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Firm Innovation in Emerging Markets

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Abstract: In this paper we investigate the determinants of firm innovation in over 19,000 firms across 47 developing economies. We define the innovation process broadly, to include not only core innovation such as the introduction of new products and new technologies, but also other types of activities that promote knowledge transfers and adapt production processes. We find that more innovative firms are large exporting firms characterized by private ownership, highly educated managers with mid-level managerial experience, and access to external finance. By contrast, firms that innovate less are typically state owned firms without foreign competitors. Identity of the controlling shareholder seems to be particularly important for core innovation - private firms whose controlling shareholder is a financial institution are the least innovative. While the use of external finance is associated with greater innovation by all private firms, it does not make state owned firms more innovative. Financing from foreign banks is associated with higher levels of innovation compared to financing from domestic banks.

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Introduction

A large literature has shown that financial development has a significant causal impact on growth. However the channels through which finance operates are not as well understood. While many economists have taken as given that innovation is one such channel essential for economic growth and development,[1] the finance literature is silent on how innovation in developing countries is affected by firms' access to finance.

In this paper, we study the determinants of the rate at which firms across developing countries innovate and adapt their organizations to meet market conditions. Most firms in emerging markets are engaged in activities far from the technological frontier and entrepreneurs innovate not just through original inventions but also by adopting new means of production, new products and new forms of organization. Hence, we define the innovation process broadly, to include not only core innovative activities such as the introduction of new products and new technologies, but also other types of activities that promote knowledge transfers such as signing joint ventures with foreign partners or obtaining new licensing agreements, and other actions that adapt the organization of the firm's business activities such as opening a new plant or outsourcing a productive activity.

We first identify the characteristics of innovative firms and then focus on the role of access to finance, governance, and market competition in influencing firms' ability to innovate. Specifically, we seek to answer the following questions:

- Are certain types of firms more innovative than others? What is the impact of firm size, age, legal status, and industry sector on the extent of innovative activities a firm is involved in?
- How does access to external finance help innovation? Does access to finance disproportionately benefit some firms more than others? How does the source of external finance and collateral requirements influence firm innovation?
- Are state-owned enterprises more or less innovative than other firms? Are private enterprises organized as corporations more innovative than other private enterprises?

[1] See, for example, Schumpeter (1934), Baumol (2002) and Aghion and Durlauf (2005) on the importance of innovation for growth and development. Schumpeter (1934) also highlights the need for thinking about innovation more broadly than just as inventions.

- How does competition, both the number of competitors and the identity of the competitor, influence innovation?

We use a sample of over 19,000 firms in 47 countries, taking measures of firm innovation from firms' responses to a stratified random survey. The survey also reports data on each firm's organization and ownership, the type of product market competition it faces, the educational level of its managers and the amount and sources of external financing.

We find that the externally financed proportion of a firm's investment expenditures is positively related to firm innovation, even after controlling for growth opportunities. Financing from foreign banks has a much larger impact than financing from local banks, both in promoting core innovation of introducing new product lines and technologies as well as other innovative activities related to opening a new plant, and establishing foreign joint ventures and new licensing agreements. Firms are also more innovative if a greater share of their borrowing is in a foreign currency.

Interestingly, we find that state-owned firms are an exception to these findings. State firms that obtain external financing are not significantly more likely to innovate (and in some cases, even less likely to innovate) than those state firms that do not obtain external financing.

These results do not appear to be driven by reverse causality. We find that there is a great deal of heterogeneity in the way external finance facilitates firm innovation. Furthermore, using instrumental variable techniques to deal with the potential endogeneity of external finance leaves the results unchanged.

Firm ownership and legal organization are also important determinants of firm innovation. Privately owned firms are, in general, more innovative than state owned enterprises and those organized as corporations are more innovative than firms organized as proprietorships, partnerships or cooperatives. Identity of the controlling shareholder seems to be particularly important for the introduction of new technology and those private firms whose controlling shareholder is a financial institution are the least innovative.

We also find suggestive evidence for the role of competition in spurring innovation. Firms are more innovative if the firm is an exporting firm. Foreign

competition, in particular, has a positive influence on the innovation rates of firms. By contrast, having a state-owned competitor does not have a significant effect on firm innovation. We also find evidence that managerial education and experience, and the education level of the workers are important determinants of firm innovation.

Our findings are most closely related to two recent papers examining the role of finance in facilitating innovation and entrepreneurship. Using data on Italian firms, Benfratello et al. (2006) show that local banking development has a positive effect on the probability of a firm introducing process or product innovation and this is particularly so for small firms and for firms in sectors more dependent on external finance. Their paper however does not examine how access to external finance at the firm level affects innovation. Gompers et al. (2006) on the other hand, study the supply side of capital. Using data on venture capital financing of US firms they show that suppliers of capital have a unique ability to identify the most skilled and successful entrepreneurs. In our paper we examine if the firms that do get external capital are indeed more innovative than firms that are not dependent on external finance.

The rest of the paper is organized as follows. Section 2 presents the motivation and our hypotheses. Section 3 discusses the data and summary statistics and section 4 presents the empirical model. We discuss our main results in section 5. Section 6 concludes.

2. Motivation

2.1. Finance and Innovation

There is a large empirical literature establishing that financial development promotes long term economic growth.[2] Specifically, at the macro cross-country level, King and Levine (1993) and Levine, Loayza, and Beck (2000) show that financial development promotes growth. Cross-country time-series studies by Bekaert, Harvey, and Lundblad (2001, 2005) also show that financial liberalization boosts economic growth by improving the allocation of resources and the investment rate. Demirguc-Kunt and Maksimovic (1998) and Rajan and Zingales (1998) provide evidence at the firm and industry level showing that reduced access to external finance is associated with lower

[2] See Levine (2005) for a review.

growth rates. Beck, Demirguc-Kunt, and Maksimovic (2005) further show that this effect is especially pronounced for smaller firms.

However, the channels through which access to finance affects firm growth is not well understood. Clearly, access to external finance can facilitate capital accumulation. However, on a macro scale, historians have identified innovation and technological progress as the principal causes of material progress over extended periods of time (see for example, Landes (1969), Rosenberg (1982) and Mokyr (1990)). Solow's (1957) path breaking analysis of growth in labor productivity in the U.S. has established that technological advances (broadly defined) and skill, rather than capital accumulation are the prime drivers of increases in labor productivity. Solow (1957) argues that approximately 80% of the increase in labor productivity in the U.S. over the period 1909-1949 was due to more productive use of capital and increases in the skill level of the labor force. More recently, Levine, Loayza, and Beck (2000) have shown that financial sector development helps economic growth through more efficient resource allocation rather than through increases in the scale of investment or savings mobilization.

Given the importance of technological advances for growth, it is important to ask whether financial development promotes growth by fostering innovation and thus increasing efficiency. Such an effect would occur if the financial system has an important role in supplying capital to firms that are innovating or restructuring their operations in ways that make them more efficient.

We consider innovation, both narrowly defined as a firm's adoption of new technology and introduction of new product lines, and a broader definition that takes into account changes in the firm's operations such as a decision to outsource certain activities or open a new plant.[3] We investigate below whether access to external finance is associated with greater firm innovation whereby firms adapt their operations at a higher rate.[4]

[3] In the next section, we define the activities we analyze more precisely.
[4] Using UK data, Aghion, Bond, Klemm, and Marinescu (2004) find that firms that report R&D activity are financed differently than firms that do not report any R&D activity.

2.2. Firm Governance and Innovation

A large literature in finance has linked firm governance to firm value, share price and profitability.[5] However, none of these papers have explored the role of firm governance in promoting innovation. We explore how four aspects of firm governance relate to innovation. First, we examine whether innovation rates differ between private businesses and state enterprises, two ownership structures with very different incentive mechanisms. The work of Shleifer (1998) and La Porta, Lopez-de-Silanes, and Shleifer (2002) on the performance differences between state and privately owned firms, suggests that the rate of innovation should be significantly higher in private businesses.

Second, we examine whether the organizational form of private businesses affects their innovation. Demirguc-Kunt, Love, and Maksimovic's (2006) investigation of the incorporation decision suggests that corporations become more prevalent and have comparatively higher growth rates in better institutional environments. However, we do not know if the differences in organizational forms, with their concomitant differences in governance, affect the rate of innovation.

Third, we also examine if the identity of the controlling shareholder of a private business affects its innovation. Recent work by Raphael and Villalonga (2006) suggests that family controlled firms may be systematically different from other businesses. Family ownership is likely to be particularly important in developing countries where the protection of minority shareholders is limited. Hence, we investigate whether the identity of the controlling shareholder is correlated with the rate of innovation.

Fourth, we examine how educational attainment, prior work experience, and tenure of the firm's top management relate to the rate of innovation. A negative relation between tenure in top management and firm innovation might suggest managerial entrenchment and be indicative of governance or contracting problems which prevent efficient turnover.

[5] The studies linking governance to firm performance include Black (2001), Black, Jang and Kim (2006), Durnev and Kim (2005), Klapper and Love (2004), Gompers, Ishii and Metrick (2003), Lang, Lins, and Miller (2003), and Doidge, Karolyi, and Stulz (2004). Most of these studies are based on large firms and do not include small and medium firms that dominate our study.

2.3. Competition and Innovation

We also examine the relation between firm innovation and the intensity of competition in the product market. The effect of the product market on firm innovation is of particular policy interest, since it is likely to be easier to control the amount of competition and the openness of the product market to foreign competition, than to reform a country's legal and financial institutions. Some support for this view is provided by Blundell, Griffith, and Van Reenan (1995), who find that in developed economies, as concentration and monopoly power increases, the rate of innovation falls. Nickell (1996) and Nickell, Nicolitsas, and Dryden (1997) find an inverse relation between growth in productivity and industry concentration. More recently, Aghion et al. (2006) have shown that intensity of competition, as measured by entry into an industry, affects efficient and inefficient incumbent firms differently. Entry spurs innovation among the more technologically advanced incumbent firms and slows it among the less efficient incumbents.

We measure the number of competitors a firm faces, their relative technological sophistication, and the quality of competition. In our sample, firm organization and governance are likely to be important predictors of efficiency. Thus, we track domestic private competitors, foreign competitors (who, in our developing country sample, are likely to be more sophisticated) and competitors who are state enterprises. The latter are likely to be poor competitors based on the findings of earlier literature.

Of particular interest is the effect of the interaction between the firm's organizational structure and the level of competition on the rate of innovation. Allen and Gale (2000) argue that for most firms in developing countries, the relevant disciplining device for controlling agency costs is the intensity of competition in the product market.[6] As the intensity of competition increases, a firm's freedom to deviate from efficient investment and innovation policies declines. A counter argument would suggest that as the level of competition increases, the firm's ability to enter into beneficial implicit contracts with customers and suppliers may decrease because the value of maintaining a

[6] See also Scharfstein (1988), Alchian (1950), Stigler (1958) and Hart (1983).

reputation also decreases.[7] Below, we explore the relation between competition, governance, and firm innovation.

Finally, we also consider the relation between firm size and innovation. Since Schumpeter (1947), there exists a large literature relating the rate of innovation to firm size in developed economies.[8] Below, we explore differences in the rate of innovation across firm size categories in our sample of developing country firms. We also treat firm size as a control variable in our tests of the relation between financial access and governance and the rate of innovation.

In summary, the literature on firm growth and financial development suggests that innovation is likely to be an important channel through which financial development affects growth. Below we test this hypothesis by examining the relationship between firm innovation and external financing, firm governance and product market competition. In our sample, the governance factors that are likely to be important are ownership structure and differences in legal organization, and their interaction with product market competition.

