequence of the dense and expansive marshland surrounding the Prypiat (Pripet) River, whose combination of peat bogs, swamps, and mixed forests significantly impeded horseback travel. In total, the Prypiat (Polesie) marshes cover an area of approximately 100,000–150,000km^2, making them one of the largest wetlands in Europe. Interestingly, this terrain was more conducive to waterborne modes of travel: the Dnieper-Pripyat system served as a medieval conduit of trade between the Baltic and Black Seas (encompassing the famed historic route from the Varangians to the Greeks.)

We exploit the close correspondence between raiding trails and geographical features that facilitate mounted travel to develop two related instruments for exposure to raids. Our main instrument treats all watershed boundary lines in the Black Sea region as potential raiding routes. As discussed in the main text, we instrument the cumulative number of raids on a given unit of observation (i.e., imperial district or urban community) with its minimum distance to Akkerman and Perekop — the starting points for raiding expeditions into Poland-Lithuania and Muscovy — along a watershed boundary line.

From an inferential perspective, an attractive feature of watershed boundaries is that they are defined by a landscape's shape and surface attributes rather than by indicators or predictors of economic development. Nevertheless, their location may be correlated with topographical characteristics that influence development outcomes, posing a threat to the exclusion restriction. Controlling for these

FIGURE A8. Raiding Trails, Rivers, and Roads in the Black Sea Region

Black Sea River Network | Roads in Polish-Lithuanian Commonwealth



Notes: The left map shows that the four principal trails used to conduct slave raids in the Black Sea region are located between the basins of large rivers and their tributaries. The right panel shows that major roads in the Polish-Lithuanian Commonwealth (1505-1648) did not significantly overlap with these trails, usually following rivers (such as the Dnieper, Daugava, Neman, and Pripyat) instead. The road network was digitized from Rzepa (1963) and geocoded by the authors.

pathways is thus critical to the instrument's validity. First, proximity to watershed boundaries may be related to distance to major rivers, which, as noted earlier, served as trade arteries in the Black Sea region. Second, watersheds are a function of elevation, variation in which (i.e., ruggedness) has been linked to development-related outcomes such as state capacity, conflict, and urbanization (Nunn and Puga 2012; Jimenez-Ayora and Ulubaşoğlu 2015; Shaver, Carter, and Shawa 2019). Third, the instrument captures distance to the Black Sea coast, where the port of Caffa was an important commercial hub during the early modern era. To enhance the plausibility of the exclusion restriction, our instrumental variables analysis accordingly controls for straight-line distance to nearest river and coastline as well as for terrain ruggedness.

We construct our instrument using a watershed shapefile provided by the HydroBASINS database (Lehner and Grill 2013), which is based on the high-resolution digital elevation model developed in 2000 by the Shuttle Radar Topography Mission (SRTM). Watersheds are delineated at different resolutions in accordance with to the Pfafstetter Coding System, with Levels 1-3 distinguishing continents, continental sub-units, and the largest river basin for each continent. We select Level 5, which includes inter-basin regions and thus most closely approximates the scale of raiding trails. We begin by preprocessing the original shapefile by correcting invalid geometry, converting polygons (i.e., river basins) to lines, and merging all line segments to form a unified network of watersheds. We then convert the shapefile to the European Albers Equal Area projection with standard parallels at 49.6667 N and and 67.33334 N and a central meridian of 42.5 E. Finally, we calculate the shortest paths through this network from (1) Perekop and (2) Akkerman to each unit of observation — the centroid of an imperial district or the geographic coordinates of an urban community — using the shortest path tool in the QGIS geographic information system (v3.32.1). The instrument is shorter of the two distances.

D.2 Least-Cost Paths Instrument

Our second instrument leverages an alternative strategy for identifying geographical features that facilitate horseback travel to raiding targets: calculating the geographically most efficient routes — or "least-cost paths" — between the endpoints of each raiding trail based on the flow of water across the earth's surface. As described below, we develop an algorithm that minimizes the accumulated water flow — which generally increases with gradient and decreases with elevation — across all possible routes from the the source of each trail (i.e., Akkerman or Perekop) to the effective destination (i.e., Moscow or Lviv). The instrument measures the minimum distance from a given unit of observation to the resulting set of least-cost paths.

The principal benefit of constructing least-cost paths is that they yield a slightly better fit to raiding trails, which exhibit fewer convolutions than watershed boundaries. As a result, the instrument is a more powerful predictor of raiding activity in the first stage of our 2SLS analysis. To avoid potential

FIGURE A9. Watershed Boundary Lines and Raiding Trails in the Black Sea Region

Notes: This map shows that the four principal trails used to conduct slave raids in the Black Sea region closely follow the boundaries of watershed zones, an exogenous geographical feature that facilitated rapid movement across the steppe on horseback. Watershed boundaries are plotted at Level 5 (which includes inter-basin regions) with a shapefile from the HydroBASINS database (Lehner and Grill 2013).

bias caused by endogeneity in the location of endpoints, we exclude units containing terminal cities from this analysis. As with the first instrument, we also control for a variety of topographical characteristics that could plausibly predict the location of least-cost paths as well as development outcomes.

Table A12 presents a pseudocode summary of our four-stage algorithm for computing least-cost paths, which we again implement using the QGIS geographic information system. The first step is preprocessing. The algorithm's input is a pre-calculated flow accumulation cost raster with a resolution of 30 arc-seconds (approximately 1km), which we acquired from the HydroSHEDS database (Lehner, Verdin, and Jarvis 2008). Raster values represent the accumulated flow in a given rectangular cell, that is, the volume of water that enters this cell from upstream areas (assuming that all cells receive the same volume of rainfall and that there is no evaporation or subsurface flow). This is a function

FIGURE A10. Least-Cost Paths and Raiding Trails in the Black Sea Region

Notes: This map shows that the four principal trails used to conduct slave raids in the Black Sea region closely track nine least-cost (i.e., maximally efficient) paths from Akkerman or Perekop to Lviv or Moscow.

of the size of its drainage basin, which, in turn, depends on its elevation and gradient. We start by reprojecting the raster from the WGS 84 coordinate system to the Albers equal area conic map, resampling values using a cubic (4×4 kernel) convolution approximation. The latter method is better able to handle areas of internal drainage than the more common nearest neighbor approach, yielding a closer approximation to the four major raiding trails.

