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Corruption, regulation, and growth: an empirical study of the United States

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Abstract This paper investigates whether the costs of corruption are conditional on the extent of government intervention in the economy. We use data on corruption convictions and economic growth between 1975 and 2007 across the US states to test this hypothesis. Although no state approaches the level of government intervention found in many developing countries, we still find evidence for the "weak" form of the grease-the-wheels hypothesis. While corruption is never good for growth, its harmful effects are smaller in states with more regulation.

Keywords Corruption · US states · Growth · Regulation

JEL classifications K4 · O1 · H7 · H0 · D7

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1 Introduction

Corruption, commonly defined as the abuse of public power for private gain, is an endemic feature of political life around the globe. It exists even in countries that enjoy relatively good governance. Corrupt practices are widely condemned and a consistent target of laws and investigations, even in regions where such behavior is common (Noonan 1984; Klitgaard 1988). Much of this public outrage and frustration is driven by the belief that corruption has detrimental effects on the economy. In this paper we investigate whether this belief is always true. In particular, we show that corruption in US states with more costly regulatory regimes is, on average, less costly than in states with less regulation.

The impact of corruption on economic growth is the subject of a large social science literature. Much early research claimed that corruption might have a positive impact in places with dysfunctional political institutions (Leff 1964; Leys 1965). It could do so by effectively "greasing the wheels" of commerce in the face of significant political obstacles. The opposite view, which has been called the "sanding the wheels" position, argues that corruption is detrimental to economic growth (Aidt 2009). According to one recent review, this last position has "achieved the status of received wisdom" (Haggard et al. 2008, 212).[1] Others hold to the position that costly rules and regulations may create incentives for individuals to evade those strictures, possibly resulting in increases in efficiency (Djankov et al. 2002).[2] Thus, there is a need for an empirical test of whether corruption's effect on growth is *conditional* on the extent of regulation (Heckelman and Powell 2010; Dreher and Gassebner 2011).

The majority of the papers on the macroeconomic cost of corruption use cross-country data. As such these studies potentially suffer from biases generated by the heterogeneity of their samples. Unobserved factors, such as geography or culture, could easily affect both the incidence of corruption and economic development through separate channels (Aghion et al. 2010). Additionally, the effect of corruption on growth might depend on country-specific factors such as the composition of the economy or political institutions. In this paper we use data on US states to test whether the grease-the-wheels or the sand-the-wheels position is correct. Studying the United States has the advantage of providing fifty jurisdictions with significant autonomy over regulatory policy. Further, our analysis is a "tough test" of our hypotheses since, compared to developing countries, the US has low levels of corruption and regulation.[3] Furthermore, conditional on finding evidence for the grease-the-wheels position, we will be able to distinguish between the "strong form" of this hypothesis in which corruption is good for growth, and the "weak form" in which corruption is simply less costly in heavily regulated economies (Méon and Weill 2010). If corruption has no

[1] A third group of scholars (Drury et al. 2006) argue that corruption has little impact one way or the other.

[2] Concomitantly, some argue that corruption should reduce the *effectiveness* of regulation (Breen and Gillanders 2012).

[3] The fact that a single federal government prosecutes cases of local corruption across all the federal jurisdictions further constrains variation on the independent variables and "controls for" the manner in which differing state cultures might otherwise affect prosecutions and thus the observed prevalence of corruption.

effect on growth in more heavily regulated US jurisdictions, *a fortiori* this relationship should hold in developing countries as well.

We find significant support for the grease-the-wheels hypothesis. Under our preferred specification, the effect of a one standard deviation increase in corruption convictions in one of our least heavily regulated states (e.g. South Dakota, New Hampshire, or Colorado) is associated with half a standard deviation decrease in GSP growth between 1975 and 2007. By contrast, in the most heavily regulated states (e.g. New York, Arkansas, or Hawaii), we estimate an insignificant effect of corruption on growth. We interpret this as support for the weak form of the grease-the-wheels hypothesis. Our estimates are robust to the inclusion of numerous demographic and economic covariates as well as controlling for a state's geographic region. We further control for potential sources of bias by instrumenting corruption using political variables with a deep historical legacy.

While we accept the dominant point of the "sand-the-wheels" theorists that corruption is generally bad for economic growth, this paper makes a useful contribution to the debate by showing that, on the margin, the cost of corruption decreases as regulation becomes more invasive. The intuition is that bureaucrats and businesses will make illegal bargains if regulations are particularly burdensome. In the next section, we summarize the key findings and arguments in the literature on corruption, regulation, and growth. The following section introduces our data and identification strategy. Section four presents and discusses the econometric results. The final section concludes with theoretical implications.

2 Background

Although there is a voluminous amount of research on the causes and consequences of corruption, academic interest in these issues is relatively new. Indeed, most of this literature dates from the last fifty years. This may be due to what Gunnar Myrdal (1970) identified as a "taboo" about engaging in research on the issue.[4]

Many of the first scholars to address the specific issue of the relationship between corruption and economic growth thought that it might actually play a positive role under certain conditions. These were the theoretical originators of the grease-the-wheels school of thought. Leff (1964), for example, proposed that corruption can further economic growth in countries with elites hostile to development by incentivizing bureaucrats to aid entrepreneurs, reducing investor uncertainty about future government intervention, and sabotaging bad economic policies. Likewise, Nye (1967, 427) thought that corruption in some instances might provide "…the only solution to an important obstacle to development." In particular, it could help promote capital formation, cut red tape, and free entrepreneurs and minorities from hostile bias against them (420).

