Institutions, the Cost of Capital, and Long-Run Economic Growth: Evidence from the 19th Century Capital Market

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Abstract: We use a unique data set of 19th century equity returns to examine the relationship between institutions, the cost of capital and economic growth. The data set consists of the monthly equity returns of 1,808 different firms located in 42 different countries and traded on the London Stock Exchange. About half of the firms are located in countries other than Great Britain. These data permit us to establish two facts about institutional quality and subsequent growth trajectories. First, we show that late 19th century investors demanded compensation to invest in countries with weak protection of property rights. Consistent with asset-pricing theories that predict positive risk-adjusted returns in the presence of expropriation risk, this compensation is systematically related to different measures of institutional quality. Second, we demonstrate that there is negative relationship between these risk-adjusted returns and subsequent economic growth during the 20th century, even controlling for other covariates shown to be important for explaining economic growth. The evidence is consistent with theories of economic growth that predict an important role for the effect of institutional quality on reducing the risk of expropriation and promoting investment. We show that one way to detect the effect of institutions on economic growth is through their effect on the equity cost of capital.

Key words: Institutions; property rights; equity cost of capital; economic growth.

JEL classification: F36, G15, O16.

1. Introduction

We examine the extent to which the equity cost of capital paid by foreign firms on the London Stock Exchange during the late 19th and early 20th century reflected cross-country variation in institutional quality and document that this variation predicts subsequent economic growth. We thus show that the capital market is a specific conduit through which we can detect the role of institutional quality in shaping economic development, a conclusion that supports the argument that the institutional foundations of prosperity were established by the middle of the 19th century (see, e.g., Acemoglu and Robinson 2012).

The evidence sheds light on the nexus between finance and economic growth, a topic that economists have long debated.[1] That there is a debate may seem surprising given the large number of theoretical arguments that access to well-functioning capital markets can promote growth in a number of ways.[2] By allocating capital among investment projects until the marginal rates of return are equalized, fully integrated international capital markets break the link between a country's level of savings and its ability to invest. An internationally integrated capital market therefore renders the initial distribution of wealth across countries irrelevant (Aghion, Caroli, and Garcia-Penalosa 1999). In addition, more liquid capital markets can improve the efficiency of existing investments by creating an environment in which speculators find it profitable to expend resources to gather information (Levine 1997). The process of trading securities embeds information in asset prices that, in turn, provide signals to entrepreneurs and managers about how best to allocate capital and effort. The available evidence is consistent with this prediction: Countries with high levels of financial development allocate capital more efficiently than those with low levels of financial development (Rajan and Zingales 1998; Wurgler 2000; and Love 2003) and financial liberalization improves the efficiency with which capital is allocated in developing countries (Galindo et al. 2007). In addition, security prices that rapidly reflect new information about a firm's prospects provide a low-cost aid to outside investors who wish to

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[1] Levine (2005) begins his survey of the finance and growth literature by observing that Merton Miller (1998) asserted that "the idea that financial markets contribute to economic growth is a proposition too obvious for serious discussion" while Robert Lucas (1988) dismissed the role of financial markets as an "over-stressed" determinant of economic growth.

[2] Gurley and Shaw (1955), Cameron (1967), and Goldsmith (1969) were early proponents of the view that well-functioning financial markets promote economic growth. More recently, Greenwood and Jovanovic (1990) and Bencivenga and Smith (1991) are examples of neoclassical growth models where financial markets affect the steady-state rate of growth.

write incentive compatible contracts with otherwise hard-to-monitor agents. Finally, when capital markets enable risk-averse entrepreneurs to trade shares in lumpy investments with imperfectly correlated risks, improved risk sharing can lead to economic growth through increased investment and capital deepening (Atje and Jovanovic 1993; Obstfeld 1994; and Acemoglu and Zilibotti 1997).

A key premise underlying such arguments in favor of the importance of finance for economic growth is that capital flows freely across geographic space because property rights, and the institutions that guarantee them, enable investors to appropriate the return on their investment. Poor protection of property rights, weak contract enforcement, and the fear of expropriation all hinder investment and entrepreneurship. Consequently, some productivity-enhancing investments may go unfinanced, thereby retarding the rate of growth of investment and the pace of economic development. Moreover, and critically for this paper, when a country lacks the institutions necessary to credibly convince outside investors that their claims are not at risk of being expropriated, economic theory predicts that, in equilibrium, the country will face a higher cost of capital. Such predictions are consistent with recent evidence on the Lucas paradox – namely, that capital does not flow from wealthy, capital-abundant countries to poor, capital scarce countries. For the recent period of financial globalization Alfaro et al. (2008) argue that low institutional quality is a leading explanation for the paradox. Their estimates indicate that changes in institutional quality imply large changes in foreign investment. Similar findings exist at the industry level and suggest that the relationship between access to well-functioning capital markets and industry output growth depends on institutional quality (Eichengreen et al. 2011; and Friedrich et al. 2013). Such evidence underscores the point that it may be possible to better understand the relationship between finance and growth by exploiting cross-sectional variation in the quality of institutions.

Using a new monthly data set that contains the returns of 1,808 equities traded on the London Stock Exchange between 1870 and 1907, we examine the relationship between institutional quality, the equity cost of capital, and 20th century GDP growth. The paper documents that strong institutions – that is, institutions that protect property rights – at the country level influenced the ability of firms to obtain low-cost financing on the London capital market during the late 19th century. Furthermore, the cross-sectional variation in risk-adjusted returns is systematically related to subsequent economic growth during the 20th century.

To the best of our knowledge, no one has examined the relationship between institutional quality and borrowing costs in the period preceding the First World War and related this cost to subsequent growth trajectories. This omission is important because the period before the First World War plays an important role in accounting for disparities in modern income per capita. Much of the current cross-country difference in wealth can be attributed to divergent growth trajectories that began before 1914 (Pritchett 1997). The divergence in growth trajectories is documented in Table 1, which is similar to Table 2 in Pritchett (1997) but based on the 42 countries in our sample (see Table 2). The first row shows the path of the United States' income since 1870. The second row reports the path of income for the poorest country in the sample since 1870. Dividing the first row by the second row yields the number in the third row, the ratio of the United States' income to that of the poorest country in the sample, which increases from 4.4 to 100. The divergence in income per capita is also evident from taking the ratio of the OECD average to that of the non-OECD average or considering the standard deviation of per capita incomes: The ratio OECD to non-OECD income per capita increases from 2.2 to 3.7 between 1870 and 2011 while the standard deviation increases from \$1,380 to \$15,481. By any of these metrics, there has been a divergence in per capita real GDP since the late 19th century.