Second, following Matranga and Natkhov (2022), we make a few small adjustments to the reprojected raster. Since flow accumulation data are skewed to the right — mainly because cells representing river mouths and estuaries receive far more water than others — we take the square root of all values. In making this transformation, we convert cells representing ocean from null values to the maximum value to prevent negative square roots and ensure that these areas are sufficiently penalized in the least-cost path calculation. To save memory and speed up the algorithm, we then clip the raster to exclude cells outside Eastern Europe (including parts of western and northern Russia).

Third, using the QGIS Least-Cost Path plugin — which implement's Dijkstra's (1959) shortest path algorithm — we compute three least-cost paths between the raiding trails' sources and destination

TABLE A12. Algorithm Pseudocode for Generating Least-Cost Raiding Paths

Data : Flow accumulation cost raster **R**, source s, destination d
Result: N least-cost paths from s to d
begin
    Reproject **R** onto Albers equal area map using cubic resampling;
    Set oceanic null values in **R** to maximum;
    Clip **R** around Eastern Europe;
    foreach s-d pair Perekop-Moscow, Perekop-Lviv, Akkerman-Lviv **do**
        Construct cost distance raster $\mathbf{R}^{D}_{sd,1}$;
        Construct backlink raster $\mathbf{R}^{B}_{sd,1}$;
        Combine $\mathbf{R}^{D}_{sd,1}$ and $\mathbf{R}^{B}_{sd,1}$ to generate least-cost path $p_{sd,1}$ from d to s;
    end
    repeat
        foreach $i = 2, \ldots, n$ **do**
            Create 15km buffer around least-cost path $p_{sd,i-1}$;
            Assign penalty of 200 to cells within buffer zone;
            Construct cost distance raster $\mathbf{R}^{D}_{sd,i}$;
            Construct backlink raster $\mathbf{R}^{B}_{sd,i}$;
            Combine $\mathbf{R}^{D}_{sd,i}$ and $\mathbf{R}^{B}_{sd,i}$ to generate least-cost path $p_{sd,i}$ from d to s;
        end
    until $n + 1$ *least-cost paths generated*;
    From $p_{sd,1}, \ldots, p_{sd,n+1}$, select N paths that best approximate actual raiding trails
end

Notes: This table describes our algorithm for generating least-cost raiding paths in pseudocode form. The algorithm is executed in the QGIS geographic information system (v.3.30.3).

points: (1) Perekop to Moscow; (2) Perekop to Lviv, and (3) Akkerman to Lviv. This involves creating two new rasters: a "cost distance" raster that encodes the least accumulated cost of traveling from the source to all other cells in the raster; and a "backlink" raster that encodes the direction from each cell to its least-cost neighbor. By combining the two grids, a path can then be traced from the destination back to the source via the most efficient combination of least-cost neighbors.

Fourth, we compute the next three least-cost paths between each source-destination pair, generating 12 paths in total. This is achieved by constructing a 15km buffer around every more efficient path (with flat end caps); assigning a "burn-in" value (or penalty) of 200 to cells within this zone; and rerunning the Dijkstra algorithm.

Finally, among the 12 computed least-cost paths, we select the nine that most closely resemble a real trail. For the Akkerman-Lviv and Perekop-Moscow pairs, the top three least-cost paths provide the best approximation; in the Perekop-Lviv case, the third least-cost path diverges substantially from every trail, extending deep into Russia before running east toward Minsk and then bending south. We thus choose the first, second, and fourth least-cost paths, all of which have a similar shape to the Czarny Trail. The nine selected routes are mapped in Figure A10.

E Long-Run Development in Imperial Russia and Austria

E.1 Summary Statistics

TABLE A13. Summary Statistics for Imperial Russia Analysis

Statistic	N	Mean	St. Dev.	Min	Max
Panel A: Treatment and Instruments					
Log Cumulative Raids	373	0.739	1.058	0.000	4.745
Distance to Least-Cost Path (km)	373	280.418	289.760	0.288	1,533.034
Distance to Placebo Least-Cost Path (km)	373	178.437	169.488	0.218	796.701
Distance along Watershed Boundary	372	2,326,640	1,104,774	301,002	6,000,886
Log Distance along Watershed Boundary	372	7.624	0.539	5.707	8.700
Panel B: Outcomes					
Log Urban Population (1863)	357	8.751	0.918	6.349	12.770
Population Density (1897)	371	43.204	32.793	0.099	503.103
Markets per km^2 (1867)	361	0.003	0.004	0.000	0.023
Markets per 1k Population	355	0.115	0.109	0.000	0.756
Factories per km^2 (1868)	362	0.006	0.017	0.000	0.230
Factories per 1k Population	356	0.241	0.484	0.000	4.157
Panel C: Controls					
Fertile Soil (Share)	373	0.324	0.363	0.000	1.000
Mean Terrain Ruggedness	373	26.502	12.129	8.454	77.429
Distance to Moscow (km)	373	568.309	295.565	0.000	1,562.100
Log Urban Population in 1400 (k)	373	0.246	0.483	0.000	3.434
Log Area (km^2)	373	8.493	0.793	7.157	12.695
Minimum Distance to Coastline (km)	373	465.039	242.548	3.957	1,075.926
Mean Seasonality (SD$\times$100)	373	955.501	99.403	733.383	1,215.760
Mean Precipitation (mm)	373	614.493	43.848	495.169	800.286
Minimum Distance to River (km)	373	44.616	35.434	0.050	194.392
Cumulative Military Conflicts, 1453-1777	373	0.260	0.789	0	8

Notes: This table presents summary statistics for variables in our district-level analysis of long-run development in Imperial Russia in the mid-19th century. We exclude districts that (1) were part of the Ottoman Empire or the Crimean Khanate during the Black Sea slave trade or (2) were incorporated into organized states (Muscovy and later Russian empire) only after its onset (1453).

