

Victory, Institutions, and State Formation in Latin America

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Abstract

Do winning wars strengthen all states equally? Building on recent work on war and state formation in Latin America, this paper argues that the effects of war outcomes depend on inherited institutional environments within countries. We combine country-year data on interstate war outcomes and state capacity between 1865 and 1913 with subnational measures of colonial institutional legacies aggregated to the national level. Rather than absorbing institutions through country fixed effects, we allow war outcomes to interact with countries' historical mixes of institutional environments. The results show that war outcomes had uneven consequences for state capacity: fiscal capacity responds systematically to defeat in countries with more extractive institutional legacies, while infrastructure expansion exhibits fragile and highly conditional patterns. These findings refine bellicist accounts by showing that war does not operate uniformly across institutional contexts and highlight the importance of modeling subnational institutional variation in studies of state formation.

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1 Introduction

Does war build states uniformly, or do its institutional consequences depend on the environments in which conflict occurs? Classical bellicist theories argue that external war pressures rulers to expand extraction, centralize authority, and develop the administrative capacity required to sustain coercion (Tilly, 1985). In this view, war making and state making are mutually reinforcing processes that generate durable increases in state capacity over time. Recent work has revived this perspective for Latin America, showing that nineteenth-century interstate wars—particularly their outcomes—shaped long-run institutional trajectories (Schenoni, 2020, 2024). Yet it remains unclear whether identical war outcomes produced comparable state-building effects across countries with very different institutional legacies.

In this paper, we argue that the effect of war outcomes on state capacity is conditional on inherited subnational institutional structures. Wars may generate political openings for fiscal reform and administrative expansion, but these openings do not translate mechanically into durable state-building gains. Across Latin America, colonial and early postcolonial development produced uneven legacies of inequality, political inclusion, and administrative capacity within the same national borders. These institutional differences shaped how states responded to major political shocks—including war—long after independence. As a result, similar war outcomes can yield sharply different state-building trajectories.

The interstate wars examined in this paper were neither rare nor trivial. Between 1865 and 1913, Latin American states fought repeated conflicts over territory, borders, and control of export-producing regions, often involving sustained mobilization, significant fiscal demands, and clearly defined winners and losers. Prominent cases include the Paraguayan War (1864–1870) and the War of the Pacific (1879–1883), which reshaped regional power balances and imposed long-lasting political and economic consequences on both victors and defeated states. These conflicts therefore constitute plausible shocks to state capacity rather than short-lived military episodes, making war outcomes—rather than mere participation—a meaningful source of institutional divergence.

To examine this conditional relationship, we extend the empirical framework developed by Schenoni (2020) by incorporating subnational variation in colonial institutions. We

combine his country–year panel of war outcomes and state capacity in Latin America between 1865 and 1913 with measures from [Bruhn and Gallego \(2012\)](#), which classify regions according to colonial economic activities and labor systems that generated durable differences in inequality, political inclusion, and administrative development within countries. Rather than absorbing these legacies through country fixed effects, we aggregate them to capture each country’s historical mix of institutional environments and estimate models that allow the postwar effects of victory and defeat to vary systematically with institutional exposure. This distinction is important because standard country fixed effects implicitly assume institutional homogeneity within national borders, whereas our argument treats institutional legacies as mediating structures that shape how states respond to war.

Our results show that war outcomes affected state capacity unevenly across institutional environments. For fiscal capacity—measured by government revenues—countries with greater exposure to historically extractive institutions experienced significantly larger postwar declines following defeat, while countries with more favorable institutional compositions exhibited more resilient fiscal trajectories. By contrast, infrastructure expansion, measured by railroad construction, displays no stable or systematic relationship with war outcomes across institutional contexts.

By bringing subnational institutional variation into the analysis of war and state formation, this paper contributes to three literatures. First, it refines bellicist accounts by showing that war outcomes do not operate uniformly, but interact with inherited institutional environments. Second, it advances research on institutional persistence by demonstrating how historical legacies mediate the effects of major political shocks rather than mechanically determining outcomes. Third, it highlights the importance of measurement choices in studies of state capacity, particularly in historical contexts where infrastructure investments may reflect political bargaining rather than administrative consolidation. Taken together, the findings clarify when and how war contributed to state formation in Latin America and underscore the role of institutional variation in shaping political development.

2 Main Argument

Classic bellicist theories hold that external conflict pressures rulers to expand extraction, consolidate authority, and construct the institutions needed to sustain coercion (Tilly, 1985). In this view, war making and state making are mutually reinforcing, as rulers bargain with societal actors to finance armies and, in the process, build more capable states. For Latin America, however, many scholars contend that the conditions underpinning this sequence—broadening fiscal extraction, centralized coercive capacity, and recurrent external threats—were only weakly present: fiscal systems remained narrow, political authority was dispersed, and major interstate wars were comparatively infrequent (Centeno, 2002). More recent work offers a different view, showing that nineteenth-century Latin America did experience wars intense enough to redirect institutional trajectories, and that war outcomes, rather than participation alone, shaped long-run development (Schenoni, 2020, 2024). Yet if war outcomes were a central turning point, an important question remains: did these same outcomes produce comparable state-building effects across countries, or did their impact depend on deeper institutional conditions?

We argue that the effect of war outcomes on state capacity is conditional on inherited subnational institutional structures. Victory is not uniformly transformative across Latin America: while war outcomes can reshape political incentives, their institutional consequences vary across historical environments. Colonial and early postcolonial development generated enduring subnational variation in institutional and economic structures, producing long-run differences in local state presence and development (e.g. Dell, 2010; Valencia-Caicedo, 2019). In some parts of Spanish America, factor endowments, dense indigenous populations, and profitable coercive labor systems led to highly unequal societies with extractive institutions that concentrated wealth and political power (Engerman & Sokoloff, 1997). Elsewhere, the institutional “fit” between colonizers and local societies produced more pluralistic arrangements that proved remarkably persistent over time (Mahoney, 2010). Building on this work, Bruhn and Gallego (2012) show that different colonial economic activities—classified as “good,” “bad,” or “ugly”—produced lasting subnational variation in institutional quality and political representation¹. These findings echo broader arguments that early distributions of economic and political

¹While some accounts argue that inequality and exclusive institutional arrangements hindered institutional development, other work suggests that similar conditions coexisted with episodes of institutional transformation, erosion of coercive labor systems, and modernization during the colonial and postcolonial periods (L. Abad &

power shape how states later respond to structural shocks (Aldaz Peña & Baquero-Mendez, 2025; Beramendi & Rogers, 2022), implying that Latin American polities entered the era of nineteenth-century wars with highly uneven subnational institutional foundations rather than a uniform baseline.