At the same time, the late 19th century is considered to be one of the earliest examples of the necessity of well-functioning financial markets. Previous episodes of rapid economic growth such as the industrial revolution in Great Britain during the late 18th and early 19th centuries relied on technologies that could be financed by mobilizing relatively modest amounts of capital. The size and scope of late 19th century industries required more significant quantities of capital which made access to the international capital market a necessary precondition for undertaking the investments. Private firms from around the world issued equity in London to raise the capital necessary to finance the transportation, industrial, raw material, and infrastructure projects that became the backbone of the Second Industrial Revolution.

The London Stock Exchange during this era offers a unique laboratory to measure country-specific determinants of the cost of capital. At the time the Exchange was the dominant location where non-British firms raised finance capital (Michie 1999). Although the equities were traded in London, they represented claims to the residual cash flows of companies located around the world. Using the prices of equities that were traded in a single, centralized market from many different countries permits us to estimate risk-adjusted returns without being forced to rely on

data drawn from different markets that are not fully integrated (Bekaert et al. 2007). Studying the London Stock Exchange during the late 19th century thus allows us to measure the country-specific cost of capital without the confounding effects of regulatory, tax, and liquidity differences among geographically separated markets that characterize modern stock exchanges.

The panel data set of stock returns contains almost 300,000 equity returns from firms located in 43 different countries. About half of the firms represented in the data set are located in Great Britain and half are located in other countries. Such a rich data set enables us to decompose the firm specific cost of capital into two components using empirical asset-pricing methods: One is related to the equity's covariance with non-diversifiable business-cycle risk, and the second is the country-specific compensation. The first main finding is that the firm-specific component of returns – that is, the firm-specific risk-adjusted return, or firm alpha – is systematically correlated with measures of institutional quality. Firms located in countries with institutions that protected property rights paid a lower cost of capital compared with similarly risky firms located in countries with weaker institutional protections for property rights. The extent of the discrimination was reflected in how much Victorian investors charged firms to raise equity capital. This evidence is consistent with asset-pricing theories that predict the existence of equilibrium risk premia associated with expropriation risk.

The second main finding is that the cross-sectional variation in the cost of capital at the country level related to institutional quality helps to explain subsequent growth outcomes during the course of the 20th century. Countries in which firms paid a high cost of capital because of weak institutions grew more slowly during the next 100 years and tend to be poorer today than countries that paid a lower cost of capital during that period. The long-run effects of the penalty imposed by Victorian investors on economic growth are economically and statistically significant. For example, the marginal effect of going from the risk-adjusted cost of capital faced by Nicaragua to that faced by the United States implies about 0.76 percentage point acceleration in real per capita GDP, all else equal. Given that the mean growth rate of the countries in the sample is 1.9% and the standard deviation is 0.6, this effect is economically significant. Taken together, these two findings provide empirical support for the view that institutions play an important role in promoting economic growth and suggest that one way to detect this effect is by examining their effect on asset prices.

The rest of the paper is organized as follows. Section 2 presents the theoretical arguments that predict a relationship between expropriation risk and the risk-adjusted cost of capital. Section 3 shows the relationship between the cost of capital during the Second Industrial Revolution and both subsequent economic growth and modern levels of GDP. Section 4 examines how country-specific institutional quality is related to the risk-adjusted cost of capital. Section 5 concludes.

2. Institutional Quality, Economic Growth, and the Cross-Section of Asset Returns

In this section we first discuss the theoretical arguments that institutions are a fundamental cause of economic growth. We then examine what theory predicts about the relationship between institutional quality and asset returns. Finally, we discuss the restrictions imposed by the theory on the behavior of observable returns and how they enable us to detect the presence of these effects in asset return data.

2.1 Institutions and Economic Growth

Before we examine how the quality of economic institutions is related to the ability of firms to raise equity capital, it is important to be clear about how we define the term "institutional quality". By "institutional quality," we mean the formal and informal constraints on political, economic, and social interaction that establish an incentive structure that reduces uncertainty and promotes economic efficiency (North 1991).

Recent research has focused on the importance of institutions as fundamental drivers of economic growth. We focus on three main strands – Acemoglu et al. (2001, 2002, 2005), Sokoloff and Engerman (2000), and La Porta et al. (1997, 1998). Acemoglu et al. (2001) trace institutional quality to the colonization strategies that Europeans adopted during early European settlement. They argue that in countries with less deadly disease environments, Europeans settled and established strong institutions that protected property rights. By contrast, in regions where settler mortality rates were high, Europeans established extractive institutions that focused on transferring resources from the colony to the home country.[3]

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[3] Nunn (2009) makes similar arguments about the importance of historical institutions for understanding modern development.

Like Acemoglu et al. (2001), Sokoloff and Engerman (2000) share the view that geographic characteristics were important exogenous determinants of the effect of colonial rule on long-run economic growth. Rather than focusing on the effect of the disease environment, however, Sokoloff and Engerman argue for the importance of initial differences in the endowments of land and geography that were most suited to cultivating internationally traded crops (i.e., "cash crops"). In countries where crops were more easily cultivated using plantations and slave labor, institutions emerged to protect the position of elite landowners at the expense of the rest of the population.

In a different vein La Porta et al. (1997, 1998) emphasize the importance of the colonizer's legal tradition. They argue that key differences between systems based on British common law and Roman civil law had direct effects on financial development because British common law provided a higher quality of contract enforcement and greater security of property rights than Roman civil law. According to the argument, the tradition adopted by each country has a direct effect on the efficiency with which financial contracts are credibly executed in that country.

