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Legal and Institutional Barriers to Optimal Financial Architecture for New Economy Firms in Developing Countries

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Abstract

This paper reviews the obstacles for an appropriate financial architecture of new economy firms in developing countries by reviewing the theoretical and some preliminary empirical underpinnings of the importance of legal and institutional barriers. Apart from the more conventional institutional and legal barriers, which are advanced by the recent law and finance literature, the analysis in this paper focuses on the importance of the ICT environment, as a potentially important barrier to the development of the business sector in general, and new economy firms in particular. This preliminary analysis confirms the importance of this ICT environment for asset allocation (and the creation of intangibles) for the financial structure and, ultimately, for firm growth.

Keywords: developing countries, new economy, ICT, law and finance, legal constraints

JEL classification: G31, G32, K10, O4

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Figures and tables appear at the end of the paper.

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1 Introduction

This paper addresses some important aspects of the financial architecture of new economy firms in developing countries and analyses which legal and institutional barriers exist for its financial architecture to be optimal. The concept of ‘financial architecture’ was first introduced by Myers (1999: 138), according to whom the term refers to ‘the entire financial design of the business, including ownership, the legal form of organization, incentives, financing and allocation of risk’. As such, the term incorporates, among others, issues of capital structure, corporate control and corporate governance. Myers states that most of corporate finance theory and practice has developed with a particular financial architecture in mind, i.e. that of a public corporation in a country like the USA or UK with well-developed security markets, but that (even in those countries) there are other distinct financial architectures present and successful. He points out that financial architectures that depend on active and risk-tolerant capital markets, in turn depend on adequate information such as financial reporting, basic protection for investors, enforceability of contracts, and law and regulation in general (Myers 1999: 139).

In this paper, we extend the model of Cassimon and Engelen (2001), who analyse the optimal financial architecture for the so-called ‘new economy’ firms in high-income OECD countries, to developing countries. They suggest that new economy firms need a distinct and different optimal capital structure and corporate control or corporate governance mechanisms compared to more traditional firms. In their analysis, they focus on a major type of new economy firms, namely the (relatively) small, start-up firms with considerable real option characteristics embedded in their operations, and with a high degree of co-investment of human and financial capital. It is shown that optimal financial architecture typically includes mechanisms with in-built option characteristics, such as the use of near-equity financing instruments (convertible bonds, or bonds-cum-warrants, which are all debt financing vehicles with in-built financial options) and the use of stock options. When analysing new economy firms, it is clear that they are characterized by their growth opportunities as embedded in their real options. It can be expected that the optimal financial architecture for new economy firms is, in principle, not different for developing countries. This paper focuses on the existence of weak legal framework and state of financial development and high uncertainty as barriers for new economy firms to move to their optimal financial architecture.

2 Characteristics of new economy firms in developing countries

It is clear that there exists no exact definition of a typical new economy firm. The term is used to refer to a wide variety of firms that are active in a high-tech sector (ICT, biotechnology) and exhibit characteristics such as a high level of real option projects, a high burnrate, etc. In this paper we mainly focus on new economy firms from the ICT sector. While the development of new information and communications technologies (ICT) is well documented in developed countries, its diffusion in developing countries is not yet well researched. This section gives an overview of the ICT infrastructure, the diffusion of personal computers, internet and mobile telephones in developing countries.

Table 2 gives an overview of the worldwide ICT environment. It gives an indication of the worldwide telecom and internet development level. Traditional measures for the development of the telecom sector in a country are the number of fixed telephone subscribers and the number of mobile phones per 1000 people. As can be seen this figure ranges from just 41

(low-income countries) to 548 (high-income countries) for fixed telephones and from 12 (low-income countries) to 592 (high-income countries) for mobile phones (see panel II of Figure 2). This means that the fixed lines density in low-income countries is only 7 per cent of the density in high-income countries, while the mobile phones density in low-income countries is even lower (2 per cent of high-income density). The number of fixed lines varies from only 2 per 1000 people in Cambodia to 700 per 1000 people in the US (see Table 3), while the number of mobile phones varies from 1 per 1000 people in Bangladesh to 737 per 1000 people in Italy. A mobile telephone network is not yet active countries such as Ethiopia and Nigeria. Interesting, however, is the fact that developing countries lacking the infrastructure of fixed lines, skip the expansion of the fixed lines infrastructure and directly move to the development of mobile telephone networks. Although the ratio of mobiles versus fixed lines is the highest for high-income countries (e.g., the ratio amounts 1.55 in Italy or 1.23 in the UK), especially African countries exhibit more mobile than fixed telephone subscribers (e.g., the ratio is equal to 1.67 in Cameroon and Côte d'Ivoire and 2.67 in Uganda). Figure 1 gives an overview of the relationship between the fixed telephone density and the mobile density.

Besides the telecom environment, the level of development of internet and computer availability is also of crucial importance for new economy firms. Good measures for this development are the number of personal computers and the number of internet users per 1000 people. Although the numbers of internet users is estimated to be around 315 million (ITU 2002), there is a huge digital gap between developed and developing countries. While almost a third of the population in developed countries are online (see column [e] in Table 2), this figure shrinks to less than 9 per cent for upper middle-income countries, less than 3 per cent for lower middle-income countries and only 0.4 per cent for low-income countries. While Nordic countries have the highest level of internet penetration (e.g. 45 per cent penetration in Sweden), it is non-existing in Ethiopia and virtually non-existing in countries like Cambodia, Bangladesh, Haiti or Albania (see Table 3). When looking at the level of development of the highly-skilled IT job market and the legal environment of ICT necessary for the development of new economy businesses, again, a huge digital gap exists between developed and developing countries. While the index of the highly-skilled IT job market is about 6 for high-income countries, it is less than 4 for low-income and lower middle-income countries (see column [f] in Table 2). It ranges from 2.2 in Romania to 6.7 in the US.¹ The same goes for the legal environment (see column [g] in Table 2).

The gap between developed and developing countries with respect to the ICT environment becomes even more clear when we compare, for instance, Columbia to Sweden. While the number of mobile phones totals over 700 per 1000 in Sweden and is even higher than the number of fixed telephones (682 per 1000), the number in Colombia is only 53 and 169 respectively. The same goes for the number of PCs and internet users: 507 and 455 per 1000 people in Sweden versus 35 and 21 per 1000 people in Colombia. Moreover, in Sweden about 62 PCs are installed in education, whereas this number decreases to 3 in Colombia. It is therefore not surprising to see that the index referring to the level of skilled IT job market is 6.1 in Sweden compared to only 3.3 in Colombia. Several other indicators confirm this picture: internet speed and access (6.4 versus 3.8), internet effects on business (4.0 compared to 3.2), competition in ISPs (6.6 versus 4.7) and laws relating to ICT use (5.7 compared to

¹ Note however that this index is not available for several African countries.

3.8).² Again, looking at ICT expenditures, similar conclusions can be drawn. While Sweden invests about US\$ 24,874 million in ICT (or US\$ 2,804 per capita), Colombia only invests US\$ 10,434 million (or US\$ 231 per capita).

3 Law and finance

The importance of the institutional and legal environment for the development of these markets and economic growth only recently attracted attention of research in corporate finance, in particular in the so-called law and finance literature. This new research area was initiated by the seminal papers of La Porta *et al.* (1997, 1998). These papers focused on investigating the relationship between a country's legal framework and its financial development. Their analyses focus on company laws and bankruptcy/reorganization laws.

In their first paper, La Porta *et al.* (1998) examine whether laws on investor protection differ across countries and whether these differences matter for corporate finance. Investors' rights, in La Porta *et al.* (1998), are both shareholder rights as well as creditor rights. The different bundles of rights to which an investor is entitled are determined by laws and are not inherent in the securities themselves, implying that legal rules matter. In line with comparative legal scholars, La Porta *et al.* (1998) classify the national legal systems of 49 countries into four families of law.³ Their results show that investor protection is determined by the legal family to which a country belongs.

In a follow-up paper La Porta *et al.* (1997) show that the legal environment is highly relevant for the size and extent of a country's capital markets. An investor is only willing to surrender funds to a company in exchange for securities, if he is protected against expropriation by management. A good legal environment, as measured by both legal rules and the quality of enforcement, therefore expands the ability of companies to raise external finance through either debt or equity. Using three equity measures (ratio of stock market capitalization to GNP, the number of listed domestic companies and the number of initial public offerings) their regression results show that low shareholder protection causes smaller equity markets as well as lower access of firms to external equity. Similar results are found with regard to the debt market. Using two different indicators,⁴ their results show that debt finance is more accessible in common law than in French civil law countries. To conclude, La Porta *et al.* (1997) offer strong evidence that the legal framework has a large effect on the size and the breath of capital markets across countries. Other papers finding similar relations between the legal framework and financial development include Carlin and Mayer (1999) and Demirgüç-Kunt and Maksimovic (1998).

² Ratings from 1 to 7 (highest is best) for Sweden and Colombia respectively, for the year 2000. Based on data provided by World Bank and ITU.

³ Historically speaking, common law is case law developed by precedents from judicial decisions. Common law countries include the UK, the United States, Canada and British colonies. Civil law countries, on the contrary, are characterized by the codification of abstract rules and rely heavily on legal scholars. Civil law countries can be divided into three families: French (a.o. France, Belgium, Spain, Portugal and several Latin American countries), German (a.o. Germany, Austria, Czechoslovakia, Hungary, Italy and Switzerland) and Scandinavian.

⁴ The total bank debt of the private sector and the total face value of corporate bonds, both relative to GNP.

Examining the impact of property rights and the enforcement of these laws using a sample of 39 countries, Claessens and Laeven (2001) extend the existing law and finance literature. Their empirical results not only show that weaker legal frameworks diminish the availability of external resources, but also show an asset-substitution effect, i.e. the investment in more fixed assets relative to intangible assets compared to firms operating in a strong legal environment, because of weaker (intellectual) property rights. This is of crucial importance for new economy firms because such firms depend heavily on the investment in intangible assets. An over-allocation of resources towards tangible assets will then impede future growth opportunities of such firms. Especially for new economy firms the asset substitution will be as important as the finance effect of a weak legal framework. Their overall results show that weaker property rights are associated with lower firm growth because of these two effects: less financing and underinvestment in intangible assets. Again, this paper adds to the growing amount of evidence provided by the law and finance literature that the legal framework matters and that it is of crucial importance for explaining financial behavior of companies and investors.

The finding of the law and finance literature that the legal environment is a crucial factor contributing to the development of financial markets, is important because recent research shows a clear link between the development of financial markets and economic growth. Several recent empirical studies find a link between financial development and economic growth. King and Levine (1993) find a relationship between indicators of financial development and indicators of economic growth. The empirical results in Levine and Zervos (1998) show a statistically significant relationship between initial stock market development and subsequent economic growth. Similar results are reported by Rousseau and Wachtel (1998) and Van Nieuwerburgh and Buelens (2000). Financial development can enhance subsequent economic growth in several ways (Levine 1997 and Beck, Levine and Loayza 2000): enhanced savings, capital accumulation, efficiency improvements and technological innovation. The link between legal framework and economic growth is clear: investor protection enhances financial development, which in turn accelerates economic growth (see Figure 2). So, from a development point of view, the legal framework is an important element for creating economic growth. A seminal recent analysis of this direct link between financial development, financing structures, legal framework and firm growth is presented in the work of Rajan and Zingales (1998).