This institutional heterogeneity also has implications for how the effects of war on state capacity should be observed and measured. While wars may generate common political shocks across countries, the institutional environments into which these shocks are introduced shape not only whether states consolidate authority, but also which dimensions of state activity respond most directly². Existing work on war and state formation in Latin America has frequently relied on infrastructure expansion—most notably railroad construction—as an indicator of state-building, on the assumption that large-scale transportation projects require centralized authority, fiscal resources, and administrative coordination. We follow this convention in part to maintain continuity with prior research. However, our argument suggests that the relationship between war outcomes, institutions, and infrastructure is conditional and distinct from the mechanisms governing fiscal extraction. In institutional environments characterized by extractive legacies and abundant labor, postwar infrastructure expansion may be driven by elite coalitions, export-oriented interests, or localized investment incentives, even in the absence of broader administrative consolidation. By contrast, fiscal capacity more directly reflects the state’s ability to extract resources, enforce authority, and sustain centralized governance. This distinction motivates our joint analysis of railroad expansion and government revenues as complementary—but not equivalent—dimensions through which the conditional effects of war on state capacity can be evaluated.

These inherited structures condition the mechanisms through which war outcomes affect state capacity. Victory can confer legitimacy on central authorities and provide leverage to renegotiate fiscal compacts, discipline regional actors, and expand administrative structures (Schenoni, 2024). However, the durability and depth of these reforms depend on whether

Maurer, 2025; L. A. Abad & Maurer, 2024; Coatsworth, 2008). This complexity reinforces the need to examine how inherited institutional environments condition, rather than deterministically predict, the effects of external shocks such as war.

²Recent research shows that war-related military spending can crowd out public investment in education and other growth-enhancing activities (Madsen & Zaman, 2025). The magnitude of such crowding-out effects, however, is likely to depend on how the state is organized, which in turn may reflect inherited institutional legacies.

subnational institutions can absorb, sustain, and amplify postwar centralization, consistent with accounts emphasizing that postcolonial trajectories in Spanish America were shaped more by later political developments than by deeply entrenched colonial orders (Mahoney, 2010). Where local institutions are relatively inclusive or administratively coherent, victories can accelerate fiscal modernization and the extension of central authority. Where subnational institutions are patrimonial, exclusionary, or fragmented, victories confront entrenched local elites and weak bureaucratic infrastructures that limit the long-run consolidation of state capacity—patterns consistent with accounts of Latin American states as “born weak” in a late, trade-centered state formation context (Mazzuca, 2021; Soifer, 2015). Defeat similarly generates more severe institutional erosion where foundations are already fragile and less damage where more robust local institutions buffer political shocks.

This conditional perspective generates clear empirical implications. If subnational institutional legacies shape the returns to war outcomes, then the effect of victory or defeat on state capacity should vary systematically with the historical mix of institutional types within each country’s territory. Countries with a larger share of regions historically classified as “good” institutions should exhibit stronger state-building responses to victory than countries where “bad” or “ugly” institutions dominate; conversely, the institutional consequences of defeat should be most damaging where inherited institutions are already weak or exclusionary. In contrast to Schenoni (2020), who absorbs the influence of colonial institutions through country fixed effects, our empirical strategy explicitly models this heterogeneity by combining his country–year panel of war outcomes and state capacity with Bruhn and Gallego (2012)’s subnational classification of good, bad, and ugly institutions aggregated to the national level to capture countries’ inherited mixes of institutional environments. This design allows us to test whether identical war outcomes have differential state-building effects depending on the colonial institutional environments countries inherited, thereby specifying when and where war contributed to state formation in Latin America.

3 Data and Empirical Strategy

3.1 Data and Variables

The data used in this paper builds on two primary sources. First, we rely on [Schenoni \(2020\)](#), who compiles a comprehensive dataset describing war outcomes, state capacity indicators, and relevant political and economic controls for Latin American countries between 1865 and 1913. Second, we incorporate historical institutional measures from [Bruhn and Gallego \(2012\)](#), who classify colonial economic activities into *good*, *bad*, and *ugly* categories depending on economies of scale and the coercibility of indigenous labor. In particular, we obtained institutional classification at the subnational level and pre colonial population density. [Bruhn and Gallego \(2012\)](#) based their analysis on the reasoning made in [Engerman and Sokoloff \(1997\)](#) on factor endowments and anthropological records for population density using as a source [Denevan \(1992\)](#).

To identify war outcomes, [Schenoni \(2020\)](#) follows the Correlates of War classification in [Sarkees and Wayman \(2010\)](#), which defines interstate wars as military confrontations between sovereign states resulting in at least 1,000 battle deaths in a single year. State capacity indicators—specifically railroad mileage and national government revenue per capita—along with controls such as military size, public expenditures per capita, exports per capita, school enrollment, legislative effectiveness, and urbanization, are taken from the updated Cross-National Time-Series Data Archive ([Banks & Wilson, 2025](#)). In this paper, we rely on the 2025 version of this database.

3.2 Sample

The sample used in this paper is defined by the intersection of the data sets constructed by [Schenoni \(2020\)](#) and [Bruhn and Gallego \(2012\)](#). Whereas the goal of the former is to build a comprehensive database for Latin America, the latter aims to enable subnational comparisons between Latin America and North America. Naturally, in the merging process, all North American observations are discarded. The resulting data set includes information for the following countries: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guatemala, Honduras,

Mexico, Peru, Paraguay, El Salvador, Uruguay, and Venezuela. The final panel comprises 686 observations covering the period 1865–1913, yielding a balanced structure with 49 observations per country. Descriptive statistics for all variables are reported in the appendix.

3.3 Empirical model

The empirical motivation of this paper rests on the possibility that the effect of war outcomes may vary depending on the type of colonial institutions to which each country was historically exposed. [Schenoni \(2020\)](#) absorbs the influence of colonial institutions through country fixed effects, a standard approach in cross-country empirical research. However, this strategy masks the fact that countries experienced markedly different degrees of exposure to distinct institutional arrangements.