Although the specific mechanisms differ among the three explanations that assign an important role to institutions, a common implication is that initial conditions shaped property right institutions and that the initial conditions in turn affected that long-term trajectory of economic growth and development. One obvious channel connecting property rights to development is the ability of countries to attract investment capital. In countries with poor institutional protection of property, investors face the prospect of having their claims expropriated by a predatory state or an insider unconstrained by local law or custom. The fear of expropriation undermines efficient monitoring by outside investors and inhibits risk sharing, thereby increasing the cost of capital. Thus, to the extent that the constraints imposed by strong institutions ensure the protection of property rights and reduce the risk of expropriation, variation in institutional quality should be reflected in asset prices. Given the rapidly declining transportation costs, increasing returns to scale, and the imperfect global competition that characterized many late 19th century industries, it is plausible that initial advantages in the cost of capital during that period manifested themselves as divergent paths of economic development. As discussed below, we find direct evidence in favor of the hypothesis and thus demonstrate a channel through which institutional quality affects economic development.

2.2 Expropriation Risk and the Cost of Capital

The prediction that initial differences in the cost of capital has implications for economic growth rates raises the question of how, precisely, differences in institutions affect the cost of equity capital. There are three principal ways in which expropriation risk can affect the cost of equity capital: (1) it decreases the expected cash flow to outside investors; (2) it reduces international risk sharing if the expropriation risk cannot be hedged; and (3) it exacerbates the agency problems related to the separation of ownership and control that are especially acute in international financial transactions.

The logic behind the cash flow channel is straightforward. If two entrepreneurs have access to identical technology but one is located in a country in which the probability of expropriation is higher, the entrepreneur in the country with better property rights can offer outside investors a greater expected post-expropriation cash flow. In the presence of transportation costs both investments may be undertaken, but if trade frictions are sufficiently low and scale economies in production sufficiently large, only the firm located in the country with strong property rights will be able to compete.

Although the cash flow channel is of first-order importance, it is difficult to measure with historical data. As long as investors form unbiased expectations of the likelihood of expropriation, the market assigns the correct price given the post-expropriation cash flow, and the econometrician observes prices that are consistent with observed cash flows. Of course, the actual cost of expropriation is the forgone investment that otherwise would have been undertaken but the counterfactual cash flow free of expropriation risk is unobservable and difficult to estimate. Cross-country variation in expropriation risk, however, should create differences in the degree of risk sharing and agency costs across countries. Such differences will manifest themselves in the discount rates of observable post-expropriation cash flows and can be estimated with asset-pricing methods.

The risk of expropriation creates a capital market friction that discourages cross-border risk sharing, which should raise the cost of capital and retard economic growth. Several models provide examples of how expropriation risk reduces international risk sharing in equilibrium (see, e.g., Eaton and Gersovitz 1984; Stulz 2005; Alfaro, Kalemli-Ozcan and Volosovych 2008; and Kose, Litov, and Yeung 2008).

Economic theory predicts that a reduction in international risk sharing opportunities can affect the ability of countries to invest and lower the rate of economic growth. For example, in Acemoglu and Zilibotti's (1997) model the degree of risk sharing determines the length of time that a country spends in a phase of "primitive accumulation" before entering a period of sustained economic growth. In that model economies are endowed with a large number of indivisible projects with high expected returns that are imperfectly correlated with each another. Because of this imperfect correlation, much of the economy-wide risk can be diversified away by entrepreneurs trading claims to each other's projects. However, there are also many safe investments with low-expected returns. Because entrepreneurs are risk averse and most of them have little capital, there is a strong incentive to invest in low-risk, low-return projects. Consequently, economies experience a long period of slow economic growth until the accumulation of capital is sufficiently large that the entrepreneurs have the incentive to switch to high-expected return projects.

In Acemoglu and Zilibotti's model growth outcomes are random in that some countries are "lucky" and have a large number of early risky investments payoff. This luck results in higher wealth and more investment in high-return projects. Other countries are "unlucky" and have a large number of early risk projects fail. The unlucky countries choose to accumulate capital more slowly than the lucky countries. Some countries are therefore "unbound by chance" and grow quickly while others are poor for an extended period of time.

Although Acemoglu and Zilibotti do not model international capital markets and expropriation risk explicitly, the economic mechanism that they identify applies equally well to an environment in which there are projects located in many different countries. If the international capital market allowed entrepreneurs to hold claims to projects in different countries, total risk could be reduced and the time in the primitive accumulation stage shortened. When capital is free to flow among countries, the consequences of being initially "unlucky" would be largely irrelevant as wealthy agents located in "lucky" countries would have a strong incentive to fund high return projects in poor countries. On the other hand, countries in which poor property rights inhibit the trading of claims to each other's projects would be excluded from the investments of "lucky" countries and spend more time in the primitive accumulation phase. Reduced risk sharing is thus another channel through which expropriation risk can retard economic growth.

Expropriation risk also exacerbates agency problems and raises the cost of external funds. Stulz (2005) presents a model that directly addresses the relationship between the risk of expropriation and country-specific risk premia. The existence of expropriation risk creates a capital market friction that prevents investors from perfectly diversifying risk and results in country-specific premia that are increasing in the risk of expropriation.

In Stulz's model both the entrepreneur and the outside investors risk expropriation by the state. Because monitoring is costly and ownership and control are separated, outside investors face the additional risk of expropriation by insiders who control the firm. Stulz refers to this friction as the "twin agency problem". The traditional efficient contracting response to the separation of ownership from control requires insiders to hold a greater investment than would otherwise be optimal and outsiders to favor firms that allocate capital to internal investments that are cheaper to monitor. The risk of expropriation by the state exacerbates the insider agency problem because techniques that are likely to be most effective at warding off state expropriation (such as opaque accounting, investing in hard-to-measure corporate resources, or hiring politically connected insiders) are exactly the mechanisms that make it difficult for outside investors to monitor and restrain corporate insiders.

Controlling shareholders who are also managers have less incentive to divert company resources than non-shareholding managers but have greater incentive to undertake actions that protect the firm from state expropriation. Consequently, equilibrium ownership concentration increases with the risk of expropriation by the state. Insiders with political connections or the ability to avoid state expropriation are either skilled at diverting resources without detection or politically powerful, and must therefore hold an even larger fraction of their wealth in the equity of their firm before outside investors will co-invest. The risk sharing benefits of financial globalization are inversely related to the degree of insider holding and the risk of state expropriation.

