Does the Size of the Bureaucracy Matter?*

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Abstract

This paper anaylzes the effect of bureacracy size on investment and growth. Government bureaucrats are modeled as regulators with common jurisdiction over firms. Our model implies that an increase in the number of regulators adversely affects firms' investment level. An objective measure of this regulatory structure is constructed by calculating the number of government ministries for a large set of countries. Empirical analysis shows that an increase in the number of government ministries hampers investment thereby lowering economic growth. Results are robust to controlling for endogeneity using population level and an index of ethno-linguistic fractionalization index as instruments.

1 Introduction

While it has long been suspected that too much bureaucracy hampers economic development, there has been little formal analysis of this point. There are two important questions that an analyst needs to address in modelling and measuring something as complex as a bureaucracy. First, through what mechanisms does a bureaucracy have a negative effect on economic development? This paper identifies one such mechanism and shows that horizontal governance—the size of a bureaucracy matters. Second, how does one measure bureaucracy? We propose a quantifiable index of bureaucracy—an objective variable—to measure this. Bureaucracy, modeled as multiple government units with common regulatory jurisdiction over firms, hampers investment thereby lowering economic growth. In cross country regressions these theoretic predictions are verified.

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Why should the size of the bureaucracy matter? De Soto (1989) points to a grabbing-hand view of government. According to this view, politicians use regulation to favor friendly firms and other political constituencies, and thereby obtain campaign contributions and votes. In principle, the collection of bribes in exchange for release from regulation can be efficient. In practice, however, when there are multiple bureaucrats each with power to collect his own bribe, over-regulation may be the end result. In this paper, we argue that the size of the bureaucracy matters even with honest regulators.

There is abundant anecdotal evidence pointing out the adverse effects of regulations imposed by multiple government units on a firm's production decisions. In "The Other Path", De Soto [1989] draws attention to the high costs of starting a business in Lima, Peru due to the complexity of the regulatory and legal system. Rosenn [1992] describes a complex bureaucracy structure in Brazil and cites an example of this complexity in the "1,470 separate legal actions with thirteen government ministries and fifty agencies" required for an export license. Salvatore [1992] informs us that in India, import licenses are issued by the Ministry of Commerce but the importer first needs to establish "essentiality" from the ministry to which he reports; inter-ministerial committees decide on the quantities imported, and the selling prices of the products are handled by government agencies. Waterbury [1993], in his analysis of public enterprises in Egypt, India, Mexico and Turkey points out the many layers of principals (bureaucrats) that a typical State Owned Enterprise is subject to as one of the reasons for the failure of such enterprises.

Despite this wealth of anecdotal evidence and rising concern of governments for the efficiency of regulations, few empirical papers study the bureaucratic environment facing firms and its effect on firms' decisions. Mauro [1995], Knack and Keefer [1995], Knack [1996], Hall and Jones [2000] examine the effects of bureaucratic efficiency on investment and growth in a cross-country framework. While these studies provide new and strong evidence that malfunctioning government institutions and inefficient bureaucracies constitute a severe obstacle to investment and growth, there are three caveats about their data and methodology. First, these studies provide no theoretical reason for the relationship. Second, these studies use subjective ratings for bureaucratic efficiency. These ratings are typically gathered from surveys that ask country experts to rate a

country's institutions; hence might be influenced by the economic and political state of the country. A stagnant economy is often blamed on bad government, and this might make ratings endogenous to a country's investment and growth. Third, bureaucratic efficiency is a vague term. Given the regression results it seems that experts know what makes a bureaucracy that aids the economy, but results do not help us understand what makes a bureaucracy more efficient.

A small branch of cross-country literature develops objective measures for the quality of governance and public sector institutions. Barro [1991] examines the effects of objective political violence measures on investment and growth, Henisz [2000] develops objective measures of the degree of constraints on policy change using data on the number of independent veto points in the political system. Calgue et al. [1996] use a measure of contract enforceability based on monetary data in their cross-country regressions.

This paper follows in the tradition of this burgeoning literature and develops a quantifiable index for the size of the bureaucracy. We model government ministries as regulators with common jurisdiction over firms. Most governments are composed of multiple decision makers. According to Laver and Shepsle (1996) cabinet ministers act as both experts and agenda setters in their assigned fields. We develop two measures for the size of bureaucracy: Number of total government ministries and number of industry/economy related government ministries. We believe that our measures have advantages over subjective measures of bureaucratic efficiency. Since they are not based on opinions, our measures will not be susceptible to endogeneity problems associated with subjective measures. Because they measure a specific aspect of bureaucracy—the size of horizontal governance—they will help us understand what makes a bureaucracy more efficient and develop policy recommendations.

Shleifer and Vishny [1993] present the first formal model of corrupt multiple government agencies that issue permits to a firm and find that per unit bribe is higher and the firm's output is lower than had there been a single agency setting the bribe levels. These authors assume that regulators only care about getting large bribes. While many regulators probably do care about bribes, this suggests that honest regulators should cause no problems. The model presented here will show that the combined actions of honest regulators may also lead to

over-regulation.[1]

In this paper, we base our model on principle-agent theory. The government ministries are the principals, wanting the firm to achieve some social objective, and the firm is the agent. The innovation in our model is to consider the effects of having more than one principal when the principals consider the effects of the firm's production on social welfare. However, we should note that, a model of corrupt regulators who care only about bribes is supported in our framework as a special case.

Martimort [1992], Stole[1997] independently developed principals-agent models of how two manufacturers (principals) contract with a common firm such as a retailer (agent). In these models the retailer (agent) has private information, and this is the source of inefficiency.[2] These models are not fully appropriate for analyzing government regulators since the manufacturers do not care about social welfare. In fact their framework is closer to a generalization of Shleifer and Vishny [1993], and they do prove that in some cases—when multiple principals provide complementary inputs to the agent—Shleifer and Vishny's results are quite general. However, their results are different if the agent views the principals' inputs as substitutes. If inputs are complements then more principals results in more inefficiency, if inputs are substitutes then more principals lead to more efficient outcomes. This inconsistency raises concern because examples can be given where the regulators' inputs are complements, substitutes, or both.

Examples of regulators providing complementary inputs include environmental ministries that control pollution and Public Utility Commissions that regulate prices [Baron 1985] or different government ministries that issue permits. Alternatively, the regulators may provide inputs that are effectively substitutes, for example if two different ministries both tax a firm's substitutable inputs. In fact, regulators that impose taxes on substitutable inputs can be considered either as substitute or complementary regulators depending upon the level of taxation. If taxes are too high, the firm may choose not to produce at all making taxes effectively complements. If the firm does produce then taxes are

[1]Furthermore, the results of Shleifer and Vishny [1993] depend on linear pricing whereas the implications of our model will be robust to allowing regulators employ non-linear pricing schemes.

[2]Since these models allow for non-linear pricing schemes, multiple principals can acheive efficiency under perfect information whereas in Shleifer and Vishny [1993] multiple principals fail to achieve efficiency as they are restricted to employ linear pricing schemes.

substitutes.

The model presented in Okten [2000] examines the case in which regulators tax substitutable inputs as well as complementary inputs, and finds that within a very general framework, having more government ministries with common jurisdiction is always worse for the economy. In this model regulators do care about social surplus/social cost generated by the firm's output to their constituent group, but can also care about their income. In the next section, a simple model which illustrates the main points of this general model will be presented. In this model, regulators' taxes are perfect complements to the extent that they affect the firm's entry decision and they are substitutes to the degree that they influence firm's output level. This model has two main predictions. First, multiple regulators acting non-cooperatively overtax the firm. Second, taxes on the firm are an increasing function of the number of regulators, hence, the firm's investment and output level will decrease as the number of regulators increases. This latter prediction will be the focus of our empirical analysis.

In the empirical section of the paper, we model the government ministries as the regulators of firms and seek to determine the effects of the number of government ministries—an objective measure of bureaucracy size—on investment and growth in a cross-country analysis. Section 3 describes the data, section 4 presents and discusses the results. Section 5 concludes.

2 Sharing regulatory rights: A Simple Model

Several authors have pointed out the adverse effects of having multiple bureaucrats with regulatory control over firms. Shleifer and Vishny (1993) argue that an important reason why multiple permits exist is probably to give officials the power to deny them and to collect bribes in return for providing the permits. Djankov et al. (2000) argue that the creation of rents for the bureaucrats and politicians through regulation is often inefficient, in part because the regulators are disorganized. They provide an interesting analogy to tollbooths on a highway. Efficient regulation may call for one toll for the use of a road. In a political equilibrium, however, each town through which the road passes might be able to erect its own tollbooth.

Okten (2000) provides a very general principal-agent type of model of multiple principals regulating a common firm and shows that over-regulation results with or without corruption when regulators act non-cooperatively. In this section, our goal is to present a simple model to illustrate the main points of this more general model. The standard regulation literature is our point of departure. In this literature, there is typically one regulator whose objective is to maximize the social welfare of his constituency (often consumers) as he oversees the firm. The extension of this model to an environment of multiple regulators is straightforward: Each government agency maximizes the social welfare of his constituent group. However, we should note that, a model of corrupt regulators who care only about bribes is supported in our framework as a special case.

