The Effect of Corporate Taxes on Investment and Entrepreneurship[†]

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We present new data on effective corporate income tax rates in 85 countries in 2004. The data come from a survey, conducted jointly with PricewaterhouseCoopers, of all taxes imposed on "the same" standardized mid-size domestic firm. In a cross-section of countries, our estimates of the effective corporate tax rate have a large adverse impact on aggregate investment, FDI, and entrepreneurial activity. Corporate tax rates are correlated with investment in manufacturing but not services, as well as with the size of the informal economy. The results are robust to the inclusion of many controls. (JEL E22, F23, G31, H25, H32, L26)

The effect of corporate taxes on investment and entrepreneurship is one of the central questions in both public finance and development. This effect matters not only for the evaluation and design of tax policy, but also for thinking about economic growth (see Robert J. Barro 1991; J. Bradford DeLong and Lawrence H. Summers 1991; and William J. Baumol, Robert E. Litan, and Carl J. Schramm 2007).

Starting with Dale W. Jorgenson (1963) and Robert E. Hall and Jorgenson (1967), many public finance economists have addressed this topic. A small selection of important studies includes Summers (1981), Martin Feldstein, Louis Dicks-Mireaux, and James Poterba (1983), Alan J. Auerbach (1983), Mervyn A. King and Don Fullerton (1984), Joel Slemrod (1990), Auerbach and Kevin Hassett (1992), James R. Hines Jr. and Eric M. Rice (1994), Jason G. Cummins, Hassett, and R. Glenn Hubbard (1996), Michael P. Devereux, Rachael Griffith, and Alexander Klemm (2002), and Mihir A. Desai, C. Fritz Foley, and Hines (2004b). Auerbach (2002), Roger H. Gordon and Hines (2002), Hasset and Hubbard (2002), and Hines (2007)

survey aspects of this literature. Generally speaking, this research finds adverse effects of corporate income taxes on investment, although studies offer different estimates of magnitudes.

In this paper, we present new cross-country evidence for the effects of corporate taxes on investment and entrepreneurship. The evidence comes from a newly constructed database of corporate income tax rates for 85 countries in 2004. We seek to contribute to the literature in four ways.

First, we use new data for a large cross section of countries. Most cross-country studies focus on either some, or all, of the OECD countries (see King and Fullerton 1984; Devereux, Griffith, and Klemm 2002; and Devereux and Griffith 2003), and hence do not provide much information about the developing world. Hassett and Aparna Mathur (2006) use a large dataset of tax rates for 72 countries over 22 years to investigate the effects of taxes, including corporate taxes, on wages rather than investment. Their data come from the AEI International Tax Database, which relies on summaries of tax rates produced by accounting firms, including PricewaterhouseCoopers, as well as the International Bureau of Fiscal Documentation.[1] Hassett and Mathur (2006) have time series data, which we do not. On the other hand, we have more complete information on depreciation and the treatment of labor taxes in the calculation of corporate tax rates.[2]

Second, we construct a new database of corporate (and other) tax rates that are *comparable* across countries. Our data, assembled jointly by the World Bank, PricewaterhouseCoopers, and Harvard University, come from a computation of *all* relevant taxes applicable to *the same* standardized domestic enterprise, called TaxpayerCo, operating in each country. In many instances, these rates differ sharply from statutory corporate tax rates. Our methodology may provide a different perspective on corporate tax rates than data from the statutes, although it is limited by the typicality of case facts. A related limitation of this study is that we do not have data on taxes paid by the owners of firms, and so cannot make a theoretically correct calculation integrating personal and corporate taxation (e.g., Auerbach 1979 and John R. Graham 2003).

Third, in addition to standard data on aggregate investment and foreign direct investment (FDI), we put together new data on entrepreneurship. These data come from the World Bank Entrepreneurship Survey, which seeks to produce comparable business registration data for a large number of countries. We use this survey to construct measures of business density and formal entry. These measures aggregate the creation of new formal firms with the transition of informal firms into formality, and as such both omit some entrepreneurial activity (the creation of informal firms, entrepreneurship inside existing firms) and include some purely administrative activity (registration of existing informal firms). We interpret the evidence recognizing these limitations.

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[1] PricewaterhouseCoopers has previously published tax rates for multiple countries, which have been used by Hassett and Mathur and others. Their rates have also been published by the World Bank's Doing Business reports. These reports cover more countries than we do, but do not contain as detailed information as we use.

[2] The correlation between the rates we compute and the Hassett-Mathur rates is only about 0.5. We return to their measures later in the paper.

Fourth, as pointed out by Steven J. Davis and Magnus Henrekson (2005), corporate income taxes might differentially affect investment in different sectors, as well as influence the allocation of resources between the formal and the informal sectors. To address these issues, we use the World Bank's Enterprise Surveys to construct separate machinery investment measures for manufacturing and services. We also use the Global Competitiveness Report estimates of the size of the informal sector. We then assess the impact of corporate taxes on investment in manufacturing and services separately, as well as on the size of the informal economy.

Research in public finance has developed elaborate constructs of corporate tax rates that are relevant to particular investment decisions. In some instances, statutory rates measure the correct marginal tax rates. Hall and Jorgenson (1967) started an extensive literature on how to compute the economically correct marginal tax rates using assessments of the profitability of future projects. But average rates might also be relevant for investment decisions if firms are credit constrained or if they make discrete investment choices (Devereux and Griffith 2003). In this paper, we remain agnostic as to which is the correct rate, and present a variety of measures and their effect on investment.

The principal corporate income tax measure we use is the effective tax rate that TaxpayerCo pays if it complies with its country's laws, defined as the actual corporate income tax owed by the company relative to pre-tax profits. Unlike much of the literature, we can actually compute that rate under our case facts. Since TaxpayerCo is a new company, we compute both the first-year effective tax rate, and the five-year tax rate, taking account of the present value of depreciation and other deductions. Our data reveal a consistent and large adverse effect of corporate taxes on both investment and entrepreneurship. A 10 percentage point increase in the first-year effective corporate tax rate reduces the aggregate investment to gross domestic product (GDP) ratio by about 2 percentage points (mean is 21 percent), and the official entry rate by 1.4 percentage points (mean is 8 percent).

To check the robustness of our results, we consider several additional potential determinants of investment and entrepreneurship. These include other taxes, including additional taxes imposed on the firm as well as the VAT and the personal income tax, measures of the cost of tax compliance, estimates of tax evasion, security of property rights, economic development, regulation, trade openness, inflation, and seignorage. Some of these factors affect some measures of investment and entrepreneurship, but they do not eliminate the large adverse effect of corporate taxes.

Finally, our data enable us to ask, in a cross-country context, whether corporate taxes encourage debt as opposed to equity finance (see Franco Modigliani and Merton H. Miller 1958; Auerbach 1979; Miller 1977; Graham 1996; Jeffrey K. MacKie-Mason 1990; Desai, Foley, and Hines 2004a). We find a large and significant positive association between the effective corporate tax rate and the aggregate debt to equity ratio.

The next section of the paper describes our data. Section II presents summary statistics. Section III presents the basic results on corporate taxation, investment, and entrepreneurship. Section IV concludes.

I. Data

We collect our data from PricewaterhouseCoopers accountants and tax lawyers. We describe a standardized business and ask them essentially to fill out its tax return, as well as to provide supporting information and relevant tax schedules. Two rounds of this exercise were conducted, in January 2005 and 2006. This paper uses data covering the tax system effective in fiscal year 2004.[3]

The sample consists of 85 countries covered by Djankov et al. (2002). It includes 27 high income, 19 upper-middle income, 21 lower-middle income, and 18 low income countries. In addition to 22 rich OECD countries, ten are in East Asia, 17 are in Eastern Europe, 13 in Latin America, six in the Middle East, 14 in Africa, and three in South Asia.

The data are constructed using a standardized case study of a business called TaxpayerCo. TaxpayerCo is a taxable corporation operating in the most populous city in the country. It is liable for taxes charged at the local, state/provincial, and national levels. It is 100 percent domestically and privately owned and has five owners, none of whom is a legal entity. TaxpayerCo performs general industrial/ commercial activities: it produces ceramic flower pots and sells them at retail. It does not engage in foreign trade or handle products subject to a special tax regime. Ceramic pots were chosen because they are made in every country, and face no industry-specific tax regime.

TaxpayerCo employs 60 people: 4 managers, 8 assistants, and 48 workers.[4] All are nationals and were hired on January 1, 2004. One of the managers is also an owner. Employees of the same hierarchical status earn the same wage. All employees are younger than 40 years old, and all workers are younger than 26 years old. All employees worked and earned the same salary the year before, and none of the employees are disabled. Managers became subject to social security taxes prior to 1993, while assistants and workers only became subject to social security taxes after 1993.

The corporation started operations on January 1, 2004. On the same date, it bought all the assets. It owns one plot of land, a building, machinery, one truck, ten computers, and other office equipment. The building is used for production, storage, and offices. It has 10,000 square feet of floor space on a 6,000 square foot land plot. The machinery is classified as light machinery for tax purposes. The value of computer assets is equally divided between hardware and software. Other office equipment is composed of standard office tables, chairs, one copier, one fax machine, one scanner, and 10 phones.

We created TaxpayerCo's financial statements as if TaxpayerCo were operating in a tax-free world. All variables in these financial statements were simple multiples of the country's income per capita in local currency (from the World Bank). The statements, as well as the case of the US using the actual values, are presented in Table 1. Panel A describes the balance sheet, and panel B the profit and loss statement. The

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[3] The survey presents respondents with financial statements for calendar year 2004. We always consider the data for calendar year 2004, even when fiscal year is different from calendar year.

[4] Sixty employees is a somewhat arbitrary number for a mid-size firm, which was chosen because it is the worldwide average employment in firms in the World Bank's Enterprise Survey.