3. Data and Summary Statistics

The World Bank Investment Climate Survey database (ICS) consists of firm survey responses of over 19,000 firms in 47 developing countries.[9] The core survey uses standardized survey instruments and a uniform sampling methodology to benchmark the investment climate of individual economies across the world and to conduct firm performance analyses. The survey also report detailed information on firm employment, age, industry, ownership, legal status, and the number of establishments. The Investment Climate Survey sample from the universe of registered businesses and follow a stratified random sampling methodology. [10]

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[7] See, for example, Maksimovic (1988) or Maksimovic and Titman (1991).

[8] According to Schumpeter, large firm size is essential for innovation since larger firms can provide economies of scale in production and innovation. Other studies, by contrast, have emphasized the role of small firms including Rothwell and Dodgson, 1994; Acs and Audretsch (1987); and Scherer (1965) to name a few.

[9] The survey actually covers 44,000 firms in 67 countries. The sample is reduced to 19813 firms in 47 countries after eliminating observations with missing firm-level innovation variables.

[10] A detailed description of the sample design and sample frame can be found at http://www.enterprisesurveys.org/documents/Sampling_Note.pdf and a detailed description of the

A great advantage of this survey is its broad coverage of the extent of innovation that the firms undertake. Previously, there has been very little consistent data across countries on the nature of innovative activities undertaken by firms. Moreover, the available data typically covers only the developed countries and focuses on patents and R&D expenditures. However, the issues are likely to be different for most developing countries where imitation and adaptation of already-created and tested innovations, rather than cutting-edge innovations, are likely to be more important. Thus, in studying innovation in developing countries, it is all the more important to define innovation broadly rather than just as new inventions.

The new investment climate surveys allow us to capture the rate of firm innovation in this broader sense. Specifically, the surveys ask firms if they have undertaken any of the following ten innovative activities in the last three years: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with a foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house, and Brought in-house a major production activity that was previously outsourced.* The firm responses are coded as 0-1 (No-Yes) dummy variables for each of the 10 questions.

In addition to the ten individual indicators of firm innovation, we analyze three aggregate indicators for each firm as reported in panel B of Table 1. Our approach parallels La Porta et al's (1998) use of indices that aggregate individual characteristics in the study of corporate governance. ***INDEX8*** is an aggregate index obtained by summing the number of activities in which the firm engages, excluding two of the activities, *Discontinued at least one product line* and *Closed at least one existing plant or outlet.*[11] These activities are left out of INDEX8 because they are less likely to require outside financing than activities such as the introduction of new technology or the opening of a

implementation can be found at http://www.enterprisesurveys.org/documents/Implementation_note_January_2007.pdf

[11] We also experimented with an aggregate indicator of the ten individual indicators of innovation as well as a principal component indicator of the ten individual indicators of innovation and found our results to be consistent with the aggregate index, INDEX8.

plant. They are instead represented in ***INDEX2*** which is obtained by summing firm responses to the two activities, *Discontinued at least one product line* and *Closed at least one existing plant or outlet*. ***CORE*** is an aggregate index obtained by summing firm responses to two activities, *Developed a major new product line*, and *Introduced new technology that has substantially changed the way that the main product is produced*, to reflect the narrow definition of core innovation as used in existing literature.[12]

In addition to the rich detail on the innovative activities undertaken by firms, the survey has information on firm size, age, legal organization, number of establishments and capacity utilization, all of which are used as firm level controls in our study. The survey defines firms of different sizes, small, medium and large firms, on the basis of the number of full time workers.[13] Small firms are defined as those with less than 20 employees, medium firms employ 20 to 99 employees, and the large firms employ 100 or more employees. The sample is largely dominated by small and medium sized firms. Small firms make up 37% of the sample, medium firms constitute 35%, and large firms constitute 28% of the overall sample. Thus, the survey provides data across a much broader cross-section of firm sizes than is available in commercial data bases, such as Worldscope.

Table 1 summarizes the proportion of firms in each country that undertook each of the ten innovative activities over the year prior to the survey. All the countries in the sample are developing economies with GDP per capita in 2000 ranging from 192 U.S. dollars in the case of Tanzania to 11,646 U.S. dollars in the case of Slovenia.

The countries in the sample show a great deal of variation across the ten different categories of firm innovation. Firms in any country are more likely to undertake only certain types of innovative activities than others and hence in no single country are firms uniformly less or more innovative across the 10 different categories. Nevertheless, the aggregate indices, INDEX8 and CORE2, suggest that firms from Cambodia, Brazil, and South Africa are the most innovative, while firms from Egypt, Oman, and Turkey are the

[12] In unreported regressions we also analyzed a core innovation index which includes *upgrading an existing product line*. While the results were unchanged in majority of the specifications, we prefer to leave this index out of the core innovation index as it may overestimate the extent of innovation, since even very minor changes may qualify as upgrades.

[13] Employment is typically the most reliable figure in developing countries. Hence, number of full time workers is used as a measure of firm size by the World Bank Group and other international survey teams including RPED and the Oxford Centre for the Study of African Economies.

least innovative. For instance, 68% of Brazilian firms introduced a new product line, 95% upgraded an existing product line and another 68% introduced a new technology compared to Egyptian firms that were the least active in each of these categories (with corresponding numbers of 15%, 23% and 11% respectively). However, it is important to note that Brazilian firms are not innovative across all categories. Only 4% of Brazilian firms sign joint ventures and only 7% enter into new licensing agreements (the numbers for Egypt, Oman, and Turkey are similar) compared to 23% of firms in Belarus that sign new joint ventures and 38% of Russian firms that enter into new licensing agreements.

When we look at the numbers across different firm size groups, we find that larger firms are more innovative across all activities compared to smaller firms. The aggregate indicators also reveal that larger firms are more innovative than smaller firms.

Table 2 contains the sample statistics of the variables we consider. It shows that across countries, a higher percentage of firms are more actively engaged in core innovation (42% introduced new product lines and 39% introduced new technology) than in other types of innovative activities (for instance, only 7% signed joint ventures). The aggregate indicator, INDEX8, shows that firms on average undertake around two out of eight activities.

The firms in the survey are broadly classified in terms of legal organization into corporations; cooperatives, sole proprietorships and partnerships; and all other forms. Corporation is a legal status dummy that takes the value one if the firm is organized as a Corporation and 0 if the firm is organized as a Cooperative, Sole Proprietorship or Partnership or has some other form. Panel A of Table 2 shows that 43% of the sample is composed of corporations. The average firm age in the sample is 16 years. The survey also asks firms to report the number of separate operating facilities or establishments. While most firms are single establishment firms (73%), the mean number of separate operating facilities is about two establishments per firm.

The growth opportunities available to a firm may be an important determinant of the extent and type of innovative activities a firm is engaged in. Since we do not have a direct measure of a firm's growth opportunities, we use firms' capacity utilization rates as a proxy for growth opportunities of the firm. In the survey, capacity utilization is defined as the amount of output actually produced relative to the maximum amount that could be

produced with the firm's existing machinery, equipment and regular shifts. We include dummy variables to identify firms that have low growth opportunities (capacity utilizations below 50%), medium level of growth opportunities (capacity utilization between 50 and 80%) and firms with high growth opportunities (capacity utilization rates in excess of 80%). The variable Capacity Utilization takes on values 1 to 3 corresponding to the three categories just identified. When we look at the individual capacity utilization dummies (summary statistics not reported in the table), we find that more than 50% of the firms in the sample have high capacity utilization rates, indicating high growth opportunities.

Panel B of Table 2 presents the correlations between the different innovation indicators and Panel C presents the correlations between the aggregate innovation indicators and firm level variables. Panel B shows that all aspects of firm innovation are highly correlated at the 1% level. The correlation coefficients range from 0.03 to about 0.46. The highest correlation coefficient of 0.46 indicates that firms that introduce a new product line are also highly likely to upgrade an existing product line. Panel C of Table 2 shows that the aggregate indicators CORE2 and INDEX8 are very highly correlated with each other, with a correlation coefficient of 0.81 and are also significantly correlated with INDEX2 and all other firm variables. However, given the correlations among different firm characteristics, we investigate these relations in the next section through regression analysis.

4. Determinants of Firm Innovation: The Empirical Model

To study determinants of firm innovation we proceed in two steps. First, we analyze innovative activities controlling for broad firm characteristics, such as size, age, legal status, number of establishments, industry and capacity utilization. We also control for the GDP/Capita of the country. Next, we introduce variables that enable us to examine the relationships between innovation and firm financing, governance, and competition environment. We do not include all variables at once so as to not overload the specification and to avoid reducing the sample size significantly since some of these variables are available for only a subset of observations.

In the first step, the regression equations we estimate are of the form:

$$\text{Firm Innovation} = \alpha + \beta_1 \text{ Log (GDP/Capita)} + \beta_2 \text{ Firm Size Dummies} + \beta_3 \text{ Age} + \beta_4 \text{ Corporation Dummy} + \beta_5 \text{ Number of Establishments} + \beta_6 \text{ Capacity Utilization Dummies} + \beta_7 \text{ Industry Dummies} + \beta_8 \text{ Country Dummies} + \varepsilon \quad (1)$$

All regressions are estimated using firm level data across 47 countries.[14] The dependent variable is either one of the three aggregate indicators (INDEX8, CORE, or INDEX2), or one of the ten underlying indicators of innovation based on firms' responses to survey questions. Since the ten individual indicators of firm innovation are 0-1 variables, these regressions are estimated using a Logit probability model. For the aggregate indicators, we use Ordered Logit. All regressions report robust standard errors.

We use equation (1) as the baseline and build on it to examine the impact of governance (i.e. competition, ownership, management) and access to external finance. In the second step the regression equations we estimate are of the form:

$$\text{Firm Innovation} = \alpha + \beta_1 \text{ Log (GDP/Capita)} + \beta_2 \text{ Firm Size Dummies} + \beta_3 \text{ Age} + \beta_4 \text{ Corporation Dummy} + \beta_5 \text{ Number of Establishments} + \beta_6 \text{ Capacity Utilization Dummies} + \beta_7 \text{ Industry Dummies} + \beta_8 \text{ Country Dummies} + \beta_9 X + \varepsilon \quad (2)$$

where X is a variable or a vector of variables characterizing different aspects of the firm's financing, governance, and competition environment.

5. Results

Table 3 reports the estimated coefficients of baseline regression (1). The table shows that individual firm characteristics are an important determinant of the extent of innovation a firm undertakes. Probability of undertaking all types of innovative activities increases with firm size. Compared to small firms, medium and large firms are more likely to develop new product lines, upgrade existing product lines, introduce new technology, discontinue at least one product, open a new plant, close at least one existing plant, sign a new joint venture with a foreign partner, sign new licensing agreements, outsource a major activity and bring in-house a previously outsourced activity. The F-test

[14] We prefer to include country dummies in the regression specification rather than clustering since clustering would assume the country effect to be a part of the composite error term and thus uncorrelated with the other regressors. However, we find that the amount of external financing varies significantly across countries necessitating the use of country dummies.

reported in Table 3 suggests that the differences between medium and large firms are significant. Larger firms are also more innovative when we look at the aggregate indicators. The marginal effects (not shown in the table) calculated for the most innovative (CORE=2) firms show that the probability of core innovation increases by 16% for large firms compared to smaller firms. [15]

The number of establishments increases the probability that a firm will open or close a plant, as expected. Firms with a larger number of establishments are also more likely to sign new joint ventures and outsource a major activity and are more innovative based on the aggregate indicators as well.

Controlling for size and the number of establishments, firms organized as corporations also report more innovative activity than other businesses. The marginal effects show that the probability of core innovation increases by 3.7% for incorporated firms compared to cooperatives, sole proprietorships or partnerships.[16] Being incorporated has no effect on plant opening and closing decisions, although it increases the probability of all other activities.