Consider the following regulatory environment. There are N government ministries (regulators) overseeing the investment decisions of a firm. The firm is about to determine the size of a project based upon the fees required by the regulators. S is the social value from a unit of this project to the society. Society is composed of N constituent groups, each represented by a government ministry such that S_i is the social value from a unit of this project to ministry $i's$ constituent group and $S = \sum_{i=1}^{N} S_i$. The constituency of a ministry can more generally be defined as the subset of the society members whose utility functions enter in the objective function of her office. Size of the project, P is

determined by the firm as,

$$P = \begin{cases} \left(k - \sum_{i=1}^{N} T_i\right)^{\alpha}, if \sum_{i=1}^{N} T_i \leq \theta \\ 0 \text{ otherwise} \end{cases} \quad (1)$$

where k is the firm's initial endowment, T_i is the fee (lump sum tax) that ministry i imposes on the firm and θ which is unknown to the ministries denotes the maximum profits a firm can achieve given taxes. We assume that $0 < \alpha \leq 1$. Implicit in this formulation is the assumption that there are capital constraints and therefore a lump sum tax that decreases the endowment of a potential firm not only affects the firm's entry decision but also its optimal output level. This assumption is not necessary for our results to hold but it allows us to construct a framework where taxes are complements when they determine the firm's entry decision and they are substitutes when they affect the firm's production level given that the firm enters. Government ministries do not observe θ which is the firm's private information but know that it is a random variable drawn from a cumulative distribution function $F(\theta)$ on $[\underline{\theta}, \overline{\theta}]$. $F[\theta]$ has continuous density $f(\theta)$ such that the monotonic hazard rate property $\frac{d}{d\theta}\left[\frac{1-F(\theta)}{f(\theta)}\right] < 0$ holds.[3] The firm decides to undertake the project if the sum $T = \sum_{i=1}^{N} T_i$ of the taxes it pays is less than θ.[4]

We will assume that ministry i's objective is to maximize the welfare of her constituent group W^i, which is equal to the value generated by the project to her constituency plus the amount of taxes she collects,

$$W^i = (T_i + S_i (k - T)^{\alpha})(1 - F(T)) \quad (2)$$

Implicit in this formulation is the assumption that taxes collected are spent for the benefit of the regulator's constituency. We will later discuss how to interpret this model if taxes are essentially bribes. The welfare of the society then is the sum of the welfare of the N constituent groups,

$$W = \sum_{i=1}^{N} W^i \quad (3)$$

[3]This condition is required for the concavity of our optimization problem.

[4]Martimort (1996) develops a similar model where regulators propose transfers to the firm for a socially valuable project but he does not allow for the size of the project to be a continuous function of the regulators' subsidies. In that model, regulators contract on the probability that the project will be undertaken by the firm and hence their transfers are perfect complements.

2.1 The Efficient Outcome

The social planner maximizes the welfare of the society,

$$\max_{T} \int_{\underline{\theta}}^{\overline{\theta}} \left(T + S\left(k - T\right)^{\alpha}\left(1 - F\left(T\right)\right) f\left(\theta\right)\right) \tag{4}$$

The first order condition to this maximization problem is

$$\left[1 - S\alpha\left(k - T^{E}\right)^{\alpha-1}\right]\left(1 - F\left(T^{E}\right)\right) - \left[T^{E} - S\left(k - T^{E}\right)^{\alpha}\right] f\left(T^{E}\right) = 0 \tag{5}$$

where T^{E} denotes the efficient amount of taxes imposed on the firm.

2.2 Non-cooperative Outcome

If regulators act non-cooperatively each maximizes the expected welfare to her constituent group. Regulator i's objective is then,

$$\max_{T_i} \int_{\underline{\theta}}^{\overline{\theta}} \left(\left(T_i + S_i\left(k - T\right)^{\alpha}\right)\left(1 - F\left(T\right)\right) f\left(\theta\right)\right) \tag{6}$$

The first order condition to this maximization problem is

$$\left[1 - \alpha S_i\left(k - T\right)^{\alpha-1}\right]\left(1 - F\left(T\right)\right) - \left(\left(T_i + S_i\left(k - T\right)^{\alpha}\right)\right) f\left(T\right) = 0 \tag{7}$$

Summing over the first order conditions of the N regulators we get

$$\left[N - \alpha S\left(k - T^{M}\right)^{\alpha-1}\right]\left(1 - F\left(T^{M}\right)\right) - \left[T^{M} - S\left(k - T^{M}\right)^{\alpha}\right] f\left(T^{M}\right) = 0 \tag{8}$$

where T^{M} denotes the total amount of taxes levied by the multiple regulators.

Since $1 - F\left(T^{M}\right) > 0$, comparative statics of equation 8 would imply that[5]

$$\frac{\partial T^{M}}{\partial N} > 0 \tag{9}$$

Hence, if the regulators act non-cooperatively we expect taxes to increase with increasing number of regulators.

Note that equation 8 is the same as equation 5 for $N = 1$. Since $\left(1 - F\left(T\right)\right) > 0$ and both 8 and 5 are decreasing in T, it must be the case that $T^{M} > T^{E}$ when $N > 1$.

[5] We are assuming an interior solution.

When government ministries act non-cooperatively, taxes are higher than the efficient amount and increase with increasing number of ministries. We could also allow regulators to be corrupt in this model such that taxes are essentially bribes that regulators collect for their own personal benefit rather than the benefit of their constituent group. Our results are robust to such an interpretation. Bribes increase with increasing number of regulators. The only difference is that socially efficient outcome can not be achieved even when there is a single regulator, while an increase in the number of regulators reduces the efficiency even more.

Does an increase in the number of regulators have any observable adverse effects on the firms' investment and output decisions? In the empirical section of the paper, we test whether we can measure the effects that our model predicts. A cross-country analysis is preferred for this task because in a given country, the degree of bureaucracy appears constant over short periods of time for which data is available, whereas it exhibits large variations across countries.

Following Laver and Shepsle [1996] we model government ministries as independent agenda setters in their jurisdictions and construct a quantifiable index of regulators by calculating the number of government ministries for each country. Our simple model provides a framework to analyze the effects of multiple ministries on the regulated firm and implies that if these ministries act non-cooperatively, they will induce less than efficient amount of investment by overtaxing the firm. Furthermore, the investment level of the firm will be a decreasing function of the number of ministries. This latter testable hypothesis, will be the focus of our empirical analysis.

3 Data and Estimation

We construct two measures of horizontal governance: Number of total government ministries (ministry) and number of government ministries of economy and industry (industry ministry). The total number of government ministries is calculated for each country by counting the number of members of the cabinet or council of ministers that are listed in Lambert's Worldwide Government Directory [WGD]. The earliest year that data on ministries is available is 1981. Since prime minister and the first deputy prime minister in a parliamentary democracy are similar to the president and the vice president in a presidential system,

these two positions are excluded when calculating the number of ministries for parliamentary systems. Including these would bias the number of ministries for parliamentary democracies upwards. Also the executive powers of the prime minister and the deputy prime minister, are likely to be different than other ministers. The number of government ministries of economy and industry is calculated in a similar fashion, except now ministries such as Ministry of Youth or Ministry of Cultural Affairs which seem to bear no apparent relationship with the economy and industry are excluded from the count.

We will use the total number of government ministries in our regressions since the creation of this variable did not call for any judgement on our part. The total number of ministries, admittedly is not an exact measure for the number of principals in government, regulating a firm. Some members of the cabinet may have nothing to do with regulation per se. We use our second measure, the number of ministries of economy and industry as a robustness check of the results with our first measure.

Another caveat of our ministry variable is that it does not reflect the power structure in a bureaucracy accurately. For example multiple regulatory agencies may get lumped into one government ministry and counted as one. Countries that are located close to each other may have similar bureaucracies and hence this problem might be more aggravated for certain regions. However, despite these potential problems, we would argue that a priori, the number of government ministries is a reasonable measure for the size of horizontal governance as numerous anecdotal examples indicate firms are subject to multiple regulations not from one single ministry but rather from a variety of government ministries. If we can measure the size of horizontal governance with some accuracy and quantify the relationship between economic performance and horizontal governance; then it will be a step forward.

The macroeconomic data are drawn from Penn World Tables by Summers and Heston [1994] and the World Bank, objective data on political uncertainty and human capital indices from Barro [1991], the subjective investment risk index from Hall and Jones [1997] [originally from International Risk Guide], the ethno-linguistic fractionalization index from the World Handbook of Political and Social Indicators. Total investment data is drawn from Penn World Tables (PWT) while data on private investment is drawn largely from the World

Development Indicators (WDI) constructed by the World Bank due to lack of sufficient data on private investment in PWT. WDI has data on private investment available only for recent decades and excludes all OECD countries with the exception of Turkey. In one specification we combine WDI data with private investment data for OECD countries from PWT to increase the size of the sample used in private investment regressions.

Table A.1 of the Appendix section provide summary statistics for all the variables of interest. Figures 1 and 2 provide scatter plots of average investment rates versus the number of ministries in 1981 for the 1960-1992 and the 1981-1992 periods respectively. Figure 3 provides a scatter plot of average private investment rate for the 1981-1992 period versus the number of ministries in 1981 for the countries analyzed.

In one specification of the investment function, we control for a subjective governance index called Government Anti-Diversionary Policies (GADP). GADP and other similar subjective indices have been the focus of the recent cross-country studies analyzing the effects of bureaucratic efficiency on investment and growth. GADP is originally assembled by a firm that specializes in providing assessments of risk to international investors, Political Risk Services (PRS).[6] These "assessments" are prepared by PRS correspondents and analysts based in the countries covered. Their International Country Risk Guide rates 130 countries according to 24 categories. GADP variable is an average of the five variables—law and order, bureaucratic quality, corruption, risk of expropriation and government repudiation of contracts—each of which has higher values for governments with more effective policies for supporting production. GADP is included to produce comparable estimates to the earlier studies and also to observe how the coefficient on the number of ministries will be affected in the presence of this variable.

In all estimations we exclude countries that are classified as "statist" by Freedom House [1994].[7] We are primarily interested in measuring the incentive effects of multiple regulators on private and semi-private agents and statist

[6] See Coplin, O'Leary and Sealy (1996) and Knack and Keefer (1995). Barro (1996) considers a measure from the same source. Mauro (1995) uses a similar variable to examine the relation between investment and growth of income per capita, on the one hand, and measures of corruption and other failures of protection, on the other hand.