TABLE A14. Summary Statistics for Analysis of Austrian Galicia and Silesia

Statistic	N	Mean	St. Dev.	Min	Max
Panel A: Treatment and Instruments					
Log Cumulative Raids	99	1.218	1.266	0.000	4.205
Distance to Watershed Boundary (km)	99	1,254,531	385,827	657,732	1,925,331
Distance to Least-Cost Path (km)	98	98.986	121.037	0.000	366.738
Panel B: Outcomes					
Log Population	99	10.813	0.670	9.049	11.668
Population per km^2	99	191.673	874.065	28.165	8,354.780
Log Houses	99	8.930	0.743	6.775	9.823
Houses per km^2	99	14.663	20.642	3.518	199.334
Log Farm Structures	99	9.277	0.762	6.696	10.291
Farm Structures per km^2	99	20.018	22.421	6.095	217.441
Panel C: Controls					
Log Land Area (km^2)	99	6.445	0.990	1.941	7.830
Mean Terrain Ruggedness	99	101.369	72.770	14.885	297.071
Log Urban Population in 1400 (k)	99	0.110	0.349	0.000	2.398
Log Distance to Coastline (km)	99	6.241	0.100	5.991	6.439
Fertile Soil (Share)	99	0.214	0.360	0.000	1.000
Log Distance to River (km)	99	3.021	0.981	0.279	4.500
Cumulative Military Conflicts (1453-1777)	99	0.141	0.495	0	3

Notes: This table presents summary statistics for variables in our district-level analysis of long-run development in Austrian Galicia and Silesia in the mid-19th century.

E.2 First-Stage Results

TABLE A15. Slave Raids and Development Outcomes in Imperial Russia and Austria: First-Stage Results

Outcome: Log Cumulative Raids	Russian Empire		Austrian Galicia & Silesia	
	(1)	(2)	(3)	(4)
Logged Distance to Crimea via Watershed Boundary	-1.044^{***}		0.000^{***}	
	(0.217)		(0.000)	
Distance to Least-Cost Paths		-0.003^{***}		-0.005^{***}
		(0.0004)		(0.002)
N	372	373	99	98
R^2	0.486	0.495	0.551	0.538
Adjusted R^2	0.462	0.472	0.511	0.496
Mean Outcome Variable	0.739	0.739	1.218	1.216
District-Level Controls	✓	✓	✓	✓
State FEs (1490 Borders)	✓	✓		

Notes: This table reports first-stage estimates from our 2SLS analysis of the impact of slave raids on district-level development outcomes in mid-19th century Russia (panel A) and Austrian Galicia and Silesia (panel B). The outcome variable is the logarithm of cumulative raids on a district. The treatment variable is a district's (1) minimum distance to Crimea along a watershed boundary line or (2) minimum distance to the nine least-cost paths from Crimea to Lviv and Moscow. All models control for urban population in 1400, land area, minimum distance to a river and to a coastline, soil fertility, terrain ruggedness, and cumulative military conflicts in 1453-1777; in column 1, temperature seasonality, precipitation, distance to Moscow, and state fixed effects with 1490 borders are also included. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

E.3 OLS Estimates

TABLE A16. Slave Raids and Development Outcomes in Imperial Russia and Austria: OLS Estimates

Panel A: Russian Empire						
Outcomes:	Population		Markets		Factories	
	Log Urban	Per km^2	Log Total	Per km^2	Log Total	Per km^2
	(1)	(2)	(3)	(4)	(5)	(6)
Log Cumulative Raids	0.178***	6.674***	0.013	0.0003	0.260***	0.002*
	(0.048)	(2.513)	(0.066)	(0.0002)	(0.071)	(0.001)
N	357	371	361	361	362	362
R^2	0.384	0.463	0.150	0.356	0.254	0.193
District-Level Controls	✓	✓	✓	✓	✓	✓
State FEs (1490 Borders)	✓	✓	✓	✓	✓	✓
Panel B: Austrian Galicia and Silesia						
Outcomes:	Population		Houses		Farm Structures	
	Log Total	Per km^2	Log Total	Per km^2	Log Total	Per km^2
	(1)	(2)	(3)	(4)	(5)	(6)
Log Cumulative Raids	0.081*	138.809**	0.052	3.760**	0.003	2.867*
	(0.042)	(69.226)	(0.033)	(1.842)	(0.028)	(1.616)
N	99	99	99	99	99	99
R^2	0.704	0.521	0.852	0.574	0.898	0.604
Mean Outcome Variable	10.813	191.673	8.930	15.293	9.277	20.018
District-Level Controls	✓	✓	✓	✓	✓	✓

Notes: This table reports OLS estimates of the relationship between slave raids and various development outcomes (indicated in the header) in districts of Imperial Russia (panel A) and Austrian Galicia and Silesia (panel B) in the mid-19th century. The treatment variable is the logarithm of cumulative raids on a district. All models control for urban population in 1400, land area, minimum distance to a river and to a coastline, soil fertility, and terrain ruggedness; in Panel A, temperature seasonality, mean precipitation, distance to Moscow, and state fixed effects with 1490 borders are also included. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

E.4 Full Regression Results

TABLE A17. Slave Raids and Long-Run Development Outcomes in Imperial Russia: Full Results

