Review of Finance, 2016, 37–76
doi: 10.1093/rof/rfv005
Advance Access Publication Date: 11 April 2015

OXFORD

Transparency, Tax Pressure, and Access to Finance*

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Abstract

More transparent firms enjoy better access to finance, and also enable closer scrutiny by tax authorities and thus face a heavier tax burden, insofar as they are required to report the same data to tax authorities and investors (book-tax conformity). We study this trade-off in a model with distortionary taxes and finance rationing, and test its predictions on an international dataset. As predicted, firms facing low corporate tax rates choose high transparency, particularly if they are not very dependent on external funding. This result is confirmed by the evidence from statutory tax reforms: reductions of corporate tax rates are followed by increases in firm transparency. Moreover, firms choose higher transparency in countries with high audit quality. Investment is positively correlated with transparency, especially for firms more dependent on external finance. Results are stronger in countries with book-tax conformity.

JEL classification: G31, G32, G38, H25, H26, M40

* We thank an anonymous referee, Ulf Axelson, Daniel Beneish, Patrick Bolton, Max Bruche, Raj Chetty, Luca Colombo, Sudipto Dasgupta, Michael Devereux, Alexander Dyck, Jonathan Goldberg, Oliver Hart, Robert Jennings, Christian Leuz, Claudio Michelacci, Dhananjay Nanda, Florian Peters, Ailsa Röell, Peter Wysocki and Jaime Zender, and participants at the 2012 AFA meetings, CSEF-IGIER Symposium on Economics and Institutions (Capri), 2011 EFA meetings, 2012 NBER Summer Institute (Corporate Finance), Yale-ECGI-Oxford Conference on "Corporate Governance and Performance: Causation?", 2011 FIRS meetings (Sydney), Conference on "Finance and the Real Economy" (St Gallen), IFN Conference (Stockholm), and seminars at Carlos III (Madrid), Catholic University (Milan), CEMFI, Chinese University of Hong Kong, Harvard University, Hong Kong University of Science and Technology, Indiana University, and the Universities of Colorado at Boulder, Miami, Oxford, Tor Vergata (Rome) and Warwick. This research has been sponsored by grants from the Millstein Center at the Yale School of Management, CIBER at Indiana University and the Italian Ministry for University and Research.

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1. Introduction

Firm transparency is largely a matter of choice: while regulation sets minimum standards, firms are free to exceed them, for instance by adopting strict accounting rules, hiring independent auditors to certify their accounts, or listing their shares on exchanges with demanding disclosure standards. But transparency is a double-edged sword: on the one hand, by enhancing investor confidence, it enables companies to attract funding and reduces their cost of capital. On the other hand, transparency makes firms' operations more visible to tax authorities, and thus reduces their ability to evade or elude taxation.[1] In this article, we show that the tradeoff between the funding benefits and the tax costs of firm transparency is influenced by (i) the country's corporate tax rate, (ii) the firm's dependence on external finance, and (iii) the extent to which the firm is required to report the same data to tax authorities and to investors, that is, the degree of "book-tax conformity".

Faced with high corporate tax rates, companies may be inclined to choose low transparency, thus forgoing the funding benefits of transparency in exchange for more opportunities to reduce their tax burden. Hence, corporate taxes reduce investment not only by increasing the cost of capital, but also by discouraging firm transparency. These effects on transparency and investment require book-tax conformity: absent this legal constraint, more transparency vis-à-vis investors need not imply a greater tax burden.

The tradeoff between the funding benefits of transparency and its cost in terms of additional taxes also depends on a firm's dependence on external finance: a company that must rely heavily on external funding will opt for high transparency to reassure investors, even if it faces high tax pressure; conversely, a company free of financial concerns will prefer low transparency. In other words, dependence on external finance weakens the extent to which firms reduce transparency in response to high tax pressure.

These points are well illustrated by an early episode concerning the Dutch company Amstel Bier. In 1936, the company's bumper earnings had allowed it to pay down its bonds completely and accumulate more cash than needed for its investments. The company held an extraordinary shareholders' meeting to decide whether its shares should be turned from bearer to registered status. When one attending shareholder asked the reason for this proposal, the chairman answered: "This is done to be *freed from the obligation to publish the balance sheet*, now that this has become possible due to the complete repayment of the company's bonds. The Board thinks the *advantages of this with regard to the government* and the workers are important."[2] This is because at the time Dutch law allowed firms with no outstanding bonds and registered shares to avoid public disclosure of the accounts. The

1 For instance, upon going public Italian companies pay 2% more taxes as a fraction of their operating income than in the pre-listing year, a likely reflection of the tighter disclosure associated with a public listing (Pagano, Panetta and Zingales, 1998).

2 Italics added. We thank Ailsa Röell for bringing this enlightening case to our attention, and for providing the English translation of the Dutch original, contained in *Notuleboek 891-1949, Gemeentearchief Amsterdam Archief 1506 (Amstel Bier) Inventarisnummer 22*. The decision by Amstel followed the introduction in 1928 of a law forcing companies with bearer shares to disclose their annual accounts, which was contentious because "traditionally many companies had kept this information private within a small inner circle—for example, by allowing only a small number of shareholder delegates to look at the accounts" (de Jong and Röell, 2005, 472). Indeed, when the law changed in 1970–71, introducing a new form of limited liability "closed company" that required lower financial disclosure, most small companies converted to this low-disclosure company type.

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proposal was approved, and Amstel Bier did not go public until well after World War II. This episode highlights that the company opted for lower transparency because it had more cash than needed, and its choice of lower transparency was motivated by the benefit of lower visibility to the government. This article argues that these points apply more generally.

To bring out these predictions more clearly, we start by presenting a model where firms choose their investment level and their degree of transparency in the presence of distortionary taxes and endogenous rationing of external finance (due to an agency problem). The model shows that, under certain conditions, firms will respond to a higher corporate tax rate by decreasing their transparency, though this effect will be attenuated if they depend heavily on external finance. Their choice of transparency should also depend on the quality of auditing services available to them: the more reliable are the country's auditors, the more likely are the company accounts to be trusted by financiers, who will reward transparency with substantial external funds; no such reward can instead be expected in countries with low audit quality. The model also generates testable predictions for investment and access to finance: firms that choose lower transparency will be more severely rationed in capital markets, and therefore will be able to invest less.

We test these predictions about transparency and investment on the Worldscope and Compustat databases (for non-US and US firms, respectively), from which we draw data for firms incorporated and listed in thirty-seven countries over the period 1988–2011.

Our main empirical results are as follows. First, as predicted by the model, firms that face greater tax pressure are less transparent, especially if they do not rely heavily on external finance; and the impact of country-level corporate taxes on firm-level transparency is much stronger in countries with high book-tax conformity. The inverse relationship between the corporate tax rate and transparency holds not only at the cross-sectional level, but also over time: after a country decreases its statutory corporate tax rate, firms located in that country tend to increase their transparency, controlling for their observed characteristics and for unobserved firm-level heterogeneity. (Note that from the standpoint of individual firms, such changes in statutory tax rates are exogenous.) Second, we find that firms that depend heavily on external financing choose to be more transparent in countries with better audit quality. Finally, more transparent firms invest more, especially if they depend strongly on external finance.[3] This result holds controlling for firm-level characteristics, sector, and country fixed effects. It also remains intact in IV regressions that take into account the endogeneity of transparency in investment equations by using the quality of audit regulation as instrument, in accordance with an exclusion restriction implied by our model. Also these findings are consistent with the model's predictions.

Previous work already pointed out that the opacity of firms is positively related with tax evasion: Desai and Dharmapala (2006); Chen *et al.* (2010); Kim, Li, and Zhang (2011); and Balakrishnan, Blouin, and Guay (2012) note that, in order to evade taxes, firms need

3 One could argue that transparency *vis-à-vis* investors does not need to translate in the same degree of transparency with respect to tax authorities. For instance, a firm may disclose to a bank information about its revenues and costs that would not disclose to the government. We do not analyze this possibility theoretically, but empirically we use the book-tax conformity index of Hung (2001) and Ashbaugh and LaFond (2004) to capture cross-country differences along this dimension and to test if the relation between accounting transparency and investment is weaker in countries with lower book-tax conformity.

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to "cook the books", thus creating opportunities for corporate insiders to extract private benefits via earnings management and related party transactions. Others have argued that opacity tends to put investors off: for instance, Graham, Li, and Qiu (2008) show that the opacity associated with corporate restatements comes at the cost of reduced credit availability, higher interest rates and more adverse lending conditions; and similar results emerge from many other empirical studies.[4] Our paper bridges these two important insights—that tax evasion requires opacity, and that opacity reduces access to external funding—and shows that firms pick optimally their opacity by balancing its tax evasion benefits with its cost in terms of forgone funding, which is greater for firms that depend more on external finance. The empirical study closest to ours is that by Mironov (2013), which focuses on Russian firms that create special purpose entities both to evade taxes and to divert resources to the firm's managers. Mironov shows that firms that engage in such practices grow less than other firms, and that this relationship is due to managerial diversion rather than tax evasion *per se*. This finding is consistent with our paper: the opacity required to evade taxes also allows managerial diversion at the expense of external investors; this makes outside funding harder to obtain, and constrains investment and growth. Along the same lines, Hasan *et al*. (2014) find that US firms with greater tax avoidance incur higher spreads when obtaining bank loans.

Our findings on the role of audit quality are consistent with those by Mironov and Srinivasan (2013), who show that better auditing mitigates managerial diversion, as predicted by our model. They also square with the results by Beck, Lin, and Ma (2014), who report that more information sharing between lenders is associated with less tax evasion, as lenders' sophistication in the use of information raises firms' opportunity cost of engaging in tax evasion. Similarly, we find that in countries with better audit quality firms tend to be more transparent, hence less able to evade taxes. In both cases, the trigger is an improvement in information technology: more information sharing among banks in Beck, Lin, and Ma (2014), more credible audits in our setting. The main difference is that our paper focuses on the resulting effect on transparency; theirs, on tax evasion.

Our paper is also related to Desai, Dyck, and Zingales (2007), who focus on the relationship between corporate taxes and corporate governance. In their setting, higher taxes increase company insiders' incentives to extract private benefits of control; conversely, stricter tax enforcement reduces such incentives and therefore benefits corporate governance. Our work differs from theirs not just because it focuses on transparency rather than governance, but more importantly because it recognizes that firms choose transparency and investment jointly, while Desai, Dyck, and Zingales (2007) take investment as given in their

4 Cross-country studies find that non-US firms with better voluntary disclosures attract more funds by US institutional investors (Bradshaw, Bushee, and Miller, 2004) and mutual funds (Aggarwal, Klapper, and Wysocki, 2005). Moreover, Khurana, Pereira, and Martin (2005) show that more comprehensive disclosure is associated with a lower cost of capital and greater external financing. Daske *et al.* (2008) document a reduction in cost of capital for firms converting to International Financial Reporting Standards (IFRS), and Lang, Lins, and Maffett (2012) show on cross-country data that transparency reduces the cost of capital (at least partly) by raising stock market liquidity. Only Daske (2006) finds no evidence that adoption of IFRS matters to the cost of capital for European firms. Moreover, there is evidence that firms operating in the unofficial economy (and therefore have murky accounts) have a hard time obtaining loans: see Straub (2005), Garmaise and Natividad (2010), and Ayyagari, Demirgüç-Kunt, and Maksimovic (2010).

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model and accordingly do not analyze the effects on investment at the empirical level.[5] In contrast, we take into account that transparency facilitates access to external funding and thus enables firms to increase investment, especially if they depend heavily on external finance. Another distinctive implication of our analysis is that the links between taxes, transparency, and investment hinge on "book-tax conformity": if this is relaxed, the effects of corporate tax on transparency and investment should weaken, which again is consistent with our cross-country evidence.

Finally, our work contributes to a vast and growing literature on the determinants and the effects of transparency, extensively surveyed in Leuz and Wysocki (2008). In particular, the empirical study by Leuz, Nanda, and Wysocki (2003) shows that the level of investor protection is an important determinant of international differences in the degree of transparency chosen by firms. Our paper adds to this research by showing that corporate taxes are of paramount importance in the choice of transparency, and that this choice has substantial consequences for firm's access to finance and growth.

The rest of the article is as follows. Section 2 presents the model. Section 3 maps its results into testable hypotheses and lays out our empirical strategy. Sections 4 and 5, respectively, present the data and the empirical results. Section 6 concludes.

2. The Model

We consider an entrepreneur who at time $t=1$ can invest a sum I in a new project that at $t=2$ will generate a cash flow $R(I)$, with $R' > 0$, $R'(0) > 1$, and $R'' < 0$. Taxable profits are $R(I) - I$, and after-tax profits are $(1-\tau)(R(I) - I)$, where τ is the tax rate.

The entrepreneur's wealth is equal to A. Hence, to invest an amount I at $t=1$, whenever $I > A$ he must borrow $I - A$ at the market interest rate, which for simplicity we standardize to 0. At $t=2$ the entrepreneur can appropriate a fraction $1-\phi$ of the cash flow $R(I)$ as private benefits of control, so that the cash flow verifiable by investors and tax authorities is $\phi R(I)$.[6] Hence, the extraction of private benefits $(1-\phi)R(I)$ from the company is tantamount to tax evasion.

We assume that the taxes levied on the profits reported by the firm distort its investment decisions, and model the distortion by assuming that only a fraction $\lambda < 1$ of the investment cost I is tax deductible, so that taxable profits are $\phi R(I) - \lambda I$. This amount determines the

5 Precisely because we treat both investment and transparency as endogenous variables, we find that in principle an increase in tax pressure has an ambiguous effect on transparency, while it has a positive effect on corporate governance in the analysis by Dyck and Zingales.