[7] Countries exluded on this basis are Algeria, Angola, Benin, Bhutan, Bulgaria, China, Czechoslovakia, Ethipia, Iraq, Mongolia, Tanzania and U.S.S.R.

economies such as former Soviet Union and Bulgaria, did not permit private investment in general. Moreover, these governments had very complex bureaucratic structures and sets of principals such that ministry variable is not an appropriate measure for the number of principals in government in these countries. In fact, our data source for the ministry variable, Worldwide Government Directory does not list a council of ministers or members of the cabinet for some of these statist countries.

Major oil producers are also excluded because the bulk of recorded GDP for these countries represents the extraction of existing resources, not value added. The countries that are excluded on this basis are the 13 members of OPEC, Bahrain and Oman.[8]

The empirical analysis uses school-enrollment rates as proxies for human capital. The two main proxies for human capital used in the regressions are the 1960 and 1970 values of school-enrollment rates at the secondary and primary levels. These variables measure number of students enrolled in the designated grade levels relative to the total population of the corresponding age group. Revolutions and coups, assassinations are objective measures of political stability and they are yearly averages of periods analyzed.

In attempting to measure the extent to which government organization affects investment, one has to recognize that institutions and economic variables evolve jointly: not only do institutions affect economic performance, but also economic variables may affect institutions. This problem of endogeneity is a valid concern for most of the explanatory variables that are used in cross-country regressions. In order to address the issue of endogeneity, we focus on a sub-sample and analyze the 1981-1992 period using lagged values of the explanatory variables. Still it might be the case that even the lagged number of ministries are endogenous to investment, i.e., investment rates may be correlated over time and countries with low investment rates may increase or decrease the number of their ministries, in order to foster investment. We use two stage least squares technique to address this problem and instrument the ministry variable by population in each country in 1981 (pop81) and in some

[8]We have also done the estimations by keeping the major oil producers and controlling for these countries by a dummy variable. The coefficient on the dummy variable is found to be positive and significant whereas the coefficients on the other explanatory variables remain the same. Results of these estimations are available upon request.

specifications dummy variables for whether the country was ever a colony (d776) and whether it achieved independence after 1945 (d945). A valid instrument should be correlated with the number of ministries but uncorrelated with the error term in the OLS specification. Population is a natural candidate since it is reasonable to expect that a higher number of constituents may be associated with a higher number of ministries, while there is no theoretical or empirical reason to presume this variable to be influencing domestic investment rate.

We also consider Ethnolinguistic Fractionalization Index (ETHNIC) as a possible instrument since earlier studies that analyzed the effects of bureaucratic efficiency on economic performance have instrumented their subjective efficiency indices with ETHNIC [Mauro 1995]. ETHNIC is constructed by a team of 70 researchers at a Soviet Institute in 1960 and printed in Atlas Narodov Mira. We obtained this data from Taylor and Hudson [1972]. The Soviet variable ETHNIC measures the probability that two randomly selected individuals in a country will belong to different ethnolinguistic groups. Easterly and Levine [1997] examine the relationship between ethnolinguistic fractionalization and long-run growth and investment and argue that ethnically diverse societies may be more likely to yield independent bribe-takers since each ethnic group may be allocated a region or ministry in the power structure. This argument implies that the more ethnically diverse a society is, the more ministries we expect to see in government. Indeed, ETHNIC and number of ministries in 1981 are significantly correlated with a simple correlation coefficient of 0.32. Caution should be exercised with this instrument however: ETHNIC may influence investment and growth rate not only by increasing the number of ministries, but also via direct channels. For example, it might slow down the diffusion of ideas and technological innovations within the country. Increased ethnic tension can cause distrust among the members of the society, increasing the transaction costs of doing business. Cooperation and provision of public goods can be more problematic in ethnically polarized societies [Alesina et al. [1999]].

4 Results and Discussion

4.1 Regulation and Investment

Table 1 analyzes the relationship between average total investment rate (Investment/GDP, 1960-1992 average) and the number of ministries. The ministry variable is negative and significant at 1% significance level in the simple regression of investment rate on the ministries (Regression 1). Regressions 2 through 8 are based on two types of specifications that have become standard in the cross-country investment and growth literature. The first one is that which Levine and Renelt (henceforth, the LR specification) use as the basis for their analysis of "robustness" of investment and growth regressions. The second one is that adopted by Barro (henceforth, the B specification). The rationale for the LR and B specifications is that a number of variables may affect the expected value and the variance of the marginal product of capital, thereby affecting the propensity to invest in the economy. These include initial per capita GDP; the educational level of the labor force, which may be a complement to physical capital in production processes; distortions, which may divert resources to less productive investment projects; and political uncertainty. In the LR specification (Regression 2) ministry variable is negative and significant at 1% significance level and a one standard deviation increase in the number of ministries is significantly associated with a decrease in the average investment rate by 1.20 percent of GDP (obtained by multiplying -0.002, the slope coefficient, by 6.02, the standard deviation of the ministry variable).

Application of the Levine and Renelt [1992] procedure (with their same control variables), which involves running a large number of regressions of investment on the variable of interest (in this case number of ministries) and various conditioning sets shows that this relationship is robust. Regression 5 replicates the B specification including the ministry variable. The number of revolutions and coups and assassinations per year are the objective measures of political stability. We include the share of government consumption in GDP to control for non-regulatory channels through which a big government can affect the investment rate. GDP per capita in 1960 controls for the initial economic conditions. A country's price level of investment (PI60) controls for the relative prices that an investor has to face in her investment decision. In the B specifi-

cation, the ministry variable is again negative and significant at 1% significance level. The signs and significance of coefficients of other variables are similar to Barro [1991].

Regressions (6) and (7) are other versions of the B specification. The former includes continent dummies for Africa and Latin America and improves the goodness of fit by 7% –an indication of the importance of omitted variables– while the signs and significance of coefficients on other variables stay the same except for a small drop in significance of revolutions and coups. Ministry variable is still negative and significant at 1% significance level. A one standard deviation increase in the number of ministries is associated with a decrease in the investment rate by 1.81 percent of GDP according to this regression.

Regression (7) controls for government's anti-diversionary policies GADP. A higher level of GADP denotes a decrease in government's anti-diversionary policies and an improvement of its institutions. We find GADP to be positive and significant at 5% while the ministry variable remains negative and significant at 1% level. Inclusion of GADP further reduces the significance of revolutions and coups such that this variable is no longer significant. This implies that GADP and revolutions and coups might be measuring the same phenomenon, and strengthens the criticism that subjective indices used to measure the efficiency of government institutions are likely to be prejudiced by the unstable political state of a country.[9]

Institutions can be endogenous to economic performance. In order to address this possible problem of endogeneity, we use two stage least squares technique and instrument for the number of ministries with population of the country in 1981 (pop81) and dummies for whether the country was ever a colony (d776) and for whether it achieved independence after 1945 (d945) along with other explanatory variables. The estimated magnitude of the effects of the number of ministries on total investment are greater (and remain significant at at least 10%) when we control for the possible endogeneity of the ministry variable. Only in one 2SLS estimation of the LR specification (Regression 4) significance of the ministry variable drops to 14%. A one-standard-deviation increase in the number of ministries is associated with a decrease in the investment rate by 2.4 per cent of GDP in the 2SLS estimation of the LR specification (Regression

[9]The simple correlation coefficient between GADP and revolutions and coups is -0.52 and significant at 1%.

4) and 3-3.6 percent of GDP in the 2SLS estimation of the B specifications (Regression 8 and 9). Hausman tests fail to reject that LR and B specifications produce consistent estimates. A test of over-identifying restrictions fails to reject that pop81, d776 and d945 are valid instruments.

We also estimate the LR specification using ETHNIC as an instrument for the ministry variable (Regression 3). Again Hausman test fails to reject the consistency of the LR specification. In an attempt to test whether ETHNIC influences the investment rate directly other than through its effects on institutional structure, we estimate 2SLS regression of the investment rate on the ministry variable using as instruments not only the ETHNIC but also pop81, d776 and d945. A test of over-identifying restrictions fails to reject the null hypothesis that instruments are valid hence the only channel through which ETHNIC affects investment is via its effects on institutional efficiency. P-values of the tests are reported in Table 1. Despite this test result, there is still a problem with ETHNIC as an instrument since it is not powerful when used in the B specification, leading one to suspect that it might be measuring the omitted variables from the LR specification. Indeed, ETHNIC is significantly correlated with the number of revolutions and coups—a variable included in the B specification but omitted from LR specification—with a simple correlation coefficient of 0.23.

In order to address this possible endogeneity problem from another angle, and also consider that the number of ministries from 1981 is unlikely to be constant over the long period just analyzed, we next focus on investment rates during the 1981-1992 period. The number of ministries in 1981 is more relevant and more likely to be exogenous to this shorter, consequent period. Another reason to focus on this period is to have comparable total investment and private investment regressions, for private investment rates are available for a large set of countries only in this recent period. Regression results as shown in Table 2, essentially remain the same as before except now coefficient on government consumption share in GDP is negative and significant (Table 2, Regression 4 through 8). The Hausman test fails to reject that the B specifications are consistent and the instruments pop81 and d776 are valid (Regressions 7 and 8). A one-standard-deviation increase in the number of ministries is associated with a decrease in the investment rate by 1.8 per cent of GDP in the 2SLS

estimation of the B specifications. In the 2SLS regression of the LR specification using ETHNIC as an instrument however, Hausman test rejects the joint null hypothesis that LR specification is consistent and ETHNIC is a valid instrument. In an attempt to distinguish whether the problem is in the specification or in the instrument, we estimate a 2SLS regression of the investment rate on the ministry variable using as instruments not only ETHNIC but also pop81, d776, d945. A test of over-identifying restrictions fails to reject that the instruments used are valid. This is consistent with the hypothesis that the problem is in the LR specification and not in the instruments. If ETHNIC is included as a regressor in the OLS regression of the LR specification however, its coefficient is negative and significant which implies that ETHNIC is correlated with the omitted variables from the LR specification. This observation casts doubt to the eligibility of ETHNIC as an instrument and therefore, we prefer to use population and dummies for independence as instruments when possible.