The twin-agency problem impedes economic growth and development in a number of ways. In the absence of frictions moving from financial autarky to full financial integration should increase firm values and raise marginal Q as the firm's cash flow is repriced to reflect its covariance with global consumption risk. Several papers provide empirical evidence that the reductions in late 20th century barriers to trading equity capital reduced the required return on equity in emerging markets (Bekaert et al. 2005; and Henry 2000). Undersea cables and the

absence of capital controls combined to make the late 19th century London Stock Exchange the first truly global capital market. To the extent that agency costs force insiders to overinvest in their firm, the risk sharing gains from this early era of international financial integration are likely to be muted.

Stulz's theory is also consistent with other models in which agency problems distort the international allocation of capital, increase the cost of capital, and depress future economic growth in poor countries with weak institutions (e.g., Gertler and Rogoff 1990; Boyd and Smith 1997; Albuquerue and Wang 2008; and Antràs and Caballero 2009). The models share the prediction that there is less risk sharing in countries with poor institutional protection of property. Furthermore, the prediction is consistent with empirical findings by Harvey (1995) and La Porta et al. (1997, 1998) that modern cross-country differences in expropriation risk exposure are related to differences in insider concentration.

2.3 Testable Implications

By trading claims to investment projects, entrepreneurs can use fully integrated capital markets to eliminate non-diversifiable risks until all investors are exposed to the same common risks. Therefore, in an internationally integrated capital market the required rate of return on an asset is determined by the covariance of the asset's return with non-diversifiable consumption risk. Expropriation risk reduces the ability of investors to share risks and drives a wedge between the return an asset would require in an integrated market and the return observed in a market segmented by market frictions.

The insight that expropriation risk exacerbates market segmentation and agency costs generates a testable restriction on the observable cross section of asset returns. If the risk of expropriation creates a friction that effectively segments the capital market, entrepreneurs located in countries with weak protections against expropriation can only obtain outside capital by agreeing to retain a large share of the equity in their ventures. As a result, risks are not perfectly shared and the required rate of return of an asset depends on both the asset's covariance with a set of non-diversifiable risk factors and its covariance with the local country consumption (Errunza and Losq 1985; and Jorion and Schwartz 1986). The component of the asset's return related to local risk generates an additional country-specific risk premium in addition to the

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premium associated with exposure to the non-diversifiable factor risks. The relationship can be cast in the form of the following factor model:

$$E[R_i - R_f] = \sum_{k=1}^{K} \beta_k \gamma_k + \beta_L \delta \qquad (1)$$

where β_k and β_L are the regression coefficients from projecting the excess returns of each asset on K non-diversifiable global factor risk portfolios and a local risk proxied by an index comprising local country stocks; γ_k is the equilibrium risk premium per unit of β_k; and δ is the equilibrium risk premium required per unit of β_L.[4] If the local market index is positively correlated with the global index, then δ is positive.[5] Although the theoretical justification for the segmentation differs, similar asset-pricing equations are derived in Albuquerque and Wang (2008) and Lee (2011). The empirical strategy that we adopt in our analysis is to estimate the country-specific risk premium using standard asset-pricing methods (see Cochrane 2006) and show that it is not only correlated with indicators of institutional quality but also that the country-level risk-premium predicts subsequent growth outcomes.

To control for common risk factors, we decompose the returns of our observable stock returns into the component that is related to its exposure to non-diversifiable business-cycle risk and the component orthogonal to non-diversifiable risk. We refer to the orthogonal component as the alpha, or the risk-adjusted cost of capital. The model that we use to control for business-cycle risk is the 3-factor Fama_French model:

$$\textbf{FF}: R_{it} - R_{ft} = \alpha_i + \beta_{i,SM}(R_{SM,t} - R_{ft}) + \beta_{i,SMB}R_{SMB,t} + \beta_{i,VAL}R_{VAL,t} + \varepsilon_{it} \qquad (2)$$

where R_{it} is the time t gross holding-period return of asset i; $R_{SM,t}$ is the time t return of the value-weighted portfolio of all UK stocks; $R_{SMB,t}$ is the time t return of a zero cost size-sorted portfolio formed by buying a value-weighted portfolio of UK stocks in the bottom 30% of market value and shorting a value-weighted portfolio of stocks ranked in the top 30% of market value; and $R_{VAL,t}$ is the time t return of a zero-cost value-sorted portfolio formed by buying a value-weighted portfolio of UK stocks ranked in the top 30% of dividend yield among all stocks that paid dividends in the past year and shorting a value-weighted portfolio of all UK stocks that

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[4] This is equation (16) in Errunza and Losq (1985) and equation (3) in Jorion and Schwartz (1986).
[5] See footnote 17 in Jorion and Schwartz (1986).

did not pay dividends in the past year. The London banker's bill rate is a proxy for the risk-free rate R_{ft}.

Equation (1) and the factor-pricing model (2) provide a testable restriction on the cross-section of observable asset returns. If foreign companies can raise capital in London on the same terms as UK companies then the expected alpha of each security should be zero. On the other hand, if investors demand compensation for holding companies domiciled in other countries with weak institutional protection of property rights the individual stock alphas should differ from zero and vary with country institutional quality.

We estimate the following multifactor pricing model:

$$R_{it} - R_{ft} = \alpha_i + \beta_{i,SM}(R_{SM,t} - R_{ft}) + \beta_{i,SMB}R_{SMB,t} + \beta_{i,VAL}R_{VAL,t} + \varepsilon_{it} \tag{3}$$

$$\alpha_i = constant + \sum_{j=1}^{J} \delta_j X_{ij}$$

where the mispricing of asset *i* is modeled as a function of the vector X_{ij} that measures the underlying institutional quality of the country in which the asset is located. If the quality of institutions affects asset prices, then the mispricing of asset *i* should be positively correlated with measures of expropriation risk.[6]

These methods require the construction of large, well-diversified portfolios, so it is important to have a data set that is adequate to the task. We use a database of all of the British and foreign equities traded on the London Stock Exchange between 1866 and 1907 that we hand-collected from 19th century publications. The data set consists of 1,808 individual equities, of which 969 are British and 839 are foreign. The price data were collected from the Friday official lists published in the *Money Market Review*, while the London dividend histories and shares outstanding were collected from the *Investor's Monthly Manual* and *The Economist*. Prices were sampled every 28 days between January 1866 and December 1907. In total we observe 295,440

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[6] Even though the existence of a positive alpha implies that Victorian investors could have earned positive alpha by forming portfolios based on this trait, it does not necessarily imply informational inefficiency or investor irrationality. The models of expropriation risk discussed above predict exactly that the additional return for investing in countries with weak property right is an equilibrium compensation for expropriation risk. Investors rationally choose to hold low alpha investments with cash flows that are secure against expropriation risk and high alpha investments with cash flows that are exposed to the risk of expropriation. In the presence of frictions related to institutional quality, we expect to observe that the cross-sectional variation in institutional quality is related to the cross-sectional variation in alphas even in a world with perfectly rational and well-informed investors.