Looking at the aggregate indicators, we also find evidence that younger firms and firms with higher growth opportunities are more innovative. These effects are also economically significant. For instance, the marginal effects of Core Innovation with respect to capacity utilization and age reveal that with a unit change in growth opportunities (high capacity utilization), the probability of core innovation increases by 7.5% and with a unit change in age, the probability of core innovation decreases by -0.08%.

The underlying innovation indicators suggest more diversity. For instance, younger firms are more likely to introduce new products and new technology, upgrade existing product lines, open a new plant, sign joint ventures, and bring in previously out-sourced activities, but older firms are more likely to discontinue products or close

[15] The marginal effects are computed at the mean of the other independent variables and are not reported in the tables. Throughout the paper, discussion of marginal effects refers to the case where marginal effects are computed for Core Innovation=2.

[16] Since the model is nonlinear, the value of predicted probabilities depends on the values of all other control variables. The economic effects reported are evaluated at the mean value of the control variables. However, even when we estimate the predicted probabilities for corporates and non-corporates for the full distribution of the control values, we see that the corporations have consistently higher predicted probabilities of innovation than un-incorporated firms.

existing plants. Growth opportunities do not affect a firm's out-sourcing/in-sourcing decisions or likelihood of opening a new plant or signing new licensing agreements. On the other hand, firms with high growth opportunities are less likely to discontinue products and close plants.

All industries are not equally innovative as suggested by the F-tests reported at the foot of the table. Although not reported in the table, our results indicate that of the 26 industries that the firms in our sample belong to, those in electronics, metals and machinery, chemicals and pharmaceuticals, telecommunications, auto and auto components, and other manufacturing are the most innovative in this sample of countries.

Table 3 also shows that for this sample of countries, there is contrasting evidence on the effect of average GDP/Capita of the country on core innovation versus the other types of innovative activities a firm undertakes. The coefficient of Log GDP/Capita is negative and significant only in the case of firms introducing new product lines, but is positive and significant for firm discontinuing products, opening and closing plants, signing joint ventures and licensing agreements and outsourcing production activities.

5.1. External Financing and Innovation

In this section, we examine whether the availability of external finance affects the extent of innovation that a firm undertakes. In the Investment Climate Assessments surveys, enterprise managers were asked: "Please identify the contribution over the last year of each of the following sources of financing for your establishment's new investments that includes new land, buildings, machinery and equipment." The sources are *internal funds or retained earnings, local commercial banks* (loan, overdraft), *foreign owned commercial banks, leasing arrangement, investment funds, trade credit, credit cards, equity, funds from family and friends, informal sources*, such as moneylenders, and *other* sources. The sum of these proportions adds up to one hundred percent. The survey also asks firms if they have a bank loan and the year in which the financing was approved. Hence we construct a Bank Loan dummy which takes the value 1 if the firm had been approved for a bank loan in 2001 or earlier and 0 if the firm did not have a bank loan approved prior to 2002. The Bank Loan dummy measures past access to external financing.

We also examine the impact of the *share of borrowing in foreign currency* and *the necessity of collateral*. The *share of borrowing in foreign currency* is the borrowing denominated in foreign currency as a share of total borrowing. The *necessity of collateral* is a dummy variable that takes the value one if financing requires collateral or a deposit, and zero otherwise.

The results in Table 4 show that there exists a significant positive relation between the use of external finance and the extent of firm innovation. In particular, external financing from foreign banks, leasing, investment funds and trade credit are significantly positively related (at the 1% level) to the aggregate innovation indices, INDEX8 and CORE. The underlying indicators reveal that foreign bank financing is important for all types of innovative activities except discontinuing products, closing plants and sourcing agreements. On the other hand, trade credit financing is particularly important for sourcing arrangements. The F-tests testing the difference between local and foreign banks show that financing from foreign banks is associated with significantly higher rates of innovation compared to financing from local domestic banks especially in the case of introducing new technology, opening new plants and signing new joint ventures. This difference is also significant for the aggregate index, INDEX8. When we examine the effect of access to bank financing in the past on innovation, we find that the Bank Loan dummy coefficient is positive and significant for all the aggregate indices.

We also find that firm innovation increases with greater share of borrowing in foreign currency. Demirguc-Kunt and Maksimovic (1998), Rajan and Zingales (1998) and Beck, Demirguc-Kunt, and Maksimovic (2005) show that access to external finance is associated with higher firm growth rates. These papers do not specify the channels by which access to finance affects firm growth. Our results show that in developing economies access to external financing and, in particular, foreign financing, is associated with a higher rate of innovation.

5.2 Governance and Innovation: The Impact of Ownership, Competition, and Management

In this section, we examine the impact a firm's governance structure has on its innovation. First, we look at the impact of firm ownership, whether it is private or state-

owned; and for private firms, the impact of the identity of the controlling shareholder. Second, we analyze the firms' competition environment. And finally, we investigate the impact of human capital, i.e. the education and experience level of firm managers, as well as that of workers.

Ownership Structure: The role of private versus public ownership has been a much researched area in finance and has been particularly relevant in developing countries, many of which opted for state ownership of the "strategic" sectors as a way of achieving their development goals. However, there has been little empirical evidence on the impact of public versus private ownership on firm innovation. In this section we examine if being a private owned firm versus a state owned firm, or a domestic versus a foreign owned firm has any impact on firm innovation. State (Domestic) ownership is a dummy variable that takes the value 1 if the state (domestic private sector) owns 50% or more of the company and 0 otherwise.

We also break down domestic private ownership into the following seven categories - *Individual, Family, Financial Institution, Managers, Employees, Domestic Corporation* and *Others*. These are dummy variables that take the value 1 if the largest shareholder or owner in the firm is an individual, family, financial institution, manager of the firm, employee of the firm, domestic company, or someone other than one of these categories including the government or government agencies.[17] Recent evidence in finance on the role of family firms has been mixed. Several papers posit that family owned and managed firms are better able to mitigate owner-manager agency problems and hence are more valuable (eg: Palia and Ravid (2002), Adams, et al. (2004), Fahlenbrach (2004)) and that founders bring valuable skills to the firm (Morck et al. (2000)). Burkart, Panunzi, and Shleifer (2003) however argue that hired professionals may be better managers than family founders or their heirs and the decision to cede control to professional management depends on the investor protection environment. In more recent work, Raphael and Villalonga (2006) show that whether family firms are more valuable or not depends closely on management (eg: Founder-CEO or Founder

[17] In our sample construction for the regressions, we first test state owned firms against all other private sector firms (both domestic and foreign). For our regressions with the domestic dummy, we drop all firms with greater than 50% state ownership and test domestic versus foreign ownership. Finally, we drop all firms with greater than 50% foreign ownership and investigate how the identity of the firm owner impacts innovation in a sample of domestic private sector firms.

Chairman with outside CEO) and the presence/absence of control enhancing features. While we don't have data on management and controlling structures in family firms, we are able to separately study the importance of both family firms and management skills on innovation.

We find that state ownership has a negative impact on overall firm innovation. State owned firms are less likely to introduce new products, upgrade existing products, introduce new technology, open new plants, or sign new joint ventures or licensing agreements than privately owned firms. When we compare domestic versus foreign ownership, we see that domestic firms are more likely to close existing plants or bring in-house previously outsourced activities whereas foreign ownership increases the probability that a firm will sign new joint ventures with foreign partners and new licensing agreements.

Next, we investigate whether the actual identity of the domestic private controlling shareholder makes a difference for firm innovation. At the 1% and 5% significance level, identity of the controlling shareholder seems to be particularly important for introduction of new products, new technology, discontinuing products, opening new plants, and signing joint ventures and licensing agreements. Private firms whose controlling shareholder is a financial institution tend to be less innovative in particular. This is of interest since firms owned by financial institutions presumably have easier access to finance, yet are less innovative, suggesting that when finance is not provided on market criteria, the effect can be counter-productive. We also find that employee owned firms and firms owned by domestic corporations are more likely to discontinue products.

When we look at the aggregate indicators of firm innovation, we find that if the controlling shareholder is an individual or a family or the manager of the firm, firms are more innovative than if the largest shareholder is the government. Firms owned by a financial institution or investment fund are particularly less innovative than other types of ownership structures. This is consistent with La Porta, Lopez-de-Silanes and Zamarripa (2003) who find that related loans, where banks lend to firms controlled by the bank's owners, are not necessarily to the best firms. They find that 33% of related loans are more likely to default and have lower recovery rates than unrelated loans. Looking at the

aggregate innovation indices, CORE and INDEX8, the F-test rejects that all coefficients are equal to each other.

Competition: We use seven variables to study different aspects of firm competition: *Number of competitors; Percentage of sales sold domestically*, that helps identify whether a firm is an exporter or not; *Firm's technology compared to competitor*, that takes values 1, 2 or 3 depending on whether the technology is less advanced, about the same or more advanced than that of its main competitor; *Does the firm have a foreign competitor* is a dummy variable that takes the value 1 if the firm has one or more foreign firms as a competitor; *Does the firm have a state competitor* is a dummy variable that takes the value 1 if the firm has one or more state owned enterprises as a competitor and 0 if the firm has no state competitors; *Foreign Competition has greatest influence to reduce production costs* is a dummy variable that takes the value 1 if foreign competition had the greatest influence to reduce production costs and takes the value 0 if the greatest influence was from domestic competition, customers, creditors, shareholders or the government instead; and *Foreign Competition had greatest influence to develop new products* is a dummy variable that takes the value 1 if foreign competition was the most important influence on the firm to develop new products and takes the value 0 if the greatest influence was from domestic competition, customers, creditors, shareholders or government instead.

The results in Table 6 suggest that the higher the number of competitors, the more likely that the firm will bring in house previously outsourced activities, and less likely that the firm will open new plants or enter into new licensing agreements. There is also some evidence that higher the number of competitors, the firm is also more likely to engage in core innovation though these results are not statistically significant. Firms with a greater percentage of their sales sold domestically rather than exported are overall not as innovative as exporting firms, suggesting that non-exporters face lesser competitive pressures than exporting firms. Exporters are more likely to upgrade product lines, introduce new technology, open new plants and enter into joint ventures or licensing agreements. If the firm's technology is better than that of its competitor, the firm is more likely to engage in all types of innovative activities except discontinuing product lines and closing plants.

Table 6 also shows that the identity of the competitor can be important.[18] Facing competition pressures from a foreign owned firm is beneficial for all types of innovative activities except opening plants and signing new licensing agreements. The aggregate indicators, CORE and INDEX8 are also positive and significant indicating the positive influence of foreign competition on core innovation. Interestingly, having one or more state owned firms as a competitor has no significant effect on the aggregate indicators of firm innovation. When we look at the individual indicators, a firm is less likely to discontinue products if it faces state competition.

Given the positive influence of foreign competition,[19] we further investigate if the influence of foreign competition works through its impact on firms' decisions to develop new products or reduce production costs. Firms reporting that foreign competition had the greatest influence to reduce their production costs were more likely to introduce new products, open new plants, sign new joint ventures and licensing agreements. Firms reporting that foreign competition had the greatest influence to develop new products were most likely to sign new joint ventures with foreign partners. Interestingly, differentiation strategies rather than cost reduction strategies had a greater impact on firm sourcing decisions.

Managerial Education and Experience - Impact of Human Capital: Next, we examine if a firm's human capital has an important influence on innovation capability. Human capital, as measured by the education and experience level of the management and workforce, has been shown to have an important influence on firm investment decisions and overall firm behavior. In this section we examine the influence of human capital on a firm's rate of innovation. We specifically look at the education and experience level of the top manager and the workforce.

