Essays on political economy

by

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Abstract

The chapters in this thesis tackle different questions, but share the attempt to open the "black box" of the relationship between institutions and economic outcomes.

In the first chapter, I examine mass media's role in countering special interest group influence by studying county-level support for US Senate candidates from 1980 to 2002. I use the concentration of campaign contributions from Political Action Committees to proxy capture of politicians by special interests, and compare the reaction to increases in concentration by voters covered by two types of media markets – in-state and out-of-state media markets. Unlike in-state media markets, out-of-state markets focus on neighboring states' politics and elections. Consistent with the idea that citizens punish political capture exposed in the media, I find that an increase in concentration of special interest contributions reduces candidate's vote shares in in-state counties relative to the out-of-state counties, where the candidate receives less coverage.

The second chapter (with Daron Acemoglu and Simon Johnson) examines the effect of population growth on violent conflict. Exploiting the international epidemiological transition starting in the 1940s, we construct an instrument for changes in population (Acemoglu and Johnson, 2007) and find that countries with higher (exogenous) increases in population experimented larger increases in social conflict. Using a simple theoretical framework, we interpret these findings as evidence that a larger population generates greater competition for resources and makes violence more likely if institutions cannot handle the higher level of disputes.

The third dissertation chapter asks the following question: if property rights in land are so beneficial, why are they not adopted more widely? I propose a theory based on the idea that limited property rights over peasants' plots may be supported by elite landowners to achieve two goals. First, limited property rights reduce peasants' income from their own plots, generating a cheap labour force. Second, they force peasants to remain in the rural sector to protect their property, even if job opportunities appear in the urban sector. The theory identifies conditions under which weak property rights institutions emerge, and provides a specific mechanism for the endogenous persistence of inefficient rural institutions.

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[1] **This Chapter was written with Daron Acemoglu and Simon Johnson.**

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Chapter 1

Media Markets, Special Interests, and Voters

1.1 Introduction

Interest groups pursue different strategies to influence policy[1]. These include gathering information that supports their positions, taking their arguments to politicians and the public to win sympathy, and undertaking disruptive activities to coerce policymakers into making concessions (Grossman & Helpman, 2001). Yet, the activity that receives perhaps the most attention from media, the public, academia, and policymakers, is interest groups' campaign contributions to parties and candidates as a vehicle for influencing policy.

How can these practices be avoided? In a democracy, elections form the most basic safeguard against potential undue influence of interest groups through campaign money. If financial support from special interest groups appears improper, voters may punish the candidate by voting against him. Of course, for this mechanism to be valid voters need to be well informed. Since the main source of political information for voters is mass media, the presence of a free, independent mass media is a key component of democratic political institutions.

In this paper, I examine the role of mass media in countering special interest group influence. I do so by examining the extent to which county-level support for candidates to the United States Senate from 1980 to 2002 varies as a function of media exposure and candidates' campaign finance

[1]I thank Sarah Hamilton and participants of the MIT/Harvard Development Seminar and MIT Political Economy Breakfast for comments, in particular, Maria Angélica Bautista, Melissa Dell, Dave Donaldson, James Feyrer, Jens Hainmueller, Horacio Larreguy, Gabe Lenz, Samuel Pienknagura, Vince Pons, and Pablo Querubin.

profiles.

To measure media exposure, I rely on the geographical patterns of TV markets. More specifically, I use the Areas of Dominance Influence (ADI's) for TV markets defined by Arbitron (a media and marketing research firm). These areas define each television market exclusive of the others, based on the geographic distribution of television viewers. Every county is allocated exclusively to one ADI, and each market's ADI is the set of counties in which the home market stations receive a preponderance of viewing. A simple example with the Denver-CO and Lincoln-NE ADI's is depicted in Figure 1. Most counties of the Denver-CO ADI lie in Colorado. Consequently, this is a Colorado-centered media market that focuses on providing information about Colorado politics. However, as seen in the figure, ADIs trascend state borders and a few counties in Wyoming and Nebraska are in the Denver-CO ADI. These counties, therefore, are more likely to get information about Colorado politics than about their own states. For example, a Nebraska county of this type is exposed to less information about Nebraska state politics than the counties in the Area of Dominance Influence of the Lincoln-NE market shown in the figure (a media market largely comprised of Nebraska counties and thus centered in Nebraska).

I follow Ansolabehere et al. (2006) in defining the dominant state of a media market (ADI) to be the state that has a majority of the population of that media market. I refer to counties in ADI's dominated by their own state as "in-state" counties. Likewise, a county is in a media market that is out-of-state dominated if the state the county is in has a minority of the population of the media market. Ansolabehere et al. (2006) show that voters in out-of-state markets receive much less television coverage of their state's politics than voters covered by in-state media markets. Thus, comparing the behavior of in-state market voters with voters in out-of-state media markets provides one possible approach to examine the role of mass media.

I use campaign contribution data to construct a proxy for "capture" of politicians by special interests. In particular, I use data on contributions from Political Action Committees (PACs) to candidates to build Herfindahl concentration indices, at both the PAC and more aggregate industry levels. The idea behind this approach is that a more concentrated pattern of contributions (i.e., a high Herfindahl index) is a good proxy for the extent to which a candidate is "captured" by narrow interest groups. Put differently, candidates with more dispersed contribution sources are preferred by voters because they are less susceptible to capture by one of the (many) interest groups sponsoring them.

My main finding is that an increase in the concentration of campaign contributions leads to

a differential response from voters across different media markets. The estimates suggest that the share of the two-party vote for an incumbent with a Herfindahl index one-standard deviation higher than average will be about 0.5 to 1.5 percentage points lower in in-state counties relative to out-of-state counties, where the candidate receives less coverage.

I address the concern that these results may be driven by the fact that counties in out-of-state dominated media markets are different in other dimensions to in-state counties. In particular, the negative impact of the interaction between campaign contribution concentration and increased media exposure is present in specifications with county fixed effects, which rely solely on variation in the Herfindahl indices across time within the same county to estimate the coefficient of interest. Also, I focus on in-state counties that are geographically contiguous to out-of-state counties. After demonstrating that they are similar to out-of-state counties on a number of observable characteristics, I reestimate the effect using solely these observations and find similar results.

I perform an additional robustness check with a placebo test designed to verify whether the movement from in-state to out-of-state counties captures a general geographic trend in the response to concentrated contributions that is unrelated with media exposure. To this end, I define the in-state counties that border out-of-state counties to be the (placebo) out-of-state counties. Then, I compare them to adjacent in-state counties in the same state. Since these sets of counties are both in-state counties with good access to information, there should be no correlation between increases in concentration and moving across county categories. Indeed, I find no correlation between increases in concentration and moving across county categories.

As noted, I use the pattern of campaign contributions as the main proxy for political capture by interest groups. Conveniently, I can build a simple measure for every representative based on campaign finance data alone. Still, it is important to take a step back and ask how voters think about special interest money. Historical anecdotes and the press' treatment of campaign money seems to indicate a clear answer: most voters dislike campaigns fueled by interest money. However, the answer is not obvious. When special interest groups have an informational advantage, their contributions may signal candidate quality. My results suggest, however, that voters assess interest group money negatively. Also, I present evidence that they do so in a relatively sophisticated way. Specifically, voters punish *total* interest group money less than they punish concentration of interest group money from a few sectors. These results support the idea that voters punish "capture" of politicians by narrow interest groups.

A related point is whether the suggested mechanism demands an unrealistic degree of knowledge

on the part of voters. But even if individuals do not know the approximate pattern of campaign contributions (a reasonable assumption for most voters), a candidate with a more concentrated pattern of contributions is prone to being pinpointed by journalists or his opponent as potentially "captured." Such a candidate is likely to figure in ads and news as linked to the economic sectors that heavily contribute to his campaign.

To verify that this is the case, I conduct automated news searches for a sample of US newspapers, counting how frequently are Senate candidates featured in news stories. For each candidate, I also count the number of stories that discuss PAC money in the campaign ("PAC stories"). The results are reassuring about the validity of the approach. There is a positive and significant correlation between the share of PAC stories for a candidate and the candidate's Herfindahl concentration index. This suggests that the concentration indices do proxy for media exposure of campaign contribution profiles. An additional important advantage of this exercise is that it helps address the concern that campaign finance concentration captures some other omitted candidate characteristics which differentially affect their performance across counties (e.g. if candidates with higher Herfindahls are more or less "popular"). Indeed, by computing the number of PAC stories as a share of the candidates' total number of stories, I directly normalize by how popular or appealing the candidate is in the media. And, more compellingly, there is in fact no correlation between the candidates' Herfindahl and his total number of news stories[2].

Moreover, additional results highlight the role of information and the robustness of the main results. Given that a large theoretical and empirical literature suggests an association between better information and higher turnout, I examine whether turnout is higher in-state than out-of-state. I find that in-state counties do have larger turnout than their (otherwise similar) contiguous, out-of-state neighbors. My estimates imply a 1.7 to 2 percentage point higher turnout in in-state counties. Furthermore, a regression of turnout on a dummy for the placebo out-of-state counties versus other in-state neighbors finds no effect, which confirms the hypothesis that information (not other differences resulting from moving toward out-of-state counties) drives differences in turnout.

This set of results opens the discussion concerning whether the concentration of campaign finance money for Senate candidates has negative spillovers for fellow party members running for other offices. To test this idea, I examine if in years where, for example, the Democratic senator has

[2]The only drawback of this exercise is that online newspaper archives are typically available only since the 1990s (at best). Hence, I cannot systematically code the share of PAC stories as an alternative measure of "capture" to replicate my main specifications with this variable. However, as indicated the correlations where information is available lend support to the validity of the approach.

a relatively high Herfindahl, the Democratic Presidential (or House) candidate tends to do worse in in-state counties relative to out-of-state counties. I find no important spillover effects of this sort[3].

This non-result, however, reaffirms that the main findings are not driven by partisan trends. Indeed, a potentially serious objection to my findings is that partisanship moves in different directions in different counties across different years. Unfortunately, I cannot control for a full set of county-year fixed effects, since the variation I use to estimate the key interaction terms is at this level. However, the regressions for Presidential and Congressional races can in fact be thought of as placebo tests to rule out this interpretation. If important partisan trends were driving the results, specifications with vote share of fellow party members as the dependent variable should mirror the effects observed for the vote share of the incumbent.

In sum, the overall evidence presented in this paper supports the idea that mass media, by informing voters, may reduce the influence of special interest groups in policy. Better access to mass media allows voters to react to potentially negative information about their candidates, and specifically to the possible influence of narrow interests in the politicians' agenda.

The results also reaffirm the idea that patterns of special interest campaign contributions signal political capture of representatives to voters. The fear of politicians' capture has long been prevalent in the United States politics and mass media, and some of the most famous political scandals have involved the alleged use of contributions in exchange for favors[4]. The subject most recently hit the headlines in connection with the recent financial meltdown. Analysts have emphasized the political force of Wall Street banks in Washington as the fundamental cause of the crisis. While certainly not their sole source of influence, campaign contributions are among the perceived sources of power for special interests. Johnson & Kwak (2010) express it clearly:

> Financial sector money poured into the campaign war chests of congressional representatives (...) Campaign contributions and the revolving door between the private sector

[3] I also find little evidence of other types of information spillovers. For example, it does not appear that voters in out-of-state counties rely on partisan cues and punish the candidate of the party with a high Herfindahl index in the neighboring state (from which they receive information), nor that they rely on comparisons between the campaign finance profiles of candidates in their state with those in neighboring states.

[4] The topic has been at the center of the policy debate since at least 1957, when allegations of improper influence of this sort led Senate to establish the Special Committee to Investigate Political Activities, Lobbying, and Campaign Contributions. A famous earlier attempt to control interest money was President Theodore Roosevelt's argument, in 1905, for a ban on all political contributions by corporations, and his call, in 1907, for public financing of federal candidates via candidates' political parties. In 1989, the "Keating Five" scandal (so named because it involved five senators accused of improperly intervening in 1987 on behalf of Charles H. Keating, Jr.) attracted public attention. Keating provided substantial political contributions to each involved senator and was chairman of Lincoln Savings and Loan Association, an institution targeted in investigations by the Federal Home Loan Bank Board in the midst of the Savings and Loan crisis of the late 1980s and early 1990s.

> and government service gave Wall Street banks influence in Washington, but their ultimate victory lay in shifting the conventional wisdom in their favor (...) Of course, when cracks appeared in the consensus, such as in the aftermath of the financial crisis, the banks could still roll out their conventional weaponry— campaign money and lobbyists (p. 5).

Similar concerns about the influence of banks before and during the financial crisis and subsequent bank reform arose in the recent "mid-term elections." To cite one example, one perspective noted that Spencer Bachus (R.-Ala), the man most likely to become chairman of the House Financial Services Committee "received well over a million dollars from political action committees representing banks, insurance companies and auditors over the past two election cycles. And wasting no time, on Wednesday, reports the Financial Times, Bachus sent a letter to the Financial Stability Oversight Council (...) that reads as if dictated by bank lobbyists"[5].

In short, in the US as in many countries there is a general perception that special interest groups can exercise to some degree the levers of power, using campaign contributions as a primary instrument to do so. Yet, there also exist key institutions, free media among them, that exert control over such influence. For instance, many argue that an active, informative press reduced corruption in the Progressive Era[6]. Discussing the period of antitrust reform in the early XXth Century, Acemoglu & Robinson (2010) highlight the role of a free press to expose the excesses of Robber Barons as well as corruption in local and federal politics. Among the examples discussed, one of the most telling about the potential of a free press to counter special interest influence is that of famous "muckraker" Ira Tarbell. Tarbell wrote the "History of the Standard Oil Company," which played a key role in moving public opinion against Rockefeller and his business interests in Standard Oil.

As Acemoglu & Robinson (2010) note, the US experience in the first half of the 20th century emphasizes that free media is a key component of the set of "inclusive institutions" that determine economic success. Absent these institutions, under absolutism or under dictatorships, the US public probably would not have mobilized against the power and abuses of Robber Barons and their trusts.

[5] "Republicans begin carving up bank reform", by Andre Leonard. In Salon, November 4, 2010. http://www.salon.com/technology/how_the_world_works/2010/11/04/spencer_bachus_wall_streets_man_in_washington/index.html

[6] Along these lines, Glaeser et al. (2004) argue that the US newspaper industry between 1870 and 1920, which expanded its circulation and became more informative and less partisan, partly caused the decline of political corruption in that period. Moreover, the entry of US daily newspapers from 1869-1928 produced a more active electorate, increasing voter turnout (Gentzkow et al., 2009).

The evidence in this paper supports this view that mass media, by informing voters, constitutes a vital component of the "inclusive institutions" which promote political and economic development by reducing the influence of special interest groups in policy.

1.1.1 Related literature

This paper is related to several strands of literature, most notably, to the relatively recent but fast-growing economics literature on the political economy of mass media (see Prat & Strömberg (2010)).

A central topic in this line of research is the role of free media in affecting policy and improving political accountability[7]. Although not focused on the potential effect of better information on reduced interest group influence, several empirical papers show how availability of information empowers voters and affects policy (see, for instance, Strömberg (2004b) and Besley & Burgess (2002)). Snyder and Strömberg's (2010) work, which estimates the impact of press coverage on citizen knowledge, politicians' actions, and policy, closely relates to this paper. The authors exploit the match, or "congruence" between newspaper markets and US congressional districts. Varying congruence causes news coverage of politics to vary across districts, but unlike other measures of media availability, it does not directly affect key outcome variables of interest. Results are largely supportive of the key role of media in facilitating political accountability. Along these lines but in a developing country context, Ferraz & Finan (2008) find that news about local corruption as uncovered by (randomly assigned) audit reports on Brazil's municipal mayors hurts incumbent's electoral performance. Furthermore, these effects are more pronounced in municipalities where local radio is present to divulge the information. In a field experiment, Banerjee et al. (2010) provide Indian slum dwellers with newspapers containing report cards on candidate qualifications and performance. The results indicate that better information increases voter turnout, reduces the incidence of cash-based vote buying, and causes electoral gains for better performing incumbents.

This paper follows this line of research by studying the role of free media on improving political accountability, and in particular in changing the electoral support for certain types of candidates. However, unlike previous work, it emphasizes the role of mass media in countering special interest

[7]Several theoretical contributions imply a role of media in countering special interest group influence. For instance, in Strömberg's (2001, 2004a) theory, mass media counteracts special interest group influence for two reasons. First, the increasing returns to scale nature of their technology and their need for advertising revenue induce media outlets to provide news to large groups rather than small interests. Thus, mass media entices politicians to "pay more attention" to the better-informed, larger audience. Second, by reducing the share of uninformed voters, free media reduces the effectiveness of advertising purchased with campaign contributions.

group influence.

In terms of the empirical strategy, the differences between in-state and out-of-state counties exploited in this paper were first studied by Ansolabehere et al. (2006). While these authors study a different question, my results may explain their surprising result: no effect of television coverage on the incumbency advantage for senators and governors. This runs against the conventional view that the rise of television played an important part in the rise of the incumbency advantage in the US (see, e.g. Erickson (1995)). This conventional logic is largely based on two premises. First, incumbents have an advantage when raising campaign funds. Second, television maximized the impact of campaign funds by facilitating personal appeal to voters. Both premises may well be true, but television can also inform voters about potentially negative candidate traits. With concentration of campaign contributions acting as a proxy for the degree of capture, this paper shows that incumbents (more so than challengers) are likely to be depicted as captured in media markets and get punished by voters.

The paper is also related to a vast empirical and theoretical literature on campaign contributions. Much of the theoretical work assumes that there are "informed voters" who vote for candidates based on their policy positions, and "uninformed" voters who can be swayed by campaign advertising. Funds for advertising, provided by interest groups, depend upon the positions taken by the candidates, and these positions take their implications for contributions and votes into account (Morton & Cameron (1992) offer an early review)[8]. While this work incorporates the response of voters to overall campaign expenditures, less research investigates how the sources of money raised by politicians influence voters. This occurs partly because the approach described above assumes that "uninformed" voters do not have rational expectations. As emphasized by Coate (2004), if they did, they could realize that a party involved in advertising must distort its policy platform to obtain the necessary funds, and switch their votes *against* the advertised party! Similarly, the empirical work has focused mostly on the effect of *gross* campaign expenditures on electoral outcomes and in altering policy positions or securing favors (see Stratmann (2005) for a review).

More recent work reviewed in Prat (2006) seeks to provide a more satisfying analysis assuming that voters update their beliefs rationally. In this approach, private campaign finance creates

[8] A much-cited contribution by Grossman & Helpman (1996) builds on Baron (1994) offering a model in which campaign giving by interest groups may be motivated by both an electoral motive (help politicians with favorable positions win elections) and by an influence motive (a straightforward *quid pro quo* of money for services).

a trade-off between a policy distortion and an informational benefit. In equilibrium, qualified candidates receive more contributions than unqualified candidates, and this provides voters with information about candidates' quality. However, candidates may need to distort their policy choices (away from voters' interests) in order to attract private donations. An empirical exercise inspired by these theories of campaign finance with rational voters is conducted by Prat et al. (2006). Using a survey-based dataset about the effectiveness of state legislators in North Carolina, they ask what voters can learn about the candidate characteristics from the amount and pattern of contributions received during the campaign[9].

Only a few other papers have examined the impact of campaign finance composition on voter behavior[10]. Vanberg (2008) uses data on the US House of Representatives from 1990 to 2002 and finds no evidence of a negative relation between a candidate's reliance on large contributions and votes[11].

Instead, Dharmapala & Palda (2002) find a negative relationship between the concentration of contributions and vote shares for open-seat candidates and challengers in the US House from 1980 to 1992, with no robust relation for the incumbents[12]. As a potential explanation, they suggest, in line with the argument put forward in this paper, that interest groups seek favors for themselves, and thus are in conflict with each other and with the voters. Therefore, if campaign contributions are instrumental in securing these favors, candidates with more dispersed contribution sources are less susceptible to being captured by any one group and are preferred by voters[13]. However, they admit that causality may run the other way: candidates with a higher likelihood of winning may

[9]They find that the total amount a candidate receives is a weak predictor of that candidate's effectiveness, and that small-sized (large) contributions from organizations positively (negatively) signal effectiveness. They conclude that the evidence contradicts the informational argument in favor of private funding when contributions are large or when they come from individuals and parties. Experimental results by Houser & Stratmann (2008) support the prediction that voters respond to advertising differently between special interest and publicly-financed campaigns.

[10]Aside from those cited, see also Palda & Palda (1998) who suggest French voters punish candidates who raise money from narrow sources.

[11]His motivation is to examine one argument in support of contribution limits: that they equalize the influence of individual donors and thereby cause candidates' aggregate financial resources to more accurately reflect public support. To capture this idea, he proposes a model in which candidates' reliance on large contributions (controlling for the total amount of contributions they receive) is negatively related to voter-preferred characteristics which cannot be credibly revealed through campaign advertisements. He thus suggests his result casts doubt on the relevance of the "equalization" argument.

[12]Their motivation is to dispute the Supreme Court's view in Buckley v. Valeo that campaign spending is a form of speech, but campaign contributions are not. An empirical link between the sources of a candidate's contributions and that candidate's share of the vote, they argue, would suggest contributions are a form of speech as well.

[13]An alternative account for why voters may respond positively to the degree of dispersion of a candidate's contributions is also discussed. Interest groups are "benign", in the sense that their interests are identical to those of each other, and of the voters. However, the groups have private information concerning the best way to achieve the common aims and their contributions are a way of buying access to legislators. Hence, a candidate with more dispersed contribution sources may end up being better informed.

attract a wider pattern of contributions.

This paper differs from Dharmapala & Palda (2002) in various ways. By exploiting the differential impact of concentrated patterns of contributions across different media markets, I attempt to rule out the reverse causality story. In fact, using this approach I find higher concentration is *positively* correlated on average with incumbent vote shares in out-of-state markets where information is poorer. An offsetting negative correlation only arises in in-state media markets. Also, I find no significant effects on challengers from my main interaction of interest–namely, the effect of increased concentration in contributions together with increased media exposure. Instead, my results are robust only for the incumbents, which is reasonable in light of the well-established fact that incumbents receive more media coverage than their opponents (see, e.g. Kahn (1993)).

The rest of the paper proceeds as follows. In Section 1.2, I spell out the basic research design and describe the main data used in the paper (a Data Appendix presents a more complete description of the variables and sources of the analysis). Section 1.3 presents the main results for the impact of concentration of campaign contribution on incumbent vote shares across different media markets. In this section, I also present a number of robustness checks, including the placebo test designed to verify the identification hypothesis that the results are not driven by geographic characteristics or distance from the media center of the state. The section also shows that, unlike concentration, total share of money from interest groups does not affect incumbent senators differentially across media markets. The section concludes by showing that concentration indices are positively correlated with the relative frequency of news stories about candidates' campaign money. Next, Section 1.4 shows that the main results are not driven by partisan trends, and finds little evidence of information spillovers across members of the same party, whether in the same or neighboring states. Section 1.5 demonstrates that the results of the paper are not sensitive to the exact classification of counties into those dominated by in-state or out-of-state media markets. I conclude in Section 1.6.

1.2 Empirical Strategy

1.2.1 Design and specification

Like Ansolabehere et al. (2006), I examine the impact of mass media on voters' response to politicians' campaign-finance profiles by exploiting the structure of media markets. Since television is the primary source of political news for voters (Ansolabehere et al., 1993), I focus on TV markets.

More concretely, I compare results in Senate elections for counties with media markets centered in their own state (henceforth, I will often refer to these simply as "in-state" counties), with those whose media markets are centered in a city of a neighboring state ("out-of-state" counties).

In out-of-state counties, news focuses on the neighboring state politics and elections. As a result, voters receive much less television coverage of their state's politics than voters covered by in-state media markets. Ansolabehere et al. (2006) present evidence indicating that being in-state versus out-of-state is more clearly a function of actual television coverage than other measures of media market structure that have been used in the literature, such as fragmentation or number of television stations. They searched the on-line archives of 90 stations affiliated with 51 media markets for stories that mention the governors of states. News programs aired 10 times as many stories about the in-state governor than they did of governors from neighboring states covered by the media market. Moreover, the number of stories of the out-of-state governors was typically extremely small, and on the order of noise. They further report data from the National Election Studies of 1974 and 1978, which contain information to determine the type of market respondents reside in, confirming that these differences on coverage have consequences on voter knowledge. About 70% of respondents of in-state counties report that they saw a Senate candidate on television during the campaign, compared to only 50% of respondents in out-of-state counties, and this is statistically significant at the 0.01 level.

These observations suggest comparing the response of voters to the campaign profiles of candidates depending on whether they are located in in-state or in out-of-state media markets. The following regression model provides the simplest comparison of this sort:

$$\begin{aligned} V_{ct}^{I} &= \gamma_{s\times P^I} + \theta_{t\times P^I} + \beta_{in} in_c + \beta_{h^I} h_{st}^{I} + \beta_{h^O} h_{st}^{O} \\ &\quad + \beta_{in\times h^I}\left(in_c \times \mathbf{h}_{st}^{I}\right) + \beta_{in\times h^O}\left(in_c \times \mathbf{h}_{st}^{O}\right) + \beta_X' X_{cst} + \varepsilon_{sct}. \end{aligned} \tag{1.1}$$

In (1.1), c indexes counties, s states, and t time. The superscript I is for incumbent and O for his opponent. The dependent variable, V_{ct}^{I}, is the share of the two-party vote received by the incumbent candidate running for the Senate in county c at time t; in_c is a dummy variable equal to one if the county is in-state and zero if it is out-of-state; h_{st}^{I} is the Herfindahl concentration index of special-interest campaign contributions to the incumbent (h_{st}^{O} is the corresponding measure for the opponent); and X_{cst} is a vector of additional controls. Demeaned variables are shown in bold. I demean Herfindahl indices before interacting them, so that the coefficient on the main effect for in_c

shows the impact measured at the mean values of h^I_{st} and h^O_{st}. The impact of h^I_{st} on the incumbent vote share is β_{h^I} for out-of-state counties and $\beta_{h^I} + \beta_{in \times h^I}$ for in-state counties (and similarly for h^O_{st}). Throughout the paper, I cluster standard errors at the county level.

This specification includes a full set of year and state "times incumbent party" fixed effects ($\theta_{t \times P^I}$ and $\gamma_{s \times P^I}$ respectively). Year fixed effects interacted with the incumbent's party are important to capture national political or economic tides, such as presidential coattails, systematic presidential punishment at the midterm, or any other general trends in political tides or economic variables (e.g. unemployment, inflation) that could affect election results in all counties. Including a full set of state-incumbent party fixed effects $\gamma_{s \times P^I}$ is important for several reasons. First, the state fixed effects focus the comparison between in-state and out-of-state counties within the same state. Thus, since in all counties within a state the same two candidates are running for Senate at each time period, I can hold the candidates running, the closeness of the election, and other features of the race constant. This comparison is very useful, as it is typically hard to control for issues like candidate quality. Finally, to capture the average partisanship of each state s, $\gamma_{s \times P^I}$ also includes a dummy variable for the party of the incumbent and its interaction with state fixed effects.

The main coefficients of interest are $\beta_{in \times h^I}$ and $\beta_{in \times h^O}$. I expect $\beta_{in \times h^I}$ to be negative, implying that when the incumbent's campaign money comes from relatively few economic sectors (a high h^I_{st}), voters residing in in-state counties are more likely to find out and punish the incumbent relative to voters in out-of-state counties. With a similar logic, I expect $\beta_{in \times h^O}$ to be positive.

However, there are some threats to the correct identification of $\beta_{in \times h^I}$ and $\beta_{in \times h^O}$ in (1.1). One potential issue is that the counties in out-of-state dominated media markets are not an adequate "control group" for in-state counties. As will be shown below, out-of-state counties are indeed different along a number of dimensions (e.g., they are smaller, less urban, poorer, and exhibit different age and racial composition) compared to in-state counties. These differences are concerning if these characteristics influence voters' preferences in ways that lead them to vote more for or against candidates with concentrated campaign contributions. If this is the case, the effect attributed to media exposure may actually be driven by these other differences between counties. I implement the simplest solution to this problem by controlling for these county characteristics in the regression. However, there may persist additional unobserved factors that are not controlled for and may be generating the results[14].

[14] In the context of their examination of the incumbency advantage, in order to assuage these concerns Ansolabehere

To address this problem I adopt three additional approaches. First, I estimate (1.1) with the inclusion of county (times party of the incumbent) fixed effects. In particular, I run the following regression:

$$\begin{aligned} V_{ct}^{I} &= \gamma_{c\times P^I} + \theta_{t\times P^I} + \beta_{h^I} h_{st}^{I} + \beta_{h^O} h_{st}^{O} \\ &\quad + \beta_{in\times h^I}\left(in_c \times h_{st}^{I}\right) + \beta_{in\times h^O}\left(in_c \times h_{st}^{O}\right) + \beta_X' X_{cst} + \varepsilon_{sct}. \end{aligned} \tag{1.2}$$

In (1.2), $\gamma_{c\times P^I}$ denotes a full set of county-times-party fixed effects. Again, the motivation to interact the partisanship of the incumbent with the county fixed effects comes from having, more than "pro-incumbent" counties, "heavily democratic" counties and "heavily republican" counties. In other words, the incumbent party times county fixed effects capture the underlying partisanship (normal vote) in each county.

While estimation of (1.2) comes at the cost of not estimating the direct effect of in-state status on the incumbent vote share, any time-invariant characteristic of the counties that could potentially be generating a spurious relationship is controlled for. Indeed, such specification relies solely on variation in the Herfindahl indices across time within the same county to estimate the coefficient of interest. This estimate asks whether in-state counties tend to punish *increases* in the Herfindahl index of the candidate more than out-of-state counties.

Equation (1.2) is therefore a much more demanding specification. However, one may still be concerned that the two sets of counties have distinct trends. If so, the response of an increase in the Herfindahl index in-state relative to out-of-state may reflect such a differential trend rather than the effect of media. Thus, as a second potential solution I look for a set of in-state counties that are more comparable to out-of-state counties. To do this, I focus on in-state counties that are geographically contiguous to out-of-state counties. After demonstrating that these counties are indeed more alike out-of-state counties along a number of dimensions, I estimate (1.2) using solely these observations.

A third relevant robustness check comes from a placebo test designed to verify whether the movement from in-state toward out-of-state captures a general geographic trend in response to concentrated contributions that is unrelated with media exposure. In particular, I define the con-

et al. (2006) match the counties with out-of-state media markets with counties with in-state media on several dimensions and estimate the size of the incumbency advantage using only the matched counties. This solution may be preferable in that it relaxes some of the assumptions of the basic regression alternative with added controls, yet the concern that there are unaccounted factors which are not controlled for remains.

tiguous, in-state counties to be the (placebo) out-of-state counties, and compare them to adjacent in-state counties. Since these sets of counties are both in-state, there should be no correlation between increases in concentration and moving across these categories of counties (i.e., the estimated $\beta_{in \times h^I}$ and $\beta_{in \times h^O}$ should be close to zero).

These robustness checks serve to rule out several potential sources of bias. Note that the variation to estimate the main coefficients of interest comes from changes across time in the Herfindahl index of the incumbent and his opponent. Thus, while it is still possible that omitted variables bias the results, these would have to come from time-varying changes (e.g., a change in candidate quality through time as opposed to a relatively fixed quality trait of the candidate) that are correlated with changes in the campaign concentration indices. Also, some of the additional robustness checks on the main results to be presented below, such as controlling for a differential impact of total campaign funds across categories of counties, may help alleviate this kind of concern.

1.2.2 Data

The sources and definitions of all variables are presented in the Data Appendix. Here, I discuss details concerning the information on media exposure and on campaign contributions, the two most important aspects of the analysis.

I focus my analysis in the period 1980-2002. The choice of this period is based partly on data availability and partly on convenience. Campaign finance data from the Federal Elections Commission (FEC), while available somewhat earlier, is most comparable and believed to be of best quality since around 1980. The year 2002 is a natural time to stop, since after 2002 changes in Federal regulation are believed to have impacted the way campaign funds are raised.

Media exposure

As noted in the Introduction, I follow Ansolabehere et al. (2006) and use the Areas of Dominance Influence (ADI's), constructed by Arbitron, to define media markets. ADI's define each television market exclusive of the others, based on the geographic distribution of television viewers. Every county is allocated exclusively to one ADI, and each market's ADI is the set of counties in which the home market stations receive a preponderance of viewing[15].

[15]These market definitions are from Broadcast and Cable (1980, 1990, 2000) and were kindly provided by James Snyder.

I also follow the authors in defining the dominant state of a media market to be the state that has at least $x\%$ ($x \geq 50$) of the population of that media market. Likewise, a county is in a media market that is out-of-state dominated if the state the county is in has less than $(100 - x)\%$ of the population of the media market. Taking population into account in this way is of course crucial as these are presumably the viewers that advertisers, politicians, and broadcasters are attempting to reach. When $x = 50$, every county can be classified as being in- or out-of-state, but such choice may imply the inclusion of counties in media markets not clearly dominated by any state. A large x, on the other hand, may exclude too many counties. As in Ansolabehere et al. (2006) I use two-thirds ($x = 66$) as as the benchmark threshold, and verify the robustness of my results to other values of x.

A second important issue is that the boundaries of television markets change over time, as new media markets are created, and old ones cease to exist by splintering or slow absorption into other media markets. Moreover, as noted above, I only have definitions of media markets once per decade. Hence, in the basic analysis, I include counties that were dominated by the same state throughout the period[16].

A final sample filter considered by Ansolabehere et al. (2006) concerns "overwhelmed" states. In these states, only a small percentage of the population lives in a media market that is dominated in state. Politicians and news broadcasts probably do not neglect a large percentage of voters in this case. For this reason, I drop all counties in states where less than two-thirds of the population live in in-state dominated media markets.

Campaign contributions

Campaign contributions by special interest groups have been regulated at least since corporate contributions to parties and candidates were banned by Congress in 1911. This prohibition was later extended to labor unions and trade associations. These rules were weakly enforced and by the early 1970s many unions and organizations had formed Political Action Committees (PACs) to collect contributions for candidates without violating the law. In 1974, the Federal Election Campaign Act (FECA) sanctioned this practice, mandating the disclosure of contributions to the FEC.

[16] I verified the robustness to the inclusion of all counties and found similar results.

Ansolabehere et al. (2003) summarize the main features of this campaign finance regulation. The FECA recognizes two main types of campaign organizations: candidate campaign committees and party committees; and two main sources of funds: individuals and interest groups[17].

Under the Act, organizations wishing to contribute to federal candidates and parties must create PACs (the FECA refers to them as "separate and segregated funds"[18]). Moreover, organizations may not give money directly to the PAC for the purpose of contributing to a federal campaign. The organization, however, as the sponsor of the PAC (i.e., its "connected organization"), may absorb all the costs of establishing and operating the committee and soliciting contributions to it from individuals.

Also, individuals, PACs, and party committees are subject to contribution limits. The constraints on PAC contributions are typically not binding. Ansolabehere et al. (2003) note that only 4 percent of all PAC contributions to House and Senate candidates are at or near the $10,000 limit[19], and the average PAC contribution is much smaller ($1,700 in their sample). The Act also limited candidate and group campaign expenditures, but in 1976 the Supreme Court struck down spending limits as a violation of free speech in Buckley v. Valeo[20].

As Ansolabehere et al. (2003) note, two loopholes in the FECA constraints have received criticism. The first, created by the Buckley v. Valeo court decision, is that individuals, groups, and corporations are permitted to spend unlimited amounts of "independent expenditures" on behalf of or against a candidate, as long as they are not coordinated with the candidate or party campaigns. The second, created by a series of FEC rulings in 1978 and 1979, created a distinction between "hard money" and "soft money," making spending limits applicable to the former. "Soft money," raised through national party organizations for non-federal accounts, may be spent on non-federal election activities. Individuals and groups may give unlimited amounts to non-federal party funds for the purpose of party building activities. Such funds, conceived to strengthen party organiza-

[17] Other sources of funds and campaigning are also allowed but are relatively unimportant in practice. Parties and candidates may also give to each other, and individuals and groups can raise their own money and run their own advocacy or independent campaigns on behalf of or against individual candidates.

[18] The press and public refer to all nonparty, noncandidate committees as PACs or political action committees. However, the Act and Commission Regulations distinguish between two types of PACs: separate segregated funds described above and nonconnected political committees (or nonconnected PACs). A nonconnected political committee must pay for its own administrative expenses, using the contributions it raises. If an organization spends funds to establish or support a nonconnected PAC, these expenditures are considered contributions to the PAC and are subject to the dollar limits and other requirements of the Act.

[19] This refers to the pre-2002 limit, relevant to my analysis. On Nov 2002, the Bipartisan Campaign Reform Act increased the contribution limits. See http://www.opensecrets.org/overview/limits.php for an overview of the changes.

[20] An exception is presidential spending limits, which survived because they are voluntary: any candidate who wishes to receive federal funding must abide by the limits.

tions in the individual states, have in practice been used by the national party organizations to raise money. Although unlimited in amount, independent expenditures and soft party donations must still be publicly disclosed[21]. A third loophole allows legislators to set up "leadership PACs" which allow donors to give up to $10,000 to a candidate, but such funds cannot be used on that candidate's campaigns.

The data on PAC contributions from the FEC provides itemized contributions containing each contribution or independent expenditure made by a PAC, party committee, candidate committee, or other federal committee to a candidate during each two-year election cycle. Types of expenditures range from independent expenditures for and against candidates, coordinated expenditures, financial contributions to candidates, and in-kind contributions. For each interest-group PAC, I aggregate all financial contributions (24K), and in-kind contribution made to candidates (24Z). The most important component are 24K's. In my analysis, I exclude independent expenditures for candidates (24E), because a candidate can more easily distance himself from such contributions (as noted, by law these contributions should not be coordinated with the candidate).

Classifying contributions

The FEC provides a very rough five-fold categorization of PAC contribution data by industry: corporation, labor organization, membership organization, trade association, cooperative, and corporation without capital stock. These are categories of the sponsoring (or connected) organization for the committee, provided on the statement of organization[22]. Since these categories are too broad, I rely on the Center for Responsive Politics (CRP) classification system to identify the interest group of each PAC.

The CRP coding system is hierarchical, with five super-categories (Business, Labor, Ideological/Single-Issue, Other and Unknown) divided into 13 "sectors," about 100 "industries," and about 400 categories. The CRP has been classifying PACs since 1990, whereas I study campaign contributions and election results since 1980. To classify PAC contribution money before 1990, I proceed in two steps. First, I check whether the pre-1990 contributing PAC survives after 1990. If so, I assign the

[21] In 2002, amendments to the FECA by the Bipartisan Campaign Reform Act placed restrictions on soft money but raised the limits on hard money party contributions.

[22] These categories apply for the two kinds of committees studied in this paper: non-party, non-qualified committees and qualified non-party committees. The first are separate segregated funds and nonconnected committees that have not qualified as multi-candidate committees, and may currently contribute up to $1,000 per candidate per election. Qualified non-party committess instead qualify as multi-candidate committees (to this end, they must be registered for 6 months, have received contributions from more than 50 people, and made contributions to at least 5 federal candidates) and may currently contribute up to $5,000 per candidate per election.

sector allocated by CRP to the respective PAC to the earlier period. Next, for the set of unmatched PACs, I follow the guidelines for PAC classification from the CRP[23] to identify the committee's interest group. As shown in greater detail in the Data Appendix, the first step allows me to classify more than 90% of the pre-1990 contributions (and a larger share of the contribution money). With the additional classification, over 95% of the contributions were typically matched.

The CRP classification system is likely to match the public's perception of the interest group behind contributions, not just because it is based on the PAC names and sponsors (the information easily visible to voters) but also because the general objective of the system and the Center is precisely to monitor money in politics and inform citizens about this.

1.2.3 Descriptive Statistics

Table 1 presents descriptive statistics for the main variables of the analysis. The incumbent share of the two-party vote is 58% on average (uncontested elections and open seats are not included). The maximum for this variable is 92%. In a few cases incumbents receive a very low vote share (the minimum in the sample is 12.6%), but in most of the cases, the incumbent receives a majority of the vote (the median, not shown in the table, is 57.8%, and in just about one-fourth of the county-years the incumbent receives less than half the votes).

There are a total of 180 Senate races in the base sample, in which almost exactly half (89) of the incumbents are Democrats. At the PAC level, the average Herfindahl index of campaign contributions is about 0.02 (with standard deviation of 0.089) for the incumbents in these races, and much larger (0.15, standard deviation 0.24) for challengers. A similar pattern is observed at the industry level, where the contrast is between an average of 0.06 for incumbents (with a standard deviation of 0.11) and 0.23 for challengers (with a standard deviation of 0.23). Incumbents raise much more money (on average around \$5 million, in 2,000 constant prices) than their challengers (around \$3 million on average). Of this money, a relatively small percentage comes from special interests. Over the period, PAC money added on average \$1 million for incumbents and about \$300,000 for challengers per election cycle. There is substantial variation both for incumbents and challengers in the money raised and the extent of its concentration.

The base sample includes 1,759 US counties, 86% of which are in-state. When restricting attention to out-of-state and in-state and contiguous counties, the sample is reduced to 542 counties,

[23] http://www.opensecrets.org/action/ftm/index.php

with roughly one-half classified as in-state (56%).

1.3 Main results

1.3.1 Main results for the full sample of counties

I begin by estimating (1.1) for the sample of US Senate candidates in the period 1980-2002. The results are shown in Table 2. As noted before, all standard errors in the paper are fully robust against heteroskedasticity and serial correlation at the county level. Also, all regressions include a full set of year (times party of the incumbent) fixed effects, which are not presented in the tables to save space.

In columns 1-5, the Herfindahl indices are constructed at the PAC level. This is a useful reference point. These indices rely solely on the extent to which contributions come mostly in the form of large contributions from relatively few PACs, and thus do not depend on the exact choice for classifying PACs by industry[24].

Column 1 estimates (1.1) without any additional controls. The coefficient (0.171) on h_{st}^{I} is positive and significant. This result indicates that in out-of-state counties, an increase in the incumbent's Herfindahl index is correlated with a higher vote share for the incumbent. The estimated coefficient implies that an incumbent with a one-standard deviation higher Herfindahl index than the average in the sample (a rise in the index in 0.09, see Table 1) will have an advantage of 1.5 additional percentage points over his opponent in these counties. The coefficient for h_{st}^{O}, though also positive and significant, is much smaller (0.078) and is not robust to the inclusion of controls in the remaining columns. More important are the results for the interaction coefficients, $\beta_{in\times h^I}$ and $\beta_{in\times h^O}$. Column 1 estimates $\beta_{in\times h^I} = -0.171$, indicating that the positive correlation between the Herfindahl for the incumbent and the incumbent vote share vanishes for in-state counties. The degree of concentration of the opponent does not seem to affect the incumbent vote share differentially across media markets, as the point estimate for $\beta_{in\times h^O}$, though positive, is small and statistically insignificant. As mentioned before, that results are present only for the incumbents is reasonable given the well-established fact that incumbents receive more media coverage than their opponents.

Columns 2-5 examine the robustness of the previous results to the inclusion of several additional

[24] A second reason why this benchmark is useful is the fact that, prior to 1990, the sector of a few PACs in the dataset could not be established. As noted in the Data Appendix, this is not a major problem as the success in classifying PAC contributions was quite high. Still, the PAC-level Herfindahl verifies that results are not driven from differential success in classifying PACs for different candidates or years.

controls. Concerns include whether the patterns of concentration of campaign contributions merely mirror the pattern of concentration of economic activity in each state at time t, and whether a change in such degree of concentration may affect the incumbent vote share for reasons unrelated to the candidate's potential link to interest groups. For such a story to drive the results the effect would need to differ across the two types of counties, which is not obvious. Still, to guard against this possibility, in column 2 I include a measure of the degree of concentration of economic activity in state s at time t (the Herfindahl index of Gross State Product at the sectoral level) as well as its interaction with the in-state dummy. These variables are significant, but the main coefficient of interest $(\beta_{in\times h^I})$ is still negative and statistically significant and, moreover, the point estimate is remarkably stable (-0.168).

A more serious concern may be that the results are driven by other characteristics of a candidate's campaign contribution patterns. For instance, candidates with different Herfindahl indices could also be candidates who receive and spend different sums of money in their campaigns. Moreover, since candidates are subject to contribution limits, there may be a mechanical negative relationship between the amount of money raised and the Herfindahl index, as raising more money may necessarily imply raising money from a larger number of PACs (see, however, Ansolabehere et al. (2003) who show that individual donors grow in importance relative to PAC money as demand for campaign cash increases). Thus, in Column 3 I include the total campaign receipts by the incumbent and his opponent, as well as the total campaign receipts from interest-group PACs, as additional controls. The estimated value of $\beta_{in\times h^I}$ decreases slightly in absolute value (-0.150),remaining significant at more than 99% confidence level. Also, once other campaign contributions patterns are taken into account, $\beta_{in\times h^O}$ is estimated to be significantly positive. This lines up with my hypothesis, though the estimated coefficient is still quite small, 0.033.

Column 4 controls for a number of time-varying county characteristics. These include real per capita income (in 2000 US$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, and percent with 12 or more years of education (among people with 25 or more years of age). This column also includes state income growth as a control, since voters tend to punish incumbent senators when growth is poor (Levitt & Snyder, 1997). Again, the estimated coefficient for $\beta_{in\times h^I}$ is remarkably stable $(-0.150$ with a standard error of $0.02)$, assuaging concerns that results are driven by other differences between the two types of counties.

While column 4 includes county characteristics, interacting each of these controls by the party

of the incumbent allows us to account for potentially different effects of demographic and social characteristics on either party. Also, it may be important to interact the campaign finance controls with the in-state dummy to make sure that the significant interaction of the Herfindahl is not capturing a potentially differential effect of such variables.

This last exercise is especially useful to rule out a number of plausible alternative mechanisms driving the results. For instance, candidates with concentrated patterns of campaign contributions could have different abilities to raise campaign funds (overall, or from connected PACs). Since campaign funds are used for advertising, this could affect candidates' support in-state relative to out-of-state. On the one hand, more advertising funds could imply more exposure in in-state TV markets, and hence a greater difference in candidate support across the two types of counties. Or, alternatively, more funds could allow candidates to reach to out-of-state voters, reducing such difference.

Whatever the correlation, failure to account for it may bias the results. For similar reasons, changes in candidate "quality" (be it objective performance characteristics of the candidate or other traits such as "charisma") may affect the candidate's electoral performance across different counties. While such a variable is hard to measure, total campaign receipts may be thought of as a crude proxy.

For these reasons, column 5 adds, as additional controls, the interaction of each county control with a dummy for the party of the incumbent as well as the interaction of each of the campaign finance variables with the in-state dummy. While the point estimate for $\beta_{in \times h^I}$ decreases in magnitude (from -0.154 to -0.129), it is still highly significant (the standard error is 0.021).

In columns 6-10, I run similar specifications as in columns 1-5, but with the Herfindahl index calculated at the industry level. While columns 1-5 have the advantage of not depending on any sort of classification, this exercise is also informative. In principle, a candidate may have a highly dispersed pattern of contributions across PACs within a single industry, but in this case it would be desirable to interpret his pattern of contributions as suggestive of a close link with the respective industry. As it turns out, results in columns 6-10 are very similar to those in columns 1-5. Most importantly, the coefficient on $\beta_{in \times h^I}$ is still negative, highly significative, and the magnitude of the effect implied by the estimated coefficient is similar.

In sum, the results in Table 2 are largely in line with the hypothesis that voters with better access to information punish a more concentrated pattern of campaign contributions is punished. However, as discussed in Section 1.2.1, a more convincing strategy to control for potential differences in

unobservable characteristics across counties and capture the underlying partisanship (normal vote) in each county, includes a full set of county-party fixed effects as in (1.2). The results are presented in Table 3, which has the same structure as Table 2. Again, the main interaction coefficient $\beta_{in \times h^I}$ is negative and significant at more than 99% confidence level. The result is robust to the definition of the Herfindahl, and to the inclusion of controls in columns 2-5 and 6-10. The coefficient is again remarkably stable across specifications, though the estimated effect is smaller than with state times incumbent-party fixed effects alone (the point estimate ranges from about -0.05 to -0.10 in Table 2, compared to about -0.14 to -0.17 in Table 3). This estimated value $\beta_{in \times h^I}$ indicates that an increase in concentration leads to lower vote shares in-state relative to out-of-state, though the effect is quantitatively small (about a half of a percentage point for a one-standard increase in the concentration indices). The coefficient on the incumbent's Herfindahl in the most demanding specifications with full controls is also reduced, both relative to columns without controls and to Table 2.

1.3.2 Examining neighboring counties

The regressions from Table 3 rely solely on variation in the Herfindahl indices across time within the same county to estimate the coefficient of interest. Those specifications ask whether in-state counties tend to punish increases in the Herfindahl index of the candidate more than out-of-state counties. This is a demanding specification which controls for any time-invariant characteristics of counties, but the response of an increase in the Herfindahl index in-state relative to out-of-state may still reflect differential trends across counties rather than the effect of media.

This subsection investigates the possibility. First, I focus on in-state counties that are geographically contiguous to out-of-state counties. Table 4 demonstrates that these counties are similar to out-of-state counties along a number of dimensions. This table runs regressions of the following form:

$$y_{cst} = \gamma_s + \theta_t + \delta_{in} in_c + \varepsilon_{cst},$$

where γ_s and θ_t are state and year fixed effects, and y_{cst} varies per column and is one of several observable county characteristics, namely: real per capita income (in $2,000$ $US\$$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, and percent with 12 or more years of education (among people with 25 or more years of age).

In Panel A, in_c is simply the in-state dummy defined before (equals 1 if the state the county is in has more than two-thirds of the population of that media market, and zero if it has less than one-third). Thus, δ_{in} measures the average difference in observable characteristics for in-state and out-of-state counties after controlling for fixed state and overall time trends. In-state counties have: about $\$1,700$ higher per capita income than out of state counties (column 1); about twice as many people and about 22 more individuals per square mile (columns 2 and 3); a higher proportion of young (under 18), black, and urban population, and a smaller proportion of people over 65 (columns 4-8); and a higher proportion of people with 12 or more years of schooling (column 9).

In contrast, in Panel B in_c equals 1 if it satisfies the same conditions as in Panel A *and* the in-state county borders an out-of-state county in the same state. These contiguous in-state counties are much more comparable to the set of out-of-state counties. In all cases, the estimated coefficients that were previously significant fall in absolute terms. Moreover, the two sets of counties are not found to be significantly different in terms of population density, or any of the basic dimensions of population structure (age, gender, race, or urban-rural). However, three estimated coefficients are still significant. While the differences are smaller than in Panel A, in-state and contiguous counties are significantly richer, more populous, and slightly better educated than neighboring in-state counties.

