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# Revisiting the Democracy-Private Investment Nexus: Does Inequality Matter?

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## Abstract

Contrary to the predictions of a large theoretical literature, recent cross-country evidence suggests autocracies can generate statistically indistinguishable levels of private investment compared to democracies. We argue that the previous exclusion of inequality explains part of this puzzle. We model current investment as a function of investors' beliefs about future tax rates, which are conditioned by the constraints on the Executive in setting tax rates and expropriating tax revenues. In democracies, where tax rates reflect the preferences of the median voter, investment declines with rising inequality. In autocracies, investor beliefs about future tax rates reflect the relative power of Elites compared to the Executive. As inequality rises, the increased resources available to Elites constrains the Executive's ability to expropriate more tax revenues. The heterogeneous determinants of investor beliefs can explain the observed pattern of investment across regime types. We first test our predictions at the macro-level with cross-country macroeconomic data. We then test the behavioral underpinnings of our model with a novel laboratory experiment showing how inequality affects individual-level investment behavior dependent upon regime type. Results from both types of analyses show that when inequality is taken into account autocracies can generate similar levels of investment to democracies.

*Keywords:* Political Regimes, Investment, Inequality, Credible Commitments, Laboratory Experiment

*JEL:* C91, E22, O10, P16, P48

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## 1. Introduction

Both theory and evidence show that private investment is important for economic growth (Acemoglu 2008; Solow 1956). Given the vast disparities in economic development across countries, a large theoretical literature has sought to explain how political institutions affect private investment incentives. This work focuses on how political institutions enable leaders to make credible commitments regarding confiscatory taxation of private investment (Acemoglu et al. 2005; North 1990). When there is uncertainty regarding taxation in the future, the incentive of private citizens to invest in the present falls. In democracies, political institutions, such as independent judiciaries and electorally-accountable legislatures and executives, positively affect incentives through their ability to provide a credible constraint on future confiscatory taxation by opportunistic leaders (Weingast 1997; Persson and Tabellini 1994).

Conversely, the absence of meaningful institutions in autocracies is argued to limit the ability of dictators to credibly signal future restraint, thus negatively affecting private investment. This view that electoral accountability is the primary difference across regime types in solving commitment problems is summarized by Acemoglu, Johnson, and Robinson (2005: p429) when they imagine a dictator who: “promises he will obey the rules of democracy, so that individuals can undertake the same investments as they would in democracy. This promise would not necessarily be credible. As long as the political system remains a dictatorship, there is no higher authority to make the dictator stick to his promise.”

The view that democracies are better for private investment, however, is not supported empirically since autocracies and democracies have statistically indistinguishable levels of private investment (Gehlbach and Keefer 2011)<sup>1</sup>. Furthermore, this institutional argument fails to explain the enormous heterogeneity in private investment observed in autocracies (Gehlbach and Keefer 2012). Even within the extensive literature investigating the effects of regime type on the determinants of Foreign Direct Investment (FDI), there is no consensus on the mechanisms by which domestic institutions explain FDI incentives<sup>2</sup>.

The inability to explain these patterns is partly due to the relative paucity of theoretical work investigating the mechanisms by which autocrats successfully foster private investment. The last decade, however, has witnessed rising interest in the politics of autocracies. A common strand of the formal literature investigating various political processes in dictatorships, such as authoritarian institutions (Boix and Svolik 2013; Gandhi 2008; Myerson 2008), focuses almost singularly on how autocrats resolve the commitment problems inherent to autocratic rule<sup>3</sup>. Unlike in democracies, formal institutions in autocracies are more easily subverted and there exists no higher authority to credibly punish opportunistic behavior. Weakly-institutionalized settings may also shorten the time horizon of autocratic leaders, which dampens private investment incentives (Oechslin 2010). As

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<sup>1</sup>The related literature on whether democracy even leads to greater taxation also remains ambiguous. While some scholars find a positive relationship (Acemoglu et al. 2014), others find no relationship (Profeta et al. 2013).

<sup>2</sup>See Pandya (2016) for a survey of this large literature.

<sup>3</sup>See Gehlbach et al. (2016) for a survey of this formal literature.

a result, the few studies investigating investment in autocracies focus on how political institutions promote private investment through their ability to foster collective action among elites and enhance their capacity to punish opportunistic behavior (Gehlbach and Keefer 2011).

We contribute to this debate by showing how inequality is an overlooked determinant of investment across regime types. Specifically, we argue that inequality affects investment incentives differently in each regime type. In democracies, rising inequality affects the preferences of voters for greater redistributive taxation, thus harming investment incentives. By comparison, in regimes where the relative power of elites plays a more important role in constraining the leader, we argue that rising inequality affects the resources available to elites to challenge the executive. Hence, in autocracies investment could be rising in inequality.

We consider this intuition further by modeling the decision process of individual investors over a range of regime types. Individual-level investment is a function of beliefs over future tax rates. When investors believe future tax rates will rise, they substitute away from investment. The investors' assessment of future tax rates are in turn determined by their beliefs of the preferences of and constraints on the tax setter. Like Gehlbach and Keefer (2011) and Guriev and Sonin (2009), we also conceive of the equilibrium tax rate as an outcome of a bargaining process between the Executive and other actors in a polity. Yet, unlike these models, which solely focus on investment and expropriation as an outcome of bargaining between the Elites and an autocratic leader, we model it as process of bargaining between the Executive, the Elites and the Masses across different regime types. The regime type determines the relative power of each actor.

We model the political process that determines the level of investment in an economy as a multi-stage strategic interaction as follows. In the first stage, investors allocate their endowments between immediate consumption and investment. In the second stage, the tax rate on gross returns to investment is determined through a bargaining process between the Masses and the Executive. The bargaining power of the Masses is determined by how democratic the regime is. In the third stage, the Executive chooses how much of tax revenues to expropriate. The remaining tax revenues are used for public investment, which enhances the payoff to the Masses and the Elites. In the next stage, the Elites can challenge the Executive over the rate of expropriation. The likelihood that the Elites win the political conflict against the Executive increases with the economic resources of the Elites.

Critically, inequality affects the beliefs of investors in two distinct ways. First, rising inequality increases the incentive of the Masses to support raising the tax rate. Second, rising inequality increases the aggregate economic resources at the disposal of the Elites, which affects the relative power of the Elites vis-a-vis the Executive. The relative effectiveness of these two channels depends on the institutional constraints that a political regime puts on the Executive. In more democratic regimes, the Executive is institutionally constrained from deviating too far from the preferred tax rate of the median voter of the Masses. As inequality rises, investors believe the median voter will vote to increase taxes, which causes investors to substitute away from investment. In autocracies, investors' beliefs reflect the ability of the Elites to restrict expropriation by the Executive. Rising inequality in turn provides greater resources for the Elites to punish the Executive for expropriating too much. As with Gehlbach and Keefer (2011), if the Executive expropriates too much, the Elites

can attempt to replace the Executive. Hence, autocratic countries in which the Elites have more power vis-a-vis the Executive can lower the rate of expropriation and therefore sustain higher levels of investment in equilibrium.

This approach yields a previously overlooked insight: regime type and inequality *jointly* condition private investment. Once inequality is included, we specify conditions under which democracy can have greater, similar, and inferior levels of private investment. This argument can also account for the observed cross-country pattern of similar *average* investment levels across regime types, albeit with much higher variance in dictatorships.

We test the predictions of this argument using both cross-country panel data and individual-level experimental data. Using cross-national panel data, we find that private investment indeed declines with rising inequality. Interestingly, we observe that investment increases with rising inequality in autocracies. While investment is greater in democracies at low levels of inequality, this difference vanishes at commonly observed levels of inequality. Furthermore, in autocracies with higher levels of inequality, we observe statistically greater levels of investment.

Given that theory predicts that institutions should affect investment incentives at the *individual level*, we then test these arguments using experimentally-generated individual-level data. In a laboratory setting, we create a stylized, context-free, economy where groups of subjects simultaneously take part in an experiment. Participants earn money and then face trade-offs between investment and consumption in two different regime treatments: Democracy and Dictatorship.

In each treatment, subjects determine how much of their resources they want to invest, which receives a return to investment but which is also subject to taxation. In the Democracy treatment, the tax rate is determined by the preferences of the median voter, and tax revenues are redistributed equally to each subject. In the Dictatorship treatment, the tax rate applied to investment is determined by a randomly-selected subject, whose earnings in this treatment are determined solely by the amount this tax-setter is able to extract via taxation. In both treatments, this process of investing is repeated for at least 16 periods, and returns from one period carry over into the next, allowing each subject to accrue wealth. The dynamic nature of this experiment, and the variation across subjects in the ability to accumulate wealth, also means that group inequality varies from period to period. This allows us to test the joint conditional effect of regime type and inequality on individual-level investment.

While we describe our specific hypotheses, experimental design, and results in more detail below, we find that the experimental results are nearly identical to that observed using cross-country panel data. Both treatments engender similar and sustained levels of investment. As predicted, we find inequality strongly conditions investment in the Democracy treatment and investment declines with rising inequality. We also find as inequality rises in Dictatorships there is a *positive* and significant relationship with investment. Taking both empirical approaches and results together, we find that the advantages of voting for fostering private investment diminish as inequality rises, and that some autocracies can foster private investment at rates similar to democracies.

Our contribution is twofold: first and foremost, we suggest that inequality may be an important ‘missing link’ in explaining how regime type affects private investment. Second, we tackle this issue from many angles, by using theoretical, experimental and empirical methods to provide evidence

that regime type and inequality conjointly determine private investment. The rest of this paper is organized as follows. Section 2 presents the model and its empirical implications. In Section 3, we test the argument using cross-country panel data. Section 4 describes the experimental design to test these hypotheses and the findings. We provide a brief discussion of some implication of our results in Section 5. Finally, in Section 6 we conclude.