The variables are defined as follows: *Top Manager's Total Years of Experience* is the total number of years of experience the top manager has had working in this sector, before running the establishment; *Mid-Level Experience* is a dummy variable that takes the value 1 if the top manager has had between 3-10 years of experience working in this

[18] The variables capturing the identity of the competitor (foreign or state) and the influence of foreign competition are available for a much smaller sample of firms. Sample sizes in these regressions range from 4300-4900 firms.

[19] In unreported regressions, we also find that percentage of foreign competition has an impact on the aggregate indicators.

sector before running the establishment; *Highly experienced* is a dummy variable that takes the value 1 if the top manager has had more than 10 years of experience working in this sector before running the establishment; *Skilled Foreign workers* is the percentage of permanent skilled workers that are foreign nationals; *Percentage of workforce that has more than 12 years of education* summarizes the percentage of workforce with formal university level education of 12 years or more; and *Highest education level of the manager* takes values 1 to 6 according to the following categories-did not complete secondary school, completed secondary school, vocational training, some university training, graduate degree and post graduate degree.

We find that the number of years of prior experience the top manager has had in the same industry has no effect on whether the firm is likely to be innovative or not. On investigating deeper, we find that firms run by managers with three to ten years of experience are more innovative than firms run by inexperienced managers. Specifically these firms are more likely to introduce new product lines, upgrade existing product lines, introduce new technology and sign new licensing agreements. Managerial experience of more than 10 years seems to be important mainly in the case of bringing in-house previously outsourced activities.

When we look at the importance of skill we find some evidence that foreign skilled workers are an asset when it comes to signing a new joint venture with a foreign partner. The education level of both the manager and the workforce, have a significant influence on the extent of innovation a firm undertakes. We find that firms with workforce with greater than twelve years of education are more innovative along most dimensions, except with respect to opening and closing plants and bringing in-house previously outsourced activities. However, having a highly educated manager makes a firm more innovative along all dimensions.[20] These results support the importance of human capital as measured by education and experience level of managers and workers for firm innovation.

[20] On the education question, firms were asked to report what percent of workforce had the following education levels: Less than 6 years ("some elementary"), 6-9 years, 10-12 years, More than 12 years (some university) with the four values summing to a 100%. Dropping firms that had values greater than or less than 100 did not change any of the results.

5.3. External Financing, Competition, and Innovation-Robustness

5.3.1. External Financing and Innovation

The results in Table 4 suggest a strong correlation between firm innovation and external finance. While this may indicate that the availability of external finance spurs firm innovation, it could also suggest reverse causality. Firms that innovate and therefore have better growth opportunities may also be the ones that are able to raise external finance and introduce new technologies and products.

To control for reverse causation, we control for growth opportunities in our regressions by including a variable "capacity utilization" at the firm level. Even after controlling for growth opportunities, firm size (employees and number of establishments), age, industry and legal organization, external financing is strongly related to firms' probability to undertake core innovation, and other innovative activities. In addition, we find that access to bank financing in years before the survey (prior to 2002) also has a positive and significant impact on firm innovation suggesting that our results are not driven by reverse causality. Nevertheless, in this section we probe deeper into the relationship between firm innovation and external finance. First, we estimate instrumental variable regressions to deal with reverse causality more formally and second, we investigate if external finance affects all firms' innovation rates in the same way.

In Panel A of Table 8, we use two stage instrumental variable (IV) regressions to deal with the potential endogeneity. The regressions control for baseline firm characteristics and the instrumented external finance variable. In the first stage we use three sets of instruments for external finance. First, we use historical variables commonly used in the literature, namely *Latitude* of a country's capital city, the country's *Legal Origin*, *Religion*, and *Ethnic Diversity*. These are found to be highly correlated with the development of financial systems around the world.[21] Second, since our analysis is at the firm level as opposed to pure cross-country, we also use external financing averaged within each country. While innovation at an individual firm may lead to greater external finance for that firm, it is not likely that it would explain the average level of external financing in that country. All instruments are significantly correlated with firm

[21] See Beck, Demirguc-Kunt, and Levine (2003) and Ayyagari, Demirguc-Kunt, and Maksimovic (2006, 2007) for a discussion of these different instruments.

level external finance. Finally, we use historical instruments again but do all the analysis at the country level. The aggregate innovation indicators (dependent variables) and external financing (independent variable) are averaged across countries. In the last specification, since we are performing the analysis at the country level, we only control for Log GDP/capita and do not control for any of the firm level variables (age, firm size, number of establishments, capacity utilization, industry or legal form).

Since the IV approach is applicable only to linear models, in panel B, we also report two stage regressions. In the first stage, ordinary least squares regressions are used to predict external financing. In the second stage, to investigate the impact of the predicted value of external financing on innovation, we use ordered logit regressions.

Panel A shows that the coefficient of the instrumented external financing variable is positive and significant in the CORE and INDEX8 regressions, suggesting that reverse causality is not the main driver of our findings. External financing does not have an effect on discontinuing products or closing plants as shown in the INDEX2 regressions. These results are reinforced when we look at the two stage results in Panel B. The predicted value of external financing from first stage regressions has a positive and significant impact on core innovation.

Next, we explore if access to external finance benefits all firms universally by interacting external finance with firm size, age, ownership and organizational form in Table 9. Table 9 shows that while the availability of external finance makes firms more likely to innovate regardless of age and legal organizational form, ownership does matter. We have some evidence that state firms are likely to innovate less with external finance (see INDEX8) compared to private firms. Foreign firms, on the other hand, are likely to innovate more with external finance compared to private domestic firms, particularly by introducing new technology and through obtaining new licensing agreements. The aggregate innovation indices also indicate that foreign firms are more innovative with external financing.

There is some evidence that large enterprises are more likely to introduce new technology and sign new licensing agreements with greater access to external finance.

External financing doesn't seem to particularly help innovation in small and medium enterprises.[22]

However, it could be that we are unable to capture the differences by treating firms of different sizes together in the same regression. Small sample sizes prevent us from running separate regressions for each size group. Hence, to further analyze the link between firm size and innovation, in Figure 1, we compute the average sources of external financing used by different firms. We sub-categorize the firm sizes into Small0, Small1, Small2, Medium0, Medium1, Medium2, Large0, Large1, and Large2 to reflect the extent of core innovation the firms undertake. For instance, Small0 reflects small firms that undertake no core innovation, Small1 reflects firms that undertake take at least one core innovative activity (i.e. introduce new products or introduce new technology) and Small2 reflects firms that undertake both types of core innovation.

Figure 1 shows that both small and large firms that innovate (Small2 and Large2 respectively) use a greater amount of external financing (or lesser amount of internal financing) than small and large firms that do not innovate (Small0 and Large0 respectively). This pattern is particularly pronounced for small firms. Several other interesting patterns are revealed in the types of financing that firms use. On comparing just the innovators, Small2, Medium2 and Large2, we find that small firms that innovate rely mostly on financing from family and friends for their external financing needs where as medium and large firms rely mainly on bank financing.

Together, Table 9 and Figure 1 suggest that there is more than simple reverse causality since not all firms that receive external finance are equally innovative. Thus, although external finance is important in enabling firms to implement innovations, some firms are better able to make use of this financing.[23]

5.3.2. Competition and Innovation

In this section we investigate if there are non-linearities in the impact of competition and external financing on innovation. Recent work by Aghion et al. (2006)

[22] In unreported regressions, we find that the interaction term of external financing and a small firm dummy is significant at the 1% level for bringing in-house previously outsourced activities.
[23] In unreported regressions we have also investigated whether availability of finance affects all industries equally. Again there are differences, with IT Services, Metals and Machinery, and Mining and Quarrying industries innovating more with greater external finance.

predicts an inverted U relationship between competition and innovation, in the sense that, innovation initially increases with an increase in product market competition and then declines. The inverted U relationship is particularly applicable to core innovation in countries and industries that are at the forefront of the technology frontier.

In our sample of emerging markets, where innovation is mainly through adaptation or imitation, we examine if there are non-linearities in the relation between competition and innovation by interacting with firm characteristics. We are particularly interested in the interaction between firm organization and competition on innovation. While we used seven indicators of competition in Table 6, in this section, we restrict ourselves to the variable which is available for the largest sample of firms - Percentage of establishment sales that are sold domestically.

In Table 10, we present interaction regressions with the full set of control variables. The aggregate indicators in Table 10 show that while there is an inverse relationship between the percentage of establishment sales sold domestically and the extent of innovation, this is less likely when the firm is a corporation and more likely when the firm has 50% or more state ownership or is a small/medium sized firm. When we interact percentage of sales sold domestically with other firm characteristics such as age and foreign ownership, we find that none of these firm characteristics have a significant influence on the extent of innovation of exporters versus non-exporters as shown by the aggregate indicators

The underlying indicators reveal some differences however. Exporters who are older are more likely to sign joint ventures with foreign partners and those that are foreign owned are more likely to sign joint ventures as well as open new plants.

While the above results show that competition has a significant impact on innovation and varies according to the types of firms, we recognize that inclusion of industry and country dummies may not be sufficient to remove all spurious correlation between competition and the innovation indicators. In the absence of time series data and information on policy reforms across our sample of countries that might have allowed us to correct for the potential endogeneity in the competition measure, we leave the identification issues in this area for future work.

6. Conclusions

The strong and independent causal role of finance in promoting growth has been demonstrated in recent literature using quantitative evidence from around the world. A large body of empirical work has also demonstrated the importance of good governance ownership structures and market competition for value creation by firms.

Understanding how an effective financial system contributes to economic development and which characteristics of the business environment promote good governance is crucial to optimize policy recommendations to help develop financial sectors that promote growth. Since innovation responses to a changing economic environment are widely considered to be the main driver of the growth process, understanding the links between finance and firm innovation is an important step in identifying the channels through which financial development contributes to economic development.

Using firm level data for over 19,000 firms in 47 developing countries, this paper provides evidence that a firm's access to finance is an important determinant of the extent of innovation it undertakes. We define innovation broadly, to include not only core innovation activities (introducing new technology, new product lines and upgrading them), but also other types of activities that promote knowledge transfers (such as signing joint ventures with foreign partners and obtaining new licensing agreements), as well as opening or closing plants, discontinuing product lines, and activity sourcing decisions, which reflect the overall dynamism of firms.

Our results indicate that the more innovative firms are younger but larger, and are exporting firms characterized by private ownership, highly educated managers with mid-level managerial experience, and access to external finance. By contrast, firms that do not innovate much are typically state owned firms who do not have foreign competitors. Identity of the controlling shareholder seems to be particularly important for the introduction of new technology and those private firms whose controlling shareholder is a financial institution, tend to be the least innovative. We find evidence that the use of external finance is associated with greater innovation by foreign firms, yet state owned firms with external financing are even less innovative. Financing from foreign banks is associated with higher levels of innovation compared to financing from domestic banks

and innovation also increases with a greater share of the firm's borrowing in foreign currency.

The findings of this paper are consistent with the well-established result in the literature that financial development and institutions that are associated with good governance lead to economic growth. In this paper, we provide additional evidence at the micro level by showing that one of the channels through which access to finance affects the growth process is through spurring firm innovation. We also find suggestive evidence that higher competition and good governance are associated with greater innovation.

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Table 1: Indicators of Firm Innovation

This table presents the proportion of firms in each country undertaking different types of innovations. The variables are described as follows: GDP per capita is real GDP per capita in US dollars in 2000. *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsourced* are all dummy variables that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet*. INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees.