Table 3 analyzes the determinants of private investment for the same period. We use two samples for this analysis. The first sample uses data on private investment from World Development Indicators constructed by the World Bank and comprises non-OECD countries with the exception of Turkey (Regressions 1 through 7). The second sample uses data on private investment for OECD countries from Penn World Tables in addition to data from the World Development Indicators (Regressions 8 through 12). The ministry variable is found to be negative and significant at least at 10% in the B specifications (Regressions 4 and 5), but it no longer is significant (significance drops to 17%) in the LR specification (Regression 2). There is a loss of significance in all variables. In the B specifications, government consumption share of GDP, secondary schooling, revolutions and coups are not found to be significant determinants of private investment whereas they have significant effects on total investment for the same period. The estimated magnitude of the effects of the number of ministries on private investment are greater and significant when we control for the possible endogeneity of the ministry variable in both LR and R specifications. Hausman test fails to reject that LR and B specifications are consistent and instruments used are valid. A one-standard-deviation increase in the number of ministries is associated with a decrease in the private investment rate by 3.6 percent of GDP in the 2SLS estimation of the B specification (Regression 7). Note that

an increase in the number of regulators has a much stronger negative effect on private investment than it had on total investment. This finding is consistent with our model which predicts that the firms will lower investment in response to an increase in the number of regulators. The significance of the ministry variable improves when we use the second sample that comprises a larger set of countries (Regressions 8 to 12). It is now significant at at least 10% level in the LR specifications (Regressions 8 and 9). We control for an OECD dummy in regressions 9 through 12, in order to take into account the fact that private investment data for OECD countries is retrieved from a different data source.

One explanation of our results, could be that higher number of ministries may measure the government's preference for public investment over private investment, and since government is inefficient in undertaking public investment, this preference may also result in a reduction of total investment rate. We already include government consumption share in GDP to address this concern. In order to further control for government's possible bias against private investment we include an economic freedom index in the B specification (Regression 6). This index rates countries according to individuals' freedom to engage in private economic activities. While economic freedom variable and government consumption share are both insignificant, the ministry variable remains negative and significant at 10% significance level.

In order to directly measure how an increase in the number of ministries affects public investment we also estimate regressions of public investment share in GDP on the ministry variable. In results not reported in this paper, we find that an increase in number of ministries does not have a significant effect on public investment. A simple regression of the public investment share in GDP on the number of ministries yields a coefficient of -0.0002 with a t-statistic -0.27. Results of LR and B regressions are available upon request. Hence, there is no evidence that the number of ministries controls for a preference in government towards public investment over private investment.

4.2 Regulation and Growth

Having provided evidence that number of government ministries affects investment, and recalling that Levine and Renelt [1992] show that the investment rate is a robust determinant of economic growth, in this subsection we analyze

the relationship between regulation and growth. Tables 4 and 5 present growth regressions for 1960-1992 and 1981-1992 periods respectively. The simple regression of average growth on ministries is found to be insignificant. However, if continent dummies are included in this simple regression, ministry variable becomes negative and significant at least at 5% significance level (Tables 4 and 5 Regression 2). This undoubtedly shows that the ministry variable can not explain all the differences in growth rates across continents. However we should note that it is natural to expect a continent fixed effect on institutions. A casual observation would indicate that countries that are located close to one another often have similar structures of government and regulation and even go through institutional changes at similar times. Therefore, possible measurement errors in the ministry variable as discussed in section 3 might be more fervent in countries that are geographically clustered together. Furthermore, Moreno and Trehan (1997) show that a country's growth rate is closely related to that of nearby countries providing grounds to control for such regional effects.[10]

We again analyze the robustness of these simple relationships to alternative control variables, using the LR and B growth specifications. A possible underlying rationale for these specifications is the neoclassical growth model. In that setting, population growth, education, and institutional variables contribute to determining steady-state per capita income levels. These variables and initial per capita income affect the speed with which the economy converges to steady state, thereby affecting the growth rate. Another rationale especially for the B specification can be found in the endogenous growth models with implications for government policies having significant effects on long-run growth (Romer [1986, 1989], Barro [1990], Barro and Sala-i-Martin [1993]).

In the LR specification with continent dummies, ministry variable is negative and significant at 1% level for the 1960-1992 period (Table 4 Regression 3) and at 10% for the 1981-1992 period (Table 5 Regression 3). A one standard deviation increase in the number of ministries is associated with 0.48 percent (0.36 percent) decrease in growth rate for the 1960-1992 (1981-1992) period. In the B specification, the ministry variable remains negative and significant at 1% significance level in both periods (Tables 4 and 5, Regression 6). A one-

[10] We also estimate Table 4 and 5 regressions including other regional dummies such as an Asia dummy and a OECD dummy. Results essentially remain the same and avialable upon request.

standard-deviation increase in number of ministries is significantly associated with a 0.30 % (0.54%) decrease in the growth rate for the 1960-1992 (1981-1992) period.

In the 2SLS regressions the estimated magnitude of the effects of the number of ministries on growth are greater but there is some loss in significance. In the 1960-1992 period, while the ministry variable is still negative and significant at at least 10% significance level in the LR specification (Table 4, Regressions 4 and 5), it no longer is significant (significance drops to 18%) in the B specification (Table 4, regression 9). The ministry variable remains strong and significant in the 2SLS regressions of the 1981-1992 period in both LR and B specifications. A one-standard-deviation increase in the number of ministries is associated with a 3 percent (1 percent) decrease in the growth rate in the LR (B) specification (Table 5, regressions 4 and 8). In both periods of analysis, Hausman test, fails to reject the consistency of the OLS estimates of the LR and B specifications and a test of over-identifying restrictions fails to reject the validity of the instruments.

Having provided evidence that regulatory structure affects growth, we now turn to analyzing the channels through which this takes place. Our model implies a distortion in the firm's investment decision due to the existence of multiple government agencies which regulate the firm. It is also plausible that this regulatory structure can lead to misallocation of production among sectors due to the differences in the number of regulatory bodies among different sectors. Hence, we should consider that regulatory structure may not only have indirect effects on growth through distorting the firm's investment decisions but also may directly affect the growth process.

In order to assess the empirical relevance of direct and indirect effects of regulatory structure on growth, we adopt two approaches. First, we add investment to the list of independent variables in OLS growth regressions, and observe the magnitude and significance of the coefficient on the number of ministries. In the LR specification, the ministry variable remains negative and significant for the 1960-1992 period (Table 4 Regression 6) but loses its significance for the 1981-1992 period (Table 5 Regression 5). Similarly, in the B specification, the ministry variable remains negative and significant for the 1960-1992 period (Table 4, regression 8), while losing its significance for the 1981-1992 period (Table 5, regression 7). The longer period (1960-1992) is more appropriate to

examine long-run growth since it is more robust to short-term fluctuations. Still we need to reflect on the loss of significance of the ministry variable when investment is included in the regressions for the 1981-1992 period. Finding loss of significance due to inclusion of investment rate is consistent with some earlier studies that analyzed the effects of bureaucratic efficiency on growth by using subjective efficiency indices [Mauro 1995]. Knack and Keefer who find a significant relationship between GADP and growth, exclude investment rate from their cross-country regressions.

Second, we estimate 2SLS regressions using the number of ministries and GADP as instruments for the investment rate. This procedure requires the testable assumption that regulatory and institutional structure affects the investment rate but does not affect growth directly. Using a test of over-identifying restrictions, the null hypothesis that the only channel through which institutions affect economic growth is through investment can not be rejected (p-value=0.12 for 1960-1992 period, p-value=0.48 for 1981-1992 period) for the LR specification with continent dummies. If the same procedure is applied to the B specification however, we reject the null for the 1960-1992 period but fail to reject if for the 1981-1992 period.

Therefore, on the basis of this data, there is only weak support for the hypothesis that bureaucratic structure reduces growth by leading to inefficient investment choices. Overall, it seems that a considerable portion of the effects of bureaucratic structure on growth works through its effects on the total amount of investment.

4.3 Further Robustness Checks

We find a robust negative relationship between number of government ministries and investment rate, but the mechanism through which this negative effect is operating needs further scrutiny. More specifically, is our measure for the size of horizontal governance—the number of government ministries—measuring over-regulation as implied by our model?

For example, one might argue that number of government ministries measures a taste for government consumption rather than over-regulation. We included share of government consumption in our regressions to address this concern. When we further look at the relationship between government con-

sumption and the number government ministries, we find that the correlation coefficient of these two variables is not significant.

Another concern might be that the total number of ministries includes many peripheral ministries (Culture, Sport, Youth, etc.) which are responsible for the large counts in some countries and these ministries may have little regulatory influence. In order to address this concern, we perform robustness checks using the number of ministries of economy and industry, a measure constructed by excluding such peripheral ministries from the count. The summary regressions are reported in the appendix (Table A2 and A3). Results are stronger with this variable. The coefficient on the ministry variable is more negative and more significant in general.

Finally, how do our measures compare with the existing subjective measures of regulation? Table A.4 presents the relationship between the number of ministries and the subjective regulatory burden index as well as indices of government effectiveness, rule of law and graft constructed by Kaufmann et al. (1999). Kaufmann data is drawn from polls of experts which reflect country ratings produced by commercial risk rating agencies and other organizations and cross-country surveys of residents carried out by international organizations and other non-governmental organizations. Hence, this data is potentially susceptible to problems of subjective ratings discussed earlier.

A higher value of a subjective governance index stands for a better score of governance. Regulatory burden index is significantly correlated with the total number of ministries with a correlation coefficient of -0.22 and it is significantly correlated with the number of ministries of economy and industry with a correlation coefficient of -0.29. The correlation coefficients are not very high but they are significant. Furthermore when the number of ministries and the subjective regulatory burden index are both included in the investment regressions, our measures work better. In fact, this subjective index, while positive and significant when it is the only variable measuring over-regulation, becomes insignificant when either of the ministry variable is also included in the regressions (Table A.5).