## 2. A Model of Investment Under Different Regime Types & Changing Inequality

Our theoretical framework analyzes the relationship between private investment and inequality across a range of political regimes and varying inequality. Each regime is headed by an *Executive*, and we characterize variation in regime types by the constraints the Executive faces in setting tax and expropriation rates, respectively, on money allocated by citizens to private investment. The tax rate on investment determines the amount of tax revenues, which we call public funds, collected; and the expropriation rate determines the amount of public funds the Executive expropriates for herself. In the extreme case of a full Dictatorship, the Executive is unconstrained in setting both the tax and expropriation rate. On the other extreme, in a full Democracy, the Executive plays no role in the determination of the tax rate; moreover, she cannot expropriate any of the public funds. In all regime types in between these two extreme cases, the Executive’s power in determining the tax and the expropriation rate, respectively, is determined by the relative power of two other actors—the *Masses* and the *Elites*.

We start with an economy with a Executive and a continuum of investors of unit mass. We assume the investors are indexed by  $i$ , uniformly distributed over  $[0, 1]$  and all investors are “small” (i.e., the marginal contribution of each investor to the aggregate outcomes is zero). Each investor has initial capital,  $K_i$ , to be allocated between consumption and investment. The distribution of capital is determined by the inequality parameter  $\lambda \in (0, 1)$  as follows: the endowment of capital of each investor  $i \in [0, 1]$  is:

$$K_i = \frac{1}{1-\lambda} i^{1-\lambda}. \quad (1)$$

The capital endowment distribution follows a power law, which captures the unequal distribution of wealth. As we increase the parameter  $\lambda$ , the endowments are exponentially transferred from investors with lower endowment to those with higher endowment at the rate of  $\frac{\lambda}{1-\lambda}$ . The top- $\delta$  percentile of investors are called the “Elite” investors throughout the model and the total endowment of the Elite investors increases with inequality  $\lambda$ . Let  $\bar{K}_\delta = \int_\delta^1 K_i di$  denote the measure of the economic power of Elite investors denoted by their total capital share, which also contributes to their political power.

We distinguish between two types of political agents that enter into distinct bargaining processes with the Executive: the Masses and the Elites. We assume that the number of investors in an economy constitutes the Masses, whose main political function is to bargain with the Executive in the determination of the tax rate (and therefore the amount of tax revenues). The top  $\delta$ -percentile of the investors, the Elites, has a second political function: the Elites represent a political threat to the Executive in the event she expropriates too much of the tax revenues. We assume that the Elites’

constitute a small minority of the Masses (i.e.,  $\delta < 0.5$ ). Because they comprise a small minority of the masses, their primary influence on the political process is the constraint they impose on the Executive's rate of expropriation.

Each investor chooses to allocate her endowment  $K_i$  between investment  $I_i$  and immediate consumption  $K_i - I_i$ . Immediate consumption gives the payoff  $(K_i - I_i)^{\sigma_C}$ , where  $\sigma_C \in (0, 1)$  is the common risk-aversion parameter of the investors. Investment leads to a net return,  $r \in (0, 1)$ . Aggregate investment  $I$  is defined as  $\int_0^1 I_i di$ . After the return to investments are realized, the gross return to investment  $(1+r)I_i$  is taxed at rate  $\tau \in [0, 1]$ . Each investor then receives  $(1-\tau)(1+r)I_i$  after-tax gross return to investment.

The tax rate is a result of a bargaining process between the Executive and the Masses. Aggregate tax revenues  $\tau(1+r)I$  can be expropriated by the Executive at rate  $\gamma \in [0, 1]$  of the total public funds. The non-expropriated public funds are allocated towards public investment, which produces  $((1-\gamma)\tau(1+r)I)^\alpha$  for some productivity parameter  $\alpha \in (0, 1)$ . We allow for the possibility that the public investment is progressive; that is, the low endowment investors benefit more from the public investment (i.e., non-expropriated public funds). To capture this type of redistribution in the simplest way, we assume that individual,  $i$ , benefits from public investment at the rate  $((1-\gamma)\tau(1+r)I)^{\frac{\alpha}{K_i}}$ , which is inversely proportional to her capital endowment,  $K_i$ .

In the first stage of the game, each investor,  $i$ , chooses how much of the endowment,  $K_i$ , to allocate between immediate consumption and investment as follows:

$$\max_{I_i \in [0, K_i]} (K_i - I_i)^{\sigma_C} + ((1-\tau)(1+r)I_i * ((1-\gamma)\tau(1+r)I)^{\frac{\alpha}{K_i}})^{\sigma_C}, \quad (2)$$

where  $\sigma_C$  parametrizes the risk preferences of the investors such that  $1 - \sigma_C$  equals the relative risk aversion of each investor. The second term in the investors' payoff function is the gross return to investment given the public investment level, which is determined both by the tax rate,  $\tau$ , and the expropriation rate,  $\gamma$ .

After individuals allocate resources towards investment, the tax rate,  $\tau$ , is determined and applied to aggregate investment. We assume that the tax rate is a result of a bargaining process between the Masses and the Executive, where the bargaining power of the Masses is determined by the institutional constraints that the Executive is subject to. Let  $\theta \in [0, 1]$  denote the bargaining power of the Masses vis-a-vis the Executive. Therefore, the tax rate, as the outcome of any public policy, is determined through a Nash Bargaining process as follows:

$$\max_{\tau} (\tau - \tau_{DEM}^*)^\theta (\tau - \tau_{DICT})^{1-\theta}, \quad (3)$$

where  $\tau_{DEM}^*$  is the tax rate that would be picked by the Masses in a full democracy, and  $\tau_{DICT}$  is the tax rate that would be picked by the Executive in the political regime characterized by the constraints  $\theta=0$ . The resulting tax rate of this bargaining process is then given simply as:

$$\tau^* = \theta\tau_{DEM}^* + (1-\theta)\tau_{DICT}. \quad (4)$$

In a full democracy (i.e.,  $\theta=1$ ), the tax rate is the one that is preferred by the majority of the

investors. Each investor would prefer the tax rate that maximizes the gross return to investment; that is, each investor,  $i$ , solves:

$$\max_{\tau_i} (1 - \tau_i)(1 + r)I_i * ((1 - \gamma)\tau_i(1 + r)I)^{\frac{\alpha}{K_i}} \quad (5)$$

for calculating her preferred tax rate.

In any regime other than the full democracy, the Executive has some power in determining the tax rate. Her optimal public sector configuration, the tax rate, the expropriation rate, and the public investment level, is determined through maximizing her expected payoff as described below:

$$Prob(\gamma, \bar{K}_\delta, \theta)u_D(\beta, \alpha, r, \gamma, \tau, I) + (1 - Prob(\tau^*, \bar{K}_\delta, \theta))0, \quad (6)$$

where  $Prob(\gamma, \bar{K}_\delta, \theta)$  is the probability that the Executive is able to hold onto office after her public policy decisions. We assume that this probability is inversely proportional to the economic power of Elite investors. That is, as the Elites accumulate more economic power, they pose a greater threat to the Executive's ability to remain in power. If the Executive is removed from office, she cannot access the rents from power, which we assume results in a payoff that is normalized to 0. Here we assume that the expropriation rate is the main issue in the bargaining between the Executive and the Elites; therefore, the probability of regime stability does not depend on the tax rate but only on the expropriation decision of the Executive.<sup>4</sup> The probability that the Executive retains office is defined as below:

$$Prob(\gamma, \bar{K}_\delta, \theta) = (1 - \gamma)^{\frac{\theta \bar{K}_\delta}{1 - \bar{K}_\delta}}. \quad (7)$$

The probability function captures in a straightforward way how economic power of the Elites and the institutional constraints jointly influence the political cost of expropriation by the Executive. First, note that:

$$\frac{\partial Prob(\gamma, \bar{K}_\delta, \theta)}{\partial \gamma}, \frac{\partial Prob(\gamma, \bar{K}_\delta, \theta)}{\partial \bar{K}_\delta}, \frac{\partial Prob(\gamma, \bar{K}_\delta, \theta)}{\partial \theta} < 0,$$

so that the amount of expropriation, economic power of the Elites, and the institutional constraints reduce the probability that the Executive remains in power. Moreover, it becomes nearly impossible for the Executive to expropriate and retain power the higher the Elites' share of the economy's aggregate capital endowment. Finally, when there are no constraints (i.e., when  $\theta = 0$ ) the probability that the Executive holds onto power is equal to one.

The rents from expropriation  $u_D(\beta, \alpha, r, \gamma, \tau, I)$  not only depend on her public policy choices,  $\gamma$  and  $\tau$ , but also on the institutional constraints,  $\theta$ , and her personal preferences. The Executive's personal preference on the allocation of the public funds is parametrized by  $\beta \in (0, 1)$ .  $\beta$  represents how much the Executive prefers to prioritize personal gain over the public investment. Hence,  $1 - \beta$  measures how much the Executive prioritizes public investment and public welfare over her private

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<sup>4</sup>We follow Svolik (2012) in separating the Executive's relationship with the Masses from that with the Elites.

benefit<sup>5</sup>

The payoff to the Executive from expropriation takes the following form:

$$u_D(\beta, \alpha, r, \gamma, \tau, I) = ((\gamma\tau(1+r)I)^\alpha)^\beta ((1-\tau)(1+r)I * ((1-\gamma)\tau(1+r)I)^\alpha)^{1-\beta}. \quad (8)$$

While the Executive prefers to choose the expropriation rate,  $\gamma$ , as high as possible, her benevolence induces a trade-off between personal gain and the well-being of the public. Second, she is also constrained by the institutions within which she operates (i.e., constrained by the value of  $\theta$ ). Moreover, the Elites might also punish the Executive for excessive expropriation. The Executive solves the following optimization problem for the optimal expropriation rate of the public funds:

$$\max_{\gamma} Prob(\gamma, \bar{K}_\delta, \theta) u_D(\beta, \alpha, r, \gamma, \tau, I) \quad \text{subject to} \quad \gamma \leq 1 - \theta, \quad (9)$$

Similarly, the tax rate  $\tau_{DICT}^*$  that the Executive would choose is determined as the solution to the payoff maximization problem of the Executive as follows:  $\max_{\tau} u_D(\beta, \alpha, r, \gamma, \tau, I)$ .