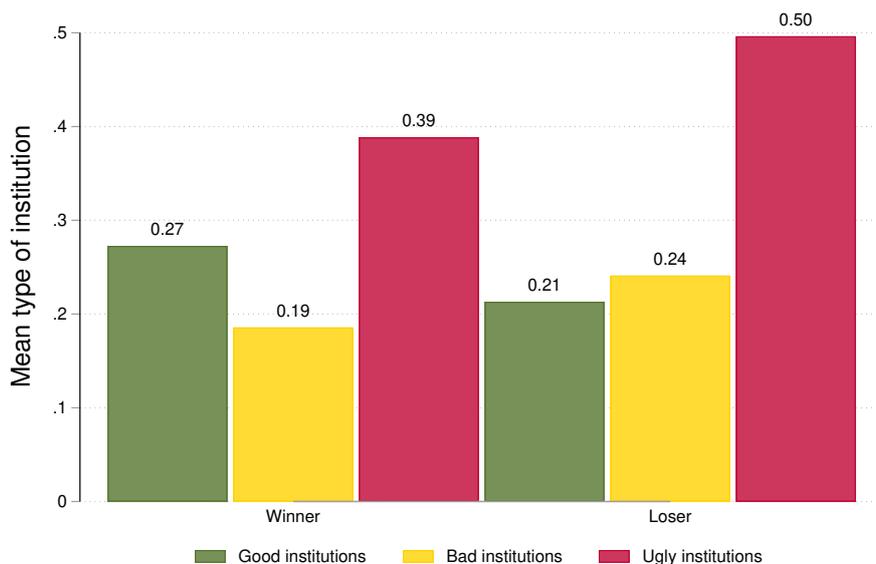
By using the data compiled by [Bruhn and Gallego \(2012\)](#) and aggregating it to the country level, we obtain the *share* of national territory historically associated with their classification of good, bad, and ugly institutions. This allows us to investigate whether heterogeneous institutional legacies condition the effect of winning (or losing) a war.

Figure 1 illustrates this empirical motivation. Even within the groups of winners and losers, there is substantial variation in the institutional environments inherited from the colonial period. The prevalence of ugly institutions is particularly striking among defeated countries, where the average share is roughly 11 percentage points higher than among winners.

Methodologically, we depart from the strategy of absorbing institutional effects solely through country fixed effects. This approach implicitly assumes that all regions within a country were uniformly affected by the same institutional legacy. However, a growing body of research on Latin America provides compelling evidence that the intensity and consequences of colonial institutions vary substantially across subnational regions (see, for example, [Dell \(2010\)](#); [Maloney and Valencia-Caicedo \(2016\)](#); [Valencia-Caicedo \(2019\)](#)).

The persistence literature frequently emphasizes local average treatment effects (LATE), which explicitly capture the localized impact of institutions within specific territories. From this perspective, it is plausible that strong institutional effects observed at the national level are driven by particular geographic regions rather than reflecting a homogeneous countrywide

Figure 1: Average type of institutions by war outcome



Note: Classification of institution follows [Bruhn and Gallego \(2012\)](#). War outcomes comes from [Schenoni \(2020\)](#).

legacy.

To examine whether the effect of war outcomes on state capacity depends on the institutional environments inherited from the colonial period, we build on the difference-in-differences framework developed by [Schenoni \(2020\)](#). His baseline specification estimates the effect of losing an interstate war on postwar trajectories of state capacity using a panel of Latin American countries with country and year fixed effects.

We extend this framework by explicitly modeling institutional heterogeneity. Rather than absorbing colonial legacies entirely through country fixed effects, we allow the effect of war outcomes to vary with the country-level exposure to different types of colonial institutions. These exposures are measured as the share of national territory historically characterized by *good*, *bad*, and *ugly* institutions, as classified by [Bruhn and Gallego \(2012\)](#).

We estimate a triple interaction model that extends the framework proposed by [Schenoni \(2020\)](#) by allowing the postwar effect of defeat to vary with historical institutional exposure. The empirical specification is:

$$\begin{aligned}
Y_{ct} = & \alpha_c + \delta_t + \beta_1 \text{Defeat}_c + \beta_2 \text{Post}_{ct} + \beta_3 \text{Institutions}_c \\
& + \beta_4 (\text{Defeat}_c \times \text{Post}_{ct}) + \beta_5 (\text{Defeat}_c \times \text{Institutions}_c) \\
& + \beta_6 (\text{Post}_{ct} \times \text{Institutions}_c) + \beta_7 (\text{Defeat}_c \times \text{Post}_{ct} \times \text{Institutions}_c) \\
& + X'_{ct}\theta + \varepsilon_{ct},
\end{aligned} \tag{1}$$

where Y_{ct} denotes the outcome variable of interest for country c in year t . Our main outcome variables will be railroad expansion (in Km) and government revenues, both variables come from [Banks and Wilson \(2025\)](#). The terms α_c and δ_t represent country and year fixed effects, respectively, which control for time-invariant country characteristics and common temporal shocks. Defeat_c is an indicator variable equal to one for countries that lost an interstate war, and Post_{ct} is an indicator for the postwar period. Institutions_c captures historical institutional exposure measured as the country-level share of territory associated with a given institutional type as classified by [Bruhn and Gallego \(2012\)](#); in the empirical analysis, Institutions_c corresponds to the share of *good*, *bad*, or *ugly* institutions (estimated in separate specifications). The vector X_{ct} includes the set of time-varying controls introduced by [Schenoni \(2020\)](#).

Following [Bruhn and Gallego \(2012\)](#), we classify colonial institutional environments into *good*, *bad*, and *ugly* institutions based on the interaction between factor endowments and pre-colonial population density. The authors argue that certain factor endowments—such as suitability for plantation crops or mining—generate strong incentives for extractive colonial activities, particularly when combined with access to coercible labor. *Ugly* institutions arise in regions characterized by extractive factor endowments and pre-colonial population density above the median, conditions that facilitated the exploitation of local labor. *Bad* institutions correspond to regions with extractive factor endowments but relatively low pre-colonial population density, where labor scarcity led to the exploitation of imported labor instead. Finally, *good* institutions are found in regions without extractive factor endowments and with pre-colonial population density below the median, settings in which colonial activities did not rely on systematic labor exploitation. This classification captures persistent differences in institutional quality rooted in colonial economic activities and labor arrangements. Figure [A4](#) reproduces a

summary table from the original paper.