5 Conclusion

Government institutions and their effects on investment and growth have recently gained much attention. However, the empirical literature in this field suffers from two main limitations : [1] Lack of a formal model and [2] Use of subjective indices of government efficiency. Almost everyone agrees that efficient government institutions foster investment and growth but what is missing from many empirical studies are the mechanisms through which such institutions affect economic performance. Subjective indices used to measure the efficiency of government institutions have been based upon individuals' perceptions and hence can be influenced by the state of the economic and political stability of a country.

In this paper, we explained how bureaucracy—modeled as multiple regulators in government regulating a common firm—can affect the firm's investment. Our model showed that regulators extract more information rents and induce greater distortions acting non-cooperatively than in concert and furthermore these distortions increase with increasing number of non-cooperating regulators.

Next, we analyzed empirically the links between the number of regulators and the rate of investment and growth. We modelled the government ministries—an objective measure of bureaucracy size—as the regulators of firms and found that an increase in the number of ministries has a negative and significant effect on investment and growth.

Our results make a strong case for better streamlining regulations. While we do not claim that there should be only one regulatory agency, we would argue that there should not be too many.

Interesting questions remain for further research. Why do the number of ministries vary across countries? Is ethnic fractionalization one of the determinants of multiple principals in the executive branch? What is the relationship between electoral systems and bureaucracy size? What conditions induce cooperation among government ministries?

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Table 1
Dependent variable: Total Investment/GDP (1960-1992 Average)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ministry	-0.002	-0.002	-0.006	-0.004	-0.002	-0.003	-0.002	-0.006	-0.005
	(-2.34)	(-2.74)	(-1.74)	(-1.50)	(-2.65)	(-3.78)	(-2.87)	(-2.40)	(2.31)
GDP per capita in 1960		0.003	0.002	0.002	-0.002	-0.003	-0.004	-0.003	-0.003
		(0.53)	(0.41)	(0.43)	(-0.60)	(-0.96)	(-1.23)	(-0.085)	(-0.98)
Secondary education in 1960		0.236	0.272	0.256	0.156	0.136	0.136	0.189	0.124
		(4.21)	(4.54)	(4.75)	(4.05)	(3.68)	(3.81)	(4.62)	(3.31)
Population growth		-0.523	0.437	0.008					
		(-0.49)	(0.34)	(0.01)					
Primary education in 1960					0.088	0.096	0.082	0.071	0.094
					(5.45)	(5.52)	(4.94)	(3.35)	(4.34)
Government Consumption					-0.023	-0.049	-0.002	0.018	-0.040
					(-0.35)	(-0.75)	(-0.03)	(0.23)	(-0.54)
Revolutions and Coups					-0.039	-0.031	-0.026	-0.045	-0.021
					(-2.50)	(-1.79)	(-1.41)	(-2.40)	(-1.03)
Assassinations					-0.008	-0.004	-0.004		
					(-1.18)	(-0.56)	(-0.63)		
PI60					0.069	-0.065	-0.063	-0.079	-0.040
						(-4.44)	(-4.77)	(-4.39)	(-3.04)
PI60DEV					0.041	0.035	0.036	0.064	
					(2.436)	(1.96)	(2.06)	(2.51)	
Africa						-0.011			-0.025
						(-0.68)			(-1.31)
Latin America						-0.042			-0.067
						(-3.69)			(-3.26)
GADP							0.08		
							(1.99)		
constant	0.214	0.156	0.202	0.182	0.161	0.193	0.116	0.246	0.243
	(8.95)	(4.61)	(3.40)	(3.21)	(6.69)	(7.28)	(3.69)	(4.29)	(4.01)
No of obs.	102	99	91	91	99	99	99	99	99
R^2	0.04	0.57	na	na	0.77	0.80	0.78	na	na
Estimation method	OLS	OLS	2SLS	2SLS	OLS	OLS	OLS	2SLS	2SLS
p-value (Hausman)			0.44	0.53				0.94	0.97

White-corrected t-statistics are in parentheses. Ethnolinguistic Fractionalization Index (ETHNIC) is used to instrument the ministry variable in 2SLS regression 3. Test of over-identifying restrictions is applied when pop81, d776 and d945 are used as instruments in addition to ETHNIC (p-value=0.57). Population (Pop81), d776 and d945 are used to instrument for the ministry variable in regression 4. Pop81 is used to instrument for the ministry variable in regressions 8 and 9. Test of over-identifying restrictions (TOR) is applied when d776 and d945 are included as instruments in addition to pop81 and p-values of TOR are 0.94 and 0.97 respectively for specifications 8 and 9.
(na) R2 is not an appropriate measure of goodness of fit with two stage least squares.

Table 2
Dependent variable: Total Investment/GDP (1981-1992 Average)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ministry	-0.002	-0.002	-0.007	-0.002	-0.003	-0.002	-0.003	-0.003
	(-2.00)	(-2.47)	(-2.25)	(-2.41)	(-4.43)	(-2.53)	(-1.55)	(-2.41)
GDP per capita in 1970		0.004	0.003	0.005	0.003	-0.002	0.004	0.003
		(1.13)	(0.88)	(1.49)	(1.46)	(-0.41)	(1.25)	(1.14)
Secondary education in 1970		0.17	0.232	0.083	0.037	0.046	0.094	0.037
		(3.33)	(4.01)	(2.15)	(1.06)	(1.28)	(2.28)	(1.03)
Population growth		-0.039	0.018					
		(-0.05)	(1.90)					
Primary education in 1970				0.028	0.046	0.027	0.025	0.047
				(1.54)	(2.57)	(1.47)	(1.35)	(2.68)
Government Consumption				-0.17	-0.215	-0.161	-0.155	-0.208
				(2.69)	(-3.24)	(-2.60)	(-2.22)	(-2.99)
Revolutions and Coups				-0.036	-0.036	-0.018	-0.032	-0.031
				(-3.05)	(-3.08)	(-1.27)	(-2.46)	(-3.37)
Assassinations				-0.012	0.018	0.004	-0.025	
				(-0.64)	(0.71)	(0.17)	(-0.99)	
PI80				-0.024	-0.028	-0.026	-0.027	-0.019
				(-2.69)	(-2.18)	(-3.21)	(-2.62)	(-3.68)
PI80DEV				0.006	0.011	0.010	0.01	
				(0.61)	(0.81)	(1.05)	(0.83)	
Africa					-0.028			-0.036
					(-1.49)			(-2.30)
Latin America					-0.069			-0.067
					(-4.19)			(-4.01)
GADP						0.179		
						(4.31)		
constant	0.197	0.122	0.164	0.189	0.255	0.104	0.221	0.252
	(8.48)	(4.10)	(3.07	(6.25)	(7.70)	(3.22)	(4.50)	(6.66)
No of obs.	102	99	91	91	99	99	102	102
R^2	0.03	0.54	na	0.68	0.75	0.74	na	na
Estimation method	OLS	OLS	2SLS	OLS	OLS	OLS	2SLS	2SLS
p-value (Hausman)			0.00				1.00	1.00

White corrected t-statistics are reported in parenthesis. ETHNIC is used to instrument for the ministry variable in 2SLS regression 3. TOR is applied when instruments pop81, d776 and d945 are included in addition to ETHNIC in regression 3 (p-value=0.55). Pop81 and d776 instrument for the ministry variable in 2SLS regressions 7 and 8. p-value of TOR in regressions 7 and 8 are 0.38 and 0.74 respectively.
(na) R2 is not an appropriate measure of goodness of fit with two-stage least squares.

Table 3
Dependent variable: Private Investment/GDP (1981-1992 Average)

	Non-OECD (World Bank Data)							Total sample (Worldbank and PWT data)				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Ministry	-0.001	-0.005	-0.002	-0.003	-0.002	-0.001	-0.006	-0.002	-0.003	-0.005	-0.003	-0.007
	(-1.38)	(-1.59)	(-1.73)	(-3.2)	(-1.66)	(-1.60)	(-2.21)	(-1.67)	(-2.35)	(-1.75)	(-2.89)	(-1.64)
GDP per capita in 1970	-0.001	-0.002	-0.007	0.001	-0.009	-0.014	-0.016	0.001	0.003	0.001	0.004	0.004
	(-0.27)	(-0.31)	(-1.22)	(0.35)	(-1.58)	(-1.93)	(-1.55)	(0.21)	(1.13)	(0.46)	(1.84)	(1.20)
Secondary education in 1970	0.174	0.191	0.076	-0.003	0.074	0.065	0.116	0.127	0.109	0.143	0.023	0.052
	(2.79)	(2.64)	(1.22)	(-0.04)	(1.21)	(1.15)	(1.29)	(2.78)	(2.59)	(2.33)	(0.58)	(0.83)
Population growth	-0.086	0.012						0.128	0.236	0.874		
	(-0.09)	(1.05)						(0.16)	(0.32)	(0.87)		
Primary education in 1970			0.070	0.094	0.075	0.068	0.072				0.075	0.081
			(2.92)	(3.73)	(2.88)	(2.85)	(2.62)				(3.54)	(3.52)
Government Consumption			0.068	0.068	0.060	0.041	0.045				-0.074	-0.059
			(0.54)	(0.68)	(0.49)	(0.38)	(0.35)				(-1.20)	(-0.86)
Revolutions and Coups			-0.014	-0.011	-0.010	0.002	-0.006				-0.015	-0.006
			(-0.86)	(-0.77)	(-0.58)	(0.11)	(-0.34)				(-0.94)	(-0.34)
Assassinations			-0.025	0.001	-0.021	-0.006	-0.054				0.009	-0.0001
			(-1.18)	(0.04)	(-1.00)	(-0.34)	(-1.96)				(0.52)	(-0.00)
PI80			-0.014	-0.017	-0.012	-0.014	-0.017				-0.024	-0.039
			(-1.22)	(-1.30)	(-1.12)	(-1.39)	(-1.36)				(-1.62)	(-1.49)
PI80DEV			0.004	0.008	0.003	0.006	0.007				0.015	0.029
			(0.30)	(0.58)	(0.24)	(0.49)	(0.53)				(0.96)	(1.09)
Africa				-0.035					-0.036	-0.040	-0.011	-0.003
				(-1.92)					(-2.08)	(-2.05)	(-0.47)	(-0.12)
Latin America				-0.074					-0.052	-0.068	-0.066	-0.092
				(-3.86)					(-2.88)	(-2.29)	(-3.48)	(-2.42)
OECD									-0.038	-0.039	-0.036	-0.043
									(-1.60)	(-1.64)	(-1.74)	(-1.64)
Economic freedom					0.003							
					(1.19)							
GADP						0.191						
						(3.71)						
constant	0.114	0.168	0.109	0.16	0.087	0.017	0.205	0.119	0.166	0.199	0.168	0.245
	(3.03)	(2.70)	(3.52)	(5.24)	(2.23)	(0.45)	(2.96)	(4.02)	(4.81)	(3.72)	(5.23)	(2.80)
No of obs.	72	64	71	71	71	71	71	91	91	91	91	91
R^2	0.22	na	0.38	0.52	0.39	0.51	na	0.34	0.40	na	0.55	na
Estimation method	OLS	2SLS	OLS	OLS	OLS	OLS	2SLS	OLS	OLS	2SLS	OLS	2SLS
p-value (Hausman)		0.99					0.99			0.99		1.00