Table 5 focuses on this set of more comparable counties, running specifications as in Table 3. The results are similar to the ones obtained for the full sample of counties. With either Herfindahl measure (at the PAC or industry level) and with or without controls, the estimated absolute value of $\beta_{in \times h^I}$ decreases slightly. Without controls, it is still close to -0.08 with a standard error of about 0.02. The inclusion of the set of controls further decreases the point estimate to around -0.5. The statistical significance also falls, though even in columns 4 and 9, with a full set of county and campaign finance controls, the hypothesis that the interaction term is zero is rejected at conventional significance levels. Only columns 5 and 10, where (i) county controls are interacted with the incumbent's party dummy and (ii) campaign finance controls are interacted with the in-state dummy, have marginally significant coefficients on the interaction term. Note, however, that even in this case, the point estimate is similar in magnitude (-0.04) to the previous estimates. Also, the increase in standard errors is not surprising given the simultaneous inclusion of various campaign finance variables in the regression.

1.3.3 A placebo test

Table 5 shows that the negative impact of increased campaign concentration in counties with better access to information relative to those with less information holds for a restricted set of more comparable in-state and out-of-state counties. Such evidence suggests that the previous results were not driven by differential trends across counties rather than the effect of media. However, it is possible to further investigate this possibility by running a simple placebo test.

In Table 6, I define the contiguous, in-state counties to be the (placebo) out-of-state counties, comparing them to adjacent in-state counties in the same state. Since these sets of counties are in-state with good access to information, there should be no correlation between increases in concentration and moving across county categories (i.e., the estimated $\beta_{in \times h^I}$ and $\beta_{in \times h^O}$ should be close to zero). However, if the previous results were driven by a general geographic trend as one moves from in-state towards out-of-state captures, these coefficients could be significant, raising concerns about the validity of the preceding results. Results from Table 6 reassure previous results. Unlike Tables 2, 3 and 5, the interaction coefficient $\beta_{in \times h^I}$ (and $\beta_{in \times h^O}$) is not statistically significant in any of the specifications (the structure of the table is the same as before). Moreover, the point estimate is very small in all columns suggesting this is a precisely measured "non-effect" rather than an uncertain potential effect.

1.3.4 Share of connected-PACs money

The evidence presented thus far suggests that voters dislike concentrated special interest money. But is it the case that voters dislike special interest money in general, concentrated or otherwise? Table 7 suggests not. This table presents similar regressions to the ones presented before, where the share of connected PAC money is used (in place of Herfindahl indices of concentration), as a "proxy" for capture of politicians by interest groups.

In the table, we see that the share of connected PAC money of the incumbent and the opponent are not robustly correlated with different vote share patterns across media markets. In the case of the incumbent, the estimated interaction term is close to zero and not statistically significant with either the full sample of counties (and including state times party fixed effects as in columns 1 and 2 or county times party fixed effects as in columns 3 and 4), or with the set of contiguous counties only (and county times party fixed effects as in columns 5 and 6).

These results are consistent with idea that voters view PAC money as buying influence. More

specifically, it is in line with the view that a high share of PAC-money is not necessarily bad for the incumbent's vote share because, if this money is dispersed in many sectors, his agenda cannot be captured by any one of them. Results in the previous subsections suggest that it is PAC money concentrated in a few sectors what may indicate capture.

1.3.5 Automated news searches

A valid concern with results presented thus far is whether the suggested mechanism demands an unrealistic degree of knowledge on the part of voters. However, even if individuals do not know the approximate pattern of campaign contributions, a candidate with a more concentrated pattern of contributions is prone to being pinpointed by journalists or his opponent as potentially "captured." The presumption is that such a candidate is likely to figure in ads and news as linked to the economic sectors that heavily contribute to his campaign.

An additional important issue is whether campaign finance concentration captures some other omitted candidate characteristics which differentially affect their performance across counties (e.g. whether candidates with higher Herfindahls are more "popular" or charismatic). As noted above, other campaign finance controls such as total campaign receipts may be thought of as a crude proxy for this, and I have demonstrated the robustness of the results to the inclusion of such controls. However, in this section, I present an additional simple exercise to help address these two issues.

In particular, I conduct automated news searches for a sample of US newspapers verifying how often are Senate candidates featured in the news. To this end, I search for back issues of a sample of US newspapers available on NewsLibrary.com. Overall, the search is for 139 newspapers across the US. The major limitation of this exercise is that only a few newspapers have online archives going back to the 1980s (in fact, only one, *The Boston Globe* goes back to 1982). Appendix Table 3 shows the number of states in the sample, per year, for which I can find one or more newspapers on which to conduct news searches.

For each candidate, I conduct two searches. In the first one, I look for stories about the candidate during the campaign period (which I define to be the two months leading up to the election). The search is limited to newspapers within the candidates' state, and allow for various possible variations in the usage of the candidates' first name, middle name (or initial), last names, and nicknames. Any news story containing the candidate's name and the words "senate" or "senator" is counted as one hit that adds to the candidate's "total stories." The second search demands stories to meet the prior

criteria and, in addition, that the words "PAC" and "money" feature in the story[25]. This subset of stories are the candidate's "PAC stories." The main interest is to examine whether the proportion of PAC stories for each candidate is positively correlated with the candidate's concentration indices[26].

Table 8 reports the results. Column 1 reports the results of a regression for each candidate's Herfindahl index (at the PAC level) on the ratio of PAC stories to total stories, controlling for year fixed effects, an incumbent dummy, and a Democratic dummy. The ratio of PAC stories is positively and very significantly correlated with the concentration index (the point estimate, 0.993, has a robust standard error of 0.161). In column 2, instead, the total number of stories is used as the main independent variable of interest (again, year fixed effects and partisan and incumbency dummies are included). Also interesting, this regression shows no significant correlation between the total number of stories and the concentration index. The same conclusion emerges in column 3, where the proportion of PAC stories and the total number of stories are included simultaneously in the regression. A similar picture emerges in columns 4-6, which repeat the specifications in columns 1-3 but use the concentration index at the industry level as the dependent variable. The only difference is that there is now a small (and marginally significant) negative correlation between total stories and the concentration index.

These results are very reassuring about the validity of the approach. In particular, the positive and significant correlation between the share of PAC stories for a candidate and the candidate's Herfindahl concentration index suggests that the concentration indices do proxy for media exposure of campaign contribution profiles. And the weak correlation between the candidates' Herfindahl and his total number of stories suggests the former is not capturing differences in candidate charisma or popularity. Along these lines, columns 7-9 in Table 8 present a final set of regressions like those in columns 1-3, but where the dependent variable is total PAC contributions to the candidate. While this is positively correlated with total stories about a candidate, it is uncorrelated with the share of PAC stories.

In short, these results lend further credibility to the validity of using the concentration indices as a proxy for capture. To provide further support for the main conclusions, I now present additional results that highlight the key role of information and the robustness of the main results.

[25] I experimented with other keywords to find the number of stories concerning campagin money, including "contributions," "campaign finance," and "interest groups," among others. However, an examination of the resulting stories suggested that the selected alternative both included the major stories about interest group money and (unlike other keywords) did not include as many unrelated stories.

[26] Appendix Table 3 gives summary statistics for the number of total stories, stories about PACs, and the ratio.

1.4 Other results: turnout and information spillovers

1.4.1 Turnout

Theory and evidence suggest that better information increases turnout[27]. Since the suggested mechanism, whereby concentration of PAC money affects incumbent's vote shares, is information, a useful question to ask is whether turnout is higher in-state than out-of-state.

I explore this question in Table 9. Columns 1 to 3 compare all in-state counties to out-of-state counties. The columns present regressions of the ratio of total votes to population in each county on the baseline dummy variable that equals 1 for in-state counties. Perhaps surprisingly, columns 1 (with state and year fixed effects) and 2 (with state-times-party and year-times-party fixed effects) find no significant effect of being in-state on turnout. However, recall that in-state counties are much more populous, which mechanically reduces the dependent variable by increasing the denominator. After controlling for population on the right hand side (as in column 3), in-state counties do have a turnout around 1.5 percentage points higher than out-of-state counties. This suggests population "grows faster" than turnout and is suggestive of the role of the better information in in-state counties.

Perhaps more convincingly, columns 4 to 6, which replicate the regressions of columns 1 to 3 but for contiguous counties only, show that irrespective of controlling for total population, in-state counties do have larger turnout than their otherwise relatively similar out-of-state neighbors. The coefficient is quite stable and implies a 1.7 to 2 percentage point higher turnout in in-state counties. While we have seen that these sets of contiguous counties are quite similar, differences remain that could explain this differential behavior of turnout and be unrelated with information. For this reason, columns 7 to 9 present a regression of the dependent variable on the placebo out-of-state counties versus their neighbors as before. In this case, I find no significant effects, confirming the hypothesis that the differences in turnout found in columns 3-6 are driven by information and not by other differences from moving towards out-of-state counties.

At first glance, these result may seem to contradict some studies (e.g. Gentzkow (2006)) that find a negative impact of television on turnout, unlike the positive impact of radio or newspapers discussed in the Introduction. The erosion of social capital and the crowding out of other media with better political coverage have been suggested as possible mechanisms for this effect. Notice,

[27]For a review of some theoretical arguments, see Feddersen (2004) and in particular Feddersen & Pesendorfer (1996); Fedderson & Pesendorfer (1999). Some of the empirical evidence was discussed in the Introduction (see also Prat and Strömberg's (2010) review).

however, that the results presented above are not necessarily inconsistent with such finding. The variation between in-state and out-of-state counties is not determined by the availability of TV, but the relevance of its content for voters. On the contrary, given the well-established connection between information and turnout, these results further confirm that moving to out-of-state counties affects information relevant for voters.

But is the main channel for the earlier results concerning incumbent vote share that news about "captured" politicians discourages voters in-state relative to out-of-state? We can investigate this question by running the main specification with turnout, rather than vote share for the incumbent, as the dependent variable. This is done in Table 10. As is clear from the table, an increased Herfindahl for the incumbent does not seem to reduce turnout differentially in-state relative to out-of-state. This is suggestive that turnout is not the main or sole channel. Moreover, by looking at the non-interacted effect of the incumbent concentration index, we see that "high Herfindahl" years do not seem systematically correlated with turnout, suggesting that effects presented for the vote share of the incumbent do not mechanically follow from differences in turnout when the Herfindahl is high.

1.4.2 Spillovers

The results presented thus far, by revealing the electoral cost that "captured" politicians face with better-informed voters, open up the discussion about whether the concentration of campaign finance money for Senate candidates has negative spillovers for fellow party members running for other offices. I examine this question in Table 11[28]. In columns 1 and 2, I present results for the main specification but with vote share for the presidential candidate of the same party as the incumbent senator functioning as the dependent variable. The standard concentration measures (and campaign finance controls), however, are for the Senate candidates. If there are significant spillovers, the coefficient on the interaction of the Herfindahl index for the incumbent senator and the in-state dummy should be negative (and that on the interaction of the index for the opponent senator and the dummy, positive). Indeed, this would be an indication that in years where, for example, the Democratic senator has a relatively high Herfindahl, the Democratic presidential candidate does worse in in-state counties relative to out-of-state counties. Column 1 presents the

[28] All regressions in this table focus on the set of contiguous counties, include a full set of county times party and year times party fixed effects, as well as the campaign finance controls, county controls, and state Herfindahl controls described above.

results for the PAC-level Herfindahl index. None of the interaction terms is significantly different from zero. A similar result is obtained in the case of the industry-level Herfindahl in column 2.

A similar exercise can be accomplished with the vote share for the House candidate of the same party as the incumbent as the dependent variable[29]. The results are reported in columns 3 and 4 for the PAC-level and industry-level concentration measures, respectively. Though imprecisely estimated (the standard error is 0.315), the negative coefficient of column 3 (-0.594) suggests the presence of spillover effects. That is, a "tainted" senator affects fellow congressmen. However, upon further examination, this does not seem to be the case. First, column 4 for the industry-level Herfindahl estimates an almost identical coefficient, yet it is not statistically significant. Second, and more importantly, columns 5 and 6 control for the House candidates' campaign contributions concentration measures, and their interaction with the in-state dummy. Indeed, it could be that the significant negative interaction in column 3 is in fact driven by correlation between the House and Senate candidates contribution patterns within the same county and year. After all, Senate and Congress candidates of the same party and state may have similar campaign finance profiles. The results suggest this because the coefficients on the interaction terms with the Senate candidates' Herfindahls are now smaller and statistically indistinguishable from zero.

While indicative of the absence of important spillover effects, results from Table 11 at the same time reassure that the results presented before are not driven by partisan trends. Indeed, a potentially serious objection to the models estimated thus far is that partisanship moves in different directions in different counties across different years. Unfortunately, I cannot control for a full set of county-year fixed effects, since the variation I use to estimate the key interaction terms is at this level. However, the President and House regressions just examined can be considered placebo regressions to rule out this interpretation. If important partisan trends were driving the results, observed effects for the vote share of the incumbent should be mirrored in specifications with the vote share of fellow party members as a dependent variable instead. They do not, and this gives further credibility to the results of Section 1.3.

Information spillovers, however, may take several other forms than simply the "contagion" of representatives from the same party and state. Specifically, out-of-state counties are exposed

[29] In this case, since voting and other data is at the county-level, a decision must be taken regarding the treatment of counties with multiple congressional districts. Results presented in Table 11 simply add the votes for all the Democratic and Republican candidates running for Congress in a county to find the Democratic and Republican vote share per county. I verified that results are similar when restricting to counties with no more than one congressional district.

relatively more to neighboring states' political information. Thus, there may be partisan spillovers from neighboring states. Imagine an out-of-state county c of state s sitting in a media market dominated by neighboring state s'. There are at least two questions that seem worth asking. First, to examine the hypothesis that voters in these out-of-state counties are on average "misinformed" voters who must rely on a partisan cue, one could ask: do voters in county c punish the candidate of party P in state s when the Herfindahl of the candidate for party P in neighboring state s' rises? Second, a different hypothesis suggests that out-of-state voters are not misinformed, but are better informed on average because they get information about both states, s and s'. Hence, they may rely on comparisons, and, for instance, it is possible to examine if voters in c punish the candidate of party P in state s if the Herfindahl of party P in state s is larger than that in state s'.

I examine both questions in Table 12. The table focuses on out-of-state counties only[30]. In line with previous results, columns 1 and 2 verify that the dependent variable, the incumbent senator's vote share, does not react to his Herfindahl index or that of his opponent in out-of-state counties. Columns 3 and 4 ask if it responds instead to the concentration indices of the neighboring states' candidates. The coefficients are again not significant, with small point estimates. Finally, columns 5 and 6 check whether it could be the difference between the incumbent's Herfindahl and the Herfindahl of his fellow party member running in a neighboring state (and similarly for the opponent) that affects voting patterns in out-of-state counties. Once again, the point estimates are close to zero and statistically insignificant.

Overall, this section suggests that partisan trends are unlikely to drive the main results of the paper. Additionally, information spillovers across members of the same party, whether in the same or neighboring states, are not first-order.

1.5 Further robustness checks: definition of media markets

Before concluding, I demonstrate the robustness of the main result to alternate definitions of the media market. Recall that a county is in-state if the state the county is in has more than $x\%$ of the population of that media market, and out-of-state if it has less than $(100 - x)\%$. Results reported thus far are for $x = 66$. In Table 13, I vary x. I focus on the most demanding specification with county fixed effects and a full set of controls. Panel A looks at all in-state and out-of-state

[30] Again, all regressions in this table include a full set of county times party and year times party fixed effects, as well as the campaign finance controls, county controls, and state Herfindahl controls described above.

counties, whereas Panel B restricts attention to the in-state and contiguous counties compared to out-of-state counties. In odd columns, the Herfindahl index is at the PAC level. In even columns, it is computed at the industry level. Finally, $x = 50$ in columns 1-2, $x = 60$ in columns 3-4, and $x = 70$ in columns 5-6. The table shows that the results do not depend on the exact threshold of population to define media markets. In all cases, $\beta_{in \times h^I}$ is negative, typically significant at more than a 99% confidence level, and the point estimate is very close in all specifications to results presented in Table 5.

An alternative approach to check the robustness of the results to the media market definition is to rely directly on the share of in-state media market population as the key, continuous, measure of availability of information in each county. More concretely, for each county c in state s and media market (Area of Dominance Influence) m, define the "ratio in-state" as the ratio of the population of media market m residing in state s to the total population of market m. This variable can then be used, in place of the in state dummy, in specifications analogous to (1.1) and (1.2). The results, presented in Table 14, are in line with the ones presented previously, both for PAC-level concentration indices (Panel A) or at the industry-level (Panel B). Regardless of whether we focus on state fixed effects regressions (columns 1 and 2), county fixed regressions (columns 3 and 4), or county fixed effects regressions among the set of more comparable contiguous counties as defined by the in-state dummy (columns 5 and 6), the message is the same. An increase in the concentration of campaign contributions for the incumbent leads to a fall in his vote share in counties with media markets that have a larger proportion of their population in the county's state.

1.6 Final Remarks

The evidence presented in this paper supports the idea that mass media, by informing voters, may reduce the influence of special interest groups. Better access to mass media allows voters to react to negative information about their candidates, and in particular the influence of narrow interests in policy as proxied by their campaign finance profiles. For this reason (among others) the presence of a free, independent mass media is a key component of democratic political institutions.

Hence, the paper contributes to the growing evidence on the crucial role of the media in empowering voters and improving accountability. In doing so, it suggests a channel that has received relatively little attention in the empirical literature. As noted in the Introduction, there is by now a fair amount of evidence on the impact of free media on voter turnout, voter knowledge, and

representative behavior and policy choices. But special interests are fundamental players in any democracy. The evidence presented here suggests that mass media may help reduce their influence. Candidates who are more likely to be connected with interest groups receive less votes on average in places where they face greater media exposure. This relation provides a direct effect on reduced interest group influence.

Admittedly, the magnitude of the effects found is relatively small, and typically would not decide the election outcome for the average incumbent. Nonetheless, there are various reasons why the estimated effect may underestimate the impact, for voters, of revealed "capture" of politicians by special interests. First, the concentration of campaign contributions to politicians is inevitably a noisy measure of the degree of capture[31]. Second, notice that if concentrating contribution patterns likely hurt politicians, those politicians who are willing to fund their campaigns with money from a narrow set of interest groups should also possess other resources to counteract the negative signal this entails. In this sense, the estimated effects likely underestimate the impact on an "average" politician of the public disclosure of his links to special interests.

Also related, notice that the reduction in candidate vote share is only one of the channels whereby mass media may reduce special interest group influence in politics. To provide just one example, mass media disclosure of potentially undue interest group influence may, even when not affecting voter behavior, trigger or facilitate the action of other institutions, such as courts, to hold politicians accountable.

More generally, the electoral cost of concentrated campaign contributions documented in this paper, even when small, may lead to a virtuous circle encouraging candidates to distance themselves from narrow interests. In fact, that campaign contributions are able to buy policy influence in the United States is not clear according to an important line of academic research on the issue. Ansolabehere et al. (2003) argue that campaign contributions in the US are not a form of policy-buying. Rather, they are primarily a form of political participation and consumption since individuals, not special interests, are the main source of campaign contributions (and their contributions behave as a normal good, dependent upon income).

At first glance, these findings appear to be at odds with some of the premises guiding the present paper. If campaign contributions are not a form of policy buying, why do voters respond

[31] For a more recent period, a more direct measure of interest-group connectedness based on searches for news stories regarding interest group influence could provide a more precise measure and allow a reexamination of the magnitude of the effects. Still, the results presented in this paper are interesting in their own right, as they allow us to study the ways in which campaign contribution patterns directly and indirectly transmit information to voters.

negatively to them? There are several replies to this question. First, while contributions may or may not actually buy policy (hard to establish or refute), voters may certainly believe they do (a more realistic assumption). Only this belief is necessary for the negative reaction. Second, such negative reaction to the presence or appearance or undue influence is in fact consistent with equilibrium situations in which candidates seek and obtain funds from individuals while trying to avoid support from narrow interest groups in ways that may be taken by journalists and voters as a proxy for their commitment to such interests. In other words, it can be part of the virtuous circle mentioned before.

Finally, along these lines the results obtained here are context-specific. While many studies have documented the bias in political news in the US, the extent of misinformation and bias in many other countries in the world is a far more serious problem[32]. In such contexts, it is not clear that greater access to mass media will enable voters at large to put a check on potentially undue influence from narrow interest groups. In other words, the power of the media is a double-edged sword. By improving information and electoral response, it may improve accountability. It may also reduce corruption (Brunetti & Weder, 2003), and perhaps aid in democratic consolidation (Andriantsoa et al., 2005), and development (Djankov & McLiesh, 2002). On the other hand, the media is in many ways a special interest group itself or may collude with interest groups (Corneo, 2006). If too powerful, the media could sway policies in its favor at the expense of other groups in society[33].

[32] In 2009, for instance, the US ranked 20 (of 175) on the Press Freedom Index published yearly by Reporters Without Borders.

[33] The negative consequences of media influence have been studied by many. By making some issues more salient than others, mass media may distract the public from pressing needs (Eisensee & Strömberg, 2007). More generally, media content may be biased, and such bias may persist over time as well as influence electoral behavior (Groseclose & Milyo, 2005; Puglisi, 2006; Baron, 2006; DellaVigna & Kaplan, 2007; Gentzkow & Shapiro, 2004, 2006, 2008, 2010). Even more detrimental, with media capture by the government or other powerful actors, checks and balances may be dismantled rather than strengthened (McMillan & Zoido, 2002; Besley & Prat, 2006; Petrova, 2008; Durante & Knight, 2009), and when used for propaganda can even exacerbate violence (Yanagizawa, 2010). Finally, there is also evidence that mass media may destroy social capital (Olken, 2009).

1.A Appendix: Data

1.A.1 Variable Sources and Definitions

See Appendix Table 1 for the sources and definitions of the variables used in the analysis.

1.A.2 Campaign finance data industry sector classification

As noted in the main text, to classify the PAC contributions in industry categories, I follow the Center for Responsive Politics' coding system. This is a hierarchical system, with five super-categories (Business, Labor, Ideological/Single-Issue, Other and Unknown) divided into 13 "sectors," about 100 "industries," and about 400 categories as shown in Appendix Table 2.

The CRP has been classifying PACs since 1990, whereas I study campaign contributions and election results since 1980. From 1990 onwards, there are nearly 50,000 PAC-candidate pairs in the sample (more precisely, there are 49,739 PAC-candidate pairs, from 3,295 PACs contributing to any of the Senate candidates in the sample after 1990). The classification of the interest group sector for these PACs is facilitated by the fact that the Federal Elections Commission assigns a unique identification number to each committee, and this identification number is also part of the CRP dataset. Hence, I can classify every PAC's interest group after 1990.

To classify PAC contribution money before 1990, I proceed in two steps. First, I check whether the pre-1990 contributing PAC survives after 1990. If so, I assign the sector allocated by CRP to the respective PAC to the earlier period. Prior to 1990, there are nearly 41,783 PAC-candidate pairs in the sample, from 3,232 PACs contributing to any of the Senate candidates before 1990. Of these PAC-candidate pairs, 38,712 (that is, 93% of the total PAC-candidate pairs, which correspond to 2,625 contributing PACs) can be classified by this first step alone.

Next, for the set of unmatched PACs, I assigned the sector in the following way. First, when possible I use the name of the sponsor of the unmatched PAC to search for other matched committees sponsored by the same organization, and assign the corresponding industry.

When this procedure does not permit the classification of the PAC, I follow the guidelines for PAC classification from the CRP[34] to identify the committee's interest group. In some cases, the PAC sponsor name does not provide enough clues to classify the interest group sector. Hence, while the classification is very complete, it is below 100%. More specifically, of the 3,071 PAC-candidate pairs that remained to be classified (corresponding to 607 unclassified PACs), 1,930 PAC-candidate pairs are classified after these steps (corresponding to 372 PACs). Hence, overall I am able to classify 40,642 PAC-candidate pairs (from 2,997 PACs) before 1990. This amounts to 97% of the total number of PACs before 1990.

Also importantly, the average contribution for unclassified PACs is smaller than the average. Thus, in terms of contribution money, the share of unclassified contributions is even smaller. For instance, in 1980, the year with least success in the classification, 94% of the contributions are classified, yet this represents 96% of the contribution money. By 1988, 98.4% of the contributions are classified, and this amounts to 99.4% of the contribution money.

[34] http://www.opensecrets.org/action/ftm/index.php

Table 1. Summary Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum	Observations
County-level variables					
Incumbent share of the two party vote	0.58	0.12	0.13	0.92	9532
per capita personal income, 2000 US$	20,597	5,042	0	69,910	9532
population	90,655	323,054	84	9,542,574	9532
population density (population per square mile)	146.28	597.41	0.13	16539.57	9532
% under 18	46.72	22.69	13.19	84.4	9532
% over 65	14.33	4.32	1.38	34.7	9532
% female	50.62	1.61	32.75	57.44	9532
% black	6.63	12.46	0	86.81	9532
% urban	38.59	29.72	0	100	9532
% 12 years of more of school (persons 25+)	69.18	10.92	25.9	95.5	9532
ratio of in-state population for county's media market	0.84	0.28	0	1	9532
Candidate-level variables					
Dummy=1 if incumbent is Democratic	0.49	0.5	0	1	180
Herfindahl index PAC contributions -incumbent	0.02	0.09	0	1	180
Herfindahl index PAC contributions -opponent	0.15	0.24	0	1	180
Herfindahl index PAC contributions at industry level -incumbent	0.06	0.11	0.03	1	180
Herfindahl index PAC contributions at industry level -opponent	0.23	0.23	0.03	1	180
Campaign receipts (2000 US $)-incumbent	5,185,977	3,550,866	0	27,301,767	180
Campaign receipts (2000 US $)-opponent	3,076,456	4,133,369	17,047	34,851,988	180
Receipts from special interest PACs (2000 US $)-incumbent	1,036,460	450,742	0	3,063,172	180
Receipts from special interest PACs (2000 US $)-opponent	312,506	387,474	37	1,690,014	180
Share of connected PACs money-incumbent	0.25	0.12	0	0.64	180
Share of connected PACs money-opponent	0.13	0.11	0	0.48	180
County Media Market Classification					
In-state dummy (1 if in-state)	0.86	0.34	0	1	1759
In-state and contiguous dummy (1 if in-state and adjacent to out-of-state)	0.56	0.5	0	1	542

Summary statistics are for the base sample in the analysis: excludes counties that were not dominated by the same state throughout the period and counties in overwhelmed states (an "overwhelmed" state has less than two-thirds of the population living in in-state dominated media markets). For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. For each county in state s and media market m, the ratio of in-state population refers to the proportion of the total media market population residing in state s. The in-state dummy equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). In the in-state and contiguous dummy, in addition to the latter conditions the in-state county must border an out-of-state county in the same state for the dummy to be equal to 1. See the text and Data Appendix for detailed variable definitions and sources.

Table 2. Media markets and electoral response to campaign finance concentration, US Senate 1980-2002

Dependent variable: share of the two-party vote received by the incumbent										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	State fixed effects									
	herfindahl at PAC level					herfindahl at interest group (industry) level				
in state dummy	0.00782	0.00537	0.00575	0.00617	-0.024	0.00738	0.00504	0.00552	0.00595	-0.0254
	(0.00365)	(0.00363)	(0.00362)	(0.00363)	(0.0105)	(0.00364)	(0.00364)	(0.00362)	(0.00363)	(0.0106)
herfindahl incumbent	0.171	0.158	0.116	0.125	0.128	0.122	0.108	0.0871	0.0978	0.0982
	(0.0221)	(0.0228)	(0.0214)	(0.0217)	(0.0207)	(0.0272)	(0.0283)	(0.0245)	(0.0249)	(0.0239)
herfindahl opponent	0.0775	0.0728	0.00175	0.00745	0.0267	0.107	0.104	0.0114	0.0181	0.043
	(0.0165)	(0.0167)	(0.0162)	(0.0162)	(0.0148)	(0.0186)	(0.0186)	(0.0184)	(0.0184)	(0.0169)
herfindahl state		-3.414	0.763	0.692	-0.169		-3.533	0.553	0.480	-0.330
		(0.503)	(0.521)	(0.510)	(0.507)		(0.499)	(0.512)	(0.501)	(0.502)
in state dummy x **herfindahl incumbent**	-0.171	-0.168	-0.15	-0.154	-0.129	-0.163	-0.156	-0.135	-0.14	-0.113
	(0.0236)	(0.0242)	(0.0230)	(0.0228)	(0.0208)	(0.0274)	(0.0285)	(0.0252)	(0.0253)	(0.0236)
in state dummy x **herfindahl opponent**	0.0205	0.0242	0.0333	0.0281	0.0108	0.0242	0.0259	0.0359	0.0308	0.0101
	(0.0173)	(0.0174)	(0.0168)	(0.0168)	(0.0154)	(0.0195)	(0.0196)	(0.0192)	(0.0192)	(0.0176)
in state dummy x **herfindahl state**		-1.465	-1.277	-1.395	-1.246		-1.382	-1.15	-1.271	-1.188
		(0.470)	(0.457)	(0.448)	(0.456)		(0.471)	(0.455)	(0.447)	(0.456)
Campaign finance controls			√	√	√			√	√	√
County controls				√	√				√	√
Campaign finance controls x in-state dummy					√					√
County controls x incumbent party					√					√
Observations	9,532	9,532	9,532	9,527	9,527	9,532	9,532	9,532	9,527	9,527
R-squared	0.286	0.294	0.363	0.369	0.490	0.293	0.302	0.364	0.370	0.491

Standard errors, clustered by county, in parenthesis. All regressions include a full set of state and year fixed effects and interactions of the state and year fixed effects with a dummy that equals 1 if the incumbent is a Democrat. Campaign finance controls in columns 3-6 and 8-10 include the total campaign receipts, and total campaign receips from connected PACs, for the incumbent and his opponent (in 2000 US$ thousands of dollars). County controls in columns 4-5 and 9-10 include real per capita income (in 2000 US$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, percent with a high 12 or more years of education (among people with 25 or more years of age), and state income growth. The in-state dummy equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. "Herfindahl state" corresponds to a similar index computed from the contribution of each of several economic sectors to the Gross State Product. Demeaned variables are shown in bold. I demean herfindahl variables before interacting them, so that the coefficient on the main effect for the in-state dummy shows the impact measured at the mean values of the herfindahl indices. See the text and Data Appendix for detailed variable definitions and sources.

Table 3. Media markets and electoral response to campaign finance concentration, US Senate 1980-2002

Dependent variable: share of the two-party vote received by the incumbent										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	County fixed effects									
	herfindahl at PAC level					herfindahl at interest group (industry) level				
herfindahl incumbent	0.113	0.098	0.0532	0.0513	0.0687	0.0661	0.0495	0.0261	0.0269	0.0449
	(0.0214)	(0.0228)	(0.0189)	(0.0191)	(0.0201)	(0.0331)	(0.0339)	(0.0251)	(0.0248)	(0.0257)
herfindahl opponent	0.0859	0.0835	0.00115	0.00324	0.0281	0.128	0.126	0.0206	0.0233	0.0567
	(0.0206)	(0.0206)	(0.0182)	(0.0185)	(0.0175)	(0.0232)	(0.0233)	(0.0212)	(0.0216)	(0.0214)
herfindahl state		-3.864	-0.378	-0.736	-1.956		-3.652	-0.399	-0.765	-2.01
		(1.011)	(1.087)	(1.056)	(1.162)		(1.021)	(1.089)	(1.053)	(1.148)
in state dummy x herfindahl incumbent	-0.0995	-0.0939	-0.0721	-0.065	-0.048	-0.0997	-0.0899	-0.065	-0.0592	-0.0456
	(0.0222)	(0.0235)	(0.0185)	(0.0182)	(0.0184)	(0.0330)	(0.0336)	(0.0246)	(0.0239)	(0.0243)
in state dummy x herfindahl opponent	0.0116	0.0126	0.033	0.0302	0.00772	0.000863	0.00116	0.0246	0.0222	-0.00792
	(0.0212)	(0.0212)	(0.0186)	(0.0188)	(0.0185)	(0.0241)	(0.0241)	(0.0217)	(0.0219)	(0.0227)
in state dummy x herfindahl state		-0.942	-0.0542	-0.0607	0.682		-1.221	-0.138	-0.146	0.602
		(1.024)	(1.061)	(1.027)	(1.154)		(1.033)	(1.063)	(1.026)	(1.142)
Campaign finance controls			√	√	√			√	√	√
County controls				√	√				√	√
Campaign finance controls x in-state dummy					√					√
County controls x incumbent party					√					√
Observations	9,532	9,532	9,532	9,527	9,527	9,532	9,532	9,532	9,527	9,527
R-squared	0.748	0.756	0.824	0.827	0.843	0.755	0.763	0.825	0.828	0.844

Standard errors, clustered by county, in parenthesis. All regressions include a full set of state and year fixed effects and interactions of the county and year fixed effects with the party of the incumbent. Campaign finance controls in columns 3-6 and 8-10 include the total campaign receipts, and total campaign receips from connected PACs, for the incumbent and his opponent (in 2000 US$ thousands of dollars). County controls in columns 4-5 and 9-10 include real per capita income (in 2000 US$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, percent with a high 12 or more years of education (among people with 25 or more years of age), and state income growth. The in-state dummy equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. "Herfindahl state" corresponds to a similar index computed from the contribution of each of several economic sectors to the Gross State Product. See the text and Data Appendix for detailed variable definitions and sources.

Table 4. In-state versus out of state counties, differences in observable characteristics

Dependent variable:	(1) Real per capita income	(2) population	(3) population density	(4) % under 18	(5) % over 65	(6) % female	(7) % black	(8) % urban	(9) % with 12+ years of school (people 25+)
Panel A: in-state versus out of state									
in state dummy	1,704	55,533	98.23	0.162	-1.158	0.0421	1.855	10.6	2.873
	(212.8)	(11,584)	(18.56)	(0.0764)	(0.228)	(0.0886)	(0.703)	(1.810)	(0.423)
Constant	22,877	51,014	76.01	25.65	15.66	50.26	5.201	31.69	69.2
	(219.0)	(8,626)	(15.71)	(0.127)	(0.223)	(0.0884)	(0.656)	(1.713)	(0.387)
Observations	9,528	9,528	9,528	9,528	9,528	9,528	9,528	9,527	9,527
R-squared	0.390	0.106	0.095	0.978	0.263	0.213	0.558	0.151	0.588
Panel B: in-state and contiguous versus out of state									
in state and contiguous dummy	782.8	12,529	12.35	-0.00876	-0.0438	0.118	1.401	3.002	1.233
	(236.7)	(4,773)	(7.880)	(0.119)	(0.300)	(0.112)	(0.886)	(2.214)	(0.535)
Constant	19,686	23,169	49.26	72.46	15.61	50.73	5.506	27.89	69.47
	(212.0)	(9,231)	(7.854)	(0.266)	(0.241)	(0.0933)	(0.606)	(1.717)	(0.371)
Observations	2,623	2,623	2,623	2,623	2,623	2,623	2,623	2,623	2,623
R-squared	0.551	0.108	0.310	0.984	0.337	0.357	0.482	0.154	0.672

Standard errors, clustered by county, in parenthesis. All regressions include a full set of state and year fixed effects. The in-state dummy equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). In the in state and contiguous dummy, in addition to the latter conditions the in-state county must border an out-of-state county in the same state for the dummy to be equal to 1.

Table 5. Media markets and electoral response to campaign finance concentration, US Senate 1980-2002
In-state contiguous counties vs out-of-state counties only

Dependent variable: share of the two-party vote received by the incumbent										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	herfindahl at PAC level					herfindahl at interest group (industry) level				
herfindahl incumbent	0.0645	0.0702	0.0319	0.0264	0.0404	0.0153	0.0232	-0.00126	-0.00436	0.0128
	(0.0254)	(0.0267)	(0.0254)	(0.0270)	(0.0292)	(0.0346)	(0.0356)	(0.0300)	(0.0305)	(0.0327)
herfindahl opponent	0.0955	0.086	0.0282	0.0307	0.0356	0.13	0.122	0.0484	0.0521	0.0621
	(0.0216)	(0.0212)	(0.0205)	(0.0206)	(0.0183)	(0.0243)	(0.0239)	(0.0235)	(0.0237)	(0.0217)
herfindahl state		-5.511	-2.32	-2.606	-3.151		-5.176	-2.266	-2.587	-3.216
		(1.067)	(1.031)	(1.002)	(1.042)		(1.085)	(1.042)	(1.006)	(1.037)
in state dummy x herfindahl incumbent	-0.0769	-0.0625	-0.0657	-0.0573	-0.0414	-0.0752	-0.0624	-0.0582	-0.0499	-0.0400
	(0.0309)	(0.0310)	(0.0241)	(0.0233)	(0.0246)	(0.0371)	(0.0379)	(0.0284)	(0.0272)	(0.0287)
in state dummy x herfindahl opponent	0.0231	0.0251	0.0344	0.0323	0.0286	0.0125	0.0111	0.0240	0.0228	0.0155
	(0.0285)	(0.0273)	(0.0270)	(0.0265)	(0.0260)	(0.0324)	(0.0311)	(0.0307)	(0.0301)	(0.0310)
in state dummy x herfindahl state		-1.885	-0.812	-0.838	-0.229		-1.867	-0.788	-0.812	-0.159
		(1.196)	(1.084)	(1.052)	(1.067)		(1.199)	(1.079)	(1.047)	(1.053)
Campaign finance controls			√	√	√			√	√	√
County controls				√	√				√	√
Campaign finance controls x in-state dummy					√					√
County controls x incumbent party					√					√
Observations	2,623	2,623	2,623	2,623	2,623	2,623	2,623	2,623	2,623	2,623
R-squared	0.764	0.777	0.825	0.831	0.844	0.771	0.782	0.827	0.833	0.845

Standard errors, clustered by county, in parenthesis. All regressions include a full set of county and year fixed effects and interactions of the county and year fixed effects with the party of the incumbent. Campaign finance controls in columns 3-4 and 7-8 include the total campaign receipts, and total campaign receips from connected PACs, for the incumbent and his opponent (in 2000 US$ thousands of dollars). County controls in columns 4 and 8 include real per capita income (in 2000 US$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, percent with a high 12 or more years of education (among people with 25 or more years of age), and state income growth. Like in Table 2, the in-state dummy equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). However, in addition to the latter conditions the in-state county must border an out-of-state county in the same state for the dummy to be equal to 1. For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. "Herfindahl state" corresponds to a similar index computed from the contribution of each of several economic sectors to the Gross State Product. See the text and Data Appendix for detailed data definitions and sources.

Table 6. Media markets and electoral response to campaign finance concentration, US Senate 1980-2002
Placebo out of state vs in-state contiguous counties only

Dependent variable: share of the two-party vote received by the incumbent								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	herfindahl at PAC level				herfindahl at interest group (industry) level			
herfindahl incumbent	-0.0107	0.00474	-0.0344	-0.0369	-0.0671	-0.0494	-0.0673	-0.0667
	(0.0337)	(0.0344)	(0.0297)	(0.0305)	(0.0363)	(0.0372)	(0.0292)	(0.0288)
herfindahl opponent	0.103	0.0999	0.0415	0.0423	0.127	0.124	0.048	0.0499
	(0.0160)	(0.0152)	(0.0171)	(0.0176)	(0.0184)	(0.0176)	(0.0196)	(0.0201)
herfindahl state		-5.913	-1.437	-1.84		-5.667	-1.375	-1.811
		(0.828)	(0.720)	(0.728)		(0.830)	(0.739)	(0.742)
in state dummy x herfindahl incumbent	0.00834	0.00376	0.0147	0.0135	0.0150	0.00866	0.0204	0.0185
	(0.0387)	(0.0391)	(0.0281)	(0.0268)	(0.0405)	(0.0417)	(0.0281)	(0.0262)
in state dummy x herfindahl opponent	0.0153	0.0133	0.00524	0.00524	0.00847	0.00726	0.00514	0.00472
	(0.0238)	(0.0224)	(0.0232)	(0.0231)	(0.0266)	(0.0249)	(0.0258)	(0.0258)
in state dummy x herfindahl state		0.541	-0.191	-0.553		0.642	-0.155	-0.527
		(1.126)	(0.994)	(1.011)		(1.123)	(0.992)	(1.009)
Campaign finance controls			√	√			√	√
County controls				√				√
Observations	2,505	2,505	2,505	2,505	2,505	2,505	2,505	2,505
R-squared	0.734	0.744	0.807	0.811	0.741	0.750	0.808	0.812

Standard errors, clustered by county, in parenthesis. All regressions include a full set of state and year fixed effects, as well as interactions of the state fixed effects with the party of the incumbent. Campaign finance controls in columns 3-4 and 7-8 include the total campaign receipts, and total campaign receips from connected PACs, for the incumbent and his opponent (in 2000 US$ thousands of dollars). County controls in columns 4 and 8 include real per capita income (in 2000 US$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, and percent with a high 12 or more years of education (among people with 25 or more years of age). The in-state dummy equals 0 for in-state and contiguos counties as defined in Table 4, and 1 for their in-state neighbors. For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a herfindahl of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such herfindahls. "Herfindahl state" corresponds to a similar index computed from the contribution of each of several economic sectors to the Gross State Product. See the text and Data Appendix for detailed variable definitions and sources.

Table 7. Media markets and electoral response to share of connected-PACs money, US Senate 1980-2002

Dependent variable: share of the two-party vote received by the incumbent						
	(1)	(2)	(3)	(4)	(5)	(6)
	State fixed effects		County fixed effects		County fixed effects, in-state and contiguous only	
in state dummy	0.00433	0.0121				
	(0.00422)	(0.00307)				
share incumbent	-0.00219	-0.00674	-0.0162	-0.0116	-0.0200	-0.0169
	(0.0186)	(0.0158)	(0.0149)	(0.0153)	(0.0156)	(0.0165)
share opponent	-0.0253	-0.00699	-0.0112	0.00173	-0.00958	0.00386
	(0.00846)	(0.00552)	(0.00634)	(0.00609)	(0.00659)	(0.00677)
in state dummy x share incumbent	-0.00929	0.0101	0.00803	0.00550	-0.00869	-0.00574
	(0.0203)	(0.0165)	(0.0158)	(0.0159)	(0.0185)	(0.0182)
in state dummy x share opponent	0.02	0.0172	0.00389	0.00247	-0.0104	-0.0143
	(0.00928)	(0.00580)	(0.00656)	(0.00631)	(0.00819)	(0.00811)
State herfindahl		√		√		√
Campaign finance controls		√		√		√
County controls		√		√		√
Observations	9,532	9,527	9,532	9,527	2,623	2,623
R-squared	0.561	0.749	0.923	0.931	0.919	0.926

Standard errors, clustered by county, in parenthesis. In columns 1-2, regressions include a full set of state x party and year x party fixed effects. In columns 3-6, regressions include a full set of county x party and year x party fixed effects. In columns 5 and 6 only contiguous counties are included. In even columns, campaign finance controls include total campaign receipts, and total campaign receipts from connected PACs, for the incumbent and his opponent (in 2000 US$ thousands of dollars); county controls include real per capita income (in 2000 US$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, percent with a high 12 or more years of education (among people with 25 or more years of age), and state income growth; state herfindahl corresponds to a herfindahl index computed from the contribution of each of several economic sectors to the Gross State Product and the interaction of this measure with the in-state dummy. The in-state dummy equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). Share incumbent and share opponent refer to the total share of connected-PACs money in campaign receipts. In columns 1 and 2, these shares are demeaned before interacting them with the in-state dummy. See the text and Data Appendix for detailed data definitions and sources.

Table 8. Concentration indices and news about campaign contributions

	Dependent Variable:								
	herfindahl (PAC level)			herfindahl (industry level)			total PAC contributions		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PAC stories/Total stories	0.993		0.984	0.887		0.869	-205,697		-91,968
	(0.161)		(0.159)	(0.155)		(0.156)	(144,480)		(158,422)
Total number of candidate stories		-0.000154	-9.23e-05		-0.000253	-0.000198		1,245	1,239
		(0.000138)	(0.000119)		(0.000127)	(0.000112)		(419.2)	(423.0)
Observations	175	175	175	175	175	175	175	175	175
R-squared	0.322	0.192	0.324	0.404	0.309	0.411	0.521	0.561	0.561

Robust standard errors in parenthesis. All specifications include a full set of year fixed effects, a dummy variable that equals 1 if the candidate is Democratic and a dummy variable that equals one if the canidate is the incumbent. Total number of stories refer to the number of stories in which keywords identifying the candidate name and the word "senate" or "senator" appears in a story. Total number of PAC stories are those in which, in addition, the story contains the keywords "PAC" and "money". The search window is two months before each election. Appendix Table 3 shows the sample of states included each year (and the number of newspapers on which the automated search was done), as well as basic summary statistics

Table 9. Media markets and turnout, US Senate 1980-2002

	Dependent variable: ratio of total votes in senate race to population								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Fixed effects:	state and year	state x party year x party	state x party year x party	state and year	state x party year x party	state x party year x party	state and year	state x party year x party	state x party year x party
in state dummy	0.00473	0.00461	0.0155						
	(0.00415)	(0.00417)	(0.00361)						
in state and contiguous dummy				0.0168	0.017	0.0205			
				(0.00534)	(0.00537)	(0.00413)			
placebo in state and contiguous dummy							-0.0123	-0.0123	-0.00207
							(0.00503)	(0.00506)	(0.00389)
Population control			√			√			√
Observations	10,331	10,331	10,331	2,782	2,782	2,782	2,675	2,675	2,675
R-squared	0.546	0.564	0.650	0.520	0.534	0.689	0.554	0.570	0.707

Standard errors, clustered by county, in parenthesis. In columns 1-3, the in-state dummy equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). In columns 4-6, to the latter conditions the in-state county must border an out-of-state county in the same state for the dummy to be equal to 1. In columns 7-9 the placebo in-state dummy equals 0 for in-state and contiguos counties as defined in columns 4-6, and 1 for their in-state neighbors. Columns 3, 6 and 9 include total population in the right hand side. The fixed effects included in each regression are noted in the title of each column.

Table 10. Media markets and turnout response to campaign finance concentration, US Senate 1980-2002

Dependent variable: ratio of total votes in senate race to population						
	(1)	(2)	(3)	(4)	(5)	(6)
	State fixed effects		County fixed effects		County fixed effects, in-state and contiguous only	
in state dummy	0.00433	0.0121				
	(0.00422)	(0.00307)				
herfindahl incumbent	-0.00219	-0.00674	-0.0162	-0.0116	-0.0200	-0.0169
	(0.0186)	(0.0158)	(0.0149)	(0.0153)	(0.0156)	(0.0165)
herfindahl opponent	-0.0253	-0.00699	-0.0112	0.00173	-0.00958	0.00386
	(0.00846)	(0.00552)	(0.00634)	(0.00609)	(0.00659)	(0.00677)
in state dummy x herfindahl incumbent	-0.00929	0.0101	0.00803	0.00550	-0.00869	-0.00574
	(0.0203)	(0.0165)	(0.0158)	(0.0159)	(0.0185)	(0.0182)
in state dummy x herfindahl opponent	0.02	0.0172	0.00389	0.00247	-0.0104	-0.0143
	(0.00928)	(0.00580)	(0.00656)	(0.00631)	(0.00819)	(0.00811)
State herfindahl		√		√		√
Campaign finance controls		√		√		√
County controls		√		√		√
Observations	9,532	9,527	9,532	9,527	2,623	2,623
R-squared	0.561	0.749	0.923	0.931	0.919	0.926

Standard errors, clustered by county, in parenthesis. In columns 1-2, regressions include a full set of state x party and year x party fixed effects. In columns 3-6, regressions include a full set of county x party and year x party fixed effects. In columns 5 and 6 only contiguous counties are included. In even columns, campaign finance controls include total campaign receipts, and total campaign receipts from connected PACs, for the incumbent and his opponent (in 2000 US$ thousands of dollars); county controls include real per capita income (in 2000 US$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, percent with a high 12 or more years of education (among people with 25 or more years of age), and state income growth; state herfindahl corresponds to a herfindahl index computed from the contribution of each of several economic sectors to the Gross State Product and the interaction of this measure with the in-state dummy. The in-state dummy equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. In columns 1 and 2, these indices are demeaned before interacting them with the in-state dummy. See the text and Data Appendix for detailed data definitions and sources.

Table 11. Spillovers: Media markets and response of House and Presidential vote to Senate race campaign finance concentration, 1980-2002

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable:					
	share of two-party vote to presidential candidate of incumbent's party		**share of two-party vote to house candidate of incumbent's party**			
Herfindahl at level:	PAC	Industry	PAC	Industry	PAC	Industry
herfindahl incumbent	-0.240	-0.457	-3.466	-1.845	-2.538	-0.0227
	(0.195)	(0.249)	(0.774)	(0.995)	(0.738)	(1.394)
herfidnahl opponent	-0.00422	-0.0151	-0.179	-0.141	-0.0621	-0.0289
	(0.0246)	(0.0266)	(0.0640)	(0.0683)	(0.0483)	(0.0550)
in state dummy x herfindahl incumbent	0.190	0.234	-0.594	-0.595	-0.210	-0.110
	(0.149)	(0.169)	(0.316)	(0.445)	(0.198)	(0.316)
in state dummy x herfindahl opponent	0.0102	0.00513	0.128	0.0992	0.0622	0.0349
	(0.0239)	(0.0267)	(0.0801)	(0.0787)	(0.0527)	(0.0559)
Control for house candidate herfindahl					√	√
Observations	1,324	1,324	1,321	1,321	1,169	1,169
R-squared	0.964	0.964	0.849	0.841	0.899	0.902

Standard errors, clustered by county, in parenthesis. All regressions include a full set of county x party and year x party fixed effects. Campaign finance controls, county controls, and state herfindahl controls as described in Table 2 are included in all regressions. The in-state dummy is limited to contiguous counties and equals 1 if the state the county is in has more than two-thirds (66%) of the population of that media market, and zero if it has less than one-third (33%). For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. Note that these measures as well as the campaign finance controls in the right hand side of the regression refer to the senate candidates, whereas the dependent variable is for house candidates and presidential candidates as described in the column titles. See the text and Data Appendix for detailed data definitions and sources.