28-day holding period returns corrected for dividends, stock splits, and special payments. Additional details on how the database was constructed can be found in Chabot and Kurz (2010).

2.4 Industry Adjustments

Our empirical tests that link asset returns to property right institutions resemble the literature linking asset returns to corporate governance in the modern era. The ease at which insiders can conceal assets, expropriate cash flow or escape monitoring can vary across industry and industry concentrations vary across countries. Taking account of industry-specific effects in returns is especially important in our context because of the possibility that an observable characteristic such as expropriation risk is correlated with another risk factor and generates a risk premium in equilibrium. For example, geography-based explanations of property rights such as Sokoloff and Engerman (2000) predict that the composition of industries at the country level and the strength of protection for property rights are correlated. The presence of an omitted third factor related to industry-specific effects that is correlated with institutional quality makes it difficult to disentangle the marginal contribution of institutional quality in the cross-section of returns.[7] Using modern data, Gompers et. al. (2003), Lewellen and Metrick (2010) and Giroud and Mueller (2011) have accounted for the potential confounding effect of industry differences when estimating the 3-factor specification in (3) and by using industry-adjusted returns in the estimation of (3). We follow their advice and use industry-adjusted returns in the estimation to follow. Industry-adjusted returns replace the time series of excess returns $R_{it} - R_{ft}$ as the dependent variable with industry-adjusted return R_{it}^{adj}, where

$$R_{it}^{adj} = R_{it} - \sum_{j=1}^{J} w_{jt-1} R_{jt} \quad (4)$$

R_{it} is the holding-period return of firm i; and the index j refers to the firms categorized in the same industry as firm i; and w_{jt-1} is the market capitalization weight of firm j in the industry

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[7] Several papers that use modern stock return data find evidence that excess returns are similar across firms belonging to the same industry (Fama and French 1997; Moskowitz and Grinblatt 1999; and Hou and Robinson 2006). For example, Johnson, Moorman, and Sorescu (2009) show that portfolios sorted by corporate governance characteristics cluster differently by industry and argue that it is important to control for industry-specific effects when computing abnormal returns, although there is a debate about how broadly to define the industry categories (see Lewellen and Metrick 2010).

portfolio at the end of period $t-1$. This method of adjusting return is standard in the asset-pricing literature that takes account of the industry-specific component of returns.

3. Institutions, the Cost of Capital, and Economic Growth

The models discussed above share two testable predictions. First, measures of the quality of institutional protection of property rights should be negatively correlated with risk-adjusted returns. Second, to the extent that weak institutional protection of property rights raises the cost of capital and depresses growth, countries with *low* risk-adjusted returns should have *high* growth. In this section we estimate the effect of institutions on the cost of capital using equation (3) and several alternative measures of institutional quality. We show that there is a systematic relationship between measures of institutional quality and risk-adjusted cost of capital. Then we present evidence that shows that the estimated alphas and subsequent economic growth during the 20th century are negatively correlated, as predicted by theories that assign an important role to institutional quality as a fundamental cause of economic growth.

3.1 Institutions and Historical Risk-Adjusted Returns

To test the two hypotheses, we require a measure of property rights protection. Acemoglu et al. (2001) trace institutional quality to the colonization strategies that Europeans adopted during the late 18th and early 19th centuries and hypothesize that Europeans established strong institutions that protected property rights in countries with less deadly disease environments during colonial rule. They document a strong correlation between the cross-country variation in modern protection against expropriation risk and current wealth. We have no 19th century equivalent to the measure of expropriation risk, but Acemoglu et al.'s argument that historical conditions determine modern property rights imply that institutions are largely immutable over long periods and that modern day protection against expropriation risk is highly correlated with historic protection as well.

In Table 3 we show that the cross-country variation in historical alpha is negatively correlated with modern protection against expropriation risk as measured by the Polity IV

database average 1985-1995 protection against expropriation risk[8]. The coefficient reported in Table 3 imply that the difference in protection against expropriation risk between a country like the United States (XROP = 9.98) and Nicaragua (XPROP = 5.29) would correspond to a 4.28% per annum difference in required rate of return.

At the same time, it is important to exercise caution when interpreting the regression results in Table 3. Property rights institutions are slow to change. The negative coefficient on protection against modern expropriation risk may indeed reflect compensation demanded by Victorian investors to hold stock issued by companies located in countries with poor historical property rights. However, causation may flow from the historical risk premium to modern property rights. The set of institutions that guarantee property rights entail significant costs. If a high cost of capital in the late 19th century prevented countries from investing in the industries of the Second Industrial Revolution, they may not be able to afford the institutions and human capital necessary for high modern protections again expropriation (Glaeser et. al, 2004).

To identify the relationship between property rights and the cost of capital, we need contemporaneous measures of institutional quality or exogenous variation in historic institutions that does not affect modern wealth except through institutions. As we discussed in section 2, Acemoglu et al. (2001) propose the Polity IV's constraints on the action of the executive as a historical measure of institutional protection and 18th and 19th century settler mortality as an exogenous instrument for modern institutions. Unlike current measures of protection against expropriation risk, late 19th century stock prices cannot cause settler mortality, and settler mortality should have no effect on current wealth except through its effect on institutions. For these reasons we use historical constraints on the executive and settler mortality as exogenous measures of institutional protections.