White corrected t-statistics are reported in parentheses. ETHNIC is used to instrument for the ministry variable in 2SLS regression 2. Test of over-identifying restrictions (TOR) is applied when instruments include pop81, d776 and d945 in addition to ETHNIC (p-value=0.15). Pop81 and d776 are used to instrument for the ministry variable in regression 7. P-value of TOR is 0.22. Pop81 is used to instrument for the ministry variable in regressions 10 and 12.
(na) R2 is not an appropriate measure of goodness of fit with two-stage least squares.

Table 4
Dependent variable: Per Capita GDP growth (1960-1992 Average)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ministry	-0.0002	-0.0007	-0.008	-0.003	-0.002	-0.0005	-0.0006	-0.0005	-0.001
	(-1.16)	(-3.08)	(-3.54)	(-1.95)	(-1.55)	(-2.37)	(-3.07)	(-2.64)	(-1.35)
GDP per capita in 1960			-0.004	-0.004	-0.004	-0.004	-0.005	-0.005	-0.005
			(-2.91)	(-2.91)	(-4.45)	(-4.45)	(-6.79)	(-6.66)	(-5.74)
Secondary education in 1960			0.025	0.036	0.032	0.006	0.008	0.003	0.009
			(2.16)	(1.85)	(1.83)	(0.54)	(0.93)	(0.36)	(0.91)
Population growth			0.011	0.606	0.348	-0.027			
			(0.05)	(1.11)	(0.77)	(-0.14)			
Primary education in 1960							0.022	0.019	0.020
							(4.56)	(3.34)	(4.05)
Government Consumption							-0.067	-0.065	-0.063
							(-2.76)	(-2.59)	(-2.58)
Revolutions and Coups							-0.008	-0.007	-0.009
							(-1.49)	(-1.32	(-1.56)
Assassinations							-0.003	-0.003	
							(-1.62)	(-1.53)	
PI60							-0.002	-0.004	-0.003
							(-0.66)	(-0.11)	(-1.28)
PI60DEV							-0.001	-0.002	
							(-0.33)	(-0.58)	
Africa		-0.025	-0.026	-0.032	-0.031	(-0.021)	-0.019	-0.019	-0.021
		(-7.37)	(-5.44)	(-3.53)	(-3.08)	(-4.39)	(-5.31)	(-4.99)	(-4.53)
Latin America		-0.023	-0.025	-0.039	-0.034	-0.019	-0.025	-0.024	-0.030
		(-6.17)	(-5.41)	(-3.53)	(-3.08)	(-4.33)	(-7.24)	(-6.46)	(-4.36)
Investment						0.102		0.033	
						(3.79)		(1.02)	
constant	0.025	0.047	0.053	0.085	0.071	0.033	0.055	0.049	0.067
	(5.28)	(7.98)	(7.55)	(3.71)	(3.52)	(3.98)	(5.87)	(4.34)	(3.28)
No of obs.	102	99	91	91	99	99	99	99	99
R^2	0.01	0.43	0.49	na	na	0.57	0.68	0.68	na
Estimation method	OLS	OLS	OLS	2SLS	2SLS	OLS	OLS	OLS	2SLS
p-value (Hausman)				0.80	0.97				0.99

White corrected t-statistics are reported in parentheses. ETHNIC is used to instrument for the ministry variable in the 2SLS regression 4. Test of over-identifying restrictions (TOR) is applied when instruments include pop81, d776 and d945 in addition to ETHNIC (p-value=0.59). Pop81 is used to instrument the ministry variable in regressions 5 and 9. TOR is applied when instruments include d776 and d945 in addition to pop81 (p-value=0.59). (na) R2 is not an appropriate measure of goodness of fit with two-stage least squares.

Table 5
Dependent variable: Per Capita GDP growth (1981-1992 Average)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ministry	0.0003	-0.0007	-0.0006	-0.005	-0.0001	-0.0009	-0.006	-0.002
	(0.61)	(-1.93)	(-1.69)	(-2.30)	(-0.34)	(-2.43)	(-1.37)	(-1.93)
GDP per capita in 1970			-0.003	-0.004	-0.003	-0.003	-0.003	-0.003
			(-3.25)	(-2.34)	(-3.82)	(-3.02)	(-3.39)	(-3.20)
Secondary education in 1970			-0.005	0.040	-0.021	0.023	0.018	0.024
			(-0.24)	(1.21)	(-1.06)	(1.36)	(1.04)	(1.49)
Population growth			-1.094	0.001	-1.144			
			(-2.95)	(0.12)	(-3.13)			
Primary education in 1970						-0.007	-0.012	-0.006
						(-0.049)	(-0.81)	(-0.44)
Government Consumption						-0.107	-0.083	-0.103
						(-3.00)	(-2.05)	(-2.84)
Revolutions and Coups						-0.012	-0.009	-0.011
						(-1.46)	(-0.960	(-1.38)
Assassinations						0.005	0.003	
						(0.42)	(0.20)	
PI80						-0.012	-0.008	-0.014
						(-1.97)	(-1.41)	(-2.17)
PI80DEV						0.015	0.013	0.017
						(2.11)	(2.02)	(2.29)
Africa		-0.029	-0.028	-0.032	-0.019	-0.021	-0.018	-0.021
		(-5.12)	(-3.55)	(-3.13)	(-2.32)	(-2.40)	(-2.00)	(-2.45)
Latin America		-0.044	-0.046	-0.065	-0.038	-0.049	-0.042	-0.054
		(-6.91)	(-6.12)	(-4.54)	(-4.92)	(-6.44)	(-4.44)	(-6.46)
Investment					0.140		0.112	
					(2.99)		(1.73)	
constant	0.046	0.083	0.116	0.166	0.089	0.127	0.098	0.142
	(5.06)	(9.96)	(8.69)	(4.77)	(5.78)	(6.77)	(4.11)	(5.64)
No of obs.	102	102	102	92	102	102	102	102
R^2	0.00	0.35	0.44	na	0.50	0.50	0.52	na
Estimation method	OLS	OLS	OLS	2SLS	OLS	OLS	OLS	2SLS
p-value (Hausman)				0.58				1.00

White corrected t-statistics are reported in parentheses. ETHNIC is used to instrument for the ministry variable in the 2SLS regression 4. Test of over-identifying restrictions is applied when instruments include pop81, d776 and d945 in addition to ETHNIC (p-value=0.13). Pop81, d776 and d945 are used to instrument for the ministry variable in regression 8. p-value of TOR is 0.67. (na) R2 is not an appropriate measure of goodness of fit with two-stage least squares.

APPENDIX

Table A.1
Summary Statistics

Series	Mean	Standard Deviation	Minimum	Maximum
Total Investment/GDP 1960-1992	0.16	0.08	0.01	0.34
Total Investment/GDP 1981-1992	0.15	0.08	0.01	0.35
Private Investment/GDP 1981-1992	0.12	0.06	0.003	0.28
Per capita GDP growth 1960-1992	0.02	0.02	-0.02	0.07
Per capita GDP growth 1981-1992	0.05	0.03	-0.03	0.13
Ministry	18.57	6.02	6	36
Industry Ministry	9.89	3.27	2	21
GDP per capita in 1960 (in 1000)	2.41	0.06	0.31	9.89
GDP per capita in 1970 (in 1000)	3.32	3.23	0.34	12.96
Secondary education in 1960	0.22	0.22	0.001	0.86
Secondary education in 1970	0.33	0.26	0.01	1
Population growth 1960-1992	0.02	0.01	0.002	0.39
Population growth 1981-1992	0.02	0.01	-0.004	0.04
Primary education in 1960	0.75	0.34	0.05	1.44
Primary education in 1970	0.83	0.29	0.09	1.33
Government Consumption/GDP 1960-1992	0.18	0.07	0.06	0.51
Government Consumption/GDP 1981-1992	0.20	0.08	0.06	0.51
Revolutions and Coups 1960-1985	0.19	0.25	0	1.15
Revolutions and Coups 1980-1985	0.21	0.34	0	1.33
Assassinations 1960-1985	0.21	0.45	0	2.85
Assassinations 1980-1985	0.04	0.18	0	1.35
Price level of investment in 1960 (PI60)	0.90	0.56	0.37	4.31
PI60DEV	0.34	0.44	0.01	3.40
Price level of investment in 1980 (PI80)	1.33	1.06	0.39	9.03
PI80DEV	0.55	0.90	0.005	7.74
Economic freedom	6.36	2.77	2.5	10
GADP	0.62	0.22	0.19	1
Population in 1981 (in 10,000)	2.51	7.48	0.02	70.28
Ethnolinguistic Fractionalization	0.39	0.30	0.01	0.90