Most infamously, Huntington (1968, 68) argued that during modernization "…corruption may be one way of surmounting traditional laws or bureaucratic regulations

[4] Although Myrdal's pronouncement is more famous, Leff (1964) noted the taboo a half decade before Myrdall's famous piece.

which hamper economic expansion." In fact, he thought that good or efficient governance in such an instance might actually be worse for economic growth than a corrupt regime. As he pithily noted, "The only thing worse than a society with a rigid, overcentralized, dishonest bureaucracy is one with a rigid, overcentralized, honest bureaucracy" (69).

Many papers have followed which support the grease-the-wheels claim.[5] Rock and Bonnett (2004, 1010), for example, argue that while corruption in many developing countries is bad for growth, corruption in large East Asian countries helped spur high growth by providing "…stable and mutually beneficial exchanges of promotional privileges for bribes and kickbacks." Likewise, Egger and Winner (2005, 949) find that "…corruption is a stimulus for FDI." More starkly, Méon and Weill (2010) demonstrate that corruption is positively correlated with efficiency in countries with "ineffective" institutions, while Heckelman and Powell (2010) argue that corruption facilitates growth in countries with limited economic freedom. Some more narrow and thickly-descriptive studies also lend support to the grease-the-wheels position (Levy 2007). Dreher and Gassebner (2011) find the negative effects of regulation on firm entry and exit is less in countries with more corruption. In related research, Breen and Gillanders (2012) find that greater corruption decreases the quality of regulation in a country.

The dominant view today, however, is that corruption has a negative impact on economic growth, especially in developing countries. Indeed, the sand-the-wheels literature is expansive and identifies a variety of different causal pathways by which corruption is corrosive of development. For example, Mauro (1995, 683) finds that corruption lowers investment even in places "…in which bureaucratic regulations are very cumbersome." Méon and Sekkat (2005) build on this by noting that corruption is bad for growth even controlling for the investment route. Murphy et al. (1991) and Murphy et al. (1993) claim that corruption harms growth by misallocating key resources while buttressing inefficient businesses. Shleifer and Vishny (1993) argue that corruption encourages secrecy, distortionary regulation, and bribery which, in turn, reduces economic efficiency and growth.[6]

Most studies of the relation between corruption and economic growth focus on developing countries. But is the impact of corruption in the developed world also negative and important? Drury et al. (2006), for example, provide empirical evidence that corruption has no significant impact in democracies. Yet there is disagreement about how corruption impacts growth in the United States. Glaeser and Saks (2006) find no significant effect of corruption on US growth. By contrast, Johnson et al. (2011) find that it reduces growth and investment. It is not clear whether Huntington thought corruption would be beneficial in fully modernized economies—but probably not given that his examples of the virtues of corruption are all places in the process of modernization. Nonetheless, corruption could play the same role in a developed as in a developing country if government displays the features of rigidity, overcentralization,

5 Lui (1996) surveys many of these contributions up to the mid-90's.

6 See also Rose-Ackerman (1999), La Porta et al. (1999), Ades and di Tella (1999), Treisman (2000), Drury et al. (2006), Fisman and Svensson (2007), and Aidt (2009).

and sclerosis due to excessive regulation discussed by Huntington. Indeed, this point is supported by Goel and Nelson (1998), who find that state government size and spending levels influence the amount of corruption.

The theoretical logic of how corruption could reduce the cost of regulation is straightforward.[7] When government imposes a regulation, such as a license for entry a corrupt bureaucrat may allow a side payment in lieu of the licensure fee or demand a side payment in addition to the cost of the license. In the latter case, corruption unambiguously reduces efficiency by raising the cost of entry even higher. In the former case, corruption may improve efficiency by reducing the cost of entry. Whether bureaucrats more often raise barriers to entry in order to extract bribes or allow bribes as an alternative to legislatively imposed barriers to entry, is an empirical question. Furthermore, even in those cases in which corruption improves efficiency, it is important to distinguish between two ways this could occur (Méon and Weill 2010). In the first, corruption merely offsets costly regulation, thus resulting in no effect of corruption on efficiency on the margin. This is the "weak" form of the grease-the-wheels hypothesis. The second possibility, called the "strong" form, occurs when corruption more than offsets any regulatory costs and increases economic growth.

The empirical research on these questions remains undecided. Méon and Weill (2010) use an index of technical inefficiency as the dependent variable in their cross-country analysis. They interact corruption and quality of governance and find that corruption no longer has a positive association with technical inefficiency, and may even have a negative association, when the quality of governance is about a standard deviation or more below the sample mean. Similarly, using cross-country data, Heckelman and Powell (2010) find that when "economic freedom" is very high (three standard deviations above the mean), corruption is negatively associated with growth. However, for most of the countries in their sample corruption is positively associated with growth. Dreher and Gassebner (2011) study firm entry in 43 economies over the 2003–2005 period and find that a larger number of procedures required to open a business deters the formation of new businesses, but that corruption can encourage firm entry once entry regulations reach values somewhat higher than the sample mean.