4 Legal and institutional barriers in developing countries

The previous section demonstrated that the law and finance literature, combined with the finance-growth literature, convincingly shows that the legal framework is an important precondition for the development of financial markets and the creation of economic growth. This section examines whether developing countries are characterized by a weaker legal framework, weaker law enforcement and poorer property rights. To the extent that such poorer legal and institutional framework leads to an impediment of growth opportunities or real options of firms, this will lead to less economic growth at the aggregate level of developing countries. This will especially be the case for new economy firms that depend heavily on the existence of capital markets, investment in intangible assets and so on. If the legal framework in developing countries is inadequate for the optimal financial architecture of such firms, the digital gap between developed and developing countries will widen further.

Figure 2 shows the impact of three elements of the legal framework on the financial architecture of new economy firms and hence on economic growth: (i) sufficient financial

resources, (ii) adequate protection of intellectual property and (iii) adequate ICT laws enhancing the institutional and technological framework for new economy firms. First, as Cassimon and Engelen (2001) show the existence of new economy firms depends on adequate financing possibilities. Given the high burnrate and the presence of many real growth options, the adequate financing of such firms occurs through the use of near-equity instruments such as (naked) warrants or convertible debt or through sequential financing by business angels and venture capitalists (Cassimon and Engelen 2002). The availability of these financial instruments and the supply of venture capital depend on the existence of well-developed capital markets. Myers (1999) points out that venture capital markets will only work if there a stock market exists that accepts initial public offerings (IPOs) by young high-tech companies. The existence of a stock market for growth companies such as NASDAQ offers venture capitalists the possibility of an exit from these firms at the time of the IPO (Black and Gilson 1998). Moreover, also entrepreneurs, who commit their entire (human) capital in a start-up company, will only do so ex-ante if they can share in the ex-post profits through an exit on a stock exchange (Myers 1999). Technological innovation and growth, therefore, depend on the development of financial markets, which in itself depends on the legal framework.

Second, the development of new economy depends heavily on the investment in intangible assets. To the extent that intellectual property rights are not well protected, Claessens and Laeven (2001) document an asset-substitution effect, which implies that in countries with a weak legal framework on intellectual property, an over-allocation of resources towards tangible assets occurs. Because the growth of new economy firms depends heavily on real growth options, this asset-substitution will impede the development of such firms.

Finally, the development of new economy firms also depends on the quality of ICT laws creating an adequate technological and institutional framework for these firms. It concerns laws relating to electronic commerce, digital signatures and consumer protection.

Table 4 gives an overview of several legal and institutional constraints which can impede the growth of new economy firms in developing countries. The data presented here are mainly the results of firm-level surveys, i.e. the *World Business Environment Survey* (WBES) conducted by the World Bank for 80 countries. First, columns [a] to [d] represent four barriers to the optimal amount of investment in intangible assets. The first variable measures the protection of intellectual property and analyses whether or not copyrights, patents and trademarks are violated by competitors. It appears that the protection of these intellectual property rights is indeed more problematic in developing countries (2.28, 2.61 and 2.44) than in high-income countries (1.90) (see column [a] of panel II of Table 4). Remarkably, the protection of these rights is less problematic in the lowest income countries. If banks and financial institutions demand collateral for providing financing, again, financing for new economy firms is problematic because of the intangible nature of such firms. As Table 4 shows the provision of collateral becomes increasingly problematic for developing countries (ranging from 2.50 to 2.63, compared to 2.13 for high-income countries). As new economy firms invest heavily in intangible assets, adequate financial reporting becomes increasingly important to value investments in goodwill and other intangible assets. As can be seen from columns [c] and [d] of Table 4, the quality of accounting standards decreases sharply with the level of income of a country, which can further impede the development of new economy firms in developing countries because shareholders and financial institutions face higher uncertainty about the fundamental value of such firms.

Next, Table 4 analyses whether the level of corruption is more of a problem in obtaining sufficient financial resources in the developing countries. Columns [e] and [n] measure the level of corruption of bank officials and the general level of corruption of a given country. As can be seen, corruption is becoming increasingly problematic in developing countries (ranging from 2.36 for upper middle-income countries to 2.89 for low-income countries, compared to only 1.60 for high-income countries)⁵.

Besides the mere existence of legal rules, La Porta *et al.* (1997, 1998) show that the enforcement of such rules is of equal importance. Therefore, variables [g] through [l] of Table 4 examine the enforcement of legal rules in developing countries. Table 4 reports the general quality of courts, the fairness and impartiality of courts, the honesty and non-corruptiveness of courts, consistency of the court's decisions, enforcement of the court's rulings and the confidence in the legal system for upholding one's rights. This legal constraints can be summarized in column [n] which measures how problematic is the functioning of the judiciary for the operation and growth of one's business. This general legal constraint is again higher for developing countries (ranging from 2.13 to 2.26 for developing countries compared to only 1.79 for developed countries).

Finally, column [o] of Table 4 reports the impact of the ICT laws relating to electronic commerce, digital signatures and consumer protection. It shows that ICT laws are well-developed and enforced in high-income countries (5.12) compared to low-income countries (2.91). Again, these results suggest that e-commerce is less well protected in developing countries which, on top of the financing and asset allocation constraints, impedes the development of new economy firms (see Figure 2). Figures 3 and 4 give a graphical representation of the relationship between legal and institutional barriers and the ICT environment and asset allocation.

5 Empirical analysis of legal barriers for new economy firms

This section provides some preliminary empirical tests of the issues discussed so far, using firm-level data, as drawn predominantly from former research discussed in the previous sections.

5.1 Hypotheses

As outlined earlier, the general discussion of the previous sections focused on three main channels: lack of adequate protection of intellectual property depressing the creation of intangible assets, lack of well-developed financial markets to provide adequate and sufficient financing, and lack of adequate ICT laws that would enhance the overall institutional and technological framework for these new economy firms. This section presents empirical tests for each of these three channels in order to assess the importance of the (absence of an appropriate) legal and institutional framework as potential barriers to the development of a new economy sector in developing countries.

⁵ Table 5 reports the numbers for individual countries.

5.1.1 *The impact of constraints on the investment in intangible assets*

First, we analyse to what extent the use of intangibles (expressed as the share in total assets) is influenced by both general and New Economy-type specific legal and institutional barriers.

Four different types of legal barriers are taken into account and their effect analysed separately: (i) the efficacy of the overall judiciary system, (ii) the efficacy of ICT laws, (iii) the collateral requirements demanded by banks and financial institutions, and (iv) the level of corruption. Furthermore, variables are added to account for the specific position of the ICT sector with respect to the use of intangibles and to account for firm size. The ICT sector-specific effect of these different barriers is analysed separately by multiplying the barrier variable with the ICT sector dummy variable. Country dummies are included. The estimated equation is the following:

$$\text{Intangible assets/total assets} = \alpha + \beta_1 \text{ ICT (or alternatively barrier}_i \cdot \text{ICT)} + \beta_2 \text{ Judiciary system (or alternatively Collateral, ICT Laws, Corruption)} + \beta_3 \text{ Size} + \beta_{4,n} \text{ Country dummies} + \varepsilon.$$

ICT-sector ICT is a dummy variable that takes the value 1 if the firm is from the ICT sector and zero if not (based on a two-digit industry code). Judiciary is an indicator of the functioning of the judiciary and ranges from 1 to 4 (lowest is best), ICT laws is an indication of the efficacy of laws relating to electronic commerce, digital signatures and consumer protection and ranges from 1 to 7 (highest is best), corruption is an indication of the corruption of bank officials and ranges from 1 to 4 (lowest is best), and collateral is an indication of the collateral requirements demanded by banks and financial institutions and ranges from 1 to 4 (lowest is best). Size is the logarithm of total assets.

5.1.2 *The impact of constraints on the availability and use of long-term and short-term debt*

Next, we analyse to what extent financial structure is influenced by these legal indicators. Two different indicators are used separately to proxy for financial structure and check for robustness of the results obtained. The first is the ratio of long-term debt over assets; the second is short-term debt over total liabilities. The legal and institutional factors accounted for here are again judiciary system (an indicator of the functioning of the judiciary ranging from 1 to 4, where lowest is best), and the presence of corruption to influence financing (using an indication of the corruption of bank officials and ranging from 1 to 4, with lowest is best). Furthermore, we also control for the importance of intangibles (as measured by the ratio of intangibles over total assets) and/or for the relative importance of capital expenditures (as a share in total assets). Again, we also account for the specific position of the ICT sector (the ICT dummy, or alternatively by including the ICT sector-specific effect of these different barriers through multiplying the barrier variable with the ICT sector dummy variable) and for firm size. The estimated equations are the following:

$$\text{Ltdebt/assets (or, alternatively STdebt/liabilities)} = \alpha + \beta_1 \text{ ICT (or alternatively barrier}_i \cdot \text{ICT)} + \beta_2 \text{ Judiciary (or alternatively Collateral)} + \beta_3 \text{ Intangibles/total assets (or alternatively capital expenditures/total assets)} + \beta_4 \text{ Size} + \beta_{5,n} \text{ Country dummies} + \varepsilon.$$

5.1.3 The impact of constraints on firm growth

Finally, we test for the influence of these legal, institutional and ICT barriers on firm growth.

We account for the efficiency of ICT laws, the collateral requirements, the presence of corruption, the overall quality of the judiciary system. Again, we also control for the importance of intangibles (as measured by the ratio of intangibles over total assets) and/or for the relative importance of capital expenditures (as a share in total assets), and account for the ICT dummy effects and for firm size separately. The estimated equation is the following:

$$\text{Firm growth} = \alpha + \beta_1 \text{ICT (or alternatively barrier}_i \cdot \text{ICT)} + \beta_2 \text{Judiciary (or alternatively ICT Laws, Corruption or Collateral)} + \beta_3 \text{Intangibles/total assets} + \beta_4 \text{Capital expenditures/total assets} + \beta_5 \text{Size} + \beta_{6,n} \text{Country dummies} + \varepsilon.$$

Firm growth is expressed as the average percentage real change in firm sales over three years (1996-98); real growth figures use PPI data.

5.2 Data description

Data are assembled from a variety of sources. Most of the data on institutional and legal barriers (the variables Collateral, Corruption, Judiciary) are obtained from the WBES database. The WBES is a recent database, developed by the World Bank, incorporating a large sample of firm-level survey type data for 81 countries, many of which are developing countries. They are qualitative data providing subjective information on the extent to which entrepreneurs perceive different institutional and legal aspects as being problematic to the development of their business. Country averages are used in the regressions. A detailed description of the variables is given in Table 1. Data with respect to the efficacy of ICT laws come from the World Economic Forum's *Global Competitiveness Report* (2001-2). Table 6 provides information on the correlation of the variables used in the empirical analysis.

Firm-level data on intangible assets, debt, and firm growth are WorldScope (WorldScope CD-Rom 1999), as used also by Claessens and Laeven (2001). WorldScope provides firm-level accounting data for a sample of listed companies-only for a set of 51 countries. Data used in the regression are for 1998, except for data on sales, for which we use the 1996-98 period to construct average growth rates. Matching both datasets and selecting only firms with three years of data (to construct the average growth variable) provides a dataset of relevant firm-level data for 2888 firms in 25 countries.⁶

5.3 Empirical results

In this section we present the results of the regression models of the previous section 5.1. We start with the discussion of the results of the impact of legal, institutional and ICT barriers on the presence of intangible assets, which is important for new economy firms, as shown in Table 7.