Table 12. Spillovers: Out-of-state counties response to neighboring state campaign finance profiles in Senate races, 1980-2002

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable is incumbent share of the two-party vote					
	PAC level	Industry level	PAC level	Industry level	PAC level	Industry level
herfindahl incumbent	-0.0224	-0.0687				
	(0.130)	(0.0982)				
herfindahl opponent	0.0393	0.0559				
	(0.0516)	(0.0591)				
herfindahl for neighboring state, incumbent's party			-0.00475	0.0240		
			(0.0575)	(0.0644)		
herfindahl for neighboring state, opponent's party			-0.0125	-0.0182		
			(0.0395)	(0.0386)		
Difference in herfindahls (incumbent-incumbent's party in neighboring state)					-0.00282	0.00276
					(0.0503)	(0.0555)
Difference in herfindahls (opponent-opponent's party in neighboring state)					0.0433	0.0403
					(0.0315)	(0.0316)
Observations	551	551	574	574	551	551
R-squared	0.901	0.902	0.902	0.902	0.902	0.902

Standard errors, clustered by county, in parenthesis. All regressions include a full set of county x party and year x partyfixed effects. All regressions include campaign finance controls, county controls, and the state herfindahl as defined in Table 2. Only out-of-state counties are included, that is if the state the county is in has less than one-third (33%) of the population of the media market. For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. See the text and Data Appendix for detailed data definitions and sources.

Table 13. Media markets and electoral response to campaign finance concentration, US Senate 1980-2002
Robustness to media market definition

Dependent variable: share of the two-party vote received by the incumbent

	In-state= if the state the county is in has more than x% of the population of that media market; out-of-state: if it has less than (100-x)%.					
	x=50		x=60		x=70	
	(1)	(2)	(3)	(4)	(5)	(6)
herfindahl at level	PAC	industry	PAC	industry	PAC	industry
PANEL A: in state versus out of state						
in state dummy x herfindahl incumbent	-0.0653	-0.0619	-0.0688	-0.0652	-0.0827	-0.0786
	(0.0172)	(0.0227)	(0.0175)	(0.0237)	(0.0190)	(0.0262)
in state dummy x herfindahl opponent	-0.00204	-0.00891	0.0148	0.0108	0.0184	0.00127
	(0.0156)	(0.0172)	(0.0168)	(0.0181)	(0.0220)	(0.0243)
State Herfindahl, Campaign finance, and county controls	√	√	√	√	√	√
Observations	12,922	12,922	11,946	11,946	8,379	8,379
R-squared	0.836	0.837	0.833	0.835	0.835	0.836
PANEL B: in state and contiguous versus out of state						
in state dummy x herfindahl incumbent	-0.064	-0.0628	-0.0627	-0.0615	-0.0697	-0.0644
	(0.0241)	(0.0287)	(0.0238)	(0.0285)	(0.0256)	(0.0302)
in state dummy x herfindahl opponent	0.0165	0.0116	0.0356	0.0309	0.0160	-0.000127
	(0.0194)	(0.0210)	(0.0226)	(0.0235)	(0.0313)	(0.0335)
State Herfindahl, Campaign finance, and county controls	√	√	√	√	√	√
Observations	3,999	3,999	3,580	3,580	2,084	2,084
R-squared	0.841	0.843	0.840	0.843	0.840	0.842

Standard errors, clustered by county, in parenthesis. All regressions include a full set of county x party and year x partyfixed effects . Campaign finance controls include the total campaign receipts, and total campaign receips from connected PACs, for the incumbent and his opponent (in 2000 US$ thousands of dollars). County controls include real per capita income (in 2000 US$ dollars), population, population density, percent of the population under 18, percent of the population over 65, percent female, percent black, percent urban, percent with a high 12 or more years of education (among people with 25 or more years of age), and state income growth. The in-state dummy is defined as described in each column title. However, in Panel B in addition to the stated conditions the in-state county must border an out-of-state county in the same state for the dummy to be equal to 1. For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. State herfindahl corresponds to a similar index computed from the contribution of each of several economic sectors to the Gross State Product. The direct effects of the herfindahl of the incumbent and the opponent, as well as the direct effect of the state herfindahl and its interaction with the in state dummy, are always included. See the text and Data Appendix for detailed data definitions and sources.

Table 14. Media markets and electoral response to campaign finance concentration, US Senate 1980-2002
Robustness to Media Market Definition

Dependent variable: share of the two-party vote received by the incumbent						
	(1)	(2)	(3)	(4)	(5)	(6)
	State fixed effects		County fixed effects		County fixed effects, in-state and contiguous only	
Panel A: herfindahl at PAC level						
ratio in state	0.00625	0.00365	0.183	0.0882	-0.0364	0.0318
	(0.00416)	(0.00411)	(0.0457)	(0.0339)	(0.118)	(0.0901)
herfindahl incumbent	0.0938	0.0535	0.0688	0.0232	0.0314	0.00198
	(0.0136)	(0.0132)	(0.0139)	(0.0129)	(0.0225)	(0.0250)
herfindahl opponent	0.0952	0.0282	0.0985	0.0275	0.106	0.0455
	(0.00880)	(0.00875)	(0.0104)	(0.00995)	(0.0160)	(0.0164)
ratio in state x herfindahl incumbent	-0.202	-0.166	-0.134	-0.0816	-0.103	-0.0798
	(0.0269)	(0.0258)	(0.0245)	(0.0207)	(0.0365)	(0.0277)
ratio in state x herfindahl opponent	-0.00278	0.00986	-0.0117	0.00684	0.0220	0.0347
	(0.0193)	(0.0185)	(0.0209)	(0.0185)	(0.0340)	(0.0319)
Campaign finance, county, and state herfindahl controls		√		√		√
Observations	10,305	10,300	10,305	10,300	2,623	2,623
R-squared	0.279	0.363	0.748	0.829	0.765	0.831
Panel B: herfindahl at interest group (industry) level						
ratio in state	0.00580	0.00339	0.193	0.0952	-0.0224	0.0393
	(0.00415)	(0.00411)	(0.0456)	(0.0345)	(0.122)	(0.0929)
herfindahl incumbent	0.0498	0.0328	0.0195	-0.00129	-0.0147	-0.0243
	(0.0158)	(0.0144)	(0.0199)	(0.0157)	(0.0262)	(0.0256)
herfindahl opponent	0.129	0.0402	0.138	0.0435	0.136	0.0626
	(0.00992)	(0.0100)	(0.0120)	(0.0117)	(0.0179)	(0.0187)
ratio in state x herfindahl incumbent	-0.18	-0.141	-0.113	-0.0619	-0.0986	-0.067
	(0.0284)	(0.0267)	(0.0352)	(0.0268)	(0.0424)	(0.0326)
ratio in state x herfindahl opponent	-0.00234	0.0126	-0.0286	-0.00312	0.00846	0.0237
	(0.0219)	(0.0213)	(0.0247)	(0.0222)	(0.0385)	(0.0362)
Campaign finance, county, and state herfindahl controls		√		√		√
Observations	10,305	10,300	10,305	10,300	2,623	2,623
R-squared	0.287	0.363	0.755	0.830	0.771	0.832

Standard errors, clustered by county, in parenthesis. Regressions in columns 1-2 include a full set of state x party and year x party fixed effects, and in columns 3-6 a full set of county x party and year x party fixed effects. Campaign finance, county controls and state herfindahl controls are as defined in Table 2. In columns 5 and 6, only the set of contiguous in-state and out-of-state counties as defined in Table 3 are included in the regression. For each county in state s and media market m, the variable "ratio in state" refers to the share of the media market population that is in state s. For the herfindahl at the PAC (industry) level, the contribution from each PAC (industry) is expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. The ratio in state and herfindahl indices are demeaned before interacting. State herfindahl corresponds to a similar index computed from the contribution of each of several economic sectors to the Gross State Product. See the text and Data Appendix for detailed data definitions and sources.

Appendix Table 1: Main variables sources and definitions

Variable	Description	Source
	Electoral results	
Incumbent share of the two-party vote	Total votes obtained by the incumbent senator divided by total votes for the Republican and Democratic candidate, 1980-2002, calculated at the county level. Open seats and unchallenged races are dropped from the analysis.	Election data and incumbency status is constructed from a variety of sources by Ansolabehere and Snyder (2002). These data run through 2000 and were updated from similar sources and kindly shared by the authors. The main original sources are ICPSR study number 13 (General Election Data for the United States, 1950-1990), and America Votes (1992, 1994, 1996, 1998, and 2000). The House election variables are available from Snyder and Strömberg's (2010) replication dataset.
Share of two-party vote to presidential candidate of incumbent's party	Total votes obtained by the presidential candidate of the same party as the incumbent senator divided by total votes for the Republican and Democratic presidential candidates, 1980-2002, calculated at the county level. For the sample of senate races included in the analysis and for the years in which there is a presidential election.	
Share of two-party vote to house candidate of incumbent's party	Total votes obtained by the Congress (House) candidate of the same party as the incumbent senator divided by total votes for the Republican and Democratic House candidates, 1980-2002, calculated at the county level. For counties with multiple congressional districts the votes for all the Democratic and Republican candidates running for Congress in a county are added to find the Democratic and Republican vote share per county.	
	Campaign contributions	
Total campaign receipts (2000 US $)	Total campaign contributions from any source to the given candidate during the two-year electoral cycle preceeding the election, deflated by the consumer price index to express in constant 2000 US dollars. Sources of funds include connected PACs, ideological/single-issue PACs, individuals, party committess and other candidates.	Federal Elections Commission. Committee master files, candidate master files, and itemized contributions files. The itemized committee contributions file containing each PAC contribution is matched to the other files using the ID number of the contributing committee and the ID number of the recipient (see http://www.fec.gov/finance/disclosure/ftpdet.shtml). Total campaign receipts and total from connected PACs are available from the candidate's master files, whereas for the herfindahl indices the itemized contribution files are necessary. For industry classification, the source is Center for Responsive Politics and author's adjustments, as explained in Appendix section 2.
Receipts from connected (special interest) PACs (2000 US $)	Total contributions from connected PACs to the candidate during the two-year electoral cycle preceeding the election, deflated by the consumer price index to express in constant 2000 US dollars. Connected PACs include all non-party committees classified by the FEC as sponsored by a corporation, labor organization, membership organization, trade association, cooperative, or corporation without capital stock. They exclude ideological and single-issue PACs, as well as party committes and contributions from other candidates.	
Herfindahl index of PAC contributions (PAC level)	Financial contributions (24K) and in-kind contributions (24Z) from each PAC are expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares. Contributions are for the two-year electoral cycle preceeding the election.	
Herfindahl index of PAC contributions (industry level)	Financial contributions (24K) and in-kind contributions (24Z) from each PAC are classified into a single industry as explained in the main text. Industry contributions are expressed as a share of the total PAC contributions to the candidate, and the index corresponds to the sum of the squares of such shares and are for the two-year electoral cycle preceeding the election.	

Appendix Table 1 (continued): Variable Sources and Definitions

Variable	Description	Source
	Media Markets	
In-state dummy	Dummy variable equal to 1 if the county is "in-state" and zero if it is out-of-state. Each county in the sample is assigned to one TV market, or Area of Dominance Influence. A county is "in-state" if the state the county is in has more than x% of the population of the media market, and "out-of-state" if the state the county is in has less than (100-x)% of such population, for x greater than or equal to 50. Unless otherwise stated, the analysis in the paper uses x=66. Only counties that were dominated by the same state are considered in the baseline analysis in the paper.	Data and media market definitions from Ansolabehere, Snowberg and Snyder (2006). Areas of Dominance Influence, constructed by Arbitron, are originally from Broadcast and Cable in 1980, 1990, and 2000.
In-state and contiguous dummy	Identical to the in-state dummy except that, in addition to the latter conditions, the in-state county must border an out-of-state county in the same state for the variable to be equal to 1. That is, the in-state and contiguous dummy is like the in-state dummy but excludes from the analysis all in-state counties that are not contiguous to other out-of-state counties in the same state.	Ansolabehere, Snowberg and Snyder (2006); Broadcast and Cable in 1980, 1990, and 2000.
Placebo in-state and contiguous dummy	Dummy variable equal to zero for the in-state and contiguous counties as defined by the in-state and continuous dummy, and one for neighboring in-state counties in the same state.	Ansolabehere, Snowberg and Snyder (2006); Broadcast and Cable in 1980, 1990, and 2000.
Overwhelmed states	States-years where less than two-thirds of the population lived in in-state dominated media markets, as defined above. Counties in these states are excluded from the analysis.	Ansolabehere, Snowberg and Snyder (2006); Broadcast and Cable in 1980, 1990, and 2000.
Ratio in state	For each county c in state s and media market (Area of Dominance Influence) m, ratio of the population of media market m residing in state s to the total population of market m.	Ansolabehere, Snowberg and Snyder (2006); Broadcast and Cable 1980, 1990, and 2000.
	Other variables and controls	
Real per capita personal income	County-level per capita personal income in constant prices (2,000 US$). Nominal figures from Bureau of Economic Analysis deflated with the Consumer Price Index.	Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce
Population and population density	County population, and county population per square mile.	US Census Bureau
% under 18, % over 65, % female, % black, % 12 years or more of school (persons 25+), % urban	Percent of the population in each category at the county level. Except in the case of percent of population with 12 or more years of school which is computed with respect to total county population of 25 or more years of age, percents are with respect to total population.	US Census Bureau
State-level growth	Yearly percentage change in real state per capita personal income. Real state per capita personal income is the nominal value reported by the BEA deflated by Consumer Price Index.	Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce
State herfindahl	Sum of the squares of the contribution shares of each economic sector to the total Gross State Product.	Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce
Total Stories and PAC stories	Total stories=number of news stories in the two months leading to an election appearing containing the candidate's name and the words "senate" or "senator." PAC stories=of the total stories for a candidate in a given election, number which include, in addition, the keywords "PAC" and "money."	Own calculation based on automated news search on NewsLibrary.com. Search limited for newspapers of the state where the candidate runs for office.

Appendix Table 2: Industry categories for special-interest PACs

Sector	Industry	Examples of categories
Agribusiness	Agricultural Services/Products	Farm bureaus, Florists & Nursery Services, Grain traders & terminals, Veterinarians, Animal feed & health products, Agricultural services & related industries, Farm organizations & cooperatives, Agricultural chemicals (fertilizers & pesticides)
	Crop Production & Basic Processing	Cotton, Sugar cane & sugar beets, Other commodities (incl rice, peanuts, honey), Vegetables, fruits and tree nut, Crop production & basic processing, Wheat, corn, soybeans and cash grain
	Dairy	Milk & dairy producers
	Food Processing & Sales	Food and kindred products manufacturing, Food wholesalers, Food stores, Food & Beverage Products and Services, Meat processing & products
	Forestry & Forest Products	Paper & pulp mills and paper manufacturing, Forestry & Forest Products
	Livestock	Horse breeders, Livestock, Feedlots & related livestock services, Sheep and Wool Producers
	Misc Agriculture	Agriculture
	Poultry & Eggs	Poultry & eggs
	Tobacco	Tobacco & Tobacco products
Communications/Electronics	Computers/Internet	Computer manufacture & services, Computer software, Computers, components & accessories, Online computer services, Data processing & computer services
	Electronics Mfg & Services	Electronics manufacturing & services
	Misc Communications/Electronics	Communications & Electronics
	Printing & Publishing	Greeting card publishing, Book, newspaper & periodical publishing, Printing and publishing (printed & online), Commercial printing & typesetting
	TV/Movies/Music	Live theater & other entertainment productions, Recorded Music & music production, TV production & distribution, Cable & satellite TV production & distribution, Movie Theaters, Entertainment Industry/Broadcast & Motion Pictures, Motion Picture
	Telecom Services & Equipment	Cellular systems and equipment, Other Communications Services, Telecommunications, Telephone & communications equipment, Satellite communications
	Telephone Utilities	Telephone utilities, Long-distance telephone & telegraph service
Construction	Building Materials & Equipment	Electrical Supply, Stone, clay, glass & concrete products, Construction equipment, Plumbing & pipe products, Building materials, Lumber and wood products, Other construction-related products
	Construction Services	Architectural services, Surveying, Engineers - type unknown, Engineering, architecture & construction mgmt svcs
	General Contractors	Dredging Contractors, Construction, unclassified, Construction & Public Works, Public works, industrial & commercial construction, Builders associations
	Home Builders	Residential construction, Mobile home construction
	Special Trade Contractors	Landscaping & Excavation Svcs, Plumbing, heating & air conditioning, Special trade contractors, Electrical contractors
Defense	Defense Aerospace	Defense aerospace contractors
	Defense Electronics	Defense electronic contractors
	Misc Defense	Homeland Security contractors, Defense shipbuilders, Defense Research & Development, Ground-based & other weapons systems, Defense-related services
Energy & Natural Resources	Electric Utilities	Independent power generation & cogeneration, Nuclear energy, Rural electric cooperatives, Nuclear plant construction, equipment & svcs, Electric Power utilities, Gas & Electric Utilities
	Environmental Svcs/Equipment	Environmental services, equipment & consulting
	Fisheries & Wildlife	Fisheries & wildlife, Fishing, Hunting & wildlife
	Mining	Mining, Mining services & equipment, Coal mining, Metal mining & processing, Non-metallic mining
	Misc Energy	Water Utilities, Power plant construction & equipment, Energy production & distribution, Alternate energy production & services, Energy, Natural Resources and Environment
	Oil & Gas	Independent oil & gas producers, LPG/Liquid Propane dealers & producers, Natural Gas transmission & distribution, Oilfield service, equipment & exploration, Gasoline service stations, Petroleum refining & marketing
	Waste Management	Waste management
Finance, Insurance & Real Estate	Accountants	Accountants
	Commercial Banks	Commercial banks & bank holding companies, Banks & lending institutions
	Credit Unions	Credit unions
	Finance/Credit Companies	Credit agencies & finance companies
	Insurance	Property & casualty insurance, Life insurance, Insurance companies, brokers & agents, Insurance, Accident & health insurance
	Misc Finance	Finance, Insurance & Real Estate, Tax return services, Investors, Financial services & consulting, Credit reporting services & collection agencies, Other financial services
	Real Estate	Mobile home dealers & parks, Mortgage bankers and brokers, Building operators and managers, Other real estate services, Title insurance & title abstract offices, Real estate agents, Real estate, Real Estate developers & subdividers
	Savings & Loans	Savings banks & Savings and Loans
	Securities & Investment	Payday lenders, Securities, commodities & investment, Commodity brokers/dealers, Security brokers & investment companies, Venture capital, Hedge Funds, Student loan companies, Private Equity & Investment Firms, Stock exchanges

Notes: Category definitions from the Center of Responsive Politics. The level of aggregation used to control concentration indsutries in the paper is that of industries. () Not all categories are presented in every industry to save space

Appendix Table 2 (continued): Industry categories for special-interest PACs

Sector	Industry	Examples of categories
Health	Health Professionals	Psychiatrists & psychologists, Chiropractors, Optometrists & Ophthalmologists, Health professionals, Physicians, Other physician specialists, Dentists, Other non-physician health practitioners, Nurses, Pharmacists
	Health Services/HMOs	Outpatient health services (incl drug & alcohol), Optical services (glasses & contact lenses), Mental Health Services, Health care services, HMOs, Medical laboratories, Home care services, AIDS treatment & testing
	Hospitals/Nursing Homes	Health care institutions, Nursing homes, Hospitals, Drug & alcohol treatment hospitals
	Misc Health	Health, Education & Human Resources
	Pharmaceuticals/Health Products	Medical supplies manufacturing & sales, Pharmaceutical wholesale, Pharmaceutical manufacturing, Biotech products & research, Personal health care products, Nutritional & dietary supplements, Health care products
Labor	Building Trade Unions	Building trades unions
	Industrial Unions	Energy-related unions (non-mining), Communications & hi-tech unions, Mining unions, Manufacturing unions, IBEW (Intl Brotherhood of Electrical Workers), Automotive unions
	Misc Unions	Other unions, Agricultural labor unions, Defense-related unions, Entertainment unions, General commercial unions, Food service & related unions, Retail trade unions, Health worker unions, Commercial service unions, Labor Unions
	Public Sector Unions	Police & firefighters unions & associations, Federal employees unions, Civil service & government unions, State & local govt employee unions, Teachers unions, US Postal Service unions & associations
	Transportation Unions	Railroad unions, Other transportation unions, Merchant marine & longshoremen unions, Transportation unions, Teamsters union, Air transport unions
Lawyers & Lobbyists	Lawyers/Law Firms	Corporate Lawyers & law firms, Attorneys & law firms, Legal Services, Trial Lawyers & law firms
	Lobbyists	Lobbyists & Public Relations, Registered Foreign Agents
Misc Business	Beer, Wine & Liquor	Liquor stores, Wine & distilled spirits manufacturing, Liquor wholesalers, Alcohol, Beer
	Business Associations	General business associations, Chambers of commerce, Small business associations, International trade associations, Pro-business associations, Business tax coalitions
	Business Services	Commercial photography, art & graphic design, Management consultants & services, Political consultants/advisers, Outdoor advertising services, Advertising & public relations services, Security services, Employment agencies, Direct mail advertis
	Casinos/Gambling	Indian Gaming, Casinos, racetracks & gambling
	Chemical & Related Manufacturing	Plastics & Rubber processing & products, Adhesives & Sealants, Paints, Solvents & Coatings, Explosives, Household cleansers & chemicals, Chemicals
	Food & Beverage	Beverages (non-alcoholic), Confectionery processors & manufacturers, Artificial sweeteners and food additives, Fish Processing, Food catering & food services, Restaurants & drinking establishments, Beverage bottling & distribution
	Lodging/Tourism	Lodging & tourism, Travel agents, Hotels & motels, Resorts
	Misc Business	Warehousing, Import/Export services, General commerce, Correctional facilities constr & mgmt/for-profit, Wholesale trade
	Misc Manufacturing & Distributing	Industrial/commercial equipment & materials, Fabricated metal products, Precision instruments, Clothing & accessories, Electroplating, polishing & related services, Household & office products, Photographic equipment & supplies, Toys, Aluminum
	Misc Services	Miscellaneous repair services, Physical fitness centers, Video tape rental, Beauty & barber shops, Equipment rental & leasing, Services, Funeral services, Laundries & dry cleaners, Pest control
	Recreation/Live Entertainment	Amusement parks, Professional sports, arenas & related equip & svcs, Recreation/Entertainment, Amusement/recreation centers
	Retail Sales	Retail trade, Hardware & building materials stores, Department, variety & convenience stores, Catalog & mail order houses, Miscellaneous retail stores, Vending Machine Sales & Services, Direct sales, Consumer electronics & computer stores
	Steel Production	Steel
	Textiles	Textiles & fabrics
Transportation	Air Transport	Air freight, Air transport, Aviation services & airports, Aircraft parts & equipment, Space vehicles & components, Airlines, Aircraft manufacturers, General aviation (private pilots), Express delivery services
	Automotive	Car rental agencies, Auto manufacturers, Auto repair, Truck/Automotive parts & accessories, Automotive, Misc, Auto dealers, new & used, Auto dealers, foreign imports
	Misc Transport	Buses & Taxis, Motor homes & camper trailers, Pleasure boats, Recreational transport, Freight & delivery services, Transportation, Bus services, Bicycles & other non-motorized recreational transp, Motorcycles, snowmobiles & other motorized vehicles
	Railroads	Manufacturers of railroad equipment, Railroads, Railroad services, Railroad transportation
	Sea Transport	Ship building & repair, Sea freight & passenger services, Sea transport, Cruise ships & lines
	Trucking	Trucking companies & services, Trucking, Truck & trailer manufacturers

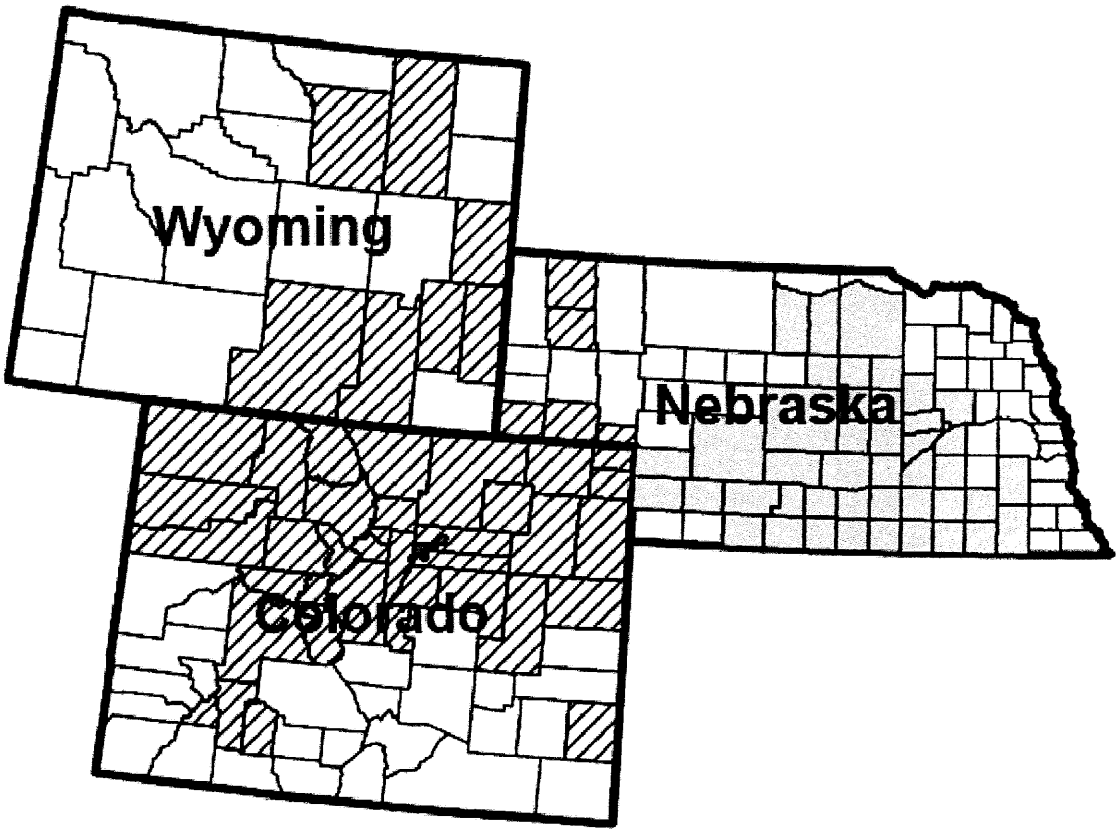
Notes: Category definitions from the Center of Responsive Politics. The level of aggregation used to control concentration indsutries in the paper is that of industries. () Not all categories are presented in every industry to save space

Appendix Table 3: Automated News Searches

year	States	Number of newspapers	Candidate news stories about candidates (total stories)		Candidate news stories discussing PAC money (PAC stories)		Ratio of PAC stories/total stories	
			mean	std. dev.	mean	std. dev.	mean	std. dev.
1982	MA	1	44.5	34.6	2.50	0.71	0.07	0.04
1984	OK	1	20.0	28.3	0.50	0.71	0.03	.
1986	CA, FL, GA, IL, IN, OH, OK, WA	18	109.9	88.1	3.25	2.98	0.04	0.02
1988	CA, IN, MA, MN, OH, TX, UT	18	77.3	90.6	0.93	1.38	0.01	0.01
1990	IL, IN, LA, MA, MN, NC, OK, OR, TN, TX	24	106.9	104.8	1.60	2.11	0.02	0.02
1992	AL, AZ, CT, FL, GA, IA, IL, IN, NC, OH, OK, OR, WI	36	78.0	87.5	2.92	4.92	0.04	0.04
1994	CA, CT, FL, IN, MA, MS, UT, WA, WI	40	131.5	142.7	1.94	2.80	0.01	0.01
1996	IA, MA, MI, MN, MS, NC, NM, OK, TN, TX	31	105.3	104.9	2.70	3.06	0.08	0.23
1998	AL, AZ, CA, CO, CT, FL, GA, IA, IL, NC, NV, OK, OR, UT, WA, WI	95	98.4	104.2	1.75	2.74	0.02	0.03
2000	CA, CT, IN, MA, ME, MI, MN, MS, OH, TN, TX, UT, WA, WI	74	84.6	88.6	1.43	3.64	0.01	0.02
2002	AL, CO, GA, IA, ID, IL, ME, MI, MN, NE, NM, OK, OR	44	59.7	59.7	0.69	1.12	0.01	0.02
Total		**139**	**91.5**	**97.1**	**1.87**	**3.07**	**0.03**	**0.08**

1.C Figures

Figure 1. The Denver-CO and Lincoln-NE Areas of Dominance Influence



Note: Counties in the Denver-CO Area of Dominance Influence (for 1980) are shown hatched, and those in the Lincoln-NE Area of Dominance Influence (for 1980) are shaded.

Chapter 2

Population Surges and Social Conflict[1]

2.1 Introduction

Civil wars have been one of the most major social events of the past several decades, creating enormous economic costs and human suffering in many countries[2]. Standard measures indicate that, since 1960, internal violent conflicts of lower intensity have affected half of all nations in the world, and a third of all countries have suffered more intense civil wars (Blattman and Miguel, 2010).

This paper investigates the effect of population growth on violent conflict. Obviously, population growth and armed conflict can be jointly determined. There may be reverse causation, for instance if only peaceful countries can sustain population growth. Also, omitted variables may cause both population and conflict, and without properly controlling for such a variable we may spuriously estimate a causal effect of population on conflict when there is none. To solve these problems, we follow Acemoglu and Johnson (2007) in using the *international epidemiological transition* (the large improvements in life expectancy driven by international health interventions, more effective public health measures and the introduction of new chemicals and drugs that began in the 1940s).

This "natural experiment" provides us with an empirical strategy to isolate potentially-exogenous changes in population. In particular, the effects of the international epidemiological transition on a country's life expectancy and population were related to the extent to which its population was initially (circa 1940) affected by various specific diseases. Acemoglu and Johnson (2007) construct

[1] **This Chapter was written with Daron Acemoglu and Simon Johnson.**

[2] We thank seminar participants at MIT's development lunch, the University of Chicago, the XXII Annual Conference of the European Society for Population Economics at UCL, Universidad de los Andes, and Universidad del Rosario. Ioannis Tokatlidis provided superb research assistance.

an instrument for population growth based on this pre-intervention distribution of mortality from various diseases around the world, and the dates of global intervention. The only source of variation in this variable, referred to as the "predicted mortality" instrument, comes from the interaction of baseline cross-country disease prevalence with global intervention dates for specific diseases. Since these innovations were exogenous to the conditions of each particular country, and since the instrument does not rely on the efficacy of each country's application of global programs, it provides the exogenous source of variation in population growth we are interested in.

Using this strategy, we find that countries with higher (exogenous) increases in population experimented higher increases in social conflict. Using various definitions of civil war and conflict commonly used in the literature, the instrumented changes in population have a significant and positive effect on the share of years per decade in which a country experiences civil war or conflict. The magnitude of our estimates indicate that a rise in log population of about 0.65 from 1940 to 1980, corresponding to the average change in (log) population in our sample of countries, causes roughly 4.3 additional years with civil war in 1980 relative to 1940. When considering lower intensity conflicts, the corresponding predicted effect is similar, of about 4.1 more years in conflict in 1980.

Our sample includes 65 countries listed in Appendix Table 1. Of these, 47 countries have complete data from 1940 or earlier (and include ten countries in Asia, 17 in Europe, 16 in Latin America, Australia and New Zealand, and Canada and the US). The remaining 18 countries, for which we have data from 1950 or 1960, include 12 non-Eastern European countries (four in Africa, six in Asia, two in Latin America) and six Eastern European countries. Thus, our sample has a good coverage of most regions in the world, with the exception of Africa. Of course, given the prevalence of violent civil conflict in Africa, this is an important limitation, but one that we cannot overcome with the available data. In particular, most African countries lack reliable data on causes of death disaggregated by disease dating back to the 1940s, and this is essential for our identification strategy.

However, in our sample, our results are robust to a wide variety of checks. Regressions using an alternative instrument show that our results are not driven by the choice for dating global interventions. In the alternative instrument, each country's initial mortality rate is assumed to decrease at the pace of the global mortality rate for the disease in question. Hence, this instrument is independent of the coding of global interventions.

Moreover, we verify that the connection between the predicted mortality instrument and conflict is not driven by a general long-run trend. More specifically, we conduct a simple falsification test

using information on conflict prior to the epidemiological transition, from 1900 to 1940. Using this information, we find that while the change in our instrument from 1940 to 1980 is correlated with changes in conflict over the same period, it has no predictive power on the changes over the prior period. This simple "placebo" test gives additional support to the approach, by ruling out the possibility that these two variables are spuriously correlated because they follow a more fundamental long-run trend caused by a third factor.

Additional evidence suggests that the effect of predicted mortality works through changes in overall population, and not through changes in the age composition of the population induced by the international epidemiological transition. Indeed, there is no significant correlation in our sample between age composition and conflict. Part of the reason for this may be the fact that our set of diseases includes diseases that affect both adults and children. Also, by 1980 or after, when most of the change in conflict is observed, any changes in the demographic structure induced by the international epidemiological transition are much reduced.

Since civil wars are hard to measure, we make sure that our results are robust to using several different measures of internal armed conflict. The "Correlates of War" dataset, that covers a longer period than other sources and allows us to conduct our basic placebo test, constitutes our baseline source. We also use the backdated version of the Uppsala Conflict Data Project put together by the International Peace Research Institute. This alternative provides a lower threshold of annual deaths for inclusion, verifying that our results are present with low-intensity conflicts and not only limited to major civil wars. We also verify that our results hold when following Fearon and Laitin's (2003) suggestion of coding anticolonial wars as occurring within the empire in question. Also importantly, we verify that other related variables, such as state failure from the Polity IV State Failure Task Force, similarly increase for countries with higher exogenous increases in population. Moreover, our results are present when examining both the simple presence or absence of civil war, and also the intensity of conflict as measured by available estimates of battle-related deaths.

The evidence also indicates that our results are not spuriously identifying a relationship between population and conflict that is truly explained by differential trends (between countries with high and low population growth) caused by an omitted variable. The results hold when controlling for differential trends, parametrized as functions of various baseline country characteristics. For instance, since our results may in part be about wars that followed independence, we allow for differential trends depending on whether countries were already independent or not in 1940, finding similar results. Other baseline characteristics include the average quality of institutions, initial

population and initial GDP. We do a similar check with variables that have often been emphasized in the literature on conflict, such as ethnolinguistic fractionalization, religion, and availability of natural resources.

The 1940s were of course a decade of big wars. To take this into account we not only examine the implications of population growth on conflict by examining panel regressions that exploit decade by decade changes in population from 1940 to 1980. We also verify that our results hold when excluding the countries demographically most affected by World War II. In an additional exercise, we assign the level of conflict of the 1950s to the 1940s. Finally, we run specifications ignoring the World War II years. In all cases, we find similar results.

Since most available measures of civil wars used by scholars rely on absolute thresholds of number of battle deaths to categorize violence as civil war or conflict, greater population may mechanically increase the number of "detected" civil wars. To test whether this may partly explain our findings, we not only use several measures as explained above. We also check if, above what is predicted from the initial size of each country's populations, conflict increases more where population increased more. Also, we create a new definition of war, based on a relative threshold of violence.

That our results are largely robust to this set of specification checks lends further support to our conclusion that countries with higher (exogenous) increases in population after World War II experienced higher increases in social conflict.

This conclusion is in line with theories dating back at least to Malthus, suggesting that large populations may affect social conflict. Along these lines, we use a simple theoretical framework to interpret our findings as suggestive that larger populations, without a corresponding increase in resources and technology, exacerbate the competition for resources and increase the likelihood of conflict and civil wars in environments where the institutions cannot handle the higher level of disputes.

Our results are of first-order importance for several reasons. First, there has been a tremendous increase in population in developing countries (the most common stage for internal warfare) in the last 100 years. Figure 1, depicting population and the logarithm of population for our sample of countries, reveals that those countries that were rich around the 1940s have experienced less rapid growth than initially-poor or middle-income countries. If greater population or sudden increases in population increase conflict, then post-World War II changes in population (partly a by-product of the international epidemiological transition) could have sizable effects on the likelihood of civil

wars. This is an important additional dimension of the implications of population changes in less-developed countries.

A few examples convey the extent of these "population surges" that followed the international epidemiological transition, especially for initially poor countries. Ecuador, for instance, more than tripled its population from 1940 to 1980, moving from being a country of roughly 2.5 million people to having nearly eight million inhabitants. While sizeable, its population increase from 1900 to 1940 was much smaller, with an increase of roughly 75% (from a level of 1.4 million in 1900). This was not an isolated case. Other countries in our sample that roughly tripled their population from 1940 to 1980 include El Salvador (1.6 million to 4.5 million), Honduras (from 1.1 million to 3.6 million), the Philippines (from 16.6 million to 51 million), and Thailand (15 million to 47 million). Also, where we have data, these rates of growth are significantly faster than those experienced by these countries during the first four decades of the century.

Contrast these increases with the increase in US population following the much discussed "baby boom" after 1945. In the US, population increased "only" around 70% from 1940 to 1980, starting at a level of about 130 million in 1940 and reaching roughly 228 million in 1980. Perhaps even more starkly, contrast the growth of these countries with the increase in population pressure over land in the United Kingdom from around the 1500s to the 1800s, a topic much discussed among economic historians given its potential repercussions for enclosures and the Industrial Revolution (see, for example, the review in Turner, 1984). According to Maddison, population in the UK rose from 3.94 million around 1500 to 6.17 million in 1600, 8.6 million in 1700, and finally reached 21 million by 1820. In three centuries, this was a five-fold increase, and looking at the 120 years leading up to 1820 population increased by a factor of 2.2. Over a bit over two centuries, from 1700 to 1820, the UK population was multiplied by 3.4. In sum, many of the low income countries in our sample had a population increase in a couple of decades similar to what the UK had in a century or more.

In line with the above, a second important implication of the effect of population growth on civil conflict is that it may help explain a puzzling fact. As Figure 2 shows, the international epidemiological transition produced significant convergence in health conditions around the world. By the year 2000, the gap in average life expectancy at birth between initially rich and initially poor countries was reduced to about a half of its 1930 level, measured in absolute terms. However, in spite of the consensus that improving health can have large indirect payoffs through accelerating economic growth, no such convergence is apparent when examining output per capita. This is shown in Figure 3, which illustrates that while average (log) GDP per capita for initially poor,

middle-income, and rich countries has trended upwards since the 1930s, poorer countries have not been able to outgrow and "catch-up" richer countries. The trends shown in these figures are robust to a more careful statistical analysis. When using the exogenous variation in health induced by the international epidemiological transition, Acemoglu and Johnson (2007) find little increases in GDP and a significant negative impact on GDP per capita. If increases in population exacerbated social conflict, the resulting productivity costs may help explain this result. Indeed, the relatively poorer countries experienced greater improvements in health and population. But they also experienced the largest increases in civil wars, as depicted in Figures 4 to 7 using the various measures of conflict that will be considered in this paper.

Our paper is related to several strands of research. A large line of research relies on cross-country evidence to study the causes of civil war. Following contributions such as those of Collier and Hoeffler (1998; 2004) and Fearon and Laitin (2003), scholars have emphasized poverty, inequality, weak institutions, political grievances, and ethnic divisions as explanations for the outbreak and persistence of civil war. Yet, the validity of the statistical inference exercise challenges many of these studies. With a few exceptions[3], they do not adequately address the possibility of reverse causality, or omitted variables bias, driving observed correlations. Indeed, Blattman and Miguel (2010) conclude in their survey of the literature that "further cross-country regressions will only be useful if they distinguish between competing explanations using more credible econometric methods for establishing causality" (p. 8).

To the best of our knowledge, Brückner's (2010) paper is the only previous work that addresses these causality issues in a study of population size and civil conflict[4]. It studies a panel of 37 Sub-Saharan countries during the period 1981–2004 and uses randomly occurring droughts as an instrumental variable for population. In line with our findings for a sample of non-African countries, Brückner finds that (instrumented) population size has an economically meaningful and statistically significant effect on African civil conflict. The most important threat to the validity of his estimates

[3]Exceptions include Miguel, Shanker Satyanath and Sergenti (2004), who use annual rainfall growth as an instrument for income growth in sub-Saharan Africa; Besley and Persson (2008), who rely on plausibly exogenous international commodity price movements; and Brückner (2010), which we review below.

[4]In most of the empirical economics literature on conflict, population is a control variable (often with a positive sign), but it is rarely the prime focus and there is no attempt to control for its endogeneity. For instance, in Sambanis (2002) review of this research, the role of population is hardly mentioned. Collier and Hoeffler (2004) report a positive coefficient on population, which the authors interpret as consistent with either a greed or grievance story for conflict, but their regressions for a panel of countries do not control for country fixed-effects and thus may well be driven by omitted country-specific characteristics. Indeed, in Fearon and Laitin's (2003) study of conflict onset, the positive coefficient on population disappears once fixed effects are included in the regression. Miguel, Satyanath, and Sergenti (2004) also report a positive coefficient, but their focus is on the effect of income on conflict.

is that droughts affect conflict through their effect on other variables, such as income, and not via population. To tackle this issue, Brückner (2010) estimates the impact of population on civil conflict risk conditional on per capita GDP, and uses rainfall and international commodity prices as additional instrumental variables to deal with the endogeneity of income. While, as noted above, we are unable to use our identification strategy for most African countries given lack of reliable disaggregated disease data dating back to the 1940s, Bruckner's results are very suggestive that the main implications of population surges studied in our sample apply to Africa also.

Somewhat surprisingly, population has not been a prime focus in the theoretical literature on the "economics of conflict" (see, for example, the survey by Garfinkel and Skaperdas, 2007). However, there has been a lively debate on the effects of population pressure on violent conflict in other disciplines, in particular political science[5]. Broadly (and simplifying) the debate is between one that highlights "Malthusian" channels to conflict and other which is more skeptical about the practical relevance of such arguments. Among the former, Homer-Dixon (1991, 1999) studies the connection between population growth, pressure on environmental resources, and conflict. For Homer-Dixon, poor countries are in general more vulnerable to environmentally-induced conflicts. Moreover, while recognizing (as do many anti-Malthusians) resilience and adaptability in human-environmental systems, he contends that "as population grows and environmental damage progresses, policymakers will have less and less capacity to intervene to keep this damage from producing serious social disruption, including conflict" (Homer-Dixon, 1991). During the 1990s, Homer-Dixon and his collaborators on the Project on Environment, Population and Security (EPS), often referred to as the Toronto Group, produced a number of case studies on "environmental conflict" which, though not concerned solely with population growth, did underscore its importance as potential source of environmental scarcity and consequently conflict (Homer-Dixon, 1994).

The overall approach of these studies on "environmental security" has come under attack from a number of researchers. Richards (1996) dismisses what he calls the "New Barbarism" theory of conflict put forward by Kaplan's (1994) essay. In particular, for the case of Sierra Leone, he refutes the neo-Malthusian "believe that ordinary Africans will 'sink their ship' by over-production, unless checked by famine, war and disease [and that] war is a process through which the poor in Africa will learn its limits" (p. 121). Instead, he notes that the process of forest conversion in Sierra Leone has taken place over many centuries, and that local land-users have responded in sensible way to

[5]The connection between population and conflict has also received significant public attention, as testified by Robert Kaplan's famous 1994 essay "The Coming Anarchy," in turn heavily influenced by Homer-Dixon.

its different phases, with no evidence of environmental degradation spiralling out of control prior or around the years of civil war between the government and the Revolutionary United Front. He concludes that in Sierra Leone "war is a consequence of political collapse and state recession, not environmental pressure (...) Violence has been incubated in forest fastnesses. [The problem] is too much forest, not too little" (p. 124).

Gleditsch (1998) also offers a critique of this line of research, but emphasizes its methodological shortcomings. Most importantly, he argues that much of it fails to qualify as "systematic" quantitative or comparative research, and violates the rules of quasi-experimental methodology[6]. On the specific issue of population density (or population growth) and violence, he notes that while "strictly speaking, these are not measures of either resource scarcity or environmental degradation," (p. 384) they may provide an indirect measure and, at least in this area, a few papers have provided systematic cross-national evidence. The evidence has not been conclusive[7]. More importantly, these studies typically do not address the endogeneity of population in regressions for conflict.

The paper proceeds as follows. In section 2.2 we present a simple motivating theory capturing the "Malthusian" mechanisms that may lead from population growth to conflict. Section 2.3 describes our data, and Section 2.4 presents ordinary least square (OLS) results. Section 2.5 discusses our identification strategy, and Section 2.6 shows our main results from two-stage least squares (2SLS) estimates. Section 2.7 presents a series of robustness checks on our estimates, and Section 2.8 is a more speculative section on possible consequences of population growth for regime changes. Section 2.9 concludes.

[6]His full critique includes 9 more specific "problems" of the literature: 1. There is a lack of clarity over what is meant by "environmental conflict"; 2. Researchers engage in definitional and polemical exercises rather than analysis; 3. Important variables are neglected, notably political and economic factors, which have a strong influence on conflict and mediate the influence of resources and environmental factors; 4. Some models become so large and complex that they are virtually untestable; 5. Cases are selected on values of the dependent variable; 6. The causality of the relationship is reversed; 7. Postulated events in the future are cited as empirical evidence; 8. Studies fail to distinguish between foreign and domestic conflict; and, 9. Confusion reigns about the appropriate level of analysis.

[7]In particular, Tir and Diehl (1998) examine the Correlates of War dataset to evaluate the impact of population growth and density on international conflict involvement, initiation, and escalation over the period 1930-89. They find that population growth pressures have a significant impact on military conflict involvement, especially in poor countries, but no correlation with conflict initiation or escalation, or between population density and conflict. Hauge and Ellingsen (1998) find that factors like deforestation, land degradation, and scarce supply of freshwater, alone and in combination with high population density, increase the risk of domestic armed conflict, especially low-level conflict, in the period 1980-92. However, economic and political variables prove more decisive than environmental scarcity in predicting the incidence of domestic armed conflict. For more studies along these lines, see the special 1998 issue of the Journal of Peace Research and Diehl and Gleditsch (2001).

2.2 Motivating Malthusian Theory

In this section, we present a simple framework capturing the "Malthusian" mechanisms that may lead from population growth to conflict. The basic idea is that population growth generates greater rents to a fixed factor relative to labor, and this form of "scarcity" makes conflict more likely. In the specific case of land as the fixed factor, this mechanism is particularly relevant in less-developed economies, where agriculture and traditional activities matter most.

It must be noted that the connection between population growth and conflict is not a necessary one. Indeed, it is not necessarily true with constant returns to scale to variable factors. However, we show that when greater population increases "scarcity," it also makes conflict more likely.

Suppose that aggregate output is given by a constant returns to scale production function of a fixed factor, Z, and labor, N, and is also a function of technology, A:

$$Y = F(Z, N, A) \equiv f(N), \tag{2.1}$$

where $F(\cdot)$ exhibits constant returns to scale in (Z, N) and f gives output as a function of labor, holding technology and Z constant. Thus, if N increases with A constant, output per worker, $f(N)/N$, declines. However, if increases in labor (population) come together with increases in the technology parameter A, output per worker can remain constant, thus avoiding scarcity.

We assume the following simple allocation of resources. Each individual i in society supplies one unit of labor inelastically and also owns a fraction θ_i of land. For simplicity, we also suppose markets are competitive, though this is not important for our analysis. With these assumptions, individual income and consumption is given by

$$c_i(N, \theta_i) = f'(N) + \theta_i \left[f(N) - N f'(N) \right]. \tag{2.2}$$

The key observation from equation (2.2) is that the marginal increase in an individual's consumption from an increase in his landholdings, is larger when population increases,

$$\frac{\partial^2 c_i}{\partial N \partial \theta_i} = -N f''(N) > 0.$$

That is, land shares matter more for consumption when population is greater. The intuition is simple: with higher N, land rents are more important relative to wages due to diminishing returns.

This implies a *Malthusian channel to conflict* when land can be contested with violence.

To explore this channel, imagine the society consists of two groups, 1 and 2. All members within a group are identical, and also, to simplify the discussion we suppose both groups are of size $N/2$ and population growth leaves relative shares unchanged. To capture the disruption costs of conflict, assume that if a group initiates conflict, then this reduces output to a fraction $(1-\rho)$ of what it would have been without conflict. Group j has probability p_j of winning the conflict and if so, it captures a fraction λ_{-j} of the land of the other group (λ loosely an inverse measure of the "specificity of assets"). With probability $p_{-j} = 1 - p_j$, it loses the conflict and a fraction λ_j of its land. Also for simplicity, the advantage of being the first mover and deaths from conflict are ignored. Also, as discussed below, voluntary concessions to avoid civil war are ignored. Finally, assume that all agents are risk neutral. Then, the expected benefits to conflict, $\pi_j(N,\theta,\lambda,\rho)$, for group j is given by

$$\begin{aligned}\pi_j(N,\theta,\lambda,\rho) &= -\rho\left\{F'(N)+\theta_j\left[f(N)-Nf'(N)\right]\right\} \\ &\quad +(1-\rho)\left[p_j\lambda_{-j}\theta_{-j}-p_{-j}\lambda_j\theta_j\right]\left[f(N)-Nf'(N)\right].\end{aligned} \tag{2.3}$$

In (2.3),the first line captures the destruction costs of conflict. The second line captures potential benefits, amounting to the undestroyed expected additional land rents that will be expropriated with violence. For there to exist equilibrium conflict, a necessary (but not sufficient condition) is to take a society in which

$$p_j\lambda_{-j}\theta_{-j}-p_{-j}\lambda_j\theta_j \neq 0.$$

so that one of the groups will have potential gains from conflict—say group j. These gains are likely to be higher when θ_{-j} and λ_{-j} are high, so greater inequality of resources between the two groups and lower degree of specificity will contribute to the potential gains from conflict. But even in this case $\pi_j(N,\theta,\lambda,\rho) < 0$ is possible for both groups because of the first term—*cost of disruption.*

The same reasoning as above in our discussion of equation (2.2) implies that whenever $\pi_j(N,\theta,\lambda,\rho) = 0$,

$$\frac{\partial \pi_j(N,\theta,\lambda,\rho)}{\partial N} > 0.$$

Therefore, an increase in population makes the group that is more likely to initiate civil war more "pro civil war." As noted before, this result does not apply when N increases in tandem with A.

This observation is important, in the sense that the Malthusian mechanism says nothing about secular increases in population. Rather, the predictions are about the level of population for given A or for "unusual increases in population".

This simple framework generates other intuitive comparative static results. Greater inequality (θ) between groups makes conflict more likely. Lower disruption costs (lower ρ) and lower asset specificity (higher λ), makes conflict more likely. The latter results may be linked to the importance of natural resources and agriculture versus human capital and industry. In particular, modern capitalism depends on production processes that may be easily disrupted with violence. When traditional production methods are prevalent, for instance when the main form of capital is land, the costs of violence are relatively smaller. Presumably, the productivity of land is harder to destroy than the productivity of a factory. Also, in less-developed economies there is less investment in specific assets, such as human capital, which not only cannot be expropriated through violence but which, unlike land, can move to other places with the outbreak of violence (Acemoglu and Robinson, 2006).