Nation	GDP/ Capita	New product line	Upgraded existing product line	New Technology	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Albania	1007.95	0.43	0.45	0.33	0.11	0.02	0.04	0.05	0.05	0.04	0.12	0.75	1.47	0.15
Armenia	629.91	0.31	0.42	0.26	0.19	0.04	0.05	0.09	0.13	0 11	0.10	0.56	1.44	0.24
Azerbaijan	533.48	0.31	0.31	0.22	0.14	0.06	0.08	0.09	0.32	0.06	0.04	0.54	1.42	0.22
Belarus	1896.41	0.44	0.62	0.33	0.17	0.06	0.07	0.23	0.37	0.21	0.14	0.77	2.41	0.24
Bhutan	532.21			0.59										
Bosnia and Herzegovina	1594.60	0.39	0.61	0.33	0.11	0.16	0.09	0.16	0.09	0.07	0.06	0.70	1.82	0.20
Brazil	4626.34	0.68	0.95	0.68	0.41	0.16	0.08	0.04	0.07	0.28	0.21	1.35	3.06	0.50
Bulgaria	1544.94	0.57	0.54	0.31	0.30	0.14	0.10	0.06	0.26	0.04	0.10	0.88	2.01	0.40
Cambodia	367.51	0.53	0.90	0.60	0.05	0.18	0.02	0.21	0.21	0.33	0.41	1.14	3.38	0.07
China	824.63	0.24	0.40	0.33								0.57		
Croatia	5077.08	0.51	0.74	0.37	0.30	0.27	0.16	0.09	0 13	0.05	0.13	0.86	2 25	0.44
Czech Republic	5380.49	0.28	0.48	0.23	0.16	0.28	0.13	0.06	0.08	0.05	0.14	0.51	1.61	0.29
Ecuador	1705.06	0.52	0.84	0.51	0.44	0.06	0.09	0.11	0.08	0.20	0.10	1.03	2.42	0.53
Egypt, Arab Rep.	1216.65	0.15	0.23	0.11	0.15			0.02	0.01	0.04		0.25		
El Salvador	1759.68	0.62	0.82	0.51	0.43	0.06	0.08	0.09	0.04	0.11	0.08	1.13	2 33	0 51
Estonia	3792.29	0.29	0.51	0.32	0.22	0.22	0.22	0.05	0.21	0.12	0.06	0.61	1.76	0.44
Georgia	768.13	0.33	0.44	0.29	0.28	0.14	0.06	0.06	0 13	0.04	0.08	0.62	1 51	0.34
Guatemala	1562.57	0.53	0.82	0.43	0.39	0.08	0.16	0.12	0.04	0.13	0.14	0.96	2.29	0.55
Honduras	713.11	0.47	0.72	0.46	0.31	0.07	0.09	0.09	0.04	0.08	0.09	0.92	2.03	0.40
Hungary	5439.15	0.24	0.35	0.15	0.22	0.20	0.16	0.04	0.08	0.14	0.09	0.39	1.29	0.37
Indonesia	1014.63	0.38	0.68	0.22	0.22	0.07	0.08	0.06	0.08	0.13	0.10	0.58	1.65	0.29
Kazakhstan	1547.98	0.34	0.43	0.19	0.19	0.05	0.16	0.06	0.27	0.06	0.03	0.52	1.43	0.34
Kyrgyz Republic	443.96	0.41	0.54	0.30	0.23	0.11	0.15	0 12	0.20	0.08	0.04	0.71	1.77	0.37
Latvia	2608.12	0.37	0.56	0.33	0.26	0.23	0.17	0.05	0.26	0.05	0.03	0.69	1.86	0.43

Nation	GDP/ Capita	New product line	Upgraded existing product line	New Technology	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Lithuania	2617.61	0.49	0.40	0.29	0.31	0.09	0.09	0.07	0.19	0.16	0.06	0.76	1.70	0.38
Macedonia, FYR	2541.06	0.35	0.40	0.32	0.09	0.15	0.04	0 21	0.08	0.22	0.08	0.67	1.80	0.12
Mali	292.81	0.46	0.59	0.50	0.11	0.11	0.06	0.06	0.05	0.06	0.07	0.94	1.85	0.17
Moldova	424.47	0.51	0.59	0.30	0.34	0.28	0.18	0.07	0.29	0.07	0.14	0.81	2.25	0.52
Nicaragua	502.65	0.47	0.85	0.53	0.37	0.05	0.11	0.09	0.02	0.10	0.08	1.00	2.19	0.48
Oman	5921.12	0.36	0.46	0.32	0.14	0.21	0.05	0.04	0.07	0.04	0.08	0.20	0.46	0.06
Philippines	1173.14	0.49	0.64	0.42	0.42	0.13	0.11	0.06	0.13	0.21	0.14	0.88	2.14	0.51
Poland	4337.37	0.43	0.56	0.27	0.18	0.08	0.08	0.01	0.09	0.02	0.02	0.70	1.48	0 25
Romania	1461.46	0.47	0.70	0.31	0.18	0.31	0.15	0.06	0.21	0.07	0.22	0.78	2.35	0.33
Russian Federation	2944.13	0.39	0.50	0.30	0.27	0.12	0.15	0.04	0.38	0.08	0.01	0.68	1.77	0.42
Serbia and Montenegro	1631.59	0.38	0.58	0.36	0.08	0.26	0.12	0 17	0.11	0.07	0.10	0.72	2.01	0.20
Slovak Republic	4303.32	0.33	0.77	0.34	0.27	0.24	0.18	0.05	0.17	0.06	0.09	0.67	2.04	0.45
Slovenia	11646.10	0.28	0.41	0.33	0.20	0 12	0.13	0.17	0.19	0.14	0.13	0.61	1.77	0.32
South Africa	4022.63	0.68	0.84	0.61	0.44	0.20	0.11	0.09	0.10	0.20	0.34	1.28	3.06	0.55
Syrian Arab Republic	792.82	0.42	0.46	0.33	0.21			0.04	0.06			0.74		
Tajikistan	229.49	0.41	0.55	0.35	0.33	0.03	0.14	0.06	0.18	0.06	0.04	0.76	1.67	0.46
Tanzania	191.75	0.33	0.58	0.32	0.18	0.11	0.07	0.04	0.09	0.05	0.09	0.63	1 57	0 24
Thailand	2827.62	0.50	0.71	0.52	0.19	0.08	0.02	0.04	0 11	0.18	0.11	1.02	2 23	0 21
Turkey	3047.65	0.18	0.27	0.15	0.07	0.06	0.04	0.04	0.03	0.05	0.04	0.33	0.81	0.10
Uganda	348.64			0.47										
Ukraine	880.88	0.45	0.57	0.37	0.18	0.10	0.08	0.19	0.19	0.10	0.11	0.83	2.10	0.26
Uzbekistan	654.31	0.28	0.44	0.22	0.16	0.06	0.11	0.05	0.19	0.06	0.05	0.50	1.35	0.27
Zambia	403.82	0.49	0.69	0.50	0.27	0.34	0.14	0.06	0.06	0.11	0.17	0.99	2.41	0.41
Small (1-19)		0.33	0.49	0.28	0.19	0.08	0.07	0.05	0.10	0.08	0.09	0.59	1.61	0.27
Medium (20-99)		0.44	0.63	0.40	0.27	0.12	0.09	0.06	0.11	0.15	0.14	0.82	2 17	0 36
Large (100 and over)		0.51	0.70	0.50	0.32	0.18	0.12	0.12	0.16	0.18	0.15	0.99	2.60	0.44

Table 2: Summary Statistics

Panel A presents the summary statistics, Panel B presents the correlation matrix between the firm innovation variables and Panel C between the aggregate innovation variables and firm level variables. The variables are described as follows: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsourced* are all dummy variables that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet.* INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet.* CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log GDP/capita is the logarithm of GDP per capita in 2000. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Firm age is the year of the survey (2000)-year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization takes values 1 to 3 corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%.

Panel A: Summary Statistics

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Individual Innovation Indicators					
New product line	19031	0.42	0.5	0	1
Upgraded existing product line	19028	0.6	0.49	0	1
New Technology	19417	0.39	0.49	0	1
Discontinued at least 1 product	16644	0.26	0.44	0	1
Opened a new plant	15121	0.13	0.33	0	1
Closed at least one existing plant	15111	0.09	0.29	0	1
New JV with foreign partner	16638	0.07	0.26	0	1
New Licensing Agreement	16647	0.12	0.32	0	1
Outsourced a major activity	16093	0.13	0.34	0	1
Brought in-house a previously out-sourced activity	15127	0.13	0.33	0	1
Aggregate Innovation Indicators					
CORE	19415	0.79	0.81	0	2
INDEX8	15478	2.08	1.68	0	8
INDEX2	15478	0.35	0.57	0	2
Control Variables					
Log (GDP/Capita)	47	7.3	0.87	5.26	9.36
Firm Size	19684	1.91	0.8	1	3
Age	19760	16.55	16.31	0	202
Number of Establishments	15314	2.05	5.89	0	200
Corporations	18963	0.43	0.49	0	1
Capacity Utilization	17982	2.4	0.67	1	3

Panel B: Correlation Matrix between the Firm Innovation Indicators

	New product line	Upgraded existing product line	New Technology	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity
Upgraded existing product line	0.4612[a]								
New Technology	0.3787[a]	0.4424[a]							
Discontinued at least 1 product	0.2777[a]	0.2297[a]	0.2004[a]						
Opened a new plant	0.1678[a]	0.1186[a]	0.1485[a]	0.0960[a]					
Closed at least one existing plant	0.0491[a]	0.0366[a]	0.0315[b]	0.2003[a]	0.2148[a]				
New JV with foreign partner	0.1366[a]	0.1112[a]	0.1177[a]	0.0623[a]	0.1340[a]	0.0976[a]			
New Licensing Agreement	0.1281[a]	0.0827[a]	0.1066[a]	0.0749[a]	0.1595[a]	0.1080[a]	0.2229[a]		
Outsourced a major activity	0.1672[a]	0.1735[a]	0.1882[a]	0.1305[a]	0.1151[a]	0.0881[a]	0.1509[a]	0.1267[a]	
Brought in-house a previously out-sourced activity	0.1746[a]	0.1699[a]	0.1832[a]	0.1117[a]	0.1292[a]	0.0764[a]	0.1114[a]	0.0966[a]	0.2946[a]

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Panel C: Correlation Matrix between the Aggregate Innovation/Innovation Indicators and the Firm Level Variables

	INDEX8	CORE	INDEX2	LGCAP	Size	Age	Number of Establishments	Corporations
CORE	0.8116[a]							
INDEX2	0.3168[a]	0.2612[a]						
LGCAP	0.0145[c]	0.0717[a]	0.0326[a]					
Size	0 2405[a]	0.1967[a]	0.1236[a]	0.0711[a]				
Age	0.0513[a]	0.0340[a]	0.1177[a]	0.0604[a]	0.2767[a]			
Number of Establishments	0.0477[a]	0.0185[b]	0.0562[a]	0.0280[a]	0.1354[a]	0.0764[a]		
Corporations	0.2089[a]	0.2025[a]	0.0776[a]	0.1982[a]	0.2555[a]	0.0148[b]	0.0102	
Capacity Utilization	0.0172[b]	0.0605[a]	-0.0726[a]	0.1689[a]	0.0937[a]	-0.0563[a]	0.0378[a]	0.0295[a]

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Table 3: Determinants of Firm Innovation