TABLE 1—PRE-TAX FINANCIAL STATEMENTS

Category	Multiplication factor	Values for the US
Panel A. Information provided in the balance sheet		
Assets		
Net cash	20	755,600
Inventory	35	1,322,300
Accounts receivable	50	1,889,000
Land	30	1,133,400
Building	40	1,511,200
Machinery	60	2,266,800
Truck	5	188,900
Computers	5	188,900
Office equipment	5	188,900
Total assets	250	9,445,000
Liabilities		
Short term debt	55	2,077,900
Accounts payable—trade	50	1,889,000
Long term debt	43	1,624,540
Equity		
Paid-in capital	102	3,853,560
Total liabilities and equity	250	9,445,000
Panel B. Information provided in the profit and loss statement		
Sales	1,050	39,699,000
Cost of goods sold	875	33,057,500
Managers	9 (= 2.25 per manager × 4)	340,020
Assistants	10 (= 1.25 per assistant × 8)	377,800
Workers	48 (= 1.00 per worker × 48)	1,813,440
Administrative expenses	10	377,800
Advertising expenses	10.5	396,690
Machinery repair expenses	3	113,340
Interest expense	5.5	207,790

multiples were chosen to be typical for a mid-size manufacturing firm. We specified that TaxpayerCo keeps 50 percent of after-tax profits as retained earnings and distributes the other 50 percent as dividends. In a tax-free world, retained earnings are then half of pre-tax earnings (equal to 79 times gross national income (GNI) per capita per Table 1), or 39.5 times GNI per capita. However, the actual amount of retained earnings is a function of the tax system and, therefore, is not included in the pre-tax Table 1.

We sent these statements to the PricewaterhouseCoopers office in Washington, DC, from which they were distributed to the country offices. One response was prepared per country. PricewaterhouseCoopers respondents in each country calculated the taxes that TaxpayerCo must pay in its first year of operation. Respondents also provided the full tax schedules for corporate income taxes,[5] labor taxes[6] (for

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[5] All taxes levied on corporate income are considered corporate income taxes for the purposes of this analysis, regardless of the name given to them.

[6] All charges levied on labor for which the statutory incidence is on the employer are considered labor taxes, whether they are called labor taxes, social security contributions, or something else, whether they are requited or unrequited, and whether they are paid to a public or private agency. We try to unbundle the mandatory accident insurance contribution from the labor taxes. Wherever we can obtain information on the contribution rate for

which the statutory incidence is on the employer), property tax, asset and capital tax, turnover tax, business license tax, financial transactions tax, but also VAT and sales taxes. Respondents further described all applicable deductions and exemptions. They informed us of the full depreciation schedules for all assets, so we could compute depreciation allowances for TaxpayerCo. Respondents also recorded the deductibility of advertising expenses, machinery repair expenses, interest expenses, and of each applicable tax. Taxes at all levels of government were included. Our analysis focuses on corporate income taxes, although we use the additional tax and compliance cost data provided by PricewaterhouseCoopers for robustness checks.[7]

For each tax, PricewaterhouseCoopers respondents described the frequency and the process for payment, e.g., whether the tax could be paid electronically or in person. The time it took to prepare, file, and pay TaxpayerCo's taxes was also recorded.

All data thus collected was subsequently discussed and checked with PricewaterhouseCoopers personnel in the sample countries.[8] The data was also double-checked with information provided by the International Bureau for Fiscal Documentation. Discrepancies were then addressed through further discussions with PricewaterhouseCoopers country offices.

A. *Tax Variables*

Table 2 describes the main variables. We start with the tax variables, and divide their presentation into three groups: corporate income tax measures, other tax measures, and tax administration measures. We compute three corporate income tax rate variables: the first is the traditional statutory corporate income tax rate, while the remaining two are based on the actual taxes owed by TaxpayerCo as computed from survey responses. Web Appendix A presents the values of tax variables for all of the sample countries.

Statutory Corporate Tax Rate.—This is the tax rate a corporation has to pay on marginal income assuming that it is in the highest tax bracket, taking into account federal, state, and local rates. We account for the deductibility of some taxes for the purposes of calculating the tax base. In Switzerland and the US, for example, state income taxes are deducted from the federal income tax base.[9]

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the mandatory accident insurance contribution, we do not include it in the labor taxes to be consistent across countries. Many countries only mandate that employers have an accident-at-work insurance in place for their employees, but we could not find rates applicable to TaxpayerCo.

[7] We do not have enough information to integrate personal income and dividend taxes with corporate income taxes. We do not consider minor taxes, such as waste collection and vehicle taxes. Taxes on real estate transactions and capital gains taxes are not included because they do not come up in the case facts.

[8] Data for the Kyrgyz Republic and Mongolia were provided by PricewaterhouseCoopers' Kazakhstan office.

[9] It is possible that TaxpayerCo faces a lower marginal tax rate than the one in the highest bracket. We computed the marginal corporate income tax rate applicable to TaxpayerCo. Worldwide, it is 1.5 percentage points lower on average than the statutory rate, but across countries is very highly correlated with the statutory rate. We have run our regressions using the marginal rate applicable to TaxpayerCo, and they are generally weaker than those for other rates. A plausible interpretation of this is that it is the statutory rate that is relevant for aggregate investment, which is what we use as the dependent variable. We therefore do not discuss the marginal rate applicable to TaxpayerCo any further in the paper.

TABLE 2—VARIABLE DEFINITIONS

Variable name	Source	Definition
Tax variables		
Statutory corporate tax rate (percent)	Authors' calculations	The tax rate for the highest bracket of all taxes on corporate income. We take into account the deductibility of any of these taxes from the tax base used for calculating pre-tax corporate income.
First-year effective tax rate (percent)	Authors' calculations	The tax rate obtained by dividing the total corporate tax TaxpayerCo pays by its pretax earnings.
Five-year effective tax rate (percent)	Authors' calculations	The tax rate obtained by dividing the present-discounted value of the total corporate tax TaxpayerCo pays over five years by the present-discounted value of the pretax earnings in these five years. To obtain the present-discounted values we use an 8 percent discount rate.
Labor tax (percent)	Authors' calculations	The sum of all labor-related taxes payable by TaxpayerCo, including payroll taxes, mandatory social security contributions, mandatory health insurance, mandatory unemployment insurance, and any local contributions that are proportional to payroll or number of employees. It is expressed as a percentage of pretax earnings.
Other taxes (percent)	Authors' calculations	The sum of all taxes payable by TaxpayerCo other than corporate income taxes and labor taxes where the statutory incidence is on the firm. It is the sum of all property tax, business license tax, financial transactions tax, turnover tax, and asset and capital tax payable by TaxpayerCo. It is expressed as a percentage of pretax earnings.
VAT and sales tax	Authors' calculations	The sum of all consumption tax rates payable or collected by TaxpayerCo, including value added tax rate, sales tax rate, and turnover tax rate, and related surtaxes.
PIT top marginal rate	World Bank (World Development Indicators), PricewaterhouseCoopers, and IBFD	The tax rate for the highest bracket of tax on personal income. Only taxes at the national level are included.
Number of tax payments	World Bank (Doing Business data)	The tax payments indicator reflects the total number of taxes paid, the method of payment, the frequency of payment, and the number of agencies involved for this standardized case during the second year of operation. It includes payments made by the company on consumption taxes, such as sales tax or value added tax.
Time to comply with taxes (in hours)	World Bank (Doing Business data)	Time is recorded in hours per year. The indicator measures the time to prepare, file and pay (or withhold) three major types of taxes: the corporate income tax, value added or sales tax, and labor taxes, including payroll taxes and social security contributions.
Outcome variables		
Investment 2003–2005 as percent of GDP	World Bank (World Development Indicators)	Gross fixed capital formation (formerly gross domestic fixed investment).
FDI 2003–2005 as percent of GDP	World Bank (World Development Indicators)	Foreign direct investment is the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor.
FDI 2002–2004 as percent of GDP	OECD (International Direct Investment Statistics)	The Foreign direct investment measured by the OECD is the sum of the direct investment by all countries made in each OECD member country receiving the investment (as published in the international direct investment statistics). The authors then measured this sum as a percentage of the total GDP in the receiving country. (Total GDP is published by the World Bank (World Development Indicators.)) For each country, these percentages were averaged over the years 2002 to 2004.
Business density per 100 people (2003–2004)	Authors' data, collected from business registries	The number of limited liability corporations (or their country-specific equivalent) legally registered divided by the working-age population (total population aged 15 to 64). Only businesses with at least one employee that are not sole proprietorships are included. The variable is scaled to measure the number of businesses per 100 people in the working-age population.
Average entry rate 2000–2004 (percent)	Authors' data, collected from business registries	The average number of limited liability corporations (or their country-specific equivalent) that were registered per year between 2000 and 2004. Only businesses with more than one employee that are not sole proprietorships are included. The variable is measured as a percentage of the stock of such firms.

(*Continued*)

Table 2—Variable Definitions (*Continued*)

Variable name	Source	Definition
Outcome variables		
Manufacturing sector investment (median)	World Bank (Enterprise Surveys)	The country median of the firm level investments in new machinery and equipment as a percentage of total sales of the firm.
Service sector investment (median)	World Bank (Enterprise Surveys)	The country median of the firm level investments in new machinery and equipment as a percentage of total sales of the firm.
Size of the informal sector 2005–2007	World Economic Forum (Global Competitiveness Report 2005–2006 and 2006–2007)	Average of the size of the informal sector as a percentage of economic activity in 2005–2006 and 2006–2007. Computed using the scale provided in sections 6.17 (2005–2006) and 6.30 (2006–2007), which report measures on informal sector activity.
Debt to equity ratio	IMF (International Financial Statistics Database)	Average of the country's companies' debt (book value) as a percentage of companies' equity (book value) weighted by the companies' market caps. This ratio is computed using the IMF's Corporate Vulnerability Utility which uses firm level data from Datastream and Worldscope.
Control variables		
Tax evasion	World Economic Forum (Global Competitiveness Report 2001–2002)	Executives' assessment of how important tax evasion is in their country (the lower the measure the more rampant is tax evasion). Based on table 6.11.
GDP per capita 2003	World Bank (World Development Indicators)	GDP per capita is gross domestic product divided by midyear population. Data are in constant US dollars.
IEF Property Rights Index	The Heritage Foundation (Index of Economic Freedom)	The property rights index is an assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state.
Procedures to start a business	World Bank (Doing Business data) Updates of Djankov et al. (2002)	This variable includes all procedures that are officially required for an entrepreneur to start up and formally operate an industrial or commercial business.
Employment rigidity index	World Bank (Doing Business data) Updates of Juan C. Botero et al. (2004)	The average of three subindices: a difficulty of hiring index, a rigidity of hours index, and a difficulty of firing index.
Average inflation 1995–2004	World Bank (World Development Indicators)	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole, averaged over the period 1995–2004. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency. World Bank national accounts data and OECD national accounts data files.
Seignorage	IMF (International Financial Statistics Database)	Currency in circulation outside banks as percentage of total GDP. The data on currency comes from IFS line 14 A.
EFW Freedom to Trade Internationally Index	The Fraser Institute (Economic Freedom of the World)	This index measures taxes on international trade, regulatory trade barriers, size of the trade sector relative to expected, black-market exchange rates, and international capital market controls.
Equity Market Cap in percentage of GDP 2003	IMF	Market capitalization is the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles. The ratio is computed by the IMF's Corporate Vulnerability Unit which uses data from Standard and Poor's Emerging Stock Markets Factbook and supplemental S&P data, and World Bank and OECD GDP estimates.
Other variables		
Income group	World Bank (World Development Indicators)	Economies are divided according to 2004 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $905 or less; lower middle income, $906–$3,595; upper middle income, $3,596–$11,115; and high income, $11,116 or more.
Legal origin	Rafael La Porta, Florencio Lopez-de-Silanes, and Shleifer (2008)	A dummy variable that identifies the legal origin of the Company law or Commercial Code of each country. The four origins are English, French, German, and Nordic.