The coefficient β_4 captures the average postwar effect of defeat when $Institutions_c = 0$. The coefficient β_6 allows postwar trajectories to vary with institutional exposure independently of defeat, while the coefficient β_7 is the main parameter of interest and measures how the postwar effect of defeat varies with the intensity of historical institutional exposure. All specifications include the same set of time-varying controls used by [Schenoni \(2020\)](#). All standard errors are clustered at the country level to account for serial correlation within countries over time³.

Given the presence of interaction terms between war outcomes, the postwar period, and institutional exposure, the parameters of the model are interpreted through marginal effects rather than raw coefficients. We therefore focus on the postwar marginal effect of defeat evaluated at different levels of historical institutional exposure. This approach allows us to directly assess how the consequences of war outcomes for state capacity vary across institutional environments, and it provides a clear mapping between the empirical specification and the heterogeneous effects we seek to test.

4 Results

4.1 Replicating results and comparing samples

We begin by comparing the original sample used in [Schenoni \(2020\)](#) with the final sample obtained after merging his data with the institutional measures from [Bruhn and Gallego \(2012\)](#). In the course of this replication exercise, we identified an issue in the clustering of standard errors in [Schenoni \(2020\)](#), which we correct in all subsequent estimations. In addition, we report wild bootstrap p-values, with inference appropriately clustered at the country level, consistent with the number of cross-sectional units in the original sample.

Table 1 reproduces the coefficient estimates reported in [Schenoni \(2020\)](#), while ad-

³During an initial replication exercise, we find that the standard errors reported in [Schenoni \(2020\)](#) are not correctly clustered at the country level. After correcting the inference procedure and re-estimating his baseline specifications, the substantive conclusions remain unchanged for fiscal outcomes. However, the estimated effects for railroad expansion become considerably more fragile, with statistical significance no longer robust to the appropriate clustering of standard errors.

justing the standard errors to reflect the correct number of clusters, namely the number of countries in the sample. After this correction, the estimated effect on railroad expansion—one of the proposed measures of state capacity—loses statistical significance. By contrast, the second outcome variable, logged government tax revenues, remains statistically significant at the 10% level. In columns 3 and 4, we apply the inverse hyperbolic sine transformation (IHS), following [Norton \(2022\)](#), to address skewness and the presence of zero values. Under this transformation, the coefficient on railroad expansion changes sign and remains statistically insignificant, whereas the results for government revenues are virtually identical to those obtained using logarithmic specifications. Finally, wild bootstrap inference yields non-significant results for railroad expansion, while government revenues attain significance only at the 12% level, falling short of conventional thresholds.

Next, [Table 2](#) reports estimates using the baseline sample for this paper, which is defined by the intersection of the data sets from [Schenoni \(2020\)](#) and [Bruhn and Gallego \(2012\)](#). In this sample, the number of clusters—corresponding to countries—is reduced to fourteen. Under this restriction, the estimated effect on government revenues becomes larger in magnitude and more precisely estimated. By contrast, railroad expansion remains statistically insignificant and continues to exhibit sensitivity to functional form assumptions ⁴.

This comparison highlights two important considerations. First, railroad expansion appears to be a relatively fragile proxy for state capacity in this sample. Second, although government revenues display greater stability across specifications, the sensitivity of the estimates to inference procedures suggests that a careful reassessment of the original results is warranted. With these considerations in mind, we proceed in the next subsection to examine whether accounting for institutional heterogeneity helps clarify the relationship between war outcomes and state capacity.

For the case of railroad extension, we adopt the inverse hyperbolic sine (IHS) transformation of the outcome variable. Because our empirical strategy relies on marginal effects derived from interaction models, this choice follows the recommendation in [Norton \(2022\)](#), which emphasizes the interpretability and stability of nonlinear transformations in such settings. We also report results in the appendix using the raw measure of railroad extension;

⁴We also transform the railroad variable using logarithms; the results lead to the same conclusions.

however, these specifications consistently yield statistically insignificant estimates.

Despite these limitations, we retain railroad expansion as an outcome of interest in the transformed specification. Consistent with our argument and with prior work, we do not interpret railroad construction as a comprehensive or direct measure of state capacity. Rather, its inclusion allows us to assess whether war outcomes generate infrastructure responses that parallel—or diverge from—those observed for fiscal capacity once institutional heterogeneity is accounted for. When analyzed jointly with historical institutional exposure and pre-colonial population density, railroad expansion captures underlying political and economic dynamics that are largely obscured in the raw measure. In particular, the transformed specification reveals that postwar infrastructure expansion responds unevenly across institutional environments and is concentrated in settings characterized by extractive legacies and abundant labor. These patterns do not yield stable or generalizable conclusions about state-building, but they are analytically informative: they indicate that infrastructure outcomes reflect localized political-economic processes—such as labor availability, elite coalitions, and export-oriented investment—rather than durable increases in centralized fiscal or administrative capacity. In this sense, the transformed railroad measure serves as a diagnostic outcome that clarifies how institutional environments condition postwar infrastructure responses, rather than as a literal indicator of state capacity.

Table 1: Schenoni Sample

	(1)	(2)	(3)	(4)
	Railroad exp	log Gov revenue	IHS Railroad	IHS Gov revenue
Defeat \times Post	-391.912 (449.192)	-0.185 (0.105)*	0.157 (0.728)	-0.185 (0.105)*
Observations	882	882	882	882
Controls	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Clusters	18	18	18	18
Mean	1294.40	6.10	5.53	6.79
W.bootstrap p-value	0.47	0.12	0.87	0.12

Cluster standard errors at the parish level in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Final sample merged with Bruhn and Gallego

	(1)	(2)	(3)	(4)
	Railroad exp	log Gov revenue	IHS Railroad	IHS Gov revenue
Defeat \times Post	-706.559 (679.602)	-0.296 (0.096)***	0.663 (0.818)	-0.296 (0.096)***
Observations	686	686	686	686
Controls	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Clusters	14	14	14	14
Mean	1640.44	6.07	6.11	6.77
W.bootstrap p-value	0.37	0.02	0.56	0.02

Cluster standard errors at the parish level in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.2 Heterogeneous effects from colonial institutions

To account for heterogeneity in institutional effects, we present our results using marginal effects and graphical analyses that explicitly illustrate how the impact of losing a war varies across different levels of institutional exposure. This approach allows us to move beyond average effects and directly examine how institutional composition conditions postwar state-capacity trajectories.