The sequencing of the game described above is therefore: 1) Investors decide on the individual investment levels by solving the maximization problem given in equation (2), which in turn determines the aggregate investment level. 2) Each investor and the Executive determines and supports her optimal tax rate. The tax rate is determined through a Nash bargaining process between the Masses and the Executive as described in equation (4). The tax rate and aggregate investment determine the amount of public funds collected through taxation. 3) The Executive chooses the expropriation rate that determines the allocation of public funds between her personal gain and the public good level. 4) The Elite investors are informed about the expropriation rate, which results in a probabilistic conflict between the Executive and the Elite investors. The payoffs are distributed according to the outcome of the conflict.

A more complete version of the analysis and a formal statement of the results are in the Appendix; however, we characterize our main finding regarding the relationship between inequality and investment as follows:

**Proposition 1.** *As the political regime becomes more democratic (i.e., when the institutional constraints are high), the expropriation rate by the Executive does not change with inequality. Increasing inequality leads to higher rates of taxation on investment, which increases investment incentives. As*

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<sup>5</sup>Our parametrization of the Executive's preferences is flexible enough to allow for the case in which the Executive cares only about her own personal gains. Our main result regarding the relation between inequality and investment remains qualitatively same as  $\beta$  varies. On the other hand,  $\beta$  captures factors that are not included in our model but possibly cause an additional empirical variation in the investment rate. For example,  $1 - \beta$  can be interpreted both as "altruism" of the Executive and as a reduced-form expression of her "long-term" concerns. In a dynamic capital accumulation scenario, expropriation and taxation reduces the accumulated capital in the hands of private investors, which reduces the amount of taxable investment in the next period. Therefore, an Executive which expects to hold office for an extended period has incentive to reduce the current size of tax revenues to foster greater future tax revenues. In this case, the Executive's taxation decision would be determined by her time preferences. Equating our benevolence measure  $1 - \beta$  to the valuation of the Executive of the future periods would produce identical results for a simple two-period extension of the game described here. Furthermore, any extensions to any finite number of periods would work similarly.

*the political regime becomes more authoritarian, the rate of expropriation decreases with inequality, which increases investment incentives. The tax rate on investment does not change with inequality.*

Proposition 1 provides a nuanced story about the relation between investment and inequality. Inequality has a non-monotonic effect on the equilibrium net return to investment for political regimes that are characterized by rigid institutional constraints (i.e., ones closer to full democracy). First, note that when inequality is extremely low, any gradual increase in inequality leads to a relative increase in the capital endowment of the median investor. Since the main political determinant of the net return to investment is the median investor's preferred tax rate for highly democratic regimes with rigid institutional constraints, an increase in inequality at low inequality levels indeed may decrease the tax rate and increase the investment level. However, when economic inequality is high enough, majoritarian determination of the tax rate implies a negative relationship between inequality and private investment.

For regimes that are characterized by lower institutional constraints on the Executive (i.e., more autocratic), the primary channel through which inequality affects private investment incentives is increasingly through the rate of expropriation chosen by the Executive, and less through the affects of tax rates. As inequality rises, the total capital endowment held by the Elites increases. This in turn reduces the ability of the Executive to ensure her hold on power in the event of a challenge by the Elites. Therefore, inequality plays a critical constraining role on the incentives of the Executive in more autocratic regimes to expropriate more tax revenues.

### *2.1. Hypotheses*

Our model has several interesting implications for private investment. For one, all regime types can sustain positive levels of private investment in equilibrium. Moreover, private investment levels vary significantly by regime type and inequality. This leads to a number of testable implications. First, in democracies, the main channel by which rising inequality affects private investment is through the median voter's incentive to increase taxation on the rich. That is, rising inequality leads to increases in the rate of taxation, which negatively affects individual-level investment incentives. Hence, we expect:

**Hypothesis 1.** *As inequality rises in democracies, individuals will allocate fewer resources towards private investment.*

In more autocratic regimes, we find that inequality affects the political process both through taxation and expropriation by increasing the ability of Elites to constrain the Executive. Therefore, as regimes become more autocratic, the relationship between inequality and investments is highly contingent (i.e., the correlation between inequality and investment can be positive, negative or uncorrelated). However, the average net effect of inequality on investment remains unclear. We expect that the tax-increasing and expropriation-restricting impacts of inequality to cancel each other out for many of the relevant examples. Therefore, we are going to test the following hypothesis:

**Hypothesis 2.** *On average, investment should not vary with inequality in dictatorships.*

When combining the intuitions behind Hypotheses 1 and 2, we can expect that as inequality increases, declining investment in democracy is greater than that which occurs in dictatorships. Indeed, our model predicts that investment should be higher in dictatorships than in democracies at most levels of inequality. Therefore, the following hypothesis is also consistent with our model:

**Hypothesis 3.** *At higher levels of inequality, private investment in democracies can be similar to or lower than levels occurring in dictatorships.*

### 3. Cross-Country Macroeconometric Analysis

We first use cross-country panel data to investigate our argument that regime type and inequality jointly condition investment. Our panel consists of annual data from 1990 to 2012. The period under examination was determined by data availability, and in particular, the availability of country-level inequality data and various controls.<sup>6</sup> We use two different country-level measures of the extent to which countries are fostering private investment as dependent variables, each of which was located in the World Bank’s World Development Indicators (WDI) database. Specifically, our two measures of country-level investment are *Total Gross Capital Formation/GDP* and *Private Investment/GDP*, respectively. While the latter is more in line with our theory, data availability of the former measure is much more extensive.

To measure the relationship between democracy and private investment and whether democracies engender greater levels of investment than dictatorships, we use the Boix et al.’s (2013) dichotomous measure of whether a country was democratic in each year of our sample. We check the robustness of this measure by separately using the Polity IV measure of regime type, which measures regimes on a scale of -10 to 10 from most autocratic to most democratic. While the former variable is easier to interpret, the Polity IV measure may be closer to our conception of a spectrum of regime types.

To measure inequality, we use two variables from the Standardized World Inequality Indicators Database (Solt 2009). First, *GiniMARKET*, measures a country’s Gini coefficient of income inequality that is generated by market activities prior to taxation and transfers. The second inequality variable, *GiniNET*, measures income inequality net of transfers and taxes. We run each specification with *GiniMARKET* and *GiniNET* separately.

We control for a number of variables identified in the political economy literature as being correlated with a country’s ability to foster private investment (Gehlbach and Keefer 2012). The expected rate of return to investment has been cited to influence investment levels, and we proxy for this with two covariates. First, we control for the overall level of capital by controlling for the log of *GDP per capita*. Second, we proxy for changes in the rate of return by including the rate of *GDP Growth*. We also expect that countries with higher rates of taxation should be correlated with lower private investment. We proxy for tax rates by including a measure of the *total tax revenues/GDP*. We also include two demographic variables that may capture the attractiveness of a country to

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<sup>6</sup>If we extend to panel to 1980 or 1970, the number of countries in the sample drops by 40% and 50%, respectively.

investment: *percent of population under 15 years old* and *total population*. We also include the logged value of a country’s size to proxy for various natural endowments and investment requirements. Each of these covariates was located in WDI database. Finally, greater social fractionalization has been posited to lower investment, and, therefore, we include the [Alesina et al. \(2003\)](#) measures of social fractionalization, as well.

### 3.1. Sample Trends

We begin by illustrating the relationship between inequality, as measured by *GiniMARKET*, and private investment, as measured by *Total Gross Capital Formation/GDP*, in a sample of countries.<sup>7</sup> We chose the countries with the world’s four largest economies, three of which are classified as democracies throughout the sample (Germany, Japan and the US) and one of which is a dictatorship throughout (China). Lastly, we chose one additional dictatorship, Cote D’Ivoire, which had declining inequality and whose data was available for the entire period. The top panel plots the raw bivariate correlation between investment and inequality in each country. The bottom panel of Figure 1 shows the time trends of investment and inequality in each country between 1970 and 2012. The prediction of Hypothesis 1 that investment should fall when inequality rises in democracy largely occurs in each of the democratic countries. In contrast to the inverse relationship observed in the three democracies, investment in the two non-democracies largely moves in parallel with changes in inequality, both positively (China) and negatively (Cote D’Ivoire). These unconditional relationships provide interesting illustrations of our arguments, which we now subject to econometric analysis.

### 3.2. Estimation Strategy and Results

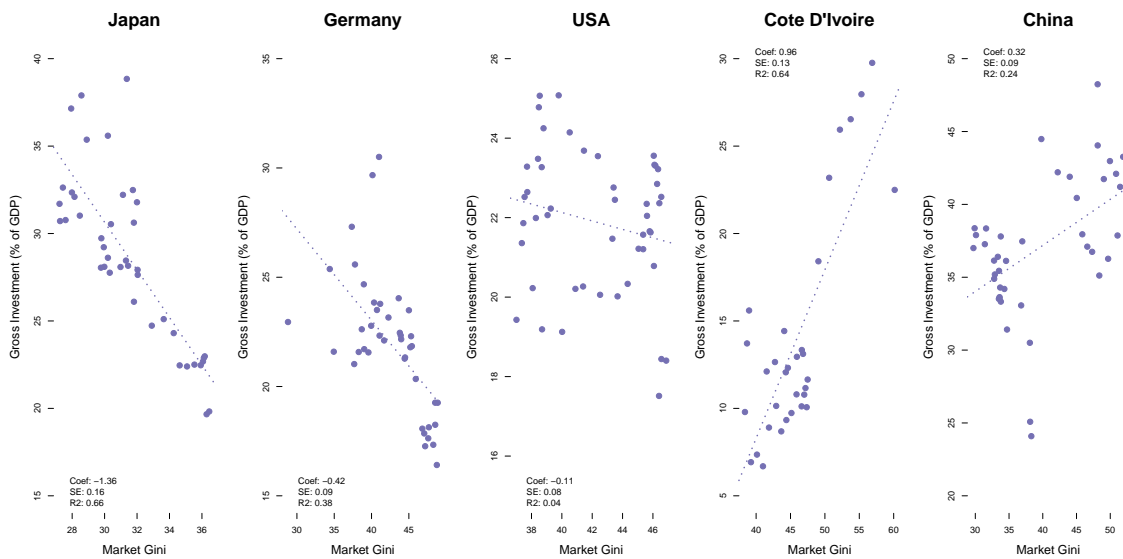
Our primary estimation strategy for measuring the conditional effect of regime type and inequality on individual investment is represented by the following equation:

$$Y_{it} = \alpha_i + \beta_1 Democracy + \beta_2 Inequality + \beta_3 Democracy \times Inequality + \lambda \bar{Z}_{it} + \delta_t + u_i + e_{it}$$