First-Year Effective Corporate Tax Rate.—This is the actual first-year corporate income tax liability of TaxpayerCo relative to pre-tax earnings (79 times GNI per capita per Table 1), taking account of all available deductions. The Appendix illustrates the exact steps used in the calculation of this tax variable, and the next, for Argentina.

Five-Year Effective Corporate Tax Rate.—This rate takes account of actual depreciation schedules going five years forward. The numerator is the present value of actual corporate tax liabilities of TaxpayerCo over five years, where only depreciation deductions change over time. The denominator is the present value of pre-tax earnings, assumed to be the same every year. We discount both taxes and profits at 8 percent.[10]

The effective corporate tax rate, both in its first-year and five-year versions, does not fully reflect all the complexities that public finance theory suggests are relevant to corporate decision-making (e.g., King and Fullerton 1984). Our measures have the advantage of extreme simplicity and transparency, and may plausibly correspond to what profit-maximizing entrepreneurs look at when they evaluate investments. We present the basic ingredients of the computation of corporate taxes for a large number of countries, to see whether, in their simplest form, they influence investment and entrepreneurship.

In addition to the corporate taxes, we use four other tax rates in our analysis, the first three of which come from our survey, and the last are derived from other PricewaterhouseCoopers data:

Labor Tax.—This is the sum of all labor-related taxes payable by TaxpayerCo, including payroll taxes, mandatory social security contributions, mandatory health insurance, mandatory unemployment insurance, and any local contributions that depend on the payroll or number of employees. The denominator is pre-tax earnings of TaxpayerCo. Only taxes with statutory incidence on the employer are included. We use the first year of operations. We do not have data on taxes paid by individuals, even if they are withheld by TaxpayerCo.

Other Taxes.—This is the sum of all taxes payable by TaxpayerCo in the first year of operation that enter the profit and loss statement where the statutory incidence is on the firm, other than corporate income and labor tax. It is the sum of all property taxes, business license taxes, financial transactions, and asset and capital taxes payable by TaxpayerCo. The denominator is pre-tax earnings of TaxpayerCo.

VAT and Sales Tax.—This is the sum of all consumption tax rates for taxes payable or collected by TaxpayerCo, including the value-added tax, the sales tax, the turnover tax, and any related surtaxes. 82 of the 85 countries in our sample have VAT. For countries that have multiple VAT rates, we use the rate applicable to

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[10] In our main calculation of the five-year effective tax rate, we do not take inflation into account. However, in our robustness checks, we both control for inflation and consider the effect of non-indexation of depreciation deductions, emphasized by Auerbach and Jorgenson (1980).

TaxpayerCo, i.e., to ceramic goods. Only five countries in our sample have a sales tax collected by TaxpayerCo, and that is what we use.

Personal Income Tax.—This is the highest bracket marginal personal income tax rate in 2004. We only include the tax at the national level. This tax rate, obtained from PricewaterhouseCoopers and other sources, is used as a control; it does not come from the main survey.

In addition to these seven tax rates, we use two measures of the burden of tax administration. The first is the number of tax payments made by TaxpayerCo in a fiscal year. The tax payments indicator reflects the actual number of taxes paid, the method of payment, the frequency of payment, and the number of agencies involved for TaxpayerCo during the second year of operation. It covers payments made by the company on consumption taxes, such as sales tax or value-added tax (which are traditionally withheld on behalf of the consumer), as well as profit, labor, property, and other tax payments. Where full electronic filing is allowed, the tax is counted as paid once a year even if the payment is more frequent. In Hong Kong, TaxpayerCo pays four times per year; in Mali, it pays 60 times per year.

The second measure of tax administration is the time to comply, recorded in hours per year. The indicator measures the time to prepare, file and pay (or withhold) three major types of taxes: the corporate income tax, value added or sales tax, and labor taxes, including payroll taxes and social security contributions. Preparation time includes the time to collect all information necessary to compute the tax payable. If separate accounting books must be kept—or separate calculations must be made—for tax purposes, the time associated with these activities is included. Filing time includes the time to complete all necessary tax forms and make all necessary calculations. Payment time is the hours needed to make the payment online or at the tax office. When taxes are paid in person, the time includes delays while waiting. In Armenia, it takes TaxpayerCo 1,120 hours per year to fulfill all tax requirements; in Ireland, it takes 76 hours per year.

B. *Outcome Variables*

We primarily analyze the effect of corporate taxes on aggregate investment and entrepreneurship. We use two measures of investment: gross fixed capital formation and foreign direct investment (FDI), both as a percentage of GDP, from the World Bank Development Indicators. FDI is the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. Although foreign firms in some countries receive tax holidays, those tend to be relatively short term, and the rates that apply to domestic firms are probably correlated with those on foreign ones. For each of the two investment to GDP ratios, we take the average of that ratio over 2003–2005.[11]

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[11] Ireland is a strong outlier in the data. If we replace the World Bank value for Ireland with the OECD value, our results only become stronger.

We also examine two measures of entrepreneurship: the number of business establishments and the rate of new business registration. These data come from the 2008 World Bank Group Entrepreneurship Survey collected from national business registries whenever possible, and other sources when not. For each country, the survey measures the existing stock and the registration rate of limited liability corporations (or their equivalent in other legal systems). The total number of registered firms is available for more countries than the entry rate. The survey seeks to assure comparability across countries, as well as to avoid shell corporations with no employees established for tax purposes. The data cover the period from 2000 to 2004. The business density measure is defined as the number of registered limited liability corporations per 100 members of the working-age population as of 2004; business registration ("entry") is defined as the average 2000–2004 ratio of registrations over the number of limited liability corporations.

The Entrepreneurship Survey does not cover sole proprietorships. For example, there are 7.2 million registered businesses in the United States that employ at least one worker. Another 15.1 million businesses do not employ a single worker other than the owner. The latter are not included in the density measure. In many sample countries, such businesses are not required to register with the company registrar, making it impossible to collect comparable data. They also usually face a different tax regime.

The fact that we use aggregate measures of investment and entrepreneurship leads to two conceptual problems. First, the rates we compute might be different from those faced by firms undertaking the bulk of aggregate investment (which are surely older and larger). Presumably, if the tax rates facing the largest firms were uncorrelated with those we compute, we would find nothing in our data.

Second, many entrepreneurial firms might be smaller than TaxpayerCo, and not even organized as corporations, which would again point to a mismatch between our tax and entrepreneurship variables (e.g., Austan Goolsbee 1998). We have gone back and checked whether the tax measures we compute apply to other legal forms. Here we summarize what we have found; see Web Appendix B for details. For 50 of the 85 countries in the sample, we could confirm that the answer is yes. We have verified that our results on the effects of taxes hold in this subsample, and are similar to those for the whole sample. For another 19 countries, tax treatment of TaxpayerCo might differ depending on its legal status. We do not have the ability to make tax computations for alternative organizational forms for these 19 countries. Our results for these 19 countries only hold for FDI, which is indeed concentrated in the corporate sector. Finally, for 16 countries, we could not verify whether the same tax rules apply to other legal forms, but our basic results actually hold for that sub-sample, especially for the effective tax rates. It is best to interpret our evidence, then, as applying to investment and entrepreneurship by limited liability corporations.

In addition to looking at the aggregate measures of investment and entrepreneurship, we consider the effects of corporate taxes on investment in manufacturing and services separately. Corporate taxes might reduce investment in manufacturing because most manufacturing firms operate in the formal sector, but shift activity from the formal to the informal sector in services, where informality is more prevalent (Davis and Henrekson 2005). It turns out that sectoral investment data are difficult

to obtain for most countries.[12] Accordingly, we built up limited manufacturing and services investment variables from the World Bank's Enterprise Surveys, which survey formal firms with more than five employees in many countries.

To construct the investment numbers (for manufacturing and services in each country separately), we compute the median over all the firms with available data of "Purchases of New Machinery and Equipment" as a percentage of the establishment's "Total Sales." This is a much narrower measure than aggregate investment, since it does not include other kinds of private investment or public investment. We use the median because there are many outliers in these data.[13] We have been able to construct these sectoral investment numbers for 31 countries for manufacturing and 20 for services.

In addition, we use an estimate of the size of the informal sector as a percentage of the total economy from the Global Competitiveness Report for 2005–2006 and 2006–2007. Several additional measures of the informal economy are available. A prominent estimate is that of Friedrich Schneider (2005), but it is computed using the ratio of tax collections to GDP. One can also construct estimates using enterprise surveys (La Porta and Shleifer 2008), but these are based on tax evasion. The advantage of the Global Competitiveness Report estimates is that they are not directly influenced by tax variables.

Finally, we use the average debt to equity ratio from the International Monetary Fund (IMF). The IMF uses international financial databases of publicly traded companies to compute these averages from these national samples of traded firms.

C. *Control Variables*

We are principally interested in the effects of our four measures of corporate income tax on investment and entrepreneurship. Since we estimate simple cross-country regressions, there is always a risk that the correlations we document are spurious. To partially address this risk, we control for many factors in the regressions. These include the additional tax and tax compliance variables described above, but also other variables. We define those in Table 2, but summarize the economic issues here.

First, since our sample is dominated by developing countries, tax enforcement might be an important factor influencing investment. We use an estimate of the magnitude of tax evasion from the 2001–2002 Global Competitiveness Report. This measure is available for 64 countries, and is constructed independently of the tax rates. Second, one might worry that the overall quality of institutions affects investment and entrepreneurship. To address this concern, we control in the robustness checks for lagged per capita income and the property rights index from the Heritage Foundation. Third, recent research suggests that government regulations, such as those of entry (Djankov et al. 2002) and labor markets (Botero et al. 2004), affect investment and entrepreneurship.[14] We check the robustness of our results

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[12] There is some data from the United Nations, but we had difficulty making sense of the numbers.