Outcomes:	Population		Markets		Factories	
	Log Urban	Per km^2	Log Total	Per km^2	Log Total	Per km^2
	(1)	(2)	(3)	(4)	(5)	(6)
Log Cumulative Raids	0.501***	22.704***	0.420*	0.001*	0.217	0.010**
(Instrumented)	(0.188)	(6.286)	(0.254)	(0.001)	(0.285)	(0.004)
Distance to River	0.0002	0.033	-0.0001	0.00000	-0.0001	0.00002
	(0.001)	(0.047)	(0.002)	(0.00001)	(0.002)	(0.00003)
Distance to Moscow	-0.0002	0.001	0.001	0.00000	-0.0003	-0.00001*
	(0.0003)	(0.010)	(0.0004)	(0.00000)	(0.0004)	(0.00001)
Soil Quality	-0.476	-20.660	-0.349	-0.0003	-0.603	-0.018**
	(0.350)	(12.566)	(0.470)	(0.001)	(0.527)	(0.007)
Ruggedness	0.012**	0.463**	-0.005	-0.00002	0.018**	0.0002**
	(0.005)	(0.184)	(0.007)	(0.00002)	(0.008)	(0.0001)
Log Urban Population in 1400	0.543***	11.735***	-0.424***	-0.001***	0.511***	0.006**
	(0.123)	(4.287)	(0.163)	(0.0005)	(0.183)	(0.003)
Cumulative Military Conflicts	0.109*	1.404	0.107	0.0001	0.130	0.0001
	(0.060)	(2.105)	(0.079)	(0.0002)	(0.089)	(0.001)
Log Area	-0.151	-19.601***	-0.099	-0.003***	0.030	-0.004*
	(0.099)	(3.273)	(0.132)	(0.0004)	(0.149)	(0.002)
Distance to Coast	-0.001	-0.052***	-0.001	-0.00001***	0.0003	-0.00002
	(0.001)	(0.018)	(0.001)	(0.00000)	(0.001)	(0.00001)
Temperature Seasonality	0.0004	0.127**	0.006***	0.00003***	-0.002	0.0001
	(0.002)	(0.058)	(0.002)	(0.00001)	(0.002)	(0.00004)
Mean Precipitation	-0.001	0.004	0.001	0.00000	-0.001	-0.00000
	(0.001)	(0.048)	(0.002)	(0.00001)	(0.002)	(0.00003)
N	356	370	360	360	361	361
Mean Outcome Variable	8.751	43.204	2.125	0.003	2.361	0.006
State FEs	✓	✓	✓	✓	✓	✓
First-Stage F-Statistic	27.856	32.373	27.348	27.348	27.639	27.639

Notes: This table reports full second-stage 2SLS estimates of the impact of slave raids on district-level development outcomes in Imperial Russia in the mid-19th century (presented in abridged form in panel A, Table 3). The treatment variable is the logarithm of cumulative raids on a district, instrumented by the minimum distance from its centroid to Crimea via a watershed boundary line. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A18. Slave Raids and Long-Run Development Outcomes in Austrian Galicia and Silesia: Full Results

Outcomes:	Population		Houses		Farm Structures	
	Log Total	Per km^2	Log Total	Per km^2	Log Total	Per km^2
	(1)	(2)	(3)	(4)	(5)	(6)
Log Cumulative Raids	0.362***	681.099***	0.253**	20.074***	0.037	15.582***
(Instrumented)	(0.132)	(231.313)	(0.100)	(6.493)	(0.072)	(5.409)
Log Urban Population	0.173	-369.979	0.070	-8.809	0.120	-5.779
in 1400	(0.147)	(257.092)	(0.112)	(7.217)	(0.080)	(6.012)
Mean Terrain	-0.001	1.215	-0.001*	0.020	-0.002***	0.000
Ruggedness	(0.001)	(1.385)	(0.001)	(0.039)	(0.000)	(0.032)
Log Land Area (km)	0.386***	-708.679***	0.614***	-22.035***	0.698***	-19.595***
	(0.070)	(123.309)	(0.054)	(3.461)	(0.039)	(2.884)
Soil Quality	-0.320	-698.187**	-0.230	-20.385**	0.012	-15.360*
	(0.198)	(346.662)	(0.151)	(9.731)	(0.108)	(8.107)
Log Distance to River	0.052	-32.744	0.040	-0.254	0.040	0.000
	(0.051)	(89.070)	(0.039)	(2.500)	(0.028)	(2.083)
Log Distance to	-0.519	-853.956	-0.919	-34.951	0.050	-20.737
Coastline	(0.734)	(1,288.629)	(0.560)	(36.173)	(0.403)	(30.134)
Cumulative Battles	0.070	149.231	0.021	1.143	0.122	2.825
(1453-1777)	(0.139)	(244.088)	(0.106)	(6.852)	(0.076)	(5.708)
N	99	99	99	99	99	99
Mean Outcome Variable	10.813	191.673	8.930	15.293	9.277	20.018
R^2	0.08067	-0.35155	0.69594	-0.30250	0.85998	-0.17287
First-Stage F-Statistic	15.961	15.961	15.961	15.961	15.961	15.961

Notes: This table presents full second-stage 2SLS estimates of the impact of slave raids on district-level development outcomes in Austrian Galicia and Silesia in the mid-19th century (presented in abridged form in panel B, Table 3). The treatment variable is the logarithm of cumulative raids on a district, instrumented by the minimum distance from its centroid to nine least-cost paths from Crimea to Lviv and Moscow. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

E.5 Alternative Instrument

TABLE A19. Slave Raids and Development in Imperial Russia and Austria: Robustness to Least-Cost-Path Instrument

Panel A: Russian Empire						
Outcome:	Population		Markets		Factories	
	Log Urban	Per km^2	Log Total	Per km^2	Log Total	Per km^2
	(1)	(2)	(3)	(4)	(5)	(6)
Log Cumulative Raids	0.470***	14.963***	0.551**	0.002***	0.351	0.004
(Instrumented)	(0.173)	(2.974)	(0.244)	(0.001)	(0.265)	(0.003)
N	356	370	360	360	361	361
Mean Outcome Variable	8.751	43.204	2.125	0.003	2.361	0.006
First-Stage F-Statistic	32.895	38.302	32.525	32.525	32.804	32.804
District-Level Controls	✓	✓	✓	✓	✓	✓
State FEs	✓	✓	✓	✓	✓	✓
Panel B: Austrian Galicia and Silesia						
Outcome:	Population		Houses		Farm Structures	
	Log Total	Per km^2	Log Total	Per km^2	Log Total	Per km^2
	(7)	(8)	(9)	(10)	(11)	(12)
Log Cumulative Raids	0.701***	1,095.164***	0.539***	32.768***	0.174*	25.939***
(Instrumented)	(0.242)	(382.344)	(0.190)	(11.150)	(0.105)	(9.135)
N	98	98	98	98	98	98
Mean Outcome Variable	10.807	192.890	8.923	15.330	9.270	20.056
First-Stage F-Statistic	10.290	10.290	10.290	10.290	10.290	10.290
District-Level Controls	✓	✓	✓	✓	✓	✓