⁶ Argentina, Brazil, Canada, Chile, China, Colombia, Czech Republic, France, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Portugal, Russia, Singapore, Slovakia, Sweden, Thailand, US and Venezuela.

Table 7 reports our univariate and multivariate regressions to test for the impact of legal and institutional constraints on investments in intangible assets, measured as the amount of intangible assets over total assets. As dependent variables we test for the impact of collateral (column [1] of panel A), corruption of bank officials (column [1] of panel B), the functioning of the judiciary (general legal constraint; column [1] of panel C), and the overall efficacy of laws relating to the ICT sector, such as e-commerce and digital signatures (column [1] of panel D).⁷ We find that each of the constraints is highly significant, indicating that legal and institutional constraints have an important impact on the asset structure of companies. The variable collateral has a negative sign and is very significant, indicating that stringent requirements on collateral indeed depress the use of intangibles. This is not surprisingly as only tangible assets can serve as collateral. Furthermore, more legal constraints as proxied by JUDS show a negative impact on the fraction of intangible assets as well. This is in line with Claessens and Laeven (2001) who report an asset-substitution effect in case of lower protection of property rights. Next, the variable indicating the quality of ICT laws is positive and very significant: high (poor) quality of ICT laws leads to an increased (depressed) use of intangibles (as a share of total assets). To test for robustness, we include sector (column [2]) and country dummies (column [4]). The above results remain the same. As could be expected ICT companies tend to have a higher fraction of intangible assets, but, more importantly, the legal and institutional constraints are more problematic for ICT companies (columns [3] and [6]). Finally, we also include size as dependent variable as it was reported as an important variable in Beck, Demirgüç-Kunt and Maksimovic (2002). Larger companies tend to have slightly more intangible assets.

Tables 8 and 9 test to what extent the financial structure of companies is influenced by institutional, legal and ICT constraints. First, Table 8 tests for a long-term debt financing effect (measured as the amount of long-term debt over total assets). Do legal and institutional barriers effect the availability of long-term debt? From panel A, we can see that legal constraints, as proxied by JUDS, have a huge negative impact on the amount of long-term debt. Moreover, again size does matter: larger firms tend to be able to attract relatively more long-term financing, a result that is well-known from other studies. We also control for investment-intensity: higher capital expenditures (as a percentage of assets) lead to a higher degree of long-term financing.

Again, we include sector and country dummies to check for robustness and find similar results. Also, these results confirm that the financing effect is more problematic for ICT companies (columns [3] and [8]). Alternatively, panel B tests for the impact of the corruption of bank officials and reports similar results. Corruption has clearly an important impact on the availability of long-term debt.

Next, in order to check for robustness of the results, Table 9 tests for the use of short-term debt, measured as the amount of short-term debt over total liabilities. The overall results are consistent with the former ones on long-term debt. Weaker legal and institutional settings lead to the more intensive use of short-term debt and also firm size matters: smaller firms indeed tend to have a higher degree of short-term debt.

Finally we discuss to what extent firm growth is influenced by these institutional, legal and ICT barriers, as shown in Table 10. The results presented in this table focus on the functioning of the judiciary as a proxy for the general legal constraint; but additional results

⁷ Correlations shown in Table 6.

are presented for the overall efficacy of laws relating to the ICT sector (columns [7-8]), as well as for the impact of collateral (column [9]) and corruption of bank officials (column [10]).

First of all, the empirical results show that firms with a higher investment-intensity (as measured by the ratio of capital expenditures over assets) and a higher degree of intangibles tend to have significantly higher growth rates. This overall result confirms our hypothesis that a policy of stimulating investment, and especially investment in intangibles, might be very important engine for growth. After controlling for these factors, the results show that legal constraints depress firm growth in a significant way, a result which is robust after checking with country dummies. In our sample, ICT firms do not seem to have significantly different growth rates⁸, nor do legal barriers seem to particularly affect growth rates of ICT firms. As witnessed from the results of columns [7] and [8], the efficiency of ICT laws does seem to have a significant impact of growth rates of all firms, but not particularly of that of ICT firms. Using other proxies such as related to collateral or corruption tend to confirm these overall results, as presented in columns [9] and [10] of the table.

6 Conclusions and further research

This paper aimed at determining the obstacles for an appropriate financial architecture of new economy firms in developing countries by reviewing the theoretical and some preliminary empirical underpinnings of the importance of legal and institutional barriers. Apart from the more conventional institutional and legal barriers, which are advanced by the recent law and finance literature, the analysis in this paper focuses on the importance of the ICT environment, as a potentially important barrier to the development of the business sector in general, and new economy firms in particular. This preliminary analysis confirms the importance of the legal environment in general, and also of the legal environment related to ICT issues in particular, not only for asset allocation (and the creation of intangibles) and for the financial structure of firms, but ultimately also for firm growth in developing countries. As a policy recommendation, further attention should be given to reducing the barriers that impede the creation of intangibles and to develop a more adequate overall legal framework and also a ICT-related legal framework for ICT companies in order to bridge the digital divide between developed and developing countries and to stimulate overall firm growth.

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⁸ In our sample, size (results not reported in the final table) does not seem to have a significant effect on firm growth. This might be a result typical to our sample of WorldScope firms, which are all listed, and a such, mostly large firms.

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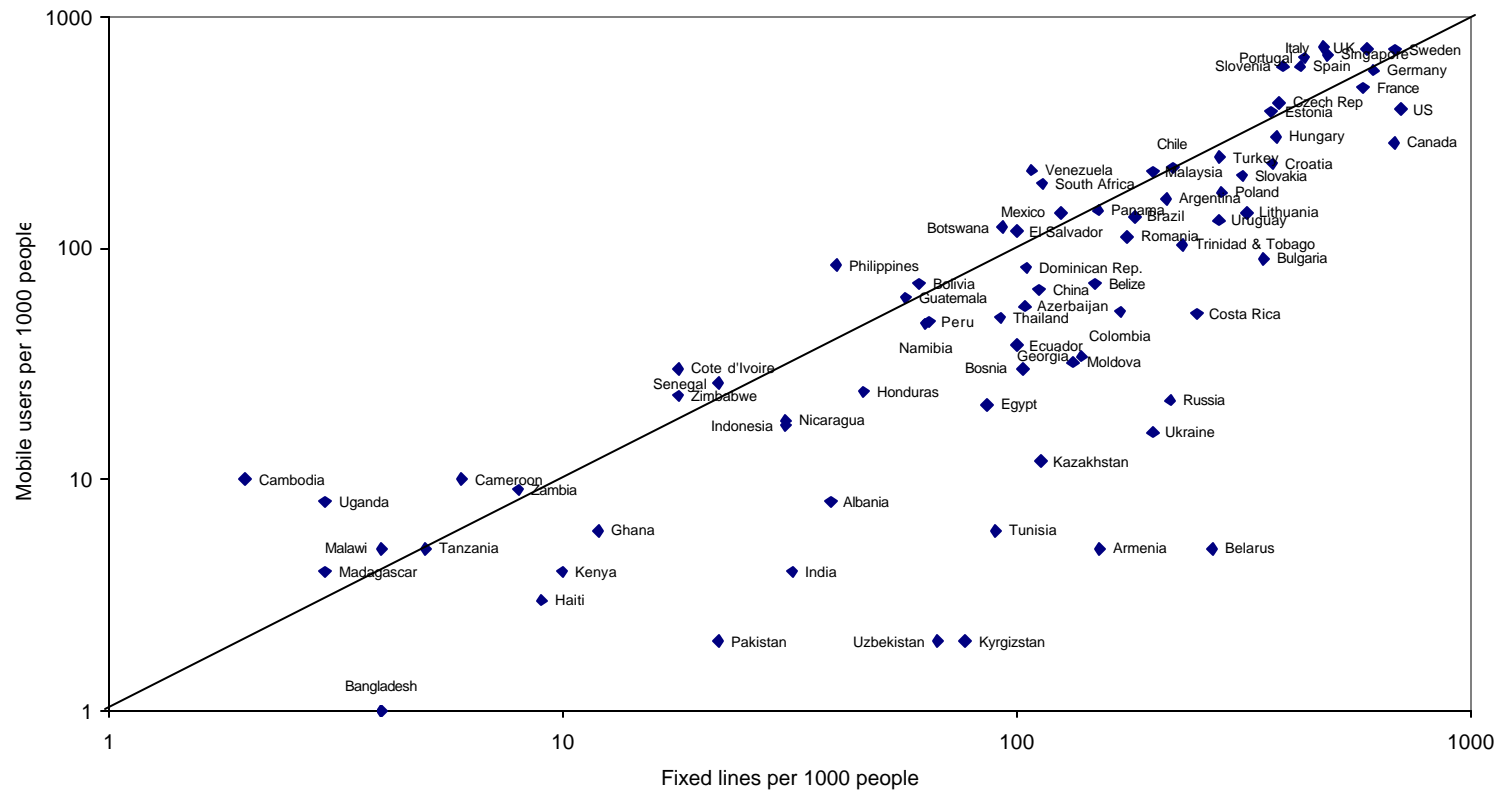
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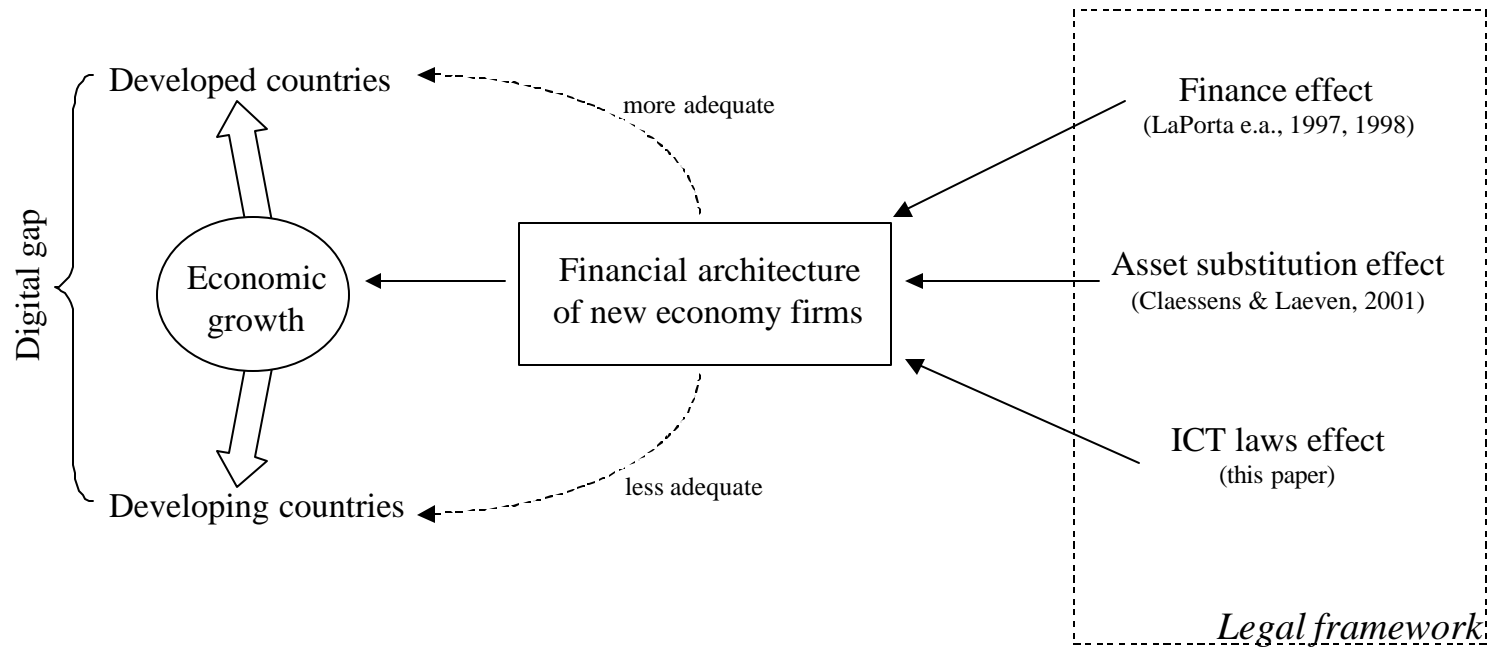
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Figure 1
The relationship between fixed-lines density and mobile density, 2000



Source: ITU (2002).