This regression model estimated is Innovation = $\alpha + \beta_1$ Log (GDP/Capita) $+\beta_2$ Firm Size Dummies + β_3 Age + β_4 Corporations $+\beta_5$ Number of Establishments + β_6 Capacity utilization Dummies + β_7 Industry Dummies + β_8 Country Dummies + ε. The variables are described as follows: GDP per capita is real GDP per capita in US dollars in 2000. Innovation is one of the following variables: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsource, INDEX8, INDEX2* and *Core.* Each of the first ten innovation indicators is a dummy variable that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet*. INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log (GDP/capita) is the logarithm of GDP per capita in 2000. Firm Size Dummies consist of three dummies corresponding to small, medium, and large firms. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Age is the year of the survey (2000) - year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization Dummies consist of three dummies corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%. Logit regressions are used for the individual indicators (columns 1-10) and Ordered Logit regressions are used for the aggregate indices (columns 11-13). The p-value for the joint significance test of the industry dummies and the p-values for Chi-square test of Medium Firms being the same as Large firms are also reported. Detailed variable definitions and sources are in the appendix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Log (GDP/Capita)	-0 244[b]	-0.015	0.014	0.306[b]	0.909[a]	0.600[a]	0.591[a]	0.602[a]	0.522[a]	0.093	-0.165[c]	-0.055	0.319[a]
	[0.098]	[0.093]	[0.097]	[0.128]	[0.257]	[0.194]	[0.173]	[0.168]	[0.182]	[0.135]	[0.088]	[0.081]	[0.120]
Medium	0.422[a]	0.427[a]	0.331[a]	0.247[a]	0.622[a]	0.360[a]	0.627[a]	0.336[a]	0.358[a]	0.424[a]	0.426[a]	0.528[a]	0.305[a]
	[0.048]	[0.052]	[0.049]	[0.054]	[0.077]	[0.083]	[0.099]	[0.073]	[0.074]	[0.077]	[0.043]	[0.041]	[0.052]
Large	0.718[a]	0.745[a]	0.740[a]	0.490[a]	1.155[a]	0.774[a]	1.353[a]	0.773[a]	0.537[a]	0.572[a]	0.820[a]	0.995[a]	0.597[a]
	[0.056]	[0.062]	[0.057]	[0.063]	[0.082]	[0.091]	[0.104]	[0.080]	[0.083]	[0.086]	[0.051]	[0.048]	[0.059]
Age	-0.004[a]	-0.003[b]	-0.004[a]	0.004[a]	-0.011[a]	0.006[a]	-0.004[c]	-0.002	-0.001	-0.006[a]	-0.005[a]	-0.006[a]	0.006[a]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]
Corporation	0.156[a]	0.252[a]	0.222[a]	0.204[a]	0.102	-0.13	0.284[a]	0.330[a]	0.223[a]	0.198[b]	0.207[a]	0.323[a]	0.138[b]
	[0.052]	[0.055]	[0.054]	[0.060]	[0.074]	[0.084]	[0.094]	[0.075]	[0.077]	[0.078]	[0.047]	[0.044]	[0.056]
Number of establishments	0	0.003	0.003	0.004	0.022[a]	0.018[a]	0.009[b]	0.003	0.008[b]	-0.007	0.002	0.010[a]	0.013[a]
	[0.003]	[0.004]	[0.003]	[0.004]	[0.004]	[0.003]	[0.004]	[0.004]	[0.004]	[0.006]	[0.003]	[0.003]	[0.003]
Capacity Utilization between [50%, 80%]	0.238[a]	0.286[a]	0.342[a]	-0.034	-0.079	-0.236[b]	0.03	0.139	-0.064	0.032	0.314[a]	0.198[a]	-0.131[c]
	[0.073]	[0.078]	[0.075]	[0.078]	[0.116]	[0.114]	[0.134]	[0.118]	[0.106]	[0.113]	[0.066]	[0.063]	[0.076]

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Capacity Utilization>=80%	0.331[a]	0.295[a]	0.447[a]	-0.274[a]	-0.025	-0.565[a]	-0.221[c]	0.087	-0.03	0.032	0.417[a]	0.229[a]	-0.383[a]
	[0.072]	[0.077]	[0.075]	[0.079]	[0.115]	[0.115]	[0.134]	[0.117]	[0.106]	[0.113]	[0.066]	[0.063]	[0.076]
Constant	1.265	-0.141	-1.104	-3.858[a]	-10.951[a]	-7.376[a]	-7.301[a]	-8.278[a]	-6.963[a]	-2.839[b]			
	[0.808]	[0.781]	[0.814]	[1.098]	[2.341]	[1.731]	[1.548]	[1.511]	[1.618]	[1.146]			
Observations	13823	13818	13889	13817	13476	13454	13763	13791	13472	13483	13886	13541	13541
Pseudo R-square	0.0942	0.1722	0.1174	0.0912	0.1024	0.0775	0.1252	0.111	0.1012	0.1118	0.0964	0.0734	0.0713
F-Test Medium= Large	0	0	0	0	0	0	0	0	0.0065	0	0	0	0
Joint Significance Test of Industry Dummies	0	0	0	0	0	0	0	0	0	0.033	0	0	0

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Table 4: Effect of Financing on Firm Innovation

This regression model estimated is Innovation = α + β_1 Log (GDP/Capita) +β_2 Firm Size Dummies + β_3 Age + β_4 Corporations +β_5 Number of Establishments + β_6 Capacity utilization Dummies +β_7 External Financing (or Bank Loan dummy) +β_8 Equity +β_9 Local Banks +β_{10} Foreign Banks +β_{11} Leasing +β_{12} Investment Funds +β_{13} Trade Credit +β_{14} Credit Cards +β_{15} Family +β_{16} Informal Sector (eg: moneylender) +β_{17} Other + β_{18} Foreign Currency Borrowing+β_{19} Necessity of Collateral + β_{20} Industry Dummies + β_{21} Country Dummies + ε. The variables are described as follows: GDP per capita is real GDP per capita in US dollars in 2000. Innovation is one of the following variables: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsource, INDEX8, INDEX2* and *Core*. Each of the first ten innovation indicators is a dummy variable that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet*. INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log (GDP/capita) is the logarithm of GDP per capita in 2000. Firm Size Dummies consist of three dummies corresponding to small, medium, and large firms. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Age is the year of the survey (2000) - year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization Dummies consist of three dummies corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%. *External Financing* is the proportion of new investments financed externally and is given by 100-Proportion of new investments financed through internal funds or retained earnings. *Bank Loan Dummy* takes the value 1 if the firm had a bank loan approved prior to 2001 and 0 if it did not have a bank loan. *Local Banks, Foreign Banks, Leasing, Investment Funds, Trade Credit, Credit Cards, Equity, Family, Informal Sources* and *Other* represent proportion of new investments financed by local commercial banks, foreign owned commercial banks, leasing arrangements, investment funds or special development financing, supplier or customer credit, credit cards, sale of stock, family and friends, informal sources such as moneylenders and other. *Foreign Currency Borrowing* is the total borrowing denominated in foreign currency and *Necessity of Collateral* is a dummy variable that takes the value 1 of the financing required collateral or a deposit and 0 otherwise. Logit regressions are used for the individual indicators (columns 1-10) and Ordered Logit regressions are used for the aggregate indices (columns 11-13). The regressions with external financing sources also present the p-values for the corresponding Chi-square test (F-tests for columns 10-13) for testing Local Bank financing is the same as Foreign Bank financing. Detailed variable definitions and sources are in the appendix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
External Financing	0.002[a]	0.002[a]	0	0.001[c]	0.003[a]	0.001	0.004[a]	0.002[b]	0.002[b]	0.001	0.001[b]	0.002[a]	0.001[c]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]
External Financing Sources of New Investments													
Equity	0	0.004	0.001	-0.007[a]	0.004	-0.006	0.007[c]	0.003	0.009[b]	0.01	0.001	0.006	-0.007[a]
	[0.003]	[0.007]	[0.004]	[0.002]	[0.003]	[0.004]	[0.004]	[0.002]	[0.004]	[0.007]	[0.004]	[0.006]	[0.003]
Local Bank	0.001	0.003	0.002	-0.003	0	-0.003	-0.001	0	0.002	0	0.002	0.002	-0.003
	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.004]	[0.003]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.003]
Foreign Bank	0.004[c]	0.007[c]	0.007[a]	0.003	0.015[a]	0.002	0.012[a]	0.007[b]	0.001	0.003	0.006[a]	0.010[a]	0.003
	[0.002]	[0.004]	[0.003]	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.002]	[0.003]	[0.002]
Leasing	0.007[a]	0.007[a]	0.005[a]	0.004[b]	0.008[a]	0.002	0.004[c]	0.002	0.001	0.002	0.006[a]	0.007[a]	0.004[b]
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.003]	[0.002]	[0.004]	[0.002]	[0.002]	[0.001]

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Investment Fund	0.008[a]	0.020[a]	0.008[a]	0	0.010[a]	0.003	0.001	0.005[b]	0.005	0.010[a]	0.009[a]	0.010[a]	0.001
	[0.002]	[0.006]	[0.003]	[0.001]	[0.001]	[0.003]	[0.003]	[0.002]	[0.003]	[0.004]	[0.002]	[0.002]	[0.002]
Trade Credit	0.007[a]	0.011[a]	0.005[a]	0.003[b]	0.004[b]	0.002	0.003	-0.001	0.004[a]	0.005[b]	0.007[a]	0.007[a]	0.003[c]
	[0.002]	[0.002]	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]
Credit Card	0.013[b]	0.006	-0.002	0.001	0.009[c]	0.002	0.010[b]	-0.007	0.006	-0.005	0.006	0.005	0.001
	[0.005]	[0.006]	[0.004]	[0.005]	[0.005]	[0.005]	[0.005]	[0.007]	[0.006]	[0.007]	[0.004]	[0.004]	[0.004]
Family	0.005[c]	0.007[b]	0.003	-0.002	0.009[a]	0.003[c]	0.003	0.001	0.007	0.007[a]	0.005[c]	0.007[b]	0
	[0.003]	[0.003]	[0.002]	[0.001]	[0.003]	[0.002]	[0.003]	[0.002]	[0.005]	[0.002]	[0.003]	[0.003]	[0.002]
Informal	0.003	0.005	0.002	0.001	-0.001	-0.001	-0.005	0.001	-0.001	0.006	0.001	0.001	0.001
	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.004]	[0.006]	[0.003]	[0.003]	[0.004]	[0.003]	[0.003]	[0.003]
Other	0.001	0.002	0.001	0.001	0.002	0.003[c]	0.003	0.001	0.004[c]	0.001	0.001	0.002	0.001
	[0.001]	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.004]	[0.001]	[0.002]	[0.002]
Bank Loan Dummy	0.055	0.196[b]	0.112	0.169[b]	-0.031	0.17	0.118	0.311[a]	0.146[c]	0.137	0.103[c]	0.162[a]	0.175[b]
	[0.069]	[0.088]	[0.069]	[0.072]	[0.104]	[0.119]	[0.133]	[0.112]	[0.085]	[0.091]	[0.062]	[0.058]	[0.068]
Necessity of collateral	-0.072	-0.045	0.092	-0.170[b]	-0.248[b]	-0.241[b]	-0.151	0.076	0.180[b]	0.163[c]	-0.016	-0.01	-0.201[a]
	[0.066]	[0.076]	[0.067]	[0.073]	[0.097]	[0.112]	[0.124]	[0.096]	[0.086]	[0.093]	[0.060]	[0.055]	[0.069]
Share of borrowing in foreign currency	0.005[a]	0.003[a]	0.001	0.003[a]	0.006[a]	0.005[a]	0.010[a]	0.005[a]	0.003[a]	0.003[b]	0.004[a]	0.005[a]	0.004[a]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Tests of Significance F-Test Local Bank=Foreign Bank	*0.2367*	*0.4696*	*0.0861*	*0.0719*	*0*	*0.1707*	*0.0008*	*0.0114*	*0.7557*	*0.3641*	*0.122*	*0.0089*	*0.0716*