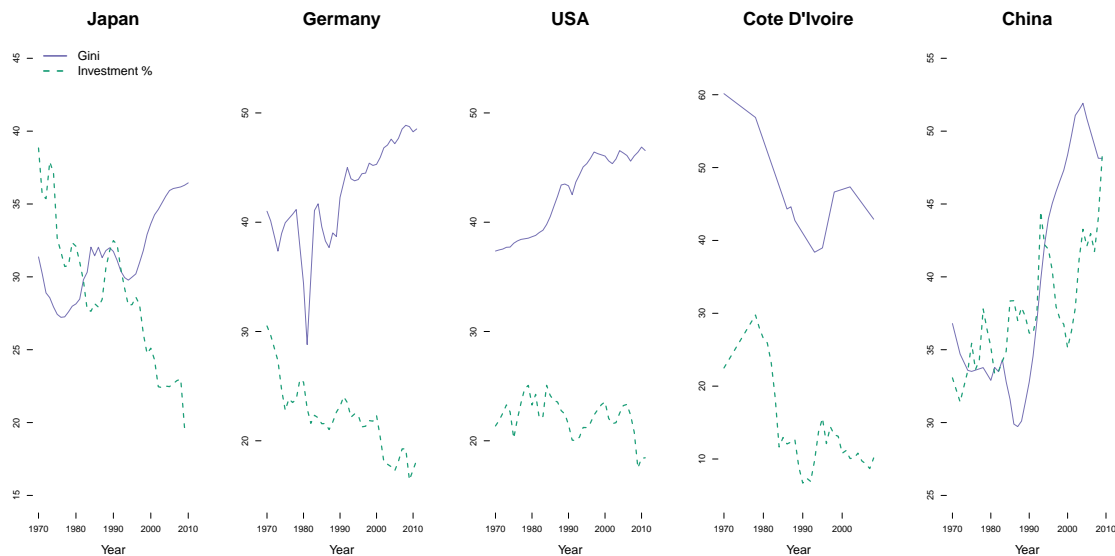
where  $i$  indexes each independent country and  $t$  indexes time in years. The model includes country fixed effects, which is denoted by  $u_i$ , and year fixed effects, which is denoted by  $\delta_t$ .  $Z$  represents a vector of control variables discussed previously. The dependent variable is a country-level measure of investment per year. To measure the effect of regime type on investment, we include in each model specification a dummy variable that indicates whether the country is a democracy in a given year. This allows us to test whether democratic regimes engender greater private investment. Our coefficient of interest,  $\beta_3$ , is an interaction of the regime dummy and country-year inequality, which captures whether political regimes and inequality jointly influence investment. This interaction allows us to test each hypothesis. At low levels of inequality we expect to observe more investment in democracies than in non-democracies. As inequality rises, we expect investment to fall in democra-

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<sup>7</sup>We chose *Total Gross Capital Formation/GDP* because it is available for a longer range of years for each country in our sample.



(a) Inequality & Investment Correlations



(b) Inequality & Investment Over Time

Figure 1: Correlation and Trends in Inequality and Investment in 5 Countries

Figure 1 shows the relationship between inequality and investment across five countries: three well-established Democracies (Japan, Germany and the United States) and two non-democracies (Cote D'Ivoire and China). Figure 1(a) shows the correlations between our two variables of interest (inequality and investment) while Figure 1(b) shows how these two factors vary over time.

cies. Therefore, at high levels of inequality we expect both regime types to foster similar levels of investment.

As is standard with cross-national panel studies for mitigating serial correlation, the standard errors are clustered at the country level. While including country fixed effects is crucial for controlling for time-invariant factors across countries, this approach may underestimate the effect of our interaction term when using variables that change little over time within countries. In particular, this is true of the dichotomous regime measure explained below, as 70% of countries remained classified as either democratic or non-democratic throughout the sample. Therefore, we also reran each specification using a random effects model and find that the estimates for the coefficient on our interaction term are very similar to those estimated with country fixed effects.

Table 1 reports our findings. First, the coefficient on *Democracy* is positive and significant. This is consistent with the view that democracies are able to foster statistically greater levels of private investment. More germane to our hypothesis, the estimates on the coefficient of the interaction between *Democracy* and *Gini* measures is negative and statistically significant at the 5 or 10% level for all dependent variables and across both fixed and random effect models. The estimate on the interaction term tells us that the marginal effect of democracy on investment becomes negative when *Gini* values are approximately 0.4.<sup>8</sup> This is consistent with **H1**, which predicts that private investment should decline with rising inequality.

To further test this hypothesis, we look at the difference between investment in countries coded as democracies and dictatorships at varying levels of inequality. Specifically, we use post-estimated simulations of investment at different levels of inequality to measure average magnitudes of the joint effect of regime and inequality on investment (King et al. 2000). Figure 2 shows the post-estimated predicted level of private investment (as a % of GDP) by regime type across various levels of inequality. Figure 2 shows a pronounced decline in private investment in democracies as the level of inequality rises. Interestingly, we observe that investment is sharply increasing with inequality in non-democracies. This finding is consistent with a prediction in which rising inequality strengthened the bargaining power of Elites vis-a-vis the Executive. While we cannot substantiate this mechanism with cross-national panel data, it provides suggestive evidence of why democracies do not engender significantly greater overall levels of investment.

The predicted substantive effect of these estimates are large. Within democracies an increase from the 25th to the 75th percentile of inequality is associated with a decrease of private investment of approximately 0.5% of GDP. The corresponding predicted effect for non-democracies is equal to an *increase* of private investment of roughly 1% of GDP.

Table 2 reports the estimates from the same model using Polity IV as our regime type variable. The estimates are more precise with Polity IV. It should be noted that both variables measuring regime type cross-nationally include many facets of political institutions beyond electoral accountability that may affect private investment incentives (e.g., variation in electoral systems, independent judiciaries, checks and balances). This is one reason why we now explore the micro-foundations of

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<sup>8</sup>Approximately 64% of the observed values for *Gini* were greater than this value.

Table 1: Regime Type, Inequality, and Investment

	Dependent Variable:			
	Gross Capital (% of GDP)		Private Capital (% of GDP)	
	(1)	(2)	(3)	(4)
Gini	0.270* (0.134)	0.259+ (0.155)	0.270+ (0.149)	0.236 (0.170)
Democracy	12.90** (4.894)	13.70* (5.267)	10.63+ (6.024)	12.12+ (6.614)
Gini × Democracy	-0.288* (0.120)	-0.304* (0.129)	-0.257+ (0.152)	-0.301+ (0.169)
Tax Revenue (% of GDP)	0.205* (0.0820)	0.238** (0.0879)	0.154 (0.154)	0.172 (0.184)
Log(GDP Per Capita)	-0.151 (0.693)	8.797* (3.372)	-0.493 (1.042)	5.097 (3.902)
Log(Population)	-0.0451 (0.574)	3.121 (4.760)	-1.227+ (0.653)	-1.591 (4.748)
Log(Land Area)	0.0162 (0.399)	-95.33+ (52.72)	0.252 (0.475)	11.68 (27.29)
% of Population < 15	-0.0600 (0.110)	0.273 (0.220)	-0.140 (0.118)	0.107 (0.266)
GDP Growth	0.343*** (0.0479)	0.281*** (0.0519)	0.141* (0.0580)	0.122+ (0.0636)
Ethnic Fractionalization	-3.031 (2.691)		-9.205** (3.168)	
Constant	9.974 (11.01)	1026.4 (663.8)	28.89* (12.70)	-158.4 (347.0)
Year Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	No	Yes
N	1544	1555	848	856
# of Countries	131	133	79	80
R <sup>2</sup> <sub>Within</sub>	0.201	0.242	0.175	0.186
R <sup>2</sup> <sub>Between</sub>	0.0971	0.00688	0.320	0.0591
R <sup>2</sup> <sub>Overall</sub>	0.111	0.00975	0.251	0.0190

Panel sample is from 1990 to 2012

Country clustered standard errors in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ 

This table presents the estimates of the the joint relationship between inequality and political regime on two measures of investment as collected by the World Bank. The coefficient of interest is reported in the row for Gini x Democracy. Inequality is measured by a countries gini coefficient of income inequality generated by market activities prior to taxation and transfers, while democracy is a binary variable constructed by [Boix et al. \(2013\)](#).