Table A2: The Effects of Industry Ministries on Investment (1981-1992 Average)

Dependent variable	**Total Investment/GDP**				**Private Investment/GDP**		
	1	**2**	**3**	**4**	**5**	**6**	**7**
Industry Ministry	-0.006	-0.004	-0.003	-0.004	-0.003	-0.004	-0.005
	(-2.62)*	(-2.57)*	(-1.58)	(-2.49)*	(-1.51)	(-2.22)*	(-2.46)*
GDP per capita in 1970		0.003	0.004	0.003		0.004	0.005
		(0.94)	(1.36)	(1.06)		(1.35)	(2.01)*
Secondary Education in 1970		0.181	0.091	0.037		0.102	0.006
		(3.44)**	(2.30)*	(0.98)		(2.35)*	-0.15
Population Growth		-0.036				0.261	
		(-0.04)				(0.36)	
Primary Education in 1970			0.029	0.039			0.076
			(1.51)	(2.04)*			(4.26)**
Government consumption			-0.177	-0.194			-0.039
			(-2.74)**	(-2.96)**			(-2.04)*
Revolutions and Coups			-0.035	-0.038			-0.07
			(-2.93)**	(-3.13)**			(-4.02)**
Assassinations			-0.011	0.017			-0.045
			(-0.56)	(-0.66)			(-2.17)*
PI80			-0.023	-0.015			0.15
			(-2.39)*	(-0.98)			(5.26)**
PI80DEV			0.007	0.001			0.052
			(0.56)	(0.06)			(0.58)
Africa				-0.047		-0.047	-0.013
				(2.06)*		(-2.66)**	(0.86)
Latin America				-0.063		-0.055	0.001
				(4.05)**		(-3.14)**	(0.11)
Oecd						-0.046	-0.016
						(-1.86)	(1.35)
Constant	0.215	0.126	0.179	0.238	0.168	0.168	0.011
	(8.94)**	(4.00)**	(5.85)**	(7.18)**	(7.38)**	(4.84)**	(0.83)
Observations	100	100	100	100	89	89	87
R-squared	0.06	0.56	0.68	0.75	0.04	0.48	0.59

Robust t statistics in parentheses * significant at 5%; ** significant at 1%

Table A3: The Effects of Industry Ministries on Investment and Growth (1960-1992 Average)

Dependent variable	Total Investment/GDP			Per Capita GDP growth			
	1	2	3	4	5	6	7
Industry Ministry	-0.006	-0.003	-0.004	-0.001	-0.001	-0.001	-0.001
	(-2.73)**	(-2.17)*	(-2.89)**	(-2.20)*	(-1.81)	(-3.22)**	(-2.99)**
GDP per capita in 1960		0.002	-0.003		-0.004	-0.005	-0.005
		(0.49)	(0.99)		(-3.14)**	(-6.78)**	(-6.69)**
Secondary Education in 1960		0.23	0.131		0.051	0.011	0.007
		(3.89)**	(2.98)**		(3.30)**	(1.16)	(0.66)
Population growth		-0.645			-0.362		
		(-0.6)			(-1.39)		
Primary Education in 1960			0.103			0.023	0.019
			(5.60)**			(4.57)**	(3.25)**
Government Consumption			-0.034			-0.058	-0.057
			(-0.48)			(-2.27)**	(-2.16)*
Revolutions and Coups			-0.031			-0.058	-0.008
			(-1.6)			(-2.27)*	(-1.25)
Assassinations			-0.001			-0.009	-0.002
			(-0.16)			(-1.39)	(-0.82)
PI60			-0.066			-0.002	-0.001
			(-4.24)**			(-0.85)	(-0.19)
PI60DEV			0.036			-0.003	0
			(2.17)*			(-0.72)	(0.01)
Africa			-0.008			0.001	-0.017
			(-0.44)			(-0.27)	(-4.11)**
Latin America			-0.038			-0.018	-0.023
			(-3.27)**			(-4.41)**	(-5.97)**
Investment							0.035
							(1.08)
Constant	0.225	0.154	0.176	0.031	0.034	0.053	0.047
	(9.43)**	(4.47)**	(7.10)**	(5.80)**	(3.87)**	(5.41)**	(4.11)**
Observations	100	98	98	100	98	98	98
R-squared	0.06	0.56	0.79	0.04	0.25	0.66	0.67

Robust t statistics in parentheses * significant at 5%; ** significant at 1%

Table A.4
Correlation Matrix for Number of Ministries and Subjective Governance Indicators

	Ministry	Industry Ministries
Governance Indicator	Coefficient	Significance
Regulatory Burden	-0.22	-0.29
	(0.03)	0
Government Effectiveness	-0.2	-0.28
	(0.06)	(0.01)
Rule of Law	-0.13	-0.19
	(0.19)	(0.06)
Graft	-0.14	-0.21
	(0.17)	(0.05)
GADP	-0.08	-0.21
	(0.43)	(0.04)

All indicators except for GADP, are from Kaufmann et. al (1999) data set. GADP is from Hall and Jones (1997)
Standard Errors are in parenthesis.

Table A5: The Effects of Ministries on Investment (1981-1992 Average)
when Kaufmann's Subjective Regulatory Burden Index is included

	with total ministries				with industry ministries			
Dependent Variable	**Investment/GDP**		**private inv/GDP**		**Investment/GDP**		**private inv/GDP**	
	1	2	3	4	5	6	7	8
Ministry	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002	-0.004	-0.004
	(-2.13)*	(-2.45)*	(-2.31)*	(-2.99)**	(-1.96)	(-1.35)	(-2.12)*	(-2.02)*
Regulatory Burden Index	0	0	0.001	0	0	0	0.001	0
	(1.48)	(0.25)	(2.19)*	(1.02)	(1.38)	(0.39)	(1.89)	(1.14)
GDP per capita in 1970	0.004	0.005	0.002	0.004	0.003	0.004	0.002	0.003
	(1.05)	(1.40)	(0.67)	(1.41)	(0.89)	(1.24)	(1.00)	(1.28)
Secondary Education in 1970	0.13	0.075	0.064	0	0.14	0.081	0.06	0.007
	(2.37)*	(1.75)	(1.49)	0	(2.45)*	(1.80)	(1.38)	(0.17)
Population Growth	-0.082		0.006		-0.101		0.038	
	(-0.1)		(0.01)		(-0.12)		(0.06)	
Primary Education in 1970		0.029		0.077		0.029		0.062
		(1.59)		(3.46)**		(1.55)		(2.89)**
Government consumption		-0.169		-0.061		-0.173		-0.047
		(-2.45)*		(-0.92)		(-2.51)*		(-0.7)
Revolutions and Coups		-0.033		-0.012		-0.032		-0.01
		(-2.65)**		(-0.63)		(-2.55)*		(-0.55)
Assassinations		-0.018		-0.001		-0.016		-0.007
		(-0.74)		-0.05		(-0.68)		(-0.4)
PI80		-0.024		-0.023		-0.022		-0.012
		(-2.54)*		(-1.56)		(-2.20)*		(-0.9)
PI80DEV		0.006		0.013		0.005		0.004
		(0.49)		(0.84)		(0.40)		(0.33)
Africa			-0.038	-0.018			-0.049	-0.035
			(2.47)*	(-0.84)			(3.09)**	(-1.73)
Latin America			-0.065	-0.075			-0.067	-0.069
			(-4.08)**	(-4.43)**			(-4.26)**	(-4.20)**
OECD			-0.041	-0.037			-0.048	-0.042
			(-2.18)*	(-1.88)			(-2.42)*	(-2.19)*
Constant	0.103	0.187	0.158	0.163	0.105	0.171	0.161	0.15
	(3.14)**	(5.37)**	(4.78)**	(4.47)**	(2.98)**	(4.75)**	(4.75)**	(3.92)**
Observations	99	99	89	89	97	97	87	87
R-squared	0.55	0.68	0.45	0.59	0.57	0.68	0.52	0.6

Robust t statistics in parentheses * significant at 5%; ** significant at 1%

Table A.6: Country Sample

Country	Ministry	Industry Ministry	Ethnic Fractionalization Index
Argentina	8	8	0.31
Australia	25	12	0.32
Austria	16	8	0.13
Bangladesh	35	18	
Barbados	11	6	0.22
Belgium	30	10	0.55
Bolivia	17	11	0.68
Botswana	12	6	0.51
Brazil	16	8	0.07
Burundi	18	9	0.04
Cameroon	27	10	0.89
Canada	33	16	0.75
Central African Rep.	18	10	0.69
Chad	21	11	0.83
Chile	20	12	0.14
Colombia	13	7	0.06
Congo	21	13	0.66
Costa Rica	16	8	0.07
Cyprus	10	5	0.35
Denmark	20	11	0.05
Dominican Rep.	12	6	0.04
Egypt	27	14	0.04
El Salvador	14	8	0.17
Fiji	18	11	
Finland	11	5	0.16
France	22	13	0.26
Gambia	11	7	0.73
Germany, West	16	8	0.02
Ghana	20	10	0.71
Greece	20	10	0.1
Guatemala	10	6	0.64
Guinea-Bissau	17	9	
Guyana	16	10	0.58
Haiti	14	7	0.01
Honduras	13	7	0.16
Hong Kong	15	9	0.02
Iceland	11	7	0.05
India	26	15	0.89
Ireland	17	9	0.04
Israel	15	8	0.2
Italy	22	13	0.04
Ivory Coast	33	15	0.86
Jamaica	14	9	0.05
Japan	21	14	0.01
Jordan	22	11	0.05
Kenya	23	13	0.83
Korea	20	8	0.01
Lesotho	14		0.22
Liberia	17	10	0.83
Luxembourg	16	9	0.15