Finally, a central question that we have ignored is why is conflict not prevented by more efficient ways of redistributing resources. A plausible (and prominent) explanation concerns commitment problems (Acemoglu and Robinson, 2001, 2006; Fearon, 1998, 2004; Powell, 2006; Acemoglu, Egorov and Sonin, 2008). To see this, consider the same environment in a dynamic setting, but in each period there is a probability $q < 1$ that either group can initiate civil war. Assume all agents have discount factor $\beta \in (0,1)$. To simplify the discussion, assume that, after civil war, there is a permanent redistribution of resources and never any social conflict again. Also to simplify, only cash transfers are feasible and group 1 is the one considering civil war.

In this context, the benefits from civil war for group 1 are proportional to $1/(1-\beta)$—because of discounting. If the group is sufficiently patient (β is high enough), then cash transfers in a given period are not sufficient to offset this gain. But group 2 cannot make a credible promise to make the cash transfers in the future once the window of opportunity for civil war disappears. In this setting, civil wars arise along the equilibrium path even though more efficient ways of dealing with conflict exist. In particular, fix $\beta \in (0,1)$, then there exists $\bar{q}$ such that for all $q < \bar{q}$, the Markov Perfect Equilibrium will involve equilibrium civil war. Also, there exists $\hat{q} < \bar{q}$, so that for all $q < \hat{q}$, all Subgame Perfect Equilibria involve civil war.

2.3 Data

Measuring civil war and conflict is not simple[8]. The most commonly used datasets differ in the data sources they draw from and in important aspects of the coding procedure, such as thresholds of violence required, definitions of war onset and termination, and treatment of outside parties, communal violence or state repression (see Sambanis, 2004). For this reason, we rely on a number of alternative databases to measure conflict.

We measure conflict as the ratio of number of years in conflict to total years for a period around a reference date t (where, typically, $t = 1940, 1950, ..., 1980$). Thus, we focus on conflict incidence, rather than onset, per decade. This is a natural choice since we are focusing on a relatively long-term phenomenon: increases in population over a period of several decades and the potential response of conflict. Relatedly, since datasets may disagree on the exact year of conflict initiation, the differences between them is typically larger for conflict onset than for conflict incidence. This problem must be addressed when examining high-frequency responses of conflict, but in our case it is better to select the most robust measure of conflict.

Our baseline dataset for conflict is version 3 of the Correlates of War (henceforth COW) dataset (Sarkees, 2000). This source records civil wars since 1816, which allows us to run a simple falsification test using pre-existing trends in conflict. A civil war is defined as a war fought within state borders, between a government and non-government forces, where the central government is actively involved in military action, with effective resistance for both sides[9], and with at least 1000 battle-related deaths during the war. This is a higher threshold of violence for inclusion than alternative sources, which we also use for robustness. When using COW, we assign the number of years with conflict to the reference dates as follows: wars from 1940-1949 are assigned to 1940, wars from 1950-1959 are assigned to 1950, etc.

Our second database for conflict, available since 1946, is the backdated version of Uppsala Conflict Data Project, in conjunction with International Peace Research Institute (UCDP/PRIO Armed Conflict Dataset Version 4, Gleditsch et al, 2002). We assign number of years in conflict to reference dates as follows: 1946-1949 to 1940, 1950-1959 to 1950, 1960-1969 to 1969, etc. Of course, in the case of 1940, we divide the number of years in war by 4, and not by 10 like in the

[8] Here we describe our main dependent and independent variables, and a full description of all variables and sources including all controls and baseline characteristics can be found in Appendix Table 1.

[9] To constitute effective resistance, both sides must have been initially organized for violent conflict, or the weaker side must be able to inflict the opponents at least five percent of the number of fatalities it sustains.

other reference years. This dataset includes conflicts where at least one of the primary parties is the government of a state, and where the use of armed force results in at least 25 battle-related deaths per year. The dataset includes four types of conflicts, and we use the two categories for internal conflict ("internal armed conflict" and "internationalized internal armed conflict").

As a third database to verify the robustness of our results, we consider Fearon and Laitin's (2003) coding of civil war. This dataset covers the period 1945-1999, and the criteria are broadly similar to those of COW[10], except that anticolonial wars are coded as occurring within the empire in question (e.g. Algeria is assigned to France). As with the other datasets, we count the number of years with any incidence of war, and use a similar assignment to reference dates (1940 = 1945−1949, 1950 = 1950 − 1959, etc.).

To examine effects on the intensity of conflict and as further robustness, we use information on battle deaths from the Center for the Study of Civil War (CSCW) Battle Deaths Dataset (Lacina and Gleditsch, 2005). We use version 2, compatible with the COW dataset, and use the "best estimate" of annual battle-related deaths (similarly assigning deaths to reference years using the rule: 1940 = 1940 − 1949, 1950 = 1950 − 1959, etc.). We also use version 3, compatible with the UCDP/PRIO dataset, since this dataset has a smaller threshold of battle-deaths for inclusion. This allows us to more convincingly check the robustness of our results to possible mechanical effects on detected wars with increases in population.

We also explore whether the large exogenous increases in population in our data have an effect on state failure and regime changes. As a measure of state failure, we use the "extreme political failure" dummy, available from 1955 from the Political Instability Task Force (Phase III), with similar assignment to dates (1950 = 1955 − 1959, ...). For regime changes and democratic changes we use Polity IV.

We have data for 65 countries listed in Appendix Table 1, although only for 47 of them we have complete data from 1940 or earlier. The remaining 18 countries, for which we have data from 1950 or 1960, include 12 non-Eastern European and six Eastern European countries. As highlighted previously, we are able to include only four African countries (Algeria, Egypt, South Africa, and Tunisia), an important limitation given the prevalence of Civil War in Africa. However, lack of reliable data on causes of death disaggregated by disease dating back to the 1940s explains the

[10] Conflicts are included if they: involved fighting between agents of (or claimants to) a state and organized, nonstate groups who sought control of a government, region, or change in government policies; killed at least 1,000 over its course, with a yearly average of at least 100; at least 100 were killed on both sides (including civilians attacked by rebels).

exclusion of most of Africa in Acemoglu and Johnson (2007). Our efforts to extend that sample proved futile.

The treatment of countries which enter or leave the state system or whose borders change over time must be explained. For each country, we check when the respective datasets considers the country as entering or leaving the state system, and adjust accordingly the number of years on a reference year. Thus, for example, if Algeria enters the COW system membership in 1962, the measure of conflict for 1960 is the number of years in conflict from 1962-1969 (if any), divided by 8 (instead of 10). Moreover, we code as missing (not zero) the observations for Algeria in reference years prior to 1960. While this surely is a reasonable choice (Algeria did not exist as a state before, just like Bangladesh did not prior to 1971, and so on), the criteria for inclusion in the COW system membership include a population threshold of 500,000 and having diplomatic recognition (prior to 1920, recognition at or above the rank of *charge d'affaires* with Britain and France and, later, being a member of the League of Nations or the United Nations, or receiving diplomatic missions from two major powers). Thus, for instance, Costa Rica and Australia are not in the system in 1900. While it may be seem reasonable to include them as (peaceful) states in 1900 for our falsification regressions, we avoided doing any of these adjustments to the data, instead following the approach of abiding by the choices made by the authors of each of the independent codings of civil war.

As a general rule, when a country splits we do not attempt to code "external" wars between formerly member states as "internal" wars in the territory as a whole. Again, we follow this procedure to avoid including our own criteria of what constitutes an internal conflict, instead abiding by the classification of the various sources we use, and verifying the validity of our results to dropping potentially problematic countries or territories.

Also, we adopt the general rule of aggregating civil wars and regime changes for the splitting territories. The countries in our sample potentially affected by this choice are just Czechoslovakia, Germany, the USSR and Vietnam. Thus, for example, we add USSR internal conflicts while it existed, and aggregate *internal* conflicts (if any) and regime changes of the member states and assign them to the USSR as a whole after 1991. As it turns out, choosing this against other alternatives makes little difference in practice for the coding of our dependent variables. First, our main specifications end in 1980, prior to many of these splits. Second, in many cases the dependent variable would be the same aggregating the territories or not. For instance, in Czech Republic in the 90s, our dependent conflict variables are always zero with or without aggregating Slovakia. Also, we would have 1 in our regime transition dummy in the 1990s whether we took Czech Republic,

Slovakia, or the aggregate.

This procedure also minimizes potential mismatches between the level of aggregation of the population figures from Maddison (2006) and civil conflict/political data. Indeed, in the case of Czechoslovakia/Czech Republic, Maddison presents throughout the data for Czechoslovakia as a whole, even after split between Slovakia and the Czech Republic. Similarly, population figures are for Vietnam as a whole, and for the USSR while it existed and later the total for ex-USSR. Maddison's treatment of Germany is more complicated. It takes the 1870 frontiers until 1918, the 1936 frontiers for 1919-1945, and present frontiers from then on. Also, it must be noted that the immediate post-war disease data from the UN are divided into Eastern Germany, Federal Republic of Germany, Berlin and West Berlin, and numbers for the Federal Republic were used in Acemoglu and Johnson (2007). To make sure our results do not depend on any of these choices, we also dropped Czechoslovakia, Germany, the USSR and Vietnam and found results similar to those reported below.

The sources to build our instruments can be found in Acemoglu and Johnson (2007)[11]. Information on age structure is from the United Nations. We also consider a number of controls for robustness exercises, all of which are described in Appendix Table 1. These include measures of institutions, whether our countries were independent in 1940 or not, whether the country was affected by World War II, initial (in 1930) GDP per capita, availability of natural resources (diamonds, oil, and gas), ethnic and religious fragmentation and fractionalization, and share of Catholic, Muslim, and Protestant populations.

Table 1 presents descriptive statistics (sample means and standard deviations) for our main data. We present these summary statistics for the sample as a whole, for groups of countries by income, as well as dividing them between countries experiencing a change in predicted mortality above and below the median. Column 2 shows a general trend, evident in every measure of conflict, of increasing conflict from 1940 to 1980. Also, columns 3 to 5 show that such an increase is concentrated in middle-income and, especially, poor countries. But more importantly, comparing the change in our conflict measures from 1940 to 1980 in columns 6 and 7, we observe that countries above median change in predicted mortality exhibit larger increases in conflict than those below the median change. For instance, the average years in conflict (per decade) according to the COW measure increased from 0.8 years to 2.5 years for countries with above median change in predicted

[11]The main source of the necessary health data on incidence of diseases circa 1940 is the League of Nations (based on national statistics), but other sources were consulted for consistency.

mortality from 1940 to 1980, while it decreased from 0.2 years to 0.06 years for those with below-median change. These patterns are suggestive for our hypothesis, and we will examine below if they survive in our regression exercises and various robustness checks.

2.4 Ordinary Least Squares (OLS) Results

As a benchmark for our IV estimates reported below, and to examine more systematically these correlations in our data, we start by presenting results for simple ordinary least squares (OLS) regressions of our measures of conflict on population. More specifically, in Table 2 we report regressions of the form

$$c_{it} = \pi x_{it} + \zeta_i + \mu_t + \mathbf{Z}'_{it}\boldsymbol{\beta} + \varepsilon_{it}, \tag{2.4}$$

where c_{it} is one of our measures of conflict for country i and reference year t, and x_{it} is (logarithm of) population. ζ_i denote a full set of country fixed effects while μ_t are a full set of year dummies, which we always include to remove time-invariant country-specific factors and global trends affecting population and conflict. Z_{it} is a vector of other controls. In Table 2, as in subsequent tables, we present two types of estimations. Panel A presents *long difference* estimations in which just 2 dates, usually 1940 and 1980, are included in the regressions. In this case, (2.4) is equivalent to a regression of the change in conflict between the two dates on the change in population between the same two dates, giving us a particularly simple interpretation. In Panel B of the Table, we look at panel results between 1940 and 1980, with data for $t = 1940, 1950, 1960, 1970, 1980$.

For all of our regressions, we calculate standard errors that are fully robust against serial correlation at the country level (e.g., Wooldridge 2002, p. 275)[12]. However, these standard errors may be downward biased due to the relatively small number of clusters. Thus, we also implemented the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). In particular, we performed wild bootstraps resampling our clusters with replacement, and calculated bootstrap p-values for the t-statistics of our main coefficients of interest. Our regression tables report p-values following both of these approaches.

The OLS results in columns 1-3 of Table 2 reveal that population is positively correlated with conflict. The estimated coefficient for log population (0.303) in the long-difference regression in

[12]Moreover, as a "degrees of freedom adjustment" we adopt the relatively conservative formula for the covariance matrix $\frac{N-1}{N-G-k}\frac{M}{M-1}V$ where N is the number of observations, k the number of coefficients (excluding the fixed effects and constant), M the number of clusters, and V is the asymptotic cluster-robust covariance matrix. A less demanding alternative often used is $\frac{N-1}{N-k-1}\frac{M}{M-1}V$.

column 1 of Panel A, where conflict is measured using the COW dataset, implies that the average change in log population in our sample of 0.65 is correlated with about 1.97 more years in conflict in 1980 relative to 1940. For a country like El Salvador, with an increase in population from 1.6 to 4.6 million, this predicts about 3.2 more years in conflict during the 1980s than during the 1940s. The size of the coefficient is fairly stable across different datasets for conflict, as columns 2 and 3, which use the UCDP/PRIO and Fearon and Laitin datasets, reveal. And while these latter estimates are not significant at conventional levels when using the standard cluster-robust p-values, we find reassuringly smaller p-values (of around 8% to 10%) with the wild bootstrapping procedure. In fact, this is a general pattern throughout this and other tables, suggesting that the degrees of freedom adjustment on the asymptotic cluster-robust covariance matrix is in fact too conservative in our case.

Also interestingly, column 4 shows a strong and very significant population between population and state failure. The estimated coefficient for battle deaths as the dependent variable, in column 5, is also positive. However, the p-values reveals that it is, if anything, only marginally significant.

One possible concern with the results from Table 2 is that they might by driven by age composition effects. In particular, rather than *larger* populations it may be that *younger* populations are correlated with conflict. Table 3 examines this issue by presenting regressions as in Table 2 with the share of population from 15 to 34 years of age as the independent variable. As the odd columns from this Table reveal, this variable is usually not significantly correlated with conflict. Moreover, when population is also included as a regressor in the even columns of the Table, the results for population are very similar to those in Table 2, and the point estimate on the share of young population is usually negative. These results suggest that rather than age composition, total population is correlated in our sample with conflict (and state failure). However, these OLS estimates are not necessarily causal, and the true effect of population on conflict might be larger or smaller than implied by these coefficients. We next investigate this question.

2.5 Identification Strategy: the International Epidemiological Transition as a Natural Experiment

As noted in the Introduction, our identification strategy relies on the *International Epidemiological Transition* as a "natural experiment" creating large increases in population. Such increase in population followed major exogenous (to most countries) innovations in drugs (e.g., penicillin) and

associated effective treatments, and chemicals (e.g., DDT) and how to apply them. International programs to spread best practices followed through, led by international agencies such as the WHO and UNICEF. This episode provides an instrument for population growth, by exploiting pre-intervention distribution of mortality from various diseases around the world, and the dates of major global interventions affecting mortality from this set of diseases.

More specifically, we use the *predicted mortality instrument*, which adds each country's initial (in 1940) mortality rate from 15 diseases until there is a global intervention, and after the global intervention, the mortality rate from the disease in question declines to the frontier mortality rate[13]. For country i at time t, the instrument is constructed as follows:

$$M_{it}^{I} = \sum_{d \in D}((1 - I_{dt})M_{di40} + I_{dt}M_{dFt}), \tag{2.5}$$

where: M_{di40} denotes mortality in 1940 (measured as number of deaths per 100 individuals per annum) for country i, from disease $d \in D$; I_{dt} is a dummy for intervention for disease d that takes the value of 1 for all dates after the intervention; M_{dFt} is mortality from disease d at the health frontier of the world at time t; and D is the set of diseases listed above. Since M_{di40} is the pre-intervention mortality for disease d and $I_{dt} = 1$ after a global intervention, the variation in this variable comes from the interaction of baseline cross-country disease prevalence with global intervention dates for specific diseases. Countries that experienced higher mortality than others for a given disease are expected to observe larger increases in population after the intervention.

One concern with the predicted mortality instrument is that it depends on the choice for dating global interventions. An alternative instrument that is independent of the coding of global interventions assumes each country's initial mortality rate decreases at the pace of the global mortality rate for the disease in question. The formula for this *global mortality instrument* is given by

$$M_{it}^{I} = \sum_{d \in D} \frac{M_{dt}}{M_{d40}} M_{di40}, \tag{2.6}$$

where M_{dt} (M_{d40}) is global mortality from disease d in year t (1940), calculated as the unweighted average across countries in the sample of countries in Acemoglu and Johnson (2007).

We use these variables as instruments for population. In particular, we posit the first-stage

[13]The 15 diseases are (in rough descending order of importance): malaria, pneumonia, and tuberculosis; influenza, cholera, typhoid, smallpox, shigella dysentery, whooping cough, measles (rubeola), dyphteria, scarlet fever, yellow fever, plague, typhus.

relationship for country i at time t,

$$x_{it} = \varphi M_{it}^{I} + \tilde{\zeta}_i + \tilde{\mu}_t + \mathbf{Z}_{it}'\tilde{\boldsymbol{\beta}} + u_{it} \tag{2.7}$$

where: x_{it} is the logarithm of population; M_{it}^{I} the predicted (or global) mortality instrument; $\tilde{\zeta}_i$ is a full set of country fixed effects; $\tilde{\mu}_t$ are year fixed effects; and $\mathbf{Z}_{it}$ represents a vector of other controls.

Acemoglu and Johnson (2007) show that the changes in predicted mortality led to major improvements in life expectancy (and other health measures). This is shown in Figure 8, where the horizontal axis depicts the change in predicted mortality between 1940 and 1980, and the vertical axis shows the change in log life expectancy during the same time period. In countries like India, Pakistan, Indonesia, Ecuador and El Salvador, where predicted mortality declined by a large amount, there were large gains in life expectancy. Instead, life expectancy remained largely unchanged in parts of western Europe, Uruguay, Argentina, Korea, and Australia, where predicted mortality did not decrease as much. Also importantly, Figure 9 depicts the same negative relationship holds without the richest countries, so it is not driven by the comparison of initially rich countries to initially low- and middle-income countries.

One concern is that these results are driven by a preexisting trend. To show that this is unlikely to be the case, Figures 10 (and 11) look at changes in life expectancy during the pre-period, 1900–1940 (and 1930-1940), and examine whether they correlate with future (post-1940) changes in predicted mortality. Unlike Figures 8 and 9, there is no strong evidence of a negative relationship. These issues are examined in greater detail in Acemoglu and Johnson (2007), and the results point to a very robust and significant relationship between predicted mortality and health that is unlikely to be driven by preexisting trends. We now build on the consequences of these improvements on health for population growth to examine the relationship between population and conflict.

2.6 Main Results

2.6.1 First Stages

That there is a strong first-stage relationship between predicted mortality and population is evident in Figures 12 and 13. Like Figures 8 and 9, these figures measure the change in predicted mortality between 1940 and 1980 in the horizontal axis, but show the change in log population during the

same time period in the vertical axis. Again, we observe a strong negative relationship (whether looking at the whole sample or at low- and middle-income countries alone).

Table 4 shows the first-stage relationship in regression form by estimating equation (2.7). This Table shows the strong negative relationship between log population and predicted mortality is robust across alternative samples. Panel A reports long-difference specifications, and panel B reports panel regressions. Column 1 includes all countries in our sample, and shows an estimate of φ equal to -0.782, which is significant at less than 1 percent. This estimate implies that an improvement in predicted mortality of 0.469 per 100 (or 469 per 100,000, which is the mean improvement between 1940 and 1980 in our base sample) leads to around a 44% percent increase in population (the mean population in our sample in 1940 was about 34 million, so this is an increase of nearly 15 million, whereas the actual mean increase in population between 1940 and 1980 was about 30 million). This implies that changes in predicted mortality account for almost one-half of the increase in population 1940 and 1980. Column 2 repeats the same regression excluding Eastern Europe, and Column 3 looks only at low- and middle-income countries. The estimate of φ is similar, and still significant at less than 1 percent. Panel B repeats the same regressions using a panel with decadal observations. The results are still highly significant but the coefficients smaller, which is reasonable since these regressions exploit shorter-run responses to changes in predicted mortality. Column 4 presents results using the global mortality instrument. The results are also strong and significant, reassuring us that they do not depend on the coding of global intervention dates. Finally, column 5 excludes the countries most affected by World War II, again with almost identical results.

The main potential threat to the exclusion restriction would be that the baseline mortality rates are correlated with future changes in conflict. To show that this is unlikely to be the case, we will show the robustness of our IV results to the inclusion of differential trends that are parametrized as functions of various baseline characteristics. Whether this explains the first-stage relationship is investigated with regressions of the form

$$x_{it} = \varphi M_{it}^{I} + \tilde{\zeta}_i + \tilde{\mu}_t + \sum_{t=1940}^{1980} \kappa_i' \bar{\omega}_t + u_{it} \tag{2.8}$$

where $\bar{\omega}_t = 1$ in year t and zero otherwise, and κ_i are "time-invariant" characteristics of country i. These characteristics include: a measure of the average quality of institutions (average of the constraints on the executive from the Polity IV data set over 1950-70; a dummy for independence in

1940; initial (in 1930) GDP per capita and population; and measures of the availability of natural resources and ethnic polarization/fragmentation, often emphasized on the empirical literature on civil war. These regressions are reported in Table 5. Since equation (2.8) includes a full set of time interactions with c_i, differential trends related to these characteristics are taken out. In long-difference regressions of panel A, this specification is equivalent to including an interaction between the 1980 dummy and the baseline characteristics.

The results in both panels show that controlling for these characteristics has little effect on our results. Overall, the evidence in this section shows that the instrument is very strong and that its correlation with population is unlikely to be driven by differential trends due to a third factor.

2.6.2 Reduced Forms and Falsification

Figures 14 and 15 find a strong reduced-form relationship between the change in conflict 1940-1980 and the change in predicted mortality over the same period, for all countries in our sample and for low- and middle-income countries only, respectively. These patterns are shown in regression form in columns 1 and 2 of Table 6: countries with a larger decline in predicted mortality experienced a larger increase in years in conflict. Given the negative relationship between predicted mortality and population shown in the previous section, this translates into a positive effect of population on conflict in our 2SLS estimates below.

Before presenting these estimates, a useful falsification exercise (as we did before for the case of life expectancy) is to look at changes in predicted mortality, and see whether they correlate with changes in conflict or population during the pre-period. Columns 3 and 4 of Table 6 find no relationship between the change in conflict from 1900 to 1940 and change in predicted mortality from 1940 to 1980, for the base sample and for low- and middle-income countries. This lack of relationship can be seen in Figures 16 and 17. There is a strong contrast between the patterns in these figures and those of Figures 14 and 15. Similar specifications for our first stage (changes in log population from 1900 to 1940 and in predicted mortality from 1940 to 1980) are shown in columns 5 and 6, again with no sign of such a relationship. Predicted mortality explains changes in population after 1940, but not before 1940.

These results therefore suggest that there were no preexisting trends related to changes in predicted mortality either in population or in our key conflict outcome variables. This gives us greater confidence in using predicted mortality as an instrument to investigate the effect of population on conflict. However, the exclusion restriction for our IV strategy -$Cov(M^I_{it}, \varepsilon_{it}) = 0$, where ε_{it} is

the error term in the second-stage equation- requires that the unique channel for casual effects of predicted mortality on conflict is changes in population. Since this exclusion restriction is fundamentally untestable, we cannot be entirely sure that this is the case. As we documented before, for example, changes in predicted mortality generated major changes in life expectancy. However, life expectancy should probably not have a direct effect on conflict aside from through its impact on population. As noted before when discussing Table 6 of first stages, as an additional check we will control for differential trends parametrized as functions of baseline characteristics in our 2SLS regressions to be discussed below.

As noted when discussing the OLS estimations, another concern is that the causal channel is partly age structure. While potentially important, the OLS results of Table 3 do not show a significant correlation. In addition, by 1980, when we observe the largest impacts on conflict, changes in the demographic structure induced by the international epidemiological transition are much reduced. Table 7 investigates this issue further. Column 1 presents long-difference regressions for our base sample (where $t = 1940$ and 1980) of the share of population of ages 15-34 on predicted mortality. The coefficient on predicted mortality is close to zero (0.004) and not statistically significant. A similar result is obtained in column 2, which restricts attention to low- and middle-income countries only. Columns 3 and 4 repeat these regressions but use the global mortality instrument instead of predicted mortality as the independent variable. Again, there is no significant relationship between the instrument and the share of young people in the population. Moreover, when we look at a longer horizon, as in columns 5-8 with specifications similar to those in columns 1-4 but where $t = 1940$ and 1990, the point estimate on our instrument is actually negative, and again not statistically different from zero. These results thus suggest that, by 1980 and 1990, the main change induced by the international epidemiological was in total population, and not in the demographic structure. Moreover, in Acemoglu and Johnson (2007) it is further shown that the international epidemiological transition affected life expectancy at various ages, not only at birth. This is not surprising, as some of the diseases used in computing predicted mortality –in particular tuberculosis and pneumonia, two of the main killers– affected the entire age distribution.

2.6.3 2SLS Results

Table 8 presents our main results, which are the 2SLS estimates of the effect of population on conflict. More specifically, our second stage regression is given by equation (2.4), where population is instrumented by predicted mortality –equation (2.7)–. As before, we report long-difference

regressions for 1940 and 1980 in panel A and panel regressions for 1940 – 1980 in panel B. This table shows that the effect of population on conflict is positive, and very significant in most specifications. In column 1, the dependent variable is the share of years in internal conflict per decade, as measured by the COW dataset.

The size of the effect (π is estimated to be 0.658) implies that the average change (0.65) in log population leads approximately to 4.3 more years in conflict during the 1980s relative to the 1940s. Compare this to the OLS coefficient of Table 2 (0.303), which implied an effect of around 1.97 more years in conflict in the 1980s compared to the 1940s. For a country like El Salvador, experiencing an increase in population from 1.6 to 4.6 million in this period, the OLS estimate predicts roughly 3.2 more years in conflict while the IV estimate of π implies an effect of roughly 7 more yeas in conflict. We find similar results in the case of the panel regressions for 1940-80 presented in panel B ($\pi = 0.54$ with a p-value of about 0.01).

Columns 2-4 investigate the robustness of this result to using different measures of conflict and the alternative global mortality instrument. In particular, the dependent variables in columns 2 and 3 are the years in internal conflict as a fraction of total years in the reference date as measured by the UCDP/PRIO and Fearon and Laitin datasets, respectively. All the estimated coefficients are positive, and typically significant at less than 1 or 5% according to our cluster-robust wild bootstrap p-values. The more standard p-values from robust standard errors clustered at the country level are somewhat more conservative. Column 4 considers instead the number of years the state failed as a fraction of total years, and column 5 presents regressions for the (log of) battle deaths per year for each reference date. While in the latter the coefficient on population is also positive and significant in both panels, for state failure we find a positive significant effect just in the panel regressions. Finally, columns 6 to 10 repeat the regressions from columns 1-5 but use global mortality as the instrument for population. The results are very similar. This evidence suggests that our results do not depend on the dating of global health interventions.

Table 9 examines the timing of the response of conflict to population growth. In particular, columns 1 to 4 look at different time horizons by estimating long-difference regressions for our baseline measure of conflict on population (instrumented with predicted mortality), where the initial time period is $t = 1940$ and the final date is 1960, 1970, 1980, and 1990. Moreover, column 5 looks at 1970-1997 as the post-period. Consistent with the idea that health improvements and population increase have a lagged effect on social conflict, results are weaker if we only look only at 1940-60 or 1940-70. This result is again not sensitive to the coding of global health interventions,

as columns 6-10 reveal.

2.7 Robustness Checks

2.7.1 Alternative Samples, Instrument, and World War II

Table 10 presents a number of robustness checks on our results. We focus on our main measure of conflict: share of years in conflict in each reference date according to the COW dataset on civil war. For comparison, column 1 reproduces our main long-difference and panel regression estimates from Table 8. In column 2, we exclude Eastern European countries, which may have had a special behavior in the context of the Cold War. The estimated value of π remains positive, of similar size and statistically significant. Column 3 drops initially rich countries to verify that these results are not driven by the comparison between rich and poor nations, and Column 4 uses the global mortality instrument.

Columns 5-7 check whether results are driven by events around World War II. Column 5 excludes the countries demographically most affected by the War, namely Austria, China, Finland, Germany, Italy, Russian Federation (Urlanis, 2003). Column 6 assigns instead the level of conflict of the 1950s to the 1940s. Column 7 simply ignores the war years, and assigns the number of years in conflict from 1946-49 (as a fraction of the 4 years in these interval) to our dependent variable in 1940.

Overall, the coefficient is very stable and retains statistical significance at conventional levels. These robustness checks thus lend more credibility to our baseline estimates.

2.7.2 Differential Trends

As emphasized before, the main potential threat to our strategy would be that these estimated effects of population on conflict are truly capturing differential trends between countries with different levels of baseline mortality rates. Since these trends may depend on unobservable characteristics, the threat is ultimately untestable. However, we can examine the robustness of our results to the inclusion of differential trends, parametrized as functions of various observable baseline characteristics. If differential trends due to independence, other institutional factors, initial population, and variables commonly emphasized in the empirical studies of civil war do not change our results, we are more confident about our exclusion restriction.

In Table 11, in line with the corresponding first stages in equation (2.8) and Table 5, our second

stage equations take the following form:

$$c_{it} = \pi x_{it} + \zeta_i + \mu_t + \sum_{t=1940}^{1980} \kappa_i' \bar{\omega}_t + \varepsilon_{it}. \tag{2.9}$$

In column 1, we examine whether the results could be driven by differential trends between countries with "good" and "bad" institutions. While there are many dimensions of institutions, we choose to measure the quality of institutions by average constraints on the executive over 1950-1970. This is a particularly relevant dimension of institutions, since, as noted in Section 2.2, the commitment problem is a persuasive explanation for civil war. In column 2, κ_i is simply a dummy variable equal to 1 if country i was independent in 1940. Columns 3 and 4 control for differential trends as a function of initial GDP per capita and initial population, respectively.

In columns 5-9, the country characteristics κ_i are variables commonly emphasized as correlates of civil war. A large literature links conflict to natural-resource abundance, in particular oil, gas, and diamonds[14]. A commonly used measure is oil exports divided by GDP or the share of the natural resource sector in GDP (Sachs and Warner, 1995). As Ross (2006) notes, this measure may be a poor proxy of rents in the economy or revenues for the government -key potential drivers of war- since it does not include oil that is produced but consumed domestically, and it does not account for extraction costs which may vary across countries. Also, even at similar levels of production, the numerator tends to be larger in poor countries because poor countries consume less of their own oil. Normalizing by GDP similarly inflates the numbers for poor countries. Motivated by this reasoning, in columns 5-7, κ_i is, respectively: oil production per capita (from Humphreys, 2005), diamond production per capita (from Humphreys, 2005), and oil and gas rents per capita (from Ross, 2006).

A number of theories also suggest that ethnic (or religious) diversity and polarization may be a cause civil war, or at least that they may facilitate surmount the big collective action problems within groups in conflict[15]. Nevertheless, cross-national studies find few differences between the

[14]The mechanisms whereby natural resources may lead to conflict are many (for a discussion, see Humphreys, 2005) and disentangling them is not simple. Within-country variation may provide a useful avenue for research, as the study of Dube and Vargas (2008) demonstrates. These authors find that an increase in the international price of coffee reduces violence in coffee-producing regions, while an increase in the international price of petroleum, increases violence in regions with oil reserves and pipelines. This is consistent with the idea that in the capital-intensive sector, an income shock increases the value of controlling the state without increasing wages and the opportunity cost of fighting, while the opposite is true of a shock to the labor-intensive sector (Dal Bó and Dal Bó 2004).

[15]In particular, ethnic identity may generate group cohesion and thus reduce free-riding within armed groups. As noted in Blattman and Miguel (2010), the motives for such cohesion vary from "primordialist" arguments –stressing the cultural, biological or psychological nature of ethnic cleavages (Horowitz, 1985) or economic models assuming

determinants of civil war in general versus "ethnic" civil wars in particular (see Fearon (2006) for a review). This may be surprising, yet it could be driven by the fact that ethnic fragmentation is measured with considerable error. As Blattman and Miguel (2010) point out, the existing proxies may also be theoretically inappropriate and these indices of ethnic fractionalization have been questioned as a meaningful proxy for ethnic tensions (e.g., Posner 2004a, 2004b). Esteban and Ray (1994, 1999) argue that more than fractionalization, a bimodal distribution of preferences or resources—"polarization"—is linked to greater conflict risk. Montalvo and Reynal-Querol (2005) construct measures for polarization and fragmentation and find support for this theory. In columns 8 and 9 we use these measures of ethnic polarization and fractionalization.

Notice that the coefficient remains significant at conventional confidence levels in almost every regression (an exception is column 9 controlling for ethnic fragmentation, where the p-value in the long-difference specification is 12% for the standard cluster-robust variance estimator, but even in this case the bootstrap p-value is around 5% -0.042-, and the panel regressions suggest a significant positive effect). Moreover, the coefficient is quite stable across specifications, ranging from around 0.6 to 0.8 in most long-difference specifications. The sole exception is column 3 that includes a differential trend by initial GDP per capita, yet here the estimated coefficient increases to 1.1. This is reassuring, as we had observed different patterns of conflict for initially rich and poor nations, but this result suggests our estimated impact of population on conflict is unlikely to be explained by differential trends by levels of income. Overall, Table 11 suggests that it is unlikely that the impact of population on conflict from our 2SLS is actually driven by differential trends[16]. The next section investigates a different issue: whether they may be driven by mechanical effects.

2.7.3 Further Robustness Checks: Mechanical Effects

Since conventional measures of civil war rely on meeting a battle death threshold, an increase in total population may mechanically increase the number of "detected" civil wars. In this section,

individuals share political preferences or prefer to mingle with co-ethnics (Alesina, Baqir, and Easterly 1999; Alesina and La Ferrara 2000; Esteban and Ray 1999)–; to theories of dense ethnic social networks and low cost information and sanctioning (Caselli and Coleman 2006; Fearon and Laitin 1996; Miguel and Gugerty, 2005); to advantages of ethnic alliances over class alliances in mobilizing for conflict (Esteban and Ray, 2008); and to "modernist" in which ethnic conflict arises when groups excluded from social and political power begin to experience economic modernization (Bates 1986; Ernest Gellner 1983).

[16]Moreover, while Table 11 uses the best available measures of resource abundance and the more theoretically-motivated measures of ethnic diversity, the results do not depend on the exact variable used to measure natural resource abundance or social diversity. This is verified in Appendix Tables 2 and 3, which present the first and second stages, respectively, for specifications similar to those in Table 11 but where alternative measures are used, including: the share of the natural resources in GDP, total (instead of per capita) oil and diamond production, religious polarization and fragmentation, and share of Catholic, Muslim, and Protestant population.

we use battle deaths data to verify that this is not driving our results.

Table 12 reports 2SLS regressions of equation (2.4), where the dependent variable is proportional to the number of battle deaths in country i at time t. In particular, we normalize battle deaths by initial (in 1940) population and take logarithms to calculate c_{it}. For this exercise, we focus on the UCDP/PRIO instead of COW dataset, since the former uses a lower threshold of battle deaths and includes more conflicts. In long-difference regressions (columns 1-3), the estimated coefficient for population is positive. The standard cluster-robust p-value is larger than 10%, but the bootstrap estimates suggest otherwise: the p-value is 4% for the base sample using predicted mortality (column 1), 2.2% when we use global mortality (column 2), and 4.4% when we allow for a differential trend for initially independent countries (column 3). In the panel regressions of columns 4 to 6, the point estimates are similar and we can be more confident about the significance of the effect for the base sample using the predicted (column 4) or global mortality (column 5) instruments. However, in column 6 which includes the interaction with initially independent the coefficient is at best marginally significant at conventional confidence levels.

As an additional check, we consider a simple test to verify whether population changes had an effect on conflict in addition to the mechanical effect that would be expected from size of the population to number of deaths alone. To construct a measure of the deviation of battle deaths from battle deaths predicted by population size, we proceed in two steps. In step 1, we use early data on battle deaths to estimate the cross-sectional relationship between population and battle deaths. In particular, we run a regression of the (log of 1+) battle deaths on log population[17], for an initial baseline reference year. In step 2, we use the estimated coefficients from step 1 and observed population figures for all countries in our sample to construct the "predicted" (log of) battle deaths for each country in each reference year. Our dependent variable is then the deviation of observed (log of) battle deaths from this prediction.

In Panel A of Table 13, we present our standard long-difference and panel regressions where step 1 is calculated using observed battle deaths in 1930. Hence, Panel A relies on data from COW, as it is our only source with data in 1930. While this source has the disadvantage of using a higher threshold of battle deaths for inclusion as civil war, the advantage is that our baseline regression for the relationship between population and battle deaths is estimated with data that precedes

[17] Analogous to our measures for civil war incidence, the exact form of our dependent variables is $\log\left(1+\frac{battle\ deaths_{it}}{no\ of\ years_{it}}\right)$, where no. of years refers to the number of years with data in the reference year (decade) t for country i.

the key period from 1940-1980. In Panel B, however, we also report regressions using data from UCDP/PRIO. In this Panel, step 1 estimates the relationship between battle deaths and population with data from the earliest reference date available, 1940.

Two observations must be made about this exercise. First, in the regressions to establish the relationship between population size and battle deaths (step 1), we consider only observations with positive battle deaths. Hence this is the relationship between population and fatalities conditional on war. While of course this implies a selection bias, it increases the predicted battle deaths and stacks the cards against finding an effect for the deviation of observed deaths from predicted. Second, while this constitutes an attempt to correct for the mechanical effect of population size, to the extent that IV and OLS estimates of the impact of population on conflict are not too different to each other, our final results for the effect of population on the deviations from predicted should be biased towards zero. The reason is that the cross-sectional relationship even in 1930 or 1940 will include the causal effect of population on Civil War. Imagine, for example, the situation in which OLS and IV estimates are the same. Then one can estimate the same relationship from the initial cross-section and the regression with deviations from predicted values will mechanically give zero. Therefore, to the extent that OLS is similar to IV we will tend to get a downward bias.

With these observations in mind, we take the results from Table 13 to be very suggestive that the results presented thus far are not driven merely by mechanical effects from population size to "detected" wars. Indeed, in Panel A the estimated coefficient for population is significant at either 90% or 95% confidence level for most specifications (depending on whether we follow the standard or bootstrap p-values). In Panel B, the estimated coefficient for population is also positive, but not significant at conventional confidence levels.

Finally, we create new definition of war, based on *relative* threshold of violence. In particular, we define a country-year as in war if its ratio of battle deaths to population is above the 5th, 10th, and 20th percentile among country-years with battle deaths in the sample. With this measure of war incidence, we construct our usual dependent variable as the share of years in war per reference date.

Table 14 reports 2SLS regressions of equation (2.4) with this measure of c_{it}. The results show positive estimated coefficients on log population, that are somewhat smaller than the corresponding ones using the standard measure of war (for the UCDP/PRIO). For instance, in columns 1 and 2 of Table 14 which use the 5th percentile threshold, the estimated coefficient for (log) population in long differences regressions (Panel A) is 0.492 and 0.527 (when using the predicted and global

mortality instruments, respectively). The corresponding coefficients in Panel A of Table 8 (columns 2 and 8), are 0.637 and 0.653. Hence, the impact does appear smaller when looking at the relative threshold of violence to define wars. However, while the coefficients are not significant according to the conventional p-values, the bootstrap p-values still suggest this is a significant positive effect. When increasing the relative threshold, and when looking at panel regressions, the general pattern is that the estimated coefficient on population, while positive, is again smaller, and hence typically not significant, or at best marginally significant at conventional confidence levels.

In sum, while some of the results in this section are less stark than those in the rest of our exercises, the general pattern does not indicate that our results merely mirror a mechanical increase in the number of "detected" civil wars from an increase in total population. In particular, most of our specifications for battle deaths relative to initial population suggest a positive impact of population growth, we present very suggestive evidence that population changes had an effect on conflict in addition to the mechanical effect that would be expected from size of the population to number of deaths alone, and population has a positive impact in some of our specifications for war defined using relative thresholds of battle deaths to define war.

2.8 Effects on Regime Changes

The preceding results indicate that large increases in population may have adverse effects on social stability by increasing the incidence of violent conflict. It is also possible to examine if other measures of social change such as political transition are affected by population growth. Indeed, a long tradition emphasizes the role of crises, and social unrest, in inducing political transitions .

To examine this question, Table 15 presents results where the dependent variable is a dummy variable equal to 1 if the country experiences any major regime change over the reference period. The definition of any major regime change comes from Polity IV, and involves significant changes in the polity score either in the direction of more democracy or more autocracy (see Appendix Table 1 for exact definitions). Columns 1-3 vary the sample considered (base sample, excluding Eastern Europe, low and middle income countries only), column 4 uses the global mortality instrument (for the base sample) and columns 5-8 allow for differential trends according to baseline characteristics (institutions, a dummy for independence in 1940, initial GDP per capita, and initial population). As usual, Panel A looks at long difference specifications, and Panel B focuses on panel regressions. The general pattern is very clear: population growth increases the likelihood a major regime changes,

and the result is very robust to the various specification checks.

When examining whether these effects are mostly driven by movements towards democracy or autocracy, we find that the most important driving force concerns democratic transitions. Table 16 shows this by presenting the same set of regressions as in Table 15, but where the dependent variable is a dummy variable that takes the value of 1 if the country experiences significant improvement in the democracy score (see Appendix Table 1). Again, the general pattern is that population growth increases the likelihood of significant movements towards democracy.

2.9 Final remarks

Civil wars create enormous economic costs and human suffering in many countries. This paper shows that the significant (and largely unprecedented) population surges that followed the *international epidemiological transition* that began in the 1940s increased violent social conflict. We interpret our findings as suggestive that larger populations, without a corresponding increase in resources and technology, exacerbate the competition for resources and increase the likelihood of conflict and civil wars in environments where the institutions cannot handle the higher level of disputes. Given the tremendous increase in population in developing countries in the last 100 years, our results highlight an important additional dimension of the implications of population changes in less-developed countries. They may also help explain the puzzling fact that, while the international epidemiological transition produced significant convergence in health conditions around the world, no comparable convergence has been observed in income per capita. Finally, in line with a long tradition emphasizing the role of crises and social unrest in inducing political transitions, we show that the likelihood of major political transitions (and in particular democratic change) also increased as a result of population growth.

2.A Tables

Table 1: Descriptive Statistics

	Year	Base Sample	Initially Rich Countries	Initially Middle Income Countries	Initially Poor Countries	Above Median Change in Predicted Mortality 1940 to 1980	Below Median Change in Predicted Mortality 1940 to 1980
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years in conflict/total years, COW	1940	0.051	0.000	0.050	0.088	0.080	0.020
		(0.189)	(0.000)	(0.175)	(0.263)	(0.249)	(0.082)
Years in conflict/total years, COW	1980	0.131	0.000	0.100	0.224	0.252	0.006
		(0.292)	(0.000)	(0.265)	(0.357)	(0.373)	(0.035)
Years in conflict/total years, Uppsala	1940	0.135	0.000	0.115	0.260	0.201	0.067
		(0.309)	(0.000)	(0.276)	(0.417)	(0.369)	(0.219)
Years in conflict/total years, Uppsala	1980	0.277	0.091	0.203	0.444	0.415	0.134
		(0.421)	(0.302)	(0.373)	(0.470)	(0.464)	(0.319)
Years in conflict/total years, Fearon and Laitin	1940	0.121	0.000	0.100	0.238	0.163	0.077
		(0.302)	(0.000)	(0.255)	(0.427)	(0.347)	(0.247)
Years in conflict/total years, Fearon and Laitin	1980	0.242	0.091	0.183	0.376	0.367	0.113
		(0.413)	(0.302)	(0.369)	(0.475)	(0.467)	(0.308)
Years with state failure/total years	1950	0.084	0.000	0.064	0.148	0.116	0.052
		(0.225)	(0.000)	(0.204)	(0.284)	(0.272)	(0.163)
Years with state failure/total years	1980	0.263	0.027	0.176	0.468	0.421	0.100
		(0.404)	(0.090)	(0.352)	(0.457)	(0.454)	(0.265)
Log 1+ Battle Deaths, COW	1940	0.925	0.000	1.138	1.228	1.126	0.708
		(2.696)	(0.000)	(2.759)	(3.425)	(2.829)	(2.585)
Log 1+ Battle Deaths, COW	1980	1.392	0.000	1.028	2.428	2.558	0.191
		(2.856)	(0.000)	(2.644)	(3.381)	(3.513)	(1.080)
Log of population	1940	9.191	9.349	8.871	9.557	9.124	9.261
		(1.499)	(1.344)	(1.349)	(1.756)	(1.617)	(1.393)
Log of population	1980	9.812	9.762	9.393	10.321	9.856	9.768
		(1.384)	(1.293)	(1.238)	(1.461)	(1.484)	(1.294)
Baseline Predicted Mortality	1940	0.469	0.171	0.487	0.626	0.690	0.241
		(0.271)	(0.050)	(0.224)	(0.272)	(0.195)	(0.080)
Global Mortality Index	1940	0.456	0.171	0.482	0.593	0.666	0.238
		(0.258)	(0.050)	(0.222)	(0.252)	(0.184)	(0.079)

NOTE- The table reports the mean values of variables in the samples described in the column heading, with their standard deviations in parentheses. Initially rich countries had log GDP per capita over 8.4 in 1940, middle-income countries had log GDP per capita betweeen 7.37 and 8.4, and low-come countries had log GDP per capita below 7.37 in 1940. Predicted mortality is measured per 100 per year. Columns 6 and 7 report descriptive statistics for subsamples in which change in predicted mortality between 1940 and 1980 was above or below median value in the base sample (-0.405). See the text and Appentix Table 1 for details and definitions.

Table 2. Population and Conflict -OLS Estimates

	Dependent variable is number of years in internal conflict or number of years state failed/total years				Dependent variable:
	(1)	(2)	(3)	(4)	(5)
	COW	Uppsala	Fearon and Laitin	State Failure	Log (1+Battle Deaths/No. of Years)
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1950 and 1980	Just 1940 and 1980
log of population	0.303	0.255	0.236	0.591	2.076
p-value	(0.058)	(0.201)	(0.238)	(0.008)	(0.265)
p-value, wild bootsrap	(0.014)	(0.084)	(0.102)	(0.002)	(0.134)
Observations	102	104	104	125	102
R-squared	0.658	0.656	0.625	0.713	0.561
Number of clusters	50	51	51	62	50
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1950-1980	Panel 1940-1980
log of population	0.265	0.307	0.251	0.528	1.989
p-value	(0.011)	(0.048)	(0.097)	(0.005)	(0.132)
p-value, wild bootsrap	0.000	(0.016)	(0.052)	(0.004)	(0.096)
Observations	307	308	308	256	307
R-squared	0.478	0.629	0.621	0.630	0.496
Number of clusters	63	63	63	63	63

Note.—OLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A is long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B is unbalanced panel with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Table 3. Population and Conflict Controlling for Age Structure -OLS Estimates

	Dependent variable is number of years in internal conflict or number of years state failed/total years								Dependent variable:	
	COW		Uppsala		Fearon and Laitin		State Failure		Log (1+Battle Deaths/No of years)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: long differences	Just 1940 and 1980		Just 1940 and 1980		Just 1940 and 1980		Just 1950 and 1980		Just 1940 and 1980	
share of population 15-34	0.865	-0.670	-0.595	-1.960	-2.091	-3.504	-2.437	-3.560	-4.255	-17.26
p-value	(0.642)	(0.723)	(0.849)	(0.517)	(0.604)	(0.388)	(0.311)	(0.100)	(0.840)	(0.430)
p-value, wild bootsrap	(0.562)	(0.570)	(0.766)	(0.438)	(0.640)	(0.426)	(0.160)	(0.030)	(0.750)	(0.218)
log of population		0.381		0.332		0.344		0.567		3.226
p-value		(0.051)		(0.143)		(0.145)		(0.032)		(0.112)
p-value, wild bootsrap		(0.026)		(0.058)		(0.046)		(0.012)		(0.022)
R-squared	0.618	0.691	0.690	0.724	0.651	0.686	0.629	0.717	0.587	0.639
Observations	86	86	88	88	88	88	90	90	86	86
Number of clusters	43	43	44	44	44	44	45	45	43	43
Panel B: panel regressions	Panel 1940-1980		Panel 1940-1980		Panel 1940-1980		Panel 1950-1980		Panel 1940-1980	
share of population 15-34	-0.465	-1.008	-1.191	-1.716	-1.643	-2.095	-1.538	-2.101	-8.577	-13.51
p-value	(0.437)	(0.108)	(0.247)	(0.096)	(0.306)	(0.198)	(0.269)	(0.100)	(0.193)	(0.061)
p-value, wild bootsrap	(0.346)	(0.074)	(0.286)	(0.108)	(0.384)	(0.216)	(0.270)	(0.076)	(0.146)	(0.042)
log of population		0.330		0.307		0.265		0.504		3.001
p-value		(0.014)		(0.083)		(0.116)		(0.029)		(0.058)
p-value, wild bootsrap		(0.008)		(0.052)		(0.062)		(0.032)		(0.054)
R-squared	0.488	0.538	0.647	0.668	0.669	0.683	0.530	0.575	0.537	0.571
Observations	227	227	228	228	228	228	184	184	227	227
Number of clusters	46	46	46	46	46	46	46	46	46	46

Note.—OLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A is long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B is unbalanced panel with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Table 4. Predicted Mortality and Population: First Stage Estimates and Basic Robustness

	Dependent variable is log population				
	(1)	(2)	(3)	(4)	(5)
	Base Sample	Excluding Eastern Europe	Low and Middle income Countries Only	Global mortality instrument	Base Sample, excluding most affected by WWII
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
baseline predicted mortality	-0.782	-0.700	-0.764	-0.818	-0.811
p-value	(0.000)	(0.001)	(0.008)	(0.000)	(0.000)
p-value, wild bootsrap	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
R-squared	0.988	0.989	0.987	0.988	0.987
Observations	102	92	80	102	94
Number of clusters	50	45	39	50	46
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
baseline predicted mortality	-0.464	-0.402	-0.471	-0.681	-0.476
p-value	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
p-value, wild bootsrap	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
R-squared	0.992	0.993	0.992	0.993	0.991
Number of observations	307	278	252	307	279
Number of clusters	63	57	52	63	57

Note.—OLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A is long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B is unbalanced panel with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Table 5. Predicted Mortality and Population: First Stage Estimates and Robustness to Differential Trends

	Dependent variable is log of population								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Interaction of post-year dummies with...								
	Institutions	Independent in 1940	Log GDP per capita in 1930	Log Population in 1930	Oil Production per Capita in 1960	Diamond Production per Capita in 1960	Oil and Gas rents per Capita in 1960	Ethnic Polarization	Ethnic Fragmentation
Panel A: Long Differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
Baseline predicted mortality	-0.730	-0.815	-0.600	-0.762	-0.782	-0.776	-0.808	-0.599	-0.587
p-value	(0.004)	(0.002)	(0.061)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	(0.018)
p-value, wild bootsrap	(0.002)	(0.002)	(0.012)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)
p-value for post year dummy x ...	0.605	0.700	0.240	0.0659	9.64e-10	1.77e-07	1.50e-07	0.0413	0.185
R-squared	0.988	0.988	0.989	0.989	0.989	0.989	0.989	0.991	0.990
Observations	102	102	100	102	102	102	102	96	96
Number of clusters	50	50	49	50	50	50	50	47	47
Panel B: Panel	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
Baseline predicted mortality	-0.436	-0.484	-0.361	-0.446	-0.463	-0.460	-0.478	-0.337	-0.330
p-value	(0.001)	(0.001)	(0.033)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.008)
p-value, wild bootsrap	(0.002)	(0.002)	(0.028)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.008)
p-value for post year dummies x ...	0.000358	0.0155	1.90e-08	0.111	0	2.40e-10	4.22e-10	0.000893	0.000488
R-squared	0.993	0.992	0.994	0.992	0.993	0.993	0.993	0.994	0.994
Observations	307	307	267	265	307	307	307	280	280
Number of clusters	63	63	53	52	63	63	63	57	57

Note.—OLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A is long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B is unbalanced panel with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Table 6. Reduced Forms and Falsification Exercises

	Base Sample	Low and Middle Income Countries Only	Base Sample	Low and Middle Income Countries Only	Base Sample	Low and Middle Income Countries Only
	(1)	(2)	(3)	(4)	(5)	(6)
	Reduced Form		Falsification Exercises			
Dependent variable is: --	Change in years in conflict/total years from 1940 to 1980		Change in years in conflict/total years from 1900 to 1940		Change in Log Population from 1900 to 1940	
Change in Predicted Mortality from 1940 to 1980	-0.516	-0.643	0.0592	0.122	-0.189	-0.198
p-value	(0.002)	(0.003)	(0.156)	(0.328)	(0.176)	(0.318)
p-value, wild bootsrap	(0.006)	(0.006)	(0.110)	(0.388)	(0.226)	(0.352)
Observations	52	41	36	28	52	41
R-squared	0.203	0.215	0.007	0.019	0.033	0.029

Note.—OLS regressions. Regular p-values for t-statistics with robust standard errors are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). See the text and Appendix Table 1 for definitions and details.