In the Appendix, we report the full set of regression results corresponding to the triple-interaction model described in equation 1. Tables A1, A2, and A3 summarize which institutional categories are, on average, associated with statistically meaningful heterogeneous effects. These results indicate that, for the inverse hyperbolic sine transformation of railroad expansion, the relevant source of heterogeneity is exposure to *ugly* institutions. By contrast, for the inverse hyperbolic sine transformation of government revenues, the relevant institutional dimension is exposure to *bad* institutions. Here, relevance refers to cases in which the triple-interaction term attains statistical significance at conventional levels, up to the 10% threshold.⁵

These results also underscore important limitations of railroad expansion as an indicator of state capacity. When railroad construction is analyzed in its raw form, we find no statistically significant or systematic relationship between war outcomes and infrastructure expansion across institutional contexts. This absence of average effects indicates that war does not generate uniform increases in railroad building and reinforces the view that infrastruc-

⁵For railroad expansion, the wild bootstrap p-value associated with the interaction involving ugly institutions is approximately 0.13.

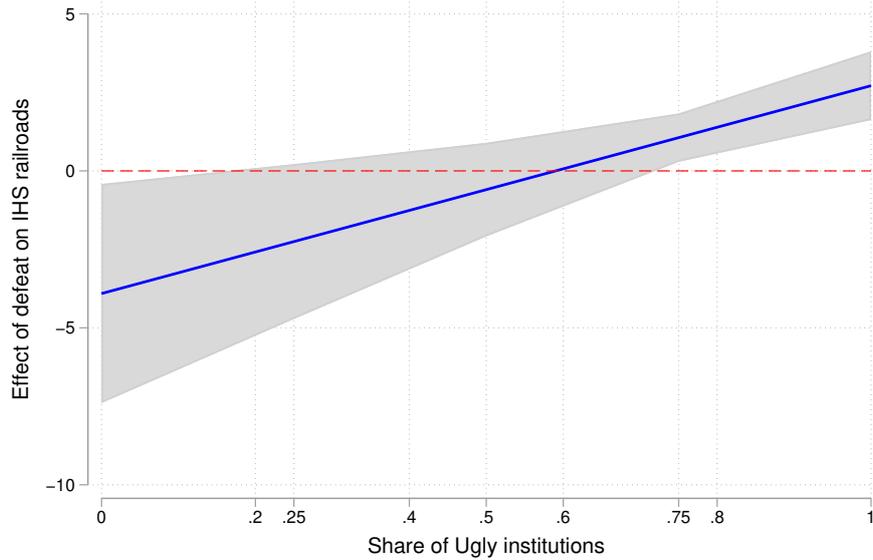
ture expansion is shaped by highly heterogeneous local conditions. The inverse hyperbolic sine transformation alters this perspective not by revealing a generalized state-building effect, but by allowing us to observe conditional responses that are otherwise masked by the skewed distribution of railroad outcomes and the prevalence of zero or near-zero expansions in many country–year observations. In this sense, the significance of the transformed specification reflects the fact that infrastructure responses to war are concentrated in specific institutional environments—particularly those characterized by extractive legacies and high labor availability—rather than broadly distributed across cases. We therefore focus our interpretation on the IHS results not because they yield generalizable conclusions about state capacity, but because they provide analytically useful insight into how institutional environments condition postwar infrastructure dynamics. Taken together, the contrast between the raw and transformed specifications reinforces our broader argument: railroad expansion captures localized political–economic processes that respond unevenly to war, whereas fiscal capacity offers a more stable and generalizable measure of state-building.

Figure 2 reports the marginal effect of defeat on the IHS transformation of railroad expansion across different levels of exposure to ugly institutions. A notable pattern emerges: at higher levels of exposure to ugly institutions—characterized by extractive factor endowments combined with high pre-colonial population density—railroad expansion increases following defeat. While this result may appear counterintuitive from a state-capacity perspective, it is consistent with the underlying political economy of infrastructure provision in highly extractive settings.

In environments with dense local populations, the availability of abundant and inexpensive labor facilitates large-scale infrastructure projects such as railroads. Moreover, such projects often align with the interests of local elites, who may organize to finance and promote railroad construction as a means of increasing rents from trade, land values, or export activities, even in the absence of broader fiscal or administrative consolidation. In this sense, postwar railroad expansion in highly extractive contexts may reflect private or localized investment incentives rather than an expansion of centralized state capacity.

This interpretation is reinforced by Figure 3, which shows a similar post-defeat relationship between pre-colonial population density and railroad expansion. Because the classifi-

Figure 2: Heterogeneous effects in railroad extension (IHS). Effect of defeat relative to the share of ugly institutions



Note: Marginal effects of defeat on railroad extension by type of institution

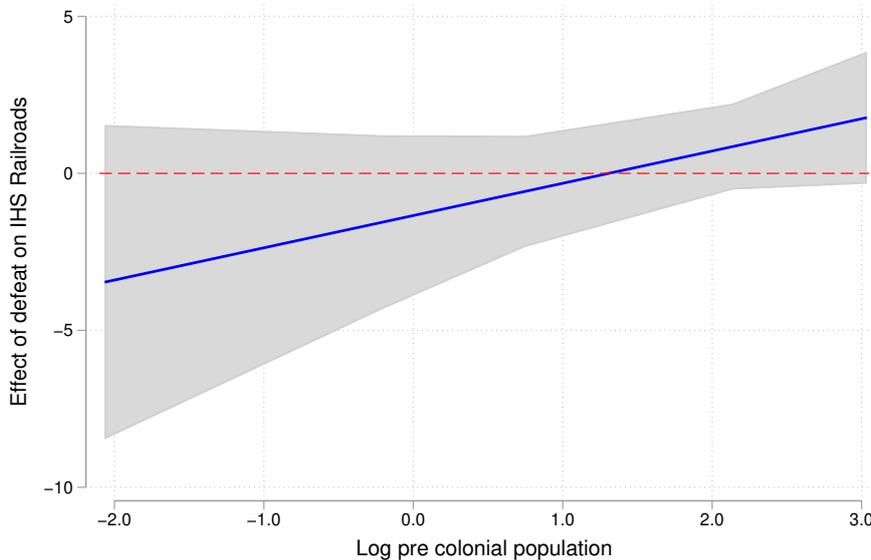
cation of ugly institutions relies in part on pre-colonial population density, this parallel pattern suggests that the estimated effect operates primarily through labor availability rather than through institutional transformation per se. Consistent with this interpretation, Figure A1 in the Appendix reports estimates using the raw measure of railroad expansion. Although the point estimates differ, they are accompanied by wide confidence intervals and are statistically indistinguishable from zero.