6 As the entrepreneur is the firm's owner-manager, the only agency problem in the model is that between management and investors: we abstract from the complications that may arise from the conflict of interest between controlling and minority shareholders. Moreover, we posit that the firm's transparency is the only instrument that reduces the extraction of private benefits by the entrepreneur, thus neglecting the mitigating role of other instruments of corporate governance, such as monitoring by shareholders (or by the board of directors) or incentives arising from managerial compensation (bonuses and/or stock options). However, transparency should also limit the ability of controlling shareholders to expropriate minority shareholders, and enhance the effectiveness of monitoring by shareholders and boards. Therefore, it can be expected to reduce rent extraction by company insiders even in companies with more complex share ownership structures and governance arrangements than those assumed here, which is probably relevant for many companies of our sample.

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company's tax liability $\tau[\phi R(I) - \lambda I]$. Hence, the net income $\Pi(I)$ that the company can pledge to repay to its creditors is:

$$\Pi\ (I) \equiv \underbrace{\phi R(I)}_{\substack{\text{reported}\\ \text{cash flow}}} - \underbrace{\tau[\phi R(I) - \lambda I]}_{\substack{\text{tax liabilities on}\\ \text{reported profits}}} = (1-\tau)\phi R(I) + \tau\lambda I. \quad (1)$$

An important assumption of our model is that the ability to extract private benefits depends on the choice of transparency made by the entrepreneur: higher transparency reduces the ability to hide (and divert) the cash flow to financiers and tax authorities. More precisely, at $t=0$, before investing, the entrepreneur can commit to a lower bound $\overline{\phi}$ on the cash flow that he can pledge to investors, ϕ, for instance by adopting stringent accounting standards, hiring a reputable auditor, listing the company on an exchange with tough disclosure standards, etc. The higher $\overline{\phi}$, the more transparent the firm and the smaller the scope to extract private benefits and evade taxes.

Notice that our setting presupposes "book-tax conformity": the firm cannot legally report different earnings to tax authorities and investors. This assumption has an important implication: by decreasing the firm's transparency $\overline{\phi}$, an entrepreneur hides the firm's income away from both the tax authority and outside investors, and raises his private benefits at the expense of both. But this implies that the tax savings obtained via greater opacity will also reduce the cash flow that the firm can pledge to external investors. Conversely, increasing the company's transparency $\overline{\phi}$ raises its tax bill but increases the cash flow that can be shown to elicit funding from investors. This trade-off in the choice of transparency is at the heart of the model's predictions.[7]

To summarize the previous assumptions, the model's timeline is as follows:

- at $t = 0$, the entrepreneur commits to a transparency level $\overline{\phi} \geq 0$;
- at $t = 1$, the entrepreneur raises outside funding $I - A$, invests and commits to repay D at $t = 2$;
- at $t = 2$, the firm generates a cash flow $R(I)$, of which the entrepreneur appropriates a fraction $1 - \phi \leq 1 - \overline{\phi}$ as private benefits of control and pays a fraction τ of its reported profits $\phi R(I) - \lambda I$ as taxes. Investors receive repayment D out of the residual income $\Pi(I)$.[8]

In solving the model, we assume that investors are perfectly competitive, there is no discounting, and both the entrepreneur and the investors are risk-neutral. The entrepreneur has no collateral to pledge beside his wealth A. As usual, the entrepreneur's optimal strategy is found by backward induction: we start with the decision about private benefits extraction at $t = 2$, then turn to the investment choice at $t = 1$ (for a given transparency level), and finally solve for the choice of transparency at $t = 0$.

7 Here, we assume that the entrepreneur can commit to any level of $\overline{\phi}$ he wishes to implement. Later, we shall take into account that institutional factors, such as the quality of financial analysts, may affect the chosen level of transparency.

8 Note that since the interest rate is 0, there are no interests on debt that can be deducted from taxes.

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2.1 Extraction of Private Benefits

At $t = 2$, the entrepreneur diverts the fraction $1 - \phi$ of the firm's cash flow that maximizes his final payoff U, namely he solves

$$\max_{\phi \in [0, \overline{\phi}]} U = \max(\Pi\ (I) - D, 0) + (1 - \phi)R(I), \tag{2}$$

where $\Pi(I)$ is defined by Equation (1) and D is the level of external funding. Hence, the entrepreneur's payoff (2) is decreasing in the degree of transparency ϕ:

$$\frac{\partial U}{\partial \phi} = \begin{cases} -\tau R(I) & \text{if} \quad \Pi(I) > D, \\ -R(I) & \text{if} \quad \Pi(I) \leq D. \end{cases} \tag{3}$$

Intuitively, the entrepreneur will hide as much cash flow as possible, given the level of transparency to which he has committed, i.e., will choose $\phi = \overline{\phi}$: since profits are taxed, while private benefits are not, once he has borrowed and invested, the entrepreneur will want to extract private benefits as much as possible. This result depends on the assumption that private benefits extraction by the entrepreneur is not associated to a deadweight loss.[9]

2.2 Investment and Financing Decision

At stage $t = 1$, the entrepreneur chooses the investment size I. This choice may be constrained by the amount of external finance that he can raise. In determining this amount, creditors must take into account that not all of the firm's cash flow will be available to repay them, because a fraction $1 - \overline{\phi}$ of it will be appropriated by the entrepreneur, and a fraction τ of the reported profit will go to the government in the form of taxes. Formally, the entrepreneur maximizes his payoff U:

$$\max_{I} \quad U = \max\left(\Pi\ (I; \overline{\phi}) - D, 0\right) + (1 - \phi)R(I) - A, \tag{4}$$

subject to the investors' participation constraint

$$D \geq I - A \tag{5}$$

and to the feasibility constraint

$$D \leq \Pi\ (I; \overline{\phi}). \tag{6}$$

The objective function (4) differs from expression (2) because it takes into account that at $t = 1$ the entrepreneur invests his initial wealth A in the firm, whereas at $t = 2$ that investment is sunk. Constraint (5) requires the repayment pledged to investors to be at least equal to their investment, while constraint (6) states that it cannot exceed the cash flow available after deducting private benefits and taxes.

Given the assumption of perfect competition in the capital market, the investors' participation constraint (5) is always binding: $D = I - A$. Imposing this equality, using the

9 As a result of this assumption, in this model the amount of private benefits (as a fraction of earnings) coincides with the degree of opacity. In the presence of a deadweight loss, the entrepreneur's private benefits will be positively related to the degree of opacity, although the two will not coincide.

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definition of $\Pi(I;\overline{\phi})$, and assuming that condition (6) holds, the entrepreneur's problem can be rewritten as

$$\max_{I} \quad U = (1-\tau\overline{\phi})R(I) - (1-\tau\lambda)I, \tag{7}$$

subject to the financing constraint resulting from Equations (5) and (6):

$$(1-\tau)\overline{\phi}R(I) + \tau\lambda I \geq I - A. \tag{8}$$

The first-order condition with respect to I yields a condition that defines implicitly the optimal investment I^* chosen by the entrepreneur if the financial constraint is not binding:

$$R'(I^*) = \frac{1-\tau\lambda}{1-\tau\overline{\phi}}. \tag{9}$$

Total differentiation of Equation (9) shows that the optimal unconstrained investment I^* is decreasing in $\overline{\phi}$:

$$\frac{\partial I^*}{\partial \overline{\phi}} = \frac{\tau}{1-\tau\overline{\phi}}\frac{R'(I^*)}{R''(I^*)} = \frac{(1-\tau\lambda)\tau}{(1-\tau\overline{\phi})^2}\frac{1}{R''(I^*)} < 0.$$

Intuitively, higher transparency discourages unconstrained investment, as it increases the tax burden without countervailing benefits. Since it reduces the level of investment, an increase in transparency also makes the financial constraint less likely to be binding: by rewriting the constraint (8) as $(1-\tau)\overline{\phi}R(I) + \tau\lambda I - (I-A) \geq 0$, totally differentiating it with respect to $\overline{\phi}$ and using Equation (9), one finds that the left-hand side of the inequality is increasing in $\overline{\phi}$:

$$(1-\tau)R(I^*) - \frac{\partial I^*}{\partial \overline{\phi}}\frac{(1-\tau\lambda)(1-\overline{\phi})}{1-\tau\overline{\phi}} > 0.$$

If instead I^* cannot be financed, the constrained level of investment—to be denoted by $\overline{I}$—is determined by the (binding) financial constraint:

$$(1-\tau)\overline{\phi}R(\overline{I}) - (1-\tau\lambda)\overline{I} + A = 0. \tag{10}$$

Notice that in this case an increase in the firm's transparency has a positive effect on investment, as it relaxes the financial constraint:

$$\frac{\partial \overline{I}}{\partial \overline{\phi}} = \frac{(1-\tau)R(\overline{I})}{(1-\tau\lambda) - (1-\tau)\overline{\phi}R'(\overline{I})} > 0, \tag{11}$$

where the denominator is positive because, for the firm to be finance-constrained, it must be that the additional income that investors can expect from an extra dollar of investment, $(1-\tau)\phi R'(\overline{I})$, falls short of its opportunity cost, $1-\tau\lambda$. Also an increase in the entrepreneur's initial wealth increases the constrained level of investment:

$$\frac{\partial \overline{I}}{\partial A} = \frac{1}{(1-\tau\lambda) - (1-\tau)\overline{\phi}R'(\overline{I})} > 0. \tag{12}$$

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Otherwise stated, firms with less internal funding, and thus more dependent on external finance, will invest less. Expressions (11) and (12) establish the following:

Proposition 1 (Effect of transparency and taxes on investment) *In a financially constrained firm, investment is increasing in the degree of transparency and decreasing in its dependence on external finance.*

Intuitively, higher transparency allows the firm to invest more because it relaxes its financing constraint, in spite of the fact that it also increases the firm's tax burden. By the same token, a larger wealth A relaxes the financing constraint and increases investment; this also implies that, if the firm starts out with some debt, its initial debt has the opposite effect, namely, it tightens the financing constraint and depresses investment.

To summarize, at $t = 1$ the entrepreneur will pick the unconstrained level of investment whenever the financial constraint (8) is satisfied. Otherwise, the level of investment will be determined by the binding financial constraint. Higher transparency is associated to lower investment if the firm is unconstrained and lower investment if it is constrained.

2.3 Choice of Transparency by the Firm

We now turn to the choice of transparency made by the entrepreneur at $t = 0$. As long as the financial constraint is slack, so that at $t = 1$ investment is given by the first-order condition (9), it is easy to see that the entrepreneur wants to have as little transparency as possible in order to minimize the tax burden. This can be seen by differentiating the entrepreneur's payoff (7) with respect to $\overline{\phi}$ and using the envelope theorem:

$$\frac{\partial U}{\partial \overline{\phi}} = -\tau R(I^*) < 0.$$

If at $\overline{\phi} = 0$ the financial constraint is still slack, then the optimal level of transparency is 0. Let us denote by $\tilde{I}$ the unconstrained level of investment when $\overline{\phi} = 0$. Then no transparency will be the optimal choice for the entrepreneur if $A \geq \tilde{I}(1 - \tau\lambda)$. The intuition of this result is simple: when the entrepreneur has such a large wealth that he can finance his desired level of investment, he has no incentive to become more transparent, as this would only expose him to tighter scrutiny by the tax authorities, thereby increasing the tax pressure faced.

However, the case in which even with zero transparency the financing constraint is slack is a quite special one, which arises only for large values of the entrepreneur's A. In general, to make the financing constraint slack the entrepreneur will have to pick a positive and high enough level of transparency. But in this case, as just shown, the entrepreneur's utility is decreasing in transparency: hence, whenever the constraint is slack, he will want to reduce transparency down to a level for which the financial constraint becomes binding. In other words, in equilibrium the firm will always be constrained.

Which level of transparency $\overline{\phi}$ will the entrepreneur choose when the financing constraint is binding? Recall that, by Proposition 1, a constrained firm can borrow and invest more by increasing its transparency. However, for a given level of investment, greater transparency lowers the entrepreneur's payoff U, because it raises his exposure to tax pressure. This creates a trade-off in the choice of transparency, in contrast with what we have in the

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unconstrained case. Formally, the trade-off can be seen by differentiating Equation (7) with respect to $\overline{\phi}$:

$$\frac{\partial U}{\partial \overline{\phi}} = -\tau R(\overline{I}) + \frac{\partial \overline{I}}{\partial \overline{\phi}}[(1-\tau\overline{\phi})R'(\overline{I}) - (1-\tau\lambda)] = 0.$$

The first term is the cost due to the larger implied tax burden; the second is the benefit that transparency confers on the entrepreneur by relaxing the financing constraint and allowing greater investment. Substituting for $\partial\overline{I}/\partial\overline{\phi}$ from Equation (11) we obtain a condition that defines the constrained level of investment corresponding to the optimal degree of transparency, $\tilde{I}$:

$$R'(\tilde{I}) = \frac{1-\tau\lambda}{1-\tau}. \tag{13}$$

From this expression, $R'(\tilde{I}) > 1$: financially constrained firms always feature underinvestment. The underinvestment disappears if all the investment cost is tax-deductible ($\lambda = 1$) or if there are no corporate taxes ($\tau = 0$). The larger the corporate tax rate, the more severe is the firm's underinvestment: upon differentiating Equation (13), one finds that an increase in τ reduces the investment of a constrained firm, also when the entrepreneur chooses its transparency optimally ($\partial\tilde{I}/\partial\tau = (1-\lambda)/[(1-\tau)^2 R''(\tilde{I})] < 0$).