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Table 5: Effect of Ownership on Firm Innovation

This regression model estimated is Innovation = α + β_1 Log (GDP/Capita) +β_2 Firm Size Dummies + β_3 Age + β_4 Corporations +β_5 Number of Establishments + β_6 Capacity utilization Dummies +β_7 State Ownership +β_8 Domestic Company + β_9 Individual+β_{10} Family+ β_{11} Financial Institution +β_{12} Managers +β_{13}Employees+β_{14}Corporation+ β_{15} Industry Dummies + β_{16} Country Dummies + ε. The variables are described as follows: GDP per capita is real GDP per capita in US dollars in 2000. Innovation is one of the following variables: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsource, INDEX8, INDEX2* and *Core.* Each of the first ten innovation indicators is a dummy variable that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet*. INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log (GDP/capita) is the logarithm of GDP per capita in 2000. Firm Size Dummies consist of three dummies corresponding to small, medium, and large firms. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Age is the year of the survey (2000) - year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization Dummies consist of three dummies corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%. *State Ownership* is a dummy variable that takes the value 1if the state owns 50% or more of the company and 0 otherwise. *Domestic Company* is a dummy variable that takes the value 1 if the domestic private sector owns more than 50%. *Individual, Family, Financial Institution, Managers, Employees* and *Domestic Corporation* are dummy variables which take the value 1 if the largest shareholder or owner in the firm is an individual, family, bank or investment fund, manager of the firm, employees of the firm, domestic corporation or government/government agency. Logit regressions are used for the individual indicators (columns 1-10) and Ordered Logit regressions are used for the aggregate indices (columns 11-13). Detailed variable definitions and sources are in the appendix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
State Ownership	-0.364[a]	-0.475[a]	-0.378[a]	-0.126	-0.683[a]	0.138	-0.532[a]	-0.453[a]	-0.13	-0.051	-0.420[a]	-0.545[a]	-0.027
	[0.090]	[0.090]	[0.094]	[0.104]	[0.141]	[0.128]	[0.159]	[0.117]	[0.147]	[0.151]	[0.082]	[0.075]	[0.095]
Domestic	-0.082	-0.123[c]	0.013	-0.003	-0.043	0.260[b]	-0.749[a]	-0.186[b]	-0.164[c]	0.155[c]	-0.032	-0.140[a]	0.082
	[0.063]	[0.069]	[0.064]	[0.070]	[0.083]	[0.108]	[0.093]	[0.081]	[0.086]	[0.091]	[0.056]	[0.053]	[0.066]
Identity of the Controlling Shareholder													
Individual	0.084	0.142	0.276[a]	0.225[b]	0.116	0.137	0.09	-0.022	-0.039	0.247[c]	0.221[a]	0.132[c]	0.190[c]
	[0.090]	[0.095]	[0.091]	[0.110]	[0.151]	[0.187]	[0.197]	[0.136]	[0.126]	[0.149]	[0.083]	[0.078]	[0.104]
Family	0.269[b]	0.084	0.468[a]	0.153	0.402[b]	0.146	0.369[c]	0.062	-0.156	0.021	0.419[a]	0.211[b]	0.142
	[0.108]	[0.119]	[0.109]	[0.127]	[0.172]	[0.209]	[0.223]	[0.169]	[0.153]	[0.173]	[0.098]	[0.092]	[0.120]
Financial Institution	-0.429	-0.203	-1.392[a]	-0.042	-0.184	0.502	-0.373	-1.661[b]	0.454	0.885[c]	-0.812[b]	-0.409	0.163
	[0.403]	[0.397]	[0.512]	[0.470]	[0.508]	[0.510]	[0.626]	[0.758]	[0.542]	[0.495]	[0.368]	[0.331]	[0.430]
Managers	0.273	0.396[b]	0.564[a]	0.216	0.088	0.117	0.532[c]	0.385[c]	0.196	0.292	0.503[a]	0.483[a]	0.215
	[0.181]	[0.193]	[0.184]	[0.213]	[0.277]	[0.319]	[0.321]	[0.231]	[0.264]	[0.269]	[0.162]	[0.155]	[0.198]
Employees	-0.156	-0.005	0.204	0.597[a]	-0.369	0.024	-0.17	-0.072	-0.123	0.237	0.066	-0.007	0.425[b]
	[0.191]	[0.189]	[0.193]	[0.208]	[0.317]	[0.309]	[0.354]	[0.230]	[0.307]	[0.315]	[0.171]	[0.157]	[0.197]

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Domestic Corporation	0.069	0.217[c]	0.164	0.369[a]	-0.025	0.312	0.504[b]	-0.026	0.168	0.119	0.143	0.132	0.355[a]
	[0.121]	[0.130]	[0.122]	[0.139]	[0.184]	[0.217]	[0.234]	[0.171]	[0.167]	[0.187]	[0.109]	[0.102]	[0.131]
F-Test All Coefficients are equal to each other	0.0205	0.3851	0.0001	0.1535	0.0119	0.7753	0.0143	0.0763	0.2344	0.1541	0.0001	0.0279	0.3287

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Table 6: Effect of Competition on Firm Innovation

This regression model estimated is Innovation = α + β_1 Log (GDP/Capita) +β_2 Firm Size Dummies + β_3 Age + β_4 Corporations +β_5 Number of Establishments + β_6 Capacity Utilization Dummies +β_7 Competition + β_8 Industry Dummies + β_9 Country Dummies + ε. The variables are described as follows: GDP per capita is real GDP per capita in US dollars in 2000. Innovation is one of the following variables: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsource, INDEX8, INDEX2* and *Core.* Each of the first ten innovation indicators is a dummy variable that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet.* INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log (GDP/capita) is the logarithm of GDP per capita in 2000. Firm Size Dummies consist of three dummies corresponding to small, medium, and large firms. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Age is the year of the survey (2000) - year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization Dummies consist of three dummies corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%. Competition is one of the following variables: *Number of competitors* is the total number of competitors in the domestic market that are private domestic enterprises, state-owned enterprises or foreign-owned enterprises, *Percentage of sales sold domestically* is the percentage of establishment sales that are sold domestically (instead of being exported), *Firm's Technology compared to that of its competitor* takes values 1, 2 or 3 depending on whether the technology is less advanced, about the same or more advanced than that of its main competitor, *Foreign Competition had greatest influence to reduce production costs* and *Foreign Competition had greatest influence to develop new products* are dummy variables that take value 1 if foreign competition had the greatest influence on the firm to reduce production costs or develop new products respectively and 0 otherwise, *Does the firm have a foreign competitor* and *Does the firm have a state competitor* are dummy variables that take the value 1 if over the last year, in the company's main product line, the firm had at least one foreign owned firm as a competitor or a state owned firm as a competitor respectively. Each cell in the table corresponds to a particular regression. Logit regressions are used for the individual indicators (columns 1-10) and Ordered Logit regressions are used for the aggregate indices (columns 11-13). Detailed variable definitions and sources are in the appendix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Number of competitors	0.001	0.002	0.002	-0.003	-0.018[a]	0	-0.007	-0.010[b]	-0.005	0.017[a]	0.001	0.001	-0.001
	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.005]	[0.005]	[0.004]	[0.003]	[0.003]	[0.002]	[0.002]	[0.003]
Percentage of sales sold domestically	-0.001	-0.002[b]	-0.001[c]	0.001	-0.002[b]	0	-0.015[a]	-0.003[a]	-0.001	-0.001	-0.001[b]	-0.003[a]	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Firm's technology compared to competitor	0.315[a]	0.371[a]	0.492[a]	-0.04	0.293[a]	-0.120[b]	0.327[a]	0.249[a]	0.109[b]	0.146[a]	0.445[a]	0.415[a]	-0.053
	[0.032]	[0.035]	[0.033]	[0.035]	[0.047]	[0.050]	[0.059]	[0.047]	[0.046]	[0.047]	[0.029]	[0.027]	[0.032]
Does the firm have a foreign competitor?	0.235[a]	0.298[a]	0.257[a]	0.149[b]	-0.002	0.236[c]	0.384[a]	0.003	0.368[a]	0.504[a]	0.278[a]	0.377[a]	0.193[a]
	[0.070]	[0.083]	[0.071]	[0.076]	[0.113]	[0.128]	[0.145]	[0.124]	[0.093]	[0.098]	[0.063]	[0.060]	[0.073]

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Does the firm have a state competitor?	-0.048	-0.035	-0.03	-0.407[b]	0.157	0.233	-0.248	-0.145	-0.255	0.127	-0.017	-0.043	.
	[0.149]	[0.168]	[0.152]	[0.166]	[0.225]	[0.234]	[0.308]	[0.271]	[0.210]	[0.197]	[0.133]	[0.123]	
Foreign Competition had greatest influence to reduce production costs	0.183[b]	0.102	0.097	0.135	0.302[b]	0.147	0.707[a]	0.445[a]	0.063	-0.024	0.168[b]	0.268[a]	0.142[c]
	[0.088]	[0.122]	[0.088]	[0.088]	[0.123]	[0.139]	[0.139]	[0.142]	[0.108]	[0.115]	[0.079]	[0.075]	[0.084]
Foreign Competition had greatest influence to develop new products	0.142	0.084	0.166[c]	0.166[c]	0.089	0.002	0.634[a]	0.113	0.212[c]	0.291[b]	0.167[b]	0.272[a]	0.128
	[0.092]	[0.128]	[0.093]	[0.092]	[0.137]	[0.152]	[0.146]	[0.159]	[0.112]	[0.116]	[0.083]	[0.078]	[0.089]

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Table 7: Effect of Human Capital on Firm Innovation