Table 7. Predicted Mortality and Age Structure

	Dependent variable is Share of Poulation of ages 15-34							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Base Sample	Low and Middle income Countries Only	Base Sample	Low and Middle income Countries Only	Base Sample	Low and Middle income Countries Only	Base Sample	Low and Middle income Countries Only
long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1990	Just 1940 and 1990	Just 1940 and 1990	Just 1940 and 1990
baseline predicted mortality	0.00384	-0.000329			-0.0285	-0.0299		
p-value	(0.871)	(0.993)			(0.300)	(0.550)		
p-value, wild bootsrap	(0.808)	(0.978)			(0.144)	(0.510)		
global mortality instrument			0.00462	0.000541			-0.0300	-0.0317
p-value			(0.859)	(0.990)			(0.314)	(0.568)
p-value, wild bootsrap			(0.798)	(0.962)			(0.194)	(0.532)
R-squared	0.587	0.533	0.588	0.533	0.571	0.526	0.571	0.526
Observations	86	64	86	64	86	64	86	64
Number of clusters	43	32	43	32	43	32	43	32

Note.—OLS regressions. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). See the text and Appendix Table 1 for definitions and details.

Table 8. The Effect of Population and Conflict - 2SLS Estimates

	Dependent variable is years in internal conflict or years state failed/total years (cols 1-4, 5-8) and Log of 1+Battle Deaths/No. of years (cols 5 and 10)									
	Baseline Predicted Mortality					Using Global Mortality Rate				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	COW	Uppsala	Fearon and Laitin	State Failure	Log (1+Battle Deaths/Total Years)	COW	Uppsala	Fearon and Laitin	State Failure	Log (1+Battle Deaths/Total Years)
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1950 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1950 and 1980	Just 1940 and 1980
Log of population	0.658	0.637	0.879	0.0315	6.774	0.649	0.653	0.872	0.681	6.646
p-value	(0.034)	(0.089)	(0.051)	(0.985)	(0.040)	(0.039)	(0.093)	(0.053)	(0.151)	(0.044)
p-value, wild bootsrap	(0.006)	(0.020)	0.000	(0.986)	(0.008)	(0.008)	(0.010)	(0.010)	(0.060)	(0.008)
Observations	102	104	104	125	102	102	104	104	125	102
Number of clusters	50	51	51	62	50	50	51	51	62	50
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1950-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1950-1980	Panel 1940-1980
Log of population	0.540	0.425	0.761	0.737	6.229	0.540	0.425	0.761	0.737	6.229
p-value	(0.013)	(0.141)	(0.051)	(0.053)	(0.024)	(0.013)	(0.141)	(0.051)	(0.053)	(0.024)
p-value, wild bootsrap	(0.014)	(0.092)	(0.020)	(0.046)	(0.018)	(0.006)	(0.088)	(0.022)	(0.022)	(0.020)
Observations	307	308	308	256	307	307	308	308	256	307
Number of clusters	63	63	63	63	63	63	63	63	63	63

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A is long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B is unbalanced panel with one observation per decade. First stages, for the sample with data on years in conflict according to COW, in column 1 and column 4 of Table 4. See the text and Appendix Table 1 for definitions and details.

Table 9. Timing the Effect of Population on Conflict -2SLS Estimates

	Dependent variable is years in conflict/total years according to Correlates of War -COW-									
	Baseline Predicted Mortality					Using Global Mortality Rate				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Just 1940 and 1960	Just 1940 and 1970	Just 1940 and 1980	Just 1940 and 1990	Just 1940s and 1970-1997	Just 1940 and 1960	Just 1940 and 1970	Just 1940 and 1980	Just 1940 and 1990	Just 1940s and 1970-1997
log of population	0.111	0.471	0.658	0.464	0.749	0.114	0.456	0.649	0.436	0.724
p-value	(0.630)	(0.105)	(0.034)	(0.073)	(0.030)	(0.668)	(0.110)	(0.039)	(0.063)	(0.029)
p-value, wild bootsrap	(0.490)	(0.012)	(0.004)	(0.022)	(0.572)	(0.022)	(0.010)	(0.018)	(0.004)	(0.012)
Observations	102	102	102	102	102	102	102	102	102	102
Number of clusters	50	50	50	50	50	50	50	50	50	50

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Long-difference specifications with two observations per country, one for the intial date and one for the final date. First stage for columns 1 to 5 in column 1 of Table 4-Panel A, and for columns 6-10 in column 4 of Table 4-Panel A. for See the text and Appendix Table 1 for definitions and details.

Table 10. The Effect of Population on Conflict: Basic Robustness Checks -2SLS Estimates

	Dependent variable is years in conflict/total years according to Correlates of War -COW-						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Base Sample	Excluding Eastern Europe	Low and Middle income Countries Only	Global mortality instrument	Base Sample, excluding most affected by WWII	Base Sample, assign 1950 to 1940	Base Sample, assign 1946-1949 to 1940
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
log of population	0.658	0.739	0.841	0.649	0.650	0.524	0.687
p-value	(0.034)	(0.041)	(0.056)	(0.039)	(0.038)	(0.098)	(0.040)
p-value, wild bootsrap	(0.010)	(0.006)	(0.008)	(0.006)	(0.004)	(0.042)	(0.004)
Observations	102	92	80	102	94	102	102
Number of clusters	50	45	39	50	46	50	50
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
log of population	0.509	0.598	0.683	0.540	0.507	0.282	0.557
p-value	(0.011)	(0.015)	(0.022)	(0.013)	(0.013)	(0.120)	(0.021)
p-value, wild bootsrap	(0.006)	(0.006)	(0.008)	(0.014)	(0.008)	(0.076)	(0.004)
Observations	307	278	252	307	279	307	307
Number of clusters	63	57	52	63	57	63	63

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A is long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B is unbalanced panel with one observation per decade. First stages for columns 1-5 in columns 1-5 of Table 4. First stages of columns 6-7 are in column 1 of Table 4. See the text and Appendix Table 1 for definitions and details.

Table 11. The Effect of Population on Conflict: Differential Trends -2SLS Estimates

	Dependent variable is years in conflict/total years according to COW								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Interaction of post-year dummies with…								
	Institutions	Independent in 1940	Log GDP per capita in 1930	Log Population in 1930	Oil Production per Capita in 1960	Diamond Production per Capita in 1960	Oil and Gas rents per Capita in 1960	Ethnic Polarization	Ethnic Fragmentation
Panel A: Long Differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
Log of population	0.791	0.589	1.127	0.665	0.658	0.665	0.635	0.805	0.748
p-value	(0.037)	(0.069)	(0.095)	(0.034)	(0.033)	(0.033)	(0.033)	(0.064)	(0.124)
p-value, wild bootsrap	(0.008)	(0.012)	(0.008)	(0.002)	(0.008)	(0.012)	(0.008)	(0.036)	(0.042)
p-value for post year dummy x	0.314	0.527	0.260	0.663	0.0337	0.0393	0.0685	0.467	0.819
Observations	102	102	100	102	102	102	102	96	96
Number of clusters	50	50	49	50	50	50	50	47	47
Panel B: Panel	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
Log of population	0.545	0.454	0.930	0.517	0.510	0.513	0.494	0.599	0.503
p-value	(0.029)	(0.011)	(0.038)	(0.011)	(0.010)	(0.010)	(0.010)	(0.038)	(0.077)
p-value, wild bootsrap	(0.012)	(0.004)	(0.002)	(0.004)	(0.006)	(0.010)	(0.004)	(0.026)	(0.044)
p-value for post year dummies x …	0.424	0.722	0.0176	0.249	0.157	0.0748	0.231	0.647	0.168
Observations	307	307	267	265	307	307	307	280	280
Number of clusters	63	63	53	52	63	63	63	57	57

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A is long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B is unbalanced panel with one observation per decade. First stages in Table 5. See the text and Appendix Table 1 for definitions and details.

Table 12. The Effect of Population on Conflict: Mechanical Effects I -2SLS Estimates

	Dependent variable is Log (1+Battle Deaths/Population in 1940), Uppsala					
	long differences			panel regressions		
	Base Sample	Global Mortality Instrument	Interaction with Independent in 1940	Base Sample	Global Mortality Instrument	Interaction with Independent in 1940
	(1)	(2)	(3)	(4)	(5)	(6)
	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
log of population	1.363	1.407	1.462	1.088	1.275	1.054
p-value	(0.134)	(0.136)	(0.179)	(0.057)	(0.034)	(0.154)
p-value, wild bootsrap	(0.040)	(0.022)	(0.044)	(0.040)	(0.038)	(0.114)
p-value for Year dummies x Independent in 1940			0.739			0.640
Observations	104	104	104	273	273	273
Number of clusters	51	51	51	54	54	54

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Columns 1-3 are long-difference specifications with two observations per country, one for the intial date and one for the final date. Columns 4-6 are unbalanced panel with one observation per decade. First stage for columns 1 and 4 in column 1 of Table 4, for columns 2 and 5 in column 4 of Table 4, and for columns 3 and 6 in column 2 of Table 5. See the text and Appendix Table 1 for definitions and details.

Table 13. The Effect of Population on Conflict: Mechanical Effects II -2SLS Estimates

	Dependent variable is Deviation of Observed Log (1+ Battle Deaths/No. of years) from Predicted, Uppsala					
	long differences			panel regressions		
	Base Sample	Global Mortality Instrument	Interaction with Independent in 1940	Base Sample	Global Mortality Instrument	Interaction with Independent in 1940
	(1)	(2)	(3)	(4)	(5)	(6)
	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
log of population	3.932	4.203	4.492	3.202	3.252	3.437
p-value	(0.270)	(0.253)	(0.300)	(0.363)	(0.334)	(0.402)
p-value, wild bootsrap	(0.112)	(0.078)	(0.124)	(0.266)	(0.260)	(0.368)
p-value for Year dummies x Independent in 1940			0.738			0.367
Observations	104	104	104	308	308	308
Number of clusters	51	51	51	63	63	63

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). To calculate the dependent variable, we run a regression of the log of (1+ battle deaths per year) for each reference date on (instrumented) log population, for 1940 only. Next, we use the estimated coefficients and observed population figures to estimate a predicted value of our dependent variable in each reference year. Finally, we calculate the deviation of the observed vale of log of (1+ battle deaths per year) from this predictio. Columns 1-3 are long-difference specifications with two observations per country, one for the intial date and one for the final date. Columns 4-6 are unbalanced panels with one observation per decade. First stage for columns 1 and 4 in column 1 of Table 4, for columns 2 and 5 in column 4 of Table 4, and for columns 3 and 6 in column 2 of Table 5. See the text and Appendix Table 1 for definitions and details.

Table 14. The Effect of Population on Conflict: Mechanical Effects III -2SLS Estimates

	Dependent variable is Years in internal conflict/total years, Uppsala					
	War if Above 5th Percentile of Battle Deaths/Population		War if Above 10th Percentile of Battle Deaths/Population		War if Above 20th Percentile of Battle Deaths/Population	
	Predicted Mortality	Global Mortality	Predicted Mortality	Global Mortality	Predicted Mortality	Global Mortality
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
log of population	0.492	0.527	0.407	0.440	0.383	0.427
p-value	(0.186)	(0.164)	(0.245)	(0.212)	(0.322)	(0.256)
p-value, wild bootsrap	(0.070)	(0.052)	(0.144)	(0.082)	(0.192)	(0.138)
Observations	104	104	104	104	104	104
Number of clusters	51	51	51	51	51	51
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
log of population	0.215	0.299	0.144	0.252	0.119	0.253
p-value	(0.505)	(0.310)	(0.653)	(0.360)	(0.726)	(0.367)
p-value, wild bootsrap	(0.458)	(0.274)	(0.570)	(0.300)	(0.744)	(0.306)
Observations	308	308	308	308	308	308
Number of clusters	63	63	63	63	63	63

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A are long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B are unbalanced panels with one observation per decade. First stage for odd columns in column 1 of Table 4, and for even columns in column 4 of Table 4. for See the text and Appendix Table 1 for definitions and details.

Table 15. The Effect of Population on Regime Changes -2SLS Estimates

	Dependent variable is Dummy=1 if any major regime change in reference period							
	Base Sample	Excluding Eastern Europe	Low and Middle income Countries Only	Global mortality instrument	Interaction with Institutions	Interaction with Independent in 1940	Interaction with (log) GDP per capita in 1930	Interaction with Log Population in 1930
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
log of population	0.576	0.471	0.963	0.557	0.892	0.495	0.777	0.594
p-value	(0.145)	(0.262)	(0.094)	(0.159)	(0.056)	(0.206)	(0.278)	(0.122)
p-value, wild bootsrap	(0.048)	(0.140)	(0.004)	(0.052)	(0.010)	(0.076)	(0.094)	(0.022)
p-value for post year dummy x ...								
Institutions					0.133			
Independent in 1940						0.586		
Initial GDP							0.639	
Continent Dummies								0.378
Observations	104	94	82	104	104	104	102	104
Number of clusters	51	46	40	51	51	51	50	51
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
log of population	1.100	0.968	1.532	0.892	1.458	0.923	1.402	1.149
p-value	(0.008)	(0.030)	(0.012)	(0.015)	(0.009)	(0.020)	(0.110)	(0.008)
p-value, wild bootsrap	(0.004)	(0.014)	(0.006)	(0.006)	0.000	(0.004)	(0.032)	0.000
p-value for year dummies x ...								
Institutions					0.484			
Independent in 1940						0.380		
Initial GDP							0.184	
Continent Dummies								0.594
Observations	308	279	253	308	308	308	268	266
Number of clusters	63	57	52	63	63	63	53	52

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A are long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B are unbalanced panels with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Table 16. The Effect of Population on Democratic Change -2SLS Estimates

	Dependent variable is Dummy=1 if Major democractic change in reference period							
	Base Sample	Excluding Eastern Europe	Low and Middle income Countries Only	Global mortality instrument	Interaction with Institutions	Interaction with Independent in 1940	Interaction with (log) GDP per capita in 1930	Interaction with Log Population in 1930
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
log of population	0.457	0.391	0.636	0.439	0.610	0.421	0.768	0.474
p-value	(0.097)	(0.168)	(0.115)	(0.102)	(0.088)	(0.112)	(0.202)	(0.064)
p-value, wild bootsrap	(0.030)	(0.082)	(0.028)	(0.020)	(0.010)	(0.036)	(0.048)	(0.004)
p-value for post year dummy x ...								
Institutions					0.368			
Independent in 1940						0.803		
Initial GDP							0.438	
Continent Dummies								0.337
Observations	104	94	82	104	104	104	102	104
Number of clusters	51	46	40	51	51	51	50	51
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
log of population	0.663	0.561	0.928	0.526	0.898	0.755	1.185	0.701
p-value	(0.008)	(0.021)	(0.030)	(0.014)	(0.031)	(0.010)	(0.076)	(0.015)
p-value, wild bootsrap	0.000	(0.002)	0.000	(0.002)	(0.008)	(0.010)	(0.018)	(0.008)
p-value for year dummies x ...								
Institutions					0.114			
Independent in 1940						0.489		
Initial GDP							0.583	
Continent Dummies								0.518
Observations	308	279	253	308	308	308	268	266
Number of clusters	63	57	52	63	63	63	53	52

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A are long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B are unbalanced panels with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Appendix Table 1. Variable Sources and Description

Variable	Description	Source
	Social Conflict	
Years in conflict/Total years	Ratio of the number of years with an internal conflict to total years assigned to reference date. Assignment of years to reference dates and exact definition of internal conflict varies by data source, as detailed below.	
COW	Number of years with internal conflict defined as combat between a State and other actor, with three categories included: civil war for control of central government, conflict over local issues, and inter-communal conflict. The threshold for inclusion is 1,000 battle-related deaths, civilian or military, but with massacres excluded. Assignment to reference dates: 1900=1900-09, 1940=1940-49, 1950=1950-59, ..., 1980=1980-89, 1990=90-1999.	Correlates of War (COW) Intra-State wars dataset. See Sarkees (2000).
Uppsala	Number of years with any incidence of an "internal armed conflict" or of "internationalized internal armed conflict". Armed conflict is defined to include all contested incompatibilities that concern government or territory or both where the use of armed force between two parties results in at least 25 battle-related deaths. Of the two parties, at least one is the government of a state. Assignment to reference dates: 1940=1946-49, 1950=1950-59, ..., 1980=1980-89, 1990=1990-99.	Backdating of the Uppsala Conflict Data Project (UCDP) database made in conjunction with the International Peace Research Institute, Oslo (PRIO). See Gleditsch et. al (2002).
Fearon and Laitin	Number of years with violent civil conflicts that: (1) involved fighting between agents of (or claimants to) a state and organized, nonstate groups who sought either to take control of a government, to take power in a region, or to use violence to change government policies, (2) killed at least 1,000 over its course, with a yearly average of at least 100, (3) At least 100 were killed on both sides (including civilians attacked by rebels). Counts anticolonial wars as occurring within the empire in question (e.g., Algeria is assigned to France). Assignment to reerence dates: : 1940=1945-49, 1950=1950-59, ..., 1980=1980-89, 1990=1990-99.	Fearon and Laitin (2003)
State Failure	Number of years where state failure dummy equals 1. Coded for all countries with populations greater than 500,000 from 1955 to 2006, and equals 1 if there is any serious instability in a given year. Four types of political instability are included: ethnic wars, revolutionary wars, genocides and politicides, and adverse regime changes. Assignment to reference dates: 1950=1955-59, 1960=1960-69,..., 1980=1980-89, 1990=1990-99.	State Failure Task Force, phase 3 replication dataset.
Log(1+Battle Deaths)	"Best estimate" of annual battle-related deaths for use with the COW dataset (version 2) and UCDP/PRIO dataset (version 3). Assignment to reference dates as in the respective conflict dataset.	Center for the Study of Civil War --CSCW-Battle Deaths Dataset. See Lacina and Gleditsch (2005).
Regime change	Dummy variable, takes value of 1 if the country experiences a regime change in the reference period. We consider in particular: a dummy for Major Democratic Transition, defined by Polity IV as six points or greater increase in the POLITY score over a period of three years or less including a shift from an autocratic POLITY value (-10 to 0) to a partial democratic POLITY value (+1 to +6) or full democratic POLITY value (+7 to +10) or a shift from a partial democratic value to a full democratic value; a major adverse regime change, defined by PolityIV as a six or more point decrease in POLITY score or an interregnal period denoting a collapse of central state authority or a revolutionary transformation in the mode of governance (not a democratic transition); and finally a dummy for any major rgime change, which equals one for either major democratic or adverse transitions.	Polity IV.
	Population	
Log of Population	Total Population per country in 1900, 1940, 1950, 1960, 1970, 1980, 1990, 1990.	Maddison (2003)
Share of population 15-34, Share of other age groups	Percentage of the population in each age group for 1940, 1950, 1960, 1970, and 1980. Other age groups included are 0-4, 5-9, 10-14,..., 75-79, and over 80.	From 1950 onwards, UN demographic database (http://esa.un.org/unpp). For 1940, UN Demographic Yearbook 1948 (United Nations 1949, Table 4, pp. 108-158). We use data for 1940 or the closest available year or range of years.

Appendix Table 1 (continued). Variable Sources and Description

Variable	Description	Source
	Health	
Predicted Mortality Instrument	Sum of country's initial (in 1940) mortality rate from 15 diseases until there is a global intervention, and after the global intervention, the mortality rate from the disease in question declines to the frontier mortality rate. See paper for mathematical formula. 15 diseases are (in rough descending order of importance): malaria, pneumonia, and tuberculosis; influenza, cholera, typhoid, smallpox, shigella dysentery, whooping cough, measles (rubeola), diphtheria, scarlet fever, yellow fever, plague, typhus.	Acemoglu and Johnson (2007), based on various sources (Summary of International Vital Statistics, Federal Security Agency (1947) of the US government, League of Nations sources, World Health Organization (1951), UN Demographic Yearbooks.)
Global Mortality Instrument	Sum of the products of each country's initial (in 1940) mortality rate from 10 diseases and the ratio between the global mortality at time t to the initial (in 1940) global mortality from the disease in question. See paper for mathematical formula. Like in Acemoglu and Johnson (2007), diseases are as for Predicted Mortality except yellow fever and dysentery/diarrhea for which it was not possible to track the diseases through changes in the classification of death over time. We also exclude cholera, typhoid, and plague since their were often not available for our extended sample of countries. Global Mortality is the unweighted average accross countries in the sample of 59 countries (47 non-Eastern European countries and 12 countries with life expectancy data since 1950, see "Base Sample" below) in Acemoglu and Johnson (2007) for which we have an evolution of mortality rates through time.	Acemoglu and Johnson (2007)
	Others	
Base Sample	Our sample includes Acemoglu and Johnson's (2007) list of 47 non-Eastern Europe countries (Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Canada, Chile, China, Colombia, Costa Rica, Denmark, Ecuador, El Salvador, Finland, France, Germany, Greece, Guatemala, Honduras, India, Indonesia, Ireland, Italy, South Korea, Rep., Malaysia, Mexico, Myanmar, Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Portugal, Spain, Sri Lanka, Sweden, Switzerland, Thailand, United Kingdom, United States, Uruguay, Venezuela); the set of 12 additional countries for which they have life expectancy data since 1950 (Algeria, Bolivia, Egypt, Iran, Iraq, Lebanon, Morocco, Singapore, South Africa, Tunisia, Turkey and Vietnam); and 6 countries from Eastern Europe (Bulgaria, Czech Republic, Hungary, Poland, Romania, and Russian Federation). This implies a total of 65 countries, but not all have all variables for all years. In particular, we lack 1940 population data for Algeria, Egypt, Iran, Iraq, Lebanon, Morocco, Russia, Singapore, South Africa, Tunisia, and Vietnam. Also, Austria is excluded in 1940 when the dependent variables are from COW since it enters the COW state system in the 1950s.	
Initially rich, middle-income, and poor countries	Each category is defined using the top, middle, and lowest third group of countries in the base sample based on income in 1940. Initially rich countries had log GDP per capita over 8.4. in 1940; middle income had log GDP per capita betweeen 7.37 and 8.4; and low income countries had log GDP per capita below 7.37 in 1940.	
Country clusters	For clustered standard errors, Bangladesh, India and Pakistan are considered a single cluster.	
Countries most affected by World War II	Austria, China, Finland, Germany, Italy, Russian Federation	Acemoglu and Johnson (2007)
	Controls and Baseline characteristics	
Institutions	Average of constraints on the executive in 1950, 1960 and 1970	Polity IV
Independent in 1940	=1 if country is independent in 1940, 0 otherwise	Own coding.
Initial GDP	Logarithm of GDP per capita in 1930	Maddison (2003)
Countries most affected by World War II	Austria, China, Finland, Germany, Italy, Russian Federation	Acemoglu and Johnson (2007) based on Urlanis (2003)
Natural Resources	Oil Production and Oil Production per capita in 1960 Diamond Production and Diamond Production per capita in 1960 Share of natural resource sector in GNP in 1970 Share of mineral produciton in GNP in 1971 Oil and gas rents per capita in 1960	Humphreys (2005) Humphreys (2005) Sachs and Warner (1995) Sachs and Warner (1995) Ross (2008) (Michael L. Ross, 2008, "Replication data for: Oil, Islam, and Women ", http://hdl.handle.net/1902.1/14307 UNF:5:fsZ5ds2dvxP26at+lCdOhg== V1)
Ethnolinguistic fractionalization and polarization and religious composition	Ethnic Polarization Ethnic Fragmentation Religious Polarization Religious Fragmentation Ethnolinguistic fractionalization index (from 0 to 1). Average value of five indices based on ethnic or linguistic characteristics of the population. Share of Muslim, Catholic and Protestant Populations in 1980.	Montalvo and Reynal-Querol (2005) Montalvo and Reynal-Querol (2005) Montalvo and Reynal-Querol (2005) Montalvo and Reynal-Querol (2005) Easterly and Levine (1997) La Porta et al (1999)

Appendix Table 2. Predicted Mortality and Population: First Stage Estimates and Additional Robustness to Differential Trends

	Dependent variable is log of population							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Interaction of post-year dummies with...							
	Share of GDP in Natural Resource Sector in 1970	Share of Mineral Production in GNP in 1971	Oil Production in 1960	Diamond Production in 1960	Religious Polarization	Religious Fragmentation	Average Ethnolinguistic Fragmentation	Share of Catholic, Muslim, Protestant in 1980
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
Baseline Predicted Mortality	-0.495	-0.661	-0.796	-0.772	-0.562	-0.636	-0.777	-0.584
p-value	(0.081)	(0.003)	(0.000)	(0.000)	(0.029)	(0.005)	(0.009)	(0.034)
p-value, wild bootsrap	(0.016)	(0.002)	(0.002)	(0.002)	(0.012)	(0.002)	(0.002)	(0.006)
p-value for post year dummy x ...	0.967	0.331	4.24e-06	0.0759	0.169	0.182	0.973	0.465
R-squared	0.992	0.990	0.989	0.989	0.990	0.989	0.988	0.989
Observations	68	92	102	102	96	96	102	100
Number of clusters	33	45	50	50	47	47	50	49
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
Baseline Predicted Mortality	-0.268	-0.378	-0.472	-0.458	-0.321	-0.366	-0.429	-0.357
p-value	(0.047)	(0.001)	(0.000)	(0.000)	(0.015)	(0.002)	(0.002)	(0.012)
p-value, wild bootsrap	(0.026)	(0.002)	(0.002)	(0.002)	(0.020)	(0.006)	(0.002)	(0.014)
p-value for post year dummies x ...	1.69e-05	0.000486	3.10e-10	3.07e-05	5.38e-06	0.00135	0.00339	1.55e-08
R-Squared	0.995	0.993	0.993	0.992	0.994	0.993	0.992	0.994
Observations	201	277	307	307	280	280	302	309
Number of clusters	39	55	63	63	57	57	60	62

Note.—OLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A are long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B are unbalanced panels with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Appendix Table 3. The Effect of Population on Conflict: Additional Differential Trends -2SLS Estimates

	Dependent variable is years in conflict/total years according to COW							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Interaction of post-year dummies with...							
	Share of GDP in Natural Resource Sector in 1970	Share of Mineral Production in GNP in 1971	Oil Production in 1960	Diamond Production in 1960	Religious Polarization	Religious Fragmentation	Average Ethnolinguistic Fragmentation	Share of Catholic, Muslim, Protestant in 1980
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
log of population	1.526	0.811	0.645	0.669	0.920	0.834	0.608	1.054
p-value	(0.101)	(0.041)	(0.031)	(0.032)	(0.111)	(0.058)	(0.135)	(0.103)
p-value, wild bootsrap	(0.002)	(0.006)	(0.010)	(0.008)	(0.042)	(0.024)	(0.046)	(0.010)
p-value for post year dummy x ...	0.248	0.165	0.0401	0.124	0.491	0.383	0.810	0.444
Observations	68	92	102	102	96	96	102	100
Number of clusters	33	45	50	50	47	47	50	49
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
log of population	1.516	0.627	0.501	0.517	0.650	0.614	0.369	0.730
p-value	(0.063)	(0.023)	(0.010)	(0.010)	(0.088)	(0.035)	(0.062)	(0.078)
p-value, wild bootsrap	(0.014)	(0.020)	(0.002)	(0.008)	(0.054)	(0.014)	(0.056)	(0.024)
p-value for post year dummies x ...	0.349	0.0854	0.208	0.0745	0.637	0.469	0.241	0.817
Observations	194	270	307	307	280	280	295	302
Number of clusters	39	55	63	63	57	57	60	62

Note.—2SLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A are long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B are unbalanced panels with one observation per decade. First stages in Appendix Table 2. See the text and Appendix Table 1 for definitions and details.

Appendix Table 4. Reduced Forms Robustness I: Population and Predicted Mortality

	Dependent variable is years in conflict/total years according to COW						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Base Sample	Excluding Eastern Europe	Low and Middle income Countries Only	Global mortality instrument	Base Sample, excluding most affected by WWII	Base Sample, assign 1950 to 1940	Base Sample, assign 1946-1949 to 1940
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
baseline predicted mortality	-0.515	-0.517	-0.642	-0.531	-0.527	-0.410	-0.537
p-value	(0.028)	(0.029)	(0.033)	(0.035)	(0.031)	(0.098)	(0.030)
p-value, wild bootsrap	(0.006)	(0.006)	(0.006)	(0.016)	(0.008)	(0.034)	(0.006)
R-squared	0.683	0.679	0.681	0.680	0.693	0.683	0.655
Observations	102	92	80	102	94	102	102
Number of clusters	50	45	39	50	46	50	50
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
baseline predicted mortality	-0.245	-0.247	-0.306	-0.367	-0.250	-0.137	-0.265
p-value	(0.003)	(0.003)	(0.004)	(0.012)	(0.003)	(0.098)	(0.005)
p-value, wild bootsrap	(0.004)	(0.002)	(0.002)	(0.008)	(0.002)	(0.068)	(0.002)
R-squared	0.451	0.447	0.445	0.475	0.456	0.482	0.445
Observations	313	283	258	308	284	313	313
Number of clusters	63	57	52	63	57	63	63

Note.—OLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A are long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B are unbalanced panels with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Appendix Table 5. Reduced Forms Robustness II: Population and Predicted Mortality

	Dependent variable is years in conflict/total years according to COW								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Interaction of post-year dummies with...								
	Institutions	Independent in 1940	Log GDP per capita in 1930	Log Population in 1930	Oil Production per Capita in 1960	Diamond Production per Capita in 1960	Oil and Gas rents per Capita in 1960	Ethnic Polarization	Ethnic Fragmentation
Panel A: Long Differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
Baseline predicted mortality	-0.578	-0.480	-0.676	-0.507	-0.515	-0.516	-0.513	-0.482	-0.439
p-value	(0.023)	(0.050)	(0.044)	(0.029)	(0.030)	(0.029)	(0.030)	(0.061)	(0.109)
p-value, wild bootsrap	(0.006)	(0.018)	(0.028)	(0.008)	(0.004)	(0.008)	(0.008)	(0.004)	(0.028)
p-value for post year dummy x ...				0.442	0.277	0.164	0.743	0.586	0.503
R-squared	0.692	0.686	0.697	0.690	0.683	0.684	0.683	0.685	0.688
Observations	102	102	100	102	102	102	102	96	96
Number of clusters	50	50	49	50	50	50	50	47	47
Panel B: Panel	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
Baseline predicted mortality	-0.233	-0.215	-0.334	-0.230	-0.245	-0.248	-0.246	-0.206	-0.175
p-value	(0.012)	(0.005)	(0.008)	(0.008)	(0.003)	(0.003)	(0.003)	(0.017)	(0.032)
p-value, wild bootsrap	(0.002)	(0.008)	(0.010)	(0.002)	(0.002)	(0.006)	(0.002)	(0.008)	(0.016)
p-value for post year dummies x ...	0.962	0.634	0.0117	0.235	0.638	0.149	0.584	0.417	0.189
R-squared	0.451	0.466	0.491	0.478	0.451	0.451	0.452	0.472	0.485
Observations	313	313	268	265	313	313	313	284	284
Number of clusters	63	63	53	52	63	63	63	57	57

Note.—OLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A are long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B are unbalanced panels with one observation per decade. See the text and Appendix Table 1 for definitions and details.

Appendix Table 6. Reduced Forms Robustness III: Population and Predicted Mortality

	Dependent variable is years in conflict/total years according to COW							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Interaction of post-year dummies with...							
	Share of GDP in Natural Resource Sector in 1970	Share of Mineral Production in GNP in 1971	Oil Production in 1960	Diamond Production in 1960	Religious Polarization	Religious Fragmentation	Average Ethnolinguistic Fragmentation	Share of Catholic, Muslim, Protestant in 1980
Panel A: long differences	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980	Just 1940 and 1980
Baseline Predicted Mortality	-0.755	-0.536	-0.513	-0.517	-0.518	-0.531	-0.472	-0.615
p-value	(0.028)	(0.026)	(0.029)	(0.029)	(0.094)	(0.049)	(0.090)	(0.032)
p-value, wild bootsrap	(0.012)	(0.002)	(0.006)	(0.004)	(0.056)	(0.016)	(0.046)	(0.014)
p-value for post year dummy x ...	0.142	0.457	0.502	0.131	0.990	0.870	0.784	0.308
R-squared	0.716	0.682	0.683	0.684	0.681	0.681	0.684	0.714
Observations	68	92	102	102	96	96	102	100
Number of clusters	33	45	50	50	47	47	50	49
Panel B: panel regressions	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980	Panel 1940-1980
Baseline Predicted Mortality	-0.384	-0.237	-0.246	-0.248	-0.199	-0.219	-0.197	-0.238
p-value	(0.009)	(0.007)	(0.003)	(0.003)	(0.063)	(0.025)	(0.005)	(0.015)
p-value, wild bootsrap	(0.004)	(0.002)	(0.002)	(0.002)	(0.038)	(0.016)	(0.004)	(0.006)
p-value for post year dummies x ...	0.392	0.514	0.759	0.150	0.612	0.675	0.393	0.515
R-Squared	0.471	0.472	0.452	0.451	0.472	0.468	0.460	0.480
Observations	195	274	313	313	284	284	298	308
Number of clusters	39	55	63	63	57	57	60	62

Note.—OLS regressions with a full set of year and country fixed effects. Regular p-values for t-statistics with robust standard errors (clustered by country) are reported in parentheses, as well as cluster robust p-values following the wild bootstrap procedure suggested by Cameron, Gelbach and Miller (2008). Panel A are long-difference specifications with two observations per country, one for the intial date and one for the final date. Panel B are unbalanced panels with one observation per decade. See the text and Appendix Table 1 for definitions and details.

2.B Figures

Figure 1. Average Population and Average Log Population
Initially Rich, Midlle-Income and Poor Countries, Base Sample

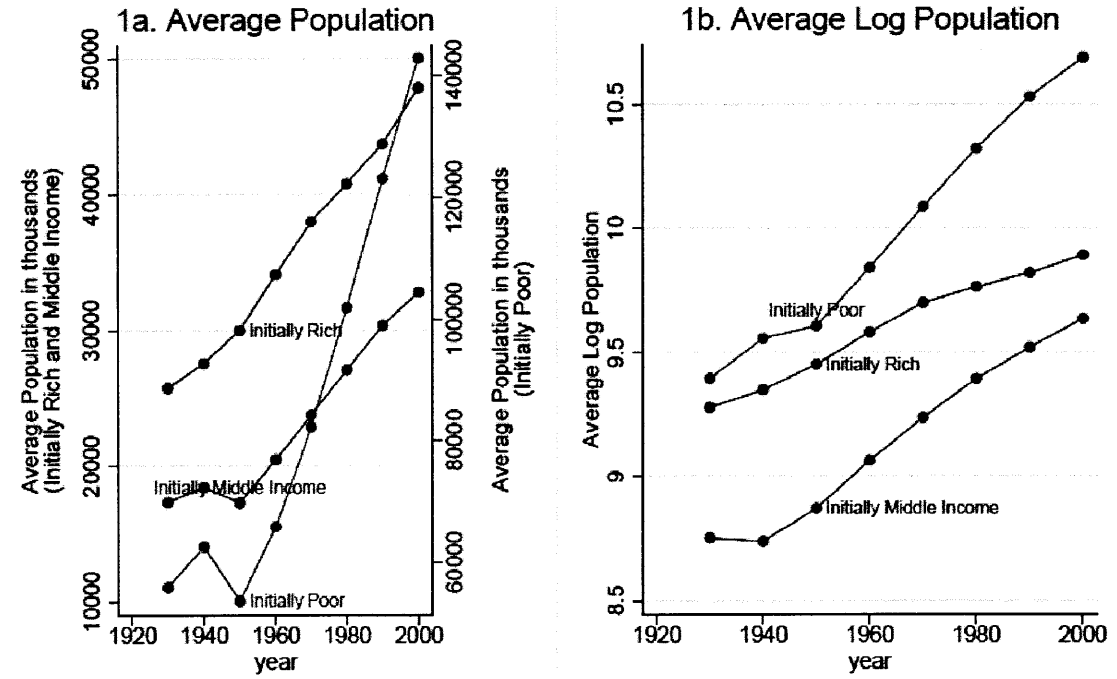


Figure 2. Average Log Life Expectancy

Initially Rich, Midlle-Income and Poor Countries, Base Sample

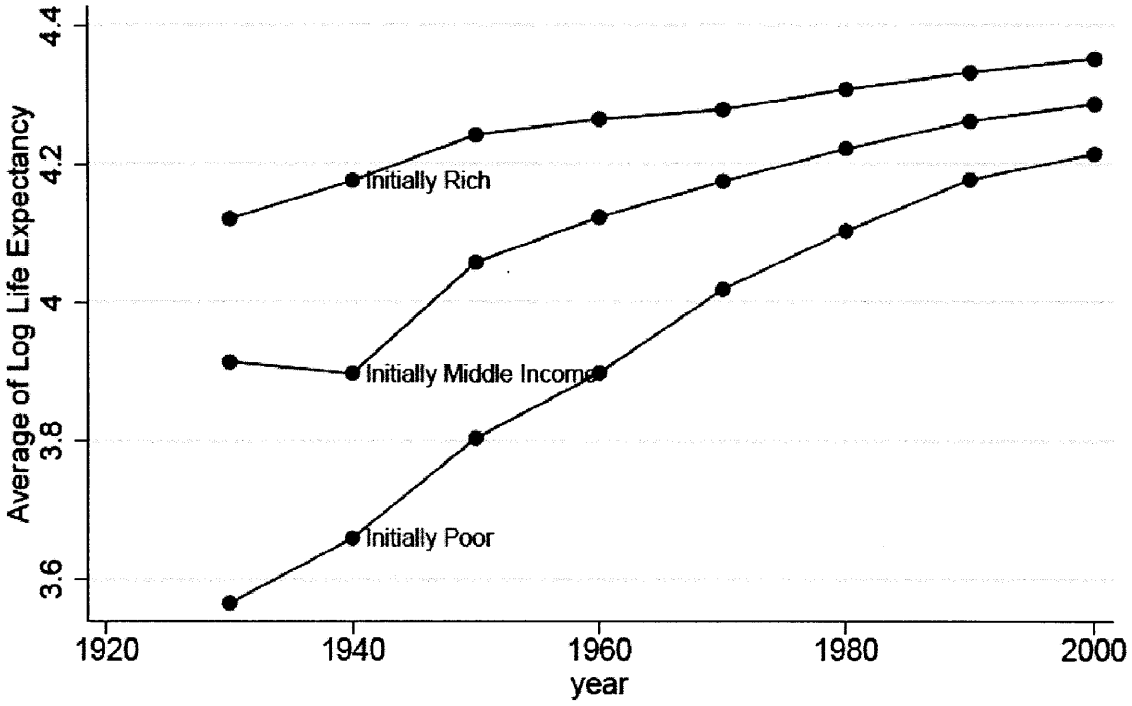


Figure 3. Average Log GDP per capita

Initially Rich, Midlle-Income and Poor Countries, Base Sample

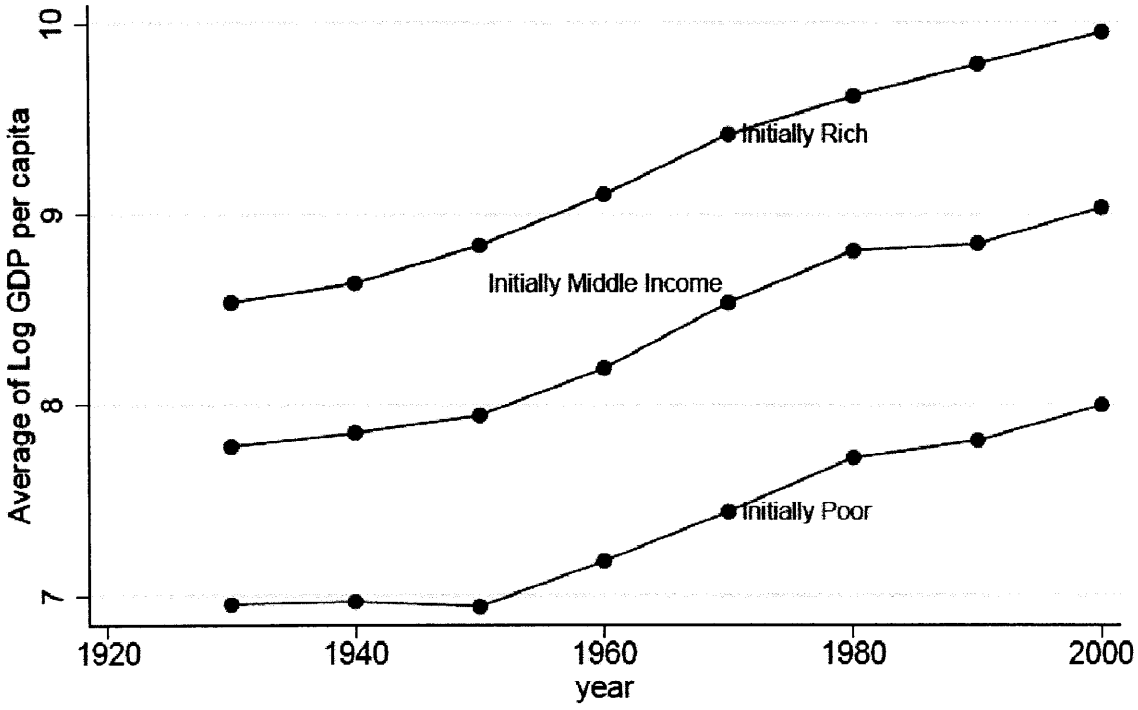


Figure 4. Conflicts: Civil War – COW

Initially Rich, Midlle-Income and Poor Countries, Base Sample

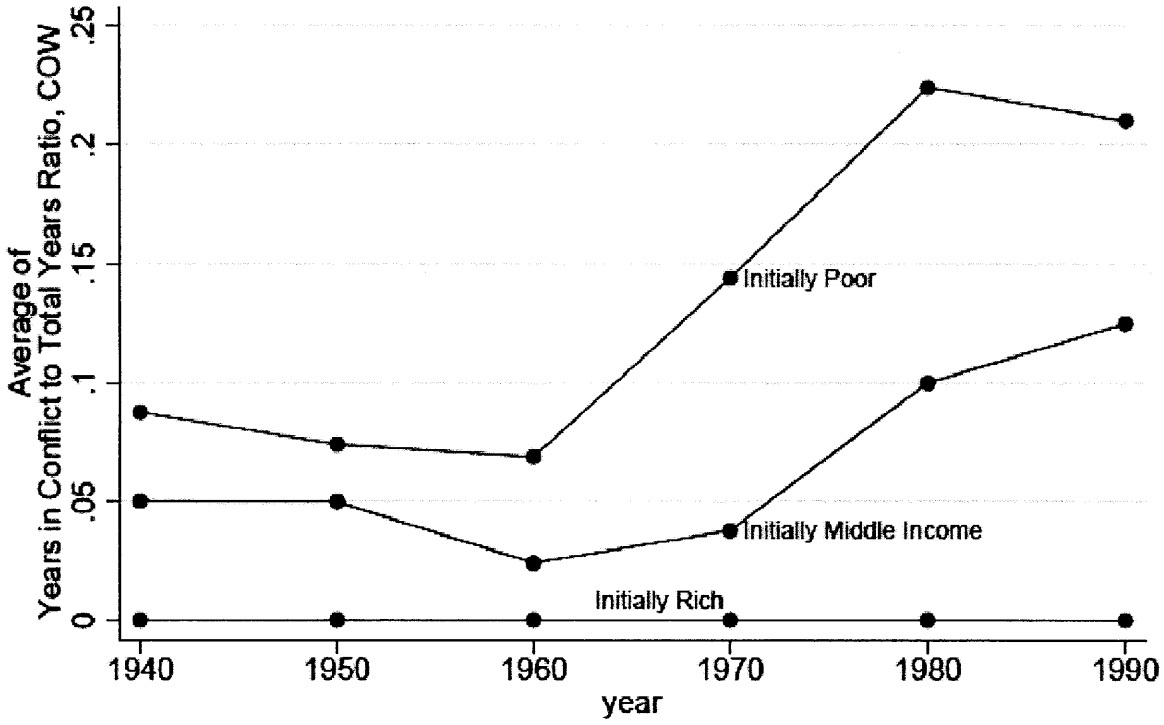
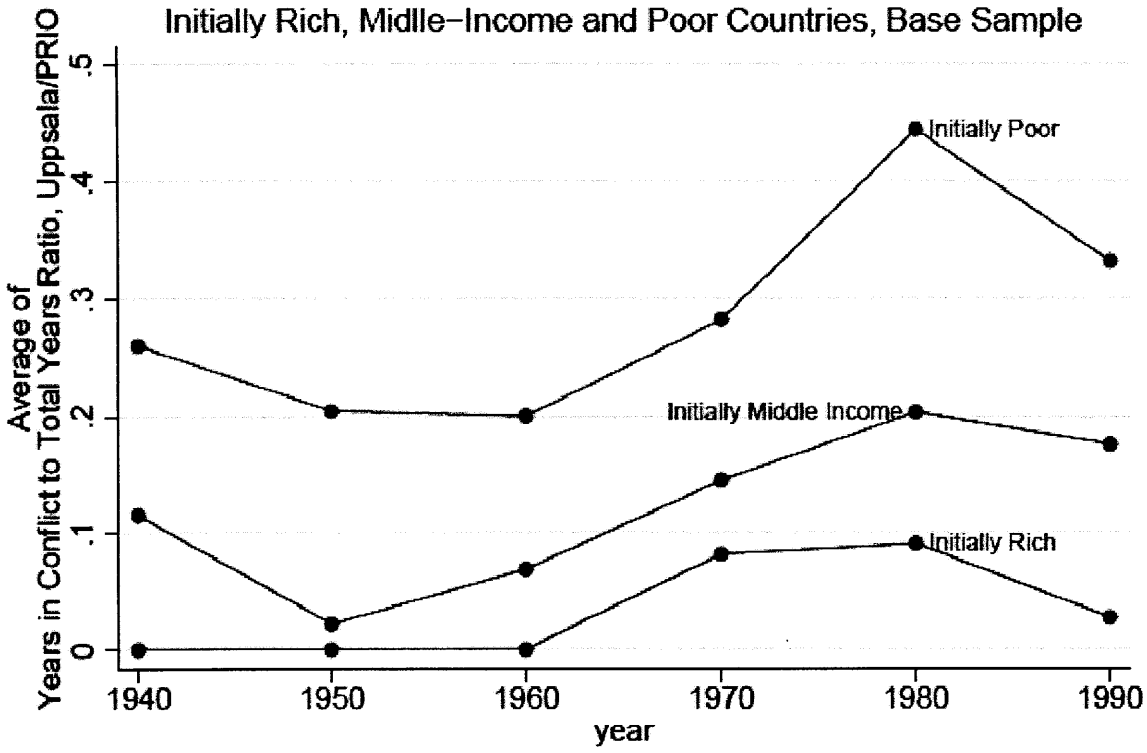