[13] Similar results obtain if we eliminate observations above the ninetieth and below the tenth percentile and take the mean.

[14] Examples of studies examining the effects of these measures of regulation on unemployment, labor reallocation, investment, and firm entry include Alberto Alesina et al. 2005; John Haltiwanger, Stefano Scarpetta, and Helena Schweiger 2008; Leora Klapper, Luc Laeven, and Raghuram Rajan 2006; and Antonio Ciccone and Elias Papaioannou 2007.

to the inclusion of these variables. Fourth, theory predicts that inflation might influence investment, partly through its impact on the cost of capital (Auerbach and Jorgenson 1980), and partly because the government might use seignorage as a substitute for taxes. To get at these issues, we control for the average 10-year inflation as a measure of long-run inflation, as well as for seignorage as a share of GDP. Finally, a country's openness to trade may influence investment and FDI; we check if it does.

II. A Look at the Data

Table 3 presents the means of tax, tax administration, investment, entrepreneurship, and other outcome variables by income group. Several interesting findings emerge from these data. First, the worldwide average statutory corporate tax rate is about 29 percent, and does not vary much across income groups. Nonetheless, there is large variation among countries. The statutory rate is 12.5 percent for Ireland, 15 percent for Latvia, Lithuania, and Lebanon, and over 40 percent for Pakistan, Japan, and the United States.

Second, in our sample, the world average first-year effective corporate tax rate, at 17.5 percent, is 11.5 percent lower than the average statutory tax rate. Upper middle income countries have lower first-year effective rates than other groups, but otherwise variation across income groups is small. Again, there is significant variation among countries. In the first year of operation, TaxpayerCo faces zero effective corporate tax rate in Hong Kong and Mongolia, but 31 percent in Pakistan and nearly 40 percent in Bolivia.

Third, the five-year effective corporate tax rate is only about 2 percentage points higher than the first year, on average, with similar patterns across income groups. We no longer have zero rates, but Mongolia has 6.6 percent and Lithuania 7.3 percent.

Our data are probably least appropriate for measuring the labor tax, since we have data on taxes paid by firms but not by individuals. At the corporate level, the worldwide labor tax is around 15 percent, with low-income countries having somewhat lower rates. Other taxes are under 2 percent on average, and do not vary significantly by income level. However, they are as high as 17.6 percent in Bolivia, and 14.5 percent in Argentina.

The combined VAT and sales tax rate averages 17 percent, and does not vary much across income groups. It hits the low of zero in Hong Kong, and the high of 73.5 percent in Brazil, although the second highest country is Hungary at 27.2 percent. The highest personal income tax rate averages 33.5 percent in the world, and is sharply higher in the rich countries than in the middle-income countries. The rate is as high as 60 percent in Vietnam and 59 percent in Denmark, and as low as zero in Uruguay and 11.5 percent in Switzerland.

Our measures of tax administration for TaxpayerCo vary hugely by income level. The average annual number of all corporate tax payments is 35, ranging from 16 for high-income countries to 48 for lower middle-income countries, and 44 for poor countries. Norway has 3 tax payments a year, Hong Kong has 4, but Romania has 89 and the Ukraine 98. Some of the higher number of payments are related to the greater number of "other taxes" and the absence of electronic payments.

TABLE 3—AVERAGES BY INCOME GROUP

	Total observations	High income	Upper middle income	T-test high versus upper middle income	Lower middle income	T-test high versus lower middle income	Low income	T-test high versus low income	Grand total
Corporate tax rates									
Observations		27	19		21		18		85
Statutory corporate tax rate		30.63	24.48	2.897***	28.69	0.982	31.86	−0.651	29.04
First-year effective tax rate		18.08	13.53	2.421**	18.99	−0.481	18.79	−0.366	17.44
Five-year effective tax rate		20.49	15.39	3.003***	20.16	0.185	21.57	−0.636	19.50
Other tax rates									
Labor tax	85	14.67	18.05	−1.122	16.73	−0.710	10.69	1.479	15.09
Other taxes	85	1.02	2.18	−1.545	2.20	−1.525	1.69	−1.397	1.71
VAT and sales tax	85	15.56	17.91	−1.234	18.46	−0.982	16.98	−0.753	17.10
PIT top marginal rate	85	38.51	30.79	2.178**	28.45	3.197***	34.72	1.096	33.50
Tax administration									
Number of tax payments	85	16	38	−4.625***	48	−6.926***	44	−6.911***	35
Time to comply with taxes (in hours)	85	229	378	−2.275**	640	−3.063***	425	−2.526**	406
Investment and entrepreneurship									
Investment 2003–2005 as percent of GDP	85	21.14	20.55	0.526	22.49	−1.005	21.67	−0.394	21.46
FDI 2003–2005 as percent of GDP	84	3.03	3.94	−0.842	4.02	−0.927	2.45	0.527	3.36
Business density per 100 people (2003–2004)	80	7.63	6.35	1.231	3.02	4.817***	1.08	6.813***	5.05
Average entry rate 2000–2004	62	8.79	9.09	−0.281	7.34	1.279	6.41	2.141**	8.11
Other dependent variables									
Size of the informal sector 2005–2007	83	18.02	27.36	−5.062***	32.26	−9.146***	35.78	−11.742***	27.29
Debt to equity ratio	51	147.00	73.74	2.869***	81.50	2.422**	58.07	1.833*	111.69
Manufacturing sector investment (median)	31	—	1.75	—	0.82	—	0.97	—	1.11
Service sector investment (median)	20	—	0.97	—	0.68	—	1.68	—	1.08

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

When it comes to the amount of time TaxpayerCo spends to comply with taxes, the worldwide average is 406 hours per year, but it varies from 229 hours for rich countries to 640 hours for lower middle-income countries (and 425 hours for poor countries). TaxpayerCo in Singapore would spend 30 hours a year complying with taxes; TaxpayerCo in Switzerland would spend 63. The corresponding numbers are 2,185 hours in the Ukraine and 2,600 hours in Brazil. Part of the burden of taxation in poorer countries clearly comes from administration, and not just rates.[15]

[15] The high correlation of our measures of tax compliance with per capita income and legal origins (see below) raises the concern that these measures reflect the quality of government more broadly rather than merely the costs of tax compliance (see La Porta et al. 1999).

From 2003 to 2005, the worldwide average investment to GDP ratio is about 21 percent, and is not substantially different across income groups. There is significant variation across countries: investment to GDP ratio is above 30 percent in Jamaica, Mongolia, Vietnam, and of course China (40.8 percent). In contrast, investment to GDP ratio is the lowest, at below 15 percent, in Uruguay, Bolivia, Malawi, and the Kyrgyz Republic. Relatively little of that investment is FDI, although several authors consider FDI numbers to be more accurate than overall investment numbers. The World Bank ratio of Foreign Direct Investment to GDP averages 3.36 percent between 2003 and 2005, and appears to be somewhat higher for the middle income than for the rich and the poor countries. Ireland, Denmark, and Bolivia have the lowest FDI numbers, Lebanon, Singapore, and Hong Kong the highest.

Business density relative to working-age population is a somewhat unusual measure of entrepreneurship, but might be a reasonable one. The variable plausibly declines from 7.63 incorporated businesses per 100 workers for high-income countries to 1.08 for low-income countries, which might reflect both fewer businesses at lower levels of development, and presumably fewer *official* businesses. The data point to 0.004 businesses per 100 workers in Burkina Faso, 0.04 in Senegal, but rising all the way to 15 in Malaysia and 16 in Sweden. The rise of business density with income is statistically significant. This measure of entrepreneurship is available for 80 countries.

Entry is defined as the number of newly registered limited liability corporations, as a percentage of the stock of such firms, for 62 countries (averaged over 2000–2004). The worldwide average entry rate is about 8.1 percent, and tends to be somewhat higher for the rich and upper middle-income countries (8.8 percent and 9.1 percent, respectively) than for the lower middle-income and poor countries (7.3 percent and 6.4 percent, respectively). The difference in entry rates between the high and the low income countries is statistically significant. The entry rates are as low as 2 percent in the Philippines, 3 percent in Peru, Sri Lanka, and Japan, and as high as 15 percent in Kazakhstan and 16 percent in New Zealand.

In addition to the aggregate measures of investment and entrepreneurship, we also consider resource allocation within and between sectors, although in smaller samples. For both manufacturing and services, median investment to sales ratios in the Enterprise Survey sample are around 1 percent, much lower than the aggregate investment to GDP ratios. As we indicated, this is in part because we have sufficient data only to estimate investment in new machinery, in part because public investment is excluded, and in part because enterprise surveys may exclude the largest firms. Informal economies are huge, reaching around 35 percent in lower middle and low income countries. Finally, ratios of debt to equity are much higher in the richer than in the poorer countries.

Table 4 presents the same variables as Table 3, except it organizes them by legal origin of national commercial laws rather than per capita income. In earlier work, legal origin has been found to be a strong predictor of national regulatory strategies, with civil law (particularly French civil law) countries providing less market-friendly regulation than common law countries (see La Porta, Lopez-de-Silanes, and Shleifer 2008 for an overview). Here we check whether our variables vary significantly by legal origin.