The contribution of this paper is to identify the mediating effect of the regulatory environment on the cost of corruption within the United States. By focusing on a single country with a reasonably unified national culture and a single enforcer of anti-corruption laws, the US Department of Justice, we hope to avoid some of the pitfalls of using cross-country data.

3 Data and identification strategy

To test whether the economic cost of corruption decreases when government involvement in the economy is greater, we estimate the following model:

[7] For a more formal treatment of the theoretical relationship between corruption and efficiency, see Leys (1965), Shleifer and Vishny (1993), and Méon and Weill (2010).

$$growth_i = \alpha + \beta_1 corruption_i + \beta_2 freedom_i + \beta_3 corruption_i * freedom_i + X_i' \eta + \epsilon_i \quad (1)$$

where i subscripts state, X is a vector of control variables, and ϵ is an i.i.d. error term.

The dependent variable is annualized growth in real gross state product (GSP) per worker between 1975 and 2007. We choose these years because it is the longest period over which both GSP and corruption data are available. The GSP data are drawn from Beemiller and Downey (1998) and *Regional Economic Accounts* (2013) and the employment data are from *State and Metro Area Employment, Hours, and Earnings* (2013).

Our independent variables of interest are corruption, economic "freedom", and the interaction between the two. Corruption is measured as the number of federal corruption convictions of federal, state, and local officials per 100,000 persons averaged from 1976 to 2007. The data are derived from the US Department of Justice's "Report to Congress on the Activities and Operations of the Public Integrity Section". These data are commonly used in the literature, and previous research has found them to be related to growth in gross state product (Johnson et al. 2011).[8]

We use two measures of economic freedom produced by the Fraser Institute. The Fraser Institute has published various indices of economic freedom for American states and Canadian provinces from 1981 to the present (Karabegović and McMahon 2008). The first variable, economic freedom, is a composite measure of government size, taxation and labor market policies. The second variable, labor market freedom, is a measure of minimum wage legislation, government employment and unionization. We use the 1981 value of each variable to reduce the chances of reverse causality. We also instrument them in some specifications (see below). We rescale each freedom variable to range from 0 (highest government regulation in economy) to 1 (lowest government regulation in economy) in order to facilitate interpretation.

We follow Johnson et al. (2011) and include controls for initial physical capital per worker, initial human capital per worker, initial population, population growth, state fiscal policy and geographic region controls. We use the log of initial physical capital per worker in 1970 to control for convergence of real per capita output (Barro and Martin 1992; Mankiw et al. 1992; Solow 2000). The capital stock data comes from Garofalo and Yamarik (2002) and Yamarik (2013). We use initial capital per worker rather than real GSP per worker because it does not requires an assumption of fixed technology across states (Johnson et al. 2011). We measure initial human capital per worker as the share of the 25+ year-old population with 12-years of schooling or less in 1970. We use the log of total population in 1970 and the growth rate of population from 1970 to 2007. To control for fiscal policy, we use state and local government consumption spending, capital outlays, and tax revenue (each divided by personal income) in 1972. Lastly, we include dummies for East, Midwest and South regions (West is the omitted category).

[8] Boylan and Long (2003) provide an alternative survey-based measure of perceived corruption for US states. We will use this as an alternative measure as part of our robustness analysis.

We expect the marginal effect of corruption on economic growth to vary according to the extent of economic freedom. As such we are interested in examining the sum of the direct effect of corruption on growth and its indirect effect through the regulatory environment. Using Eq. (1), this marginal effect and its standard deviation are given as:

$$\frac{\partial growth}{\partial corruption} = \beta_1 + \beta_3 freedom_i \tag{2}$$

$$\sigma = \sqrt{var(\hat{\beta}_1) + (freedom_i)^2 var(\hat{\beta}_3) + 2(freedom_i)(cov(\hat{\beta}_1\hat{\beta}_3))} \tag{3}$$

when economic freedom is at its lowest, we expect corruption's effect on growth to be either zero or positive. If ($\beta_1 + \beta_3 = 0$), then this will be support for the weak form of the grease-the-wheels hypothesis. If ($\beta_1 + \beta_3 > 0$), then this would support the strong form. When economic freedom is at its highest, we expect corruption to be negatively related to growth ($\beta_1 + \beta_3 < 0$), regardless, of whether the weak or strong form of the grease-the-wheels theory holds. We provide graphs of Eq. (2) along with their 95 % confidence intervals in Sect. 4. In each of our main regression tables we also report that value of Eq. (2) along with its standard error evaluated at both the minimum and maximum values of economic freedom.

We adopt a three-pronged strategy to address potential endogeneity issues in the estimation of β_1 and β_3. First, in addition to the standard control variables, we include region dummies to account for unobserved factors correlated with geography. Second, by restricting the sample to US states, we significantly reduce the amount of underlying heterogeneity that could bias our estimates (Besley and Case 2003). Lastly, we adopt an instrumental variables approach in which we use potentially exogenous political variables to instrument for corruption.