Notes: This table shows that the results of our instrumental variables analyses of the impact of slave raids on district-level development outcomes in mid-19th century Russia (panel A) and Austrian Galicia and Silesia (panel B) are robust to the use of an alternative instrument: minimum distance to nine least-cost paths from Crimea to Lviv or Moscow. All models control for urban population in 1400, distance to a river and to a coastline, land area, soil fertility, terrain ruggedness, and cumulative military conflicts in 1453-1777; in Panel A, temperature seasonality, precipitation, and distance to Moscow are also included. Districts including the least-cost paths' terminal cities are excluded from the analysis. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

F The Defensive State-Building Mechanism

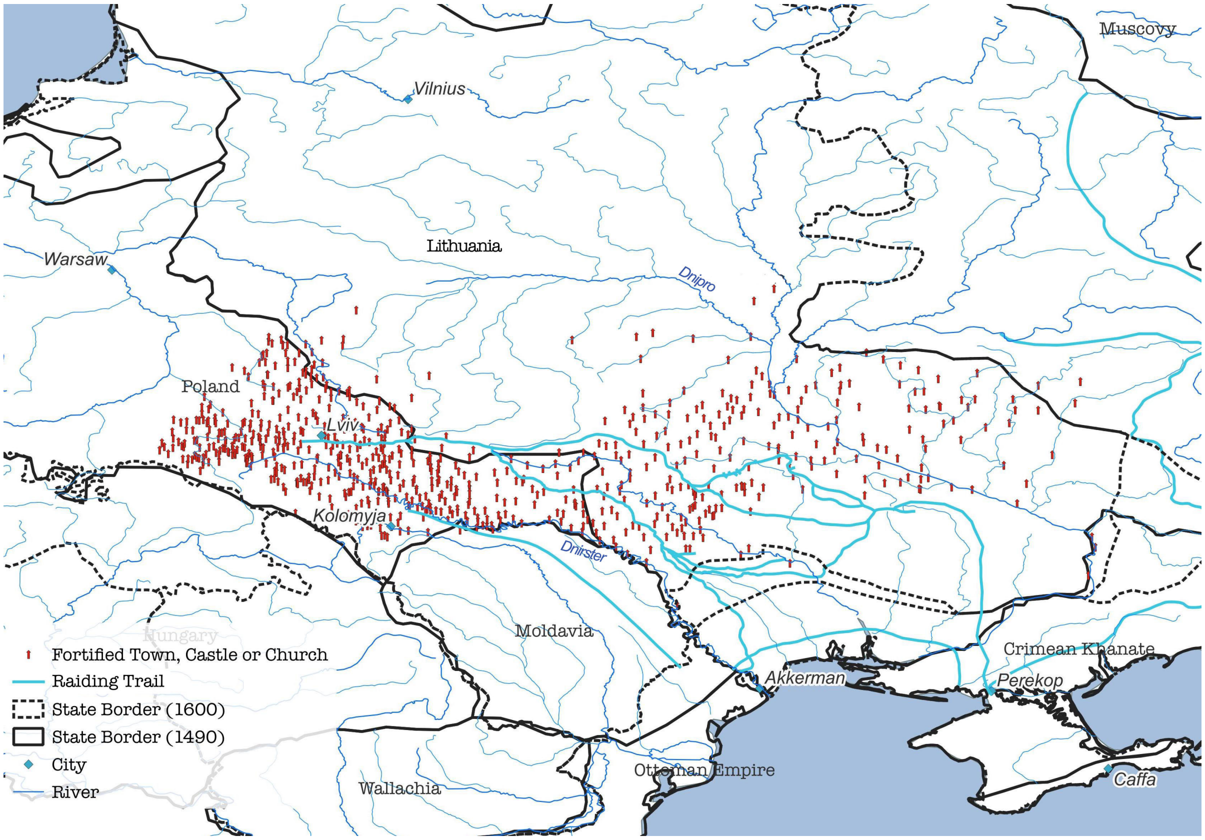
F.1 Poland-Lithuania

TABLE A20. Slave Raids, Military Deployments, and Fiscal Activity in Poland-Lithuania

Outcome:	Log Soliders in Red Ruthenia (1)	Log Fiscal Revenue (zł.) (2)
Exposure to Raids_{t-1} (Red Ruthenia)	0.518^{*} (0.293)	
Exposure to Raids_{t-1} (Poland-Lithuania)		1.081^{***} (0.407)
N	58	45
R^2	0.063	0.190
Mean Outcome Variable	8.145	13.908
No. Military Conflicts_{t-1}	✓	✓
Time Trend	✓	✓

Notes: OLS estimates of the association between lagged exposure to slave raids and (1) the logarithm of military camp population in Red Ruthenia between 1501 and 1558, as recorded by Łopatecki and Bołdyrew (2024) (column 1); and (2) the logarithm of annual revenues (in złotys) collected by the Polish and Lithuanian treasuries – principally from land taxes, property taxes, and customs duties — between 1588 and 1647, as measured by Filipczak-Kocur (2006) (column 2). Both models control for a linear time trend and the lagged number of military conflicts in the area of interest. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

FIGURE A11. Fortifications in Southern Borderlands of Poland-Lithuania



Notes: This map displays the location of permanent fortifications constructed in response to slave raids in Poland-Lithuania. Raiding trails and state borders from 1490 and 1600 are also indicated. Fortifications data were digitized from Adamczyk (2004) and geocoded by the authors. Borders in 1490 are based on maps printed in *Ocherki Istorii SSSR: Konets XV-Nachalo XVII vv.* (Kopanev 1957), digitized and georeferenced by the authors; borders in 1600 are from the Euratlas Historical Political Boundaries of Europe database (Nüssli 2016).