TABLE 4—AVERAGES BY LEGAL ORIGIN

Legal origin	English	French	German	Nordic	Grand total	Observa- tions	T-test English ver- sus French
Corporate tax rates							
Observations	24	40	17	4	85		
Statutory corporate tax rate	30.99	29.35	25.62	28.75	29.04		0.962
First-year effective tax rate	18.68	18.76	12.72	16.80	17.44		−0.045
Five-year effective tax rate	22.45	19.69	14.85	19.66	19.50		1.891*
Other tax rates							
Labor tax	7.43	17.83	19.62	14.44	15.09	85	−5.356***
Other taxes	1.55	2.25	0.95	0.55	1.71	85	−0.881
VAT and sales tax	13.83	18.52	16.78	24.00	17.10	85	−2.101**
PIT top marginal rate	33.54	32.74	35.44	32.55	33.50	85	0.284
Tax administration							
Number of tax payments	30.92	41.63	30.18	11.25	34.88	85	−1.809*
Time to comply with taxes (in hours)	281.96	505.80	403.88	152.00	405.56	85	−1.984*
Investment and entrepreneurship							
Investment 2003–2005 as percent of GDP	21.18	20.45	24.96	18.30	21.46	85	0.681
FDI 2003–2005 as percent of GDP	3.15	3.50	3.91	1.03	3.36	84	−0.417
Business density per 100 people (2003–2004)	5.35	3.73	6.80	8.96	5.05	80	1.597
Average entry rate 2000–2004	8.50	7.51	8.07	9.92	8.11	62	0.952
Other dependent variables							
Size of the informal sector 2005–2007	26.70	30.54	23.55	15.83	27.29	83	−1.666*
Debt to equity ratio	97.14	130.83	109.97	75.66	111.69	51	−1.318
Manufacturing sector investment (median)	0.82	0.98	3.86	—	1.11	31	−0.276
Service sector investment (median)	1.77	0.71	0.68	—	1.08	20	1.182

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

There is no evidence that statutory corporate tax rates vary by legal origin, although there is some evidence that German legal origin countries (several of which are in East Asia and Eastern Europe) have lower first-year effective rates. There is also weak evidence that, for the five-year effective corporate tax rates, common law countries have 3 percentage points higher rates, on average, than French civil law countries. The labor tax is higher in civil law countries, although this might merely reflect the fact that these countries impose labor taxes on firms rather than individuals. French legal origin countries also have higher levels of "other taxes," although the difference is not statistically significant. Civil law countries also have a higher

rate of VAT and sales taxes than common law countries do. Highest bracket personal income tax rates do not vary much by legal origin.

For tax administration, French legal origin countries exhibit sharply higher numbers of tax payments and time to comply with taxes than other legal traditions (particularly common law). This result is consistent with the finding of higher formalism and burden of government regulation in the French legal origin countries (Djankov et al. 2002, 2003; La Porta, Lopez-de-Silanes, and Shleifer 2008). There is not much difference in overall investment, FDI, or entrepreneurship rates among legal origins. Finally, there is some evidence that French civil law countries have larger informal economies than do common law ones.

III. Results

We first show the basic relations between corporate taxes and investment and entrepreneurship, then check their robustness to controls and alternative specifications.

A. *Basic Results*

Table 5 presents our main findings; Figures 1–4 illustrate them. We use the four measures of investment and entrepreneurship as dependent variables, and the three corporate tax rates as independent variables, for a total of 12 specifications. In Table 5, we use no controls. The results for the statutory tax rate are similar to those for effective rates in both the magnitude and the statistical significance (except for aggregate investment). Also, the results for the first-year and five-year effective corporate income tax rates are very similar (the two rates are correlated at 0.92). As we indicated in the introduction, we do not believe that, given our data, we can distinguish the relative importance of marginal and effective tax rates. For these reasons, we focus the results using the first-year effective tax rate even though the statutory rate is often significant.

The results show no statistically significant effect of the statutory tax rate on investment but a large effect of that rate on FDI. The effects of effective rates on both investment and FDI are statistically significant and large. The estimates indicate that raising the first-year effective tax rate by 10 percentage points reduces the investment rate by 2.2 percentage points (average investment rate is 21.5 percent) and FDI rate by 2.3 percentage points (average FDI rate is 3.36 percent).[16] These results are comparable to those found in the literature. According to a survey by Hassett and Hubbard (2002, 1,325), "[r]ecent empirical studies appear to have reached a consensus that the elasticity of investment with respect to the tax-adjusted user cost of capital is between -0.5 and -1.0." At the mean of our tax and investment variables, the comparable elasticity using the first-year effective rate is -0.835, very much in the Hassett-Hubbard range.

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[16] We have confirmed these FDI results using data from the OECD (Web Appendix C). We also examined the effects of taxes on the aggregate capital labor ratio, updating Francesco Caselli and James Feyrer (2007) to 2003 and 2004. We did not find any significant results. We tried to build up new estimates of the capital labor ratio from the World Bank's Enterprise Survey, but the Survey is much less suited for this than for investment.

TABLE 5

	Investment 2003–2005			FDI 2003–2005		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Investment						
Statutory corporate tax rate	−0.072			−0.195***		
	(0.076)			(0.046)		
First-year effective tax rate		−0.217***			−0.226***	
		(0.074)			(0.045)	
Five-year effective tax rate			−0.247***			−0.223***
			(0.080)			(0.050)
Constant	23.547***	25.239***	26.269***	9.044***	7.292***	7.718***
	(2.274)	(1.385)	(1.627)	(1.378)	(0.845)	(1.023)
Observations	85	85	85	84	84	84
R^2	0.01	0.09	0.10	0.18	0.23	0.20
	Business density			Average entry rate 2000–2004		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. Entrepreneurship						
Statutory corporate tax rate	−0.153**			−0.127**		
	(0.063)			(0.060)		
First-year effective tax rate		−0.193***			−0.137**	
		(0.062)			(0.057)	
Five-year effective tax rate			−0.200***			−0.136**
			(0.068)			(0.061)
Constant	9.473***	8.394***	8.913***	11.812***	10.452***	10.771***
	(1.864)	(1.162)	(1.375)	(1.790)	(1.048)	(1.262)
Observations	80	80	80	62	62	62
R^2	0.07	0.11	0.10	0.07	0.09	0.08

Note: Standard errors in parentheses.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

The effects of taxes on our measures of entrepreneurship are large and statistically significant, and show up with both the statutory and the effective tax rates. A 10 percentage point increase in the first-year effective corporate tax rate reduces business density by 1.9 firms per 100 people (average is 5), and the average entry rate by 1.4 percentage points (average is 8).[17]

Before checking the robustness of these findings, we report the results of running these specifications with Hassett-Mathur (2006) data. The overlap of the two samples is 64 observations. The correlation of our first-year effective tax rate with their Effective Average Tax Rate (EATR) is 0.56, and with their Effective Marginal Tax Rate (EMTR) is 0.48. Both correlations are highly statistically significant. Neither of the two Hassett-Mathur rates significantly predicts aggregate investment. EMTR predicts FDI at the 10 percent significance level, and the coefficient is roughly half of that on our first-year effective tax rate. The EATR (but not EMTR) is also a statistically significant predictor of the two entrepreneurship variables, with

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[17] Some studies examine the effect of personal income taxes on entrepreneurial activity in the United States, and find significant effects. See, e.g., William M. Gentry and Hubbard (2000) and Julie Berry Cullen and Gordon (2007).
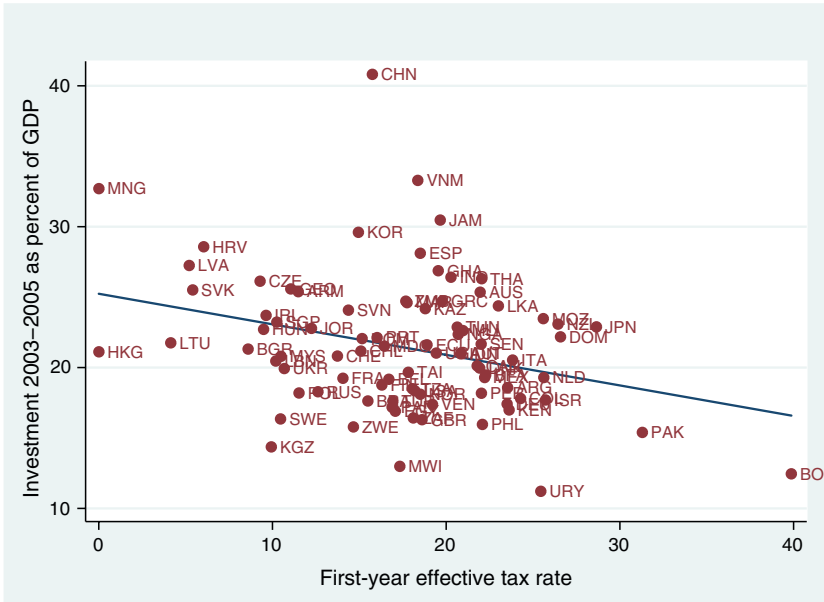
FIGURE 1. FIRST-YEAR EFFECTIVE TAX RATE AND INVESTMENT
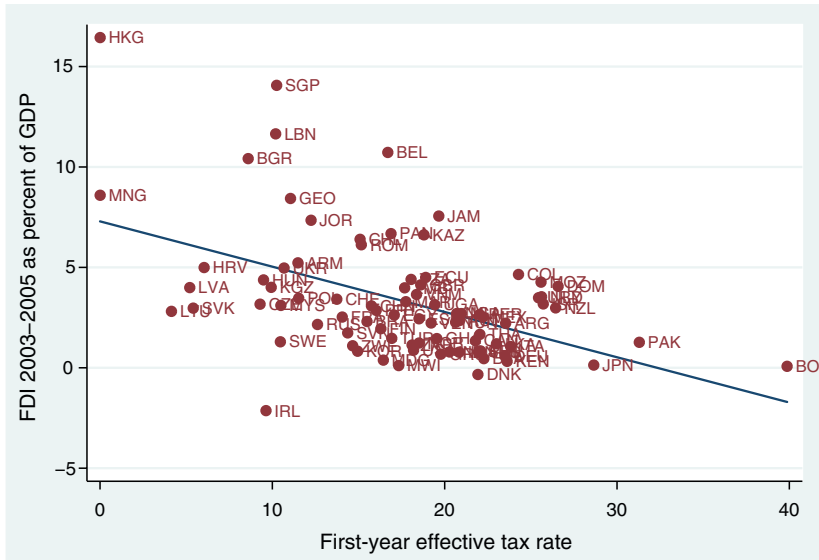
FIGURE 2. FIRST-YEAR EFFECTIVE TAX RATE AND FDI

coefficients roughly two-thirds of ours. Hassett-Mathur variables thus point in the same direction as ours, but not as strongly.

B. *Robustness*

The magnitude of the effects documented in Table 5 is large, and raises obvious questions about spuriousness. In this subsection, we add a variety of variables to the

FIGURE 3. FIRST-YEAR EFFECTIVE TAX RATE AND BUSINESS DENSITY

FIGURE 4. FIRST-YEAR EFFECTIVE TAX RATE AND ENTRY RATE

specifications in Table 5 to verify whether the results are robust.[18] In our working paper (Djankov et al. 2008), we added these controls individually, and many of them were significant predictors of entrepreneurship and investment. Since we are largely interested in the robustness of corporate income tax results, however, here we add the controls in groups.

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[18] One observation that looks very influential in Figures 1–4 is Bolivia. The results are robust to omitting it.