Our measure of constraint on the executive is the average 1870-1907 constraint on the executive in the polity IV database. Table 3 regression (2) reports the effect of cross-country variation in historical constraints on the executive on historical alphas. We find a strong negative correlation between historical cost of capital and constraints on the executive. The regression coefficient in Table 3 (2) imply the cost of capital associated with locating in a country with

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[8] This is the measure of modern expropriation risk employed by Acemoglu et al. (2001) and McArthur and Sachs (2001). Our values are taken from the appendix of McArthur and Sachs (2001).

maximum constraints (United States = 7) and a country with minimal constraints (Nicaragua = 1) varied by 2.34% per year.

Likewise, settler mortality is significantly correlated with the risk-adjusted cost of capital. Firms located in high settler mortality countries faced a significant cost of capital disadvantage compared with firms located in low settler mortality countries. The point estimates in regression (3) imply a firm located in the country with the lowest settler mortality (New Zealand = 2.14) would enjoy a 3.24% annual cost of capital advantage over a similar firm located in the highest settle mortality country (Niger = 5.99).

The use of settler mortality in cross-sectional growth regressions has not gone unchallenged. For example, Sachs (2003) has criticized the use of settler mortality in cross-sectional GDP regressions. He argues that settler mortality is correlated with geographic and climate variables and that the geographic variables have a direct effect on productivity and output. Although this problem is a concern for growth regressions, it is not clear that climate-driven differences in productivity or the marginal product of capital would influence stock returns and the risk premium. As long as the differences are known at the time that the investor purchases the shares, they should be reflected in stock prices.

In Table 4 we add geography and climate to our explanatory variables to examine this possibility. We control for climate and geography by including absolute latitude and mean temperature. The variables have been shown to have explanatory power in cross-country growth and wealth regressions, but they have ambiguous effects on the historical cost of capital. Temperature has no effect in any specification. Latitude on the other hand has a negative correlated with asset returns when included in a specification without settler mortality but a positive coefficient when settler mortality is included. The negative relationship between alpha and settler mortality remains robust to the inclusion of latitude and temperature covariates. As a whole, the evidence suggests that historical cost of capital is positively correlated with settler mortality and that the correlation is robust to the inclusion climate and geography controls.

Ferguson and Schularick (2006) argue that colonial status mattered for government borrowing costs during the late 19th century. British colonies are also more likely to have the British legal traditions that La Porta et al. (1997) and Levine (1998) argue influence both the cost of capital and economic development today. The British disproportionately colonized northern

low-mortality climates, however, and we may conflate the settler mortality finding with the salutary effect of British institutions on the cost of capital.

In Table 5 we estimate a specification that allows the cost of capital to vary with British colonial status and British legal origin. The Table 5 specification with a British colony dummy compares the risk-adjusted cost of capital between firms located in British colonies and those located elsewhere. Firms located in British colonies did not enjoy a funding advantage relative to non-British firms.

Many British colonies retained their legal traditions imposed by earlier Spanish and French settlers. Therefore, a regression on a dummy that measures whether a country was a British colony is not necessarily the same as controlling for legal origin. Table 5 also reports regressions on La Porta et.al. (1997) British legal tradition dummy. There is no significant relationship between British legal tradition and the Fama-French risk-adjusted cost of capital.

4. Historical Alpha and Real GDP Growth during the 20th Century

The evidence reported thus far indicates that London investors were indifferent to the climate, legal tradition or colonial status of the host countries of their investments but discriminated against firms located in countries that lacked institutional protection of property rights. Countries with weak property right institutions paid a higher risk-adjusted cost of capital. These higher capital costs are consistent with models that generate an equilibrium outcome related to expropriation risk that exacerbated market segmentation and agency costs that are especially acute in international financial transactions.

In Table 6 we show that differences in country alphas also mattered for the subsequent development trajectories of the countries in our sample even conditional on other determinants of growth.

4.1 Per Capita Real GDP Growth 1913-2014:

Our measure of the economic growth of a given country is the annualized real per capita GDP growth in excess of the real per capita growth of the world over the same sample years. We express growth relative to the world economy to account for the fact that GDP data is not

available for all countries in all years. If each country has the same starting date we could simply compare the cross-sectional change in per-capita GDP to our alpha estimates and other controls. However, some country GDP accounts are not available until 1920 or 1950[9]. Most countries suffered recession after World War I and all countries had lower growth rates during the 1929-1950 period. We must therefore correct for different starting dates and do so by comparing each countries growth rate to the world growth rate over the available sample period.

4.2 Other Determinants of Economic Growth:

In Table 6 we relate 1866-1907 alphas to subsequent economic growth. In our regression we also include other plausible determinants of economic growth that have been shown to be important in previous studies (e.g., in Barro 1991 and Glaeser et;al. 2004). Our additional controls include:

Initial GDP = per capita GDP in the first observable year as a fraction of world per capita GDP

Oil = oil production in 2013 expressed as barrels per day per capita.

Schooling 1910 = the average years of schooling among the population aged between 15 and 64 years in 1910 from Morrisson and Murtin (2009).

The overlap between Morrisson and Murtin (2009) schooling database and ours reduces the full sample from 42 countries to 36 countries.[10] However, the results are insensitive to including the average years of schooling variable and reducing the size of the cross-section, as we discuss further below.

4.4 Empirical Results

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[9] The countries with data beginning after 1913 are Costa Rica (1920), Nicaragua (1920), Mauritius (1950), and Zimbabwe (1950).

[10] There are six countries contained in our data set that are not included in Morrisson and Murtin's (2009) data set: China, Colombia, Mauritius, Romania, Russia and Sri Lanka.

Table 6 reports a set of benchmark regression results for the full sample and a subsample of countries that overlaps with the schooling database or excludes Norway.

Let us focus first on the results obtained for the full sample. Beginning with a regression of real per capita GDP between 1913 and 2014 on the estimated alpha, each column adds another covariate. Alpha has a negative and significant effect on subsequent GDP growth across all specifications. Moving from left to right in the first panel of the table shows that adding initial GDP per capita and then oil production per capita increases the economic and statistical significance of the effect of alpha on GDP growth from -0.3 to -0.44 - that is, the size of the effect increases almost 50%.