TABLE A21. Slave Raids and Fortification Construction in Poland-Lithuania: Robustness Checks

Outcomes: # per Grid Cell of...	Major Castles (1)	Small Castles (2)	Fortified Towns (3)	Fortified Villages (4)	Fortified Churches (5)	Fortifications Built (Any) (6)
Panel A: Sample Restricted to Poland (1490 Borders)						
Exposure to Raids	2.266***	1.281***	1.282***	0.103***	0.824***	6.624***
	(0.342)	(0.252)	(0.208)	(0.036)	(0.160)	(0.963)
N	1,935	1,935	1,935	1,935	1,935	1,935
R^2	0.621	0.508	0.582	0.453	0.545	0.588
Mean Outcome Variable	0.154	0.012	0.113	0.004	0.018	0.307
Panel B: Sample Restricted to Lithuania (1490 Borders)						
Exposure to Raids	0.703***	0.059***	0.525***	0.013	0.059***	1.460***
	(0.107)	(0.021)	(0.089)	(0.008)	(0.018)	(0.220)
N	6,735	6,735	6,735	6,735	6,735	6,735
R^2	0.486	0.376	0.444	0.282	0.636	0.472
Mean Outcome Variable	0.154	0.012	0.113	0.004	0.018	0.307
Panel C: Sample Restricted to Slave Trade (1453-1777)						
Exposure to Raids	1.339***	0.483***	0.858***	0.047***	0.331***	3.320***
	(0.149)	(0.099)	(0.097)	(0.015)	(0.064)	(0.388)
N	8,568	8,568	8,568	8,568	8,568	8,568
R^2	0.540	0.409	0.485	0.345	0.482	0.498
Mean Outcome Variable	0.095	0.026	0.050	0.002	0.031	0.194
Panel D: Sample Restricted to 1100-1600						
Exposure to Raids	0.891***	0.264***	0.473***	0.032**	0.277***	1.984***
	(0.129)	(0.071)	(0.074)	(0.015)	(0.062)	(0.309)
N	6,732	6,732	6,732	6,732	6,732	6,732
R^2	0.500	0.412	0.458	0.315	0.492	0.479
Mean Outcome Variable	0.095	0.026	0.050	0.002	0.031	0.194
Log Cumulative Battles	✓	✓	✓	✓	✓	✓
Grid Cell FEs	✓	✓	✓	✓	✓	✓
Period FEs	✓	✓	✓	✓	✓	✓

Notes: This tables examines whether our grid cell-level difference-in-differences estimates of the impact of slave raids on the construction of permanent fortifications in southern Poland-Lithuania (panel A, Table 4) are robust to subsetting the sample to different areas and time periods. The sample comprises 129 grid cells in Poland (1490 borders) observed 17 times between 1100 and 1800 in panel A; 449 grid cells in Lithuania (1490 borders) observed 17 times between 1100 and 1800 in panel B; 612 grid cells in Poland-Lithuania (1600 borders) observed 14 times between 1100 and 1777 in panel C; and 612 grid cells in Poland-Lithuania (1600 borders) observed 11 times between 1100 and 1600 in panel D. Robust standard errors, clustered by grid cell, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

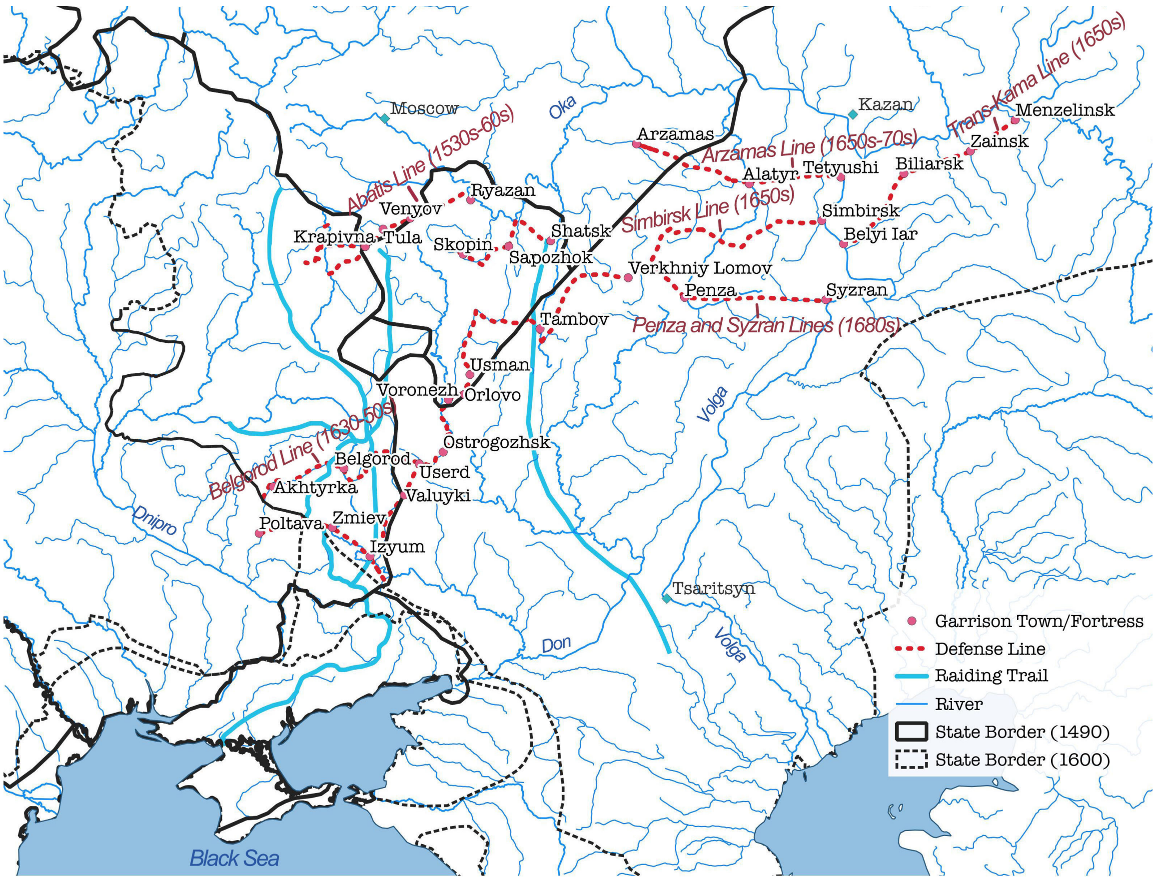
TABLE A22. Slave Raids and Castle Ownership in Poland-Lithuania: Robustness Checks