It is difficult to find valid instruments for corruption (Shaw et al. 2009). Nonetheless, multiple studies have identified corruption by using systematic differences in state-level political institutions. For example, Alt and Lassen (2008) find that corruption is higher in states where judges are appointed rather than elected. Likewise, Rose-Ackerman (1978) and North et al. (2009), argue that broader access to the franchise reduces corruption. Similarly, Adsera et al. (2003) suggests that a better educated electorate is more likely to vote corrupt officials out of office.

We follow their lead and use three instruments for corruption that are related to politics.[9] Our first instrument is the number of days a citizen has to live in the state before he or she can vote. Longer waiting periods are much more likely in the South and, as such, this measure is probably identifying multiple historical institutions related to Jim Crow that prevented citizens from disciplining the electorate using their voice (Kousser 1999). Our second instrument is an index of campaign finance restrictions compiled from various volumes of the Book of the States. There is plenty of empirical evidence that higher campaign contributions result in more votes for a candidate (Depken 1998; Levitt 1994; Lott 1991; Grier 1989). There is also evidence that politicians reward donors in exchange for these contributions (Stratmann 1995, 1998). Thus, the fewer

9 These are the same instruments used in Johnson et al. (2011).

the restrictions on campaign contributions, the greater the likelihood that a candidate will be elected based on private as opposed to public interest. Our third instrument is the age of the state constitution in 1970. The reasoning behind this measure is that when the residents of a state wish to alter the rules under which they govern themselves, they can either amend the existing constitution or adopt a new one. We hypothesize that amending an existing constitution is a more incremental way of changing rules than re-constituting the social contract. Furthermore, there is some support for this notion in the literature (Tarr 2000).

We also instrument for economic freedom and labor market freedom in some specifications. For this purpose, we use dummies for a former civil law legal system, a former Confederate state, an interaction of former civil law with a former Confederacy, and the log of the percentage of population in slavery. Berkowitz and Clay (2011) shows that former civil-law and common-law states had different balances of powers in the late 18th century that led to different long-run levels of state political competition, legislatures and courts. Research by Kousser (1999) argues that that the legacy of slavery had profound effects on state institutions that persist to today. However, Mitchener and McLean (2003) show that the direct impact of slavery on state labor productivity declined markedly over time until its magnitude become nearly zero by 1980.

4 Econometric results

We first estimate a baseline model with our corruption and freedom variables along with all controls. Table 1 presents these OLS results. In each specification, we find a negative link between corruption and growth and a positive relationship between freedom and growth. The coefficient on corruption is stable across specifications and implies a one standard deviation increase in corruption lowers the growth of state product between 1975 and 2007 by about a quarter of a standard deviation. The coefficient on freedom is also fairly stable across specifications. Its point estimate of 0.005 implies that a one standard deviation increase in freedom (less regulation) is associated with an increase in GSP growth of about a quarter of a standard deviation. In addition, the coefficients for the control variables have their expected signs. Of particular interest, the sign for the initial capital per worker is negative and significant, while the sign for population growth is positive and significant.

We next estimate our baseline model using 2SLS in Table 2. We use voter residency requirements, campaign finance restrictions, and the age of the state constitution to instrument for corruption; and former civil law legal system, former Confederate member, interaction of former civil law with Confederacy and the log of slaves per capita to instrument for freedom. The results, especially those in columns 4 and 5, show that corruption lowers state-level growth, while freedom raises growth.

We next test our main hypothesis by estimating Eq. (1) which includes an interaction term of corruption and freedom. Table 3 presents the OLS results in Panel A and 2SLS results in Panel B for the variables of interest.[10] The first two columns use the Fraser

[10] For 2SLS we assume that corruption is endogenous and freedom is exogenous given the timing of the data and the Durbin-Wu-Hausman test results in Table 2. As a result, we use the three instruments for corruption and those instruments interacted with freedom (Ozer-Balli and Sorensen 2010).

Table 1 Baseline OLS regression results (dependent variable = growth in real GSP per worker, 1975–2007)

Variables	(1)	(2)	(3)	(4)	(5)
Corruption	−0.0714**			−0.0731**	−0.0756**
	(0.0314)			(0.0332)	(0.0331)
Fraser economic freedom		0.0050*		0.0051**	
		(0.0028)		(0.0023)	
Fraser labor market freedom			0.0051*		0.0054**
			(0.0026)		(0.0021)
Log of capital per labor in 1970	−0.0028	−0.0053	−0.0054*	−0.0050*	−0.0052**
	(0.0027)	(0.0034)	(0.0030)	(0.0028)	(0.0025)
Schooling in 1970	−0.0109	0.0008	0.0029	0.0034	0.0062
	(0.0154)	(0.0161)	(0.0165)	(0.0149)	(0.0150)
Log of population in 1970	0.0007*	0.0008*	0.0009**	0.0008**	0.0009**
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Growth rate in population 1970–2007	0.0314	0.0439	0.0349	0.0053	−0.0061
	(0.0671)	(0.0747)	(0.0822)	(0.0583)	(0.0656)
Gov. Cons. spending in 1972	0.0453	0.0271	0.0336	0.0361	0.0430
	(0.0413)	(0.0448)	(0.0452)	(0.0423)	(0.0419)
Gov. Cap. spending in 1972	−0.0383	−0.0422	−0.0282	−0.0297	−0.0144
	(0.0526)	(0.0597)	(0.0614)	(0.0531)	(0.0547)
Gov. tax burden in 1972	−0.0755	−0.0314	−0.0373	−0.0498	−0.0559
	(0.0478)	(0.0567)	(0.0575)	(0.0488)	(0.0494)
Reg. dummies	Yes	Yes	Yes	Yes	Yes
Observations	50	50	50	50	50
R-squared	0.6169	0.6247	0.6239	0.6661	0.6681