To get a better sense of its overall importance of alpha for real GDP growth, let us look more closely at the economic significance of the estimated coefficients obtained from the benchmark regression. The 1913 to 2014 real GDP growth rates are expressed at annual rates, while the alphas are estimated risk premia from the 28-day regressions. A country that paid 100 basis point more in monthly alpha would be expected to grow 30 to 44 basis points less per year. To give these numbers more texture, consider the examples of Nicaragua and the United States. The estimated alpha for Nicaragua is 41 basis points per month and that for the United States is -3 per month. Given the coefficient in the full specification, going from Nicaragua's alpha to the United States' alpha translates into about a 19 basis points ($= -0.44 \times [-0.0003 - 0.0041]$) increase in real annual per capita income growth. Compounded over the 1913-2014 sample period 19 additional basis points of growth would translate into 21% more wealth in 2014. The discrimination imposed by Victorian investors related to institutional quality possessed substantial economic importance in terms of future growth trajectories.

The second panel in Table 6 presents the same set of regressions based on subsamples of countries that include School enrollment data or excludes Norway. In all three specifications, the estimated effects of risk-adjusted return on 20th century economic growth are significant and stable (between -0.43 $and -.044$), which is close to the estimated coefficient reported in the benchmark specification for the full sample.

Table 6 reveals that including the average years of schooling from Morrisson and Murtin (2009) does not affect the size of the estimated coefficient or its statistical significance. Whether we include or exclude this measure of initial human capital, the marginal effect of institutional

quality as measured by the country alphas in regression columns 4 and 5 remains essentially unchanged.

Our final column in Table 6 excludes Norway. The case of Norway is worth discussing in detail because several of the country's characteristics render it an obvious outlier. First, the Norwegian country portfolio consists of a single stock issued by a copper mine, Bratsberg Copper.[11] Furthermore, the Bratsberg Copper's returns are highly volatile. There are several months during which the stock experiences 100% gains and some in which there are losses of close to 50%. The volatility contributes to the size of the estimated alpha and, most important, has more to do with the cash flows of this specific copper mine rather than the overall quality of Norway's institutions, which are ranked highly by any measure. Norway also grew rapidly during the 20th century. Between 1913 and 2011 Norwegian income per capita increased by about 2.5% per year, putting its growth rate in the highest quartile of country growth rates. Finally, there is Norway's unique status as a high-income country that exports oil, a fact that accounts for much of the increase in the country's income per capita since the exploitation of oil resources began in the late 1960s. Norway is the largest per capita producer of energy in the full sample of 43 countries, producing roughly four times more oil per capita than the second largest producer (Canada). All of these factors pose a challenge to the claim that capital costs during that period reflected institutional quality and had an effect on subsequent patterns of economic development. For these reasons we consider a specification of the growth regression that omits Norway from the sample and drops the per capita oil production as a covariate.

Excluding Norway from the analysis dramatically increases the coefficient alpha coefficient (compare regression column 3 to 6) and is roughly equivalent to controlling for oil production.

5. Conclusion

The paper documents the relationship between institutions that protect property rights, the cost of capital during the late 19th century, and subsequent wealth. We established two striking relationships. First, there is a negative correlation between the strength of institutions that protect property rights and the risk-adjusted cost of capital in the late 19th and early 20th century. When

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[11] We observe the stock for over 7 years.

firms located in countries with weak institutions raised capital in London, they were charged a premium compared to similarly risky firms located in countries with strong institutions. Second, there is a similarly strong negative correlation between post 1913 GDP growth or current per capita GDP and historical risk-adjusted cost of capital. Firms located in countries that grew slowly after our sample period faced a significantly higher cost of capital during the Second Industrial Revolution.

It is worth stepping back to think about the economic logic behind the conclusion that the 19th century cost of capita is negatively related to subsequent development outcomes. At first glance, such a conclusion seems counterintuitive. If we told economists in 2015 that they could go back to 1870 London to purchase stocks, it is plausible that most would choose stocks located in the countries that, with the benefit of hindsight, are known to have succeeded in the 20th century and to have high per capita GDP today. But a portfolio of U.S., Canadian, Australian, and German stocks would have underperformed the market by a significant margin.

The reason for this seemingly counterintuitive finding becomes clear upon reflection. In most applications of multifactor asset pricing models we think of alpha as the unexpected component of returns and test whether it surprises was actually predictable (e.g., Fama and French 1996). If firms had large positive alphas during the late 19th century because they consistently generated cash flows that were a positive surprise to investors, we would observe a positive alpha, but we would also expect the countries that host such firms to grow quickly. Alternatively, if firms offered investors a positive alpha as equilibrium compensation for weak institutional protection of their property rights, as many theoretical models predict, we expect that the countries in which the firms were located to grow slowly. That we observe a negative correlation between 20th GDP growth and modern GDP per capita, on the one hand, and the 19th century risk-adjusted cost of capital, on the other, provides evidence in support of the role of institutions as an important force driving economic development. More specifically, the evidence shows that one channel through which the effect of institutions on economic development can be detected is the capital market and the risk-adjusted cost of capital.

Taken together, the facts suggest that the extent to which institutions guarantee property rights influenced the cost of capital during the late 19th century and that this influence had consequences for long-run economic growth. Institutions seem to matter for economic growth by

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providing a secure environment for investment. Financial markets thus act as an important

conduit through which institutions shaped long-run economic growth.

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Table 1: Estimates of Divergence of Per Capita Incomes since 1870

	1870	1913	1950	2011
United States	3,262	7,018	15,114	50,000
Poorest	737	155	178	500
Ratio of GDP per capita of United States to poorest	4.4	45.2	84.7	100.0
Avg. of OECD countries	3,223	5,304	8,345	35,105
Avg. of non-OECD countries	1,453	1,869	3,096	9,368
Ratio of Avg. of OECD to non-OECD countries	2.2	2.8	2.7	3.7
Std. Dev. of per-capita incomes	1,380	2,630	4,287	15,481
No. of countries	23	43	43	43

Note: Due to the lack of GDP per capita data for several countries, we use the observation that is as close as possible to the year reported in the table. For Niger and Zimbabwe, we use GDP per capita in 1910; for Costa Rica and Nicaragua, we use GDP per capita in 1920; and for Myanmar, we use GDP per capita in 2008. The 2011 data are from the CIA Factbook and are rounded.