Outcome (per Grid Cell):	No. Castles Controlled by Crown (1)	No. Castles Controlled by Crown/Reps. (2)	No. Non-Crown Castles (3)	Share Castles Controlled by Crown (4)	Share Castles Controlled by Crown/Reps. (5)
Panel A: Baseline Specification with No Controls					
Exposure to Raids	0.042**	0.037**	0.028	0.047**	0.042**
	(0.017)	(0.018)	(0.034)	(0.021)	(0.021)
N	5,896	5,896	5,896	5,896	5,896
R^2	0.707	0.739	0.769	0.472	0.534
Mean Outcome Variable	0.084	0.111	0.197	0.069	0.088
Panel B: Sample Restricted to 1400-1650					
Exposure to Raids	0.037**	0.026*	0.036	0.025**	0.018*
	(0.015)	(0.015)	(0.028)	(0.010)	(0.010)
N	3,216	3,216	3,216	3,216	3,216
R^2	0.893	0.935	0.916	0.887	0.934
Mean Outcome	0.108	0.148	0.247	0.069	0.094
Panel C: Sample Modified to Poland-Lithuania with 1490 Borders					
Exposure to Raids	0.030**	0.027**	0.010	0.038**	0.035**
	(0.012)	(0.012)	(0.011)	(0.016)	(0.016)
N	6,358	6,358	6,358	6,358	6,358
R^2	0.791	0.848	0.936	0.509	0.593
Mean Outcome	0.062	0.085	0.153	0.060	0.078
Panel D: Sample Expanded to Nine Historical States within Modern Poland					
Exposure to Raids	0.016*	0.017*	0.032	0.013*	0.013*
	(0.009)	(0.010)	(0.020)	(0.008)	(0.008)
N	15,763	15,763	15,763	15,763	15,763
R^2	0.702	0.735	0.780	0.510	0.574
Mean Outcome	0.036	0.047	0.087	0.024	0.031
Log Cumulative Battles	✓	✓	✓	✓	✓
Grid Cell FEs	✓	✓	✓	✓	✓
Period FEs	✓	✓	✓	✓	✓

Notes: This tables examines whether our grid cell-level difference-in-differences estimates of the impact of slave raids on castle ownership in Poland-Lithuania (panel B, Table 4) are robust to subsetting the sample to different areas and time periods. The sample comprises 536 (0.5×0.5°) grid cells in Poland-Lithuania (1600 borders) observed 11 times between 1300 and 1800 in panel A; 536 grid cells in Poland-Lithuania (1600 borders) observed six times between 1400 and 1650 in panel B; 578 grid cells in Poland-Lithuania (1490 borders) observed 11 times between 1300 and 1800; and 1,433 grid cells in nine historical states within modern Poland (i.e., all polities excluding the Ottoman Empire) observed 11 times between 1100 and 1800. Robust standard errors, clustered by grid cell, in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

F.2 Russia

FIGURE A12. Defense Lines against Slave Raids in Russia



Notes: This map displays the location of defense lines constructed in response to slave raids in the Tsardom of Russia. Raiding trails and state borders from 1490 and 1600 are also indicated. Defense lines are based on maps and lists of garrison towns provided by Davies (2007) and Witzenrath (2022). Borders in 1490 are reconstructed from maps printed in *Ocherki Istorii SSSR: Konets XV-Nachalo XVII vv.* (Kopanev 1957), digitized and georeferenced by the authors; borders in 1600 are from the Euratlas Historical Political Boundaries of Europe database (Nüssli 2016).

FIGURE A13. Russian Urban Communities, 1646-1722

Notes: This map displays the location of 194 Russian urban communities with the right to engage in commerce or industry (*posady*) in the 17th and early 18th centuries, the unit of observation in Table 5. The data, which were compiled by Vodarskii (1966) and digitized and geocoded by the authors, are based on the Russian censuses of 1646-1647, 1649-1652, 1678-1679, and 1722. Dates of founding were gathered by the authors.

TABLE A23. SUMMARY STATISTICS FOR RUSSIAN URBAN COMMUNITIES DATASET

	N	Mean	St. Dev.	Min	Max
Servicemen (*Sluzhilye*)					
Servicemen Households, 1650	108	537.667	2,013.518	1	20,000
Servicemen Households, 1670-80	28	135.786	174.372	1	643
Servicemen Individuals, 1670-80	111	652.054	2,003.714	2	20,048
Traders and Artisans (*Posadskie*)					
Trader and Artisan Households, 1646	134	245.507	368.501	2	2,871
Trader and Artisan Households, 1652	99	356.889	565.277	5	3,615
Trader and Artisan Households, 1670-80	160	281.062	615.585	1	7,043
Trader and Artisan Individuals, 1646-52	138	775.072	1,304.392	8	9,399
Trader and Artisan Individuals, 1670-80	162	780.870	1,695.748	4	19,720
Trader and Artisan Individuals, 1722	176	1,006.097	1,433.595	2	13,673
Slave Raids					
Distance to Crimea via Watershed Boundary	194	7.849	0.343	6.977	8.711
Distance to Least-Cost Paths	194	280.879	290.977	0.102	1,491.203
Log Cumulative Raids, 1646	194	1.469	3.466	0	34
Log Cumulative Raids, 1670	194	1.670	3.749	0	34
Control Variables					
Distance to Crimea via Watershed Boundary	194	7.849	0.343	6.977	8.711
Distance to Least-Cost Path	194	280.094	290.207	0.102	1,487.415
Distance to Coastline	194	627.321	218.354	20.741	1,161.019
Minimum Distance to River	194	27.068	31.631	0.001	129.451
Soil Fertility	194	0.290	0.366	0.000	1.000
Date of Founding/First Mention	191	1,358.932	226.077	753	1,731
Distance to Moscow	194	440,238	278,625.500	0	1,522,273
Within 1490 Muscovy	194	0.675	0.469	0	1

Notes: This table reports summary statistics for variables in our analysis of Russian urban community (*posad*) population between 1646 and 1722 (Table 5). The data, which were compiled by Vodarskii (1966) and digitized and geocoded by the authors, are based on the Russian censuses of 1646-1647, 1649-1652, 1678-1679, and 1722. Dates of founding were gathered by the authors.