Robust standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All regressions include region dummies

economic freedom and labor market freedom measures, while the third column uses an alternative Mercatus economic freedom measure.[11] To conserve space, we report only the coefficients of interest.

The results show that the negative impact for growth is reduced as the degree of freedom falls. When freedom is greatest, corruption has a negative impact on state-level growth since the negative coefficient for the interaction term is larger than the positive coefficient for corruption. However, as the freedom measure declines, the negative impact of corruption is reduced and eventually becomes positive. As a result, when freedom is lowest, corruption has a positive, albeit insignificant, impact on economic growth. One way to see these results is to note that when we evalue the marginal effect of corruption at the minimum value of freedom, the point estimate is insignificant.

[11] The Mercatus Center economic freedom is a composite measure of state fiscal policy along with regulatory and judicial policies (Ruger and Sorens 2011). Unfortunately, the data are only available starting in 2007 so there is a strong likelihood of reverse causality even in the 2SLS.

Table 2 Baseline IV regression results (dependent variable = growth in real GSP per worker)

Variables	(1)	(2)	(3)	(4)	(5)
Corruption	−0.1273**			−0.1381**	−0.1271**
	(0.0582)			(0.0630)	(0.0587)
Fraser economic freedom		0.0035		0.0092**	
		(0.0034)		(0.0038)	
Fraser labor market freedom			0.0037		0.0097***
			(0.0036)		(0.0037)
Log of capital per labor in 1970	−0.0026	−0.0047	−0.0048*	−0.0065**	−0.0069**
	(0.0023)	(0.0030)	(0.0030)	(0.0031)	(0.0029)
Schooling in 1970	−0.0091	−0.0033	−0.0016	0.0168	0.0214
	(0.0137)	(0.0163)	(0.0176)	(0.0168)	(0.0175)
Log of population in 1970	0.0007**	0.0008**	0.0009**	0.0009**	0.0011***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Growth rate in population 1970–2007	0.0023	0.0511	0.0444	−0.0484	−0.0612
	(0.0597)	(0.0693)	(0.0741)	(0.0544)	(0.0593)
Gov. Cons. spending in 1972	0.0523	0.0298	0.0343	0.0368	0.0472
	(0.0365)	(0.0404)	(0.0393)	(0.0387)	(0.0365)
Gov. Cap. spending in 1972	−0.0290	−0.0445	−0.0344	−0.0123	0.0128
	(0.0435)	(0.0531)	(0.0573)	(0.0492)	(0.0545)
Gov. tax burden in 1972	−0.0900**	−0.0390	−0.0429	−0.0458	−0.0525
	(0.0412)	(0.0526)	(0.0525)	(0.0461)	(0.0462)
Reg. dummies	Yes	Yes	Yes	Yes	Yes
Observations	50	50	50	50	50
R-squared	0.5926	0.6206	0.6202	0.6038	0.6172
First-stage F-statistics	5.60	3.94	5.28	4.24, 2.57	4.24, 3.53
Shea partial R-squared	0.30	0.29	0.29	0.32, 0.32	0.34, 0.36
Hansen J-statistic (p value)	0.03	0.25	0.28	0.05	0.08

Robust standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All regressions include region dummies

Table 3 Main results: the less regulation in a state, the more negative is the impact of corruption on growth

Variables	(1)	(2)	(3)
Panel A: OLS			
Corruption convictions	0.0516	0.0746	−0.0049
	(0.0531)	(0.0556)	(0.0781)
Economic freedom	0.0132***		0.0072*
	(0.0044)		(0.0038)
Corruption × economic freedom	−0.2499**		−0.1102
	(0.0956)		(0.1195)
Fraser labor market freedom		0.0146***	