Figure 5. Conflicts: Internal Conflict – UCDP/PRIO

Initially Rich, Midlle-Income and Poor Countries, Base Sample



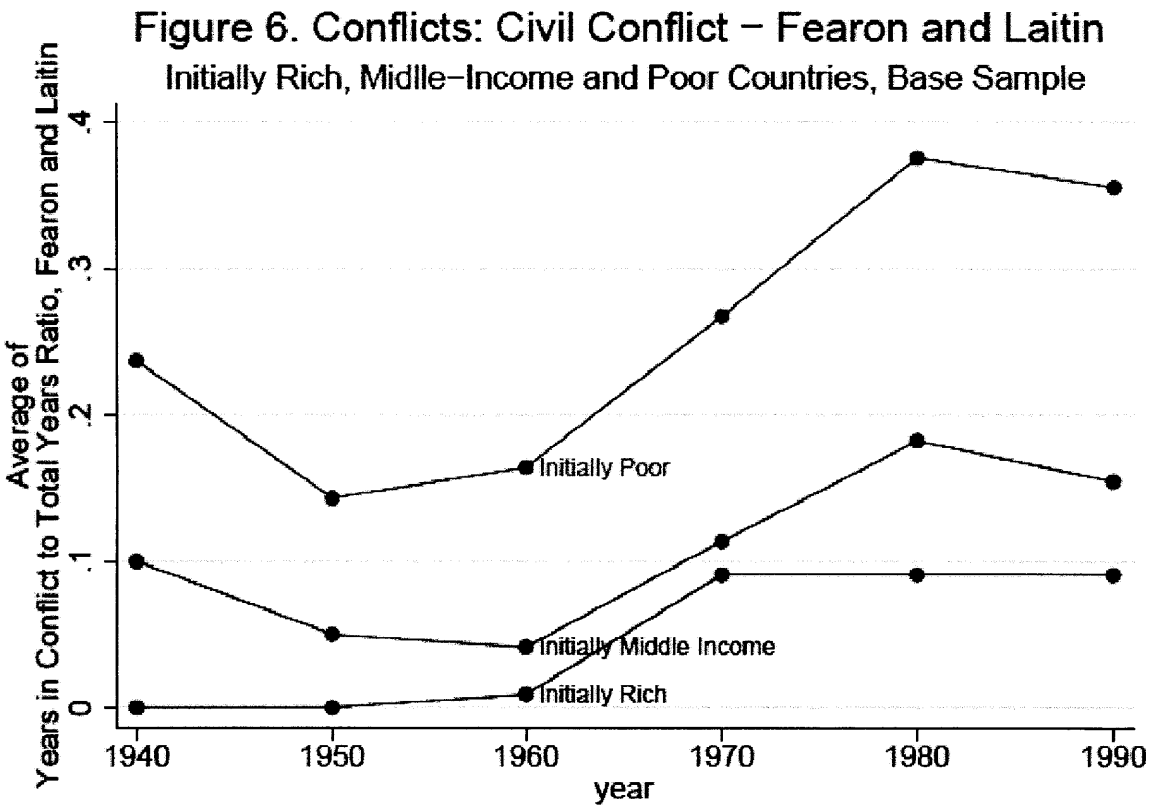


Figure 6. Conflicts: Civil Conflict – Fearon and Laitin
Initially Rich, Midlle-Income and Poor Countries, Base Sample
Average of
Years in Conflict to Total Years Ratio, Fearon and Laitin
0
.1
.2
.3
.4
Initially Poor
Initially Middle Income
Initially Rich
1940
1950
1960
1970
1980
1990
year

Figure 7. Conflicts: Battle Deaths – COW

Initially Rich, Midlle-Income and Poor Countries, Base Sample

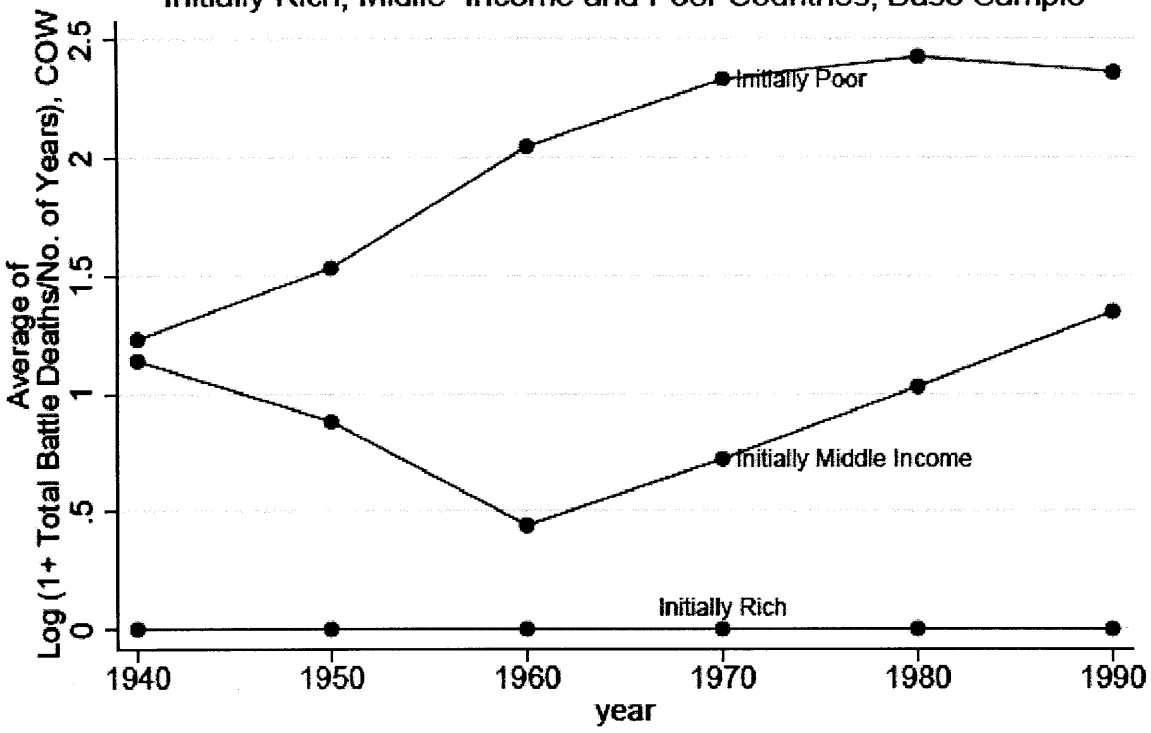


Figure 8
Change in Log Life Expectancy and Change in Predicted Mortality
Base Sample

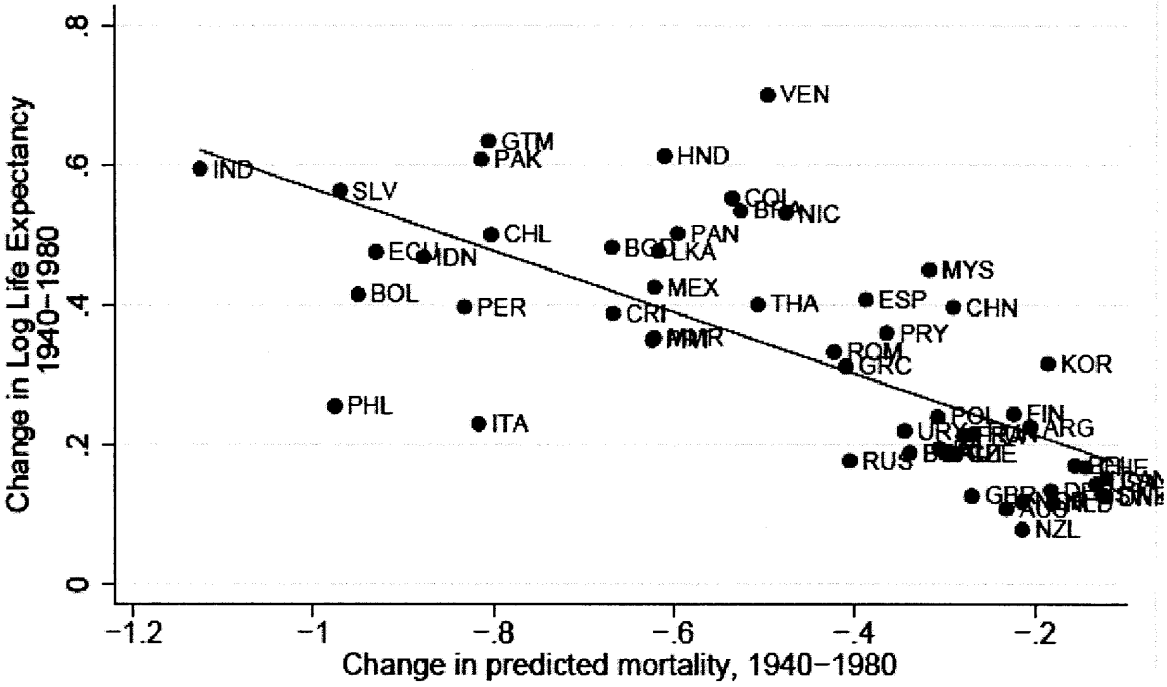


Figure 9
Change in Log Life Expectancy and Change in Predicted Mortality
Low and Middle Income Countries

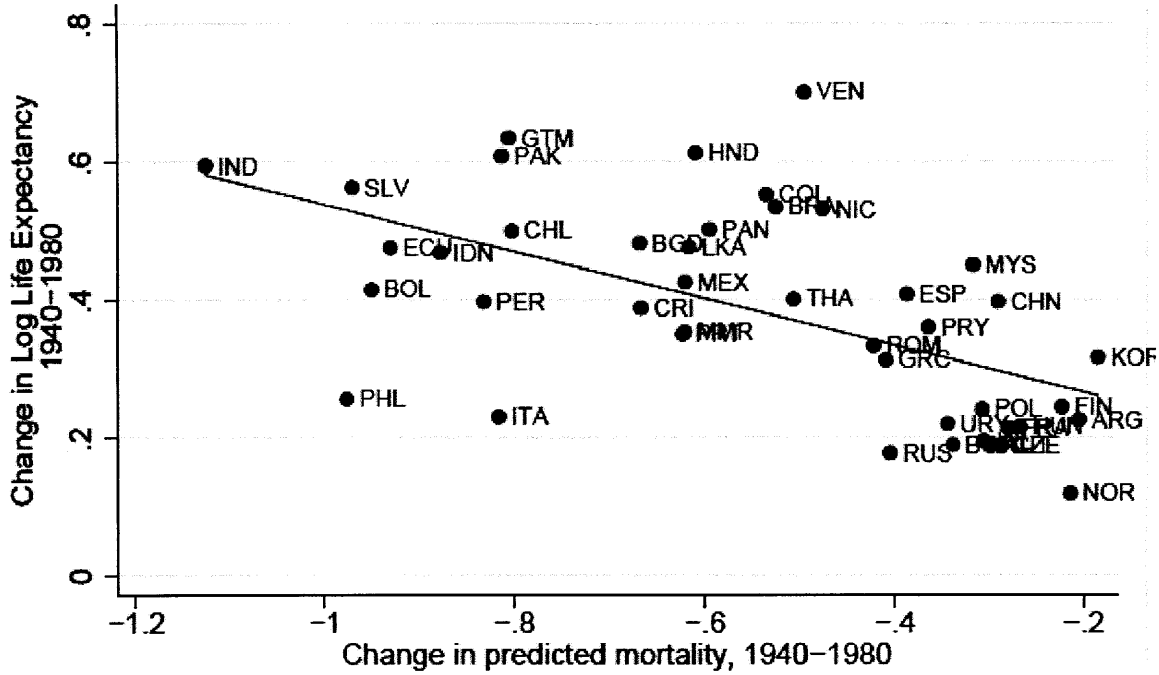


Figure 10
Change in Log Life Expectancy 1900–1940, and
Change in Predicted Mortality 1940–1980
Base Sample

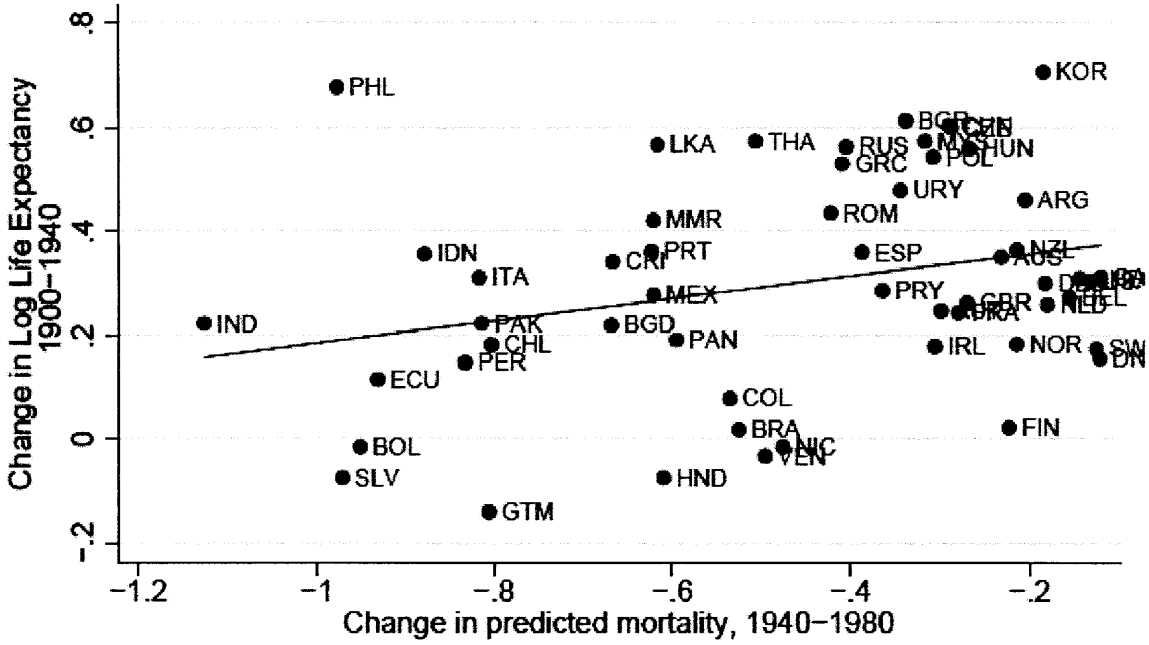


Figure 11
Change in Log Life Expectancy 1930–1940, and
Change in Predicted Mortality 1940–1980
Base Sample

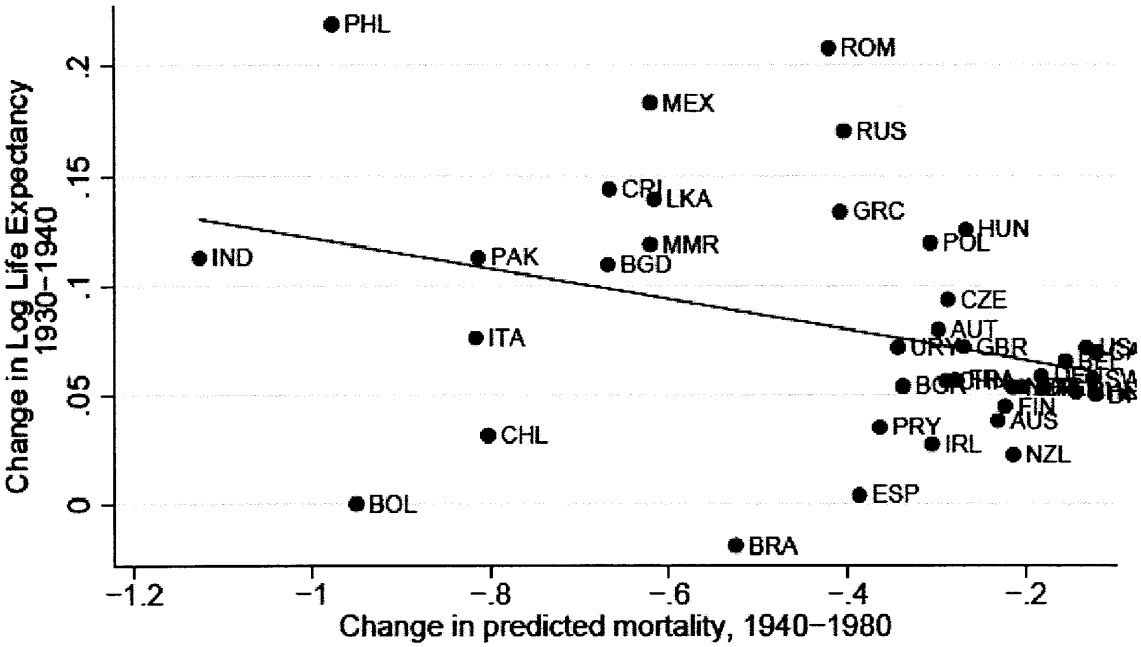


Figure 12
Change in Log Population and Change in Predicted Mortality
Base Sample

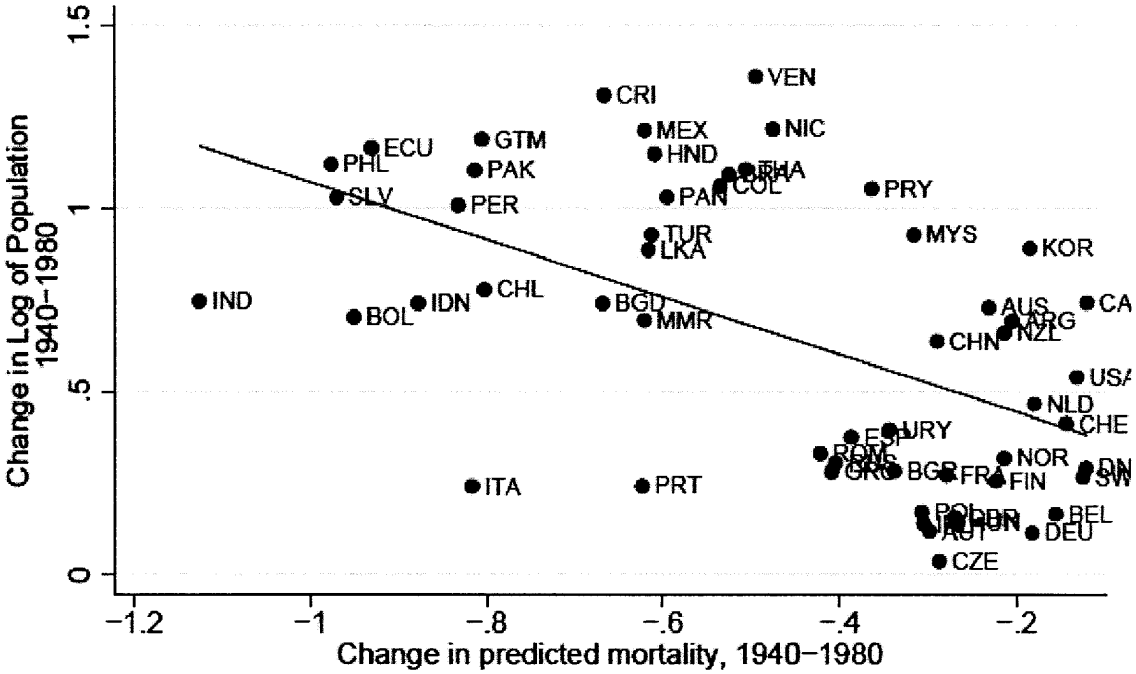


Figure 13
Change in Log Population and Change in Predicted Mortality
Low and Middle Income Countries

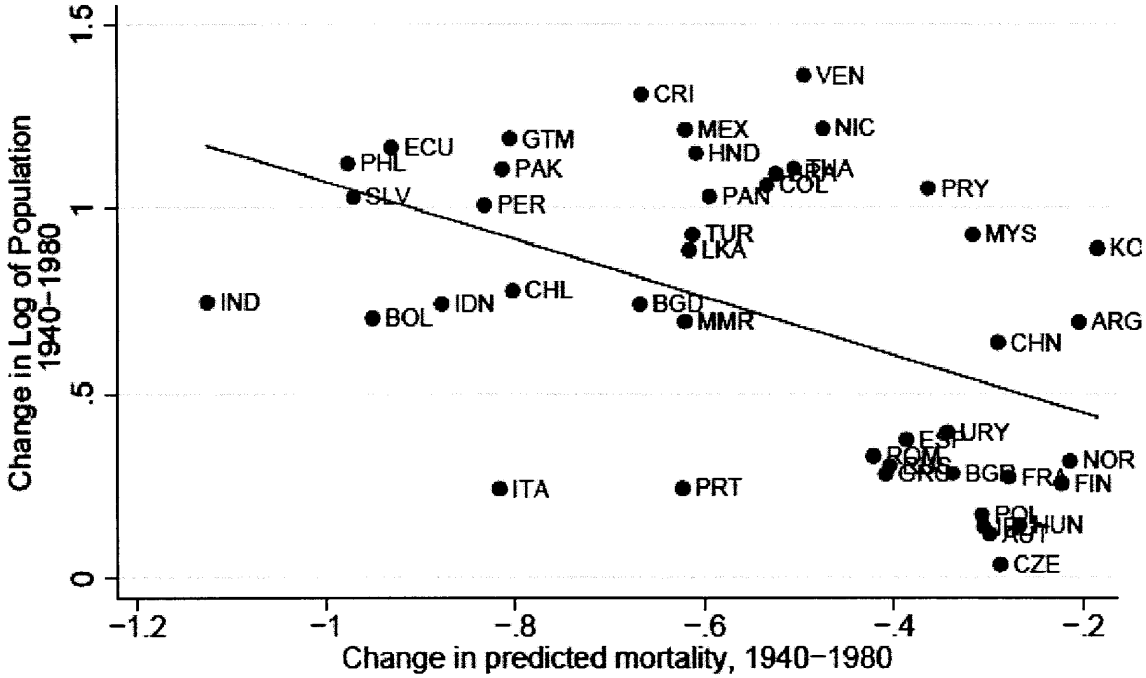


Figure 14
Change in Years in Conflict/Total Years and
Change in Predicted Mortality
Base Sample

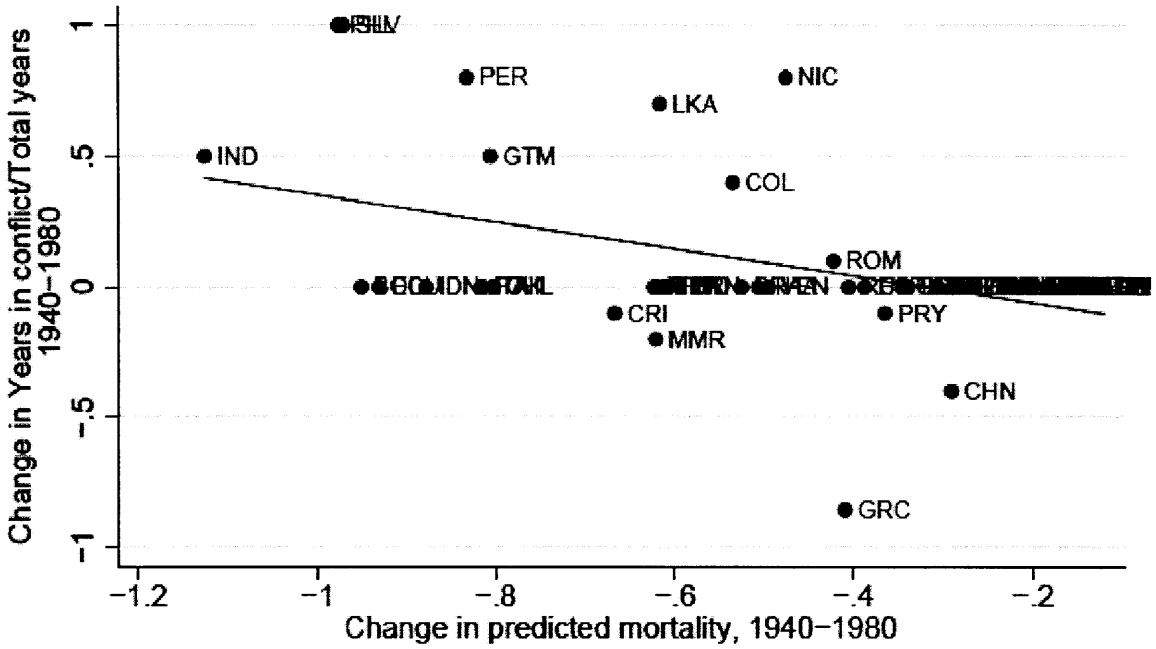


Figure 15
Change in Years in Conflict/Total Years and
Change in Predicted Mortality
Low and Middle Income Countries

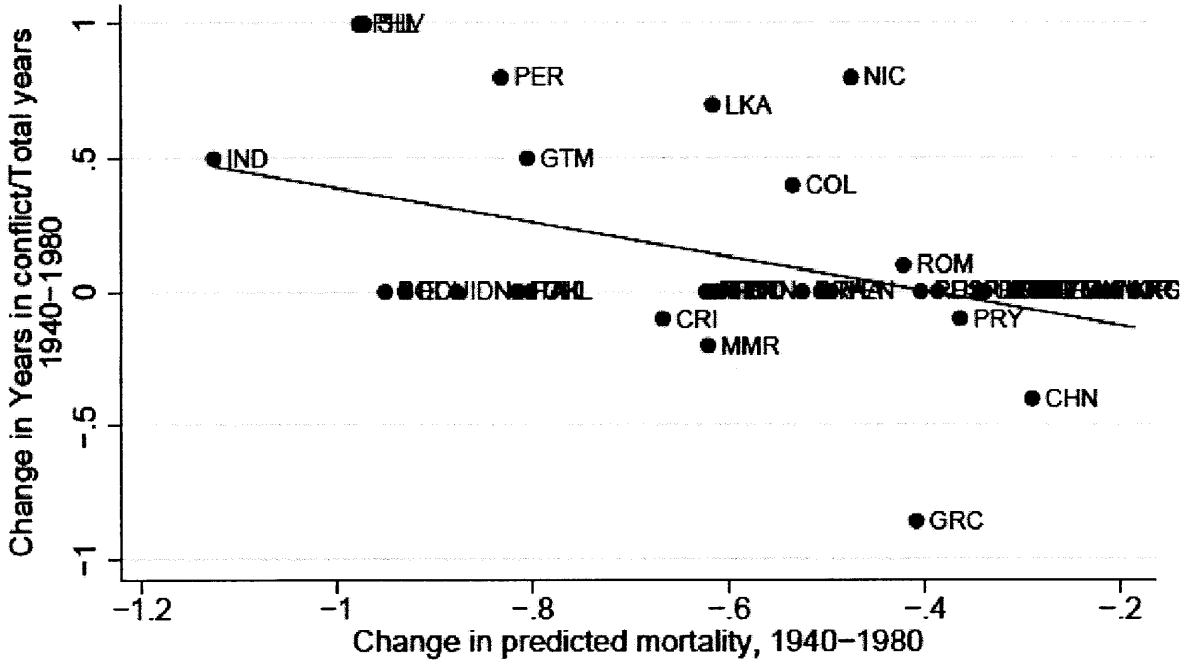


Figure 16
Change in Years in Conflict/Total Years 1900–1940, and
Change in Predicted Mortality 1940–1980
Base Sample

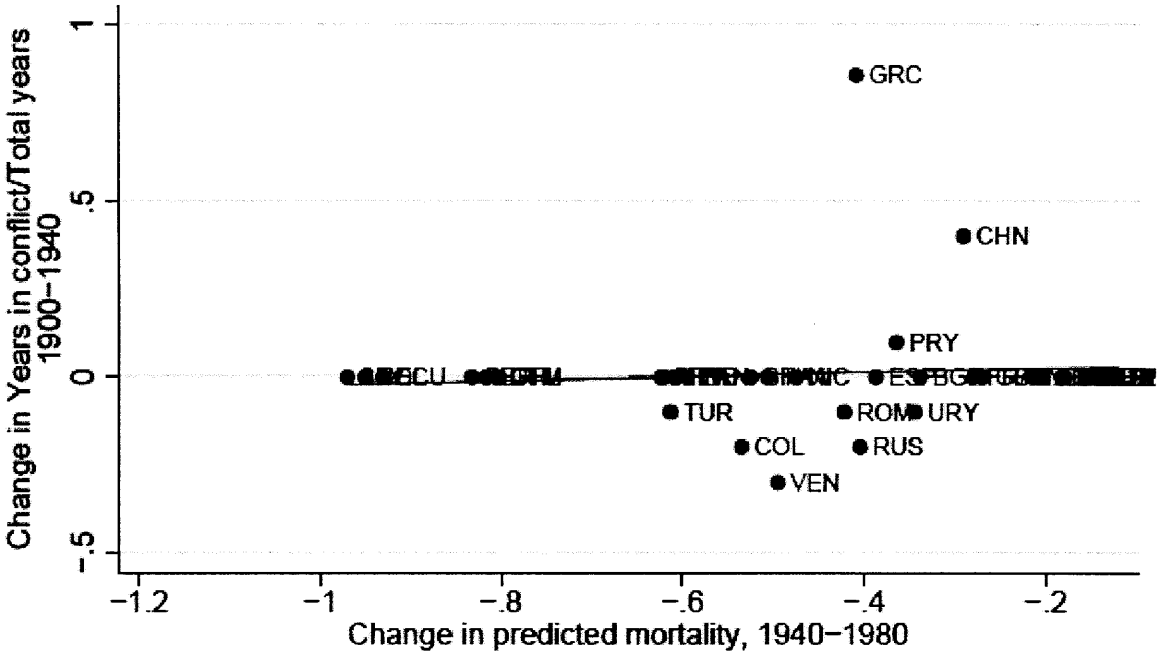
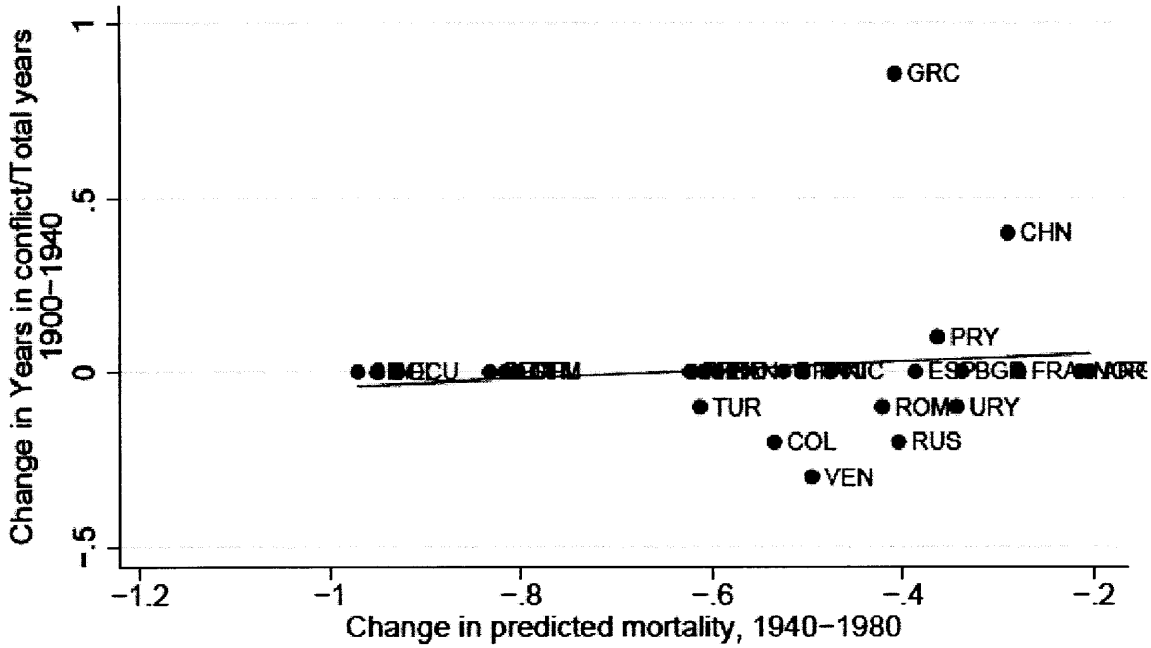


Figure 17
Change in Years in Conflict/Total Years 1900–1940, and
Change in Predicted Mortality 1940–1980
Low and Middle Income Countries



Chapter 3

The Political Economy of Rural Property Rights and the Persistence of the Dual Economy

The fact that the wage level in the capitalist sector depends upon earnings in the subsistence sector is sometimes of immense political importance, since its effect is that capitalists have a direct interest in holding down the productivity of the subsistence workers (...) In actual fact the record of every imperial power in Africa in modern times is one of impoverishing the subsistence economy, either by taking away the people's land, or by demanding forced labour in the capitalist sector, or by imposing taxes to drive people to work for capitalist employers.

Sir W. Arthur Lewis, 1954

3.1 Introduction

Widespread poverty and low aggregate productivity in less-developed countries is partly due to poorly performing rural sectors[1,2]. This raises the question of why is agriculture so unproductive

[1]I thank participants of the MIT development lunch, MIT political economy breakfast, the Political Economy and the Economic History/Historical Development (EHHD) groups at Harvard-MIT, and the 2010 Midwestern Political Science Association for comments. In particular, I thank Ximena Cadena, Dave Donaldson, Esther Duflo, Rachel Glennerster, Sarah Hamilton, Ana María Ibáñez, Gina M.S. Lambright, Carl Levan, Benjamin Olken, Samuel Pienknagura, and Juan Fernando Vargas.

[2]Compared to rich countries, poor countries have lower output per worker in agriculture relative to non-agriculture (Restuccia et al., 2008). Since more people work in agriculture in poor countries than in rich countries, this apparent

in poor countries. While there is no simple answer, there is broad consensus that property rights are vital to agricultural productivity. Of course, such a general statement blurs several distinctions. First, property rights refer to a variety of rights. These include: (i) *transfer* rights, which determine the right to sell, rent, bequeath, or mortgage the land, and (ii) *use* rights, which establish permissible activities. Second, there are many types of property rights. A key distinction is between *communal* systems, where a customary authority holds and administers land rights, and *private* property rights, which lie in the hands of individuals.

Given these distinctions, consider a more precise statement of the conventional wisdom: individual, well-specified and secure property rights over productive assets, and land in particular, improve economic outcomes. Besley & Ghatak (2010b) suggest a two-fold categorization of the underlying theory. First, secure property rights limit expropriation, incentivizing investment and effort and reducing resources diverted for protection. Second, well-defined individual rights facilitate market transactions, improving asset collaterilazability (which may ease credit constraints that hinder investments) and generating gains from trade (by making sure land is held by the most productive owner). Although communal tenure systems may increase tenure security and provide some basis for land transactions under certain circumstances (Deininger & Binswanger, 1999), in practice private property rights, when clearly specified and well-enforced, improve productivity in agriculture[3].

Despite these positive effects of property rights, the rural sectors of many less-developed countries are characterized by poor specification and weak enforcement of property rights. More specifically, rural areas in developing countries throughout history and even today frequently involve the coexistence of more than one regime of property rights and production. A more "modern" group of "capitalist" landowners, with large farms around institutions of private property, coexists with a more "traditional" or "subsistence" group of peasants, who farm small plots with limited property

violation of comparative advantage helps explain the bad productivity performance of poor countries (Caselli, 2005). World Bank (2008) surveys the connection between agriculture, poverty, and development, and urges for measures at improving agricultural productivity as a central strategy against world poverty.

[3]A microeconomic literature, too large to do it justice, examines the effects of property rights on investment and productivity. Papers using an instrumental variables strategy to address the endogeneity problem offer mixed results. For example, Besley (1995) reports some positive effects of individual's transfer rights on investment in Ghana, whereas Brasselle et al. (2002) find no effect of tenure security on investment in Burkina Faso. However, other studies using variation in the security of property rights induced by natural experiments or policy reforms find positive effects of better property rights (e.g. Banerjee et al. (2002), Goldstein & Udry (2008), Hornbeck (2010), Jacoby et al. (2002)). In a recent survey for the case of West Africa, Fenske (2010) concludes that, empirically, the link between more complete land rights and investment has been found to be weaker than expected. Several reasons ranging from thin credit markets to empirical difficulties help explain this, yet in an examination of multiple data sets for the region the relationship seems robust for certain investments, such as fallow.

rights.

Given the effects of property rights on productivity, this "dual" structure within the agricultural sector may cause its low productivity. Why aren't private property rights adopted more widely? Why did this socially sub-optimal organization emerge? Why did it persist?

In this paper, I examine these questions and put forward a theory that rests on the premise that politically powerful landowners use this power to impoverish the subsistence sector to extract cheap labour from peasants. Admittedly, landowners can hold down the productivity of the subsistence sector in various ways. Still, limited property rights are especially attractive because, unlike other distortions such as taxation, they achieve an additional goal: they tie peasants to land. Imperfect property rights force peasants to remain in the agricultural sector to protect their property. In this sense, imperfect property rights may be preferred to other types of distortions that reduce peasants' welfare in the subsistence sector, especially if alternative employment opportunities appear in other sectors.

I build a simple theoretical model to capture this intuition and examine the determinants of peasants' property rights. Also, I explore whether these determinants change when employment opportunities for peasants in other sectors improve. Alternative sectors may be any others that compete with landowners for labour and require peasants' outmigration. It is natural to think of them collectively as the "urban sector," and to associate an increase in the urban wage with "modernization."

The main predictions of the model include the conditions under which weak property rights emerge. In particular, I show that weak property rights arise when urban wages are low only if the elite cannot tax peasants effectively. In contrast, when urban wages are high (and the threat of migration is effective), poor property rights arise even when the elite tax peasants effectively if peasants own relatively little land.

These results are driven by the conflicting effects of peasant limited property rights on elite's welfare. By reducing peasant income, bad property rights increase peasants' labour supply for the elite. On the other hand, reduced productivity decreases tax revenues for politically powerful landowners.

How is this ambivalence over property rights resolved? When urban wages are low, good property rights prevail if landowners can tax peasants. In this case, the elite want to impose high taxes on peasants both for tax revenue and to get more labour from them. A high tax rate, in turn, compels the elite to prioritize extracting peasants' income via taxation and thus to be mostly

interested in increasing productivity by selecting good property rights institutions.

As noted, the implications of this theory at higher levels of modernization are markedly different. The reason is that, with an effective threat of migration, increasing taxes on peasants' income no longer induces them to work for landowners. On the contrary, it reduces the attractiveness of rural areas; the ensuing migration decreases labour input for landowners. Thus, when hoping to avoid labour force migration, the elite will choose minimal taxation. This implies tax revenues become an unimportant component of landowner's income, muting incentives to adopt good property rights institutions. To avoid migration and extract more labour from peasants, the elite select poor property rights institutions. This logic prevails when peasants own little land. If peasants own sufficient land, however, taxable income is high enough that the elite assign greater importance to taxation. Thus, to increase tax revenues, the elite promote strong property rights for peasants.

Therefore, in the presence of landowner political power and a small subsistence sector, the theory suggests a specific mechanism for the endogenous persistence of bad rural institutions as development unfolds. This contrasts other theories of the dual economy in which the disappearance of the subsistence sector is a more or less natural consequence of an exogenous process of capital accumulation[4]. In this sense, this work relates to underdevelopment theories of the "dependency" tradition, most notably applied to Africa[5]. As Clarke (1975) puts it:

> "the 'traditional' social forms are not simply relics of the past but have been necessary and integral to the development, maintenance and reproduction of peripheral capitalism (...) the state, continues to support such 'traditional' structures [which] have not therefore been in 'transition' to modernity, being shaped by the global system and settler colonialism, have been made thoroughly modern, poor, and dependent" (p.75).

In the theory outlined above, precisely the rise of an alternative "modern" or "urban" sector may shift the rural elite's attention away from taxation. But when the elite is not concerned about

[4]In Lewis (1954), capital accumulation or productivity gains in the modern sector pull "unlimited supplies of labour" out of the subsistence sector. Models of the dual economy and growth with structural change overcome some of the limitations of the Lewis' model, but share the idea that accumulation of capital and knowledge in the modern economy gradually reduces the size of the subsistence sector. Examples range from models of unbalanced growth focusing on demand side forces (e.g., Kongsamut et al. (2001)) to models where income growth is associated with information accumulation, reduction of idiosyncratic risk, and reduction of credit constraints (e.g. Banerjee & Newman (1998), Acemoglu & Zilibotti (1999)).

[5]See Phimister (1979) for a historiographical essay. Arrighi (1970) argued, against the ideas in Barber (1961), that capitalist development began with labour scarcity and high wages, not unlimited labour, and that as capital accumulation proceeded it created cheap labour. Amin (1972), Clarke (1975), Palmer & Parsons (1977), and Palmer (1977b) express similar views. Below, I draw heavily on the latter to discuss the Rhodesian case. Mosley (1983) offers a critique of certain versions of underdevelopment theory.

tax revenue, it has no direct interest in the productivity of the subsistence sector, and thus has no incentive to promote efficiency-enhancing innovations in property rights institutions. Instead, it has incentive to sustain the rural dual economy.

Also noteworthy, the model predicts a non-monotonic relationship between the quality of rural property rights and peasant land. Indeed, when peasants' limited landholdings increase, this strengthens the rural elite's incentives to reduce property rights in order to extract labour. However, if sufficient land is allocated to peasants, the elite prefers promoting optimal property rights institutions to increase tax revenues. This suggests a general theory as to why small land reforms deliver poor results compared to larger transfers of land to peasants.

The developing world provides several illustrations of dual rural economies where, as in the model proposed in this paper, peasants have limited property rights and less political influence than landowners. Communal tenure systems alongside private, commercial agriculture have been dominant in parts of Latin America. Mexico is an important example: a long history of land dispossession during the colonial and early independent periods fueled many of the agrarian reclamations during the Mexican Revolution of the early XXth Century. Land distribution was at the center of Mexico's 1917 Constitution. Throughout the XXth Century, land distributed to peasant communities in the form of *ejidos* was characterized by institutions of communal property. Land was granted to *ejidos* as a whole, and members of the community typically enjoyed inheritable (but otherwise non-transferable) use rights over specific plots. Also, these rights would be lost after absence. Importantly, a large political economy tradition of land reform in Mexico emphasizes the influence of landowner agricultural interests in shaping the land reform process and discriminating against the *ejido* sector[6].

Mexico illustrates a few basic tenants of my analysis. For instance, comparing *ejidatarios* to private peasants with similar small units of production, Lamartine Yates (1981) notes the role of poor property rights in tying peasants to their land: "In recent times there has been observed a sharp reduction in the number of these [small private] units as their owners have sold out and migrated to the cities, (whereas ejidatarios on equally small units being prohibited from selling, are much less mobile)" (p. 151). And later adds, emphasizing the limits to private initiative imposed by these property rights institutions,

[6]The role of land reform in Mexico and its connection with the Partido Revolucionario Institutional's (PRI) long hegemony has been much studied. A review is outside the scope of this paper.

"theoretically, [the ejidatario] is free to leave whenever he wishes, but in practice he is a prisoner tied to his land, because, if he left, the ejido would give him no compensation for improvements he may have achieved through years of hard work. He is forbidden by law to rent his land, even to another member of his own ejido. He is forbidden to subdivide his parcela among his sons if by doing so the new parcelas would be below the legal minimum size–which most of them would be" (p. 180).

Another exhaustive investigation of the Mexican agricultural sector highlights the role of *ejidatarios* as a labour force for large landowners and the role of the property rights regime (Reyes-Osorio, 1974). Surveys conducted in the late 1960s revealed that only 6% of property owners worked as *jornaleros.* In contrast, 23% of *ejidatarios* did, and they worked more days as *jornaleros* than owners (p. 270). The data from the decennial agricultural censuses cited in this study also reveal an upward trend: the share of *ejidatarios* working as *jornaleros* rises from 9.4% in 1940 to 10.7% in 1950 and 25.4% in 1960 (p.332). Moreover, *ejidatarios* suffered from underemployment more often, with 74% of those in their sample reporting having been unemployed for part of the year as compared to 54% of private owners. This study concluded that "it is useful to give a greater flexibility to the land-man link in the ejido. That is, that the *ejidatario* may abandon the *ejido,* if it benefits him, and sell his investments on his land plot to the community" (p. 972). Still, the *ejido,* in its basic form, persisted until the 1990s in spite of the inefficiencies it created.

The settler colonies of Southern Africa are also good examples of the premises and mechanisms analyzed in this paper. The distortions introduced against African farmers in Rhodesia (formerly Southern Rhodesia, or current-day Zimbabwe) will be examined in more detail below. A parallel story could also be told of the black reserves in South Africa, the discriminatory policies against the black economy, and their role in providing white elites with cheap black labour[7]. Large, private estates of white farmers have coexisted with overcrowded African Reserves. Resembling ancient

[7]As noted by Feinstein (2005), "the tragedy of the reserves created by this discrimination was an integral part of the measures adopted to ensure the necessary supply of labor for the modern sector of the South African economy" (p. 72). Perhaps the most important difference with Rhodesia is that agricultural elites faced competition for labour from the mines. But mines adopted a system of short-term migrant workers, with skilled work reserved for white workers (via the "colour bar"). While mining could survive with this scheme, it implied huge obstacles for industry, which required a more stable and better educated labour force (see Feinstein, 2005, p. 130). Hence, in terms of the theoretical framework, it may be useful in the case of South Africa to see the elite as a coalition of mining and rural elites, both of which benefitted from the distortions of limited property rights and a scheme of short-term migrant labourers, at the expense of the modern industrial sector (and of course, of black peasants!). Finally, there is little doubt about the very low productivity of African reserves in South Africa, and communal tenure "was a potential barrier in the reserves to those few who might have wished to be more innovative and entrepreneurial" (Feinstein, 2005, p. 73).

customs of African societies, land in black Reserves is typically owned by the community, not the individual. While individuals may have secure (and often inheritable) rights to use land, the communal structure often implies the lack of permanent property rights over a specific plot, or that these rights expire after a period of absence. Also, transfer rights (if any), such as sales or rentals, are limited to the community. Needless to say, white agricultural interests held historically far greater political power than the excluded black majority.

However, the argument proposed for the persistence of bad property rights does not pertain exclusively to cases in which the rural dual economy has been institutionally codified and land has been geographically segregated along racial or other lines. The theoretical mechanisms may be present in many poor countries where large landowners often have more political power and better-defined rights than smallholders. As noted in a recent World Bank Development Report, "Heterogeneity defines the rural world (...) Large commercial farmers coexist with smallholders. [Many smallholders] are in subsistence farming, mainly due to low asset endowments and unfavorable contexts. Consuming most of the food they produce, they participate in the market as buyers of food and seller of labor" (World Bank, 2008, p. 5.)[8].

Moreover, the political economy approach to explain the dualistic structure of the rural sector is well-established. A large historical literature shows that land rights grow out of power relationships. Large landowners use their political power to generate distortions in various markets to discriminate against peasants and support their inefficiently large estates[9]. Binswanger et al. (1995) offer a review[10], noting that getting labour for the large estates "required lowering expected utility of profits in the free peasant sector in order to reduce peasants' reservation utility (...) or shift their labor supply curve to the right" (p. 15).

However, the role of the subsistence sector's property rights structure as a potential mechanism to achieve this purpose has received comparatively little attention[11]. The idea that informal prop-

[8] See also
Binswanger & Deininger (1997), Deininger & Binswanger (1999), and Deininger & Feder (2001).

[9] The relationship between farm size and productivity is theoretically ambiguous, trading off the potential benefits of scale economies with the incentive problems from monitoring labour in larger plots. However, available evidence suggest that, at least for developing countries, incentive problems outweigh economies of scale (see Ray (1998, p. 453) and Banerjee (1999)). Thus, the dual structure in poor societies' countryside may be doubly detrimental for productivity: the subsistence sector lacks the appropriate institutions of property rights to generate economic efficiency, and the capitalist sector is organized around inefficiently large farms.

[10] See also Deininger & Binswanger (1993, 1995).

[11] For instance, it is not part of the list suggested by Binswanger et al. (1995) (or Binswanger & Deininger (1993) for the specific case of South Africa). But the mechanism has not been completely neglected, and Binswanger & Deininger (1993) recognize its relevance when they note: "A further distortion against black African farming was the excessively restrictive 'traditional' communal tenure system imposed by successive land laws [in South Africa], the

erty rights may "tie" households to their property and affect labor market decisions is studied in a different context by Field (2007). She examines a large titling program in urban Peru, finding that squatter families with no legal claim to property work fewer hours –since they spend more hours per week maintaining informal tenure security– and are more likely to work inside their homes.

More generally, De Soto (1989, 2000) famously emphasized barriers to legal property ownership of assets in developing countries as a major obstacle for prosperity. Without legal titles, the world's poor can't use their houses, land, and machines as leverage to gain capital. However, De Soto is more vague about the causes of such extralegality. This paper, while emphasizing the factor market consequences of imperfect property rights, focuses on their possible political economy determinants, arguing that property rights are intentionally precarious. In some instances, the consequences of informal property rights on factor markets explain some groups' interests in sustaining them. In a related contribution, Besley & Ghatak (2010a) explore the consequences of creating and improving property rights so that fixed assets can be used as collateral. They show that the impact will vary with the degree of market competition. Where competition is weak, it is possible that borrowers will be worse off when property rights improve. Intuitively, imperfect property rights may in effect protect borrowers from the power of lenders to force them to put up more of thier wealth as collateral. An implication of the theory is that, under certain conditions, borrowers may thus oppose the improvement of property rights.

A few related papers provide simple formal models in which poor property rights are encouraged by powerful elites. However, the arguments put forward in this paper are distinct. Diaz (2000) argues rural elites prefer granting land inefficiently in Latin America. In her argument, granting plots with poorly defined rights and low productivity "destroys" land. This strategy profits landowners under sufficiently strong complementarity of land and labour and sufficient land abundance. She argues these conditions prevailed in Latin America. Unfortunately, many other distortions on the land-reform sector have similar consequences. In contrast, the attractiveness of poor property rights in the theory I propose depends upon a characteristic that distinguishes this distortion from others: it simultaneously affects the productivity of the sector *and* the cost of migration to other sectors. Sonin (2003) offers a theory more focused on property rights, though his emphasis is not in the rural sector or land. He uses the Russian case to argue that the rich have a comparative advantage in the private provision of property rights. Hence, poor definition of property rights for a wide cross section of the population allows them to use this comparative advantage to predate

first and most important of which was the Glen Grey Act of 1894" (p. 1461).

from the poor.

On a more general level, this work builds on the idea that the nature of institutions is a crucial determinant of economic performance. In recent years, this idea has received attention and support beyond the microeconomic literature mentioned before[12]. Also, the paper is related to the literature on institutional persistence. It concurs with the political economy or "social conflict view" of institutions which contends that inefficient institutions arise and persist because powerful political groups benefit (Acemoglu et al., 2005). This view contrasts others which emphasize that institutions are largely determined by economic forces, ideology, or historical accidents. The paper is closely related, both in following this approach and in the formal analysis, to Acemoglu (2006). Specifically, the theoretical mechanisms capture two of the sources for inefficient institutions highlighted by Acemoglu (2006). The first source, *revenue extraction*, in which elites extract resources from other groups in society via instruments which, like taxation, are typically distortionary. The second source, *factor price manipulation,* arises when the elite compete for factors[13].

This approach implies that property rights institutions may be less responsive to economic conditions than others theories suggest. For instance, economic theories of property rights suggest that increased population density leads to a gradual transformation from poor property rights, to communal systems, and eventually reaching individualized, well-defined and strictly enforced property rights (Boserup (1965) and Demsetz (1967))[14]. While population density may incentivize better property rights, political considerations may partially counteract these incentives. Indeed, in the theory I suggest, rural elites have a strong incentive to lock as much labour in the agricultural sector as possible by blocking institutional innovations in the nature of property rights.