Equations (13) and (10) determine implicitly the optimal degree of transparency that the entrepreneur will choose initially, taking into account its effects on the firm's tax liabilities as well as on its access to external finance. They can then be used to determine how the optimal level of transparency in the constrained regime responds to changes in the corporate tax rate τ and in the entrepreneur's initial wealth A. By differentiating the financing constraint (10), one obtains

$$\frac{\partial\overline{\phi}}{\partial\tau} = -\frac{-\overline{\phi}R(\tilde{I}) + \tilde{I} + (\partial\tilde{I}/\partial\tau)[(1-\tau)\overline{\phi}R'(\tilde{I}) - (1-\tau\lambda)]}{(1-\tau)R(\tilde{I})},$$

which, upon substituting for $R'(\tilde{I})$ from Equation (13), becomes

$$\frac{\partial\overline{\phi}}{\partial\tau} = \frac{\overline{\phi}R(\tilde{I}) - \tilde{I} + (\partial\tilde{I}/\partial\tau)(1-\tau\lambda)(1-\overline{\phi})}{(1-\tau)R(\tilde{I})}. \tag{14}$$

Inspection of Equation (14) indicates that, in general, tax pressure has an ambiguous effect on firm transparency: in the numerator, the first term $\overline{\phi}R(\tilde{I}) - \tilde{I}$ may be positive, while the second term is invariably negative, recalling that $\partial\tilde{I}/\partial\tau < 0$. The overall sign depends on the absolute magnitude of this term, that is, how strong is the response of investment to taxes: whether higher corporate taxes induce greater or lower firm transparency is an empirical issue. The reason why the theory is ambiguous on this point is simple. An increase in tax pressure reduces the investment that an entrepreneur wishes to fund but it can also reduce the investment that he can fund, and these two effects have opposite implications for his choice of transparency. Insofar as higher taxes reduce the desired investment, the firm needs less pledgeable income, and this allows the entrepreneur to be less transparent. But higher taxes can also curtail the income that can be pledged to outside investors and thereby may compress the fundable investment below its desired level: if so, the firm will react to higher taxes by becoming more transparent. The first effect dominates if investment is sufficiently sensitive to taxes, that is, if $\mathrm{d}\tilde{I}/\mathrm{d}\tau$ is sufficiently large in absolute value.

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By differentiating the financing constraint (10) and using Equation (13), one finds also that an increase in the entrepreneur's wealth A lowers the firm's optimal degree of transparency—i.e., induces it to become more opaque:

$$\frac{\partial \overline{\phi}}{\partial A} = -\frac{1}{(1-\tau)R(\tilde{I})} < 0. \tag{15}$$

Here, the intuition goes back to the episode of Amstel Bier quoted in the introduction: as the entrepreneur needs to borrow less, he will want to reduce its transparency in order to reduce its tax burden. Conversely, firms more dependent on external finance (i.e., with lower A) will be more transparent. Moreover, a firm less dependent on external finance will choose to reduce transparency more in a high-tax country than in a low-tax one:

$$\frac{\partial^2 \overline{\phi}}{\partial \tau \partial A} = \frac{-R(\tilde{I}) + (1-\tau)R'(\tilde{I})(\partial \tilde{I}/\partial \tau)}{\left[(1-\tau)R(\tilde{I})\right]^2} < 0, \tag{16}$$

recalling that $\partial \tilde{I}/\partial \tau < 0$. Intuitively, if corporate taxes are high, the tax savings from opacity are higher, and therefore a firm that is less dependent on external funding will want to be more opaque. Conversely, a firm more dependent on external funding will choose a higher degree of transparency if it faces a high tax rate: to pay high taxes, such a firm will need to raise more external funding, and thus will choose greater transparency. To understand the empirical implication of this result, consider the case where on balance an increase in corporate taxes lowers transparency (i.e., expression (14) is negative): then, by Equation (16), a tax increase will reduce the transparency of financially dependent firms by less than that of cash-rich ones.

We summarize these results in the following Proposition:

Proposition 2 (Effects of taxes and cash flow on transparency) *The transparency chosen by the entrepreneur is (i) decreasing in the corporate tax rate if the negative effect of taxes on investment is sufficiently large; and (ii) increasing in the firm's dependence on external finance, the more so if it faces a high corporate tax rate.*

An interesting case in which an increase in the corporate tax rate always reduces transparency is that of a firm whose revenue is a power function of its investment: $R(I) = I^\alpha/\alpha$ (with $0 < \alpha < 1$). In this case, the optimal transparency has the following closed-form expression[10]:

$$\overline{\phi} = \alpha\left\{1 - A\left[\frac{(1-\tau\lambda)^\alpha}{1-\tau}\right]^{\frac{1}{1-\alpha}}\right\}, \tag{17}$$

whose derivative with respect to τ is negative, and larger in absolute value the greater is the entrepreneur's wealth A: firms react to higher taxes by lowering transparency, all the more

10 To see this, notice that if $R(I) = I^\alpha/\alpha$, from Equation (13) the firm's constrained investment and revenue are, respectively,

$$\tilde{I} = \left(\frac{1-\tau}{1-\tau\lambda}\right)^{\frac{1}{1-\alpha}} \text{ and } R(\tilde{I}) = \frac{1}{\alpha}\left(\frac{1-\tau}{1-\tau\lambda}\right)^{\frac{\alpha}{1-\alpha}}.$$

Hence the financing constraint (10) becomes $(1-\tau)\overline{\phi}R(\tilde{I}) = (1-\tau\lambda)\tilde{I} - A$, which upon substituting $\tilde{I}$ and $R(\tilde{I})$ from the previous expressions yields Equation (17), where $\overline{\phi}$ can be shown to be decreasing in τ and in A. In this example, it is easy to check that, as implied by Equation (16), the cross-derivative $\partial^2\overline{\phi}/\partial\tau\partial A$ is negative.

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so if they are free of external financing concerns. By the same token, the negative effect of corporate taxes on transparency should be mitigated for companies that depend heavily on external funding.

2.4 Audit Quality and the Choice of Transparency

So far, we have assumed that the only friction in capital markets arises from a firm-level agency problem—the extraction of private benefits of control—that can be controlled by the firm-level decision about the degree of transparency. However, the ability to precommit to a given level of transparency depends on the competence and on the independence of the auditors: lacking competent and independent auditors, investors will not trust the firms' accounts. Therefore, the availability of external funding depends not only on the firm-level choice of transparency, but also on the quality of the auditing standards in the country where the firm operates. To capture the relationship between transparency and audit quality, we assume that $\overline{\phi}$, the chosen level of transparency, is limited by the quality of the auditing industry, that we denote by q. In other words, $\overline{\phi}(q)$ is an increasing function of q.

If the financing constraint is not binding, the analysis is unchanged. When the financing constraint is binding, however, the optimal level of investment implied by Equation (13) may now be associated to an optimal level of transparency $\overline{\phi}$ that exceeds the feasible one $\overline{\phi}(q)$. In this case, investment will be even more severely constrained, being given by the financial constraint under the lower feasible level of transparency:

$$(1-\tau)\overline{\phi}(q)R(I) - (1-\tau\lambda)I + A = 0.$$

Recall that by Equation (15) the higher the entrepreneur's wealth, A, i.e., the less financially dependent is the firm, the lower is the optimal degree of transparency chosen by the firm, and thus the less likely it is that the constraint imposed on transparency by the audit quality becomes binding. This discussion can be summarized as follows:

Proposition 3 (Effects of auditing quality on transparency) *A higher audit quality (weakly) increases the degree of transparency and investment, the more so for firms that are less dependent on external finance.*

Importantly, audit quality is an exogenous country-level characteristic: it affects firm-level transparency, but is not affected by it. Moreover, it affects the firm's investment only through its effect on its choice of transparency, and not directly. Hence, when testing the model audit quality is an ideal instrument for transparency in investment regressions.

3. Empirical Strategy

As illustrated in Section 2, the model yields two sets of related predictions: the first and most important about transparency, and the second about investment and external funding. In what follows, we summarize these predictions and describe the empirical strategy. To test the model, we use firm-level data from Worldscope, which has listed companies incorporated in thirty-seven countries in 1988–2011. The dataset has detailed income statement and balance sheet data, which allow us to compute accounting-based measures of transparency that are widely used in the literature (Leuz and Wysocki, 2008).

The core analysis is the estimate of the relation between transparency and tax pressure, using both cross-sectional and panel regressions. We end by exploring the relationship

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between investment, transparency, and taxes, taking into account the endogeneity of transparency by IV estimation.[11]

3.1 Transparency

The first set of predictions of the model refers to transparency, using both cross-sectional analysis and panel data analysis. In the cross-sectional analysis, we rely on the following specification (or variants depending on the dataset):

$$T_{ics} = \beta_1 \tau_{ics} + \beta_2 \tau_{ics} \times \mathrm{DEP}_s + \beta_3 \mathrm{AQ}_c \times \mathrm{DEP}_s + \theta X_{ics} + \mu_c + \mu_s + \eta_{ics}, \qquad (18)$$

where T_{ics} is the empirical proxy for firm i's transparency, τ_{ics} is a measure of its tax burden, AQ_c is a measure of country c's audit quality, DEP_s is a measure of financial dependence in sector s, X_{ics} is a set of firm or country-sector characteristics, and μ_c and μ_s are country-level and sector-level fixed effects, respectively.

According to Proposition 2, the effect of taxes on transparency is in general ambiguous, but is predicted to be negative ($\beta_1 < 0$) if taxes depress investment sufficiently (see Equation (14)). Proposition 2 also predicts this negative effect to be attenuated for financially dependent firms ($\beta_2 > 0$),[12] as in the example with isoelastic revenue in Equation (17). Note that we cannot estimate the coefficient β_1 when we use country fixed effects because these will absorb the tax variable.

By Proposition 3, we expect the firm's choice of transparency to be affected by the quality of the auditing services on offer in its country: hence audit quality (AQ_c) should have a positive direct impact on transparency, but this effect is not identified if the regression includes the country effects μ_c. However, AQ_c also affects transparency via its interaction with financial dependence: firms that rely more on external funding (because they have lower cash flow from assets in place A) benefit most from high-quality auditing services, when available. Hence, we expect $\beta_3 > 0$.

Finally, we expect firms to choose high transparency if they operate in countries with highly developed financial markets, because in these countries they face more sophisticated financiers, who can better understand financial information. Indeed, Leuz, Nanda, and Wysocki (2003) document that firm transparency is positively associated with financial development. The effect of financial development is identified only in specifications without the country effects μ_c. However, even in the presence of country effects, we can still test the prediction that more financially dependent firms benefit more from financial development. Therefore, among the controls X_{ics} we include the interaction between financial development and financial dependence.

11 One potential way to test the model would be to estimate a simultaneous system of two structural equations (one for transparency and one for investment). However, this approach would require not only an exclusion restriction in the investment equation (currently, the restriction that audit standards do not affect investment directly, but only through transparency), but also a restriction to identify the effect of investment in the transparency equation. Identifying the latter effect is very difficult, so we estimate a single-equation reduced-form for transparency, and an IV regression for investment.

12 Note that the parameter β_2 is the cross-derivative of transparency with respect to the tax rate (τ) and financial dependence (DEP), while Equation (16) is the cross-derivative of transparency with respect to the tax rate (τ) and the entrepreneur's wealth (A). As DEP is inversely related to A, the sign of β_2 is opposite to that of the expression (16).

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We estimate also Equation (18) with panel data exploiting the time variation in firm-level transparency and in statutory tax rates over our sample period. The firm-level fixed effects in these panel regressions explore the robustness of our results to the presence of unobserved heterogeneity at the firm level. Of course, in these panel regressions the effect of any time-invariant variable (most importantly, audit quality) is not identified, so that we cannot estimate comparable panel investment regressions using audit quality as instrument. We use lagged values, rather than initial values, of time-varying control variables.

3.2 Investment and External Finance

The relationships between investment, transparency, and taxes will be estimated via variants of the following regression:

$$I_{ics} = \alpha_1 \tau_{ics} + \alpha_2 \tau_{ics} \times \mathrm{DEP}_s + \alpha_3 T_{ics} + \alpha_4 T_{ics} \times \mathrm{DEP}_s + \gamma X_{ics} + \delta_c + \delta_s + \varepsilon_{ics}, \qquad (19)$$

where I_{ics} is the ratio between capital expenditure and total assets of firm i in country c and sector s, T_{ics} is an empirical proxy for its transparency, τ_{ics} is a measure of its tax burden, DEP_s is a sector-level measure of financial dependence, X_{ics} is a set of firm-specific characteristics, δ_c and δ_s are country-level and sector-level fixed effects, respectively. Among the firm-level characteristics X_{ics}, we include total assets, since the model predicts that cash flow from the firm's assets in place mitigate the financing constraint and therefore is associated with greater investment.

According to Proposition 1 in the previous section, for constrained firms investment should be negatively correlated with the firm's tax burden ($\alpha_1 < 0$) and positively correlated with transparency ($\alpha_3 > 0$).[13] For more financially constrained firms, investment should have a stronger negative correlation with taxes and a stronger positive correlation with transparency. Thus, the coefficient of the interaction between financial dependence and taxes should be negative ($\alpha_2 < 0$), and between financial dependence and transparency should be positive ($\alpha_4 > 0$). Note that in the model financial dependence is captured by a low value of A, the entrepreneur's wealth: since this variable is unavailable in our data, in our empirical analysis we capture financial dependence by the external funding requirements of firms, which vary across industrial sectors.

As highlighted in Section 2.4, our model predicts that audit quality affects investment only through its effect on transparency, as captured by the coefficient $\beta_3 > 0$ in Equation (16). Hence, we rely on audit quality (and its interaction with financial dependence) as an instrument for transparency (and its interaction with financial dependence).

The controls X_{ics} also include: (i) the interaction between corporate taxes and financial dependence ($\tau_{ics} \times \mathrm{DEP}_s$), since this variable affects the choice of transparency, as shown in Equation (18) and (ii) the interaction between financial development and financial dependence, because as argued by Rajan and Zingales (1998) financially dependent firms are more likely to be constrained. As for the transparency regressions, also in investment regressions we use variants of specification (19) depending on whether the dataset allows the inclusion of country fixed effects or not.