The absence of statistically significant average effects in the raw measure of railroad expansion is not in tension with the results obtained using the inverse hyperbolic sine transformation. Rather, it is informative about the nature of railroad construction itself. The raw specification tests whether war outcomes generated uniform increases in railroad expansion across countries, and the null result indicates that this was not the case. The transformed specification does not overturn this conclusion; instead, it allows us to examine how railroad expansion responds conditionally across different institutional environments by reducing the influence of extreme skewness and zero outcomes. In doing so, the IHS results reveal heterogeneous postwar responses that are systematically related to labor abundance and localized investment incentives, rather than to centralized fiscal capacity or administrative consolidation. Taken together, the raw and transformed results point to the same conclusion: railroad expansion does not operate as a general measure of state capacity, but reflects distinct political

and economic dynamics that vary with institutional context.

Taken together, these results point to two broader conclusions. First, railroad expansion—particularly in highly extractive institutional environments—may not be a reliable indicator of state capacity, as it can be driven by labor abundance and elite-led investment rather than by fiscal or administrative strengthening. Second, because railroad extension is used as an outcome in [Schenoni \(2020\)](#), we also report results using the raw measure for comparability. The absence of statistically significant effects in those specifications further supports the interpretation that railroad expansion captures dynamics distinct from those typically associated with state capacity.

Figure 3: Heterogeneous effects in railroad extension (IHS). Effect of defeat relative to the log of pre colonial population density



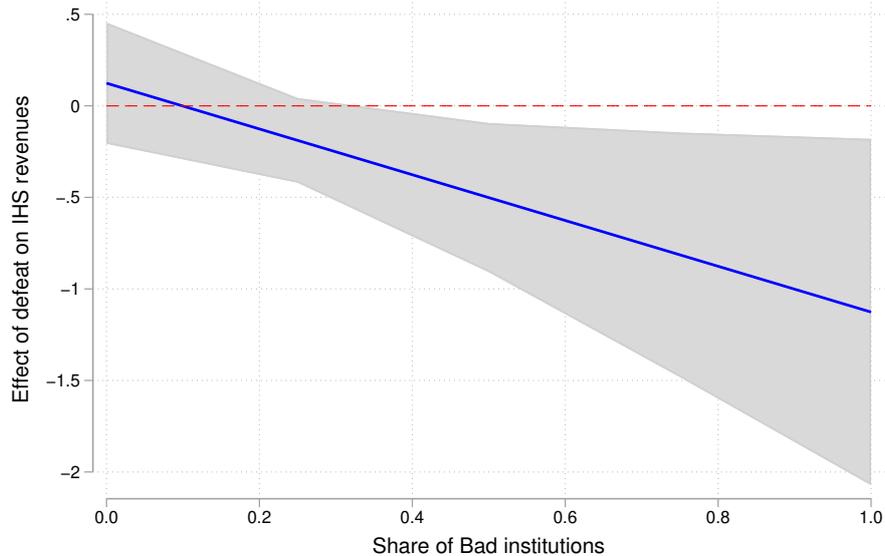
Note: Marginal effects of pre-colonial population density on railroad extension by type of institution

Turning to the second measure of state capacity—fiscal capacity—Figure 4 illustrates how institutional heterogeneity conditions postwar outcomes. In contrast to railroad expansion, the relevant institutional dimension for government revenues is exposure to *bad* institutions, defined as factor endowments that foster extractive arrangements independently of pre-colonial population density. The central result is that higher exposure to bad institutions is associated with a larger decline in government revenues following defeat. In other words, institutional environments characterized by bad institutions amplify the negative fiscal consequences of losing a war.

Unlike railroad expansion, government revenues exhibit a clearer and more stable

relationship with war outcomes and institutional exposure. This pattern supports the interpretation that fiscal capacity captures the core state-building processes of interest—namely, the ability of governments to extract resources and sustain centralized authority—rather than reflecting localized investment dynamics. As such, government revenues provide a more reliable measure of state capacity in this historical context.

Figure 4: Heterogeneous effects in government revenue (IHS). Effect of defeat relative to the share of bad institutions



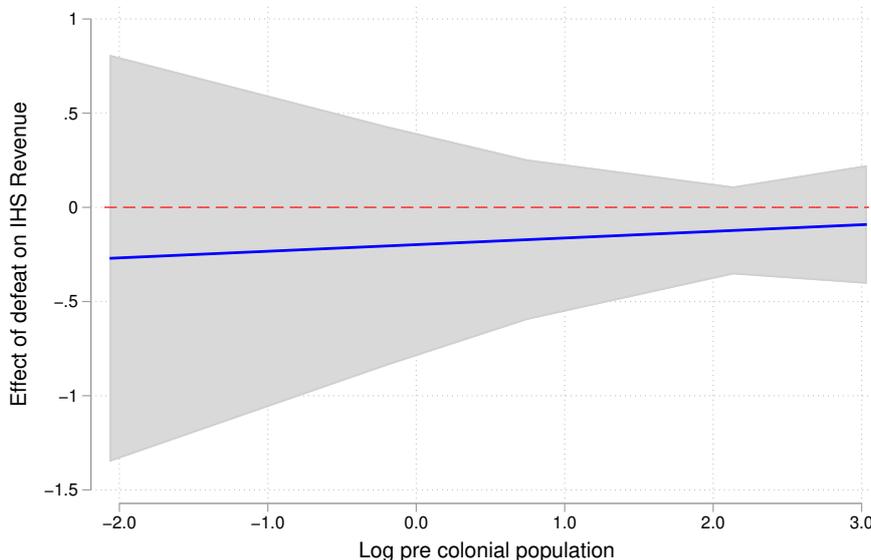
Note: Marginal effects of defeat on government revenue by type of institution

As an additional check, Figure 5 examines whether pre-colonial population density conditions the effect of defeat on government revenues. In contrast to the railroad results, the estimated marginal effect is statistically insignificant and effectively flat across the distribution of population density. This pattern suggests that, unlike infrastructure expansion, fiscal capacity does not depend on labor abundance or population concentration. Instead, government revenues reflect the state’s ability to extract resources from society, reinforcing the interpretation that this outcome captures the core dimension of state capacity relevant to our analysis.