The paper proceeds as follows. In Section 3.2, I lay out the basic setup of the model. Section 3.3 describes the economic equilibrium for a given set of institutions. Next, Section 3.4 characterizes the equilibrium institutions by finding the political equilibrium and describes the main results.

[12]Historical discussions that revived economists' interest in institutions include North & Thomas (1977), Olson (1982), and North & Weingast (1989). Support from cross-country data has been provided, among many others, by Barro (1991), Knack & Keefer (1995), and Hall & Jones (1999). Acemoglu et al. (2001, 2002) have exploited variation in the types of institutions set by colonial powers to study the effect of property rights and checks on government powers on long-run economic performance across countries, and several others have followed a similar strategy to examine the effects of institutions within countries (e.g. Banerjee & Iyer (2005)).

[13]*Political consolidation* is also a powerful source of inefficient institutions if the elite's political power is threatened when other groups prosper. A paper emphasizing the role of political consolidation in creating distortions in the rural sector is Baland & Robinson (2008).

[14]While economists have provided a lot of evidence on the consequences of poor property rights in agriculture, much less has been done to test theories on the adoption and persistence of these institutions. Bubb (2009) shows that part of the variation in property rights institutions is explained by economic factors in Ghana and Cote d'Ivoire (in particular, the extent to which soil is suitable to the production of commercial crops).

Section 3.5 discusses the historical case of Rhodesia and examines it under the lens of the theory. Section 3.6 concludes with some final thoughts.

3.2 A Model of (Poor) Property Rights in the (Dual) Rural Economy

Consider a society with two types of producers in the agricultural sector. Producers differ not only in their economic resources, but also in their political power. "Capitalists" or "landowners" are politically powerful, control most of the land in society, but have little labour of their own. I will also refer to this group as the elite. "Peasants" or "subsistence" farmers, on the other hand, face the opposite situation: while their political power and ownership of land is limited, they are the sole suppliers of labour in society.

The political power of the elite translates into the ability to select two key variables: taxation, and property rights protection in the rural subsistence sector. Although these instruments introduce distortions in the economy, the elite may rationally choose both positive taxation and imperfect property rights.

The society is thus characterized by a rural or agricultural economy R divided in two (sub)sectors: the "subsistence" sector denoted by S and the "capitalist" or landowner sector denoted by E (for elite). Output in rural areas is produced using land and labour. There are T hectares of land in the economy, with t under the control of the subsistence sector. Suppose there are L households in the economy, each possessing a unit of labour. Each household i in the rural areas allocates a share e_i of its labour input to the subsistence sector and the rest $(1 - e_i)$ to the landowner sector. For simplicity, I assume each household has an initial land endowment of t/L units of land.

Aside from the rural economy, there is an additional sector U in which workers are paid an exogenous wage w_U. It may be useful to think of this as the urban or industrial sector, but it could represent any additional sector that competes with the landowner for labour. The crucial assumption is that peasants must migrate to the U sector and cannot work in the agricultural sector simultaneously (i.e., a peasant leaves with his entire unit of labour).

The "capitalist" agricultural sector consists of a representative landowner with the following production function:

$$A_E F(T - t, L_E) = A_E \frac{1}{\alpha} (T - t)^{1-\alpha} L_E^{\alpha},$$

where $\alpha \in (0,1)$ and A_E is a productivity term that will be normalized to 1. Since landowners own no labour, just $T-t$ hectares of land, the labour input in their farms (L_E) amounts to total peasant input. That is, $L_E = \sum_{i \in R}(1-e_i) = L_R - L_S$, where the second equality defines total labour input in the rural sector (L_R) and in the subsistence subsector (L_S). I denote the number of migrating households with m (so $L_R = L - m$). Landowners hire labour and pay a wage rate w_E, which they take as given.

One key assumption of the model concerns the impact of property rights in the subsistence sector. Even though defining property rights is not simple, the model only requires two conditions. These conditions are plausible under various meanings of the term. First, a lower level of property rights must reduce the productivity of the subsistence sector. Second, a lower level of property rights must increase the cost of migration. Property rights in the subsistence sector can therefore be captured by a positive scalar $\mu \in \left[\underline{\mu}, \bar{\mu}\right]$, where a larger μ both increases the productivity of the subsector and affects the cost of migration.

To capture the first part, I consider a reduced-form formulation and assume that each household's output in the subsistence sector is given by

$$A(\mu) f(x_i^s, e_i) = A(\mu) \frac{1}{\alpha} (x_i^s)^{1-\alpha} e_i^{\alpha}$$

where x_i^s is the land input (with $\sum_{i \in R} x_i^s = t$). Also, I assume $A(\mu) = \mu A_E$, with $\bar{\mu} = 1$ and $\underline{\mu}$ small (i.e. $\underline{\mu} \approx 0$). Adopting this functional form simplifies the analysis and satisfies two key properties: $A'(\mu) > 0$ and $A(\bar{\mu}) = A_E$. The first property follows the theoretical arguments and empirical evidence mentioned in the Introduction. Still, I will remain agnostic about the exact channels at play. The second property is a useful benchmark: with perfect property rights, both sectors are technologically identical.

To capture the second part, I assume that a migrating peasant household can rent his land, but the poor definition of property rights creates transaction costs or facilitates outright expropriation of part of his land upon migration[15]. Hence, if r is the prevailing rental rate of land from the subsistence sector, the migrating household will only get $\mu \frac{t}{L} r$ as rental income. The remaining

[15] Again, there may be different reasons for this, but certainly the persistence of a traditional system of communal tenure is one of them. Under such system, use rights are typically lost if the household permanently detachs itself from the rural community. While this is the type of example that motivates this paper, it is interesting to note that these general assumptions speak to other circumstances in which smallholders have relatively less secure tenure than large landowners. Moreover, it can also be relevant when smallholders face greater monitoring costs that largeholders upon migration to the cities, such that when renting their lands they must surrender to a greater share of land rents to induce effort. This is plausible if large landowners rely on more mechanized production techniques.

fraction $(1-\mu)$ may be expropriated and shared among all non-migrating households, or simply lost[16]. These assumptions imply that the value of going to the urban sector, V_U, is given by

$$V_U = w_U + \mu \frac{t}{L} r. \tag{3.1}$$

The rental rate of land in the subsistence sector (r) is taken as given by individual members of the subsistence sector. Subsistence farmers cannot rent land from nor to the landowners.

In the case of the elites, their income is taxed at a rate τ_E and they receive a lump sum transfer of T_E. Hence, the consumption of a representative member of the elite is:

$$\begin{aligned} c_E &= \pi_E + \mathsf{T}_E, \\ \text{where} &: \\ \pi_E &= (1-\tau_E) F(T-t, L_E) - w_E L_E. \end{aligned}$$

Non-migrating peasants face taxes and transfers τ_S and T_S. However, their income also includes any potential rents from land that are "expropriated" from migrating households. Therefore, consumption for a member of the L_R peasants is:

$$\begin{aligned} c_{iS} &= \pi_{iS} + \mathsf{T}_S + \frac{m}{L_R}(1-\mu) r \frac{t}{L} \\ \text{where} &: \\ \pi_{iS} &= (1-\tau_S) A(\mu) f(x_i^s, e_i) + (1-e_i) w_E + \left[\frac{t}{L} - x_i^s\right] r. \end{aligned}$$

The government's budget constraint is

$$\mathsf{T}_E + \mathsf{T}_S = \phi \left[\tau_E F(T-t, L_E) + \tau_S A(\mu) f(t, L_S)\right]. \tag{3.2}$$

where $\phi \in [0,1]$. I assume there exists an upper bound $\bar{\tau}$ on taxation, with $\bar{\tau} \leq 1$, for example because producers can hide each dollar of income at a cost of $\bar{\tau}$.

This completes the description of the environment. I consider different versions of the following simple game:

[16]To accommodate any case in between these extremes, one can think of non-migrating households keeping a fraction $\sigma(1-\mu)$ of the rental income $\frac{t}{L} r$ from each migrating household, with $\sigma \in [0,1]$. For analytical convenience, however, I focus on the case $\sigma = 1$. With $\sigma = 1$, unlike $\sigma < 1$, the model has a simple explicit solution.

1. A representative agent of the landowning elite chooses tax policies ($\tau_E, \tau_S, \mathsf{T}_E, \mathsf{T}_S$) and a level of property rights protection μ. Since the elites never tax themselves and only redistribute to themselves ($\tau_E = \mathsf{T}_S = 0$), the interesting choices are τ_S and μ, with T_E given by the government budget constraint.

2. Subsistence farmers compare the value of going to the urban sector (V_U) with the value of staying in the rural areas (V_R, to be defined below), and decide whether or not to migrate to the city.

3. Producers in the rural areas maximize their consumption. Non-migrating peasants choose labour and land inputs in the subsistence sector (e_i and x_i) to maximize consumption (c_{iS}). Landowners hire labour (L_E) to maximize consumption (c_E). I assume labour markets are competitive and all agents take the wage rate (w_E) as given.

Stages 2 and 3 will determine the *economic equilibrium* of the model, for a given set of policies. This is the focus of Section 3.3. The incentives of the elite to alter this economic equilibrium via their choice of policy in stage 1 gives us the *political equilibrium,* which is analyzed in Section 3.4.

3.3 Economic Equilibrium

To characterize the economic equilibrium, consider the landowners' problem in the third stage. They choose optimal labor demand (L_E) to maximize consumption (c_E). At this stage, T_E is taken as given by the landowners. That is, landowners act as a team politically in the first stage of the game, but atomistically in the last stage. The first-order condition for this problem is the standard condition

$$F_2\left(T - t, L_E\right) = w_E. \tag{3.3}$$

Each of the L_R non-migrating peasants, in turn, choose land (x_i^s) and labour (e_i) inputs in the subsistence sector to maximize consumption (c_{iS}), taking migration and policies as given. The optimal choice must satisfy the usual pair of first-order conditions specifying equality between each factor's marginal productivity and its price for all $i \in R$. These conditions can be written as those of a representative subsistence producer with access to t units of land, hiring $L_S = L - m - L_E$

units of labour:

$$(1-\tau_S)\,A(\mu)\,f_1(t, L-m-L_E) = r, \tag{3.4}$$

$$(1-\tau_S)\,A(\mu)\,f_2(t, L-m-L_E) = w_E. \tag{3.5}$$

For a given m, (3.3)-(3.5) determine the equilibrium rural wage rate (w_E) and the allocation of rural labour between landowner and subsistence farms (L_E and L_S). More precisely, given m as determined in the second stage, $L_E(m)$ will satisfy:

$$F_2(T-t, L_E(m)) = (1-\tau_S)\,A(\mu)\,f_2(t, L-m-L_E(m)) \equiv w(m). \tag{3.6}$$

where the last term defines the resulting equilibrium wage[17].

To complete the description of the economic equilibrium, only the level of migration remains unestablished. In the second stage, peasants continue to migrate as long as $V_U > V_R$, staying in rural areas otherwise. Note that V_R, simply the optimal value of c_{iS}, can be written using the homogeneity of degree zero of f and competitive markets (equations (3.4) and (3.5)) as the sum of labour and land rents:

$$V_R = w_E + \frac{t}{L} r \left(1 + \frac{m}{L_R}(1-\mu)\right). \tag{3.7}$$

In (3.7), there are two components of rural land rent income: rents from the initial endowment and land left behind by migrant households. Of course, if either no one migrates ($m = 0$), or there are perfect property rights for migrating households ($\mu = 1$), this second component of land rents vanishes.

Starting with a situation with $V_U > V_R$, migration will continue until $V_U = V_R$, or

$$w_U - w_E = (1-\mu)\frac{t}{L_R} r. \tag{3.8}$$

In words, when there is positive migration the wage gain from going to the city $w_U - w_E$, must be equal the loss in land rents from migration. This loss arises due to imperfect property rights in the sense that migrating households do not get the full value of their land's rent. Clearly, with $\mu = 1$ there is no such loss; the no-migration condition simplifies to $w_U = w_E$.

Of course, it is possible that $V_U < V_R$ at $m = 0$. In this case, there are no incentives to migrate.

[17] Similarly, $r(m) \equiv (1-\tau_S)\,A(\mu)\,f_1(t, L-m-L_E(m))$.

In general, therefore, the migration decision can be summarized as follows:

$$m(V_R - V_U) = 0,\ m \geq 0,\ V_R - V_U \geq 0. \tag{3.9}$$

This completes the basic description of the economic equilibrium, which I define as follows.

Definition 1 ***(Economic Equilibrium)*** *The economic equilibrium is given by a tuple* $\{m^{eq}, L_E^{eq}, r^{eq}, w_E^{eq}\}$ *such that:*

1. *Taking* w_E, r *and* m *as given, landowners choose* L_E *to maximize their consumption* c_E *and each non-migrating peasant* $i \in R$ *chooses* e_i *and* x_i^S *to maximize his consumption* c_{iS}. *In particular,* $\{L_E^{eq}, r^{eq}, w_E^{eq}\}$ *satisfy (3.3)-(3.5), and*
2. *Migration* (m^{eq}) *satisfies (3.9).*

Figure 1. Economic Equilibrium

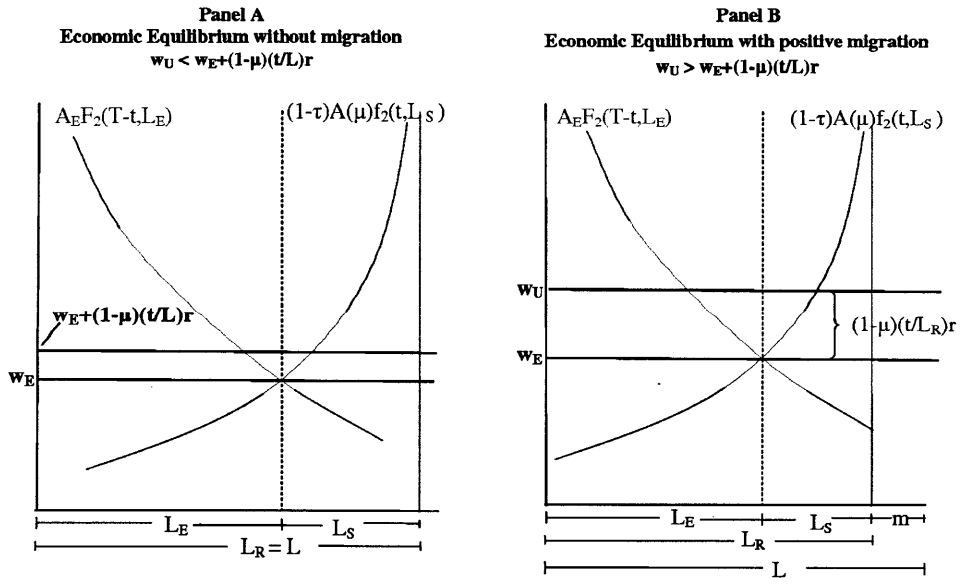


Figure 1 illustrates the economic equilibrium. In Panel A, even at $m = 0$ the resulting wage w_E, which equates the marginal product of labour in the capitalist and subsistence subsectors, is sufficient to avoid migration. The urban wage is not large enough to compensate for the wage and relative land-rent benefit of the rural areas. Accordingly, in Panel A, w_U is smaller than

$w_E + (1-\mu)\frac{t}{L}r$ when $m = 0$. However, if w_U rises above this level, as in the case depicted in Panel B, there will be incentives to migrate that only cease when $w_U - w_E = (1-\mu)\frac{t}{L_R}r$.

Thus far, I largely ignored functional form assumptions. It is useful to note that given the Cobb-Douglas assumption for both subsectors, the only difference in technology results from the parameters A_E and $A(\mu)$. Additionally, it is also useful to define the following "distortion adjusted" measure of the land endowment in society: $\tilde{T} \equiv t\left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}} + (T-t)$. Absent any policy distortion (when $\mu = 1$ and $\tau = 0$), $\tilde{T} = T$. Much of the following analysis focuses on elite's incentives to reduce μ or increase τ, which effectively reduce $\tilde{T}$ below T. Along these lines, I define the "distortion-adjusted" share of land in the capitalist sector as $\gamma_E = \frac{T-t}{\tilde{T}}$, and similarly, for the subsistence sector, $\gamma_S = 1 - \gamma_E$. Then, the equations that satisfy the economic equilibrium indicate that the subsistence and capitalist sectors absorb a share of rural labour proportional to the size of their (distortion-adjusted) landholdings: $L_E = \gamma_E L_R$ and $L_S = \gamma_S L_R$[18].

As for migration, (3.9) implies that

$$m = 0 \text{ if } w_U < \left(\frac{\tilde{T}}{L}\right)^{1-\alpha}\left[1 + (1-\mu)\frac{1-\alpha}{\alpha}\gamma_S\right] \equiv \bar{w}(\tau_S, \mu). \tag{3.10}$$

Otherwise, m satisfies[19]

$$w_U = \left(\frac{\tilde{T}}{L-m}\right)^{1-\alpha}\left[1 + (1-\mu)\frac{1-\alpha}{\alpha}\gamma_S\right]. \tag{3.11}$$

The right hand side of (3.11) is the wage in rural areas plus an extra term capturing the relative advantage of land rents a peasant enjoys if he decides to stay in the rural areas rather than migrate. Similarly, the function $\bar{w}(\tau_S, \mu)$, defined in the right hand side of (3.10), is the rural wage plus the relative land rents advantage of rural areas when $m = 0$. It determines whether or not there will be migration in equilibrium. I summarize the features of $\bar{w}(\tau_S, \mu)$ in the following remark.

Remark 2 *Consider the function* $\bar{w} : [0, \bar{\tau}] \times [\underline{\mu}, 1] \to \mathsf{R}^+$ *as defined in (3.10).*

1. $\bar{w}(\tau_S, \mu)$ *achieves a global maximum at* $(0, \mu^*)$, *where*

   (a) $\mu^* = 1$ *if* $\alpha \in [1/2, 1)$.

[18] Factor prices, in turn, are given by $w_E = \left(\frac{\tilde{T}}{L_R}\right)^{1-\alpha}$ and $r = \left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}}\frac{1-\alpha}{\alpha}\left(\frac{L_R}{\tilde{T}}\right)^{\alpha}$.

[19] In this step, the assumption $\sigma = 1$ is important. When $\sigma < 1$, the corresponding expression for equilibrium, unlike when $\sigma = 1$, provides no closed-form solution for m.

(b) $\mu^* < 1$ *otherwise*[20]. *Moreover,* $\bar{w}(\tau_S, \mu)$ *is increasing for* $\mu \in [\underline{\mu}, \mu^*)$ *and decreasing for* $\mu \in (\mu^*, 1]$

2. $\bar{w}(\tau_S, 1) = \left(\frac{\bar{T}}{L}\right)^{1-\alpha} > \left(\frac{T-t}{L}\right)^{1-\alpha} \approx \bar{w}(\tau_S, \underline{\mu})$ *for small* $\underline{\mu}$.

The second part is straightforward. Consider the first part, which is proven in Section 3.A.1. It should be clear that $\partial\bar{w}/\partial\tau_s < 0$, so an increase in taxation makes a migration threat more likely. Indeed, an increase in τ_S reduces two terms in $\bar{w}$. First, the rural equilibrium wage w_E at zero migration $\left(\left(\tilde{T}/L\right)^{1-\alpha}\right)$, and second, the effective share of land in the subsistence sector (γ_S). In other words, given more rural taxation, peasants earn less from both land and labour, so they are more willing to migrate.

Property rights have a more intricate effect. A decrease in the degree of property rights' enforcement in the subsistence sector has two countervailing effects: (i) by reducing the productivity of the subsistence sector, it reduces the relative value of the rural areas in a similar way as taxation does (by reducing w_E and γ_S); (ii) while this *productivity effect* encourages migration, a lower μ also has a *security effect* as captured by $(1-\mu)$ in the expression. This second effect encourages peasants to remain in the countryside to protect land rents, which would be (partially) lost upon migration to the cities.

Now, recall that α is the coefficient of labour in the Cobb-Douglas production function. Thus, when $\alpha \geq 1/2$, income from land rents is relatively unimportant compared to wage income. Therefore, the productivity effect prevails and an increase in μ improves the relative value of rural areas and $\bar{w}$. However, if land rents are important enough (if $\alpha < 1/2$), with high μ the security effect prevails and the value of μ that maximizes $\bar{w}$ is less than 1.

This remark is useful in establishing the following three regimes that arise regardless of the value of α[21].

1. *No migration regime* $\left(w_U < \bar{w}(\bar{\tau}, \underline{\mu})\right)$. If the urban wage is very low (lower than $\bar{w}(\bar{\tau}, \underline{\mu})$, the global minimum of $\bar{w}(\tau_S, \mu)$), there will be no migration in equilibrium regardless of the

[20] *The exact value of* μ^* *in this case is given by the solution to*

$$1 = \frac{1-\alpha}{\alpha}\mu^* - \frac{1-\mu^*}{\alpha} + (1-\mu^*)\frac{t[\mu^*]^{\frac{1}{1-\alpha}}}{t[\mu^*]^{\frac{1}{1-\alpha}} + T - t}.$$

[21] I rule out the case $\alpha = 1$, which is uninteresting. In such case, the rural technology is linear in labour, land is irrelevant, and the migration decision for peasants simply depends on the comparison between $w_E = A_E = 1$ and w_U.

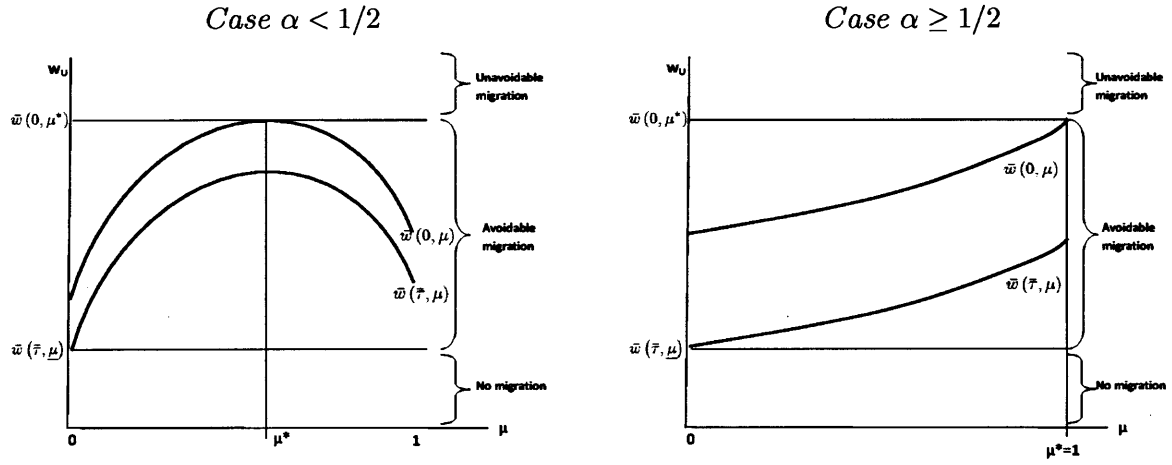
policies adopted, so $L_R = L$. Moreover, in the case where $\bar{\tau}$ is close to 1 and since $\underline{\mu}$ is small, $\bar{w}\left(\bar{\tau}, \underline{\mu}\right) \approx \left(\frac{T-t}{L}\right)^{1-\alpha}$. That is, $\bar{w}\left(\bar{\tau}, \underline{\mu}\right)$ approaches the competitive wage that landowners would pay if they were employing all rural labour. Thus, the no migration regime is more likely to arise with w_U, t or L small, or with T large[22].

2. *Avoidable migration regime* $\left(w_U \in \left[\bar{w}\left(\bar{\tau}, \underline{\mu}\right), \bar{w}\left(0, \mu^*\right)\right]\right)$. If the urban wage is at an intermediate level, the elite can avoid migration with the right combination of policies.

3. *Unavoidable migration regime* $\left(w_U > \bar{w}\left(0, \mu^*\right)\right)$. With high wages, not even zero rural taxation and the level of property rights (μ^*) that maximizes $\bar{w}\left(\tau_S, \mu\right)$ can forestall migration.

Figure 2 depicts the functions $\bar{w}\left(\bar{\tau}, \mu\right)$ and $\bar{w}\left(0, \mu\right)$. It also shows the regions for w_U in which the economy would finds itself in each regime.

Figure 2: Three Regimes



3.4 Political Equilibrium

As noted, elites never tax themselves and only redistribute selfishly. Thus, $\tau_E = \mathsf{T}_S = 0$ and the political equilibrium is simply defined:

Definition 3 ***(Political Equilibrium)*** *A political equilibrium is defined as a tuple* $\{\tau_S^{POL}, \tau_E^{POL}, \mu^{POL}, \mathsf{T}_S^{POL}, T_E^{POL}\}$ *such that*

$$\left(\tau_S^{POL}, \mu^{POL}\right) \in \arg\max_{\tau_S, \mu} F\left(T-t, L_E^{eq}\right) - w_E^{eq} L_E^{eq} + T_E^{POL}$$

[22] Or, if we allow A_E to vary, with A_E large since $\bar{w}\left(\bar{\tau}, \underline{\mu}\right) \approx A_E \left(\frac{T-t}{L}\right)^{1-\alpha}$ in this case.

where T_E^{POL} *satisfies (3.2),* $\tau_E^{POL} = \mathsf{T}_S^{POL} = 0$*, and migration, labour allocation, land rents, and wages, are given by* $\left\{m^{eq}, L_E^{eq}, r^{eq}, w_E^{eq}\right\}$ *in Definition 1.*

Solving for L_R in (3.11), the problem can be written as follows:

$$\max_{\tau,\mu}(1-\alpha)\left[\frac{1}{\alpha}(\gamma_E L_R)^{\alpha}(T-t)^{1-\alpha}\right]+\phi\tau_S\left[\frac{1}{\alpha}\mu(\gamma_S L_R)^{\alpha}t^{1-\alpha}\right], \tag{3.12}$$

subject to:

$$L_R = \min\left\{L, L_R^I\right\}, \tag{3.13}$$

where I is for "interior" and L_R^I is given by

$$L_R^I = \tilde{T}\left[\frac{1}{w_U}\left(1+(1-\mu)\frac{1-\alpha}{\alpha}\gamma_S\right)\right]^{\frac{1}{1-\alpha}}. \tag{3.14}$$

The previous discussion showed the conflicting effects on elite's welfare of limited property rights in peasant plots. To highlight these conflicting effects, I analyze problem (3.12), as in Acemoglu (2006), with two separate problems: (i) the Factor Price Manipulation (henceforth FPM) problem, which arises when $\phi = 0$ and the elite has no tax revenue-generating motive; (ii) the Revenue Extraction (henceforth RE) problem, which focuses squarely on this latter motive, the maximization of the second term in (3.12). I discuss each case, emphasizing the conditions under which a dual rural economy arises, or those in which $\mu < 1$ and the subsistence sector has inferior economic institutions.

3.4.1 Factor Price Manipulation

Consider first the pure FPM problem that arises when $\phi = 0$:

$$\max_{\tau,\mu}\pi_{FPM} = \max_{\tau,\mu}(1-\alpha)\left[\frac{1}{\alpha}(\gamma_E L_R)^{\alpha}(T-t)^{1-\alpha}\right]. \tag{3.15}$$

Ignoring constant terms, and substituting γ_E, this expression underlines the fact that under purely FPM objectives, landowners choose tax and property rights to maximize the labour to "land" ratio $\left(\frac{L_R}{T}\right)$ to minimize the equilibrium rural wage.

The main features of the solution are as follows. First, FPM incentives compel the elite to impose maximal distortions (high levels of taxation and low property rights) when there is no threat of migration. Second, at intermediate and high levels of modernization, checks are imposed

on these distortions. In the case of taxation, any effort to reduce the peasants' welfare in the subsistence sector is eventually self-defeated by their freedom to move to an alternative sector. But while taxation is reduced to a minimum, the level of property rights protection is not raised to its maximum level, even with a very high urban wage. At the root of this result is that part of peasants' land rents would be lost upon migration under poor property rights. The following proposition summarizes these and other features of the solution[23].

Proposition 4 ***(Summary of FPM policies)*** *Suppose $\phi = 0$. Then, with $\bar{w}(\tau, \mu)$ as defined in (3.10) and μ^* from Remark 2, the unique political equilibrium features the following level of taxation $\left(\tau_S^{FPM}\right)$ and property rights $\left(\mu^{FPM}\right)$:*

1. *(No migration) If $w_U < \bar{w}\left(\bar{\tau}, \underline{\mu}\right)$, then $\tau_S^{FPM} = \bar{\tau}$ and $\mu^{FPM} = \underline{\mu}$.*

2. *(Unavoidable migration) If $w_U > \bar{w}(0, \mu^*)$, then $\tau_S^{FPM} = 0$ and $\mu^{FPM} \in (0, 1/(2-\alpha))$.*

Moreover, $\partial\mu^{FPM}/\partial T > 0$, $\partial\mu^{FPM}/\partial\alpha > 0$, and $\partial\mu^{FPM}/\partial t < 0$. Finally, as $T \to \infty$ or $t \to 0$, $\mu^{FPM} \to 1/(2-\alpha)$.

Proof. See Section 3.A.2. ■

Consider the results of Proposition 4 for $w_U < \bar{w}\left(\bar{\tau}, \underline{\mu}\right)$. In this no migration regime, regardless of the policies selected by the elite, $L_R = L$. Therefore, to maximize profits, the elite raise taxation to its maximum level, $\bar{\tau}$, reducing property rights in the subsistence sector to their lowest admissible value, $\underline{\mu}$. Indeed, the FPM motive compels landowners to make peasants' "outside option" as poor as possible. Since without an effective threat of migration to another sector the only peasant outside is income from their own plots, this is achieved by imposing the highest taxation and poorest property rights institutions on the subsistence subsector. These policies minimize the rural equilibrium wage and thus increase their rents, or, equivalently, maximize the proportion of rural labour in the capitalist sector (note that $L_E/L_R = (T-t)/\tilde{T}$).

In the other extreme, the society is in the unavoidable migration regime, $L_R = L_R^I$ for any combination of policies. Thus landowners maximize $L_R^I/\tilde{T}$. Let's examine the intuition of this solution, as stated in part 2 of Proposition 4. It is straightforward to verify that $L_R^I/\tilde{T}$ is monotonically

[23]The avoidable migration regime is, in general, a transitional regime in which policies gradually converge from those prevailing in a no migration regime and in an unavoidable migration regime. For this reason, and to reduce the number of cases to be analyzed, I relegate the unavoidable migration case to Appendix 3.B. I focus on the intuition of the results in the main text, and present algebraic details in sections 3.A.2-3.A.4.

decreasing in τ_S, and this has a simple intuition. Landowners receive no benefit from imposing taxation on the subsistence sector because, while increasing the share of rural labour in their plots, γ_E, it encourages enough migration to the alternative (urban) sector that overall labour input falls.

Although optimal taxation is zero, not all distortions disappear under this regime. In particular, the subsistence sector will not have perfect property rights, $\mu = 1$. Instead, a similar basic trade-off between better rural productivity and protection of property rights (i.e., between the productivity and security effects), implies the optimal level of property rights is $\mu^{FPM} < 1$.

The solution shows that the equilibrium level of property rights is an increasing function of α. Moreover, in the empirically relevant case of T large and t small, it is almost wholly determined by α. Larger α means land is less important in the production function and land rents are less important in peasants' decision to stay. This increases μ^{FPM} because it weakens the security effect (the importance of losing land rents upon migration, which pushes μ down) relative to the productivity effect (the impact on the subsistence sectors' productivity and effective land endowment, which persuades the elite to concede better property rights).

The comparative static results indicate that when peasants have more land it is important to *reduce* the security of their property rights, compelling them to stay. Indeed, if t is very small then staying in the rural areas to protect their land rents is relatively unimportant for peasants compared to the fall in rural well-being that a lower μ generates. In contexts where peasants are able to control or obtain larger land concessions, the model predicts that landowners will try to partly compensate for this by reducing μ. On the other hand, when T is large relative to t, landowners willingly give better property rights to peasants.

The FPM case highlights in the simplest form the main argument about poor property rights as a distinct distortion which persists because it ties peasants to the land. However, it does so by removing any direct tax benefit for elite landowners. To understand the puzzle persistently bad property rights, one must ask whether elites choose them even when they directly benefit from taxation in the subsistence sector. I turn to these issues in two steps. First, I demonstrate that tax revenues accruing to the elite are always increasing in property rights. Next, I show that despite this result, landowners may choose low property rights, especially when threatened by "modernization."

3.4.2 Revenue Extraction

Consider now the problem of maximizing Revenue Extraction (RE) only[24]:

$$\max_{\tau,\mu} \phi\tau_S \left[\frac{1}{\alpha}\mu\left(\gamma_S L_R\right)^{\alpha} t^{1-\alpha}\right]. \tag{3.16}$$

Unlike Proposition 4, this section shows that, in the RE solution, policies are similar at different levels for the urban wage. In particular, there is an intermediate level of taxation, and the level of property rights is always maximal. I summarize the key features of the solution in the next Proposition.

Proposition 5 ***(Summary of RE policies)*** *Suppose the elite solves problem (3.16). Then, with* $\bar{w}(\tau,\mu)$ *as defined in (3.10) and* μ^* *from Remark 2, the unique political equilibrium features* $\mu^{RE}=1$ *and the following level of taxation* $\left(\tau_S^{RE}\right)$*:*

1. *(No migration) If* $w_U < \bar{w}\left(\bar{\tau},\underline{\mu}\right)$*, then* $\tau_S^{RE}=\min\{\bar{\tau},\tau^{Laffer}\}$*, where* $\tau^{Laffer}>1-\alpha$*.*

2. *(Unavoidable migration) If* $w_U > \bar{w}\left(0,\mu^*\right)$*, then* $\tau_S^{RE}=\min\left\{\bar{\tau},1-\alpha\right\}$*.*

Moreover, $\partial\tau^{Laffer}/\partial T<0$*,* $\partial\tau^{Laffer}/\partial\alpha<0$*, and* $\partial\tau^{Laffer}/\partial t>0$*. Finally, as* $T\to\infty$ *or* $t\to 0$*,* $\tau^{Laffer}\to 1-\alpha$*.*

Proof. See Section 3.A.3. ■

The intuition for this solution in the no migration regime (when $L_R=L$) is simple. To maximize tax revenue, the landowning elite has a direct interest on raising productivity in the subsistence sector to increase the tax base. With respect to τ_S, on the other hand, there is a standard Laffer-curve logic. Although there is no labour-leisure trade-off for workers and they supply a unit of labour inelastically, labour supply in the subsistence sector responds to τ_S because there exists an alternative, untaxed sector in the elite's farms. Therefore, increasing the tax rate reduces the tax base by reducing the share of labour in the subsistence sector. Unless the exogenous level of feasible taxation, $\bar{\tau}$, is binding, taxation will be set at the interior tax rate $\tau^{Laffer}\in(0,1)$ such that the marginal increase in revenue from raising the tax rate equates the marginal decrease in revenue from the tax base erosion.

[24] One may alternatively think of the RE problem as that which emerges when all the land is under the control of the subsistence sector, $t=T$. Indeed, when the elites are not involved in production, they inevitably do not compete for factors with the subsistence producers, and focus merely on revenue extraction. The features of the solution to such a problem can be seen as a special case of problem (3.16). Thus I focus on the latter.

In the other extreme, society is in the "unavoidable migration" regime and $L_R = L_R^I$ for any combination of policies. To characterize the solution in this case, it can be shown again that although poor property rights may deter some migration, the maximand is increasing in μ for each τ_S. Therefore, the preferred level of μ remains equal 1. Taking this as given, the optimal level of taxation, τ^{Laffer}, can be easily calculated as $\tau^{Laffer} = 1-\alpha$. Again, the exogenous limit to taxation may become binding. Thus, the equilibrium level of taxation is given by $\tau^{RE} = \min\{\bar{\tau}, 1-\alpha\}$, as noted in the Proposition.

Regarding comparative static results, the tax rate is higher when α is small. In this case, the extent of distortions is reduced, since there are greater diminishing returns to labour and labour input declines little in response to taxes. In the no migration regime, the elite also set a higher tax rate when t is larger or T is smaller. More land in the traditional sector amounts to an increase in the tax base. A decrease in T implies the alternative landowner sector is able to absorb less labour[25]. With unavoidable migration, instead, taxation is independent of relative land endowments. The relevant outside option for peasants is now the urban sector, which by assumption can absorb as many workers as possible at a fixed wage w_U.

In sum, when the objective is maximizing tax revenues, increasing urban wages reduce taxation to some extent, but property rights are maintained at their maximum level. This moderate change in policy as w_U rises contrasts the FPM solution, where bad property rights persist and taxation is limited by "modernization." In the RE solution, unlike FPM, the dual economy does not emerge endogenously as w_U increases. Revenue extraction, in other words, poorly explains the dual rural economy. The RE economy is instead a single-sector economy with differential taxation on politically-weak producers[26]. Thus, it is important to examine whether the argument about the persistence of bad property rights set forth with the FPM case is robust to inclusion of a RE concern. The next section tackles this issue.

[25] A simple way to see this is to note that the weight that the erosion of the tax base bears in the first order condition of problem (3.16), as shown in Section 3.A.3, is simply the share of land in the elite's sector, γ_E. When either t fall or T increase, γ_E increases and approaches 1, and τ^{Laffer} decreases approaching $1-\alpha$. On the other extreme, if the share of landowner land is zero then $\tau^{Laffer} = 1$. This follows from the assumption of no labour-leisure trade-off and the absence of an effective threat of migration. The elite can set a confiscatory tax rate with no effect on the tax base since labour is supplied inelastically and there are no alternative sectors for peasants.

[26] Since property rights are maintained at their maximum level and taxation is moderated by the desire not to erode the tax base, the RE solution is also associated with lower costs in terms of productivity. Relatedly, the share of labour working in the capitalist sector is not as large as in the FPM economy.

3.4.3 The Combined Problem

In this section I examine problem (3.12) with $\phi = 1$, so that the elite receives the full benefit of taxation of peasants' income and is also concerned with obtaining cheap labour. The next Proposition summarizes the solution. To simplify the cases, I suppose that the exogenous limit to taxation is not binding (and note in the Corollary an important instance where the solution changes if it were).

Proposition 6 ***(Summary of COM policies)*** *Suppose $\phi = 1$ and the elite solves problem (3.12). Also, assume that $\bar{\tau} = 1$. Then, with $\bar{w}(\tau, \mu)$ as defined in (3.10) and μ^* from Remark 2, the unique political equilibrium features the following level of taxation $\left(\tau_S^{COM}\right)$ and property rights (μ^{COM}):*

1. *(No migration) If $w_U < \bar{w}\left(\bar{\tau}, \underline{\mu}\right)$, then $\mu^{COM} = 1$ and $\tau_S^{COM} = (\tau^{Laffer}, 1)$.*
2. *(Unavoidable migration) If $w_U > \bar{w}(0, \mu^*)$, then there exist thresholds $\underline{t}$ and $\bar{t}$ with $0 < \underline{t} < \bar{t} < 1$ such that: (i) if $t \in (0, \underline{t}]$, then $\tau_S^{COM} = 0$ and $\mu^{COM} = \mu^{FPM}$; (ii) if $t \in [\bar{t}, T]$, then $\tau_S^{COM} = 1 - \alpha$, and $\mu^{COM} = 1$.*

Corollary 7 *If $w_U < \bar{w}\left(\bar{\tau}, \underline{\mu}\right)$ and $\bar{\tau} < \frac{\alpha(1-\alpha)}{1+\alpha(1-\alpha)} < \tau^{Laffer}$, then $\mu^{COM} = \underline{\mu}$ and $\tau_S^{COM} = \bar{\tau}$.*

Proof. See Section 3.A.4. ■

To understand Proposition 6, it is useful to contrast it with Propositions 4 and 5. Starting with the no migration regime, Part 1 of Proposition 6 shows that once the elite can also benefit from taxation of peasants' income, RE-type policies with optimal property rights and positive but less than confiscatory taxation similar to those of Proposition 5 will prevail.

The intuition for why, without migration, incentives to extract revenue prevail over reducing wages stems directly from the proof of Section 3.A.4's result. In particular, elite consumption can be either increasing or decreasing with the level of property rights in peasants' plots, for the reasons already emphasized in the FPM and RE cases, respectively. On the one hand, FPM implies that by reducing peasant income in their own plots, bad property rights increase peasants' labour supply for the elite. On the other hand, RE indicates that they also reduce tax revenues, received by politically powerful landowners. While RE and FPM push the elite on different directions regarding property rights institutions, the elite has incentives to impose high taxes on peasants both for tax revenue and to get more labour from them. For this reason, as noted in the proposition, the desired level of taxation τ_S^{COM} will exceed the RE desired taxation, $\tau_S^{RE} = \tau^{Laffer}$. A high tax rate, in turn,

resolves the ambivalence over property rights: it compels the elite to focus on extracting peasants' revenue from taxation and thus to be directly interested in increasing peasants' productivity by selecting good property rights institutions.

The intuition of the preceding paragraph also has an interesting corollary. If the exogenous limit to taxation $\bar{\tau}$ is low enough, then the elite's FPM incentives will again prevail, because tax revenues form a relatively unimportant component of their consumption[27]. In other words, without an effective threat of migration, the case for bad property rights for the elite is only compelling if the elite has limited ability to tax the sector (low $\bar{\tau}$), or to receive revenues from such taxation (low ϕ).

Proposition 6 shows that when the urban wage is high and the threat of migration effective, the prevalence of RE incentives is less obvious. The reason for this also follows from the preceding discussion. In particular, notice that with an effective threat of migration, increasing taxes on peasants' income is no longer useful from the point of view of FPM. As Proposition 4 established, increasing taxes reduces the attractiveness of rural areas and the ensuing migration decreases labour input for landowners and their profits. Thus, we can no longer conclude, as in the no migration case, that a high level of taxation prevails, inducing the elite to focus on RE-type policies with optimal property rights institutions.

In fact, if sufficiently concerned with avoiding labour force migration, the elite choose minimal taxation. Proposition 6 establishes that the elite will be "sufficiently" concerned with migration, relative to tax revenues, if peasants own little land. Since less land for peasants means more land for the elite, this not only reduces the importance of revenues from taxation of peasants' production, but also increases that of profits in landowners' farms which are increasing in the amount of rural labour. Thus, the desired tax rate is zero. This mutes incentives to adopt good property rights institutions. In the resulting equilibrium, to avoid migration and extract more labour from peasants, the elite selects poor property rights institutions.

However, if peasants own enough land, the elite face the reverse situation. Due to sufficiently large peasant income and sufficiently small landowner profit from their own farms, the elite focus on increasing taxation and not on reducing wages. Thus, in this case, peasant property rights are optimal and taxation is positive.

[27] In Section 3.A.4 it is shown that a sufficient condition for this to happen is $\bar{\tau} < \frac{\alpha(1-\alpha)}{1+\alpha(1-\alpha)}$.

Turning to comparative static results, note that over the range $t \in (0, \underline{t}]$ the fact that $\tau^{COM} = 0$ implies that RE has no bearing on the desired level of property rights. Hence, μ^{COM} coincides with μ^{FPM} from the FPM Proposition 4, and satisfies the same comparative static results. Similarly, over the range $t \in [\bar{t}, T]$ the fact that $\mu^{COM} = 1$ implies that τ^{COM} coincides exactly with $\tau^{RE} = 1 - \alpha$ of Proposition 5 for the RE case. Indeed, with perfect property rights the rural wage (w_E) will be identical to the exogenous urban wage w_U, eliminating any scope for factor price manipulation.

Nonetheless, the comparative static results of the combined problem are richer because variation in the model's parameters may move the economy from a situation with $t \in (0, \underline{t}]$ to one in which $t \in [\bar{t}, T]$. More specifically, they predict a non-monotonic relationship between quality of rural property rights and land in the hands of peasants. When peasants hold relatively little land ($t \in (0, \underline{t}]$), obtaining more land increases the rural elite's incentives to reduce property rights in order to obtain cheap labour. However, if enough land is allocated to the peasants such that $t \in [\bar{t}, T]$, the elite promote optimal property rights institutions to increase tax revenues.

This result highlights a general reason why, compared to more aggressive reforms, small land reforms may deliver disappointing results in terms of productivity. More specifically, with preexisting distortions against smallholders (in this case poor property rights institutions), timid land transfers to peasants may exacerbate the incentives of politically powerful rural elites to sustain distortions against them. However, if land transfers are sufficiently large, extracting revenue from peasants through taxes becomes a relatively more attractive option for politically powerful groups. This also creates distortions, but with natural limits because elites have a direct interest in the productivity of peasants.

More importantly, the analysis provides one possible mechanism for the endogenous persistence of bad property rights institutions in rural areas. As noted before, several authors have emphasized that the persistence of a backward "traditional" rural economy has been congenial to capitalist development. Moreover, scholars of the "dependency" tradition have emphasized the incentives to extract cheap labour as the major motivation behind the "underdevelopment" of traditional economies. However, the particular role of bad property rights in this strategy has received less attention.

This model shows that it is precisely the rise of an alternative "modern" or "urban" sector which may shift the rural elite's attention away from taxation, creating incentives to sustain the rural dual economy. The rise in the urban wage puts a natural check on taxation by promoting migration. Instead, bad property rights elude this check, since they actually force peasants to stay

in the rural areas to protect their property. Furthermore, the reduction in the tax rate provokes the elite's disregard for the subsistence sector's income and productivity, and thus the elite lack incentives to promote efficiency enhancing innovations in property rights institutions.

According to the theoretical results in Proposition 6, poor property rights should play this role when rural elites face the threat of peasants outmigration *and* peasants communities hold relatively little land. This makes Rhodesia a particularly relevant case study because peasant communities were dispossessed by colonists from most of their lands. Moreover, when urban industry developed and pressures arose to increase peasants' productivity, the issue of introducing individual property rights gained prominence. Having presented all the theoretical results, let us examine the Rhodesian case for an analytical interpretation.

3.5 The Rhodesian Case

In Rhodesian agricultural history, Palmer (1977a) notes that the dominant theme "is surely the triumph of European over African farmers" (p. 221). The process whereby this triumph came about can be usefully divided into three main stages, described briefly in Appendix 3.C.

In an initial stage, white settlers, consolidating their domination, were not concerned about obtaining cheap labour from natives. Instead, they were interested in extracting resources from them.

Later on, as settlers became more heavily involved in agricultural production, the extraction of cheap labour from natives became a prime concern. White elites enacted policies that actively contributed to the formation of a rural dual economy. These included forcing the natives into unsuitable and overcrowded Reserves, segregating the land along racial lines, and codifying the property rights institutions of the native land areas.

Finally, with this dual structure in place, the greater opportunities for labour in the urban industrial sector gradually led to a third stage in which the rural elite faced stronger limits to the extent of the distortions that it could introduce in the rural areas.

Next, I review each of these stages and interpret them using the analytical framework presented above. The review reveals, first, that the structure of the subsistence economy was far from accidental. Rather, white elites actively promoted policies and institutions in the black peasant economy to defend their own interests. Second, the white influence had consequences for the rural economy in line with much of the theoretical analysis. In particular, when white involvement in

agricultural production was not so widespread, productivity in traditional black agriculture was not threatened and, if anything, improved. Nevertheless, as white settlers competed directly with black peasants and, more importantly, needed their labour, they attempted to impose the maximum possible distortions on natives. In their strategy to impoverish the traditional economy, few methods were spared. Finally, among the various methods, the role of poor property rights became apparent when the urban sector and industrial interests gained prominence, and pressure to improve the productivity of native Reserves and cut the ties of the native to his land arose. Rural elites, instead, had strong incentives to sustain the rural dual economy.

3.5.1 The early years: consolidating power and resource extraction

The motives of the early settlers in the initial period in Rhodesian economic history were clear enough that little interpretation is required: "the main reason we are all here is to make money and lose no time about it" (Palmer, 1977b, p. 13). Apart from searching for gold, this meant extracting resources from the natives in the form of forced labour and taxes[28]. Moreover, the settlers quickly obtained the political power necessary to accomplish this.

However, direct involvement in agricultural production was limited. Hence, competition for factors of production such as labour was not as fierce as it would become afterwards[29]. Indeed, the initial land grabbing was mostly for companies and speculators who were not actively involved in farming[30]. Absentee landowners charged Africans for the right to occupy them. This 'kaffir farming' limited the impact of the initial land-grabbing on the natives, who kept producing in these lands (Mosley, 1983, p. 20) to pay rents and taxes imposed on them[31]. Early European farmers resented this as it diminished their labour supply, but absentee landowners (and the poorest European

[28] Regarding forced labour, in 1895 Native Commissioner Hartley stated: "I am at present forcing the natives of this district to work sorely against their will, using such methods as I think desirable" (Palmer, 1977b, p. 43) and early Pioneers made similar remarks. As for taxation, Rhodes and the BSAC suggested a hut tax that would "to a certain extent furnish an incentive to labour which might otherwise be wanting" (Palmer, 1977b, p. 43). The Imperial Government declined, but the Company began collecting a hut tax in 1894 in Mashonaland and in Matabeleland Ndebele cattle was confiscated. Then a Native Department was set up for these purposes (Palmer, 1977b, p. 43).

[29] This is not to deny that even the early settlers were searching for ways to coerce labour, as the quotes in footnote 28 suggest.

[30] Many pioneers, more interested in gold, sold their land rights to them: "Of an estimated 15.8 million acres alienated to Europeans by March 1899, some 9.3 million acres were in the hands of companies" (Palmer, 1977b, p. 33).

[31] After the 1896-1897 Risings, the Ndebele on European farms were obliged to enter agreements and, after a grace period, start paying rents. Also, a hut tax was imposed simultaneously in Matabeleland. While the Ndebele resented paying rents on their own land, and many were forced to become temporary wage labourers to pay, "On the whole [they] preferred to remain on their old lands and put up with these exactions rather than move into the native Reserves (...) situated in inhospitable country" (Palmer, 1977b, p. 65).

farmers, who depended on these arrangements for labour) supported it and, initially, had their way[32]. An interesting implication of the prevalence of land absenteeism was that the greatest pressure on the natives initially was not necessarily the alienation of land. "Evidence to support this conclusion lies in the fact that no direct correlation can be drawn between the extent of land alienated and the outbreak of resistance in 1896" (Palmer, 1977b, p. 44).

Strong pressure did not stop African agriculture from experiencing a period of prosperity, because natives took advantage of new opportunities. During early years of white settlement,

> "A substantial amount of productive investment was none the less carried out by the African peasantry during the first two decades of the present century. Africans bought wagons and carts for the transport to the towns and mining centres, some invested in corn crushers and in water boreholes, (...) by far the most prominent forms of productive investment were cattle and ploughs. In the period 1905-21 the number of African-owned cattle increased from 114,560 to 854,000 head (...) the number of ploughs in use by Africans increasing from 440 in 1905 to 16,900 in 1921" (Arrighi, 1970, p. 214).