13 Since for a constrained firm investment is driven by the availability of external finance, in some unreported regressions we replace investment with proxies of firms' ability to access credit markets.

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4. Data and Descriptive Statistics

To test the model's empirical predictions on the relation between tax pressure, transparency, and investment, we bring together three types of data: (i) firm-level data for measures of transparency, capital expenditures, sales, total assets, leverage, and market-to-book ratios; (ii) sector-level financial dependence; and (iii) measures of country-level corporate effective tax rates, tax enforcement, and financial development.

The financial and accounting data are obtained from Worldscope (for non-US firms) and Compustat (for US firms), which provide historical data from the financial reports of publicly listed firms incorporated and listed in thirty-seven countries over the period 1988–2011. We apply two screens to the data: first, we remove financial institutions and banks; second, we include firms only if income and balance sheet data are available for at least 6 consecutive years, thus allowing us to compute various measures of earnings management. This leaves us with 14,260 firms. To limit the potential impact of outliers, we winsorize the data at the 1st and 99th percentage level, leaving us with a sample of 205,427 firm-year observations. Our results, however, are unaffected if we do not winsorize the data.

We obtain country-level data on statutory tax rates using the Price Waterhouse Coopers' "Doing Business" Publication and the corporate effective taxation from Djankov *et al*. (2010). The effective tax rates are closer than the statutory tax rates to the actual tax schedule faced by companies, since they take into account provisions of the tax code about depreciation provisions and exemptions.[14] While time-varying statutory tax rates are available for the sample period, no such data exist for effective tax rates. Thus, we use statutory tax rates in most regressions and then perform robustness checks using the effective tax rates.

We compute the measure of financial development using the stock market capitalization as percentage of GDP, and rely on the sector-level data by Rajan and Zingales (1998) to measure financial dependence. Audit quality is the quality of the audit process as measured by Bronson *et al*. (2009): this variable is the principal component of various indicators of the audit process in each country, described in the Appendix.

In the cross-sectional and panel regressions we rely on two different firm-level earnings-based measures of accounting transparency and a single qualitative indicator of transparency, which are described below.

4.1 Earnings-Based Measures of Transparency

As highlighted by the literature,[15] the degree of accounting transparency of a firm is inversely related to the degree of earnings smoothing and discretion: both measures should capture the extent to which insiders misstate the firm's true economic performance. Measures of earnings smoothing gauge the extent to which management dampens fluctuations in reported earnings relative to true earnings, thus increasing accounting opacity.[16]

14 The effective corporate tax rates are assembled jointly by the World Bank, Pricewaterhouse Coopers, and Harvard University, and come from a calculation of *all* relevant taxes applicable to *the same* standardized firm operating in each country.

15 See, for example, Jones (1991), Dechow and Dichev (2002), Dechow, Ge, and Schrand (2010), Francis *et al.* (2005), and Leuz, Nanda, and Wysocki (2003).

16 Another measure of accounting opacity is earnings discretion, namely the latitude that management has in reporting—and thereby misstating—earnings, based on the extent and use of

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We first compute measures of earnings management at the firm level, and then we proceed to decompose them into their "normal" and "abnormal" constituents, thus obtaining the firm-level excessive earnings smoothing and earnings discretion. As shown in the accounting literature (for instance Francis *et al.*, 2005), the informativeness of reported earnings is influenced by various factors, such as environmental uncertainty and industry affiliation, as well as by intentional estimation mistakes arising from insiders' incentives to reduce transparency. In keeping with the models' assumption, we want to capture exclusively management's intentional errors to reduce transparency. There are two different ways to achieve this objective. First, one can use the total amount of smoothing (or discretion) at the firm level and then control for variables that capture environmental uncertainty and industry affiliation. Second, one can extract the abnormal component of earnings smoothing without using any control variables. Both methods have been widely used in the accounting literature and we will use both approaches.

Our accounting-based transparency measures are based on the idea that managers reduce the variability of reported earnings compared with "fundamental earnings", i.e., cash flows, chiefly by managing accounting accruals, namely, the changes in inventories, accounts payable, accounts receivables, and depreciation charges. Clearly, the less transparent a company's accounts are, the greater is management's ability to engage in such "earnings smoothing".

Hence, our first transparency measure is the ratio of the firm-level standard deviation of operating earnings (scaled by assets) and the firm-level standard deviation of cash flows from operations (also scaled by assets). As in Leuz, Nanda, and Wysocki (2003), we find that in some countries data on cash flows from operations are sparse. To address this issue, we adopt the methodology by Leuz, Nanda, and Wysocki (2003) whereby the cash flow from operations is computed indirectly by purging firm's reported earnings of their accrual component.[17] We denote this as "Transparency Measure 1" (*T1*): larger values of this measure correspond to greater transparency. When we use this measure in our transparency regressions, we expand the specification to include various firm-level characteristics to control for the firm's "normal" level of transparency.

We also rely on a second transparency measure, which disentangles abnormal accruals from normal ones using the modified Jones (1991) approach, as proposed by Francis *et al.* (2005). We obtain firm-specific normal accruals by estimating separate regressions for each of the ten Fama-French industry groups and for each year.[18] We then compute the absolute levels of abnormal accruals by subtracting normal from actual accruals. The Appendix explains the details of the calculations. This measure of abnormal earnings management is increasing in the firm's accounting opacity; since the model's predictions refer to

accounting accruals. On balance, given the non-linearities in corporate taxation (i.e., no taxes are paid when losses are incurred), earnings smoothing measures are closer to the spirit of the model. We thank Christian Leuz for this suggestion.

17 Consistent with Dechow, Sloan, and Sweeney (1995) and Leuz, Nanda, and Wysocki (2003), we compute the accrual component of earnings as $\Delta CA_{it} - \Delta Cash_{it} - \Delta CL_{it} + \Delta STD_{it} + \Delta TP_{it} - Dep_{it}$, where ΔCA_{it} is the change in total assets, $\Delta Cash_{it}$ the change in cash and cash equivalent items, ΔCL_{it} the change in total current liabilities, ΔSTD_{it} the change in short-term debt, ΔTP_{it} the change in income taxes payable, and Dep_{it} the depreciation and amortization expense of firm *i* in year t.

18 Since we require having at least ten firms in each industry group, we are unable to calculate T2 for countries and industries in which not enough firms are listed.

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transparency, we take the negative of this measure, which we refer to as "Transparency Measure 2" (*T2*). Due to lack of a sufficient number of observations, *T2* is unavailable for some countries, as shown in Table III.

In the cross-sectional regressions, we rely both on *T1* and (firm-level average of) *T2*, while in the panel regressions we use only *T2* (and some variants of it) because T1 does not vary over time. For robustness, we also compute other measures of transparency that we describe in the Appendix, and report the results obtained with these additional measures in our cross-sectional and panel regressions in the Supplementry Data.

4.2 Qualitative Measure of Transparency

Measures based on earnings management may provide an incomplete gauge of firm transparency. For example, analyst following is commonly regarded as a mechanism that makes firms more transparent even from an accounting point of view: Yu (2008) finds that firms with higher analyst coverage exhibit a lower level of accrual-based earnings management. Likewise, the literature on cross-listings shows that the listing decision, especially when the NYSE is chosen as the cross-listing market, is associated with higher quality and more transparent information production because of the listing requirements.

Consistent with this strand of literature, we construct a qualitative measure of transparency based on several firm-level characteristics: analyst coverage, type of accounting standards, identity of the auditor, cross-listing on the NYSE, separate (and voluntary) reporting of R&D expenses, and staff costs. Notice that firms reporting R&D and staff costs disclose such information voluntarily. Existing studies (Botosan, 1997) show that this decision correlates with the overall degree of disclosure, especially when there is no analyst coverage.

In particular, we define a binary 0–1 variable for each firm characteristic and year as follows: (a) analyst coverage equals 1 if the firm has at least one analyst covering it, (b) accounting standard equals 1 if the firm uses IFRS or US GAAP, (c) auditor equals 1 if the firm contracts the service of one of the Big 5 auditors, (d) cross-listing equals 1 if the firm is cross-listed on the NYSE, (e) R&D expenses equals 1 if the firm reports R&D expenses, and (f) staff costs equals 1 if the firm reports staff costs. Then we build a qualitative transparency index taking the sum of these binary variables at the firm level for each year and average across all the years of our sample period.[19] We use the qualitative index in our cross-sectional regressions as a complement to the earnings-based measures of transparency *T1* and *T2* just described.[20] Since this index displays very little time variability, it is not used in the panel regressions.

4.3 Book-Tax Conformity

Recall that an assumption in our model is that the degree of accounting transparency chosen by firms affects both their tax liabilities and their debt capacity: firms are assumed

19 Since not all firms carry our R&D, we use a second transparency index excluding reporting of R&D expenditures. Results using this index are qualitatively similar to the ones reported in the article and not reported for brevity.

20 Since one of the variables in the qualitative index is the cross-listing in the USA we cannot compute the index value for US firms. We also compute an alternative version of the transparency index, which excludes cross-listings and thus can be computed also for US firms. Results using this index are qualitatively similar to the ones reported in the article and not reported for brevity.

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to produce a single set of accounting data for both tax authorities and financial markets. So an important issue for our empirical tests is whether this assumption actually holds in the data. In fact, not all countries require "book-tax conformity", that is, a high degree of alignment between tax and financial reporting.[21] Where such conformity is not required, the tax-avoidance payoff from lower accounting transparency should be low or non-existent, and therefore taxes should have low or no impact on the choice of transparency.

We use two different measures of the book-tax conformity. The first measure is based on Atwood, Drake, and Myers (2010), who use firm-level accounting data and defines book-tax conformity as "the flexibility that a firm has to report taxable income that is different from pre-tax book income": a large disparity between the two is evidence of lack of book-tax conformity. Details on the calculation of the book-tax conformity are reported in the Appendix. This measure can be calculated by averaging across firms in each year and country of our sample. We use the Atwood, Drake, and Myers (2010) measure for our baseline regressions, taking the time-series average at the country level when we run cross-sectional regressions. We obtain qualitatively similar results using an alternative measure of book-tax conformity, i.e. the time-invariant index of Hung (2001) and Ashbaugh and LaFond (2004), which is not based on company accounts but on country-level measures of accounting standards.[22]

4.4 Descriptive Statistics

Table I reports sample statistics for all variables used in the estimation. The statistics in panel A reveal that firms differ considerably in their level of transparency, for each of the three transparency measures. Likewise, we find significant cross-firm differences in the level of capital investment, initial firm size, leverage, and market-to-book ratios. The standard deviations in Panel B are constructed averaging the data alternatively by firm, country, and year: most of the variability in the indicators of transparency, investment, and firm size appears to be between firms; but there is also considerable variability between countries and over time, except for the qualitative transparency index, for which variation across countries and over time is more limited. Table II shows the correlation matrix between the variables: the correlations between all three measures of transparency are high (between 72% and 83%). This is encouraging, since it implies that there is significant information overlap between the different transparency measures and that a particular indicator used is not likely to affect our results.

All three transparency measures are in turn positively and strongly correlated with audit quality, as predicted by our model. This is illustrated by Figure 1, where countries with relatively high values of audit quality, such as Australia, USA, and Switzerland, also feature high transparency, measured by T1; on the other hand, Mexico, Indonesia, and Argentina have low audit quality and transparency.

Transparency is also positively correlated with investment, which is another central prediction of the model. This is illustrated by Figure 2 at the cross-country level: countries with high transparency also feature a high investment rate (Singapore, Australia, Ireland,

21 See Alford *et al.* (1993), Ali and Hwang (2000), Kasanen, Kinnunen, and Niskanen (1996), and Ashbaugh and LaFond (2004).

22 The two measures produce fairly similar rankings of countries with some exceptions: for example, Germany is defined as a country with low book-tax conformity based on the Atwood *et al.* (2010) measure but not using the second measure.

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Table I. Descriptive statistics

Panel A of the table presents firm-level descriptive statistics of the variables used in the regressions. The sample contains firm-year observations of 14,260 firms incorporated in thirty-seven countries, over the period 1989–2011. Transparency Measure 1 (*T1*) is the ratio of the firm-level standard deviation of operating earnings (scaled by assets) to the firm-level standard deviation of cash flows from operations (scaled by assets); Transparency Measure 2 (*T2*) is the (negative values of) abnormal accruals measure of Jones (1991) as modified by Francis *et al.* (2005); qualitative transparency index is based on six binary variables that measure transparency; investment is measured as the mean ratio of capital expenditure to total assets in the previous year; initial assets is the firm's total assets in US dollars in the first year for which Worldscope provides data; initial market-to-book is the firm's market-to-book ratio in the first year for which Worldscope provides data; initial leverage is the firm's leverage (total debt divided by total assets) in the first year for which Worldscope provides data; financial dependence is the measure of financial dependence from Rajan and Zingales (1998); statutory corporate tax rate (in %) is defined as the rate for the highest bracket of all taxes on corporate income; effective 5th year corporate tax rate (in %) is derived from a calculation of all relevant taxes applicable to the same standardized firm over the first 5 years after its incorporation and is obtained from Djankov *et al.* (2010); audit quality is the principal component of indicators of auditing regulation; and financial development is the average of the stock market capitalization as % of GDP. Panel B presents the standard deviation between firms, countries, and years of the transparency measures 1 and 2, the qualitative transparency index, investment, and initial assets.