Figure 2
A theoretical approach to law, finance and growth of new economy firms in developing countries



Source: Levine (1997); Beck, Levine and Loayza (2000); La Porta *et al.* (1997, 1998); Claessens and Laeven (2001).

Figure 3
The relationship between the legal development of ICT and the new economy environment

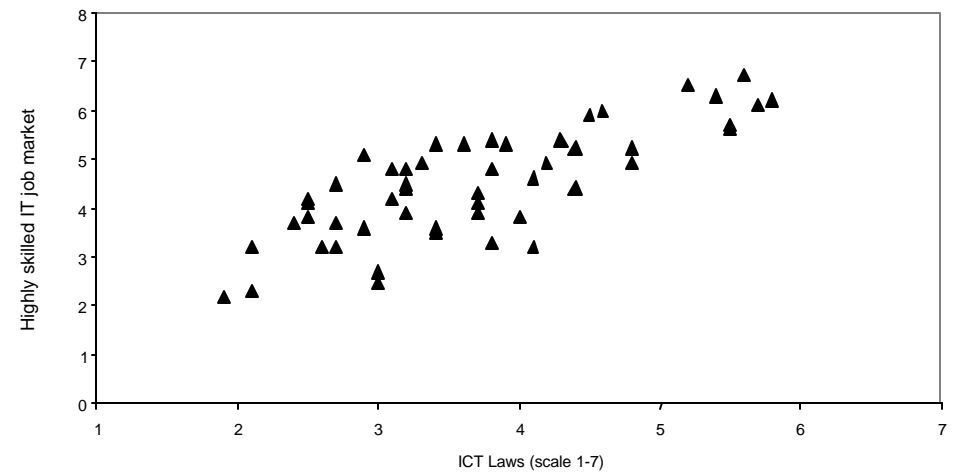
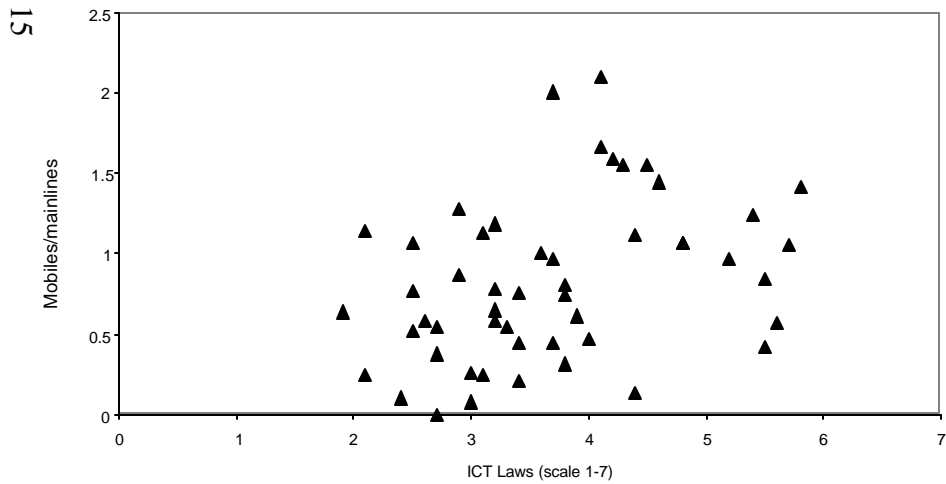
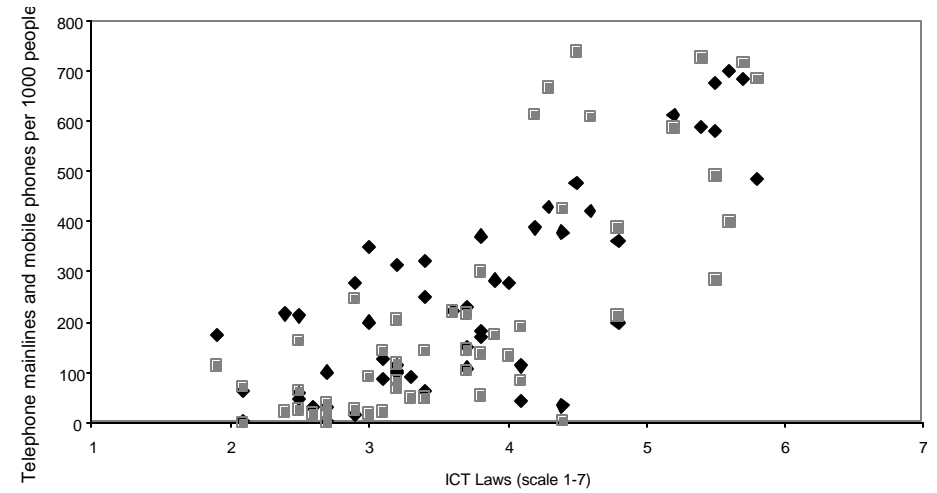
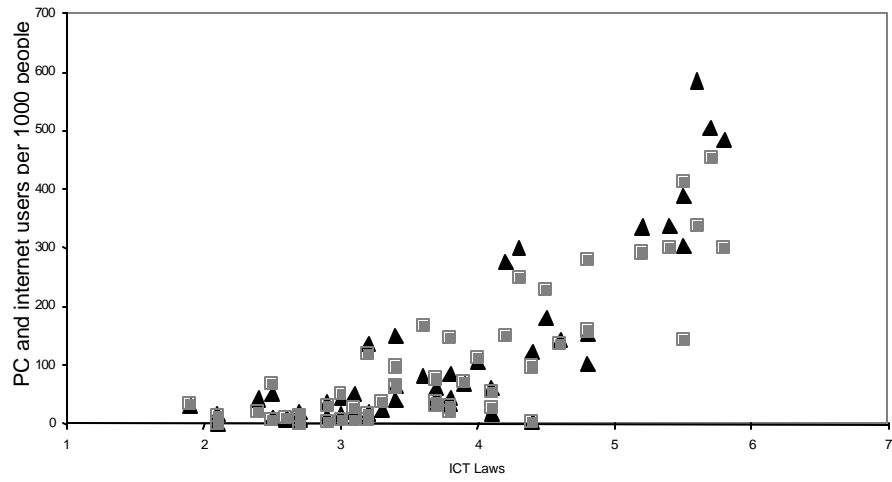
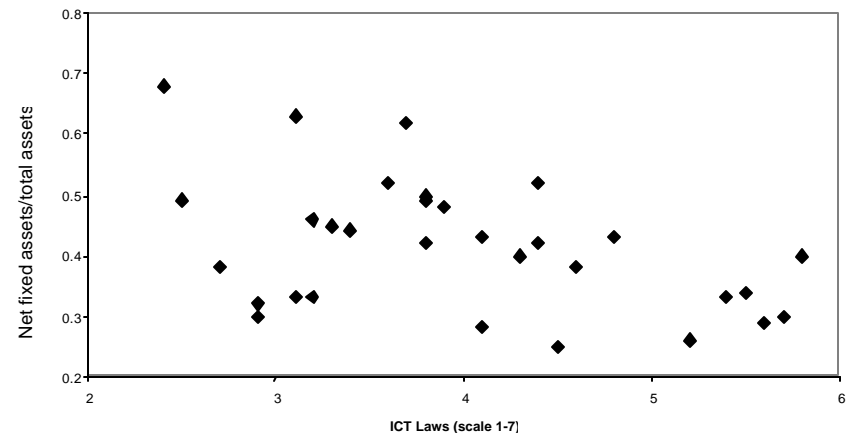
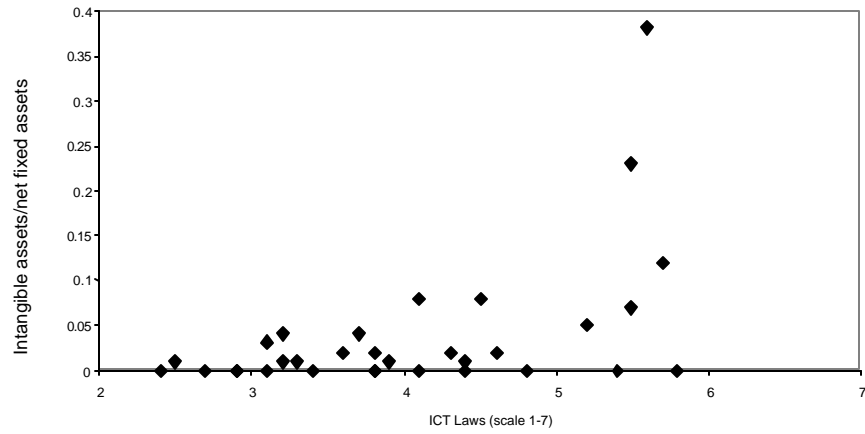


Figure 4
The relationship between several constraints and the allocation of resources among intangible and net fixed assets



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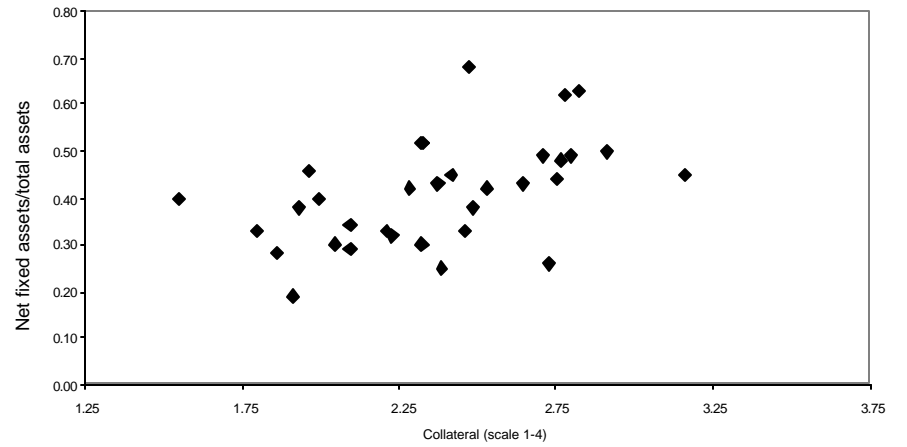
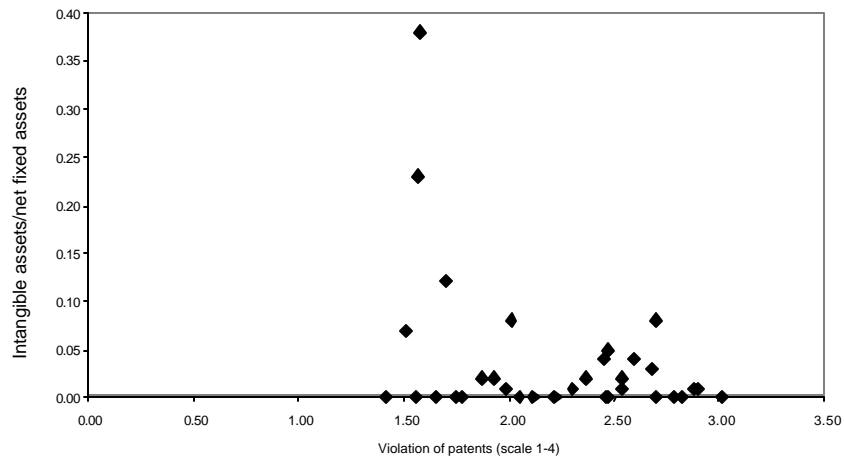