FIGURE 5. FIRST-YEAR EFFECTIVE TAX RATE AND SIZE OF INFORMAL SECTOR
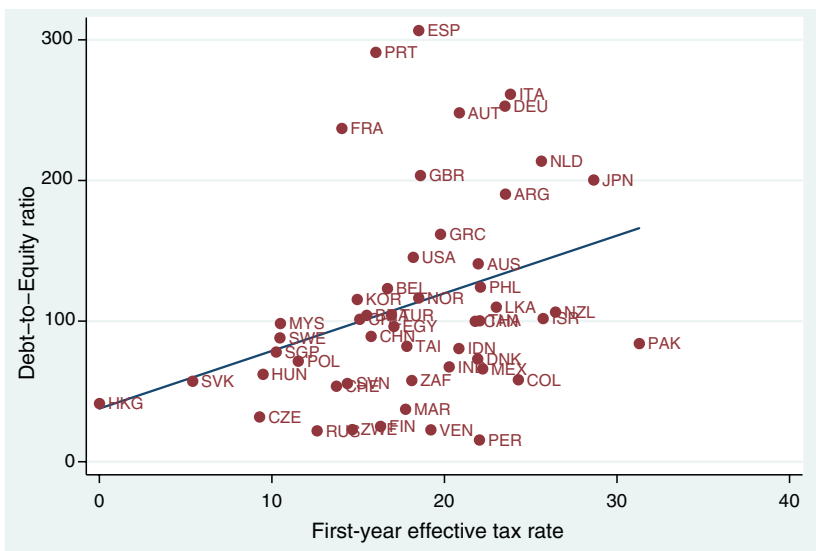
FIGURE 6. FIRST-YEAR EFFECTIVE TAX RATE AND DEBT-TO-EQUITY RATIO

In Table 5A, we add other tax variables, including "other taxes," VAT and sales tax, and the highest national rate on personal income tax.[19] As Table 5A shows, "other taxes" enter significantly very occasionally, VAT and sales tax shows up significantly only in the FDI specifications, and personal income tax has a positive

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[19] We also tried the labor tax, which by itself never enters significantly or affects the coefficients on corporate tax variables.

TABLE 5A

	Investment 2003–2005			FDI 2003–2005		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Investment						
Statutory corporate tax rate	−0.089			−0.166***		
	(0.077)			(0.048)		
First-year effective tax rate		−0.202**			−0.225***	
		(0.079)			(0.048)	
Five-year effective tax rate			−0.248***			−0.238***
			(0.085)			(0.053)
Controls:						
Other taxes	−0.413**	−0.255	−0.232	−0.127	0.019	0.012
	(0.183)	(0.190)	(0.188)	(0.113)	(0.115)	(0.116)
VAT and sales tax	−0.068	−0.084	−0.104*	−0.064*	−0.079**	−0.097***
	(0.060)	(0.058)	(0.059)	(0.038)	(0.036)	(0.037)
PIT top marginal rate	0.087*	0.090**	0.090**	−0.047	−0.056**	−0.059**
	(0.046)	(0.043)	(0.043)	(0.029)	(0.026)	(0.027)
Constant	22.981***	23.823***	25.442***	11.078***	10.488***	11.621***
	(2.545)	(2.126)	(2.352)	(1.588)	(1.294)	(1.464)
Observations	85	85	85	84	84	84
R^2	0.14	0.19	0.21	0.24	0.32	0.31
	Business density			Average entry rate 2000–2004		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. Entrepreneurship						
Statutory corporate tax rate	−0.141**			−0.146**		
	(0.067)			(0.069)		
First-year effective tax rate		−0.163**			−0.149**	
		(0.070)			(0.066)	
Five-year effective tax rate			−0.171**			−0.158**
			(0.076)			(0.073)
Controls:						
Other taxes	−0.306*	−0.205	−0.214	−0.071	0.031	0.026
	(0.160)	(0.171)	(0.171)	(0.141)	(0.154)	(0.154)
VAT and sales tax	−0.003	−0.016	−0.027	−0.065	−0.049	−0.073
	(0.051)	(0.051)	(0.052)	(0.077)	(0.075)	(0.078)
PIT top marginal rate	0.010	−0.000	−0.004	0.023	0.010	0.007
	(0.041)	(0.039)	(0.039)	(0.045)	(0.043)	(0.042)
Constant	9.350***	8.481***	9.303***	12.792***	11.057***	12.105***
	(2.172)	(1.869)	(2.094)	(2.361)	(1.866)	(2.133)
Observations	80	80	80	62	62	62
R^2	0.12	0.13	0.13	0.09	0.10	0.09

Note: Standard errors in parentheses.
   ***Significant at the 1 percent level.
   **Significant at the 5 percent level.
   *Significant at the 10 percent level.

effect on investment[20] and negative on FDI. We do not read much into these findings, but note that, with all these controls, the coefficients on our tax variables maintain their magnitude and statistical significance throughout.

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[20] This result is a fluke caused by China and Vietnam, which have both very high personal tax rates and investment rates. Without them, there is no relationship.

In Table 5B, we include the logarithm of the number of tax payments, an indicator of tax evasion from the Global Competitiveness Report (with higher scores indicating less evasion), and the number of procedures to start a business from the *Doing Business* update of Djankov et al. (2002). The logarithm of the number of tax payments has no effect on investment and FDI, but it is negatively related to both business density and entry. Lower tax evasion is associated with more FDI, but not with more investment or entrepreneurial activity. More procedures to start a business are marginally associated with lower business density, but are otherwise unrelated to our outcome measures. But, again, the corporate tax rates remain consistently significant, and the magnitude of their coefficients falls only slightly with the simultaneous inclusion of all these controls.

In Table 5C, we focus on institutional controls. These include a property rights index from the Heritage Foundation, and indicators of rigidity of employment laws from the *Doing Business* update of Botero et al. (2004); an index of a country's openness to trade; and, as a catch-all residual proxy for institutional quality, lagged per capita income — which might also capture other sources of heterogeneity. We do not find interesting results for the property rights index. Rigid employment laws are negatively related to FDI, but not other outcomes. Trade openness is strongly related to both investment and FDI, but not to our measures of entrepreneurship. Lagged per capita income is only related to business density. Yet even with all these theoretically (though not empirically) powerful controls, the corporate income tax variables remain highly significant, and their coefficients have very similar values to original specifications.

In Table 5D, we include all of the controls we already considered, but also two measures of inflation. Inflation may have an adverse effect on investment because depreciation deductions are not indexed in most countries (e.g., Auerbach and Jorgenson 1980, Summers 1981). Moreover, countries that have difficulty collecting taxes might finance their budgets, including capital budgets, by printing money. We include the average 1995–2004 inflation and 2004 seignorage as a measure of government reliance on the printing press.[21] We do not find any consistent results for inflation or for that matter for any other control variable in the kitchen sink regression of Table 5D. With 12 control variables we also lose the statistical significance of the coefficients on the corporate income tax variables, as their magnitudes fall by one-third to one-half.

So what is the bottom line of these robustness checks? Most groups of control variables have not made much of a dent into the effects of corporate taxes, although the inclusion of all controls at once eliminates the significance of the results. None of the controls appears to be as persistently important as do the tax rates. Our empirical design can never entirely eliminate the concern that some other factor correlated

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[21] Our results remain statistically significant when either of the two inflation measures is included as the only extra control. As perhaps a more refined way to deal with inflation, we have computed the five-year effective corporate tax rate allowing TaxpayerCo's revenues and costs, but not depreciation deductions, to rise with inflation (regardless of whether the law allows for indexation of depreciation deductions). This inflation-adjusted five-year effective corporate tax rate was correlated with the not inflation-adjusted one at 99 percent. The results using this rate were virtually identical, and so are not reported. In this time of low world-wide inflation and this cross-country context, then, we do not find evidence that inflation has much influence on investment.

TABLE 5B

	Investment 2003–2005			FDI 2003–2005		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Investment						
Statutory corporate tax rate	−0.075			−0.177***		
	(0.092)			(0.055)		
First-year effective tax rate		−0.179*			−0.209***	
		(0.093)			(0.056)	
Five-year effective tax rate			−0.224**			−0.197***
			(0.098)			(0.061)
Controls:						
Log of number of tax payments	0.634	0.813	0.828	0.351	0.511	0.456
	(0.947)	(0.929)	(0.916)	(0.568)	(0.557)	(0.570)
Tax evasion (GCR)	0.586	0.590	0.736	1.014**	0.986**	1.108**
	(0.741)	(0.723)	(0.717)	(0.444)	(0.432)	(0.446)
Procedures to start a business	0.082	0.102	0.090	0.083	0.090	0.071
	(0.213)	(0.208)	(0.205)	(0.128)	(0.124)	(0.127)
Constant	18.693***	18.907***	19.665***	2.958	1.041	1.144
	(5.755)	(5.291)	(5.262)	(3.452)	(3.165)	(3.269)
Observations	63	63	63	62	62	62
R^2	0.02	0.07	0.09	0.22	0.26	0.22
	Business density			Average entry rate 2000–2004		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. Entrepreneurship						
Statutory corporate tax rate	−0.057			−0.126**		
	(0.065)			(0.059)		
First-year effective tax rate		−0.125*			−0.110*	
		(0.067)			(0.060)	
Five-year effective tax rate			−0.134*			−0.137**
			(0.070)			(0.063)
Controls:						
Log of number of tax payments	−1.139*	−1.006	−1.030	−1.243**	−1.269**	−1.269**
	(0.677)	(0.667)	(0.664)	(0.598)	(0.605)	(0.596)
Tax evasion (GCR)	0.337	0.333	0.423	0.056	−0.064	0.041
	(0.529)	(0.516)	(0.519)	(0.481)	(0.482)	(0.479)
Procedures to start a business	−0.267*	−0.255*	−0.264*	−0.164	−0.172	−0.170
	(0.152)	(0.148)	(0.148)	(0.145)	(0.147)	(0.145)
Constant	11.983***	12.019***	12.265***	16.962***	15.749***	16.146***
	(4.098)	(3.775)	(3.798)	(3.600)	(3.511)	(3.480)
Observations	62	62	62	51	51	51
R^2	0.26	0.29	0.29	0.29	0.27	0.29

Note: Standard errors in parentheses.
  ***Significant at the 1 percent level.
   **Significant at the 5 percent level.
    *Significant at the 10 percent level.

with the corporate tax rate influences investment. Corporate taxes have a substantial adverse effect on investment and entrepreneurship, and one that persists with a range of controls.