Panel A. Total sample statistics

Variable	Number of observations	Mean	Median	Standard deviation	Min. value	Max. value
Transparency measure 1	205,427	0.457	0.461	0.246	0.149	0.872
Transparency measure 2	194,108	−0.073	−0.068	0.044	−0.209	−0.037
Qualitative transparency index	172,093	3.102	2.940	1.435	1	6
Investment	205,427	0.071	0.058	0.046	0.009	0.182
Initial assets (in $ million)	205,427	5,947	384	10,084	10.92	40,244
Initial market-to-book	205,427	2.442	1.875	2.144	0.3751	5.681
Initial leverage	205,427	0.265	0.221	0.250	0	0.899
Financial dependence	205,427	0.442	0.413	0.276	−0.469	1.651
Statutory corporate tax rate	205,427	33.411	31.182	10.714	16.40	46.027
5th year effective corporate tax rate	205,427	23.081	21.250	9.101	9.620	31.991
Audit quality	205,427	0.487	0.436	0.429	−0.251	1.188
Financial development	205,427	71.82	65.09	70.10	10.65	301.94

Panel B. Standard deviations of main variables

Variable	Between firms	Between countries	Between years
Transparency measure 1	0.160	0.063	0.040
Transparency measure 2	0.032	0.008	0.006
Qualitative transparency index	1.275	0.072	0.050
Investment	0.030	0.010	0.008
Initial assets (in $ million)	4,951	2,896	1,028

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Table II. Correlation between measures of transparency, investment, and country-level characteristics, standard deviations of the main variables

The table presents the correlation between the variables used in the regressions. Transparency measure 1 (*T1*) is the ratio of the firm-level standard deviation of operating earnings (scaled by assets) to the firm-level standard deviation of cash flows from operations (scaled by assets); Transparency measure 2 (*T2*) is the (negative values of) abnormal accruals measure of Jones (1991) as modified by Francis *et al.* (2005); Qualitative transparency index is based on six binary variables that measure transparency; investment is measured as the mean ratio of capital expenditure to total assets in the previous year; statutory corporate tax rate (in %) is defined as the rate for the highest bracket of all taxes on corporate income; effective 5th year corporate tax rate (in %) is derived from a calculation of all relevant taxes applicable to the same standardized firm over the first 5 years after its incorporation and is obtained from Djankov *et al.* (2010); audit quality is the principal component of indicators of auditing regulation; and financial development is the average of the stock market capitalization as % of GDP. *P*-values are shown in parenthesis.

Variable	Transparency measure 1	Transparency measure 2	Qualitative transparency index	Investment	Statutory corporate tax rate	Effective 5th year corporate tax rate	Audit quality	Financial development
Transparency measure 1	1							
Transparency measure 2	0.8290	1						
	(0.00)							
Qualitative transparency index	0.7185	0.7989	1					
	(0.00)	(0.00)						
Investment	0.5218	0.4941	0.4015	1				
	(0.00)	(0.00)	(0.03)					
Statutory corporate tax rate	−0.3149	−0.2829	−0.2367	−0.4706	1			
	(0.10)	(0.12)	(0.16)	(0.01)				
5th year effective corporate tax rate	−0.2407	−0.2592	−0.1956	−0.4043	0.7270	1		
	(0.14)	(0.13)	(0.21)	(0.03)	(0.00)			
Audit quality	0.6825	0.7016	0.6240	0.3411	−0.0887	−0.1201	1	
	(0.00)	(0.00)	(0.00)	(0.07)	(0.24)	(0.21)		
Financial development	0.6203	0.4808	0.4007	0.5420	−0.3247	−0.2762	0.4178	1
	(0.00)	(0.01)	(0.03)	(0.00)	(0.08)	(0.11)	(0.03)	

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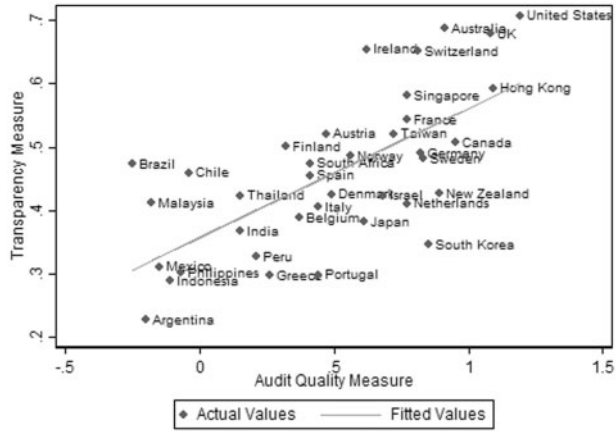

Figure 1. Transparency and audit quality.

Transparency is the measure T1 based on Worldscope data as defined in Section 4.1. Audit Quality is defined in Section 4 and in the Appendix. Both variables are country-level averages of the corresponding firm values.

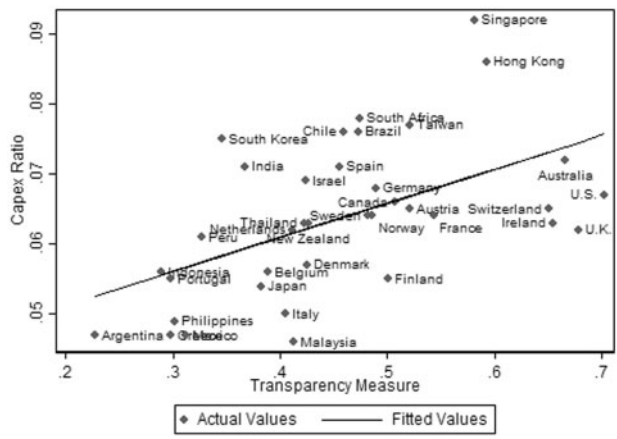

Figure 2. Transparency and investment.

Transparency is the *T1* measure based on Worldscope data as defined in Section 4.1, and averaged across countries. Investment is measured as the 1989–2011 average ratio of capital expenditure to total assets in the previous year.

Switzerland), as opposed to low-transparency countries (such as Portugal, Greece, Argentina). Of course, these cross-country two-way correlations are purely suggestive, and it is still to be seen whether they survive in econometric tests based on firm-level data, to which we turn in the next section.

Transparency is also correlated with country-level financial development, but the magnitude of this correlation is not high. No statistically significant correlation is found instead between statutory (effective) corporate tax rates, audit quality, and financial development.

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Table III reports the number of firms for each of the thirty-seven countries in our sample. As expected, there is a significant variation in the number of firms in each country, with the USA, Japan, the UK, Germany, France, and Australia being the countries with the larger number of firms. Table III also provides information on average statutory corporate taxes over the sample period 1988–2011 and the 5th year corporate effective tax rates.[23] Over this sample period, Germany (46%), Japan (44%), and Italy (almost 40%) have the highest rates, while Hong Kong, Singapore, and Switzerland have the lowest rates. Comparing Column 2 with Column 3, one sees large differences between effective tax rates and statutory tax rates. For example, while Germany and Japan have very high statutory rates, the 5th year effective tax rates are only around 24%and 32%, respectively.

The country-level indicator of audit quality reported in Column 4 differs significantly across countries: it is highest in the USA, Hong Kong, and UK (all with values at or above 1.08) and lowest in Brazil, Argentina, and Malaysia (all with values lower than −0.18). Column 5 shows the average firm-level investment ratio, measured as the 2000–2011 average of Capital Expenditure scaled by Total Assets in the previous year. Columns 6 and 7 present country averages of the two earnings-based transparency indicators (*T1* and *T2*), while Column 8 shows the country averages of the qualitative transparency index. The cross-country differences in accounting transparency are broadly consistent with Leuz, Nanda, and Wysocki (2003). Countries with large stock markets (such as Australia, Canada, the UK, and USA) have consistently high transparency according to all measures, while countries characterized by insiders' control and weak legal enforcement (such as Argentina, Brazil, Greece, India, Italy, and Spain) feature lower transparency.

5. Empirical Results

We start with regressions that test the impact of corporate taxes, audit quality, financial dependence, and financial development on firms' transparency. We then turn to regressions where the dependent variable is firm's investment.

5.1 Transparency Regressions

In Table IV, we report the estimates of two different specifications of cross-sectional transparency regressions. The first set of regressions (Columns 1, 3, and 5) omits country dummies, but includes country-level variables (corporate taxes, audit quality, and financial development), as well as industry fixed effects and firm-level variables (log of initial assets in US dollars, initial book-to-market ratio, and initial leverage, where "initial" refers to the first year for which data are available).[24] The second specification (Columns 2, 4, and 6) includes country dummies, and therefore omits country-level variables.

23 While statutory tax rates measure the rate for the highest bracket of all taxes on corporate income, the effective tax rates take into account deduction provisions of the tax code about depreciation provisions and exemptions, which reduce payable tax. The 5th year effective corporate tax rates are assembled jointly by the World Bank, PricewaterhouseCoopers and Harvard University, and come from a calculation of all relevant taxes applicable to the same standardized firm over the first 5 years after its incorporation operating in each country.

24 We use the initial value of each of these variables, instead of the sample average, to minimize endogeneity concerns.

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Table III. Country-level descriptive statistics

Column 1 reports the number of publicly listed firms in each country used in our sample. Column 2 reports the average statutory tax rate (in %) in each country over the period 1988–2011. The statutory corporate tax rate is defined as the rate for the highest bracket of all taxes on corporate income. Column 3 reports the effective 5th year corporate tax rate obtained from Djankov *et al.* (2010). The effective corporate tax rate takes into account the pre-tax earnings and the actual depreciation charges. Column 4 reports the audit quality measure which is the principal component of indicators of auditing regulation. Column 5 reports investment which is measured as the mean ratio of capital expenditure to total assets in the previous year, calculated over the period 1989–2011. Column 6 reports the measure of Transparency measure 1 (*T1*), based on abnormal earnings smoothing. Column 7 reports Transparency measure 2 (*T2*), which is the (negative values of) abnormal accruals measure of Jones (1991) as modified by Francis *et al.* (2005). Column 8 reports the qualitative transparency index. The bottom row shows the total number of firms for the entire sample, the country-level average values for the statutory corporate tax rate, effective 5th year corporate tax rate, audit quality, and investment, and the firm-level average values for the transparency measures and the qualitative transparency index.

Country	Number of firms (1)	Statutory corporate tax rate (2)	5th year effective corporate tax rate (3)	Audit quality (4)	Investment (5)	Transparency measure 1 (T1) (6)	Transparency measure 2 (T2) (7)	Qualitative transparency index (8)
Argentina	74	34.12	23.80	−0.20	0.047	0.2274	n.a.	1.98
Australia	628	33.40	23.03	0.91	0.074	0.6876	−0.0535	4.86
Austria	165	31.16	21.04	0.47	0.065	0.5205	−0.0607	3.95
Belgium	159	37.87	19.57	0.37	0.056	0.3882	−0.0948	2.92
Brazil	248	25.00	15.49	−0.25	0.076	0.4729	−0.0878	2.28
Canada	490	37.76	25.93	0.95	0.066	0.5072	−0.0726	3.87
Chile	165	25.46	15.09	−0.04	0.076	0.4598	−0.0890	4.02
Denmark	161	32.24	24.53	0.49	0.057	0.4257	−0.0865	3.94
Finland	229	30.72	18.84	0.32	0.055	0.5005	−0.0735	4.25
France	877	36.87	14.42	0.77	0.064	0.5437	−0.0728	3.43
Germany	962	46.00	23.60	0.82	0.068	0.4899	−0.0701	3.68
Greece	89	34.60	19.91	0.26	0.047	0.2974	n.a.	1.7
Hong Kong	318	16.40	12.25	1.09	0.086	0.5932	−0.0582	3.95
India	397	39.27	24.29	0.15	0.071	0.3675	−0.1102	2.01

(continued)

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Table III. (continued)

Country	Number of firms (1)	Statutory corporate tax rate (2)	5th year effective corporate tax rate (3)	Audit quality (4)	Investment (5)	Transparency measure 1 (T1) (6)	Transparency measure 2 (T2) (7)	Qualitative transparency index (8)
Indonesia	95	31.80	21.01	−0.11	0.056	0.2891	n.a.	1.94
Ireland	162	25.92	9.62	0.62	0.063	0.6544	−0.0594	3.89
Israel	143	33.28	25.98	0.68	0.069	0.4240	−0.0868	2.47
Italy	275	39.63	23.82	0.44	0.050	0.4055	−0.1109	2.49
Japan	1,598	44.25	31.64	0.61	0.054	0.3821	−0.0963	2.11
Malaysia	182	30.00	16.13	−0.18	0.046	0.4123	−0.1282	2.1
Mexico	215	33.08	22.48	−0.15	0.047	0.3113	−0.1090	2.98
Netherlands	190	32.54	25.62	0.77	0.062	0.4108	−0.0862	3.62
New Zealand	81	32.04	28.45	0.89	0.063	0.427	n.a.	4.6
Norway	256	31.65	20.33	0.56	0.064	0.4859	−0.0565	3.9
Peru	49	30.00	23.57	0.21	0.061	0.3273	n.a.	2
Philippines	194	33.80	22.88	−0.07	0.049	0.3015	−0.1239	1.98
Portugal	102	34.44	16.10	0.44	0.055	0.2983	n.a.	3.97
Singapore	372	24.60	13.17	0.77	0.092	0.5816	−0.0776	2.86
South Africa	67	32.04	22.69	0.41	0.078	0.4746	n.a.	2.68
South Korea	507	30.12	18.38	0.85	0.075	0.3461	−0.0893	2.52
Spain	322	33.90	18.61	0.41	0.071	0.4554	−0.0808	2.41
Sweden	289	31.40	14.93	0.83	0.064	0.4819	−0.0705	4.1
Switzerland	245	24.98	16.18	0.81	0.065	0.6509	−0.0565	4.18
Taiwan	210	25.00	18.01	0.72	0.077	0.5205	−0.0707	3.79
Thailand	224	30.00	22.26	0.15	0.063	0.4232	−0.0870	2.78
UK	1,592	30.72	21.44	1.08	0.062	0.6786	−0.0522	4.29
USA	1,928	39.23	31.99	1.19	0.067	0.7078	−0.0519	n.a.
Total sample	14,260	32.31	20.73	0.49	0.064	0.4576	−0.0790	3.14

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Table IV. Transparency regressions

This table presents the estimates of a cross-sectional regression model for 14,260 firms from thirty-seven countries. The dependent variables are measures of firm-level transparency calculated over the period 1988–2011 for all firms for which we have at least 6 years of data. The dependent variable, Transparency, consists of various firm-level measures of transparency: in Columns 1 and 2 it is the earnings smoothing measure (*T1*) obtained from the correlation between firm-level (absolute) accounting accruals and operating cash flows over the entire sample period, in Columns 3 and 4 are the (negative values of) abnormal accruals measure of Jones (1991) (*T2*), and in Columns 5 and 6 are the qualitative transparency index. The independent variables are as follows: Corporate Taxes is the average value of the statutory corporate tax rates over the period 1988–2011; audit quality is the principal component of indicators of auditing regulation; financial dependence is the measure of financial dependence from Rajan and Zingales (1998); financial development is the average of the stock market capitalization as % of GDP calculated every year over the period 1988–2011; initial assets is the logarithm of the firm's total assets in US dollars in the first year for which Worldscope provides data; initial market-to-book is the firm's market-to-book ratio in the first year for which Worldscope provides data; and initial leverage is the firm's leverage (total debt divided by total assets) in the first year for which Worldscope provides data. Transparency controls included in Columns 1 and 2 are initial operating cycle, initial PPE divided by assets, and initial average cash flows divided by assets. Standard errors are corrected for clustering at the country and sector level. Asterisks (*, **, and ***) indicate statistical significance (at the 10%, 5%, and 1% level, respectively).