Table 2: Country of Origin of Listed Firms in Full Sample, by Region

North America	*Middle East and North Africa*
Canada	Egypt
United States	Iran
	Turkey
Latin America	
Argentina	*Sub-Saharan Africa*
Brazil	Mauritius
Chile	Niger
Colombia	South Africa
	Zimbabwe
Costa Rica	
Mexico	*East Asia*
Nicaragua	China
Peru	Malaysia
Uruguay	Philippines
Venezuela	
Eastern Europe and Russia	*South Asia*
Romania	India
Russia	Myanmar
	Sri Lanka
Western Europe	
Austria	*Oceania*
Belgium	Australia
Denmark	New Zealand
France	
Germany	
Greece	
Italy	
Netherlands	
Norway	
Portugal	
Spain	
Sweden	
United Kingdom	

Notes: The countries' names listed in the table are the modern ones. In some cases, the modern name differs from the name used during the late 19th and early 20th centuries. In other cases, the country in its current form did not exist during that period. In such cases, we used a variety of methods to determine the modern-day country in which the firm operated. For example, the name of the firm frequently contains the name of the region or city where the firm operated.

Table 3. Institutions and Alpha

The Table reports the determinants of Alpha from the monthly Fama-French three factor regression:

$$R_{it} - R_{ft} = \alpha_i + \beta_{i,SM}(R_{SM,t} - R_{ft}) + \beta_{i,SMB}R_{SMB,t} + \beta_{i,VAL}R_{VAL,t} + \varepsilon_{it}$$

alpha is constrained to be a linear function of protection against expropriation risk, constraints on the executive or settler mortality:

$$\alpha_i = con + \delta_1(Exprop\ Protection) + \delta_2(Ex\ Constraint) + \delta_3(Ln\ Setmort)$$

	(1)	(2)	(3)
Constant	0.0069	0.0016	-0.0014
	[4.26***]	[2.47***]	[-1.18]
Exprop. Protection	-0.0007		
	[-4.25***]		
Executive Const.		-0.0003	
		[-2.61***]	
Ln(Setmort)			0.0007
			[1.86**]
$\bar{R}^2$	0.02	0.02	0.02
No. of obs.	277,588	262,237	104,797

Notes: The independent variables are defined in Appendix Table 1. Robust *t*-statistics are in square [.] brackets. The two-tailed hypothesis tests are based on the asymptotic critical values. *** (**) (*) indicates that the coefficient estimate is significant at the 1% (5%) (10%) level.

Table 4. Climate and Alpha

The Table reports the determinants of Alpha from the monthly Fama-French three factor regression:

$$R_{it} - R_{ft} = \alpha_i + \beta_{i,SM}(R_{SM,t} - R_{ft}) + \beta_{i,SMB}R_{SMB,t} + \beta_{i,VAL}R_{VAL,t} + \varepsilon_{it}$$

alpha is constrained to be a linear function of the log of Settler Mortality, Mean Temperature and abs Latitude:

$$\alpha_i = con + \delta_1(Ln\ Setmort) + \delta_2(Mean\ Temp) + \delta_3(Abs\ Latitude)$$

	(1)	(2)	(3)
Constant	-0.0014	0.0037	-0.008
	[-1.18]	[1.63]	[-1.96*]
Ln(Setmort)	0.0007		0.0011
	[1.86**]		[2.57***]
Mean Temp		-0.0001	0.0001
		[-1.06]	[1.05]
Abs Latitude		-.0055	.0097
		[-1.91**]	[1.73*]
$\bar{R}^2$	0.02	0.02	0.02
No. of obs.	104,797	278,327	104,797

Notes: The independent variables are defined in Appendix Table 1. Robust *t*-statistics are in square [.] brackets. The two-tailed hypothesis tests are based on the asymptotic critical values. *** (**) (*) indicates that the coefficient estimate is significant at the 1% (5%) (10%) level.

Table 5. Colonial Origins and Alpha

The Table reports the determinants of Alpha from the monthly Fama-French three factor regression:

$$R_{it} - R_{ft} = \alpha_i + \beta_{i,SM}\left(R_{SM,t} - R_{ft}\right) + \beta_{i,SMB}R_{SMB,t} + \beta_{i,VAL}R_{VAL,t} + \varepsilon_{it}$$

alpha is constrained to be a linear function of colonial status and legal origin:

$$\alpha_i = con + \delta_1(Brit\ Colony) + \delta_2(British\ Legal\ Origin)$$

	(1)	(2)	(3)
Constant	0.0012	0.0012	0.0013
	[2.88***]	[2.95***]	[3.02***]
British Colony	-0.0007		-0.0011
	[-1.39]		[-0.63]
Brit Legal Origin		-0.0008	-.0002
		[-1.47]	[-0.14]
$\bar{R}^2$	0.02	0.02	0.02
No. of obs.	126,298	120,384	120,384

Notes: UK stocks are excluded from these regressions. The independent variables are defined in Appendix Table 1. Robust *t*-statistics are in square [.] brackets. The two-tailed hypothesis tests are based on the asymptotic critical values. *** (**) (*) indicates that the coefficient estimate is significant at the 1% (5%) (10%) level.

Table 6: Real GDP Growth 1913-2014 and the Risk-Adjusted Cost of Capital

Dep. Var.: Real Per Capita GDP Growth – World Per Capita GDP Growth, 1913-2014

	Full Sample			School Sample.		Ex.Norway
Const.	0.0024**	.0039*	0.0037*	0.0016	0.0014	0.004*
	(2.18)	(1.75)	(1.91)	(0.84)	(0.79)	(1.96)
$\hat{\alpha}_i$	-0.30*	-0.33*	-0.44**	-0.42***	-0.43***	-0.44**
	(-1.71)	(-1.81)	(-2.44)	(-2.91)	(-2.71)	(-2.33)
Initial GDP		-0.0009	-0.0012	-.0013	-0.0003	-0.0011
		(-0.78)	(-1.19)	(-0.60)	(-0.32)	(-0.97)
Oil production			0.0356**	0.035**	0.038***	
			(2.02)	(2.17)	(2.66)	
Schooling 1910				0.0004		
				(.50)		
$\bar{R}^2$	0.05	0.04	0.11	0.16	0.18	0.09
No. obs.	42	42	42	36	36	41

Notes: Bootstrap *t*-statistics, accounting for the use of generated regressors, are reported in parentheses. *** (**) (*) indicates that the estimated coefficient is significant at the 1% (5%) (10%) level.