Madagascar	20	10	
Malawi	17	9	0.62
Malaysia	21	13	0.72
Mali	16	9	0.78
Malta	11	7	0.08
Mauritania	16	9	0.33
Mauritius	20	13	0.58
Mexico	19	10	0.3
Morocco	26	10	0.53
Mozambique	19	10	0.65
Myanmar	18	11	0.47
Nepal	16	9	0.7
Netherlands	14	6	0.1
New Zealand	18	10	0.37
Nicaragua	22	12	0.18
Niger	18	9	0.73
Norway	16	11	0.04
Pakistan	36	17	0.64
Panama	12	7	0.28
Papua New Guinea	18	12	0.42
Paraguay	11	4	0.14
Peru	17	7	0.59
Philippines	27	16	0.74
Portugal	16	9	0.01
Rwanda	16	8	0.14
Senegal	22	11	0.72
Sierra Leone	22	14	0.77
Singapore	14	6	0.42
Somalia	24	15	0.08
South Africa	22	12	0.88
Spain	21	9	0.44
Sri Lanka	36	21	
Sudan	21	11	0.73
Suriname	11	7	
Swaziland	11	6	
Sweden	14	9	0.08
Switzerland	6	2	0.5
Syria	27	15	0.22
Taiwan	23	8	0.42
Thailand	13	5	0.66
Togo	19	9	0.71
Trinidad & Tobago	13	7	0.56
Tunisia	17	6	0.16
Turkey	21	12	0.25
U.K	27	9	0.32
U.S.A	21	8	0.5
Uganda	17	15	0.9
Uruguay	12	6	0.2
Yemen	19		0.04
Zaire	25	14	0.9
Zambia	18	11	0.82
Zimbabwe	24	13	

Figure 1 Investment/GDP 1960-1992

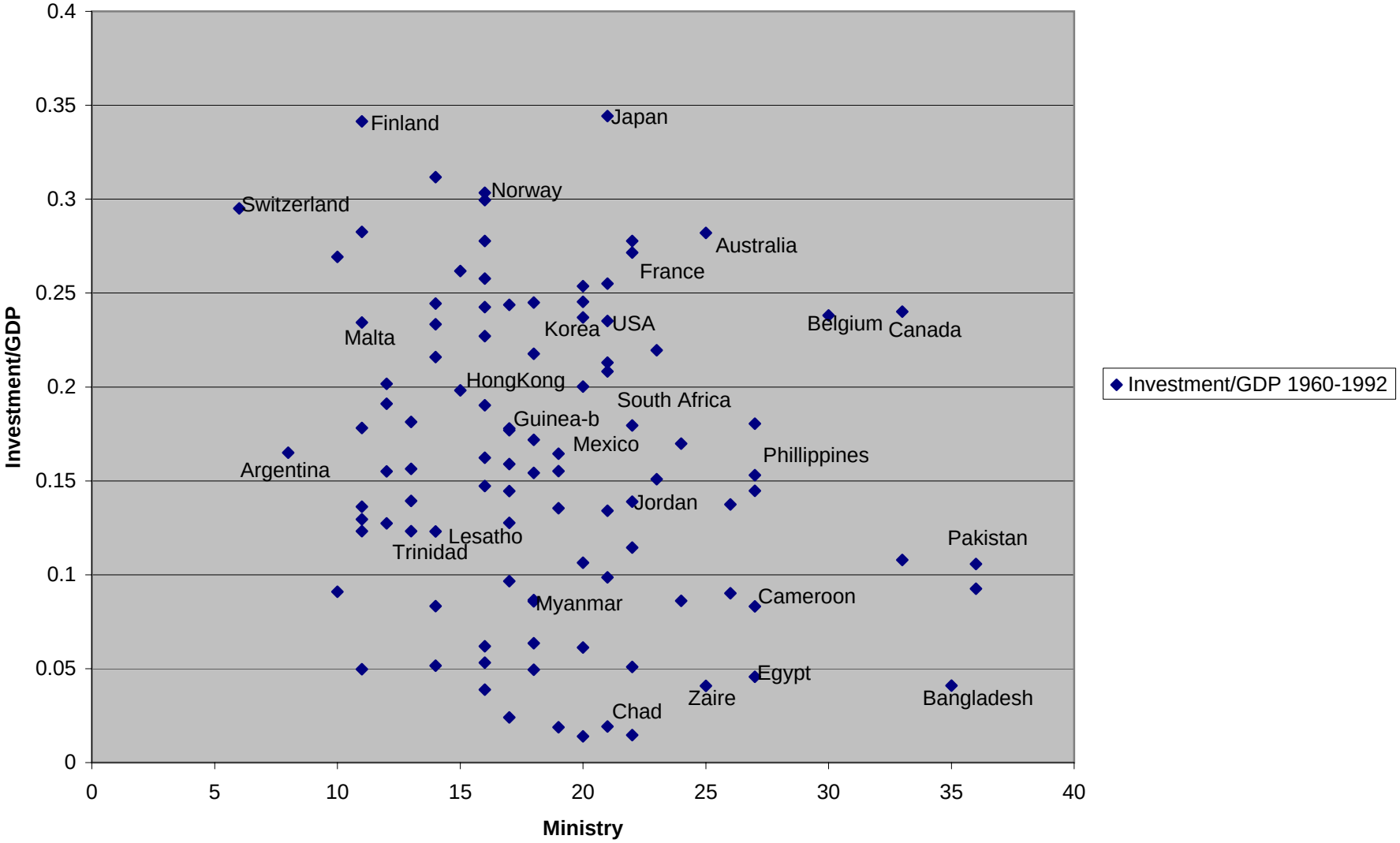

Figure 2 Investment/GDP 1981-1992

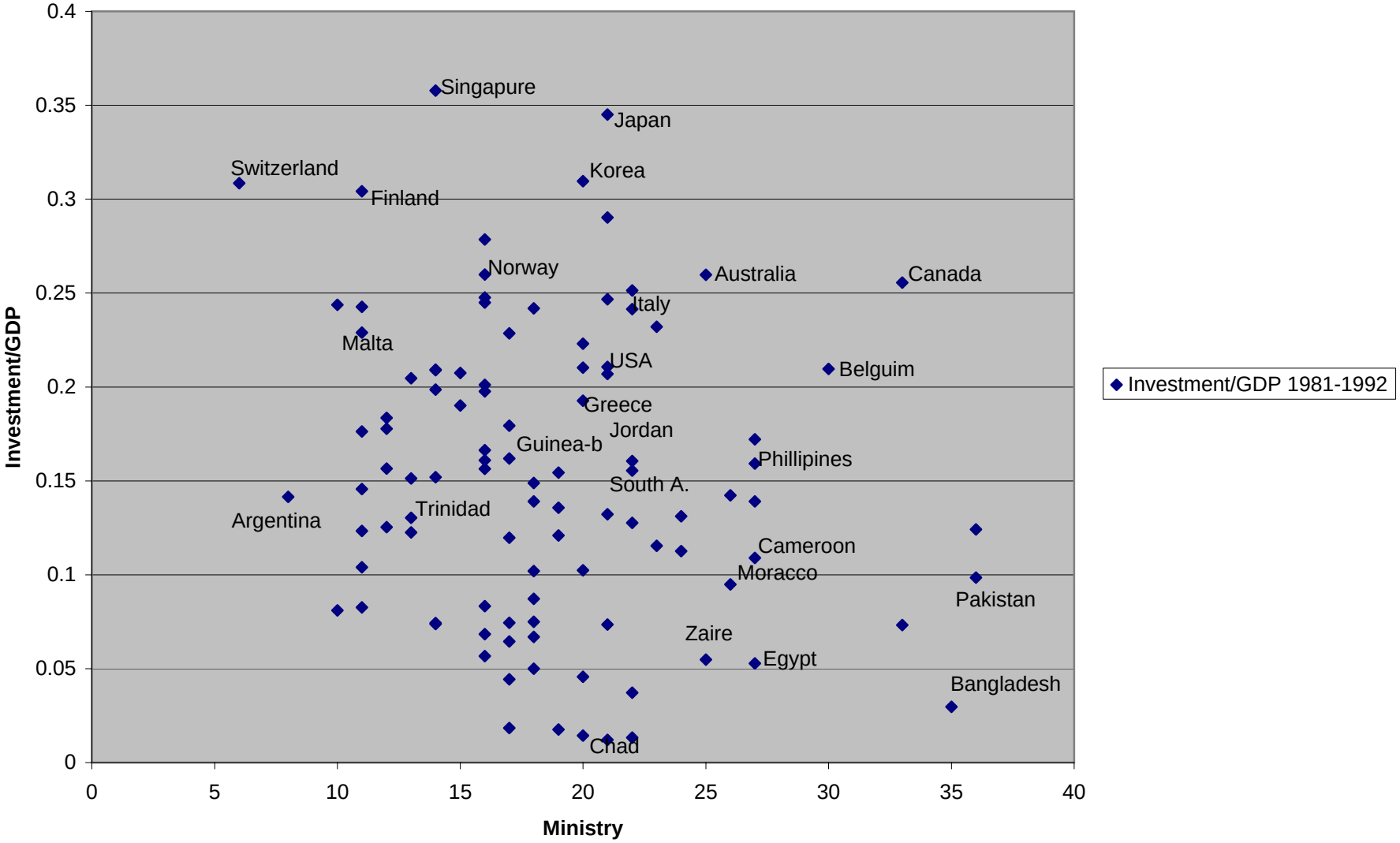

Figure 3 Private Investment/GDP 1981-1992