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Corporate taxes	−0.0142**	–	−0.0025**	–	−0.1108***	–
	(−2.10)		(−2.34)		(−2.78)	
Audit quality	0.2918**	–	0.0869***	–	1.4270**	–
	(2.51)		(3.09)		(2.05)	
Financial development	0.0011	–	0.0003	–	0.0064*	–
	(1.40)		(1.22)		(1.89)	
Corporate taxes × financial dependence	0.0134**	0.0159**	0.0021**	0.0025*	0.1209**	0.1911**
	(2.39)	(2.15)	(2.47)	(1.75)	(2.44)	(2.29)
Audit quality × financial dependence	0.8492***	0.9276**	0.1456***	0.1842**	2.817*	2.2910*
	(2.92)	(2.21)	(3.16)	(2.49)	(1.90)	(1.72)
Audit quality × financial development	0.0030	–	0.0010	–	0.0215	–
	(1.54)		(1.40)		(1.58)	
Financial development × financial dependence	0.0047*	0.0062	0.0009	0.0010	0.0352**	0.0172
	(1.91)	(1.57)	(1.43)	(1.26)	(2.16)	(1.52)
Initial assets	0.0288***	0.0361***	0.0041***	0.0057***	0.1592***	0.1802***
	(3.42)	(3.06)	(3.62)	(3.09)	(3.49)	(3.21)
Initial market-to-book	0.1294**	0.1132**	0.0308**	0.0304**	0.5890*	0.6080**
	(2.07)	(2.17)	(2.37)	(2.04)	(1.87)	(2.00)
Initial leverage	0.0486	0.0451	0.0154	0.0126	0.2511	0.2749
	(0.71)	(0.62)	(0.98)	(0.51)	(0.95)	(0.92)
Transparency controls	Yes	Yes	–	–	–	–
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	Yes	No	Yes	No	Yes
Number of observations	14,260	14,260	13,703	13,703	12,332	12,332
R^2	0.46	0.48	0.45	0.48	0.30	0.31

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Each specification is estimated using our three measures of transparency (calculated over 1988–2011 for all firms for which we have at least 6 years of data): the earnings smoothing measure *T1* (Columns 1 and 2), the abnormal accruals measure *T2* (Columns 3 and 4), and the qualitative transparency index (Columns 5 and 6).[25] When using *T1*, we expand the set of firm-level controls for the transparency specification to capture environmental uncertainty (initial operating cycle, initial leverage, initial PPE divided by assets, and initial average cash flows divided by total assets).[26]

In the specification without country dummies (Columns 1, 3, and 5), we find that firms choose greater transparency in countries that have lower corporate taxes, higher financial development, and better audit quality. Hence, the coefficients of all three country-level variables have the expected sign.

In all specifications, the effect of statutory corporate taxes (β_1) on transparency is negative and significant. More importantly, the effect of taxes on transparency is stronger for firms operating in sectors that depend more on external finance: hence, $\beta_2 > 0$, consistently with the model. The coefficient is significant at the 5% level, except for *T2* with country fixed effects, where its significance is 10%. The impact of taxes is sizable: fixing corporate taxes at their average level (32%) and focusing on the industry with average financial dependence[27] (0.44), a one-standard-deviation increase in financial dependence is associated with an increase in *T1* of about 0.10, according to the estimates in Column 2. Since the average value of *T1* is 0.457, this amounts to a 22% increase in transparency relative to the mean. Similarly, increasing the corporate tax rate by one standard deviation (11 percentage points) is associated with a reduction in transparency of 8 percentage points in the Electric Machinery industry, which is at the 75th percentile of external dependence, to be compared with a reduction of around 31 percentage points in the Beverages industry, which is at the 25th percentile of external dependence. We find similar effects using the qualitative transparency indicator and slightly lower effects using *T2*. Overall, the evidence shows that financial dependence attenuates the transparency-reducing effect of taxes.

Another interesting result in Table IV concerns the effect of audit quality on transparency: firms that depend more on external finance tend to choose higher transparency if they are located in countries with better audit quality ($\beta_3 > 0$). The effect is sizable, because an increase of one standard deviation of the strength of audit quality increases transparency (measured by *T1*) by 0.27 standard deviations. In the specification without country dummies also the interaction term between audit quality and financial development is positive, suggesting that transparency incentives are greatest where financial markets are more developed.[28]

It is important to test whether these results are affected by international differences in the degree of book-tax conformity. Indeed, the predictions of our model should apply only

25 The number of firm-level observations when using *T2* and the qualitative transparency measures are fewer than when we use the *T1* measure, as we explain in the data section.

26 We check the robustness of these results by using sales growth as an additional control variable. The results are qualitatively similar to those we report in the article.

27 Being the sample average, this figure effectively weighs financial dependence (which varies only across industries) by the frequencies with which firms are present in the various industries in our sample.

28 Again, the results summarized above do not change when we use other measures of transparency (see Appendix B).

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(or mainly) in countries with high book-tax conformity, and not (or less strongly) in countries where entrepreneurs are not required to produce the same data to tax authorities and investors. To test this prediction, we split the sample based on book-tax conformity. We estimate book-tax conformity for country following the approach by Atwood Drake, and Myers (2010), then split the sample based on the median value across countries.[29] Transparency regressions for the two sub-samples are shown in Table V. For brevity, we report only regressions with country dummies.[30]

Panel A reports the estimates for countries with low book-tax conformity and Panel B those for countries with high book-tax conformity. The size and significance of the relevant coefficients is much stronger for firms where high book-tax conformity exists. For instance, focusing on the estimates reported in Columns 1 and 4, the coefficient of the interaction between taxes and financial dependence (β_3) is not statistically different from zero in countries with low book-tax conformity, while it is positive and significant in those with high book-tax conformity.

We next turn to use the time-series dimension of our sample. We start by plotting in Figure 3 changes in the abnormal accruals measure (*T2*, averaged over all firms in each country) against changes in statutory tax rates, as well as the fitted values obtained from a regression of changes in transparency on changes in statutory tax rates.[31] We rely on the accounting measure of transparency defined as *T2* in the previous section, because for this measure we can compute annual values.[32] Most of the changes shown in the figure are reductions in tax rates, the largest ones being those of Sweden in 1991, Norway in 1992, and Chile in 2000: in each of these three cases the tax rate dropped by 20 percentage points.[33] The graph clearly shows that on average increases in the statutory tax rates are associated with significant decreases in firm-level transparency, and vice versa.

The negative correlation between taxes and transparency shown by Figure 3 is confirmed by panel regression estimates that control for unobserved heterogeneity.

29 Countries with low book-tax conformity are: Australia, Belgium, Canada, Denmark, Germany, Greece, India, Indonesia, Ireland, Mexico, New Zealand, Norway, Philippines, South Africa, Sweden, Thailand, UK, USA. Countries with high book-tax conformity are: Argentina, Austria, Brazil, Chile, Finland, France, Hong Kong, Israel, Italy, Japan, Malaysia, Netherlands, Peru, Portugal, Singapore, South Korea, Spain, Switzerland, and Taiwan. The results are unaffected if the sample split is done using the alternative index provided by Hung (2001) and Ashbaugh and LaFond (2004), and extending their data with information for book-tax conformity for Argentina, Austria, Chile, Greece, New Zealand, and Portugal, drawn from *Corporate Taxes: A Worldwide Summary* of PricewaterhouseCoopers.

30 Results replacing country effects with corporate taxes, and audit quality are similar and not reported for brevity.

31 In Figure 3, the change in transparency in year t is defined as the difference between the average of *T2* in years t, $t+1$, and $t+2$ and the average of *T2* in years $t-1$, $t-2$, and $t-3$. The figure shows these changes in transparency only if at time t the corporate tax rate exceeds 1% in absolute value, to avoid cluttering the picture with many observations close to zero. The t-statistic of the regression coefficient is -6.95.

32 This is not possible for the *T1* measure, which is based on the standard deviations of operating earnings and cash flows, calculated over time.

33 The largest decrease in the sample period is by Austria in 1989, when statutory tax rates declined by 25 percentage points. This observation is not in Figure 3 since we require 3 years of data before the change in the tax rate.

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Table V. Transparency regressions: sample split by book-tax conformity

This table presents the estimates of a cross-sectional regression model for 14,260 firms from thirty-seven countries. Panel A presents results for firms in countries that have low book-tax conformity (Australia, Belgium, Canada, Denmark, Germany, Greece, India, Indonesia, Ireland, Mexico, New Zealand, Norway, Philippines, South Africa, Sweden, Thailand, UK, and USA) and Panel B presents results for countries with high book-tax conformity (Argentina, Brazil, Austria, Chile, Finland, France, Hong Kong, Israel, Italy, Japan, Malaysia, Netherlands, Peru, Portugal, Singapore, Spain, South Korea, Taiwan, and Switzerland). Book-tax conformity is the annual average of the standard error from the regressions of firm-level current tax expense on pre-tax book income and is calculated as in Atwood *et al.* (2010). The dependent variables are measures of firm-level transparency calculated over the period 1988–2011 for all firms for which we have at least 6 years of data. The transparency measure in Columns 1 and 2 is the earnings smoothing measure (*T1*) obtained from the correlation between firm-level (absolute) accounting accruals and operating cash flows over the entire sample period; in Columns 3 and 4 it is the (negative values of) abnormal accruals measure of Jones (1991) (*T2*), and in Columns 5 and 6 is the qualitative transparency index. The independent variables are as follows: corporate taxes is the average value of the statutory corporate tax rates over the period 1988–2011; financial dependence is the measure of financial dependence drawn from Rajan and Zingales (1998); financial development is the average of the stock market capitalization as % of GDP calculated every year over the period 1988–2011; audit quality is the principal component of indicators of auditing regulation; initial assets is the logarithm of each firm's total assets in US dollars in the first year for which Worldscope provides accounting data; initial market-to-book is the value of the firm's market-to-book ratio in the first year for which Worldscope provides data; and initial leverage is the value of the firm's leverage (calculated as total debt divided by total assets) in the first year for which Worldscope provides data. Standard errors are corrected for clustering at the country and sector level. Asterisks (*, **, and ***) indicate statistical significance (at the 10%, 5%, and 1% level, respectively).

Variable	Panel A: low book-tax conformity			Panel B: high book-tax conformity		
	(1)	(2)	(3)	(4)	(5)	(6)
Corporate taxes × financial dependence	0.0120* (1.70)	0.0018* (1.71)	0.1107 (1.30)	0.0241*** (3.49)	0.0039*** (2.98)	0.2857** (2.61)
Audit quality × financial dependence	0.5209* (1.68)	0.1146* (1.72)	1.1809 (1.12)	1.4202*** (3.04)	0.2991*** (3.18)	3.4003** (2.05)
Financial development × financial dependence	0.004 (1.37)	0.0005 (1.21)	0.0114 (1.16)	0.0084* (1.91)	0.0012* (1.72)	0.0231* (1.70)
Initial assets	0.0244*** (3.18)	0.0063*** (3.31)	0.2911*** (2.98)	0.0261*** (3.06)	0.0059*** (3.30)	0.2705*** (2.94)
Initial market-to-book	0.1276** (2.44)	0.0345*** (2.91)	0.9271** (2.49)	0.1199** (2.40)	0.0392** (2.70)	1.0107** (2.40)
Initial leverage	0.0391 (1.06)	0.0144 (1.20)	0.3219 (1.26)	0.0406 (1.05)	0.0134 (1.27)	0.3420 (1.01)
Other transparency controls	Yes	–	–	Yes	–	–
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	7,989	7,657	6,061	6,271	6,046	6,271
R^2	0.32	0.35	0.20	0.51	0.53	0.34

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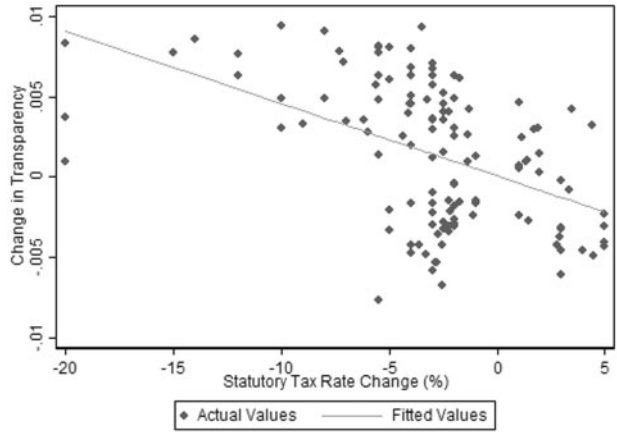

Figure 3. Changes in statutory tax rates and transparency.