Taken together, these results underscore a clear distinction between infrastructure expansion and fiscal capacity as channels of postwar state building. Railroad construction responds primarily to labor availability and localized investment incentives in extractive institutional environments, reflecting dynamics that are not necessarily indicative of centralized state strengthening. By contrast, government revenues more directly capture how inherited institutional legacies condition the state’s ability to extract resources and consolidate authority

after war. As a result, institutional heterogeneity shapes the state-building consequences of war primarily through fiscal capacity rather than through infrastructure expansion driven by local economic conditions.

Figure 5: Heterogeneous effects in government revenue (IHS). Effect of defeat relative to the log of pre colonial population density



Note: Marginal effects of pre-colonial population density on government revenue by type of institution

5 Discussion and Conclusion

This paper advances the study of war and state formation in Latin America by showing that the institutional consequences of conflict cannot be understood solely at the national level. While bellicist accounts emphasize how war outcomes shape state capacity, our findings show that these effects are mediated by inherited institutional differences within countries. Treating institutions as country fixed effects—though standard in cross-national research—implicitly assumes uniform institutional environments and risks obscuring meaningful variation in both the magnitude and the channels through which war affects state capacity. Instead, we show that similar war outcomes were followed by sharply different postwar trajectories across countries with distinct institutional compositions.

This perspective has broader implications for empirical strategies in the study of state formation. Fixed effects are often used to absorb historical and institutional differences, but when institutions themselves shape states' responses to major shocks, absorbing them may

eliminate precisely the variation of theoretical interest. Our approach instead treats institutions as mediating structures, allowing us to specify when war outcomes matter for state capacity and when they do not. More generally, the findings underscore the importance of moving beyond country-level homogeneity assumptions and incorporating historically grounded measures of subnational institutional variation into comparative analyses of political development.

A secondary implication concerns the measurement of state capacity. Our analysis does not treat railroad expansion as a direct measure of generalized state capacity, but rather as an auxiliary outcome whose behavior helps distinguish fiscal consolidation from infrastructure investment driven by local political–economic dynamics. One commonly used indicator—railroad expansion—appears to be a weak proxy for state capacity in the Latin American context. Railroads often reflected elite bargaining, selective routing, and distributional conflict rather than broad-based administrative consolidation. In Ecuador, for example, railway construction was shaped by competing regional elites and favored narrow local interests rather than national integration (Trujillo León, 1986). More broadly, railway development across the region frequently connected inland production centers to export ports, relied heavily on public investment or state-backed guarantees, and imposed substantial fiscal costs on governments (Halperin Donghi, 1998). As a result, railroad expansion may capture patterns of elite influence or export orientation more than underlying administrative or fiscal capacity.

Our empirical analysis reflects these limitations directly. We retain railroad expansion to maintain continuity with existing work and to assess whether infrastructure-based measures respond to war outcomes in ways comparable to fiscal capacity once institutional heterogeneity is taken seriously. The results show that they do not. When railroad construction is measured in raw terms, war outcomes do not produce systematic or generalizable effects across institutional contexts. Statistically meaningful patterns emerge only under nonlinear transformation, and even then they are highly conditional, concentrated in environments characterized by extractive legacies and abundant labor. We therefore interpret these results not as evidence of infrastructure-led state-building, but as insight into how postwar political–economic dynamics vary across institutional settings. In this sense, the railroad analysis is informative precisely because it highlights the limits of infrastructure expansion as a proxy for state capacity and reinforces the conclusion that fiscal extraction provides a more stable and theoretically appro-

priate measure of state-building in this context.

A natural question raised by our findings concerns the relationship between extractive institutional legacies and different forms of state capacity. Historical cases such as the Inka state demonstrate that highly coercive institutions could sustain large-scale mobilization and effective military organization. Our results do not contradict this observation. Instead, they highlight a distinction between the capacity to mobilize coercively and the capacity to consolidate durable fiscal and administrative institutions in the postwar period. Colonial extractive institutions were designed to facilitate resource extraction while limiting political incorporation and bureaucratic development. These features may enable short-run mobilization yet constrain the long-run expansion of centralized fiscal capacity following major political shocks such as war.

These findings point toward several avenues for future research. First, greater attention to subnational institutional variation may help reconcile competing results in the war and state-building literature, particularly in regions marked by uneven colonial and postcolonial development. Second, refining the measurement of state capacity—especially in historical settings where infrastructure investments were politically contested—remains an important task. More direct indicators of fiscal extraction, bureaucratic reach, and administrative enforcement may better capture the dimensions of capacity most relevant to theories of state formation. Taken together, these extensions would further clarify when war strengthens states, when it does not, and why similar shocks can produce divergent institutional trajectories.