Table 2: Regime Type, Inequality, and Investment - Polity IV

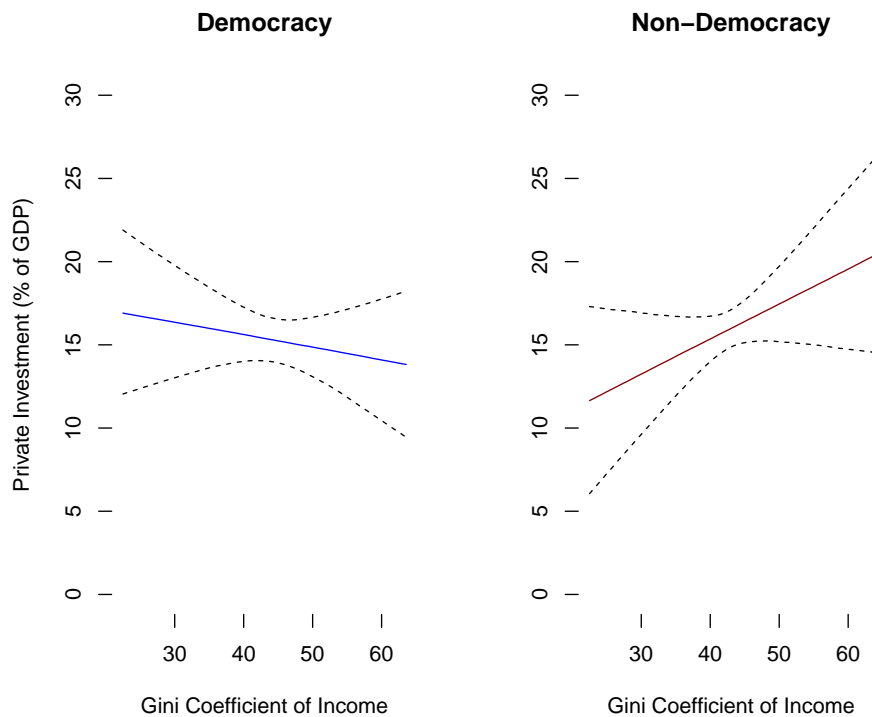
	Dependent Variable:			
	Gross Capital (% of GDP) (1)	Gross Capital (% of GDP) (2)	Private Capital (% of GDP) (3)	Private Capital (% of GDP) (4)
Gini	0.171 (0.105)	0.160 (0.127)	0.205+ (0.122)	0.181 (0.148)
Polity IV	0.965*** (0.280)	1.038** (0.323)	0.738* (0.338)	0.764* (0.352)
Gini × Polity IV	-0.0208*** (0.00581)	-0.0211** (0.00639)	-0.0161* (0.00789)	-0.0156* (0.00774)
Tax Revenue (% of GDP)	0.233* (0.105)	0.262* (0.113)	0.144 (0.169)	0.133 (0.213)
Log(GDP Per Capita)	-0.498 (0.702)	8.606* (3.466)	-0.691 (1.108)	4.610 (4.175)
Log(Population)	0.0338 (0.628)	4.743 (5.369)	-1.119+ (0.619)	-1.406 (6.189)
Log(Land Area)	0.00408 (0.411)	-152.6 (99.17)	0.285 (0.510)	72.94 (151.1)
% of Population < 15	-0.0849 (0.108)	0.308 (0.223)	-0.154 (0.123)	0.0605 (0.285)
GDP Growth	0.336*** (0.0446)	0.285*** (0.0488)	0.146** (0.0510)	0.127* (0.0561)
Ethnic Fractionalization	-3.275 (2.588)		-9.315** (3.002)	
Constant	16.46 (11.90)	1714.4 (1179.2)	31.51* (13.43)	-913.9 (1823.0)
Year Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	No	Yes
N	1472	1480	837	845
# of Countries	123	124	77	78
R <sup>2</sup> <sub>Within</sub>	0.185	0.226	0.160	0.171
R <sup>2</sup> <sub>Between</sub>	0.145	0.00371	0.336	0.0592
R <sup>2</sup> <sub>Overall</sub>	0.128	0.0122	0.262	0.0429

Panel sample is from 1990 to 2012

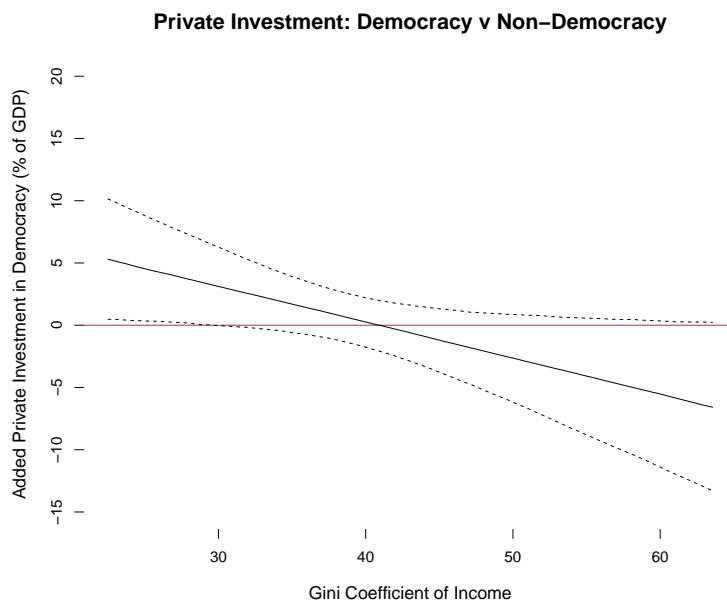
Country clustered standard errors in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

This table presents the estimates of the the joint relationship between inequality and political regime on two measures of investment as collected by the World Bank. The coefficient of interest is reported in the row for Gini x Polity IV. Polity IV measure of regime type, which measures regimes on a scale of -10 to 10 from most autocratic to most democratic. Inequality is measured by a countries gini coefficient of income inequality generated by market activities prior to taxation and transfers, while political regimes is measured by Polity IV.



(a) Predicted Private Investment Across Regime Types



(b) Added Predicted Individual Investment in Democracies

Figure 2: Cross-Country Results – Individual Investment, Regime Type, & Inequality

Figure 2(a) displays the post-estimated predictions with 90% confidence intervals of how private investment is related to inequality across regime types (Democracy (left) and Non-Democracy (right)) from regression (4) of Table 1, while holding all other variables at their means/medians. Figure 2(b) shows the expected difference of investment in democracies compared to the dictatorships as inequality rises from its minimum to maximum.

our hypotheses using regime type as a treatment in a laboratory experiment.

#### 4. Experimental Evidence

We now test the micro-level behavioral foundations of the fundamental intuition behind our model using a laboratory experiment. While the necessary limitations of a laboratory experiment require us to strip away many of the complications of our model and real life, there are two virtues to exploring our question with experimentally-generated data. First, accurately measuring inequality and political regime types cross-nationally and over time is riddled with measurement error that makes interpretation difficult. Second, our model presumes that regime type and inequality jointly affects aggregate investment through its influence on *individual-level* incentives. Experimental approaches allow us to explore our question at the appropriate level of analysis. Our experimental design resembles those in the literature investigating whether democracies choose efficient institutions and policies<sup>9</sup>. We are unaware of any experiment, however, that tests the joint effects of determining the tax rate by voting and inequality on individual-level investment behavior.

##### 4.1. Experimental Design

To test our hypotheses at the appropriate theoretical level, we use a computer laboratory experiment to generate individual-level data on the tradeoff between investment and consumption. The experiment is designed to create a context-free economy in order to measure an individual's decision to "invest" or "consume" their income under different regime treatments and varying levels of inequality. The economy is comprised of a session of subjects who cannot communicate with one another, but whose individual decisions affect the investment incentives and payoffs of other subjects in the session. Specifically, we implement a mixed factorial design, as seen in Table 3, where sessions are assigned to one of two initial income distributions (Equal or Unequal). Subjects are then asked to decide how much of their earnings to invest within two regime treatments: a fully constrained Democracy where the tax rate on investment is determined by the median voter and an unconstrained Dictatorship where the dictator unilaterally sets the tax rate.

We chose this design for three reasons. First, our within-subject design allows us to measure how different regimes impact an *individual's* propensity to invest, rather than the average investment across different regimes. Second, since inequality is a group-level variable, it is a between-subject factor. Exogenously imposing different initial income distributions by randomly assigning sessions into one of two inequality treatments allows us to observe how different groups behave depending upon their level of inequality. This mixed factorial design is the crux of our identification strategy to measure the effects of regime type and inequality on individual-level investment behavior. Finally, laboratory experiments are best when they are simple. While our model predicts investment behaviors across a continuum of political constraints, an unconstrained dictator and fully

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<sup>9</sup>See Dal Bó (2014) for a survey of the experimental literature on the efficiency of democracy in selecting efficient institutions and solving social dilemmas. See Palfrey (2016) for a survey of the voluminous literature on voting experiments in political economy.

Table 3: Experimental Design

Initial Income Distribution	Regime Treatment	
	Setting A	Setting B
Unequal	Session 1 <sub>t</sub>	Session 1 <sub>t+n</sub>
Equal	Session 2 <sub>t</sub>	Session 2 <sub>t+n</sub>

constrained democracy reduces the complexity of the experiment while retaining the incentives of political regimes.

The experiment consists of three stages: an income distribution generating stage, and two investment stages with different regime treatments<sup>10</sup>. In the income distribution generating stage, subjects solve 50 math problems without the help of a calculator. The performance on the math test creates a rank ordering among subjects in each session. This rank ordering determines the initial amount of points each subject receives at the beginning of each period. We take this approach because recent experimental studies show that unearned wealth can alter subjects risk-taking behavior (Carlsson et al. 2013).

While the average number of initial points is the same across sessions, the difference in initial points across subjects within a session varies by whether the session is assigned into the Equal or Unequal initial-inequality treatment. Subjects in sessions assigned to the Equal treatment are separated according to their rank ordering by 2 points each. In the Unequal treatment, subjects are separated by 10 points. Following the conclusion of the math test, each subject is shown a graph that displays their initial points as well as the points of all other subjects. We call the amount of points each subject receives in each period due to their performance on the math test their “income.”

After the income-generating phase, the core of the experiment is simple: subjects decide the share of their points to allocate to investment in each period.<sup>11</sup> Specifically, every subject is asked what percentage, between 0 and 100, of their points they wish to invest. Invested points earn a rate of return, which randomly varies between 1 and 25 percent, and carries over from period to period. However, all points invested are also exposed to political expropriation by an endogenously determined tax rate in each period. Points not allocated towards investment face no risk of political expropriation, but do not earn a rate of return. Without taxation, subjects have a dominant strategy to invest all of their points every period. This would allow subjects to compound their earnings from period to period and produce the highest payout for each subject. We attempt to minimize end-of-experiment effects in two ways. First, participants are informed that their payout will be calculated by the average of their points from ten randomly selected periods from both treatments.<sup>12</sup> Second,

<sup>10</sup>The experiment was programed in z-Tree (Fischbacher 2007). See the Supplementary Appendix for a description of the experimental design, instructions and screen shots.

<sup>11</sup>We call each opportunity in which a subject makes an investment decision a “period”, which, in essence, represents time.

<sup>12</sup>The points a subject has at the end of a period are: Points = Consumption + Investment + (Investment × Rate of Return) – Taxes Paid + Tax Revenue Received.

subjects do not know the number of rounds for each treatment. Each treatment randomly ends anywhere from 16 to 18 rounds.