The figure plots changes in transparency (*T2*, averaged over all firms in each country) against changes in statutory tax rates, against the fitted values obtained from a regression of changes in transparency on changes in statutory tax rates. The change in transparency in year *t* is defined as the difference between the average of *T2* in years *t*, *t*+1, and *t*+2 and the average of *T2* in years *t*−1, *t*−2, and *t*−3.

All regressions are estimated by a fixed-effect estimator at the firm level, and in all of them standard errors are corrected for clustering at the firm level. The results are shown in Table VI. For robustness, we repeat the panel analysis using two alternative time-varying measures of transparency besides *T2*: the results are reported in the Supplementry Data.

The regression in Column 1 confirms the results of the cross-sectional analysis of Table IV: statutory tax rates affect transparency directly with a negative and significant coefficient, but this effect is attenuated for firms that depend heavily on external finance, as shown by the positive coefficient of the interaction between taxes and financial dependence. In Column 2 we repeat the estimation adding year fixed effects to control for common shifts in transparency due to worldwide events: the results are qualitatively unaffected. The impact of a change in corporate taxes is sizeable: using the coefficients of Column 2, for a country with financial dependence close to the average (0.45, such as Finland), an increase of corporate taxes by 1 percentage point decreases transparency by 0.0014, to be compared with the sample average of 0.07 (a 2% drop relative to the mean).

In Columns 3 and 4 we repeat the estimation separately for countries with high and low book-tax conformity, respectively. Consistently with the cross-sectional estimates of Table V, in countries with high book-tax conformity the coefficient of the corporate tax rate is strongly negative and statistically significant (at the 1% confidence level), whereas it is much smaller and less precisely estimated in countries with low book-tax conformity. Furthermore, the coefficient of the interaction variable between corporate taxes and financial dependence is positive and statistically significant only for countries with high book-tax conformity. The impact on transparency of an increase in the corporate tax rate by 1 percentage point varies in the two sub-samples: at the median level of financial dependence in each group of countries, in the high book-tax conformity group transparency decreases by 0.0011, a decrease of more than 1 percentage point (relative to the sample average of

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Table VI. Transparency regressions—panel regressions

This table presents the estimates of a fixed-effects regression model for 13,703 firms from thirty-seven countries from 1989 to 2011. The dependent variable is the yearly value of the *T2* measure of firm-level transparency for firms for which at least 6 years of data are available. *T2* is the negative value of the abnormal accruals measure proposed by Jones (1991), as modified by Francis *et al.* (2005). In Columns 3 and 4 the sample is split between countries with book-tax conformity above and below the median. Book-tax conformity is the annual average of the standard error from the regressions of firm-level current tax expense on pre-tax book income and is calculated as in Atwood *et al.* (2010). The corporate taxes variable is the yearly value of the statutory corporate tax rate for each country. Financial dependence is defined as in Rajan and Zingales (1998). Total assets is the logarithm of the firm's total assets in US dollars in the previous year. Initial market-to-book is the firm's market-to-book ratio in the previous year. Leverage is the total debt divided by total assets in the previous year. Standard errors are corrected for clustering at the firm level. Asterisks (*, **, and ***) indicate statistical significance (at the 10%, 5%, and 1% level, respectively).

Variable	Total sample	Total sample	High book-tax conformity	Low book-tax conformity
	(1)	(2)	(3)	(4)
Corporate taxes	−0.0023***	−0.0020***	−0.0027***	−0.0011*
	(−3.26)	(−2.91)	(−4.02)	(−1.89)
Corporate taxes × financial dependence	0.0028***	0.0023**	0.0035***	0.0014
	(2.97)	(2.57)	(3.44)	(1.60)
Total assets	0.0095***	0.0086***	0.0079***	0.0082***
	(4.47)	(4.29)	(4.30)	(4.51)
Market-to-book	0.0560**	0.0451**	0.0502***	0.0481**
	(2.49)	(2.21)	(2.71)	(2.58)
Leverage	0.0141	0.0112	0.0122	0.0130
	(1.21)	(1.02)	(1.11)	(1.22)
Year fixed effects	No	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Number of observations	194,108	194,108	85,394	108,714
R^2	0.38	0.40	0.46	0.27

high book-tax conformity countries of 0.094), while the effect is not significantly different from zero in the other group.

The predicted effects of changes in corporate taxes vary across countries also because the mitigating effect of financial dependence differs by country. For instance, compare South Korea, where financial dependence is 0.62, with Austria, where it is 0.43 (both are classified as high book-tax conformity countries). Increasing the corporate tax rate by 1 percentage point reduces transparency by 0.85% in South Korea and by 1.18% in Austria. In other words, the greater financial dependence of South Korean firms dampens their transparency reaction to corporate taxes.

In Figure 4, we provide a more comprehensive view of the impact on transparency following a change in corporate taxes for firms in industries with different financial

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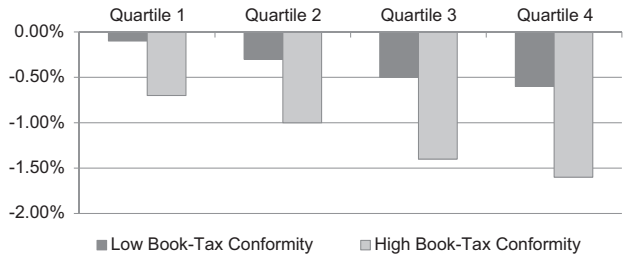

Figure 4. Impact of an increase in statutory tax rates on transparency.

The figure provides estimates from the panel regression shown in Table V run separately for firms domiciled in countries with high and low book-tax conformity. The estimates are shown in Columns 3 and 4 of Table V, respectively. We estimate the predicted change in transparency measure *T*2 following an increase of the statutory corporate tax rate of 1% for firms classified in quartiles based on their industry's financial dependence. Quartile 1 (4) is the quartile with the highest (lowest) financial dependence.

dependence and domiciled in countries with high and low book-tax conformity. Figure 4 measures the impact of a 1% increase in corporate taxes on firms' transparency measures, by quartiles of financial dependence. In each group, firms in countries with high book-tax conformity experience a larger decrease in transparency following an increase in corporate taxation. For example, an increase of 1% in corporate taxes is associated with a decrease of 1.6% in the transparency of firms in the lowest financial dependence quartile in high book-tax conformity countries compared with a decrease of only 0.6% for similar firms in low book-tax conformity countries. Looking across groups, it is apparent that the effect increases with financial dependence. For instance, in the high book-tax conformity group, the change in transparency following a 1% reduction in corporate taxes is 1.5% in the fourth quartile of financial dependence, while it is only 0.7% in the first quartile.

5.2 Investment Regressions

We now turn to the investment regressions: recall that the crucial issue here is the endogeneity of transparency with respect to investment decisions, as highlighted by our model in Section 2. Recall also that, based on the model, audit quality is an exogenous country-level characteristic that affects firm-level transparency, and impacts a firm's investment only via its choice of transparency, and not directly. As such, audit quality has all the features of a valid instrument in IV estimation of investment regressions. By the same token, transparency regressions like those shown in Table IV are natural candidates as first-stage regressions of the investment equation.[34] In addition, audit quality is unlikely to capture the

34 To reduce further the possible endogeneity of transparency, we also estimate an IV regression where in the first stage for transparency we use (i) the estimates based only on the first 12 years of data (1988–99), and (ii) the transparency measure relevant for firm *i* is replaced by the mean value of transparency for firm *i*'s industry in the same (geographic) continent in 1988–99 (excluding from its calculation the transparency of firm *i* itself), the idea being that each firm wants to choose a level of transparency not too distant from that of its competitors. In this specification, in the second stage investment regression we use the estimates based on the last 12 years of data (2000–11). We find that the results in the second stage regressions are quantitatively similar to those shown in Table VII.

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effect of other potential determinants of investment, such as leverage, R&D spending, book-to-market value, and asset tangibility, because in our sample it is not significantly correlated with such variables. Since the investment regressions include both the level of transparency and its interaction with financial dependence and financial development, we use as instruments audit quality and its interactions with these two variables.[35]

Investment is defined as the ratio of capital expenditure to total assets in the previous year. The investment regressions in Table VII are estimated by IV over the period 1989–2011; their corresponding first-stage regressions are those reported in Table IV and already discussed above. Standard errors are corrected for clustering at the country and sector level. Table VII reports six investment regressions: these differ because they are based on different measures of transparency: *T1* in Columns 1 and 2, *T2* in Columns 3 and 4, and the qualitative measure of transparency in Columns 5 and 6. The two specifications in each couple of columns differ by the presence of country dummies. In the specifications with country dummies (Columns 2, 4, and 6), audit quality and its interaction with financial development are perfectly collinear with the country effects, so that the only instrument is the interaction of audit quality with financial dependence. The last row of Table VII shows that the instruments help predict transparency: the *F*-statistic on the first-stage instruments is always higher than 18.

The estimates in Columns 1, 3, and 5 show that, regardless of the measure of transparency used, investment is positively correlated with transparency, and negatively correlated with taxes. The economic impact of an increase in transparency is also significant: keeping financial dependence and financial development at their average values, an increase in transparency (measured as T1, in Column 1) of one standard deviation leads to an increase of investment rate by 0.64 standard deviations. Similar effects are found for the other two measures of transparency. Moreover, financial dependence tends to amplify the effect of transparency on investment, because the coefficient of the interaction term between transparency and financial dependence is positive: as predicted by the model, transparency relaxes financing constraints more for firms that depend more on external finance. The specification with country dummies confirms that this interaction term carries a positive coefficient.

Recall that the sample split reported in Table V showed that transparency is much more strongly correlated with corporate taxes, financial dependence, and especially audit quality in the sample of countries with high book-tax conformity. This suggests that the IV estimates should be more reliable in countries with high book-tax conformity, where our instrument has more power. Therefore, Table VIII repeats the investment regressions separately for the two samples.

We find that the impact of transparency (and of its interactions with financial dependence and with financial development) on investment is much stronger and more precisely estimated for firms that operate in countries with high book-tax conformity. For instance, using the estimates of Column 4 based on the earnings-smoothing measure *T1* of transparency, one finds that an increase of transparency by one standard deviation increases investment by 0.45 standard deviations of the investment rate for countries with high book-tax conformity. The transparency coefficients in Column 1, instead, are smaller in value and not significantly different from zero: transparency has no impact on investment in countries with low book-tax conformity.

35 Since the model is exactly identified, we do not provide a test of the over-identifying restrictions.

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Table VII. Investment regressions—IV estimation

This table presents IV estimates for 14,260 firms from thirty-seven countries. In Columns 1, 3, and 5 the instruments are audit quality and its interaction with financial dependence and financial development. In Columns 2, 4, and 6 the instruments are audit quality and the interaction with financial dependence. The dependent variable is the mean ratio of capital expenditure to total assets in the previous year calculated in 1989–2011. The transparency measure in Columns 1 and 2 is the earnings smoothing measure (*T1*) obtained from the correlation between firm-level (absolute) accounting accruals and operating cash flows over the entire sample period; in Columns 3 and 4 it is the (negative values of) abnormal accruals measure of Jones (1991) (T2), and in Columns 5 and 6 is the qualitative transparency index; transparency × financial dependence is the interaction between measures of Transparency and financial dependence drawn from Rajan and Zingales (1998); transparency × financial development is the interaction between measures of Transparency and stock market capitalization as % of GDP; corporate taxes is the statutory tax rate; initial assets is the logarithm of each firm's total assets in US dollar in the first year for which Worldscope provides accounting data; initial market-to-book is the value of the firm's market-to-book ratio in the first year for which Worldscope provides data; and initial leverage is the value of the firm's leverage (calculated as total debt divided by total assets) in the first year for which Worldscope provides data. Standard errors are corrected for clustering at the country and sector level. Asterisks (*, **, and ***) indicate statistical significance (at the 10%, 5%, and 1% level, respectively).