Table 1
The variables and sources

Variables	Description
Violation of patents	Is the violation of your copyrights, patents or trademarks by your competitors: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)? ^(a)
Collateral requirements	Are collateral requirements of banks/financial institutions: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)? ^(a)
Audited financial statements	Does your firm provide its shareholders with annual financial statements that have been reviewed by an external auditor: yes (1) or no (2)? ^(a)
IAS	Does your firm use international accounting standards (IAS): yes (1) or no (2)? ^(a)
Corruption of bank officials	Is the corruption of bank officials: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)? ^(a)
Predictability of laws and regulations	The process of developing new rules, regulations or policies is usually such that business are informed in advance of changes affecting them: (1) always, (2) mostly, (3) frequently, (4) sometimes, (5) seldom or (6) never. ^(a)
Quality of courts	The overall quality of the judiciary/courts is: (1) very good, (2) good, (3) slightly good, (4) slightly bad, (5) bad or (6) very bad. ^(a)
Courts are fair and impartial	In resolving business disputes, do you believe your country's court system to be fair and impartial: (1) always, (2) mostly, (3) frequently, (4) sometimes, (5) seldom or (6) never. ^(a)
Courts are honest and uncorrupted	In resolving business disputes, do you believe your country's court system to be honest and uncorrupted: (1) always, (2) mostly, (3) frequently, (4) sometimes, (5) seldom or (6) never. ^(a)
Courts are consistent	In resolving business disputes, do you believe your country's court system to be consistent: (1) always, (2) mostly, (3) frequently, (4) sometimes, (5) seldom or (6) never. ^(a)
Court decisions are enforced	In resolving business disputes, do you believe your country's courts to enforce decisions: (1) always, (2) mostly, (3) frequently, (4) sometimes, (5) seldom or (6) never. ^(a)
Confidence in legal system to uphold my rights	I am confident that the legal system will uphold my contract and property rights in business disputes: (1) fully agree, (2) agree in most cases, (3) tend to agree, (4) tend to disagree, (5) disagree in most cases or (6) fully disagree. ^(a)
Corruption	How problematic is corruption for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)? ^(a)
Judiciary (legal constraint)	How problematic is functioning of the judiciary for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3) or a major obstacle (4)? ^(a)

Table 1 continues

Table 1 (con't)
The variables and sources

Variables	Description
ICT laws	It measures the efficacy of laws relating to electronic commerce, digital signatures, and consumer protection. Ratings range from 1 to 7; the higher the rating the better. A rating of 1 means the laws are nonexistent; a rating of 7 means that the laws are well developed and enforced. ^(b)
Population	The population of the country in millions at the mid of 2000. ^(a)
Telephone mainlines	Telephone mainlines are telephone lines connecting a customer's equipment to the public switched telephone network (data for the entire country; per 1000 people). ^(c)
Mobile phones	Mobile phones refer to users of portable telephones subscribing to an automatic public mobile telephone service using cellular technology that provides access to the public switched telephone network, per 1000 people. ^(c)
Mobiles/mainlines	
Personal computers	Personal computers per 1000 people are self-contained computers designed to be used by a single individual. ^(c)
Internet	Internet users are people with access to the worldwide network. Data on Internet users are based on reported estimates or derived from reported counts of Internet service provider (ISP) subscribers. ^(c)
Highly-skilled IT job market	It measures the availability of highly skilled technology workers in industry. Ratings range from 1 to 7; the higher the rating the better. A rating of 1 means that skilled IT there has been no change; a rating of 7 means large improvements. ^(b)

Note: This table describes the variables collected for the countries and firms included in this paper. Column one gives the names of the variables, while column two gives a description and provides the source from which it was collected.

Sources: ^(a) World Bank (2000);
^(b) World Economic Forum (2002);
^(c) ITU (2000).

Table 2
Overview of the ICT environment according to region and development status, 2000

	[a]	[b]	[c]	[d]	[e]	[f]	[g]
	Telephone mainlines	Mobile phones	Mobiles/main- lines	PCs	Internet users	Highly-skilled IT job market ^a	ICT Laws ^a
	per 1000 people			per 1000 people			
Panel I: Region							
Africa	31	29	1.01	14	7	4.18	3.20
Transition Europe & former USSR	224	132	0.44	77	54	4.08	3.45
Asia	118	125	1.15	64	53	4.44	3.70
Latin America	132	95	0.76	51	43	4.06	3.19
High-income OECD	574	580	1.07	342	284	6.02	5.14
Panel II: Income classification							
Low income	41	12	0.82	6	4	3.49	2.91
Lower middle income	127	55	0.56	32	24	3.68	2.99
Upper middle income	238	200	0.93	80	87	4.72	3.73
High income	548	592	1.15	349	274	5.94	5.12

Legend: ^(a) Rating from 1 to 7, highest is best; income classification as defined by the World Bank; sample of 81 countries included in WBES database

Source: ITU (2000).

Table 3
Overview of the ICT environment per country, 2000

	Income level	Telephone	Mobile phones	Mobiles/main-	PCs	Internet users	Highly-skilled IT job market ^(a)	ICT Laws ^(a)
		mainlines		lines				
		per 1000 people			per 1000 people			
Albania	2	39	8	0.21	6	1	na	na
Argentina	3	213	163	0.77	51	68	4.10	2.50
Armenia	1	152	5	0.03	7	13	na	na
Azerbaijan	1	104	56	0.54	na	2	na	na
Bangladesh	1	4	1	0.25	2	1	2.30	2.10
Belarus	2	269	5	0.02	na	18	na	na
Belize	2	149	70	0.47	125	63	na	na
Bolivia	2	61	70	1.15	17	14	3.20	2.10
Bosnia	2	103	30	0.29	na	5	na	na
Botswana	3	93	123	1.32	37	9	na	na
Brazil	3	182	136	0.75	44	29	5.40	3.80
Bulgaria	2	350	90	0.26	44	52	2.50	3.00
Cambodia	1	2	10	5.00	1	1	na	na
Cameroon	1	6	10	1.67	3	3	na	na
Canada	4	677	285	0.42	390	412	5.60	5.50
Chile	3	221	222	1.00	82	167	5.30	3.60
China	2	112	66	0.59	16	18	4.50	3.20
Colombia	2	169	53	0.31	35	21	3.30	3.80
Costa Rica	3	249	52	0.21	149	66	5.30	3.40
Cote d'Ivoire	1	18	30	1.67	6	3	na	na
Croatia	3	365	231	0.63	81	57	na	na
Czech Rep	3	378	424	1.12	122	97	5.20	4.40
Dominican Rep.	2	105	82	0.78	na	7	4.40	3.20
Ecuador	2	100	38	0.38	22	14	3.20	2.70
Egypt	2	86	21	0.24	22	7	4.80	3.10
El Salvador	2	100	118	1.18	19	8	3.90	3.20
Estonia	3	363	387	1.07	153	280	5.20	4.80
Ethiopia	1	4	0	0.00	1	0	na	na
France	4	579	493	0.85	304	144	5.70	5.50
Georgia	1	139	34	0.24	na	5	na	na
Germany	4	611	586	0.96	336	292	6.50	5.20
Ghana	1	12	6	0.50	3	2	na	na
Guatemala	2	57	61	1.07	11	7	3.80	2.50
Haiti	1	9	3	0.33	na	1	na	na
Honduras	2	46	24	0.52	11	6	4.20	2.50
Hungary	3	372	302	0.81	85	148	4.80	3.80
India	1	32	4	0.13	5	5	4.40	4.40
Indonesia	1	31	17	0.55	10	10	4.50	2.70
Italy	4	474	737	1.55	180	229	5.90	4.50
Kazakhstan	2	113	12	0.11	na	7	na	na
Kenya	1	10	4	0.40	5	7	na	na
Kyrgyzstan	1	77	2	0.03	na	11	na	na

Table 3 continues

Table 3 (con't)
Overview of the ICT environment per country, 2000

	Income level	Telephone mainlines	Mobile phones	Mobiles/main-lines	PCs	Internet users	Highly-skilled IT job market ^a	ICT laws ^a
		per 1000 people			per 1000 people			
Lithuania	2	321	142	0.44	65	61	3.60	3.40
Madagascar	1	3	4	1.33	2	2	na	na
Malawi	1	4	5	1.25	1	1	na	na
Malaysia	3	199	213	1.07	103	159	4.90	4.80
Mexico	3	125	142	1.14	51	28	4.20	3.10
Moldova	1	133	32	0.24	15	12	na	na
Namibia	2	63	47	0.75	34	17	na	na
Nicaragua	1	31	18	0.58	9	10	3.20	2.60
Nigeria	1	4	0	0.00	7	2	3.70	2.70
Pakistan	1	22	2	0.09	4	1	na	na
Panama	3	151	145	0.96	37	31	4.30	3.70
Peru	2	64	48	0.75	41	97	3.50	3.40
Philippines	2	40	84	2.10	19	26	3.20	4.10
Poland	3	282	174	0.62	69	72	5.30	3.90
Portugal	4	430	665	1.55	299	250	5.40	4.30
Romania	2	175	112	0.64	32	36	2.20	1.90
Russia	2	218	22	0.10	43	21	3.70	2.40
Senegal	1	22	26	1.18	17	4	na	na
Singapore	4	484	684	1.41	483	300	6.20	5.80
Slovakia	3	314	205	0.65	137	120	4.80	3.20
Slovenia	4	386	612	1.59	276	150	4.90	4.20
South Africa	3	114	190	1.67	62	56	4.60	4.10
Spain	4	421	609	1.45	143	136	6.00	4.60
Sweden	4	682	717	1.05	507	455	6.10	5.70
Tanzania	1	5	5	1.00	3	3	na	na
Thailand	2	92	50	0.54	24	38	4.90	3.30
Trinidad & Tobago	3	231	103	0.45	62	77	4.10	3.70
Tunisia	2	90	6	0.07	23	10	na	na
Turkey	3	280	246	0.88	38	31	5.10	2.90
Uganda	1	3	8	2.67	3	2	na	na
UK	4	589	727	1.23	338	302	6.30	5.40
Ukraine	1	199	16	0.08	18	6	2.70	3.00
Uruguay	3	278	132	0.47	105	112	3.80	4.00
US	4	700	398	0.57	585	339	6.70	5.60
Uzbekistan	1	67	2	0.03	na	5	na	na
Venezuela	3	108	217	2.01	46	39	3.90	3.70
Zambia	1	8	9	1.13	7	2	na	na
Zimbabwe	1	18	23	1.28	12	4	3.60	2.90

Legend: ^(a) Rating from 1 to 7, highest is best; na = not available; income level: low income (1), lower middle income (2), upper middle income (3) and high income (4), as defined by the World Bank; sample of 81 countries included in WBES database.