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Appendix

Table A1: Heterogeneous effects ugly institutions

	(1)	(2)	(3)
	Railroad exp	IHS Railroad	IHS Gov Revenue
Defeat \times Post \times Ugly	-518.809 (1509.996)	6.621 (2.156) ^{***}	0.368 (0.422)
Observations	686	686	686
Controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Clusters	14	14	14
Mean	1640.44	6.11	6.77
W.bootstrap p-value	0.82	0.13	0.51

Cluster standard errors at the parish level in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Heterogeneous effects good institutions

	(1)	(2)	(3)
	Railroad exp	IHS Railroad	IHS Gov Revenue
Defeat \times Post \times Good	1062.808 (2535.225)	-5.149 (3.150)	-0.043 (0.730)
Observations	686	686	686
Controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Clusters	14	14	14
Mean	1640.44	6.11	6.77
W.bootstrap p-value	0.75	0.24	0.96

Cluster standard errors at the parish level in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

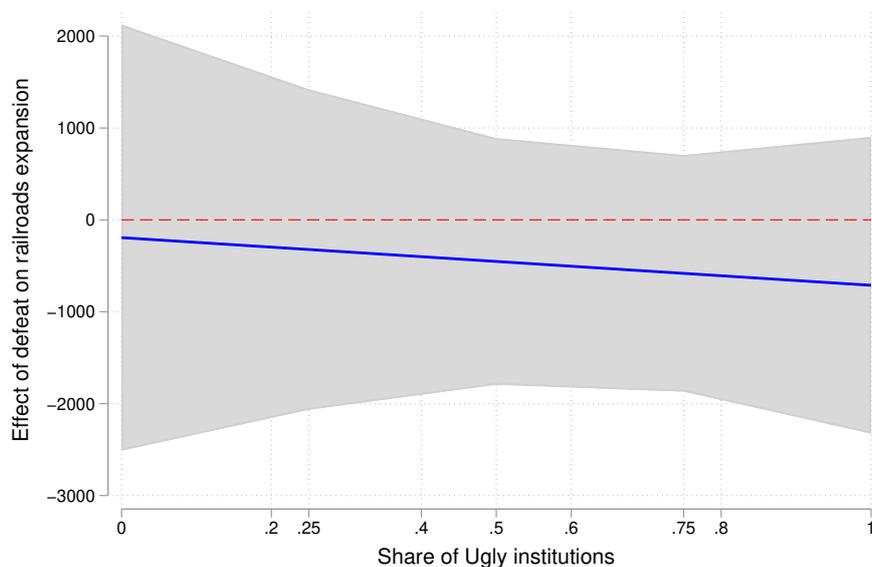
Table A3: Heterogeneous effects bad institutions

	(1)	(2)	(3)
	Railroad exp	IHS Railroad	IHS Gov Revenue
Defeat \times Post \times Bad	-3804.582 (4120.693)	-2.249 (4.190)	-1.250 (0.592)*
Observations	686	686	686
Controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Clusters	14	14	14
Mean	1640.44	6.11	6.77
W.bootstrap p-value	0.41	0.70	0.06

Cluster standard errors at the parish level in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure A1: Heterogeneous effects in railroad extension (raw measure). Effect of defeat relative to the share of ugly institutions



Note: xxxx

Table A4: Classification of Colonial Activities into Good, Bad, and Ugly

Colonial activities	Precolonial population density	
	Low	High
Without economies of scale	Good: No exploitation of labor	Ugly: Exploitation of local labor
With economies of scale	Bad: Exploitation of imported labor	Bad: Exploitation of local and imported labor

Note: Table adapted from Bruhn and Gallego (2012)

Table A5: Sample Statistics

	count	mean	sd	min	max
IHS trans. railroad extension	686	6.107	2.524	0.000	10.558
IHS trans. government revenue pc	686	6.768	0.858	4.771	8.805
dummy defeat	686	0.429	0.495	0.000	1.000
Share of ugly institutions	686	0.435	0.303	0.000	1.000
Share of good institutions	686	0.247	0.262	0.000	0.737
share of bad institutions	686	0.210	0.158	0.000	0.481
government expenditure pc	686	668.878	648.151	52.000	3318.000
Exports pc	686	1150.605	1118.154	190.000	6146.000
Military personnel	686	14.190	25.321	1.000	354.000
Effective legislature	686	1.583	0.749	0.000	3.000
School enrollment	686	9.997	18.117	0.000	150.000
Urbanization	686	201.972	384.904	0.000	2381.000
Land area	686	1403799.208	2089410.551	21393.000	8512000.000

Table A6: Summary Statistics (means) by Country (wbcode)

Variables	IHSrailroad ext	IHSgov rev pc	dummy defeat	Share ugly inst	Share good inst	share bad inst	gov exp pc	Exports pc	Military personnel	EFF. legislature	School enrollment	Urbanization	Land area
ARG	8.878564	7.695	0	0	.7083333	.0833333	1189.796	2965.163	13.55102	2.836735	7.265306	675.1429	2807857
BOL	5.095364	5.906068	1	.2222222	.5555556	.2222222	249.3673	568.6735	2.55102	1.632653	6.040816	0	1589306
BRA	8.839394	6.904317	0	.1481481	.2222222	.4814815	577.7347	1047.98	58.04082	1.857143	9.551021	1074.286	8348265
CHL	7.947178	7.985246	0	5.384616	0	.2307692	1734.204	2334.551	21.5102	3	42.7551	328.4694	620265.3
COL	5.949901	5.900809	0	.5333334	.1666667	.2	216.7347	376.1224	3.918367	1.306122	10.08163	79.63265	1083939
ECU	5.36526	6.258308	1	.4090909	.1818182	.3636364	331.2857	560.9388	2.795918	1.265306	1	0	284000
GTM	4.175113	6.650563	1	1	0	0	518.9592	741.8163	27.67347	1.55102	19.02041	0	109000
HND	3.530579	6.490454	1	.6111111	0	.3888889	331.102	526.7551	1.102041	1	15.28571	0	112000
MEX	8.640624	6.198462	0	.625	.03125	.28125	257.6327	381.7143	27.65306	1.183674	8.510204	393.0408	1972000
PER	7.200138	7.250605	1	.4583333	.0416667	.4166667	997.9592	859.7755	9.387755	1.571429	8163266	97.81633	1335429
PRY	5.107092	5.990843	1	.2777778	.5	.0555556	249.5102	585.4898	7.408163	.8979592	.3061225	0	171020.4
SLV	4.046446	6.787612	0	1	0	0	457.7551	742.9592	12.22449	1	7.959184	0	21393
URY	5.950372	8.181219	0	0	.7368421	0	1880.878	3696.082	5.204082	2.061224	9.6593061	179.2245	176000
VEN	4.775313	6.551748	0	.2631579	.3157895	.2105263	371.3673	720.449	5.632653	1	1.714286	0	1022714