Palmer (1977b, p. 72) concurs, noting an early Shona prosperity. Peasants, living within access to the main markets and the railroad and facing growing demand from mines, took advantage of new market opportunities and grew new crops.

In short, these early years may be thought of as mirroring the equilibrium of Proposition 5 describing a RE solution. Without strong, direct involvement in agricultural production, politically powerful groups had few reasons to resent this early prosperity. Moreover, the implications for the agricultural sector were also consistent with the theoretical analysis. In particular, rather than as a dual economy with a stagnant traditional sector, the rural economy was best characterized as a single-sector economy wherein natives were at least as productive as white producers[33].

3.5.2 White agriculture and factor price manipulation

Later, the situation changed. Contemporary observers were aware about the impacts of native prosperity on labour supply (cited in Palmer (1977b, p. 78-79)):

[32] The early members elected to the Legislative Council established in 1898 all had close connections with land-owning companies and defended absentee landlords. In 1897, a Government Notice calling on all who had been granted land on terms of beneficial occupation to comply by August 1898 or face threat of forfeiture was blocked by Rhodes and settlers. An 1899 Land Ordinance was blocked by a Representatives Association and settlers in the Legislative Council. In 1900, a Land Occupation Conditions Ordinance weakened occupation conditions (Palmer, 1977b, p. 61).

[33] Alternatively, since the industrial or urban sector was not a mayor concern in this period, the political equilibrium of this period can be thought of as resembling the situation of Proposition 6 with low wages, with similar implications.

"The natives today are cultivating twice the amount they did when we came to the country, and so long as the land is unlimited and they have a market for their produce, will the labour supply suffer" (Native Commissioner 'Wiri' Edwards, 1906);

"[Locusts are] not an unmitigated evil, for a really abundant harvest of kaffir corn and mwalies would probably have the effect of reducing the number of Native labourers 50 per cent" (Native Commissioner Malema, 1906);

"At present the paltry sum of 10/- per hut is so easily earned it will never induce them to work" (Native Commissioner Makoni, 1903).

Therefore, when white settlers got seriously involved in agriculture, they used political power to erode the early prosperity of the Shona and Ndebele. Again, they were explicit about their motivations. In particular, the Reserves were attractive as far as they could become a source of cheap and abundant labour and were largely ignored otherwise. For instance, even when Europeans had already expropriated natives, they did not push them to Reserves if these were too far away because, as explained by the Native Affairs Committee of Enquiry in 1911, "it would be very short-sighted policy to remove these natives to reserves, as their services may be of great value to future European occupants" (Arrighi, 1970) [34]. Conversely, when some Reserves came under attack in 1914-15, their role in providing labour for nearby white neighbors was used as an argument to protect them: "Inskipp was warned not to advocate the abolition of the Soshwe Reserve, 'as the farmers in the vicinity are dependent upon it for their labour supply'" (Palmer, 1977b, p. 117)[35].

[34] E.F. Knight, correspondent to Rhodesia for *The Times* of London whose articles later appeared on a book, *Rhodesia of Today*, gave the following view against the creation of Reserves in 1895: "To set these savages apart in (large) Reserves would be to indefinitely retard their civilisation. Rich in cattle and mealie crops they would refuse to labour for us and would pass their lives in indolence" (Floyd, 1959, p. 12). What Knight did not anticipate, of course, was that Reserves would not be large, and that they could provide a handsome amount of migrant labour to white producers.

The fact that Reserves were not as attractive if they did not serve the purpose of providing labour because they were too far away was clear even on the early years. In Matabele (the land of the Ndebele), during the initial phase in which land was mostly held by companies and speculators, "no attempt was ever made to force the Ndebele into the distant Gwaii and Shangani Reserves, as they were too highly prized as a potential pool of labour. Frank Johnson, the organizer of the Pioneer Column, was moved to comment that: 'We have excellent labourers in Matabele, and from the mining and commercial point of view I regret the loss of the 2,000 odd Matabele killed in the late war very much'" (Palmer, 1977b, p. 42).

[35] Along the same lines, when Coryndon –the chairman of the 1914 Commission– argued that medium-size Reserves scattered evenly throughout the country were preferable to the situation in Matabeleland in 1914 of practically no Reserves in the center and huge ones in the outer districts, he cited among the arguments that "the labour supply would be more evenly distributed" (Palmer, 1977b, p. 129)

Also, when the 1925 Land Commission met to examine the best allocation of the Native Purchase Areas (NPAs), dividing the country in two was rejected because it would damage the labour supply, and instead NPAs should whenever possible adjoin the existing Reserves to form with them compact Native Areas.

However, not all Africans were expected to go to the Reserves and follow the customs of a tribal society. The most entrepreneurial ones could in theory become private owners in the Native Purchase Areas (NPAs). Fear of competition from African farmers was largely responsible for the creation of the NPAs. NPAs were presented in the Legislative Assembly as a necessary evil to deal with the problem of Natives buying land anywhere (Palmer, 1977b, p. 169-170). In these circumstances, it is hardly surprising that the NPAs did not generate a competitive African agricultural sector. The limitations of the assigned NPAs are documented in Appendix 3.C[36]. Furthermore, the nature of property rights limited their productivity, as assumed in the theoretical analysis. Though land allocated in the NPAs was owned individually, "there were many limitations to its transferability, such as maximum size of holdings and sales to Europeans. Among other things this meant that the extension of credit (which could possibly only come from European sources) to African farmers was hampered and therefore a constant lack of financing was bound to hold back their development" (Arrighi, 1973, p. 347).

While it was useful to think of the early years as mirroring the equilibrium of Proposition 5 describing a RE solution, the years of white agricultural development mirror the incentives of a FPM equilibrium as in Proposition 4. During these years, there was relatively low industry development in urban areas. As expected in a FPM solution with low urban wages, the rural elites competing for labour had reason to resent native prosperity and attempted to impose the maximum possible distortions on natives. White colonists strategically impoverished the traditional economy as much as possible, to force peasants into the labour market.

However, the Corollary to Proposition 6 underlines an additional important element: landowners' capacity to tax the subsistence sector should have been limited. Otherwise, they would have been interested in increasing subsistence sector productivity and taxing the returns. African state weakness is well-established, and lies at the center of many academic debates (see e.g. Herbst. (2000)). While Rhodesia, and Southern Africa in general, had special characteristics in the continent given the relatively high proportion of white settlers, state capacity was undoubtedly limited. Alexander (2006) puts it clearly, referring to the process by which power over Africans and their

[36]To provide some evidence here, "By 1943 the Rhodesian Government had come to admit, at least privately, that some 4.727,000 acres of the NPAs were 'generally unsuitable for divisions into small holdings'" (Palmer, 1977b, p. 185). Arrighi (1973) summarizes some of the limitations of NPAs in his classic essay on the political economy of Rhodesia. He claims competition from an African rural bourgeoisie was potentially dangerous for whites and for this reason it was regulated and held within limits via the NPAs, which, moreover "constituted only 8 percent of the total land areas of the country and it was generally located even farther away from markets, railway lines, and main roads than those of the traditional peasantry" (Arrighi, 1973, p. 347).

land was constituted: "This was in part a story of dispossession and repression, but it was also a story of contradiction and compromise in which the state's goals were far from easily realised" (p. 17). State-making, she argues, was constantly challenged by Africans, who "spread out from hilltop fortifications; they fled from landlords; they sought to evade tax" (p. 20).

As should be clear from the review of European agriculture expansion, the notion that land expropriation and ownership segregation resulted from white elites' efforts to obtain cheap and abundant labour from natives is by no means new, nor lacking evidence. Less attention has been paid to the role of the nature of property rights in the Reserves. The experience with NPAs shows that efforts to introduce private land ownership for Africans were weak. The role of property rights became even more apparent when the urban sector gained prominence. Rhodesia entered the third stage identified above. The pressure to improve the native Reserve productivity and cut ties between the natives and their land arose.

3.5.3 The role of industry

As noted by (Arrighi, 1970, p. 223) and as assumed in the theoretical analysis, the tribal social system in Rhodesia made black peasants unwilling to permanently migrate to industrial urban centers. By migrating only temporarily, "participation in the labour force thus left the worker's obligations and duties to his rural kinsmen and his general involvement in the tribal social system unchanged so as to retain his cultivation rights and to be able to claim support and succour when necessary" (Arrighi, 1970, p. 223). By the 1950s, this scheme was hurting industrial capital, especially industries requiring labour stabilization[37].

The stated aims of the NLHA suggest that this Act was a response to such a situation. With this introduction of individual rights, those excluded from land would provide a stable labour for industry, and security of tenure in the Reserves would improve productivity. This, however, exactly opposes what the rural elite in the model economy of Section 3.2 look for. According to the results of Proposition 6, the rural elite oppose these aims for the same reason the industrial sector supports them.

As with the NPAs, however, policies to introduce private property on the traditional African sector turned out to be partial and timid. While the NLHA was supposedly revolutionary, and

> "directly repudiated 'customary' and communal rights to land in favour of individual

[37](Arrighi, 1970, p. 223) claims that "It was in fact in those sectors in which stabilization mattered the most (manufacturing, transport and communication) that after 1954 most of the increase in real wages was concentrated."

land right holders and 'secular state power', [it] was to be tempered by a host of restrictions. Only those who farmed and owned stock at the time of the Act's implementation were eligible for rights; land rights could not be used as collateral against a loan; the size of the arable allocations and number of stock rights was limited [and] African 'rights' to land were to be subordinated to the discipline of 'development'" Alexander (2006).

Therefore, rather than see it as a triumph for manufacturing interests, it is preferable to view the NLHA as the compromise between settler farmers and secondary industry[38]. The impossibility of truly revolutionary changes in policy was recognized by a senior official of the Native Affairs Department. He remarked at the time, referring to an increase in the minimum wage that would stabilize labour in the urban areas: "if a minimum wage was introduced in the towns you are bound to have repercussions amongst the farming community and *today the farming community rules the country*, so that flattens out the minimum wage straight away" (Arrighi, 1973, p. 362, emphasis added).

In the 1950s, liberals failed to repeal the Land Apportionment Act. White farmers reaffirmed their political power when the United Federal Party lost the 1962 elections to the Rhodesian Front Party (Mosley (1983, p. 29) and Duggan (1980, p. 232)). The Land Apportionment Act was confirmed by the 1969 Land Tenure Act. Duggan (1980) interprets these measures in the following way:

"The Rhodesian state had thus come full circle. Its first coherent agricultural policy, in the decade before World War I, was to eliminate the commercial production of Africans and encourage that of settlers. Industrialization after 1940 produced and ambivalent government policy; protection of settler farmers was costly to the growing manufacturing sector. The NLHA was a compromise between the upper and lower strata of settler society (...) During the 1960s, with the Rhodesian Front in power, ambivalence towards African commercial agriculture disappeared" (Duggan, 1980, p. 237).

[38]See Duggan (1980, p. 230) and Arrighi (1973) . Phimister (1993) reviews these arguments by Arrighi (1973) and others along this vein, but also suggests that the actual impact of the Act may have been overestimated, as it was done hastily and with limited resources, and less enthusiastically once it was clear that industry would not be able to absorb all the landless proletariat that would have been created. Moreover, he stresses that opposition to the Act did not only come from Africans who would have been left landless, but also from the African rural elites or 'reserve entrepreneurs' who had managed to concentrate wealth (land and cattle) in the Reserves, and whose position would have been threatened by the redistribution of the Act. Indeed, for this it is important to remember that while the NLHA allowed for sales of titles, no one could hold more than three times the standard area established by authorities, and these provisions "were actually more egalitarian than the previous allocation of land in Rhodesian reserves under the control of government-aid chiefs" (Duggan, 1980, p. 232).

These tensions between the need of a stable labour force in industry and existing institutions in rural areas can also be interpreted using the model. More specifically, rural elites interests were instrumental in making institutional innovations in the traditional rural sector partial and timid.

Given that natives had been dispossessed from most of their lands for years, the political incentives of rural elites are consistent with the results from Proposition 6 with $t < \underline{t}$. Indeed, Proposition 6 predicts that the rise in the industrial wage should put some limits on the distortions that the rural elites are able to impose on the traditional rural sector. But, if rural elites are sufficiently powerful with a sufficiently small subsistence sector, industrial development can lead to no revolutionary institutional innovation in the subsistence sector. Rhodesian history from the 1940s to the 1960s adjusts well to this pattern. Although industrial development revealed that the Reserve property rights regime put limits on both agricultural productivity and the migration of labour to urban areas, settler political power and their strategy of factor price manipulation and avoiding competition with black farmers successfully prevented the elimination of the rural dual economy. The NLHA, hastily conducted and including a number of restrictions, is consistent with this interpretation. With a small subsistence sector, rural elites favored poor attempted to obtain cheap labour using poor property rights institutions. Poor property rights were preferred over the strategy of promoting productivity-enhancing institutional innovation and taxing the returns.

3.6 Final remarks

Improving agricultural productivity in poor countries is important for several reasons. Most obviously, many people derive their livelihood from the rural sector in less-developed countries. Also, agricultural productivity is more broadly related with the determinants of overall economic performance. Indeed, development economists and historians have long argued that agricultural productivity may drive the overall development process. In particular, by creating the supply of labour to industry and the surplus of food in society, agricultural productivity catalyzes the structural transformations of development that Kuznets (1966) famously discussed[39].

On the other hand, property rights appear to determine agricultural productivity. If property rights in land are so good, why are they not adopted more widely? This paper suggests a political

[39]See (Ray, 1998, p. 353) for a review of these arguments, and Matsuyama (1992) or Gollin et al. (2002) for examples of formalizations of these ideas. In the context of British economic history, the questions of whether there existed an agricultural revolution that preceded the Industrial Revolution, and whether parliamentary enclosures caused it, have generated a long and lively debate (see Allen (1999) and the references therein).

economy explanation. Often, the rural sector in developing countries has a "dual" structure with politically powerful producers or elites alongside traditional peasants with little voice in the political process. In this context, rural elites maintain low agricultural productivity in the traditional sector to obtain cheap peasant labour. However, this objective runs into trouble when peasants enjoy alternative employment opportunities in the urban (or other) sector. In general, the emergence of new "outside options" for peasants limits the elite's ability to manipulate factor prices. Distorting the traditional economy, fails to increase elites' profits, but increases outmigration. This is true for a number of potential distortions on the subsistence sector, which I have succinctly captured in the theoretical model with taxation on subsistence income. But limited property rights in the subsistence sector constitute a distinct distortion. Like other distortions they reduce peasants' income in subsistence plots, but achieve something more: they force peasants to remain in the agricultural sector to protect their property.

Thus, rural elites have little incentive to promote a transition to institutions of private property in the subsistence economy. This suggests a specific mechanism for the endogenous persistence of bad rural institutions as development unfolds. While other theories of "dualism" predict an erosion of the "traditional" economy with development, in this theory it is precisely the rise of an alternative "modern" or "urban" sector which shifts rural elite's attention away from taxation to avoid migration. As a result, direct interests of rural elites in the productivity of the subsistence sector disappear, together with incentives to promote efficiency-enhancing innovations in property rights institutions. Also noteworthy, poor property rights are preferred for precisely the same reason they hurt overall economic development: they simultaneously reduce the supply of labour to industry (tie peasants to land) and the surplus of food in society (reduce subsistence sector productivity). In this sense, this theory provides a link between political institutions that give disproportionate power to large landowners and barriers to the structural transformations required for development[40].

Two final important caveats are worth mentioning. First, communal systems of land ownership may provide a number of benefits to peasants. The flip side of providing peasants with full, private property rights over their land is creating a number of landless people. The traditional organization of the subsistence economy may provide insurance for peasants. This may not only

[40] Other theories share this spirit, but emphasize the interests of the landed elite to raise direct barriers to industrialization or under-invest in necessary public goods in order to protect its rents (see, for example, Adamopoulos (2008) and Galor et al. (2009)).

protect them from extreme poverty, but also help explain the persistence of a relatively unproductive "traditional" economy (Banerjee & Newman, 1998). Also, eliminating the option to sell their land may protect peasants from selling it at low prices in times of distress, or under pressure from more powerful groups. For example, Lamartine Yates (1981) notes that, decades later, Mexican peasants still accepted the original motivation behind the inalienability of ejido land: "it was highly necessary to protect the newly created groups of ejidatarios from having their land stolen back from them by unscrupulous persons" (p.180). As Ray (2008) puts it while discussing the current state of development economics, "the political economy of rights is a messy business, but of central importance in development economics. Poverty in general enhances the social and political need for ambiguity" (p. 21).

Second, motivations aside from extracting cheap labour from rural labourers may explain the interest in keeping peasants tied to land. A prominent justification in the African cases is maintenance of social order, under the (perhaps correct) impression of elites that concentrating population in urban centers may threaten the stability of the regime. As Feinstein (2005) describes for the case of South Africa, "The logic of domination dictated that the majority of the black population should remain isolated and dispersed in rural areas and mine compounds; the logic of industrialization dictated that they should concentrate in urban areas to provide labor necessary for economic expansion. This was a contradiction with which all white politicians had grappled since the formation of the Union" (p. 151).

3.A Proofs

3.A.1 Characterization of $\bar{w}(\tau_S, \mu)$

That the relative attractiveness of the rural areas at $m = 0$, $\bar{w}(\tau_S, \mu)$, is decreasing in τ_S is straightforward from inspection of (3.10) or simple differentiation. To characterize the behaviour of $\bar{w}(\tau_S, \mu)$ as μ changes, rewrite it as follows:

$$\begin{aligned}
\frac{\partial \bar{w}(\tau_S, \mu)}{\partial \mu} &= B * k(\mu) * l(\mu), \\
\text{where} &: \\
B &\equiv \left(\frac{1}{L}\right)^{1-\alpha} t\left[(1-\tau_S)\right]^{\frac{1}{1-\alpha}} > 0, \\
k(\mu) &\equiv \frac{\mu^{\frac{\alpha}{1-\alpha}}}{\left(t\left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}} + T - t\right)^{\alpha}}, \\
l(\mu) &\equiv 1 - \frac{1-\alpha}{\alpha}\mu + \frac{1-\mu}{\alpha} - (1-\mu)\frac{t\left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}}}{t\left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}} + T - t}.
\end{aligned}$$

Now note the following properties[41]: (1) $k(\mu) > 0$ for all $\mu \in [\underline{\mu}, 1]$, (2) $l(\underline{\mu}) \approx 1 + 1/\alpha > 0$, (3) $l(1) = \frac{2\alpha - 1}{\alpha} \lesseqgtr 0$ if $\alpha \lesseqgtr 1/2$, and (4) $l'(\mu) < 0$. If $\alpha > 1/2$, these properties imply that $\partial \bar{w}(\tau_S, \mu)/\partial \mu > 0$ for all $\mu \in [\underline{\mu}, 1]$ and thus $\mu^* = 1$. If instead $\alpha < 1/2$, from properties 1 and 3 $\partial \bar{w}(\tau_S, 1)/\partial \mu < 0$. Properties 1 and 2 imply in turn that $\frac{\partial \bar{w}(\tau_S, \underline{\mu})}{\partial \mu} > 0$. These observations, together with properties 1 and 4, imply that there exists a unique $\mu^* \in (\underline{\mu}, 1)$ such that $\frac{\partial \bar{w}(\tau_S, \mu^*)}{\partial \mu} = B * k(\mu^*) * l(\mu^*) = 0$ which maximizes $\bar{w}(\tau_S, \mu)$. Since $k(\mu^*) > 0$, μ^* is defined by $l(\mu^*) = 0$, or (also using $\tau_S = 0$) by:

$$1 = \frac{1-\alpha}{\alpha}\mu^* - \frac{1-\mu^*}{\alpha} + (1-\mu^*)\frac{t\left[\mu^*\right]^{\frac{1}{1-\alpha}}}{t\left[\mu^*\right]^{\frac{1}{1-\alpha}} + T - t}.$$

3.A.2 Characterization of the FPM problem

Equilibrium policies in the no migration regime

The elite maximize $\frac{L}{T}$ which is monotonically increasing in τ_S and monotonically decreasing in μ.

Equilibrium policies in the unavoidable migration regime

In the main text it was observed that the optimal property tax rate for the elite is $\tau = 0$. Taking this as given, one can take a monotone transformation and note that maximizing $L_R^I/\tilde{T}$ with respect to μ

[41] To see property 4, write $l'(\mu) = (\alpha - 2)/\alpha + a(\mu) * b(\mu)$ with $a(\mu) \equiv t\left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}} / \left[t\left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}} + T - t\right]$ and $b(\mu) \equiv 1 - (1-\mu)(1-a(\mu))/(\mu(1-\alpha))$. Note the following: $(\alpha - 2)/\alpha$ is negative and independent of μ; $a(\mu)$ is increasing in μ and positive for all μ; $b(\mu)$ approaches minus infinity at $\mu = 0$, equals 1 at $\mu = 1$, and is also increasing in μ. Thus a sufficient condition for $l'(\mu)$ to be negative for all $\mu \in [\underline{\mu}, 1]$ is that it is negative at $\mu = 1$. But this always holds because $(2 - \alpha)/\alpha > 1 > a(1)$.

is equivalent to maximizing $z(\mu) = \log\left[(1-\mu)\frac{t\mu^{\frac{1}{1-\alpha}}}{\tilde{T}}\right]$. The first order condition can be written as, $z'(\mu) = -1/(1-\mu) + \gamma_E/[(1-\alpha)\mu] = 0$. Since $z'(\mu)$ is monotonically decreasing in μ, $z'(0) = \infty$, and $z'(1) = -\infty$, there exists a unique $\mu^{FPM} \in (\mu, 1)$ such that $z'(\mu^{FPM}) = 0$. Hence, $L_R^I/\tilde{T}$ achieves a unique maximum at μ^{FPM}. Straightforward differentiation then yields the following comparative static results: $\partial\mu^{FPM}/\partial T > 0$, $\partial\mu^{FPM}/\partial\alpha > 0$, $\partial\mu^{FPM}/\partial t < 0$. Moreover, note from inspection of the first order condition that $z'(1/(2-\alpha)) < 0$, and since $z'(\mu)$ is decreasing in μ, $\mu^{FPM} < 1/(2-\alpha)$. Also from the first order condition, as $T \to \infty$ or $t \to 0$, γ_E approaches 1 and thus $\mu^{FPM} \to \frac{1}{2-\alpha}$.

3.A.3 Characterization of the RE problem

Equilibrium policies in the no migration regime

In the main text it was observed that in the no migration regime the optimal property rights level for the elite in the RE problem is $\mu = 1$. Taking this as given, taking logs on the maximand, and ignoring constant terms, one can find the optimal level of taxation by maximizing $\tilde{z}(\tau_S) = \log\left[\tau_S\left(\frac{(1-\tau_S)^{\frac{1}{1-\alpha}}}{t(1-\tau_S)^{\frac{1}{1-\alpha}}+(T-t)}\right)^{\alpha}\right]$. The first order condition is $\tilde{z}'(\tau_S) = 1/\tau_S - \alpha\gamma_E/((1-\alpha)(1-\tau_S)) = 0$. Since $\tilde{z}'(\tau_S)$ is monotonically decreasing in μ, $z'(0) = \infty$, and $z'(1) = -\infty$, there exists a unique $\tau \in [0,1]$, denoted τ^{Laffer} such that $\tilde{z}'(\tau) = 0$. Hence, there exists a unique $\tau_S \in (0,1)$ that satisfies the first order condition and maximizes tax revenues[42]. Inspection of this condition or straightforward differentiation then yields the following comparative static results: $\partial\tau^{Laffer}/\partial T < 0$, $\partial\tau^{Laffer}/\partial\alpha < 0$, $\partial\tau^{Laffer}/\partial t > 0$. Moreover, $\tau_S > 1-\alpha$ but as $T \to \infty$ or $t \to 0$, $\tau_S \to 1-\alpha$.

Equilibrium policies in the unavoidable migration regime

Taking logs and ignoring constant terms, the maximization problem in this case is equivalent to maximizing

$$\bar{z}(\tau_S, \mu) = \log\tau_S + \frac{1}{1-\alpha}\log\mu + \frac{\alpha}{1-\alpha}\log\left((1-\tau_S)\left(1+(1-\mu)\frac{1-\alpha}{\alpha}\frac{t[(1-\tau_S)\mu]^{\frac{1}{1-\alpha}}}{\tilde{T}}\right)\right)$$

Taking the derivative with respect to μ, it is clear that $\bar{z}(\tau_S, \mu)$ is increasing in μ for each τ_S. To see this, taking the derivative and simplifying:

$$\bar{z}_2(\tau_S, \mu) = \frac{1}{1-\alpha}\left[\frac{1}{\mu} + \frac{\alpha t[(1-\tau_S)\mu]^{\frac{1}{1-\alpha}}}{\alpha\tilde{T} + (1-\mu)(1-\alpha)t[(1-\tau_S)\mu]^{\frac{1}{1-\alpha}}}\left(-(1-\alpha) + \frac{1-\mu}{\mu}\frac{T-t}{\tilde{T}}\right)\right]$$

Now note that $\frac{1}{\mu} > 1$, and $\left(-(1-\alpha) + \frac{1-\mu}{\mu}\frac{T-t}{\tilde{T}}\right)$ is decreasing in μ and it can be no smaller than $-(1-\alpha)$. Thus, to verify that the expression is positive, it is sufficient to show that

$$\frac{\alpha t[(1-\tau_S)\mu]^{\frac{1}{1-\alpha}}}{\alpha\tilde{T} + (1-\mu)(1-\alpha)t[(1-\tau_S)\mu]^{\frac{1}{1-\alpha}}} < \frac{1}{1-\alpha}.$$

[42] Alternatrively, straightforward differentiation shows that the maximand is everywhere concave in τ_S, so this solution is indeed a global maximum.

After some algebra, it can be shown that this is equivalent to verifying that

$$-1+(\mu+\alpha)(1-\alpha)<\frac{\alpha(T-t)}{t\left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}}}.$$

But since since $\mu<1$ substituting $(1+\alpha)$ for $(\mu+\alpha)$ in the left hand side of the inequality,

$$-1+(\alpha+\mu)(1-\alpha)<-1+(1+\alpha)(1-\alpha)=-\alpha^2<0<\frac{\alpha(T-t)}{t\left[(1-\tau_S)\mu\right]^{\frac{1}{1-\alpha}}}.$$

Therefore $\bar{z}_2(\tau_S,\mu)>0$ and the preferred level of μ is 1. Taking this as given, one can find $\bar{z}_1(\tau_S,1)=1/\tau_S-\alpha/\left[(1-\alpha)(1-\tau_S)\right]=0$ and solve for the optimal τ_S, $\tau_S=1-\alpha$.This is indeed a maximum since $\bar{z}_{11}(\tau_S,1)<0$.

3.A.4 Characterization of the Combined Problem

Equilibrium policies in the no migration regime

Rewrite (3.12) as $\max c^E=\max \pi^{FPM}+\pi^{RE}$ where, $\pi^{FPM}=k\tilde{T}^{-\alpha}$, $\pi^{RE}=kt\mu^{\frac{1}{1-\alpha}}\tau_S(1-\tau_S)^{\frac{\alpha}{1-\alpha}}$, and $k=A_E\frac{L^\alpha}{\alpha}$. That the optimal τ_S must be larger than τ^{Laffer}, follows by taking the derivative of c^E with respect to τ_S, $\partial c^E/\partial\tau_S=\partial\pi^{FPM}/\partial\tau_S+\partial\pi^{RE}/\partial\tau_S$, and noting from the analysis of the previous cases that while the first term is positive, the second is zero for $\tau_S=\tau^{Laffer}$ (and positive for lower values and negative for larger ones). Thus, τ_S^{COM} such that $\partial c^E/\partial\tau_S=0$ must satisfy $\tau_S^{COM}\geq\tau^{Laffer}\geq 1-\alpha$. Also, since $\lim_{\tau\to 1}\partial\pi^{RE}/\partial\tau_S=-\infty$ while $\lim_{\tau\to 1}\partial\pi^{FPM}/\partial\tau_S$ is finite, $\tau_S^{COM}<1$.

On the other hand, $\frac{\partial c^E}{\partial\mu}=k(\cdot)h(\tau_S)$, where $k(\cdot)=\mu^{\frac{\alpha}{1-\alpha}}\tilde{g}t(1-\tau_S)^{\frac{1}{1-\alpha}}$ is a function of parameters that is always positive, while $h(\tau_S)=-\alpha(1-\gamma_S)+\tau_S(1-\alpha\gamma_S)/\left[(1-\tau_S)(1-\alpha)\right]$ may be positive or negative. However, one can verify that $h'(\tau_S)>0$ for $\tau_S>1-\alpha$. This, together with the fact that $h(1-\alpha)>0$ implies that $h(\tau_S)>0$ for any $\tau_S>1-\alpha$. This completes the proof that $\partial c^E/\partial\mu>0$ for $\tau_S\geq 1-\alpha$, and since $\tau_S^{COM}\geq 1-\alpha$, that $\mu^{COM}=1$. Finally, note that for small τ_S the second term in $h(\tau_S)$ approaches 0, thus rendering $h(\tau_S)<0$. Thus, a sufficient condition for μ^{COM} to be equal to zero is that $\bar{\tau}$ is sufficiently small that $h(\tau_S)<0$ at $\mu=0$, or since $\gamma_S=0$ at $\mu=0$, that $\bar{\tau}<\alpha(1-\alpha)/(1+\alpha(1-\alpha))$.

Equilibrium policies in the unavoidable migration regime

Rewrite $\max c^E=\max K\left[\omega^{FPM}(t)\tilde{\pi}^{FPM}(\mu,\tau_S)+\pi^{RE}\bar{f}(\mu,\tau_S)\right]$ where $K=\frac{1}{\alpha}\left(\frac{A_E}{w_U^\alpha}\right)^{\frac{1}{1-\alpha}}$, $\omega^{FPM}(t)=(1-\alpha)(T-t)$, $\omega^{RE}(t)=t\left(1+(1-\mu)\frac{1-\alpha}{\alpha}\gamma_S\right)^{\frac{\alpha}{1-\alpha}}$, $\tilde{\pi}^{FPM}=\left(1+(1-\mu)\frac{1-\alpha}{\alpha}\gamma_S\right)^{\frac{\alpha}{1-\alpha}}$, $\tilde{\pi}^{RE}=\mu^{\frac{1}{1-\alpha}}\tau_S(1-\tau_S)^{\frac{\alpha}{1-\alpha}}$. Now we can observe that $\omega^{FPM}(t)$, the weight on $\tilde{\pi}^{FPM}(\mu,\tau_S)$, is monotonically decreasing in t, and zero at $t=T$. Also, $\omega^{RE}(t)$, the weight on $\tilde{\pi}^{RE}(\mu,\tau_S)$, is monotonically increasing in t, and zero at $t=0$. Thus for any t sufficiently close to T, the optimal is equivalent to that of maximizing $\tilde{\pi}^{FPM}$, which from the preceding cases has a maximum at $\mu=\mu^{FPM}$, $\tau=0$, and for any t sufficiently close to 0, the optimum coincides with that of $\tilde{\pi}^{RE}$, which has a maximum at $\mu=1$, $\tau=1-\alpha$. This establishes the result in the Proposition.

3.B The Avoidable Migration Regime

3.B.1 FPM Policies

As could be expected, when the urban wages increases and the society transitions from the "no migration" to the "unavoidable migration" regime, increases in the urban wage force the elite to give policy concessions (in the form of lower taxation or better property rights in the subsistence areas) to try to avoid migration. The elite gradually reduces τ and increases μ from $\bar{\tau}$ and $\underline{\mu}$, their levels in the no migration regime. Over a range of values for w_U, these concessions imply that there is in fact no migration even though the migration threat is present. However, once the elite reaches zero taxation and property rights as given by the unavoidable migration regime in Proposition 3.15, it will choose to give no more policy concessions. From this point forward, further increases in the urban wage generate positive migration. The next proposition summarizes the solution more precisely.

Proposition 8 *(Summary of FPM policies in the avoidable migration regime) Suppose* $\phi = 0$ *and* $w_U \in \left[\bar{w}\left(\bar{\tau}, \underline{\mu}\right), \bar{w}\left(0, \mu^*\right)\right]$. *Also, let* μ^{**} *be the level of property rights in the unavoidable migration regime with FPM policies as described in Proposition 4. Then, with* $\bar{w}(\tau, \mu)$ *as defined in (3.10) and* μ^* *from Remark 2, the unique political equilibrium features the following level of taxation* $\left(\tau_S^{FPM}\right)$ *and property rights* $\left(\mu^{FPM}\right)$*:*

1. *if* $w_U < \bar{w}\left(0, \mu^{**}\right)$, *then* $\tau_S^{FPM} \in [0, \bar{\tau}]$, $\mu^{FPM} \in \left[\underline{\mu}, \mu^{**}\right]$, *and as* w_U *increases,* τ_S^{FPM} *falls, or* μ^{FPM} *increases, or both.*
2. *if* $w_U \geq \bar{w}\left(0, \mu^{**}\right)$, *then* $\tau_S^{FPM} = 0$ *and* $\mu^{FPM} = \mu^{**}$.

Proof. The problem is to $\max \min \left\{L_R^I/\tilde{T}, L/\tilde{T}\right\}$ subject to $w_U \in \left[\bar{w}\left(\bar{\tau}, \underline{\mu}\right), \bar{w}\left(0, \mu^*\right)\right]$. Since $L \geq L_R^I$, it is preferable, if unconstrained, to maximize $L/\tilde{T}$ than to maximize $L_R^I/\tilde{T}$. However, since the elite's problem is to maximize the minimum of the two expressions, the unconstrained maximum of $\frac{L}{\tilde{T}}$ will in fact, over the relevant range of wages of the avoidable migration regime, be above $L_R^I/\tilde{T}$. This means that the elite will have to content itself with the "best" combination of policies (that maximizes $\frac{L}{\tilde{T}}$) such that $\left(L/\tilde{T}\right) \leq \left(L_R^I/\tilde{T}\right)$ (equivalently, $w_U \leq \bar{w}\left(\tau_S, \mu\right)$). Hence, for a range of values of w_U, one can think of the elite as solving the problem:

$$\max_{\tau_s, \mu} L/\tilde{T} \text{ subject to } w_U \leq \bar{w}\left(\tau_S, \mu\right). \tag{3.17}$$

However, this reasoning fails when w_U is large enough that $(\tau_S, \mu) = (0, \mu^{**})$ and $L_R^I/\tilde{T}$ is smaller than $L/\tilde{T}$ (that is, $w_U > \bar{w}\left(0, \mu^{**}\right)$). Since $(\tau_S, \mu) = (0, \mu^{**})$ maximizes $\frac{L_R^I}{\tilde{T}}$, there can be no other combination of policies that yields a higher utility for the elite and satisfies $\left(L/\tilde{T}\right) \leq \left(L_R^I/\tilde{T}\right)$.

Therefore, only for $w_U \leq \bar{w}\left(0, \mu^{**}\right)$ the solution is given by the solution to (3.17), and for $w_U > \bar{w}\left(0, \mu^{**}\right)$ it is $(\tau_S, \mu) = (0, \mu^{**})$.

As for the characteristics of the solution to (3.17), note the following. First, recall that $\bar{w}\left(\tau_S, \mu\right)$ is increasing in μ for $\mu < \mu^*$, is maximized at μ^*, and is decreasing thereafter. Note also that μ^{**} maximizes $\frac{L_R^I}{\tilde{T}}$, but since $\frac{L_R^I}{\tilde{T}} = \frac{\bar{w}(\tau_S, \mu)^{\frac{1}{1-\alpha}}}{w_u} \frac{L}{\tilde{T}}$ and $\frac{L}{\tilde{T}}$ is monotonically decreasing in μ, it must be the case that $\mu^{**} < \mu^*$. From Remark 2, this implies that $\bar{w}\left(\tau_S, \mu\right)$ in the constraint of (3.17) is increasing in μ. We also know that $\bar{w}\left(\tau_S, \mu\right)$ is decreasing in τ_S. Second, the objective function, $\frac{L}{\tilde{T}}$, is decreasing in μ and increasing in τ_S. These two observations imply that the constraint will

always bind and, regardless of the exact combination of policies (τ_S, μ) that solve (3.17), an increase in w_U will necessarily imply a decrease in τ_S, and increase in μ, or both to satisfy such constraint. ■

3.B.2 RE Policies

Since $\mu = 1$ is optimal in either extreme regime, it is optimal in the avoidable migration regime, where L_R in the maximand is either L or L_R^I. Fixing $\mu = 1$, this is then a simple maximization problem in one variable. In particular, when feasible the elite will set τ_S such that $L_R^I = L$. Intuitively, this equilibrium level of taxation decreases as the rural area becomes more attractive and the elite tries to avoid migration. When migration becomes unavoidable, as noted above, the desired level of taxation reaches $1 - \alpha$. Of course, if the exogenous limit on taxation $\bar{\tau}$ is binding, then $\tau_S^{RE} = \bar{\tau}$.

Proposition 9 *(Summary of RE policies in the avoidable migration regime) Suppose the elite solves problem (3.16) and* $w_U \in \left[\bar{w}\left(\bar{\tau}, \underline{\mu}\right), \bar{w}\left(0, \mu^*\right)\right]$. *Then, with* $\bar{w}(\tau, \mu)$ *as defined in (3.10) and* μ^* *from Remark 2, the unique political equilibrium features* $\mu^{RE} = 1$ *and* $\tau_S^{RE} = \min\{\bar{\tau}, \tilde{\tau}\}$, *where* $\tilde{\tau} \in \left[1 - \alpha, \tau^{Laffer}\right]$ *and is decreasing in* w_U.

Proof. Fixing $\mu = 1$, this is a standard maximization of Leontieff-type preferences on one variable, τ_S. The elite will set τ_S such that $L_R^I = L$, or $w_U = A_E\left[(1/L)\left(t(1-\tau_S)^{\frac{1}{1-\alpha}} + T - t\right)\right]^{1-\alpha}$. Solving for τ_S, this is $\tau_S = 1 - \left((1/t)\left(L\left(w_U/A_E\right)^{\frac{1}{1-\alpha}} - (T-t)\right)\right)^{1-\alpha}$ which is decreasing in w_U. ■

3.B.3 COM Policies

A general characterization of equilibrium policies for the combined problem is more complicated. However, from the preceding analysis some of its key features are easily established.

Proposition 10 *(Summary of COM policies in the avoidable migration regime) Suppose the elite solves problem (3.12),* $\phi = 1$, *and* $w_U \in \left[\bar{w}\left(\bar{\tau}, \underline{\mu}\right), \bar{w}\left(0, \mu^*\right)\right]$. *Then, with* $\bar{w}(\tau, \mu)$ *as defined in (3.10),* $\left(\tau_S^{FPM}, \mu^{FPM}\right)$ *and* $\left(\tau_S^{RE}, \mu^{RE}\right)$ *given by Propositions 8 and 9, respectively, and* μ^* *from Remark 2, the unique political equilibrium features the following level of taxation* $\left(\tau_S^{COM}\right)$ *and property rights* $\left(\mu^{COM}\right)$*: (i) if* $t \in (0, \underline{t}]$, *then* $\tau_S^{COM} = \tau_S^{FPM}$, $\mu^{COM} = \mu^{FPM}$; *if* $t \in [\bar{t}, T]$, *then* $\tau_S^{COM} = \tau_S^{RE}$, $\mu^{COM} = \mu^{RE} = 1$.

Proof. Follows from the proof for COM policies in the unavoidable regime case. ■

3.C Three stages in Rhodesian Agricultural History

The early years: consolidating power and resource extraction

According to Palmer (1977b, p. 12), the drive for the initial colonization of Rhodesia in the late 19th century was the discovery of gold in the Transvaal[43]. This convinced the British that too much power was placed on the hands of Afrikaners. And it convinced Cecil Rhodes of the British South Africa Company (BSAC) that he should look North to find a "Second Rand." As a result, in 1889 the BSAC obtained a Royal Charter to administer the territory as a protectorate. Soon, the two main groups of natives (the Ndebele or Matabele, and the Shona) experienced a large-scale dispossession of their land through violent and illegal means, and found themselves under the political domination of the settlers. The strategies for dispossession of land included agreements that were seen as "detestable, whether viewed on the light of policy or morality" (Palmer, 1977b, p. 27) even by John Smith Moffat, the British Resident Commissioner[44].

War eventually broke out with the Matabele, and in 1893 another controversial agreement, the Victoria Agreement, stipulated that everyone taking up arms for the BSAC in the Matabele war was to be entitled to land with no obligation to occupy it. During these years, the best land was taken away from the natives with little checks from the Imperial government. For instance, after the Matabele war was won by the BSAC, a Land Commission was established in 1894 to provide land for the natives. But the Gwaai and Shangani Reserves created by the Commission had little concern for the natives and two years later "the Colonial Office was forced to concede that 'the proceedings of the Land Commission were a farce' [while] Earl Grey, admitted that the Ndebele regarded the two Reserves as 'cemeteries not Homes'" (Palmer, 1977b, p. 33).

The 1896-1897 Ndebele and Shona Risings (or First ChiMurenga) led the British government to put some control on the BSAC. The main change was the establishment of an Imperial Resident Commissioner who communicated with the British Imperial government[45]. Also, the post-Risings Ordinance of 1898, stipulated that the Company would "from time to time" assign to the natives land sufficient for their occupation[46].

Aside from the creation of Reserves for the natives, Imperial authorities attempted an attack

[43]The Transvaal Republic was one of the independent republics colonized by Boer (or Afrikaners) settlers who left the British-dominated Cape Colony in the XIXth Century during the "Great Trek." The emigrating Boers –Afrikaans speaking descendants from the Dutch, German and French early colonizers of South Africa– established several republics to the north, outside British control, after the British occupation of the former Dutch colony. In 1885, huge amounts of gold deposits were discovered in the *Witwatersrand* (in Afrikaans, "the ridge of white waters"), often known simply as the Rand.

[44]In 1888, Cecil Rhodes persuaded Ndebele King Lobengula to grant mining and administration rights to the BSAC (via the Rudd Concession), promising to bring no more than ten white men to dig for gold, something that was not included in the version that Lobengula signed. This was sufficient for Rhodes to raise the Pioneer Column, offering pioneers land and mining claims in exchange for the occupation of Mashonaland (the land of the Shona). In 1891, Lobengula attempted to divide and rule, granting rights over administration and land, trade and banks to Edouard Lippert, at the time a rival of Rhodes. The strategy backfired when, in an agreement that was kept secret from Lobengula, Rhodes bought the concession from Lippert in exchange for shares, cash and grants over land (although part of it was still under Lobengula's control!).

[45]They also forced Rhodes to resign, and Leander Starr Jameson, the BSAC administrator, was on jail and replaced by others, including Earl Grey and William Milton, who were more conscious that the Company had to have a more orderly land policy. James had invaded the Transvaal in a (failed) attempt to assert British supremacy, and this provided a window of opportunity for the Risings.

[46]80 Mashonaland Reserves plus the Mtoko District and 16 Matabeleland Reserves were formally approved in 1902 by the Company Administrator. Imperial approval was granted in 1908 by the Colonial Office, on the understanding that further consideration was not precluded.

on absentee landlords[47]. But the Legislative Council that had been set up in 1898 had a lot of representation from local settlers with strong ties to the large absentee landowning companies. In 1903 a compromise was adopted that allowed absentee landlordism to continue: landlords, by surrendering one-third of their holding, could receive title free of occupation for the remaining[48].

White agriculture and factor price manipulation

A change of approach followed around 1907, when a BSAC Directors tour of Rhodesia ended the myth of the "Second Rand." One year later, the "White Agricultural Policy" marked the beginning of a differential support for European farmers via government bureaucracy, banks, and support in research, none of which were available for Africans. The Company decided to promote settler agriculture and attract new immigrants, and this required an inevitable "squeezing-out process" (Palmer, 1977b, p. 80).

But the Company did not just squeeze-out more natives into the Reserves; it attacked the Reserves to recover the good land for European farmers[49]. The British Resident Commissioners tried to resist the attack on the Reserves, and ultimately agreed to create a commission in 1914 to settle the land question.

The 1914 Native Reserves Commission[50] was very arbitrary. For instance, it reported that "land has been assigned to natives which is quite unsuitable for their purposes, though desirable from an European point of view" (Palmer, 1977b, pg.108) without stating the criteria for suitability for Africans or Europeans. But the criteria was clear, to the point that the Chief Native Commissioner, referring to Reserves proposed "defended their extent on the ground that much of the land selected was 'interspersed with granite and was otherwise unfit for cultivation'" (Floyd, 1959, p. 72). Likewise, the remarks of the of the Land Settlement Department Director, F.W. Inskipp, who was very active giving advice to the Commission, are quite revealing. To quote just two examples:

> "As the area in question, which is practically a conglomeration of kopjes with very small cultivable valleys in between, is infested with baboons and is only transversable by pack animals, I see no objection [to making it a native reserve]" (Palmer, 1977b, p. 104); and
>
> "I understand that the greater part of this land applied for consists of a steep gorge with the Hondi river flowing through it and that this portion at least is quite unsuitable for European occupation. Further that natives are thickly scattered throughout the area and that the climate is intensely hot and probably malarious. In view of these facts

[47] Landlord absenteeism was so prevalent and the expropriation of land had been so brutal, that it was hard for the government to get land for the Reserves or immigrants. Palmer (1977b) quotes a letter from Milton to his wife in 1896 saying that there was "absolutely no land left that is of any value at all for settlement of Immigrants by the Government" (p. 60).

[48] The post-Rising Ordinance also gave natives the same rights "to acquire, hold, encumber, and dispose of land" as non-natives (Article 43). While the issue faced resistance from white settlers, it was unimportant at the time since so few Africans could actually buy land. However, it would become important in the segregation debates of the 1910s and 1920s that led to the Land Apportionment Act of 1930.

[49] A Native Affairs Committee of Enquiry was established in 1910-1911, and reported "strong views concerning the excessive acreages allocated for African settlement. The testimony of Native Department officials was substantially against [the surveyor], however, for it was pointed out that in many Reserves the soil was poor, water was deficient and certain localities were wholly unsuited for human occupation" (Floyd, 1959, p. 75).

[50] The Commission was composed by 3 members, 2 chosen by the Imperial Government –including the chairman Robert Coryndon– and 1 nominated by the Company.

and of the remoteness of the land from market and railway, I suggest that there is no objection to its reservation" (Palmer, 1977b, p. 117).

Apart from giving the Reserves the worst tracts of land, the Commission did not expropriate European lands, thus ratifying the former process of dispossession. The end result was a suggested reduction in the size of Reserves of 2.7 million acres, which was partially reduced by a last-minute Imperial intervention to create 1.7 million acres of "reserve Reserves"[51]. The Imperial Government finally approved the Commission's Report in 1917, but the necessary Order of Council was delayed by complaints until November of 1920.

In 1922, Southern Rhodesia held a government referendum in which the (small and mostly European) electorate rejected joining the Union of South Africa. The era of Company rule came to an end, and political power formally passed to white settlers. In 1925 a new Land Commission was appointed and reported in favour of a policy of separate land purchase areas for Africans and Europeans (the former referred to as Native Purchase Areas, NPAs)[52].

The Land Apportionment Act of 1930 followed many of the recommendations from this Commission. With this act, NPAs (adjoining the Reserves were tribal tenure and land use would continue) were created "within which Africans alone could purchase land, with the quid pro quo that they could no longer buy land in the better-situated European areas" (Palmer, 1977a, p. 236)[53].

The biases against the African farmers were again evident. Many of the NPAs were either malarial, or too distant from markets, or lacked water, or had already been occupied by natives that had left overcrowded Reserves (Palmer, 1977b, p. 198, 213, 255)[54]. The situation was not different in the Reserves. In 1926, policies of development of the Reserves were introduced. But these were far too modest to compensate for the discriminatory policies in favour of European farmers or to generate an agricultural revolution in the Reserves[55].

The role of industry

Several amendments followed after the 1930 Land Apportionment Act. The most important was the 1950 Land Apportionment Amendment Act. By then, the population pressure in the Reserves led the government to reduce the NPAs to provide more Reserve land. These new lands, called Special

[51] The Commission also dismissed the evidence provided by Native Commissioners, and also falsely reported the recommendations were acceptable to the Native Department (examples on Palmer (1977b, pg.119-120)). This Commission also saw no reason to "disturb" the Shona by informing them of the expropriation being planned.

[52] In the debate over the convenience of segregation of land ownership different groups supported the idea for different reasons. European farmers' racial prejudice and fear of competition from African farmers led them to embrace the idea. The Native Department saw it as the only politically feasible option to encourage individual tenure for Africans. Something similar occurred with Missionaries and African Associations, who noted "the fact that Africans were being prevented from buying land on the open market and a [feared] that (as in South Africa) they would end up with very little land" (Palmer, 1977b, p. 141).

[53] The Act also set a deadline for the abolition for rent-paying agreements on European farms in 1937 (this date was later amended). From then on, only labour agreements would be allowed and absentee landowners would be forced to sell or develop their land. It also set aside some Unassigned Areas for allocation at a later date.

[54] Similarly, Unassigned Areas set apart "totaled 17.793,300 acres, of which all but 2,300,000 acres were later stated to be either infested with tsetse fly or deficient in water" (Floyd, 1959, p. 85)

[55] Palmer (1977a, p.218) notes that in 1936-7, the government voted £13,546 to be spent for African agriculture and £262,956 for European agriculture. In 1940, the numbers were £14,107 compared to £208,127. Also, regulation such as the 1934 Maize Control Amendment Act was set in place which discriminated against African maize growers.

Native Areas, "in reality they were simply additions to the Native Reserves. Sizable acreages were also acquired from European land and reclassified as Special Native Areas" (Floyd, 1962, p. 579).

But perhaps more important than this was the adoption one year later of the Native Land Husbandry Act (NLHA). The stated aims were to replace the traditional system of native land tenure under chief control with a system of individual tenure under government control and to promote "good" husbandry. At this point, the role of the industrial urban sector was already playing an important role, as the official discourse reveals:

> "Grave problems flow from crowded and stagnant communities scraping a bare existence from the exhausted countryside, and spilling as an inefficient migrant labour force into industrial centers many miles from their homes and families" (cited in Floyd (1959, p. 114)).
>
> "The time has come when all indigenous natives can no longer continue to maintain a dual existence as part-time employment in the European areas and part-time farming in the Native reserves for, apart from its impossibility, it does not conduce to efficiency in either area" (cited in Alexander (2006, pg.46)).

Thus emerged the NLHA, conferring individual rights in the Reserves to eligible farmers (essentially, peasants who under tribal tenurial conditions were cultivating land or had land under crops during the preceding growing season).

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