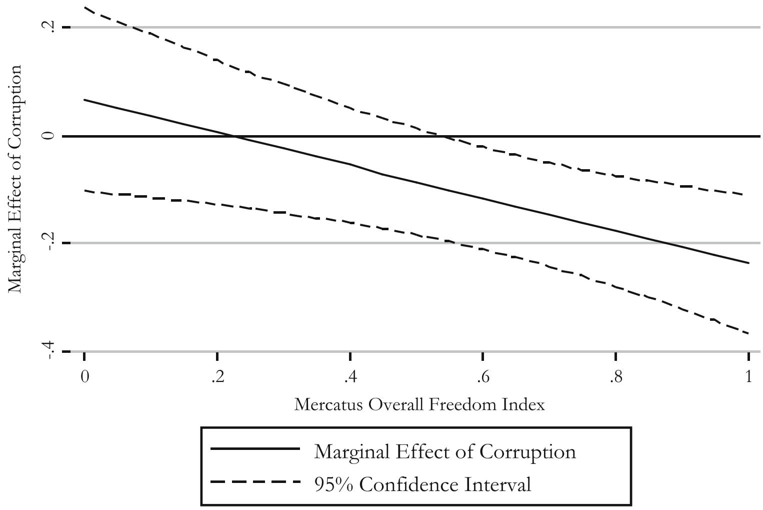
Table 3 continued

Variables	(1)	(2)	(3)
		(0.0043)	
Corruption × labor freedom		−0.3291***	
		(0.1112)	
Effect at max freedom	−0.1983***	−0.2545***	−0.1151**
	(0.0608)	(0.0705)	(0.0564)
Effect at min freedom	0.0516	0.0746	−0.0049
	(0.0531)	(0.0556)	(0.0781)
Controls	Yes	Yes	Yes
Reg. dummies	Yes	Yes	Yes
Observations	50	50	50
R-squared	0.6953	0.7073	0.6504
Panel B: 2SLS			
Corruption convictions	0.0673	0.0699	0.1844
	(0.0866)	(0.0844)	(0.1221)
Economic freedom	0.0150***		0.0195***
	(0.0046)		(0.0070)
Corruption × economic freedom	−0.3044***		−0.5223**
	(0.1160)		(0.2147)
Fraser labor market freedom		0.0168***	
		(0.0045)	
Corruption × labor freedom		−0.4023***	
		(0.1464)	
Effect at max freedom	-0.2370***	−0.3324***	−0.3379***
	(0.0652)	(0.0885)	(0.1154)
Effect at min freedom	0.0673	0.0699	0.1844
	(0.0865)	(0.0844)	(0.1221)
Controls	Yes	Yes	Yes
Reg. dummies	Yes	Yes	Yes
Observations	50	50	50
R-squared	0.6929	0.6941	0.5289
First-stage F-statistic	2.55, 12.74	3.24, 11.47	3.84, 2.19
Shea partial R-squared	0.49, 0.69	0.44, 0.59	0.48, 0.37
Hansen J-Statistic (p value)	0.07	0.20	0.39

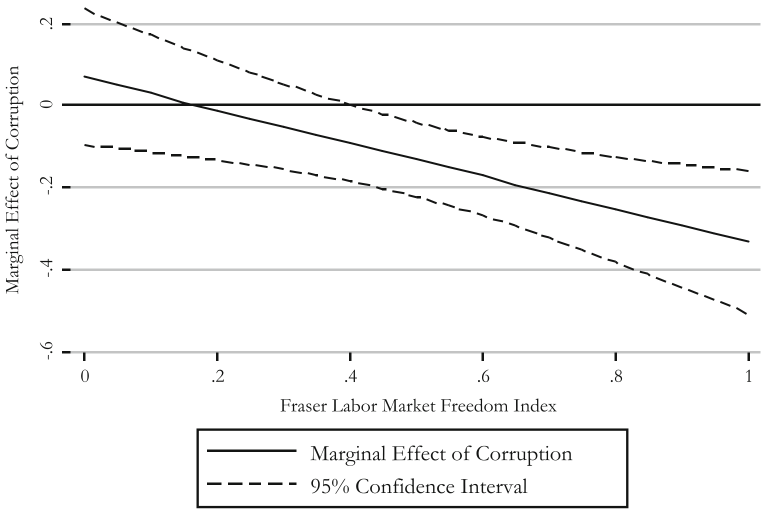
Larger values of the variable "freedom" indicate *less* regulation in a state Robust standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All regressions include controls described in "Appendix" as well as region dummies

However, when we evalute this marginal effect at the maximium value of freedom, the point estimate is negative and significant at the one percent level.

To further assist in the interpretation of these results, Fig. 1 plots the derivative described by Eq. (2) along with the 95 % confidence interval derived from Eq. (3) (Brambor et al. 2006). The 2SLS results of column 1 are shown in panel (a), while



(a) Fraser Economic Freedom Index



(b) Fraser Labor Market Freedom

Fig. 1 Effect of Corruption on State Growth as Regulation Decreases. Panel **a** uses specification (1) from Panel B of Table 3. Panel **b** uses specification (2) from Panel B of Table 3. *Dashed lines* show 95 % confidence intervals. Both figures indicate a marginal cost of corruption consistent with zero for heavily regulated states. By contrast, states with more invasive regulatory environments face a negative and statistically significant marginal cost of corruption. **a** Fraser economic freedom index. **b** Fraser labor market freedom

the 2SLS results of column 2 are shown in panel (b). Each figure illustrates that when freedom is above its mean corruption is harmful for growth. However, for states in which freedom is lower than average, there is no significant evidence that corruption is harmful for growth. For the states with the greatest amount of regulatory freedom, corruption is even more harmful than our baseline estimates in Table 1. The effect of a one standard deviation increase in corruption convictions in one of these states is associated with half a standard deviation decrease in real GSP growth. Also, consistent with the weak form of the grease-the-wheels hypothesis, we estimate a zero impact of corruption on growth in states with high amounts of regulation. So, at least according to our findings, corruption is never good for growth, but its impact becomes worse, on the margin, the more invasive the regulatory environment.