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Transparency	0.0372***	–	0.2026***	–	0.0092***	–
	(3.18)		(3.40)		(3.58)	
Corporate taxes	−0.0012**	–	−0.0018**	–	−0.0012*	–
	(−2.24)		(−2.52)		(−1.87)	
Financial development	0.0002	–	0.0002	–	0.0002	–
	(1.57)		(1.31)		(1.47)	
Transparency × financial dependence	0.1441***	0.1802**	0.8773***	0.9142***	0.0192***	0.0208***
	(2.81)	(2.60)	(3.14)	(3.04)	(3.59)	(3.44)
Transparency × financial development	0.0002*	–	0.0015	–	0.0012	–
	(1.82)		(1.19)		(0.81)	
Corporate taxes × financial dependence	−0.0008*	−0.0007*	−0.0007*	−0.0007*	−0.0008**	−0.0007**
	(−1.90)	(−1.74)	(−1.88)	(−1.79)	(−2.12)	(−2.01)
Financial dependence × financial development	0.0004	0.0004	0.0003	0.0003	0.0004	0.0004
	(1.27)	(1.29)	(1.01)	(0.97)	(1.00)	(0.99)
Initial assets	−0.0035***	−0.0041***	−0.0032***	−0.0036***	−0.0031***	−0.0032***
	(−5.10)	(−5.29)	(−6.51)	(−6.88)	(−7.28)	(−7.01)
Initial market-to-book	0.0151***	0.0167***	0.0144***	0.0160***	0.0156***	0.0160**
	(3.67)	(3.80)	(3.76)	(3.98)	(3.89)	(4.04)
Initial leverage	−0.0029	−0.0024	−0.0022	−0.0021	−0.0024	−0.0031
	(−1.27)	(−1.26)	(−1.09)	(−1.04)	(−1.24)	(−1.32)
Other transparency controls	Yes	Yes	–	–	–	–
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	Yes	No	Yes	No	Yes
Number of observations	14,260	14,260	13,703	13,703	12,332	12,332
F-test	22.42	23.09	24.97	31.02	18.06	19.78

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Table VIII. Investment regressions, sample split by book-tax conformity

This table presents the estimates of a cross-sectional regression for 14,260 firms from thirty-seven countries. Panel A presents results for firms in countries that have low book-tax conformity (Australia, Belgium, Canada, Denmark, Germany, Greece, India, Indonesia, Ireland, Mexico, New Zealand, Norway, Philippines, South Africa, Sweden, Thailand, UK, and USA) and Panel B presents results for countries with high book-tax conformity (Argentina, Brazil, Austria, Chile, Finland, France, Hong Kong, Israel, Italy, Japan, Malaysia, Netherlands, Peru, Portugal, Singapore, Spain, South Korea, Taiwan, and Switzerland). The dependent variable is the mean ratio of capital expenditure to total assets in the previous year calculated over the period from 1989 to 2011 for firms with at least 6 years of data. The transparency measure in Columns 1 and 4 is the earnings smoothing measure (*T1*) obtained from the correlation between firm-level (absolute) accounting accruals and operating cash flows over the entire sample period; in Columns 2 and 5 it is the (negative values of) abnormal accruals measure of Jones (1991) (T2), and in Columns 3 and 6 is the qualitative transparency index. Transparency × financial dependence is the interaction between measures of Transparency and financial dependence drawn from Rajan and Zingales (1998); Transparency × financial development is the interaction between measures of Transparency and financial development which is the average of the stock market capitalization as % of GDP calculated every year over the period 1988–2011; initial assets is the logarithm of each firm's total assets in US dollars in the first year for which Worldscope provides accounting data; initial market-to-book is the value of the firm's market-to-book ratio in the first year for which Worldscope provides data; and initial leverage is the value of the firm's leverage (calculated as total debt divided by total assets) in the first year for which Worldscope provides data. Standard errors are corrected for clustering at the country and sector level. Asterisks (*, **, and ***) indicate statistical significance (at the 10%, 5%, and 1% level, respectively).

Variable	Panel A: low book-tax conformity			Panel B: high book-tax conformity		
	(1)	(2)	(3)	(4)	(5)	(6)
Transparency	0.0152	0.0925	0.0071	0.0452***	0.2912***	0.0185***
	(1.06)	(1.50)	(0.97)	(3.71)	(3.98)	(2.84)
Transparency ×	0.0756	0.2493	0.0091	0.1844***	1.244***	0.0241***
financial dependence	(0.90)	(1.34)	(1.00)	(3.30)	(3.27)	(3.11)
Transparency ×	0.0001	0.0004	0.0001	0.0003*	0.0019*	0.0002*
financial development	(1.15)	(1.26)	(1.37)	(1.79)	(1.75)	(1.80)
Financial dependence ×	0.0003	0.0014	0.0029	0.0005	0.0028	0.0052
financial development	(1.30)	(1.29)	(1.42)	(1.58)	(1.54)	(1.49)
Corporate taxes ×	−0.0004	−0.0003	−0.0004	−0.0010*	−0.0009*	−0.0012**
financial dependence	(−1.18)	(−1.01)	(−1.22)	(−1.90)	(−1.86)	(−2.09)
Initial assets	−0.0038***	−0.0050***	−0.031***	−0.0040***	−0.0047***	−0.0040***
	(−4.97)	(−6.12)	(−6.09)	(−5.39)	(−4.80)	(−7.47)
Initial market-to-book	0.0127**	0.0149***	0.0162**	0.0136**	0.0144**	0.0158**
	(3.01)	(3.38)	(4.04)	(3.20)	(2.91)	(3.31)
Initial leverage	−0.0030	−0.0024	−0.0028	−0.0038	−0.0030	−0.0039
	(−1.32)	(−1.22)	(−1.28)	(−1.39)	(−1.36)	(1.37)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	7,989	7,657	6,061	6,271	6,046	6,271
R^2	0.21	0.28	0.16	0.35	0.38	0.25

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5.3 Robustness Checks

We check the robustness of our results to several changes in specification. A major concern is that the results may be influenced by economic or legal heterogeneity across countries that are not completely controlled for by the inclusion of country fixed effects. For example, as argued by Leuz, Nanda, and Wysocki (2003), variation in transparency related to firm size, industry composition, or presence of multinationals across countries may bear an impact on our results. Large multinational firms can typically arbitrage differences across tax jurisdictions, strategically transferring resources across subsidiaries located in different countries so as to underreport earnings in high-tax jurisdictions and over-report them in low-tax ones. Our predictions should be far less relevant for these firms.

To address the first concern, we follow Leuz, Nanda, and Wysocki (2003) by re-estimating our regressions separately for large and medium-small firms. We find that the results of Tables IV and VII are stronger for medium and small companies than for large ones, for both transparency and investment regressions. This accords with expectations, considering that large firms should be in a better position to legally arbitrage tax rules across jurisdictions without a significant impact on transparency.

We further explore the robustness of our results to differences in product market competition across industries. High product market competition may deter firms from being transparent, for fear of giving out valuable information to their competitors. But we find that our results hold both in industries where product market competition is high and in those where it is low, although they are slightly stronger in the latter.

We also exclude countries that could be driving the results because they are overrepresented in the sample. We first exclude from our regressions US firms because Compustat data are arguably of different quality than Worldscope data. We also repeat the estimation excluding all countries with the largest number of companies, i.e., Japan, the UK, and the USA.[36]

Finally, we check the robustness of the results to the type of corporate tax rates that we use for our regressions. Recall that we use the statutory corporate tax rates, which can be criticized because these tax rates may differ from those that firms effectively face given the deductions allowed by each country's tax code. We check the robustness of our results using the effective 5-Year Corporate Tax Rate from Djankov *et al.* (2010). Broadly speaking, we find that results become stronger (both statistically and economically) when using Effective 5th Year Corporate Tax Rate.

6. Conclusions

A large literature documents the link between the degree of firm transparency, the cost of capital, and the availability of external funds. Also the effect of taxes on the investment decisions of firms has been extensively studied. But previous research has overlooked the fact that taxes may reduce the degree of transparency chosen by firms, and through that channel reduce their access to finance and investment, insofar as "book-tax conformity" forces firms to produce the same set of accounts for tax inspectors and for investors.

36 We exclude firms in South and Central American countries, which suffered high monetary instability in most of our sample period, so that their accounting data may be clouded by inflation. We find that our main results remain broadly unchanged in these three different specifications.

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The contribution of this article lies precisely in analyzing these linkages between taxes, transparency, access to finance and investment. Using a simple model with distortionary taxes and endogenous credit rationing, we show that there is a tradeoff between the funding benefits and the tax costs of transparency, and that this tradeoff depends on the level of corporate tax rates, the quality of auditors, the degree of "book-tax conformity", the cash flows from companies' asset base, and the degree of financial development of the economy surrounding the firm. Hence, analyzing this tradeoff generates rich empirical predictions regarding how each of these variables affects firms' choice of accounting transparency, investment, and external funding.

We test these predictions using the Worldscope database, which allows us to compute different measures of transparency. The evidence largely accords with the model's predictions. First, firm-level transparency correlates negatively with tax pressure and positively with audit quality; moreover, the negative effect of taxes on transparency is weaker in industries where firms depend more on external finance. Second, investment is greater in firms that feature greater transparency and lower in firms that face a heavier tax burden, controlling for a variety of firm characteristics and for sector and country effects. Third, these results are much stronger in countries that prescribe "book-tax conformity", so that choosing greater transparency is more likely to expose them to the unwelcome attention of tax enforcement agencies.

Supplementary Material

Supplementary data are available at Review of Finance online and also at http://www.revfin.org/supplemental.html.

Appendix

1. Audit Quality

The audit quality variable is the principal component of the following country-level indicators drawn from survey data collected by the International Federation of Accountants: (i) Independence, which indicates the presence of a non-government audit standard setting body; (ii) Audit Oversight and Power, i.e., whether the country has an audit oversight authority; (iii) Audit Partner Rotation, i.e., whether audit partners engaged in the firm's audit are required to rotate across years; (iv) Fixed Audit Term, to indicate whether auditors are appointed by firms for a fixed period of time; (v) Joint Audit, i.e., whether joint audit of listed firms is required; (vi) Auditors' Continuing Obligations, i.e., ongoing requirements, such as continuing education, for auditors to retain a license; (vii) Audit Quality Assurance, i.e., whether any organization of professional auditors organize a program to monitor compliance with accounting, reporting, and auditing requirements; and (viii) Experience, i.e., the number of years the country's standard-setting body has been in existence.

2. Book-Tax Conformity

Following Atwood, Drake, and Myers (2010), we model a country's book-tax conformity as the average of the firm-level amount of variation of the current taxation expenditure which is not explained by variation in pre-taxation earnings in a given country-year. Atwood, Drake, and Myers (2010) define book-tax conformity "as the flexibility that a

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firm has to report taxable income that is different from pre-tax book income." They argue that countries that allow firms a higher level of flexibility in the reporting of taxable income given a particular level of financial pre-tax income should require lower book-tax conformity. Following this approach, we measure book-tax conformity as the conditional variance of (current) tax expense from the following model for firm i in country c in year t:

$$TE_{ict} = \gamma_0 + \gamma_1 PTBI_{ict} + \gamma_2 ForPTBI_{ict} + \gamma_3 DIV + \varepsilon_{ict},$$

where TE is the current tax expense, PTBI is the pre-tax book income, ForPTBI is an estimate of the foreign pre-tax book income, DIV is the total dividends, and ε is an error term with mean zero. We divide each variable by total assets. The measure of book-tax conformity is calculated as the root mean-squared errors (RMSEs) obtained from country-year estimates. A higher (lower) RMSE indicates lower (higher) book-tax conformity.

It should be noted that ForPTBI controls for foreign earnings of multinational firms (their earnings may be taxed at different rates than the domestic corporate tax rate) and DIV for any cross-country differences in tax expense due to dividend distributions. Importantly, Atwood, Drake, and Myers (2010) find that their country rankings of book-tax conformity do not change when they exclude ForPTBI or DIV from the estimation.

3. Transparency Measures

3.1 MEASURES USED IN CROSS-SECTIONAL REGRESSIONS

For further robustness checks, we also produce four alternative measures of transparency from the Worldscope data, beside those described in Section 4. The first two measures are used for robustness checks in the cross-sectional specification; the other two measures are used for robustness checks in the panel regression.

The first robustness measure captures earnings smoothing based on the contemporaneous correlation between accounting accruals and operating cash flows. Insiders can try to hide shocks to the firm's cash flows by increasing such correlation.[37] We call this measure $T3$ and it is measured as the correlation between firm-level (absolute) accounting accruals and operating cash flows over the entire sample period. The second robustness measure is based on Leuz, Nanda, and Wysocki (2003) and defined as (the negative of) the absolute value of total accruals divided by the absolute value of cash flow from operations. We call this measure $T4$. In Table IA 1 (in the Supplementry Data) we report results obtained using $T3$ and $T4$ for our cross-sectional regressions.

3.2 MEASURES USED IN PANEL REGRESSIONS

The measure $T2$ that we use for the baseline regressions disentangles abnormal accruals from normal ones using the modified Jones (1991) approach, as proposed by Francis *et al.* (2005). The abnormal accrual for firm j in year t is the (absolute value of) residual $\upsilon_{j,t}$ from the following regression, which is estimated separately for each of the ten Fama-French

37 Although Dechow (1994) shows that a negative correlation between accruals and cash flows may result from the accrual accounting itself, larger correlations have been found to be related to smoothing of earnings unrelated to true firm's performance (Myers, Myers and Skinner, 2007).

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(1997) industry groups and each calendar year t (where all variables are normalized by total lagged assets):

$$\mathrm{TA}_{jt} = \phi_{0j} + \phi_{1j}(1/\mathrm{Assets}_{jt-1}) + \phi_{2j}\Delta \mathrm{Re}\, v_{jt} + \phi_{3j}\mathrm{PPE}_{jt} + \upsilon_{jt},$$

where TA_{jt} is firm's j total accruals, $\Delta\mathrm{Rev}_{jt}$ change in revenues, $\Delta\mathrm{AR}_{jt}$ change in account receivables, and PPE_{jt} gross value of property, plant, and equipment in year t.

As robustness checks we use, first, the performance-augmented-modified Jones (1991) measure discussed above and, second, the modified Dechow and Dichev (2002) model. The latter measure is obtained through the following model, where all variables are normalized by total lagged assets:

$$\mathrm{TCA}_{jt} = \phi_{0j} + \phi_{1j}(1/\mathrm{Assets}_{jt-1}) + \phi_{2j}\mathrm{CFO}_{jt-1} + \phi_{3j}\mathrm{CFO}_{jt} + \\ + \phi_{4j}\mathrm{CFO}_{jt+1} + \phi_{5j}\Delta \mathrm{Re}\, v_{jt} + \phi_{6j}\mathrm{PPE}_{jt} + \upsilon_{jt},$$

where $\mathrm{TCA}_{j,t}$ is the total current accruals and CFO_{jt} the cash flow from operations.

In Table IA.2 of the Supplementry Data we report results obtained using the performance-augmented-modified Jones (1991) measure, and the Dechow and Dichev (2002) measure for our panel regressions.

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