C. *Allocation*

In Table 6, we look at the influence of corporate taxes on different sectors, using the World Bank Enterprise Survey's estimates of new machinery investment in

TABLE 5C

	Investment 2003–2005			FDI 2003–2005		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Investment						
Statutory corporate tax rate	0.003			−0.110**		
	(0.088)			(0.051)		
First-year effective tax rate		−0.198**			−0.172***	
		(0.079)			(0.045)	
Five-year effective tax rate			−0.254***			−0.175***
			(0.090)			(0.053)
Controls:						
IEF Property Rights Index	−0.072*	−0.060	−0.053	−0.053**	−0.055**	−0.052**
	(0.043)	(0.040)	(0.040)	(0.025)	(0.023)	(0.024)
Rigidity of employment	−0.030	−0.035	−0.051	−0.042**	−0.044**	−0.054***
	(0.034)	(0.033)	(0.034)	(0.020)	(0.019)	(0.020)
EFW Freedom to Trade Internationally Index	2.291**	1.543*	1.224	1.418***	1.317***	1.230**
	(0.922)	(0.835)	(0.858)	(0.536)	(0.477)	(0.505)
Log GDP pc 2003	−0.483	−0.398	−0.395	0.016	0.034	0.021
	(0.536)	(0.515)	(0.509)	(0.311)	(0.293)	(0.299)
Constant	14.129**	21.833***	25.812***	0.649	1.224	2.593
	(7.024)	(5.737)	(6.311)	(4.086)	(3.297)	(3.735)
Observations	81	81	81	80	80	80
R^2	0.12	0.19	0.21	0.27	0.35	0.33
	Business density			Average entry rate 2000–2004		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. Entrepreneurship						
Statutory corporate tax rate	−0.112*			−0.128**		
	(0.065)			(0.062)		
First-year effective tax rate		−0.136**			−0.123**	
		(0.060)			(0.056)	
Five-year effective tax rate			−0.161**			−0.140**
			(0.068)			(0.063)
Controls:						
IEF Property Rights Index	0.002	−0.002	0.002	0.020	0.009	0.015
	(0.032)	(0.031)	(0.031)	(0.034)	(0.033)	(0.033)
Rigidity of employment	−0.003	−0.004	−0.014	−0.020	−0.019	−0.028
	(0.026)	(0.025)	(0.026)	(0.025)	(0.025)	(0.026)
EFW Freedom to Trade Internationally Index	1.126	1.107	0.936	0.663	0.819	0.681
	(0.812)	(0.752)	(0.780)	(0.642)	(0.602)	(0.626)
Log GDP pc 2003	1.024**	1.045**	1.040**	−0.008	0.039	−0.002
	(0.432)	(0.424)	(0.422)	(0.438)	(0.437)	(0.435)
Constant	−8.291	−8.871*	−6.706	6.600	3.997	6.014
	(6.012)	(5.127)	(5.626)	(4.988)	(4.165)	(4.649)
Observations	76	76	76	60	60	60
R^2	0.40	0.41	0.42	0.24	0.24	0.25

Note: Standard errors in parentheses.
   ***Significant at the 1 percent level.
   **Significant at the 5 percent level.
    *Significant at the 10 percent level.

manufacturing and services. The samples now are much smaller, especially for services. The results show that first- and five-year effective tax rates have an adverse effect on investment in manufacturing but not in services. Even with a very small sample, the coefficients for manufacturing are roughly half of what we obtained

Table 5D

	Investment 2003–2005			FDI 2003–2005		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Investment						
Statutory corporate tax rate	−0.064			−0.030		
	(0.098)			(0.066)		
First-year effective tax rate		−0.117			−0.100	
		(0.106)			(0.071)	
Five-year effective tax rate			−0.189			−0.095
			(0.118)			(0.081)
Controls:						
Other taxes	−0.527***	−0.450**	−0.396*	−0.065	0.003	0.001
	(0.188)	(0.201)	(0.203)	(0.127)	(0.134)	(0.138)
VAT and sales tax	0.034	0.018	−0.002	0.003	−0.013	−0.016
	(0.065)	(0.067)	(0.068)	(0.044)	(0.045)	(0.047)
PIT top marginal rate	0.139***	0.144***	0.144***	−0.047	−0.038	−0.044
	(0.050)	(0.049)	(0.047)	(0.034)	(0.033)	(0.032)
Log of number of tax payments	−0.024	0.149	0.185	−0.185	0.020	−0.074
	(0.987)	(0.998)	(0.968)	(0.667)	(0.667)	(0.660)
Log GDP pc 2003	−0.052	−0.258	−0.221	0.201	0.069	0.121
	(0.900)	(0.880)	(0.865)	(0.608)	(0.588)	(0.590)
IEF Property Rights Index	−0.124*	−0.110	−0.101	−0.084*	−0.068	−0.071
	(0.064)	(0.066)	(0.065)	(0.043)	(0.044)	(0.044)
Procedures to start a business	−0.004	0.028	0.043	0.040	0.083	0.065
	(0.222)	(0.222)	(0.217)	(0.150)	(0.148)	(0.148)
Rigidity of employment	−0.083**	−0.081**	−0.091**	−0.036	−0.037	−0.040
	(0.040)	(0.039)	(0.040)	(0.027)	(0.026)	(0.027)
EFW Freedom to Trade Internationally Index	0.767	0.723	0.397	2.218***	2.064***	2.019***
	(0.976)	(0.916)	(0.947)	(0.659)	(0.612)	(0.645)
Seignorage 2004	0.384**	0.336**	0.319*	0.037	−0.007	0.003
	(0.158)	(0.164)	(0.160)	(0.106)	(0.109)	(0.109)
Average inflation (1995−2004)	−0.066**	−0.070**	−0.074**	0.049**	0.043**	0.044**
	(0.029)	(0.029)	(0.028)	(0.019)	(0.019)	(0.019)
Tax evasion (GCR)	0.301	0.297	0.299	1.040*	1.002*	1.036*
	(0.798)	(0.785)	(0.772)	(0.539)	(0.525)	(0.526)
Constant	21.441**	22.301**	25.963**	−10.302	−8.776	−7.938
	(10.537)	(10.344)	(10.685)	(7.115)	(6.911)	(7.283)
Observations	61	61	61	61	61	61
R^2	0.47	0.48	0.49	0.46	0.48	0.47

(*Continued*)

with aggregate data. This evidence is consistent with Davis and Henrekson (2005), who suggest that the relevant margin of distortion for services might be informality rather than reduction in formal investment. Alternatively, we might just have bad data for investment in services.

In the same spirit, we look at the effect of corporate taxes on the size of the informal economy, since one of the principal ways in which taxes might deter official entry or official investment is by keeping firms in the informal sector. A 10 percentage point increase in the first-year effective tax rate raises the informal economy as a share of economic activity by nearly 2 percentage points. This result is robust to the inclusion of the Global Competitiveness Report measure of tax evasion, suggesting that the tax rates, rather than tax administration more generally, influence

TABLE 5D (*Continued*)

	Business density			Average entry rate 2000–2004		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. Entrepreneurship						
Statutory corporate tax rate	−0.034			−0.029		
	(0.083)			(0.086)		
First-year effective tax rate		−0.068			−0.083	
		(0.092)			(0.094)	
Five-year effective tax rate			−0.070			−0.133
			(0.103)			(0.103)
Controls:						
Other taxes	−0.312*	−0.263	−0.262	0.012	0.083	0.124
	(0.156)	(0.171)	(0.175)	(0.155)	(0.175)	(0.176)
VAT and sales tax	0.025	0.015	0.012	0.065	0.043	0.022
	(0.054)	(0.056)	(0.058)	(0.102)	(0.104)	(0.105)
PIT top marginal rate	−0.053	−0.048	−0.052	0.006	0.016	0.016
	(0.043)	(0.043)	(0.041)	(0.054)	(0.054)	(0.052)
Log of number of tax payments	−0.362	−0.269	−0.319	−2.146**	−1.978**	−1.940**
	(0.811)	(0.821)	(0.810)	(0.845)	(0.850)	(0.823)
Log GDP pc 2003	1.833**	1.711**	1.747**	−0.402	−0.534	−0.551
	(0.737)	(0.727)	(0.724)	(0.795)	(0.794)	(0.782)
IEF Property Rights Index	−0.045	−0.035	−0.038	−0.062	−0.041	−0.029
	(0.054)	(0.056)	(0.055)	(0.062)	(0.066)	(0.065)
Procedures to start a business	−0.100	−0.081	−0.090	−0.179	−0.118	−0.101
	(0.182)	(0.182)	(0.181)	(0.223)	(0.231)	(0.222)
Rigidity of employment	−0.019	−0.019	−0.021	−0.012	−0.010	−0.015
	(0.033)	(0.033)	(0.034)	(0.033)	(0.033)	(0.033)
EFW Freedom to Trade Internationally Index	1.645	1.530	1.506	1.410*	1.337*	1.126
	(1.002)	(0.968)	(1.008)	(0.809)	(0.742)	(0.767)
Seignorage 2004	−0.087	−0.115	−0.110	−0.191	−0.252	−0.265
	(0.129)	(0.135)	(0.134)	(0.170)	(0.183)	(0.177)
Average inflation (1995–2004)	−0.006	−0.006	−0.006	0.026	0.026	0.025
	(0.027)	(0.026)	(0.027)	(0.025)	(0.024)	(0.024)
Tax evasion (GCR)	−0.627	−0.624	−0.606	0.530	0.459	0.448
	(0.655)	(0.648)	(0.647)	(0.715)	(0.712)	(0.699)
Constant	−11.506	−10.350	−9.787	12.254	12.683	15.192*
	(9.694)	(9.666)	(10.169)	(8.268)	(7.921)	(8.239)
Observations	60	60	60	50	50	50
R^2	0.47	0.47	0.47	0.41	0.42	0.44

Note: Standard errors in parentheses.

   ***Significant at the 1 percent level.

   **Significant at the 5 percent level.

    *Significant at the 10 percent level.

informality.[22] Consistent with Simon Johnson, Daniel Kaufmann, and Shleifer (1997); Davis and Henrekson (2005); Schneider (2005); and La Porta and Shleifer (2008), taxes are an important reason firms stay unofficial.

These results have important implications for our findings on the large adverse effects of corporate income taxation on investment and entrepreneurship. The

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   [22] The picture with other controls is more mixed. The coefficient on the first-year effective tax rate remains significant if we control for the VAT and sales tax, the top marginal tax rate, the property rights index, employment rigidity, and inflation. It loses significance (without falling much in magnitude) if we control for the number of tax payments, the number of procedures to start a business, seignorage, and freedom to trade internationally.