Following the income-generating phase, subjects enter the first of two regime treatments: investment in Setting A (Democracy) or Setting B (Dictatorship). Normatively charged terminology, such as democracy or dictatorship, has been shown to bias subject behavior (Tomz and Weeks 2013). Therefore, subjects are only told whether they are in Setting A or B. The sequence of whether a session begins with A or B is randomly determined, but each session completes both treatments (and the first treatment before beginning the second). This allows us to test the effect of the regime treatments within individuals rather than across groups.<sup>13</sup>

In the Democracy treatment, each subject chooses both how much she wishes to invest, and a tax rate between 0 and 100 that each would like to be applied to all points allocated to investment during that period. The median of all the subjects' preferred tax rates is applied to all points invested and the returns to this investment. The resulting tax revenue is redistributed in equal lump sum amounts to each subject.

For the Dictatorship treatment, we adopt a similar design as Grossman and Baldassarri (2012), who use a randomly-selected subject to proxy for an unaccountable leader. In our design, the tax rate applied to all investment is determined by this randomly-selected subject who remains the sole tax setter for each period in this treatment. All other subjects in the session are again asked to invest a share of their available points between 0 and 100 in each period. The tax setter does not invest in the Dictatorship treatment; thus, the points this subject accrues in this treatment are based solely on the amount they are able to generate through taxation. Redistribution in the Dictatorship treatment is from the private investors to the dictator.

At the end of each period, the subject is shown a graph of their points available for investment, as well as that of the other participants in this session. The graph provides for each subject the source of all available points: income, investment (and the return to investment), the taxes paid, and the share of tax revenue each received. This screen shot also displays the same information of every subject in the session so that each subject can visually see how they compare to the other subjects in the session. We wanted each participant to easily understand the sources of their points available for investment, and how their resources compared to other participants in the session. They are also shown how much tax revenue the randomly-selected tax setter receives during the Dictatorship treatment.

Wealth accumulated in the first regime treatment does *not* carry over into the second. Therefore, in both regime treatments, group inequality in the first period is determined exogenously by whether the session was randomly assigned to the Equal or Unequal initial-inequality treatment. Following period one of each regime treatment, group inequality varies endogenously across periods. This occurs because subjects carry over returns to investment from period to period, allowing for individual accumulation of points. Recall that each subject's income to begin each period is determined by their performance on the math test, and does not vary by period. This means that each subject's

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<sup>13</sup>See, for instance, Dal Bó et al. (2010) for a similar within-group treatment design.

points are the sum of their income and all points the subject has accumulated from investment in the previous periods of that regime treatment. Thus, total points at the end of any period consists of the net sum of all accumulated investments and points not allocated towards investment during that specific regime treatment. Variation across subjects in investment, variation in the exogenously determined rate of return to investment, and variation in the endogenously determined group tax rate can each have large effects on inequality across periods. Therefore, while inequality is endogenously determined, it is not endogenous at the individual level.

We allow inequality to vary endogenously primarily because we want to incentivize subjects to accumulate points over the entirety of each regime treatment. By allowing points to accrue from period to period, and making the payout based on the total points subjects are able to accrue, we incentivize subjects to consider their future absolute points rather than simply their relative standing. This choice is also a matter of practicality. Since we hypothesize that various levels of inequality affect individual investment incentives, we would need many treatments of inequality to test its effect. Allowing inequality to vary endogenously is an efficient solution that allowed us to address our research question without an overly costly increase in treatments, subjects, and subject payouts.

This experiment was conducted with undergraduate students at three different universities in two countries - two in Switzerland and one in the United Arab Emirates (UAE). In total, 299 subjects participated in 24 different sessions, with 8 sessions occurring at each university. An average of 14 subjects participated in each session. For each subject, earned points were converted to 0.25 Swiss Francs and 1 UAE dirham, respectively. Participants earned a 30-point show up fee and received on average a payout of 150 points, or approximately \$42 each, for the 60-minute experiment.

#### 4.2. Experimental Results: Individual Level

Since our experiment uses a within-subject design, where each subject is exposed to both regime treatments, we are able to control for subject-level characteristics associated with their preferred levels of risk and investment. We use hierarchical linear models, which are most appropriate when subjects are embedded within larger groups, to test our hypotheses (Gelman and Hill 2008). This allows us to capture the effect of group-level variables, such as regime type and inequality, on *individual-level* investment, while controlling for individual-level heterogeneity. Our estimation strategy for measuring the conditional effect of regime type and inequality on individual investment is very similar to the model used above and is represented by the following equation:

$$Y_{it} = \alpha_i + \beta_1 Democracy + \beta_2 Inequality + \beta_3 Democracy \times Inequality + \lambda \bar{Z}_{it} + \delta_t + u_i + e_{it}$$

Our dependent variable of interest is the percentage of a subject's available points each subject  $i$  chooses to invest in each period  $t$ . Recall that points invested – and their return – are the only points that are subject to taxation. Therefore the percentage of points invested in each period represents a subject's willingness to invest when faced with the risk of expropriation. To measure the effect of regime type on individual-level investment, we include in each model specification a dummy variable that indicates whether the subject is in the Democracy treatment. This allows us to test whether, as

the political literature claims, voting for the tax rate engenders greater individual-level investment. We find strong evidence that there is a positive and significant relationship between the Democracy treatment and individual-level investment. The unconditional means of the two regime treatments reveals that subjects invest roughly 56% of their points in the Dictatorship treatment compared to 67% in the Democracy treatment.

To capture the degree of within-session inequality we include a gini coefficient measuring the inequality in points across subjects for each period. Our coefficient of interest is an interaction ( $\beta_3$ ) of the regime dummy and group-period inequality, which captures whether political regimes and inequality jointly influence individual-level investment behavior. This interaction allows for the testing of **H1**, **H2** and **H3**. According to **H2**, we expect that investment in the Dictatorship treatment is independent of changes in inequality. **H1** states that in democracies, we expect that investment will be the greatest at low levels of inequality, and will decline as inequality rises. At low levels of inequality we expect to observe more investment in the Democracy treatment than in the Dictatorship treatment. As inequality rises, we expect investment to fall in the Democracy treatment, but with ambiguous effects in the Dictatorship treatment. According to **H3**, we expect that at the highest levels of inequality the difference between investment across regime types should be indistinguishable.

We control for several basic observable factors that might influence individual-level investment incentives (represented in our equation by  $\bar{Z}_{it}$ ). To control for the possible influences of wealth on investment, we include two subject-level measures of wealth: the subject’s relative wealth and absolute wealth. A participant’s relative points are determined by the rank of each subject’s points compared to other subjects in each period. To capture the absolute wealth of each subject, we include the log of each subject’s total points for each period. Next we control for the information subjects use in making their investment decisions. We include lagged variables of the rate of return to investment and the applied rate of taxation to investment. If the rate of return was high in the previous period, we might expect subjects to allocate more to investment, all things being equal, in the current period. Similarly, if the tax rate was high in the previous period, our model predicts that subjects will lower their exposure to expropriation in the current period. Most importantly, we include subject fixed effects to control for any subject-level heterogeneity that might influence a subject’s propensity to invest. We also include period fixed effects to account for any unobserved effects of time on investment. To mitigate serial correlation, standard errors are clustered at the subject level. The results are reported in Table 2.

We first find that the positive and significant relationship between the Democracy treatment and investment reported above is robust to all specifications, from simple regression with no controls to a fully specified model. In the fully specified regressions the difference in average individual investment across regime treatment is roughly 10%. While this difference is significant, our results demonstrate that despite the lack of a formal constraints on their behavior, these unaccountable tax setters can foster comparatively high levels of investment.

The coefficient on the interaction between the political regime dummy and the Gini coefficient of each period’s inequality is negative and significant, which indicates that investment falls as inequality rises within democracies. This provides support for **H1**: inequality conditions the level of investment

Table 4: Regime Type, Income Inequality, and Individual Investment: Subject Fixed Effects

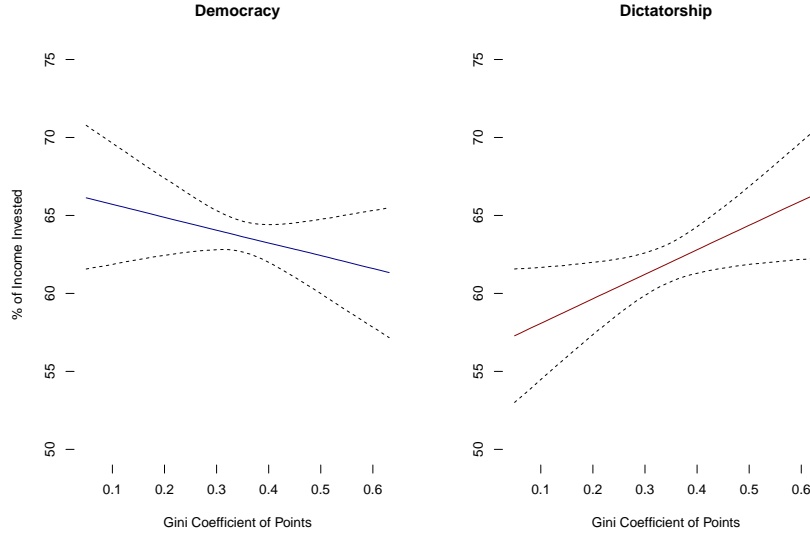
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Invest	Invest	Invest	Invest	Invest	Invest	Invest
Democracy	12.95*** (1.433)	11.32*** (3.104)	9.193*** (2.571)	9.867*** (2.513)	10.01*** (2.695)	9.991*** (2.674)	9.876*** (2.637)
Gini		45.80*** (8.918)	15.85* (6.859)	19.58** (6.913)	15.67* (7.243)	15.61* (7.161)	14.83* (6.866)
Democracy × Gini		-5.527 (8.427)	-24.07*** (7.190)	-22.02** (6.925)	-23.94** (7.296)	-23.78*** (7.143)	-23.65** (7.155)
Log(Points)			13.59*** (0.910)	11.92*** (1.034)	10.82*** (1.050)	10.76*** (1.085)	10.87*** (1.040)
Relative Points				0.702** (0.225)	0.808*** (0.240)	0.844** (0.280)	0.830*** (0.244)
Lag Taxrate					-0.0885** (0.0291)	-0.0769 (0.0596)	-0.0149 (0.174)
Lag Growthrate					7.028* (2.797)	7.012* (2.789)	7.006* (2.790)
Relative Points × Lag Taxrate						-0.00172 (0.00713)	
Log(Points) × Lag Taxrate							-0.0187 (0.0416)
Constant	36.67*** (1.883)	28.22*** (2.828)	-14.07*** (3.872)	-13.88*** (3.810)	-11.11* (4.516)	-11.11* (4.509)	-11.18* (4.529)
Period Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9782	9782	9782	9782	9493	9493	9493
# of Subjects	299	299	299	299	299	299	299
R <sup>2</sup> Within Subjects	0.122	0.136	0.229	0.232	0.229	0.230	0.230
R <sup>2</sup> Between Subjects	0.0229	0.00980	0.212	0.210	0.224	0.224	0.226
R <sup>2</sup> Overall	0.0795	0.0803	0.217	0.216	0.221	0.221	0.222