Source: ITU (2000).

Table 4
Overview of legal and institutional constraints according to region and development status

	[a] ^(a)	[b] ^(a)	[c] ^(b)	[d] ^(b)	[e] ^(a)	[f] ^(c)	[g] ^(c)	[h] ^(c)	[i] ^(c)	[j] ^(c)	[k] ^(c)	[l] ^(c)	[m] ^(a)	[n] ^(a)	[o] ^(d)
	cmpe	coll	afs	ias	corr	law_pred	qcr	fi_crt	hu_crt	cst_crt	enf_crt	cf_crt	gcorr	jds	ICT laws
Panel I: Region															
1 Africa	1.92	2.52	1.84	1.86	1.81	4.3	3.19	3	3.18	3.48	3.18	3.16	2.83	na	3.2
2 Transition Europe & former USSR	2.49	2.48	1.59	1.68	1.82	4.2	3.77	3.86	4	4.04	3.73	3.53	2.46	2.12	3.45
3 Asia	2.48	2.36	1.39	1.52	2.06	3.64	3.23	3.18	3.38	3.36	3.4	2.83	2.67	2.04	3.7
4 Latin America	2.72	2.79	1.25	1.35	1.68	3.73	3.93	3.97	4.02	4.31	3.89	3.23	2.75	2.38	3.19
5 OECD	1.88	2.11	1.27	1.53	1.26	3.52	3.38	3.31	3.03	3.72	3.33	3.05	1.63	1.77	5.14
Panel II: Income classification															
1 Low income	2.28	2.63	1.65	1.7	2.02	4.22	3.58	3.67	3.95	4.05	3.68	3.47	2.89	2.13	2.91
2 Lower middle income	2.61	2.51	1.49	1.6	1.9	3.97	3.56	3.74	3.85	3.93	3.78	3.37	2.72	2.26	2.99
3 Upper middle income	2.44	2.5	1.43	1.51	1.57	3.82	3.67	3.39	3.42	3.76	3.4	2.94	2.36	2.17	3.73
4 High income	1.9	2.13	1.26	1.5	1.26	3.49	3.31	3.11	2.87	3.48	3.09	2.92	1.6	1.79	5.12

Legend: cmpe (violation of patents), coll (collateral), afs (audited financial statements), ias (international accounting standards), corr (corruption of bank officials), law_pred (predictability of laws and regulations), qcr (quality of courts), fi_crt (courts are fair and impartial), hu_crt (courts are honest and uncorrupt), cst_crt (courts are consistent), enf_crt (court decisions are enforced), cf_crt (confidence in legal system to uphold my rights), gcorr (corruption), jds (judiciary). See Table 1 for the precise definition.

^(a) rating from 1 to 4 (lowest best);

^(b) rating from 1 to 2 (lowest best);

^(c) rating from 1 to 6 (lowest best);

^(d) rating from 1 to 7 (highest best);

Income classification as defined by the World Bank; sample of 81 countries included in WBES database.

Source: World Bank and ITU (2000).

Table 5
Overview of legal and institutional constraints per country

Country	cmpe	coll	afs_yn	ias_yn	corr	law_pred	qcr	fi_crt	hu_crt	cst_crt	enf_crt	cf_crt	gcorr	juds	ICT laws
Albania	3.01	2.37	1.50	1.37	2.11	3.76	3.88	3.66	2.85	4.21	4.58	3.66	3.25	2.61	na
Argentina	2.91	2.71	1.22	1.48	1.52	3.84	4.16	4.33	4.17	4.64	3.91	3.50	2.62	2.33	2.50
Armenia	2.23	1.51	1.82	1.82	1.16	4.13	3.90	4.53	4.71	4.61	3.73	3.43	1.90	1.47	na
Azerbaijan	2.83	2.57	1.92	1.82	2.86	2.94	3.46	3.25	3.67	4.16	3.79	2.84	2.76	2.37	na
Bangladesh	2.64	2.69	1.05	1.24	2.16	3.78	3.30	3.04	3.39	3.70	3.55	2.92	3.50	2.41	2.10
Belarus	1.39	2.27	1.54	1.89	1.26	4.45	3.69	3.88	4.17	3.97	3.43	3.72	1.78	1.50	na
Belize	2.00	2.42	1.36	1.45	1.40	3.14	2.85	2.54	2.85	3.13	3.33	2.25	2.10	1.60	na
Bolivia	3.17	3.19	1.21	1.29	1.63	3.76	4.67	4.71	4.85	4.90	4.47	3.79	3.55	2.72	2.10
Bosnia	3.23	2.34	1.49	1.22	1.56	4.38	3.78	3.48	3.57	4.02	4.16	3.08	2.57	2.47	na
Botswana	1.70	2.26	0.84	0.92	1.21	3.53	2.29	1.82	1.80	2.27	2.18	2.09	1.69	na	na
Brazil	2.47	2.91	1.18	1.42	1.28	4.18	4.28	3.77	3.82	4.25	3.39	3.32	2.49	2.54	3.80
Bulgaria	3.13	3.03	1.69	1.80	2.08	3.89	3.34	3.95	4.26	3.96	2.41	3.25	2.59	2.18	3.00
Cambodia	na	1.98	1.78	1.74	2.23	3.96	3.87	4.25	4.42	na	3.73	3.28	na	2.00	na
Cameroon	2.18	2.39	0.90	0.94	1.83	4.47	4.06	4.00	4.14	4.22	3.65	3.80	3.39	na	na
Canada	1.51	2.10	1.32	1.55	1.07	3.23	2.55	2.72	2.52	3.13	2.72	2.55	1.31	1.43	5.50
Chile	1.87	2.32	1.17	1.33	1.20	3.03	3.53	3.00	2.79	3.30	2.69	2.15	1.87	1.99	3.60
China	2.45	1.80	1.57	1.88	1.99	3.28	3.00	2.92	3.30	3.10	3.07	2.59	2.03	1.56	3.20
Colombia	2.79	2.80	1.12	1.32	1.59	4.16	4.10	3.89	4.16	4.31	4.04	3.17	2.78	2.37	3.80
Costa Rica	2.71	2.88	1.20	1.18	1.77	3.34	3.54	2.94	3.09	3.51	3.55	2.52	2.51	2.13	3.40
Côte d'Ivoire	2.05	2.72	0.89	0.98	2.05	4.27	3.67	3.76	3.95	4.04	3.69	3.68	3.29	na	na
Croatia	3.04	2.55	1.09	1.01	1.79	4.02	4.07	3.87	3.97	4.06	3.85	3.04	2.62	2.72	na
Czech Rep	1.98	2.33	1.79	1.85	1.87	3.89	4.13	4.01	4.18	4.08	3.70	3.72	2.14	2.13	4.40
Dominican Rep.	2.88	2.63	1.10	1.31	1.38	3.83	3.45	3.94	3.83	4.23	3.80	3.12	2.94	2.48	3.20
Ecuador	2.81	2.92	1.38	1.46	2.67	4.08	4.28	4.48	4.35	4.75	4.46	3.49	3.54	3.04	2.70
Egypt	2.22	2.46	0.84	0.62	2.31	4.22	2.13	1.87	2.07	2.38	2.40	2.35	3.15	na	3.10
El Salvador	2.97	3.09	1.07	1.49	1.70	3.70	3.86	4.32	4.53	4.54	4.25	3.12	3.03	2.65	3.20
Estonia	2.15	2.28	1.66	1.31	1.35	4.14	3.43	3.06	3.05	3.25	3.09	2.81	1.85	1.70	4.80
Ethiopia	1.78	3.08	0.71	0.85	1.85	4.20	3.80	3.51	3.82	4.00	3.43	3.45	2.56	na	na

Table 5 continues

Table 5 (con't)
 Overview of legal and institutional constraints per country

Country	cmpe	coll	afs_yn	ias_yn	corr	law_pred	qcr	fi_crt	hu_crt	cst_crt	enf_crt	cf_crt	gcorr	juds	ICT laws
France	1.57	1.91	1.13	1.59	1.28	3.51	3.21	3.44	3.06	3.46	2.54	2.83	1.60	1.73	5.50
Georgia	2.69	2.43	1.57	1.55	2.05	4.35	3.72	4.09	4.18	4.09	3.86	3.27	3.03	1.92	na
Germany	2.47	2.73	1.63	1.48	1.51	3.90	3.46	3.47	3.41	4.17	4.02	3.35	1.84	2.07	5.20
Ghana	1.72	2.38	0.81	0.82	1.99	4.14	2.82	3.17	3.31	3.48	3.10	2.99	2.68	na	na
Guatemala	2.54	3.00	1.37	1.45	1.51	3.62	4.31	4.24	4.26	4.56	4.41	3.26	2.62	2.45	2.50
Haiti	2.90	2.75	1.67	1.34	2.02	4.26	4.56	4.75	5.10	5.03	4.75	3.94	3.17	2.29	na
Honduras	2.57	2.76	1.35	1.25	2.03	3.41	3.76	4.09	4.29	4.29	4.22	3.77	2.78	2.26	2.50
Hungary	2.54	2.29	1.41	1.73	1.47	4.04	3.53	3.02	2.82	3.31	3.42	2.74	1.91	1.29	3.80
India	2.05	2.53	1.03	1.25	1.60	3.69	2.96	2.42	2.85	3.32	3.13	2.51	2.80	2.01	4.40
Indonesia	2.47	2.48	1.48	1.55	2.51	4.10	3.93	4.60	4.98	4.73	4.41	3.71	2.63	2.20	2.70
Italy	2.01	2.39	1.31	1.45	1.16	3.80	4.41	3.69	3.51	4.18	3.86	3.63	1.76	2.08	4.50
Kazakhstan	2.46	2.83	1.63	1.37	1.82	4.76	3.80	4.38	4.52	4.42	4.26	3.79	2.50	1.97	na
Kenya	2.07	2.49	0.97	0.88	1.64	4.72	4.25	3.78	4.22	4.42	3.93	4.13	3.46	na	na
Kyrgyzstan	2.57	3.12	1.67	1.76	2.73	4.20	3.97	4.52	4.55	4.65	4.49	4.10	3.34	2.24	na
Lithuania	2.86	1.82	1.83	1.85	2.18	4.37	3.87	4.19	4.40	4.42	3.49	3.88	2.57	2.19	3.40
Madagascar	2.16	2.69	0.54	0.80	2.31	4.75	4.36	4.34	4.41	4.48	3.99	4.41	3.39	na	na
Malawi	1.50	2.98	0.94	0.93	1.37	4.08	3.08	3.07	3.13	3.60	3.63	3.51	2.62	na	na
Malaysia	1.65	2.37	1.53	1.80	1.70	3.52	3.05	2.91	3.10	3.26	3.13	2.57	1.85	1.69	4.80
Mexico	2.69	2.82	1.22	1.26	2.04	3.94	3.92	4.17	4.64	4.74	4.32	3.44	3.33	2.84	3.10
Moldova	2.68	2.78	1.58	1.25	2.07	4.32	3.91	4.29	4.58	4.41	4.12	4.04	2.88	2.48	na
Namibia	1.50	2.21	0.97	0.85	1.17	3.34	2.29	1.90	1.84	2.39	2.42	2.43	1.63	na	na
Nicaragua	2.98	3.01	1.37	1.48	2.27	3.69	3.89	4.53	4.55	4.52	4.22	3.89	2.87	2.33	2.60
Nigeria	2.08	2.27	0.94	0.91	2.03	5.06	3.19	3.24	3.70	3.83	3.30	3.56	3.40	na	2.70
Pakistan	2.71	3.16	1.48	1.36	2.53	3.44	3.71	3.34	3.38	3.78	3.54	3.16	3.29	2.60	na
Panama	2.89	2.40	1.08	1.20	1.45	3.26	3.52	3.90	3.93	4.15	3.63	2.67	2.86	2.47	3.70
Peru	3.02	2.75	1.21	1.47	2.20	3.37	4.26	4.44	4.68	4.77	4.30	3.72	2.83	2.50	3.40
Philippines	2.70	2.65	1.19	1.69	2.18	3.48	2.91	3.38	3.77	3.96	3.73	2.81	3.11	2.28	4.10