5 Robustness

We next examine the robustness of our results for economic freedom in Table 4 and for labor market freedom in Table 5. First, we split the sample period and estimate our model for 1975–1990 in column 1 and for 1991–2007 in column 2. Second, we use an alternative measure of corruption in column 3. The alternative measure is the perception of corruption of state house reporters in 2000 (Boylan and Long 2003).[12] Third, we estimate our model without region dummies in column 4.

The results in Tables 4 and 5 are generally supportive of the grease-the-wheels hypothesis. The coefficient for the interaction term is negative and significant in each column except 2. In addition, the coefficient for freedom is positive and mostly significant. Surprisingly, the coefficient for corruption becomes positive (and significant) in columns 3 and 4. These positive coefficients however are likely a consequence of measurement error and the regional distribution of corruption. In column 3, the corruption perceptions measure is likely to be mis-measured since each reporter is asked to rank corruption in his/her state (which they may know) relative to the other 49 states (which they are unlikely to know). In fact, the correlation between corruption perceptions and our preferred corruption convictions measure is only 0.26. In column 4, the exclusion of the region dummies allows the geographic distribution of corruption to play an undue role. As a result, the concentration of highly corrupt states in the high-growth South generates a positive coefficient for corruption.

6 Conclusion

We have presented suggestive evidence for the grease-the-wheels hypothesis in the United States, as unlikely a place as any for such a finding. It is commonly thought that advanced industrial democracies have relatively well functioning institutions and that, as a consequence, corruption is an unalloyed negative. However, given the United States' federal structure, state and local governments have considerable scope for economic regulation. We exploit this institutional variation to identify an increasing cost of corruption, on the margin, in states with more invasive regulatory regimes. This supports the cross-country results of Méon and Weill (2010), Heckelman and Powell (2010), and Dreher and Gassebner (2011). Our findings also speak directly to the

[12] We use the response from question 6 on the overall perception of corruption. Note that a zero response rate from Massachusetts, New Hampshire and New Jersey reduced our sample to 47 states Boylan and Long (2003).

Table 4 Robustness: using economic freedom as the measure of government intervention

Variables	(1)	(2)	(3)	(4)
	1975–1990	1991–2007	1975–2007	1975–2007
Panel A: OLS				
Corruption convictions	0.0148	−0.0241		0.0674
	(0.1510)	(0.0900)		(0.0711)
Corruption perception			0.0083**	
			(0.0039)	
Fraser economic freedom	0.0057	0.0086*	0.0139***	0.0129***
	(0.0083)	(0.0058)	(0.0047)	(0.0043)
Corruption × economic freedom	−0.2339	0.0655	−0.0155**	−0.2651**
	(0.2603)	(0.1422)	(0.0070)	(0.1134)
Effect at max freedom	−0.2191	0.0414	−0.0071*	−0.1978***
	(0.1476)	(0.0665)	(0.0038)	(0.0705)
Effect at min freedom	0.0148	−0.0241	0.0083**	0.0674***
	(0.1510)	(0.0900)	(0.0039)	(0.0071)
Controls	Yes	Yes	Yes	Yes
Reg. dummies	Yes	Yes	Yes	No
Observations	50	50	47	50
R-squared	0.5427	0.4872	0.5922	0.3476
Panel B: 2SLS				
Corruption convictions	0.0797	−0.0894		0.1131
	(0.2164)	(0.1505)		(0.0904)
Corruption perception			0.0145**	
			(0.0057)	
Fraser economic freedom	0.0185**	0.0067	0.0220***	0.0166***
	(0.0073)	(0.0084)	(0.0054)	(0.0053)
Corruption × economic freedom	−0.6960***	0.1169	−0.0289***	−0.3804***
	(0.2298)	(0.2175)	(0.0073)	(0.1401)
Effect at max freedom	−0.6163***	0.0275	−0.0144***	−0.2673***
	(0.2000)	(0.0820)	(0.0035)	(0.0856)
Effect at min freedom	0.0797	−0.0894	0.0145***	0.1131
	(0.2164)	(0.1505)	(0.0057)	(0.0904)
Controls	Yes	Yes	Yes	Yes
Reg. dummies	Yes	Yes	Yes	No
Observations	50	50	47	50
R-squared	0.4461	0.4680	0.5440	0.3402
First-stage F-statistic	0.59, 3.51	4.00, 5.33	3.68, 6.67	5.88, 15.15
Shea partial R-squared	0.28, 0.57	0.37, 0.48	0.29, 0.35	0.53, 0.68

Robust standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All regressions include controls described in "Appendix" as well as region dummies

Table 5 Robustness: using labor freedom as the measure of government intervention