Dependent variable for each model is the percentage of subject's income invested, measured between 0 and 100%

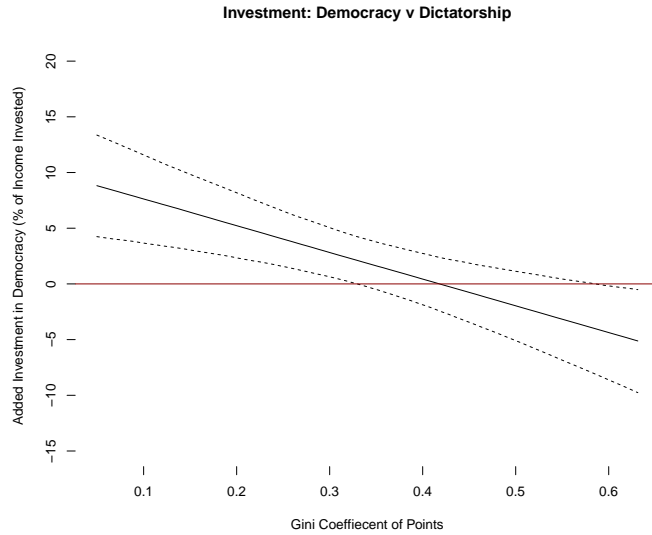
Subject clustered standard errors in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

This table presents the estimates of the the joint relationship between inequality and on each regime treatment on subject-level investment. The coefficient of interest is reported in the row for Democracy x Gini. All models include period fixed effects and subject fixed effects and standard errors are clustered by the participant. The number of observations are lower in regressions (5)-(7) since we are controlling for lagged characteristics.



(a) Predicted Individual Investment across Regime Treatments



(b) Added Predicted Individual Investment in Democratic Treatment

Figure 3: Experimental Results – Individual Investment, Regime Treatments, & Inequality

Figure 3(a) shows the post-estimated predictions of how private investment is related to inequality across regime treatments from regression (5) on Table 4 while holding all other variables at their means/medians. Figure 3(b) displays the expected difference of investment in the Democracy treatment compared to the Dictatorship treatment as inequality rises from its minimum to maximum.

within the Democracy treatment. To more thoroughly test our hypotheses we turn to post-estimated simulations to better understand the relationship between regime type and inequality (King et al. 2000). Figure 3(a) shows the predicted levels of individual investment at various levels of inequality for both the Democracy treatment (left) and the Dictatorship treatment (right), holding all other

covariates at their mean. The Y-axis for both treatments measures the predicted percentage of invested points by an individual, while the X-axis measures inequality as captured by the session-period gini coefficient. As we can see, the predicted level of investment is greatest at low levels of inequality in the Democracy treatment, but declines as inequality rises. This provides evidence supporting **H1**, that individuals in democracies will invest less as inequality rises. Interestingly, we again observe strongly rising investment with increasing inequality in Dictatorships. As predicted, the level of investment in dictatorships begins significantly lower than in democracies. However, unlike in democracies, the share allocated toward investment rises in dictatorships as inequality increases.

One potential concern about our results stems from the interaction term itself. While the coefficient on the interaction in each specification shows that the effect of inequality is different across democracies and dictatorships, the precise interpretation of this result is unclear from this estimate alone. It is possible that the relationship between inequality and regime type is being driven solely by the increase in investment associated with rising inequality in dictatorships. To test this, we look at the marginal effect of inequality within democracies at varying levels of inequality. If **H1** is correct, we should observe that investment is lower and statistically different at higher levels of inequality within democracies. This is precisely what we find. In the fully specified model, the marginal effect of rising inequality in democracies is negative and statistically significant when changing from the minimum to the maximum levels of inequality in the sample. The model predicts that individuals will decrease the share allocated towards investment by 9% when moving from the minimum to the maximum of inequality. More importantly, this finding remains statistically significant even when restricting the analysis to a change from the 25th percentile to the 75th percentile of inequality. This model predicts individuals, on average, will decrease their investment by 5%.

We also use the estimates for this interaction term to test **H3**: whether the Democracy treatment will always foster more investment than dictatorships regardless of the level of inequality. The coefficient on the interaction term tells us that the marginal effect of democracy on investment is greater than zero when session-level gini coefficient is less than 0.4.<sup>14</sup> To further test this hypothesis, we look at the difference between investment in both treatments at varying levels of inequality. Figure 3(b) shows the simulated predicted difference between investment in the Democracy and Dictatorship treatments. The X-axis of Figure 3(b), again, represents the session-period inequality in points as captured by the Gini coefficient. The Y-axis measures the predicted difference in investment between democracies and dictatorships. This means that when the Y-axis is positive, the predicted investment in the Democracy treatment is greater than that in the Dictatorship treatment at a particular level of inequality; and when negative, the predicted investment in the Democracy treatment is lower. Figure 3(b) shows that as inequality rises, the predicted benefit of the Democratic treatment falls until it is no different statistically than dictatorships. In fact, the Democracy treatment is more likely to foster statistically greater levels of individual investment in only the lower *three fifths* of the gini coefficients observed in the sample. Within the upper two fifths of group inequality observations,

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<sup>14</sup>Approximately 40% of observed session-gini coefficients were more than this value.

the investment advantage in the Democracy treatment is statistically indistinguishable from the Dictatorship treatment. At the highest levels of inequality, investment in dictatorships is actually statistically greater than that in democracies. Therefore, we find evidence for **H3**, as the Democracy treatment does not always foster more investment than the Dictatorship treatment.

Overall we conduct a number of robustness tests of our findings. One concern may be that session-level inequality in our design is endogenous. We can, however, provide further evidence for the validity of the findings above by estimating the effect of the initial-inequality treatment (Equal or Unequal) interaction with the regime-type dummy on our dependent variable. If our hypothesis is correct, subjects should invest less in the Democracy treatment in the sessions assigned to the Unequal initial-inequality treatment. This is a particularly stringent test, as the initial income distribution is exogenously set once and then allowed to vary endogenously by period throughout the rest of the regime treatment. Despite this limited intervention, the coefficient on the interaction of the regime and initial-inequality treatments is negative and statistically significant in each specification.<sup>15</sup>

Further robustness tests include re-running each specification from Table 2 using a subject random-effects instead of a subject fixed-effects model. Doing so allows us to separately control for subject gender and citizenship, the location of each experimental lab, and whether the Democracy treatment came first. Each of these specifications also includes period, session, and subject-citizenship fixed effects. The findings are nearly identical to those reported in Table 2. To ensure that our findings are not being driven by investment decisions at the highest levels of inequality, we rerun each specification using only the bottom 75% of the observed session-period Gini coefficients and we find very similar results.<sup>16</sup> While our variable of interest is investment, changes in tax rates are the channel through which private investment is affected. Thus, we also investigate whether changes in tax rates influence investment, and find strong evidence that they do.<sup>17</sup>

#### 4.3. *Experimental Results: Session Level*

We believe that the subject fixed-effects model employed above is the most appropriate method for estimating the conditional effect of democracy and inequality on individual-level investment. This allows us to control for unobserved heterogeneity across subjects and provides a direct comparison for how subjects will behave when embedded within different regime treatments. We can, however, provide further evidence for our hypotheses by measuring whether the negative interaction between regime type and group inequality remains when aggregating from the individual to the session level. We conduct a particularly stringent test of this relationship by estimating the

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<sup>15</sup>Since one of our primary independent variables of interest, initial-inequality treatment, is randomized at the session level, we are unable to use subject fixed effects. Therefore, we use random effects at the subject level. Each specification does include session, period, gender, citizenship, and university fixed effects. Results are shown in Table 4 of the Supplementary Appendix.

<sup>16</sup>Tables 5 and 6 of the Supplementary Appendix report these results.

<sup>17</sup>See Section 3.1 of the Supplementary Appendix for evidence on the effect of tax rates on investment behavior. See Table 7 of the Supplementary Appendix for estimates of the relationship between relative income status and preferences for greater tax rates on investment in the Democracy treatment.