Table 5 continues

Table 5 (con't)
Overview of legal and institutional constraints per country

Country	cmpe	coll	afs_yn	ias_yn	corr	law_pred	qcr	fi_crt	hu_crt	cst_crt	enf_crt	cf_crt	gcorr	juds	ICT laws
Poland	2.55	2.77	1.47	1.77	1.39	3.97	3.76	3.49	3.51	3.73	3.82	2.98	2.21	2.21	3.90
Portugal	1.93	1.55	1.14	1.15	1.47	3.04	3.70	3.38	3.13	3.56	3.52	3.25	1.72	1.76	4.30
Romania	2.58	3.03	1.82	1.73	1.97	4.66	3.63	3.52	3.88	3.80	3.29	3.46	2.83	2.59	1.90
Russia	2.11	2.47	1.57	1.90	1.88	4.64	3.85	4.38	4.55	4.38	4.32	4.25	2.55	2.13	2.40
Senegal	2.47	3.08	0.68	0.68	1.93	4.50	3.00	3.29	3.45	3.61	3.22	2.80	2.94	na	na
Singapore	1.41	1.99	1.05	1.32	1.26	2.83	1.79	1.58	1.44	1.83	1.67	1.53	1.25	1.32	5.80
Slovakia	2.31	1.96	1.64	1.91	1.98	4.10	3.74	3.60	3.82	3.90	3.15	3.20	2.38	2.10	3.20
Slovenia	2.56	2.39	1.34	1.43	1.24	3.84	4.00	2.94	2.98	3.12	2.58	3.16	1.63	2.29	4.20
South Africa	1.55	1.86	0.97	0.92	1.11	3.97	2.95	2.10	2.16	2.80	2.71	2.26	2.60	na	4.10
Spain	2.37	1.93	1.29	1.70	1.26	3.60	3.29	3.88	3.53	4.14	3.08	3.02	2.15	2.02	4.60
Sweden	1.70	2.04	1.04	1.18	1.05	3.74	2.91	2.66	2.16	3.09	3.53	2.67	1.18	1.51	5.70
Tanzania	2.05	2.96	0.86	0.88	1.98	4.58	3.55	3.35	3.73	3.84	3.19	3.51	2.93	na	na
Thailand	2.89	2.42	1.17	1.38	3.00	3.78	2.85	2.78	2.85	3.03	3.45	2.56	3.47	2.13	3.30
Trinidad & Tobago	2.23	3.01	1.32	1.21	1.76	3.48	2.40	2.70	2.91	3.80	3.40	2.61	1.78	1.42	3.70
Tunisia	2.32	1.75	0.94	0.94	1.14	2.98	2.04	1.94	1.96	2.07	1.85	1.82	2.13	na	na
Turkey	2.83	2.32	1.57	1.52	2.34	3.76	4.00	3.23	3.50	3.72	3.33	3.09	2.88	2.29	2.90
Uganda	2.04	2.87	0.84	0.77	2.61	4.64	3.45	3.67	4.09	4.05	3.78	3.52	3.13	na	na
UK	1.77	2.21	1.34	1.85	1.03	3.61	3.26	3.09	2.56	3.72	3.24	3.12	1.29	1.55	5.40
Ukraine	2.66	2.84	1.64	1.92	1.94	4.49	3.79	4.23	4.57	4.31	4.00	4.19	2.40	2.05	3.00
Uruguay	2.93	2.33	1.38	1.33	1.13	3.35	3.65	3.49	2.36	3.40	2.72	2.76	2.12	1.92	4.00
US	1.57	2.09	1.34	1.86	1.51	3.22	3.51	3.55	3.53	4.09	3.60	3.09	1.84	1.78	5.60
Uzbekistan	1.66	2.25	1.52	1.86	1.81	3.86	3.20	3.23	3.83	3.45	2.54	2.67	2.24	1.70	na
Venezuela	2.60	2.78	1.07	1.24	1.52	4.44	4.89	4.60	4.78	4.83	4.19	3.65	3.03	2.72	3.70
Zambia	1.82	2.78	0.87	0.93	1.76	4.43	3.10	3.16	3.14	3.78	3.41	3.62	2.76	na	na
Zimbabwe	1.75	2.23	0.80	0.90	1.71	4.65	3.00	2.51	2.74	3.41	3.26	2.90	2.86	na	2.90

Notes and source: As given in Table 4.

Table 1
Correlation matrix

	CAPEX	COLL	CORR	GROWTH	ICT	ICTLAWS	LTDEBT	JUDS	STDEBT	INTANG	JUDS*ICT	COLL*ICT	CORR*ICT	ICTLAWS*ICT	SIZE
CAPEX	1	1.57E-05	-0.200722	0.065079	0.101732	0.114208	0.191424	-0.071147	-0.232902	-0.069817	0.098601	0.104126	0.085457	0.097658	-0.051586
COLL	1.57E-05	1	0.396153	-0.072810	0.019060	-0.621982	0.008610	0.806911	-0.047166	-0.245422	0.053706	0.049515	0.050798	-0.014449	0.096235
CORR	-0.200722	0.396153	1	-0.083279	-0.000810	-0.735351	-0.084677	0.513004	0.129904	-0.186692	0.023719	0.013411	0.071427	-0.031173	0.198839
GROWTH	0.065079	-0.072810	-0.083279	1	0.022944	0.091312	0.029631	-0.060506	-0.025332	0.062469	0.018068	0.019570	0.013797	0.027293	-0.041121
ICTDUM	0.101732	0.019060	-0.000810	0.022944	1	0.000856	0.109781	0.024712	-0.100717	0.156649	0.978408	0.989185	0.939565	0.976379	0.058330
ICTLAWS	0.114208	-0.621982	-0.735351	0.091312	0.000856	1	0.119142	-0.716165	-0.097326	0.272047	-0.032261	-0.021263	-0.046218	0.045331	-0.281858
LTDEBT	0.191424	0.008610	-0.084677	0.029631	0.109781	0.119142	1	-0.057937	-0.898028	0.086469	0.098993	0.110269	0.100992	0.111078	0.080121
JUDS	-0.071147	0.806911	0.513004	-0.060506	0.024712	-0.716165	-0.057937	1	0.033548	-0.133716	0.070043	0.050855	0.065953	-0.013157	0.278009
STDEBT	-0.232902	-0.047166	0.129904	-0.025332	-0.100717	-0.097326	-0.898028	0.033548	1	-0.083513	-0.092507	-0.103682	-0.088613	-0.100237	-0.061457
INTANG	-0.069817	-0.245422	-0.186692	0.062469	0.156649	0.272047	0.086469	-0.133716	-0.083513	1	0.144166	0.144990	0.148177	0.171142	0.068076
JUDS*ICT	0.098601	0.053706	0.023719	0.018068	0.978408	-0.032261	0.098993	0.070043	-0.092507	0.144166	1	0.992425	0.959080	0.920571	0.059135
COLL*ICT	0.104126	0.049515	0.013411	0.019570	0.989185	-0.021263	0.110269	0.050855	-0.103682	0.144990	0.992425	1	0.952480	0.942622	0.055237
CORR*ICT	0.085457	0.050798	0.071427	0.013797	0.939565	-0.046218	0.100992	0.065953	-0.088613	0.148177	0.959080	0.952480	1	0.868037	0.060394
ICTLAWS*ICT	0.097658	-0.014449	-0.031173	0.027293	0.976379	0.045331	0.111078	-0.013157	-0.100237	0.171142	0.920571	0.942622	0.868037	1	0.053224
SIZE	-0.051586	0.096235	0.198839	-0.041121	0.058330	-0.281858	0.080121	0.278009	-0.061457	0.068076	0.059135	0.055237	0.060394	0.053224	1

Table 7
The impact of constraints on the investment in intangible assets

Panel A	[1]	[2]	[3]	[4]	[5]	[6]
Intercept	0.200*** (17.27)	0.199*** (17.26)	0.202*** (17.55)	0.135*** (6.13)	0.107*** (3.94)	0.110** (4.05)
COLL	-0.068*** (-14.42)	-0.069*** (-14.74)	-0.071*** (-15.07)	-0.048*** (-5.82)	-0.052*** (-6.19)	-0.054*** (-6.29)
ICT		0.099*** (5.03)		0.093*** (4.93)	0.093*** (4.84)	
COLL*ICT			0.042*** (4.84)			0.039*** (4.68)
Country dummies				Yes	Yes	Yes
SIZE					0.003** (2.49)	0.003** (2.54)
Number of firms	2814	2814	2814	2814	2789	2789
Adjusted R ²	0.04	0.08	0.08	0.14	0.15	0.14
Panel B						
Intercept	0.098*** (18.03)	0.095*** (17.53)	0.098*** (18.63)	0.040*** (5.05)	0.004 (0.22)	0.007 (0.46)
CORR	-0.031*** (-10.78)	-0.031*** (-11.30)	-0.032 (-13.02)	-0.012*** (-3.16)	-0.014*** (-3.77)	-0.017*** (-4.69)
ICT		0.097*** (4.79)		0.094*** (4.88)	0.093*** (4.77)	
CORR*ICT			0.057*** (4.18)			0.056*** (4.08)
Country dummies				Yes	Yes	Yes
SIZE					0.003*** (2.66)	0.003*** (2.71)
Number of firms	2814	2814	2814	2814	2789	2789
Adjusted R ²	0.03	0.06	0.06	0.14	0.15	0.14
Panel C						
Intercept	0.111*** (13.46)	0.110*** (13.68)	0.114*** (14.15)	0.091*** (6.01)	0.058*** (2.73)	0.062*** (2.90)
JUDS	-0.034*** (-8.32)	-0.035*** (-8.96)	-0.037*** (-9.50)	-0.037*** (-5.45)	-0.040*** (-5.93)	-0.043*** (-6.21)
ICT		0.098*** (4.93)		0.094*** (4.91)	0.092*** (4.81)	
JUDS*ICT			0.048*** (4.71)			0.046*** (4.64)
Country dummies				Yes	Yes	Yes
SIZE					0.003*** (2.69)	0.003*** (2.78)
Number of firms	2814	2814	2814	2814	2789	2789
Adjusted R ²	0.01	0.05	0.05	0.14	0.15	0.15
Panel D						
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.062*** (-9.08)	-0.066*** (-9.99)	-0.063*** (-9.36)	-0.040*** (-2.86)	-0.098*** (-4.23)	0.055*** (2.66)
ICT LAWS	0.023*** (14.52)	0.023*** (14.91)	0.023*** (14.41)	0.014*** (4.24)	0.017*** (4.89)	0.016*** (5.06)
ICT		0.097*** (4.93)		0.094*** (4.92)	0.093*** (4.79)	
ICTLAWS *ICT			0.021*** (5.17)			0.020*** (4.99)
Country dummies				Yes	Yes	Yes
SIZE					0.003*** (2.96)	0.003*** (2.90)
Number of firms	2807	2807	2807	2807	2782	2782
Adjusted R ²	0.05	0.05	0.09	0.14	0.15	0.15

Notes to Table 7:

The dependent variable is intangible assets/total assets. COLL is an indicator of the collateral requirements demanded by banks and financial institutions and ranges from 1 to 4 (lowest is best). ICT is a dummy variable that takes the value 1 if the firm is from the ICT sector and zero if not (based on a two-digit industry code). CORR is an indicator of indication of the corruption of bank officials and ranges from 1 to 4 (lowest is best). JUDS is an indicator of the functioning of the judiciary and ranges from 1 to 4 (lowest is best). ICTLAWS is an indicator of the overall efficacy of laws relating to the ICT sector and ranges from 1 to 7 (highest is best). SIZE is the logarithm of total assets. The variables COLL and JUDS are obtained from the WBES, ICT and SIZE from WorldScope, ICTLAWS from World Economic Forum's Global Competitiveness Report 2001-2. Detailed variable definitions and sources are given in Table 1. Dataset includes 25 countries (Argentina, Brazil, Canada, Chile, China, Colombia, Czech Republic, France, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Portugal, Russia, Singapore, Slovakia, Sweden, Thailand, US, Venezuela). T-statistics are in parenthesis: *, **, *** indicate significance levels of 10, 5 and 1 percent respectively. Standard errors and covariance are White heteroskedasticity-consistent.