TABLE A24. Slave Raids, Defensive State Capacity, and Commercial Activity in Russian Urban Communities: Full Results

Outcome:	Log Military & State Officials		Log Traders & Artisans		
	Households (1650)	Individuals (1678-79)	Households (1646)	Households (1678-79)	Households (1722)
	(1)	(2)	(3)	(4)	(5)
Log Cumulative Raids by 1646	0.599*		-0.757**		
(Instrumented)	(0.354)		(0.370)		
Log Cumulative Raids by 1670		1.377***		-0.400	0.065
(Instrumented)		(0.322)		(0.252)	(0.238)
Distance to Moscow	0.00000	0.00000***	0.00000	0.00000	-0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Distance to Coastline	-0.002***	-0.002***	0.002***	0.001	0.00000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0005)
Distance to River	-0.009*	0.003	-0.007	-0.003	-0.001
	(0.005)	(0.006)	(0.005)	(0.004)	(0.003)
Soil Quality	1.208***	0.430	-0.204	-0.590	-1.256***
	(0.447)	(0.478)	(0.490)	(0.375)	(0.314)
Year of Founding/First Mention	-0.00004	0.002**	-0.004***	-0.003***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Within 1490 Muscovy	-1.064***	-0.743*	0.429	0.116	-0.193
	(0.343)	(0.426)	(0.331)	(0.258)	(0.220)
Constant	5.924***	1.999	9.347***	8.031***	9.515***
	(1.270)	(1.556)	(1.206)	(0.937)	(0.853)
N	108	110	133	157	175
First-Stage F-Statistic	39.129	58.803	37.632	66.332	64.772
R^2	0.372	0.272	0.098	0.116	0.285
Mean Outcome Variable	4.857	5.045	4.644	4.806	6.209

Notes: This table reports full second-stage 2SLS estimates of the impact of slave raids on indicators of defensive state capacity (columns 1-2) and commercial activity (columns 3-5) in Russian urban communities (*posady*) between 1646 and 1722 (presented in abridged form in Table 5). The treatment variable is the logarithm of cumulative raids on a community when the outcome is measured (i.e., 1646 or 1679), instrumented by its minimum distance to Crimea along a watershed boundary. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A25. Slave Raids, Defensive State Capacity, and Commercial Activity in Russian Urban Communities: OLS Estimates

Outcome:	Log Military/State Officials		Log Traders and Artisans		
	Households (1650)	Individuals (1678-79)	Households (1646)	Households (1678-79)	Households (1722)
	(1)	(2)	(3)	(4)	(5)
Log Cumulative Raids by 1646	0.744***		0.160		
	(0.180)		(0.157)		
Log Cumulative Raids by 1670		0.706***		0.051	0.288**
		(0.173)		(0.143)	(0.119)
N	108	110	133	157	175
R^2	0.376	0.357	0.290	0.177	0.298
Mean Outcome Variable	4.857	5.045	4.644	4.806	6.209
Community-Level Controls	✓	✓	✓	✓	✓
Within Muscovy (1490 Borders)	✓	✓	✓	✓	✓

Notes: This table shows that our instrumental variables estimates of the impact of slave raids on indicators of defensive state capacity and commercial activity in Russian urban communities (*posady*) between 1646 and 1722 are robust to conducting the analysis with OLS rather than 2SLS. The treatment variable is the logarithm of cumulative raids on a community when the outcome is measured (i.e., 1646 or 1679). Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A26. Relationship between Defensive State Capacity and Commercial Activity in Russian Urban Communities

Outcome: Log Trader & Artisan...	Households		Individuals	
	(1646)	(1678-79)	(1722)	(1722)
	(1)	(2)	(3)	(4)
Log Military Households (1650)	0.087	0.042	0.124**	
	(0.088)	(0.056)	(0.053)	
Log Military Individuals (1678-79)				0.173***
				(0.038)
Log Total Households (1646)		0.868***	0.517***	0.491***
		(0.075)	(0.079)	(0.088)
N	88	85	85	80
R^2	0.315	0.817	0.651	0.636
Mean Outcome Variable	4.749	5.112	6.684	6.786
Community-Level Controls	✓	✓	✓	✓
Within Muscovy (1490 Borders)	✓	✓	✓	✓

Notes: OLS estimates of the relationship between indicators of defensive state capacity and commercial in Russian urban communities (*posady*) between 1646 and 1722. All models control for minimum distance to a river and to a coastline, date of founding or first mention, soil fertility, distance to Moscow, and inclusion in Muscovy's 1490 borders. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

F.3 Wages and Prices

TABLE A27. Slave Raids and Earnings in Central and Eastern Europe, 1393-1913

Outcome:	Building Craftsmen		Building Laborers	
	Real Wage	Welfare Ratio	Real Wage	Welfare Ratio
	(1)	(2)	(3)	(4)
Exposure to Raids	2.462***	0.492***	1.944***	0.318***
	(0.477)	(0.065)	(0.001)	(0.049)
N	2,297	2,405	1,848	1,955
R^2	0.724	0.720	0.739	0.672
Mean Outcome Variable	7.706	1.478	4.623	0.878
City FEs	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓

Notes: Difference-in-differences estimates of the impact of exposure to slave raids on two indicators of earnings by building craftsmen and laborers in eight Central and Eastern European cities — Augsburg, Gdansk, Krakow, Leipzig, Lviv, Vienna, and Warsaw — over varying subsets of the period 1393-1913 (at the city-year level): (1) daily real wages in grams of silver per day; and (2) the welfare ratio, that is, average annual earnings divided by the cost of a poverty line consumption bundle. Data on these indicators come from Allen (2001). Robust standard errors, clustered by city, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

TABLE A28. Slave Raids and Consumer Prices in Poland, 1501-1776

Outcome: Consumer Price Index	(1)	(2)
Cumulative Raids	1.337***	
	(0.214)	
Cumulative Captives		0.001***
		(0.000)
N	57	57
R^2	0.910	0.920
Mean Outcome Variable	102.544	102.544
City FEs	✓	✓
Year FEs	✓	✓

Notes: Difference-in-differences estimates of the impact of exposure to slave raids on the price of a broad basket of consumer goods in six Polish cities — Kracow, Poznań, Lublin, Gdańsk, Warsaw, and Lviv — at 12 intervals between 1501 and 1776 (at the city-period level). The basket comprises the amount of rye/wheat, beans, meat, butter, soap, candles, lamp oil, linen, and fuel needed to support a household of two adults and two children for one year. Price data come from Malinowski (2016). Robust standard errors, clustered by city, in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

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