Variables	(1)	(2)	(3)	(4)
	1975–1990	1991–2007	1975–2007	1975–2007
Panel A: OLS				
Corruption convictions	0.1003	−0.1269		0.0205***
	(0.1356)	(0.1034)		(0.0056)
Corruption perception			0.0055	
			(0.0038)	
Fraser labor market freedom	0.0088	0.0068	0.0102**	0.0205***
	(0.0085)	(0.0055)	(0.0047)	(0.0056)
Corruption × labor freedom	−0.4616*	0.2304	−0.0098	−0.5226***
	(0.2726)	(0.1546)	(0.0079)	(0.1634)
Effect at max freedom	−0.3613**	0.1035*	−0.0044	−0.3519***
	(0.1718)	(0.0601)	(0.0047)	(0.0971)
Effect at min freedom	0.1003	−0.1269	0.0055	0.1708**
	(0.1356)	(0.1034)	(0.0038)	(0.0845)
Controls	Yes	Yes	Yes	Yes
Reg. dummies	Yes	Yes	Yes	No
Observations	50	50	47	50
R-squared	0.5599	0.5550	0.5583	0.4505
Panel B: 2SLS				
Corruption convictions	−0.0519	−0.0880		0.1477
	(0.3248)	(0.1612)		(0.0947)
Corruption perception			0.0106**	
			(0.0047)	
Fraser labor market freedom	0.0229**	0.0089	0.0186***	0.0218***
	(0.0100)	(0.0070)	(0.0046)	(0.0059)
Corruption × labor freedom	−1.0142***	0.1633	−0.0267***	−0.5598***
	(0.3931)	(0.2280)	(0.0070)	(0.1822)
Effect at max freedom	−1.0661***	0.0752	−0.0162***	−0.4121***
	(0.2487)	(0.0789)	(0.0045)	(0.1168)
Effect at min freedom	−0.0519	−0.0880	0.0106***	0.1477
	(0.3248)	(0.1612)	(0.0047)	(0.0947)
Controls	Yes	Yes	Yes	Yes
Reg. dummies	Yes	Yes	Yes	No
Observations	50	50	47	50
R-squared	0.1242	0.5530	0.4473	0.4365
First-stage F-statistic	0.73, 3.22	3.20, 3.74	3.00, 3.80	5.74, 17.78
Shea partial R-squared	0.31, 0.55	0.36, 0.44	0.43, 0.39	0.45, 0.58
Hansen J-statistic (*p* value)	0.74	0.45	0.10	0.19

Robust standard errors in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All regressions include controls described in "Appendix" as well as region dummies theoretical work of Shleifer and Vishny (1993). Their model generates an ambiguous answer as to whether or not corruption increases or decreases welfare in the presence of costly regulation. We find no evidence that corruption is ever good for growth. Instead, we find support for the weak form of the grease-the-wheels hypothesis. The welfare cost of corruption is lower in the presence of regulation, but never positive.

The usual cautions about interpreting causation from non-experimental data apply. However, we have done our best to address endogeneity concerns by instrumenting corruption in accordance with standard measures in the literature. At the very least, our instrumental variables approach suggests that variation across states in historical access to the franchise and in constitutional politics affects economic development through the corruption channel. This is highly consistent with the empirical work of Alt and Lassen (2008) and Rose-Ackerman (1978).

Our finding that the regulatory environment mediates the effect of corruption on growth also suggests one reason why others, such as (Glaeser and Saks 2006), have had difficulty showing that corruption matters across US states. As is often the case, the mechanism through which corruption operates is highly contingent on local institutions. The fact that this is true even when comparing across places which share a common language, culture, and national government, is remarkable.

7 Appendix: variable definitions and descriptive statistics

See Table 6.

Table 6 There are fifty observations for each variable

	Mean	SD	Min	Max
Variable				
Growth rate in real GSP per worker (annual average 1975–2007)	0.018	0.004	0.010	0.029
Corruption convictions per 100,000 people (1975–2007 average)	0.029	0.013	0.008	0.061
Fraser economic freedom (1981) (higher = less regulation)	0.482	0.205	0.000	1.000
Fraser labor market freedom (1981) (higher = less regulation)	0.435	0.200	0.000	1.000
Mercatus economic freedom (2007) (higher = less regulation)	0.602	0.235	0.000	1.000
Controls				
ln(capital per worker in 1970)	10.790	0.207	10.391	11.428
Share of adult population with 12-years of schooling or less (1970)	0.783	0.043	0.685	0.859
ln(population in 1970)	0.895	1.062	−1.186	2.998
Growth rate in population (annual average 1970–2007)	0.011	0.009	0.001	0.045
State and local government consumption share of personal income (1972)	0.157	0.025	0.121	0.258
State and local government capital outlays share of personal income (1972)	0.039	0.017	0.022	0.143
State and local tax revenue share of personal income (1972)	0.106	0.014	0.080	0.145

Table 6 continued

Variable	Mean	SD	Min	Max
Instruments				
Days of residency required to vote (1970)	110.700	86.985	0.000	365.000
Campaign finance restrictions index (1970)	0.520	0.292	0.000	1.000
Number of years with constitution (1970)	85.520	44.096	1.000	190.000
State with initial civil law legal system	0.260	0.443	0.000	1.000
Confederate State with initial civil law	0.120	0.328	0.000	1.000
Confederate State with initial common law	0.120	0.328	0.000	1.000
ln(slave population in 1860)	1.031	1.586	0.000	4.064

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