Table 5: Regime Type, Initial Income Distribution, and Average Group Investment: Group Random Effects

	(1)	(2)	(3)	(4)
	Group Invest	Group Invest	Group Invest	Group Invest
Democracy	11.72*** (0.772)	14.14*** (1.087)	7.908*** (1.056)	7.829*** (1.051)
Unequal Initial Income Distribution		3.708 (3.336)	2.484 (3.057)	2.473 (3.083)
Democracy × Unequal Initial Income Distribution		-4.858** (1.537)	-4.262** (1.350)	-4.018** (1.346)
Lag Taxrate			-0.285*** (0.0186)	-0.283*** (0.0185)
Lag Growthrate				9.898** (3.520)
Constant	38.04*** (3.259)	36.19*** (3.634)	50.82*** (3.634)	48.84*** (3.717)
Period Fixed Effects	Yes	Yes	Yes	Yes
University Fixed Effects	Yes	Yes	Yes	Yes
Observations	819	819	795	795
# of Sessions	24	24	24	24
$R^2$ Within Sessions	0.354	0.362	0.501	0.507
$R^2$ Between Subjects	0.151	0.161	0.403	0.409
$R^2$ Overall	0.302	0.310	0.473	0.479

Dependent variable for each model is the mean percentage of income invested by each group in a period, measured between 0 and 100%

Standard errors in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The table reports the estimates for average session-level investment across our two treatments: regime type and initial income distribution. The coefficient of interest is in the row for Democracy × Unequal Initial Income Distribution. The unit of analysis is the session period, and each regression controls for university fixed effects and period fixed effects. Regressions (3) & (4) have fewer observations due to the inclusion of lagged variables.

effect of the initial-inequality treatment (Equal or Unequal) interacted with the regime-type dummy (DEMOCRACY) on average session-level investment. If our hypothesis is correct, sessions assigned to the Unequal initial-inequality treatment should invest less in the Democracy treatment than those sessions assigned to the Equal treatment.

Despite the initial-inequality treatment only exogenously determining inequality in the first period of each regime treatment, we still find a statistically significant relationship between the interaction of our two treatments (regime type and initial inequality) and average session-period investment. As Table 4.3 shows, we find a statistically negative coefficient on the interaction term in every specification we run at the group level. This finding provides support for our argument that investment in democracies will be affected by inequality more than in dictatorships.

Within the Dictatorship treatment, sessions assigned to the Unequal initial-inequality treatment invest, on average, a greater share of their available points than those assigned to the Equal treatment. The opposite is true within the Democracy treatment, where sessions assigned to the Unequal treatment invest fewer of their points. It should be noted that while the difference between the Equal and Unequal initial-inequality treatment within Democracies is negative, it is not statistically significant. Importantly, there is also a statistically *indistinguishable* difference in average investment between Democracies and Dictatorships assigned to the Unequal initial-inequality treatment. By comparison, average group-level investment of the Democracy treatment assigned to the Equal initial-inequality treatment is statistically greater than average investment in Dictatorships,

Table 6: Investment &amp; Tax Rates Across Regime Types

Panel A					
Regime	Dictator Type	Avg. Tax Rate	Avg. Investment	Std Deviation Tax Rate	Std Deviation Investment
Dictator	Selfish	37.37%	51.9%	30.98	15.40
	Benevolent	12.09%	65.3%	8.51	13.01
Democracy		5.55%	67.60%	6.99	12.59

Panel B					
Regime	Dictator Type	Avg. Tax Rate	Avg. Investment	Std Deviation Tax Rate	Std Deviation Investment
Dictator	Lowest 12 Sessions	13.79%	64.07%	15.81	13.12
	Highest 12 Sessions	46.22%	47.74%	29.83	14.30
Democracy		5.55%	67.60%	6.99	12.59

This table reports the average and standard deviation of the tax rates and investments across regime treatments in the experiment. Dictators that set low and stable tax rates are labelled “Benevolent” while all others are labelled “Selfish” in Panel A, while Panel B splits the Dictator treatment in half by looking at the sessions that set the lowest tax rates and the highest tax rates out of the 24 sessions.

regardless of the initial-inequality treatment assignment. This is an interesting set of findings considering that the initial-inequality treatment only imposes a greater or lower level of group inequality in the first period of each regime treatment, and varies endogenously thereafter. Despite this limited intervention, its effect is felt throughout the entirety of each regime treatment, and influences individual investment behavior differently in each regime treatment.<sup>18</sup>

#### 4.4. Explaining the Variance in the Dictatorship Treatment

In line with Gehlbach and Keefer (2011, 2012) we find significantly greater variation in average investment across sessions in the Dictatorship treatment. We investigate whether the tax-setting strategies of the Dictators influenced the investment behavior of the subjects by categorizing the Dictators into two types. We call Dictators that set low and stable tax rates *Benevolent Dictators*. We call those that vary their tax rates significantly from period to period *Selfish Dictators*.<sup>19</sup>

The Dictators who set low and relatively stable tax rates were able to engender higher levels of investment, thereby generating significantly greater wealth within their sessions. To show this, we look at the average investment and tax rate our different regimes engendered across sessions. Table 6 shows these results. Benevolent Dictators fostered an average investment across all subjects of 65.3% in comparison with a rate of average investment of 51.9% by Selfish Dictators. The Democracy treatment generated a qualitatively similar share of average investment (67.6%).

<sup>18</sup>As with individual-level data, we also use this strategy to test the model’s predictions whether the channel through which investment is being influenced is through taxation. Using a similar specification, we find that the interaction of the Unequal treatment and Democracy treatment on tax rates is significantly positive.

<sup>19</sup>It is important to note that we cannot determine whether the low-tax strategies of some Dictators lead subjects to infer that this unaccountable subject was altruistic instead of selfish.

An obvious concern is that in choosing dictators who set low and stable tax rates, and calling them ‘benevolent’, we are selecting on the dependent variable. In our design, we did not create a treatment in which tax rates were exogenously set low and stable versus high and variable. Instead of choosing sessions arbitrarily, we additionally sort the sessions in each regime treatment by lowest to highest in average tax rates. In Panel B of Table 6, we report the same outcomes but with the 12 lowest and 12 highest tax rate sessions in each grouping. We again see that the highest tax rate sessions in the Dictatorship treatment have substantially more variation in their tax rates and investment behavior than any other grouping<sup>20</sup>

This approach also speaks to our unexpected finding that investment rises with inequality in the Dictatorship treatment. Since inequality varies endogenously from period to period, sessions in which investors believe tax rates will remain low will see very high rates of investment thus causing inequality to increase further.

## 5. Discussion

There are several important implications of our findings. Most importantly, we find that inequality strongly conditions the level of investment in democracies and non-democracies in opposing ways. As inequality rises in democracies, the level of investment declines. Furthermore, we show both theoretically and empirically that the opposite is possible in autocratic settings. At high levels of inequality, we find that democracies and dictatorships engender similar levels of investment (and perhaps even greater levels in the latter regime type). Yet, our model also yields an additional insight: high levels of investment are sustainable across a wide array of regime types and institutional arrangements. Even without the institutional constraints emphasized in the theoretical literature, our model predicts, and our laboratory evidence corroborates, that unconstrained dictators are able to induce private investment.

While our arguments and evidence require further investigation, our paper indicates that rising inequality is more harmful for investment in democracies than non-democracies. This is a critically important finding, as the levels of within-country inequality have increased significantly across most countries of the world in recent decades (Milanovic 2016). Not only do our arguments have important implications for why we now observe statistically indistinguishable levels of investment across regime types, it also demonstrates another political channel through which rising inequality differently affects welfare across regime types.

That said, and while we think this is an important first step in highlighting the effect of inequality on private investment, there are several limitations to our work. First, our regime type measures do not include or consider many of the possible institutional arrangements that could also affect private investment incentives. For instance, the US system of extreme checks and balances and winner-take-all voting may result in a status quo bias that makes it difficult for policy to respond to changes

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<sup>20</sup>Each measure is the average across sessions at the group level. In Panel A, Benevolent Dictators are sessions in which the tax-setter set a consistently low tax rate on investment. Panel B separates the sessions by 12 lowest and highest average tax rates, respectively. See Section 2.1 for more information.

in inequality. This could explain, in part, the weaker negative correlation between inequality and investment in the US compared to Germany and Japan as shown in Figure 1. Further considerations of these additional effects are warranted.

Another limitation is our conception of investment. For instance, we only consider one type of short-term investment; and we do not investigate how long-term expropriation risks might be different across political regimes or inequality. Second, we only consider investments with known payoffs. Given the added uncertainty around taxation by political regimes, we do not know how investors might choose high or low risk investments depending upon the political regime. Finally, we only looked at domestic investment and did not include an option of investing across political regimes. Opening up investment to foreign capital might put additional constraints on dictator's ability to expropriate and affect the preferences of the median voter for redistribution in democracies. Future research should broaden the scope of investment types to see how different political regimes react under various levels of inequality. We also believe that new experimental designs should be considered and used to test the various mechanisms as outlined by our model (and others).

## 6. Conclusion

Recent empirical evidence has challenged a large theoretical literature on why democracies should foster significantly higher levels of private investment. In this study, we argue that previous omission of inequality from the analysis explains in part the puzzle of why dictatorships foster similar average levels of private investment to democracies. Our model focuses on how each regime type affects investor beliefs of future tax rates, which conditions present investment incentives. Using this theoretical framework, we show that regime type and inequality jointly condition private investment. We posit two distinct channels through which inequality affects the beliefs of investors. First, rising inequality raises the incentive of the citizenry to increase taxes on the rich. Because institutionally-constrained regimes have to hew closely to preferences of median voter, rising inequality credibly signals higher future tax rates. Second, rising inequality increases the aggregate economic resources available to wealthy elites. As a regime type becomes less institutionally constrained (i.e., more autocratic), the de facto power of elites versus the leader becomes a greater determinant of the rate of expropriation by the leader. Hence, in autocracies, investors' beliefs reflect the ability of the elites to restrict expropriation by the leader. Using both experimental and cross-country macroeconomic evidence, we show that this previously overlooked channel through which investor beliefs are influenced is important.

Our study also highlights the limitations of current theory regarding investment in dictatorships. According to the Global Competitiveness Rankings, as compiled by the World Economic Forum, politicians from many autocracies, are rated as 'trustworthy', and compare favorably to many well-established democracies.<sup>21</sup> Our paper points to the importance of better understanding

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<sup>21</sup>For instance, Qatar and China (ranked 14 and 28, respectively) are ranked similarly to democracies such as Australia (21), France (22) and South Korea (26). The 2016 rankings were accessed here: <http://reports.weforum.org/global-competitiveness-report-2015-2016/competitiveness-rankings/>

the relationship between elites and leaders, and the factors that affect the relative power of each. Yet our work also suggests that there are many additional factors influencing investment incentives in non-democratic regimes. The factors that affect the trust that investors have in these leaders facing fewer institutional constraints are poorly understood.

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