TABLE 6—OTHER OUTCOMES

	Manufacturing sector			Service sector		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Purchases of new machinery and equipment as percent of sales						
Statutory corporate tax rate	−0.012			0.081		
	(0.062)			(0.066)		
First-year effective tax rate		−0.118**			−0.054	
		(0.044)			(0.071)	
Five-year effective tax rate			−0.125**			−0.013
			(0.051)			(0.074)
Constant	1.470	3.458***	3.806***	−1.423	2.230	1.367
	(1.945)	(0.925)	(1.146)	(2.089)	(1.559)	(1.745)
Observations	31	31	31	20	20	20
R^2	0.00	0.20	0.17	0.08	0.03	0.00
	Size of the informal sector					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. Size of the informal sector						
Statutory corporate tax rate	0.166*			0.087		
	(0.089)			(0.090)		
First-year effective tax rate		0.184**			0.193**	
		(0.089)			(0.091)	
Five-year effective tax rate			0.184*			0.271***
			(0.097)			(0.095)
Controls:						
Log GDP pc 2003	−4.405***	−4.372***	−4.381***			
	(0.372)	(0.371)	(0.372)			
Tax evasion (GCR)				−6.286***	−6.168***	−6.342***
				(0.543)	(0.532)	(0.513)
Constant	58.090***	59.465***	59.155***	44.062***	42.802***	41.510***
	(4.045)	(3.500)	(3.673)	(3.342)	(2.651)	(2.588)
Observations	83	83	83	64	64	64
R^2	0.64	0.65	0.64	0.69	0.71	0.72

Notes: Standard errors in parentheses.
  ***Significant at the 1 percent level.
   **Significant at the 5 percent level.
    *Significant at the 10 percent level.

measures of investment, FDI, business density, and entry that we use all reflect formal economic activity. Corporate taxes might affect these measures either by reducing total activity or by keeping it informal. The finding on the informal economy suggests that at least part of the adverse effect of taxes is to keep economic activity, such as investment and new business formation, informal, rather than to eliminate activity altogether.

The impact of corporate taxes is not just that on informality, however. Corporate taxes have a large adverse effect on FDI, virtually all of which is formal. Also relevant is the adverse effect on manufacturing investment in the World Bank Enterprise Surveys, which deal only with formal firms. It seems likely, then, that corporate income taxation diminishes aggregate investment and entrepreneurship, and not only influences formality.

In Table 7, we ask whether corporate taxes encourage debt finance, since interest payments are universally tax-deductible. We control for the logarithm of 2003 GDP

TABLE 7—DEBT-TO-EQUITY RATIO

	Debt-to-Equity ratio		
	(1)	(2)	(3)
Statutory corporate tax rate	4.205***		
	(1.469)		
First-year effective tax rate		3.912**	
		(1.630)	
Five-year effective tax rate			2.674
			(1.715)
Controls:			
Equity market cap in percent of GDP 2003	−0.183	−0.194	−0.318*
	(0.183)	(0.189)	(0.184)
Log GDP pc 2003	28.360***	29.618***	30.510***
	(8.104)	(8.253)	(8.517)
Constant	−257.278***	−209.359***	−192.678**
	(78.153)	(74.165)	(77.768)
Observations	50	50	50
R^2	0.34	0.31	0.26

Notes: Note that we exclude Zimbabwe from this sample as the size of the equity market seems to be blown up due to inflation. When we include Zimbabwe, our results get stronger.

   ***Significant at the 1 percent level.
   **Significant at the 5 percent level.
   *Significant at the 10 percent level.

per capita, as well as the ratio of equity market capitalization to GDP. The control variables suggest that firms in richer countries have higher debt to equity ratios, but that the size of the equity market does not matter. Taxes, however, do. A 10 percentage point increase in the first-year effective corporate tax rate raises the debt to equity ratio by highly statistically significant 40 percentage points (the mean is 111 percent). In our data, countries with higher effective (as well as statutory) tax rates use sharply more debt. This result is consistent with most theories of optimal capital structure (Graham 2003).

IV. Conclusion

This paper presents basic statistical relationships between corporate taxes, investment, and entrepreneurship using new data on effective first-year and five-year corporate income tax rates for 85 countries. We present cross-country evidence that effective corporate tax rates have a large and significant adverse effect on corporate investment and entrepreneurship. This effect is robust if we control for other tax rates, including personal income taxes and the VAT and sales tax, for measures of administrative burdens, tax compliance, property rights protection, regulations, economic development, openness to foreign trade, seignorage, and inflation. Higher effective corporate income taxes are also associated with lower investment in manufacturing but not in services, a larger unofficial economy, and greater reliance on debt as opposed to equity finance. In these new data, corporate taxes matter a lot, and in ways consistent with basic economic theory.

APPENDIX

Using the example of Argentina, the following is a description of how we obtained the tax measures "first-year effective corporate tax rate" and "five-year effective corporate tax rate."

The statutory corporate income tax rate in Argentina is a single rate of 35 percent. The social security contributions paid by the employer are 23 percent total. The tax base for the social security contributions is the employee's gross salary with a ceiling (which is not binding for TaxpayerCo). The social security contributions are deductible from the tax base for the corporate income tax. Depreciation rates are as follows: land–not depreciable; building–2 percent straight-line; machinery–10 percent straight-line; truck–20 percent straight-line; computers–33.33 percent straight-line; office equipment–20 percent straight-line. Advertising, interest, and machinery repair expenses are deductible in the tax base for the corporate income tax.

We calculate the labor tax liability of TaxpayerCo as shown in Table A.

TABLE A—LABOR TAX CALCULATIONS

Managers		
Total annual salaries for the four managers	$9 \times$ GNI per capita $=$	95,808
Monthly salaries	$95,808/(12 \times 4) =$	1,996
Monthly social security contributions	23 percent $\times$ 1,996 $=$	459
Annual social security contributions per manager	$12 \times 459 =$	5,509
Total annual social security contributions for the four managers	$4 \times 5,509 =$	22,036
Assistants		
Total annual salaries for the eight assistants	$10 \times$ GNI per capita $=$	106,453
Monthly salaries	$106,453/(12 \times 8) =$	1,109
Monthly social security contributions	23 percent $\times$ 1,109 $=$	255
Annual social security contributions per assistant	$12 \times 255 =$	3,061
Total annual social security contributions for the eight assistants	$8 \times 3,061 =$	24,484
Workers		
Total annual salaries for the 48 workers	$48 \times$ GNI per capita $=$	510,975
Monthly salaries	$510,975/(12 \times 48) =$	887
Monthly social security contributions	23 percent $\times$ 887 $=$	204
Annual social security contributions per worker	$12 \times 204 =$	2,448
Total annual social security contributions for the 48 workers	$48 \times 2,448 =$	117,524
Total annual social security contributions paid by TaxpayerCo		164,044

The depreciation allowances for the first five years are calculated as shown in Table B.

TABLE B—CALCULATION OF DEPRECIATION ALLOWANCES

	Year 1	Year 2	Year 3	Year 4	Year 5
Building (40 × GNI per capita)	425,812	417,296	408,780	400,264	391,747
Annual depreciation (2 percent straight line)	8,516	8,516	8,516	8,516	8,516
Net building	417,296	408,780	400,264	391,747	383,231
Machinery (60 × GNI per capita)	638,719	574,847	510,975	447,103	383,231
Annual depreciation (10 percent straight line)	63,872	63,872	63,872	63,872	63,872
Net machinery	574,847	510,975	447,103	383,231	319,359
Truck (5 × GNI per capita)	53,227	42,581	31,936	21,291	10,645
Annual depreciation (20 percent straight line)	10,645	10,645	10,645	10,645	10,645
Net truck	42,581	31,936	21,291	10,645	—
Computers (5 × GNI per capita)	53,227	35,484	17,742	—	—
Annual depreciation (33.33 percent straight line)	17,742	17,742	17,742		
Net computers	35,484	17,742	—		
Office equipment (5 × GNI per capita)	53,227	42,581	31,936	21,291	10,645
Annual depreciation (20 percent straight line)	10,645	10,645	10,645	10,645	10,645
Net office equipment	42,581	31,936	21,291	10,645	—
Total depreciation allowance	111,421	111,421	111,421	93,679	93,679

The labor tax liability, which as stated above is deductible in the corporate income tax base, and the depreciation allowance are then used in the calculation of the corporate income tax liability, which we calculate as shown in Table C.

TABLE C—INCOME STATEMENT

	Year 1	Year 2	Year 3	Year 4	Year 5
Sales (=1,050 × GNI per capita)	11,177,578	11,177,578	11,177,578	11,177,578	11,177,578
Cost of goods sold (=875 × GNI per capita)	9,314,648	9,314,648	9,314,648	9,314,648	9,314,648
Operating expenses (=77 × GNI per capita)	819,689	819,689	819,689	819,689	819,689
Labor taxes (as calculated above)	164,044	164,044	164,044	164,044	164,044
Other possible deductions (i.e., advertising expenses at 10.5 GNI per capita and machinery repair expenses at 4 × GNI per capita)	143,712	143,712	143,712	143,712	143,712
EBITDA	735,485	735,485	735,485	735,485	735,485
Depreciation and amortization (as calculated above)	111,421	111,421	111,421	93,679	93,679
EBIT	624,064	624,064	624,064	641,806	641,806
Interest expense (=5.5 × GNI per capita)	58,549	58,549	58,549	58,549	58,549
Earnings before taxes	565,514	565,514	565,514	583,257	583,257
Income tax	197,930	197,930	197,930	204,140	204,140
Net income	367,584	367,584	367,584	379,117	379,117
PDV of income tax (at an 8 percent discount rate)	197,930	183,269	169,693	162,053	150,049

With this information the first-year effective corporate tax rate and the five-year effective corporate tax rate are calculated as follows:

- The first-year effective corporate tax rate is simply income tax liability in the first year divided by the denominator (i.e., 79 times GNI per capita), which in Argentina's case works out to be (197,930/840,980 =) 23.54 percent.

- The five-year effective corporate tax rate is simply the income tax liability in the first year divided by sum of the present-discounted values of the denominator in years one to five (which does not change in absolute terms but does change in PDV terms). In Argentina's case, this works out to be (862,993/3,626,411 =) 23.80 percent.

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