Table 8
The impact of constraints on the availability of long-term debt

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Panel A								
Intercept	0.124*** (4.11)	0.081*** (3.24)	0.087*** (3.49)	0.086** (3.43)	0.412*** (9.38)	0.278*** (5.79)	0.281*** (5.88)	0.283*** (5.92)
JUDS	- 0.040*** (-4.53)	- 0.032*** (-3.54)	- 0.035*** (-3.77)	- 0.033*** (-3.61)	- 0.173*** (-8.68)	- 0.149*** (-6.91)	- 0.148*** (-6.92)	- 0.149*** (-6.99)
SIZE	0.007*** (4.22)	0.008*** (5.37)	0.007*** (5.19)	0.007*** (5.11)	0.007*** (4.47)	0.013*** (7.14)	0.012*** (6.91)	0.012*** (6.96)
CAPEX		0.004*** (6.70)	0.004*** (6.45)	0.004*** (6.43)		0.003*** (5.71)	0.003*** (5.51)	0.003*** (5.52)
JUDS*ICT			0.032*** (3.16)					0.022*** (2.18)
ICT				0.068*** (3.35)			0.046** (2.37)	
Country dummies					Yes	Yes	Yes	Yes
Number of firms	2789	2178	2178	2178	2789	2178	2178	2178
Adjusted R ²	0.01	0.05	0.05	0.06	0.08	0.15	0.16	0.16
Panel B								
Intercept	0.100*** (3.46)	0.061*** (2.61)	0.067*** (2.88)	0.065*** (2.80)	0.233*** (7.94)	0.123*** (3.77)	0.126*** (3.89)	0.129*** (3.97)
CORR	- 0.029*** (-4.10)	- 0.019*** (-2.80)	- 0.022*** (-3.11)	- 0.020*** (-2.84)	- 0.071*** (-8.05)	- 0.059*** (-6.17)	- 0.058*** (-6.16)	- 0.059*** (-6.34)
SIZE	0.007*** (4.30)	0.007*** (5.16)	0.007*** (4.93)	0.007*** (4.88)	0.008*** (4.74)	0.013*** (7.40)	0.013*** (7.16)	0.013*** (7.17)
CAPEX		0.004*** (6.31)	0.004*** (6.05)	0.004*** (6.03)		0.003*** (5.56)	0.003*** (5.37)	0.003*** (5.37)
CORR*ICT			0.039*** (3.06)					0.027** (2.15)
ICT				0.067*** (3.30)			0.045** (2.32)	
Country dummies					Yes	Yes	Yes	Yes
Number of firms	2789	2178	2178	2178	2789	2178	2178	2178
Adjusted R ²	0.01	0.05	0.05	0.06	0.08	0.15	0.16	0.16

Notes: LT debt/assets is the amount of long-term debt over total assets. ICT is a dummy variable that takes the value 1 if the firm is from the ICT sector and zero if not (based on a two-digit industry code). CORR is an indication of the corruption of bank officials and ranges from 1 to 4 (lowest is best). JUDS is an indicator of the functioning of the judiciary and ranges from 1 to 4 (lowest is best). CAPEX is the ratio of capital expenditures as a percentage of total assets. SIZE is the logarithm of total assets. The variables JUDS and CORR are obtained from the WBES; ICT, CAPEX and SIZE from WorldScope. Detailed variable definitions and sources are given in Table 1. The twenty-five countries included in the dataset given in Table 7. T-statistics are in parenthesis: *, **, *** indicate significance levels of 10, 5 and 1 per cent respectively. Standard errors and covariance are White heteroskedasticity-consistent.

Table 9
The impact of constraints on the availability of short-term debt

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Panel A								
Intercept	0.684*** (26.64)	0.725*** (20.64)	0.715*** (20.54)	0.717*** (20.41)	0.193*** (3.07)	0.195*** (3.12)	0.207*** (3.29)	0.205*** (3.25)
JUDS	0.030** (2.25)	0.045*** (3.27)	0.046*** (3.36)	0.049*** (3.53)	0.299*** (10.40)	0.296*** (10.33)	0.290*** (10.07)	0.292*** (10.15)
SIZE		-0.005** (-2.44)	-0.004** (-2.18)	-0.004** (-2.24)	-0.004 (-1.59)	-0.003 (-1.37)	-0.003 (-1.26)	-0.003 (-1.29)
ICT			-0.118*** (-4.63)			-0.087*** (-3.69)	-0.071*** (-3.02)	
JUDS*ICT				-0.058*** (-4.41)				-0.034*** (-2.72)
INTANG							-0.147*** (-3.01)	-0.149*** (-3.08)
Country dummies					Yes	Yes	Yes	Yes
No. of firms	2885	2840	2840	2840	2840	2840	2840	2840
Adjusted R ²	0.01	0.01	0.01	0.01	0.11	0.11	0.12	0.12
Panel B								
Intercept	0.657*** (45.69)	0.726*** (24.01)	0.723*** (23.94)	0.719*** (23.82)	0.490*** (11.47)	0.490*** (11.49)	0.496*** (11.54)	0.493*** (11.48)
CORR	0.052*** (6.05)	0.063*** (7.41)	0.062*** (7.40)	0.065*** (7.71)	0.131*** (11.03)	0.129*** (10.93)	0.127*** (10.68)	0.128*** (10.89)
SIZE		-0.006*** (-3.16)	-0.006*** (-2.87)	-0.005*** (-2.91)	-0.005** (-1.99)	-0.004* (-1.77)	-0.004* (-1.67)	-0.004* (-1.68)
ICT			-0.115*** (-4.49)			-0.085*** (-3.60)	-0.070*** (-2.95)	
CORR*ICT				-0.067*** (-4.11)				-0.043*** (-2.72)
INTANG							-0.144** (-2.92)	-0.143** (-2.95)
Country dummies					Yes	Yes	Yes	Yes
No. of firms	2885	2840	2840	2840	2840	2840	2840	2840
Adjusted R ²	0.01	0.02	0.03	0.03	0.11	0.12	0.12	0.12

Notes: The dependent variable is the amount of short-term debt over total liabilities. ICT is a dummy variable that takes the value 1 if the firm is from the ICT sector and zero if not (based on a two-digit industry code). CORR is an indication of the corruption of bank officials and ranges from 1 to 4 (lowest is best). JUDS is an indicator of the functioning of the judiciary and ranges from 1 to 4 (lowest is best). INTANG is the ratio of intangible assets over total assets. SIZE is the logarithm of total assets. The variables JUDS and CORR are obtained from the WBES; ICT, INTANG and SIZE from WorldScope. Detailed variable definitions and sources are given in Table 1. The twenty-five countries included in the dataset given in Table 7. T-statistics are in parenthesis: *, **, *** indicate significance levels of 10, 5 and 1 per cent, respectively. Standard errors and covariance are White heteroskedasticity-consistent.

Table 10
The impact of constraints on the real growth of firms

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Intercept	71.40*** (5.42)	71.67*** (5.43)	72.41*** (5.47)	52.07*** (3.77)	90.75* (1.83)	78.52 (1.60)	-73.22*** (-5.60)	-57.70** (-2.39)	150.79* (1.73)	39.22 (1.35)
JUDS	-33.81*** (-5.79)	-34.19*** (-5.83)	-34.56*** (-5.90)	-27.46*** (-4.61)	-45.87** (-2.12)	-41.03* (-1.91)				
CAPEX	1.74** (2.07)	1.69** (1.97)	1.69** (1.98)	1.92** (2.27)	1.58* (1.64)	1.70* (1.78)	1.53* (1.84)	1.69* (1.74)	1.77* (1.88)	1.67* (1.71)
ICT		18.37 (1.11)								
JUDS*ICT			8.29 (1.13)							
INTANG				116.25*** (3.72)		75.90** (1.96)		75.68** (1.96)	77.27** (1.96)	75.56* (1.93)
ICTLAWS							17.67*** (6.13)	14.18* (1.82)		
ICTLAWS* ICT							3.88 (1.01)			
COLL									-64.11* (-1.91)	
CORR										-17.32* (-1.88)
Country dummies					Yes	Yes		Yes	Yes	Yes
Number of firms	2211	2211	2211	2180	2211	2180	2205	2174	2180	2180
Adjusted R ²	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Notes: The dependent variable is the 3-year average real growth of sales (period 1996-98), in percentage points. ICT is a dummy variable that takes the value 1 if the firm is from the ICT sector and zero if not (based on a two-digit industry code). COLL is an indicator of the collateral requirements demanded by banks and financial institutions and ranges from 1 to 4 (lowest is best). CORR is an indicator of indication of the corruption of bank officials and ranges from 1 to 4 (lowest is best). JUDS is an indicator of the functioning of the judiciary and ranges from 1 to 4 (lowest is best). ICTLAWS is an indicator of the overall efficacy of laws relating to the ICT sector and ranges from 1 to 7 (highest is best). SIZE is the logarithm of total assets. CAPEX is the ratio of capital expenditures as a percentage of total assets.). INTANG is the ratio of intangible assets over total assets. The variables COLL and JUDS are obtained from the WBES, ICT and SIZE from WorldScope, ICTLAWS from World Economic Forum's Global Competitiveness Report 2001-02. CORR is an indication of the corruption of bank officials and ranges from 1 to 4 (lowest is best). JUDS is an indicator of the functioning of the judiciary and ranges from 1 to 4 (lowest is best). SIZE is the logarithm of total assets. The variables JUDS and CORR are obtained from the WBES; ICT, INTANG, CAPEX and SIZE from WorldScope. Detailed variable definitions, and sources are given in Table 1. The twenty-five countries included in the dataset given in Table 7. T-statistics are in parenthesis: *, **, *** indicate significance levels of 10, 5 and 1 per cent, respectively. Standard errors and covariance are White heteroskedasticity-consistent.