This regression model estimated is Innovation = $\alpha + \beta_1$ Log (GDP/Capita) $+\beta_2$ Firm Size Dummies + β_3 Age + β_4 Corporations $+\beta_5$ Number of Establishments + β_6 Capacity utilization Dummies $+\beta_7$ Human Capital Indicator + β_8 Industry Dummies + β_9 Country Dummies + ε. The variables are described as follows: GDP per capita is real GDP per capita in US dollars in 2000. Innovation is one of the following variables: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsource, INDEX8, INDEX2* and *Core*. Each of the first ten innovation indicators is a dummy variable that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet*. INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log (GDP/capita) is the logarithm of GDP per capita in 2000. Firm Size Dummies consist of three dummies corresponding to small, medium, and large firms. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Age is the year of the survey (2000) - year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization Dummies consist of three dummies corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%. Human Capital Indicator is one of the following variables: *Top Manager's Total Years of Experience* is the total number of years of experience the top manager has had in working in this sector before running the establishment; *Mid-Level Experience* is a dummy variable that takes the value 1 if the top manager has had between 3-10 years of experience working in this sector before running the establishment; *Highly experienced* is a dummy variable that takes the value 1 if the top manager has had more than 10 years of experience working in this sector before running the establishment; *Skilled Foreign workers* is the percentage of permanent skilled workers that are foreign nationals; *Highest education level of the manager* takes values 1 to 6 according to the following categories-did not complete secondary school, secondary school, vocational training, some university training, graduate degree and post graduate degree; *Percentage of workforce with more than 12 years of education* is the percentage of workforce at the establishment that has attended university or higher and had more than 12 years of education. Each cell in the table corresponds to a particular regression. Logit regressions are used for the individual indicators (columns 1-10) and Ordered Logit regressions are used for the aggregate indices (columns 11-13). Detailed variable definitions and sources are in the appendix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Top Mgr's total years of experience	0.002	0.002	0.004	0	0	-0.005	0.004	0.003	0	0.006	0.003	0.001	0
	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.005]	[0.006]	[0.005]	[0.004]	[0.004]	[0.003]	[0.002]	[0.003]
Mid-level experience	0.123[c]	0.293[a]	0.160[b]	-0.009	0.119	0.112	0.207	0.249[c]	0.115	0.11	0.158[b]	0.191[a]	0.006
	[0.071]	[0.089]	[0.072]	[0.075]	[0.113]	[0.128]	[0.158]	[0.129]	[0.092]	[0.103]	[0.065]	[0.061]	[0.074]
Highly experienced	0.098	0.121[c]	0.103[c]	-0.006	0.042	-0.125	0.227[c]	0.131	0.019	0.242[a]	0.098[c]	0.103[b]	-0.032
	[0.060]	[0.074]	[0.060]	[0.062]	[0.094]	[0.111]	[0.129]	[0.111]	[0.078]	[0.083]	[0.054]	[0.052]	[0.061]
Skilled foreign workers	0.003	-0.001	0.004	0.002	0.002	-0.005	0.009[c]	-0.004	0.006	-0.008	0.003	0.003	-0.002
	[0.003]	[0.004]	[0.003]	[0.004]	[0.004]	[0.006]	[0.005]	[0.005]	[0.004]	[0.005]	[0.003]	[0.003]	[0.004]
% workforce with >12 yrs years education	0.005[a]	0.003[a]	0.003[a]	0.003[a]	0	-0.001	0.015[a]	0.006[a]	0.005[a]	0.002	0.004[a]	0.006[a]	0.002[b]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Highest level of education of manager	0.111[a]	0.083[a]	0.052[a]	0.047[a]	0.080[a]	0.092[a]	0.267[a]	0.134[a]	0.110[a]	0.038[c]	0.090[a]	0.111[a]	0.058[a]
	[0.015]	[0.017]	[0.016]	[0.017]	[0.023]	[0.026]	[0.035]	[0.026]	[0.022]	[0.022]	[0.014]	[0.013]	[0.016]

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Table 8: Effect of Financing on Firm Innovation – Addressing Reverse Causality

Panel A reports instrumental variable regressions while Panel B reports two stage regressions. The first stage regression is External Financing = $\alpha + \beta_1$ Log (GDP/Capita) $+\beta_2$ Firm Size Dummies + β_3 Age + β_4 Corporations $+\beta_5$ Number of Establishments + β_6 Capacity utilization Dummies + β_7 Industry Dummies + β_8 Country Dummies + β_9 Historical Variables (Latitude, Ethnic ,Common Law, Catholic, Muslim, Protest) OR Average Value of External Financing. The second stage regression in both panels is INDEX8/INDEX2/CORE= $\alpha + \beta_1$ Log (GDP/Capita) $+\beta_2$ Firm Size Dummies + β_3 Age + β_4 Corporations $+\beta_5$ Number of Establishments + β_6 Capacity utilization Dummies + β_7 Industry Dummies + β_8 (Predicted Value of External Financing from the First Stage) + β_9 Country Dummies. The second stage regression is estimated using ordinary least squares in Panel A and using ordered logit in Panel B. The variables are described as follows: INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet*. INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log (GDP/capita) is the logarithm of GDP per capita in 2000. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Age is the year of the survey (2000) - year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization Dummies consist of three dummies corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%. External Financing is the proportion of new investments financed externally and is given by 100-Proportion of new investments financed through internal funds or retained earnings. In columns 1-3, historical variables are used as instruments. English Common Law is a dummy variable that takes the value 1 for Common Law Countries, Catholic, Muslim and Protest are dummy variables that take the value 1 depending on whether the dominant religious group in the country are Catholics, Protestants, or Muslims respectively, Ethnic Fractionalization is the probability that two randomly selected individuals in a country do not belong to the same ethnic group. Latitude is the absolute value of the latitude of the country scaled between zero and one. In columns 4-6, the instrument is average external financing averaged across countries. In columns 7-9, all variables are averaged across countries. In both panels, each specification reports the adjusted R-squares from the first stage regression. Panel A also reports the p-values of the F-test for the instruments used. Detailed variable definitions and sources are given in the appendix.

Panel A: Instrumental Variables

Instruments	*Historical Variables*			*Average External Financing Across Countries*			*Historical Variables*		
	1	2	3	4	5	6	7	8	9
	CORE	INDEX8	INDEX2	CORE	INDEX8	INDEX2	CORE (Averaged across countries)	INDEX8 (Averaged across countries)	INDEX2 (Averaged across countries)
External Financing	0.006[a]	0.039[a]	0	0.006[a]	0.039[a]	0			
	[0.002]	[0.005]	[0.001]	[0.002]	[0.005]	[0.001]			
External Financing (Averaged across countries)							0.012[a]	0.031[a]	0.003
							[0.004]	[0.008]	[0.002]
First Stage Adjusted R2	0.2093	0.2088	0.2088	0.209	0.2086	0.2086	0.4676	0.4004	0.4004
F-Test of Instruments	0	0	0	0	0	0	0	0	0
N	9577	9439	9439	9726	9588	9588	44	41	41

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Panel B: Two Stage Regressions (OLS in the First Stage, Ordered Logit in the Second Stage)

Predicted Values in Second Stage	*Historical Variables*			*Average External Financing Across Countries*			*Historical Variables*		
	1	2	3	4	5	6	7	8	9
Dependent Variable in Second Stage	CORE	INDEX8	INDEX2	CORE	INDEX8	INDEX2	CORE (Averaged across countries)	INDEX8 (Averaged across countries)	INDEX2 (Averaged across countries)
External Financing	0.014 [a]	0.041 [a]	-0.008	0.014 [a]	0.041 [a]	-0.007			
	[0.004]	[0.004]	[0.007]	[0.004]	[0.004]	[0.007]			
External Financing (Averaged across countries)							0.118 [a]	0.134 [a]	0.003
							[0.029]	[0.033]	[0.002]
First Stage Adjusted R2	0.2093	0.2088	0.2088	0.209	0.2086	0.2086	0.4676	0.4004	0.4004
N	13688	13343	13343	13886	13541	13541	44	41	41

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

Table 9: Interaction of Financing with Firm Characteristics

This regression model estimated is Innovation = α + β_1 Log (GDP/Capita) +β_2 Firm Size Dummies + β_3 Age + β_4 Corporations +β_5 Number of Establishments + β_6 Capacity utilization Dummies +β_7 External Financing +β_8 External Financing X Age + β_9 External Financing X Micro/Small Dummy +β_{10} External Financing X State + β_{11} External Financing X Foreign + β_{12} External Financing X Corporations + β_{13} Industry Dummies + β_{14} Country Dummies + ε. The variables are described as follows: GDP per capita is real GDP per capita in US dollars in 2000. Innovation is one of the following variables: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsource, INDEX8, INDEX2* and *Core.* Each of the first ten innovation indicators is a dummy variable that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet*. INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log (GDP/capita) is the logarithm of GDP per capita in 2000. Firm Size Dummies consist of three dummies corresponding to small, medium, and large firms. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Age is the year of the survey (2000) - year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization Dummies consist of three dummies corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%. External Financing is the proportion of new investments financed externally and is given by 100-Proportion of new investments financed through internal funds or retained earnings. State Ownership is a dummy variable that takes the value 1if the state owns 50% or more of the company and 0 otherwise. Foreign Company is a dummy variable that takes the value 1 if the foreign private sector owns more than 50% of the company. Logit regressions are used for the individual indicators (columns 1-10) and Ordered Logit regressions are used for the aggregate indices (columns 11-13). Detailed variable definitions and sources are in the appendix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Corporations	0.208[a]	0.181[b]	0.174[b]	0.164[c]	0.128	-0.125	0.22	0.363[a]	0.122	0.276[b]	0.216[a]	0.322[a]	0.096
	[0.078]	[0.087]	[0.079]	[0.089]	[0.107]	[0.123]	[0.141]	[0.111]	[0.114]	[0.112]	[0.070]	[0.066]	[0.082]
External Financing	0.002[b]	0.002[c]	-0.001	0.001	0.004[a]	0.001	0.003[b]	0.001	0.001	0.002[c]	0.001	0.002[a]	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
External Financing x Corporations	0	0.002	0.001	0.001	-0.001	0	0.001	0.001	0.001	-0.003[c]	0.001	0	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.001]	[0.002]	[0.001]	[0.001]	[0.001]
Age	-0.002	-0.003	-0.002	0.004[b]	-0.013[a]	0.009[a]	-0.003	-0.001	0	-0.001	-0.002	0.007[a]	-0.004[a]
	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.002]	[0.002]	[0.002]
External Financing	0.003[a]	0.002[b]	0	0.001	0.002[b]	0.002[c]	0.004[a]	0.002[c]	0.002[c]	0.002[c]	0.002[b]	0.001[c]	0.002[a]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
External Financing x Age	0	0	0	0	0	0	0	0	0	-0.000[c]	0	0	0
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
State	-0.227[c]	-0.295[b]	-0.227[c]	-0.036	-0.530[a]	0.276	-0.588[b]	-0.238	-0.06	0.119	-0.264[b]	-0.343[a]	0.115
	[0.131]	[0.132]	[0.133]	[0.153]	[0.192]	[0.178]	[0.230]	[0.166]	[0.210]	[0.205]	[0.117]	[0.109]	[0.137]

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
External Financing	0.002[a]	0.002[a]	0	0.001	0.003[a]	0.002[c]	0.003[a]	0.002[a]	0.001[c]	0.001	0.001[b]	0.002[a]	0.001[b]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]
External Financing x State	-0.002	-0.003	-0.002	-0.001	-0.001	-0.007[b]	0.002	-0.007[b]	0.004	-0.004	-0.002	-0.003[c]	-0.003
	[0.002]	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]	[0.004]	[0.003]	[0.003]	[0.004]	[0.002]	[0.002]	[0.002]
Foreign	-0.012	0.053	-0.308[a]	0	-0.08	-0.083	0.737[a]	-0.11	0.216	0.017	-0.174[b]	-0.013	-0.044
	[0.098]	[0.108]	[0.101]	[0.109]	[0.131]	[0.159]	[0.147]	[0.132]	[0.136]	[0.137]	[0.087]	[0.081]	[0.102]
External Financing	0.002[b]	0.002[a]	0	0.001	0.003[a]	0.002[b]	0.004[a]	0.001	0.002[b]	0.001	0.001	0.002[a]	0.001[b]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
External Financing x Foreign	0.002	0.001	0.005[a]	0	0.002	-0.002	0.001	0.007[a]	-0.001	-0.003	0.004[a]	0.003[b]	0
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.002]
Micro/Small Dummy	-0.348[a]	-0.358[a]	-0.314[a]	-0.205[b]	-0.690[a]	-0.530[a]	-0.788[a]	-0.459[a]	-0.259[b]	-0.294[a]	-0.366[a]	-0.316[a]	-0.517[a]
	[0.076]	[0.087]	[0.076]	[0.083]	[0.100]	[0.116]	[0.130]	[0.105]	[0 103]	[0.104]	[0.068]	[0.077]	[0.064]
External Financing	0.003[a]	0.005[a]	0.002[b]	0.002[c]	0.004[a]	0.001	0.006[a]	0.004[a]	0.001	-0.001	0.003[a]	0.001	0.004[a]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
External Financing x Micro/Small	-0.001	-0.003[b]	-0.003[a]	-0.001	0	0.001	-0.003[c]	-0.003[c]	0.001	0.002	-0.003[a]	0	-0.002[b]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]

[a], [b], and [c] represent significance at 1%, 5% and 10% respectively

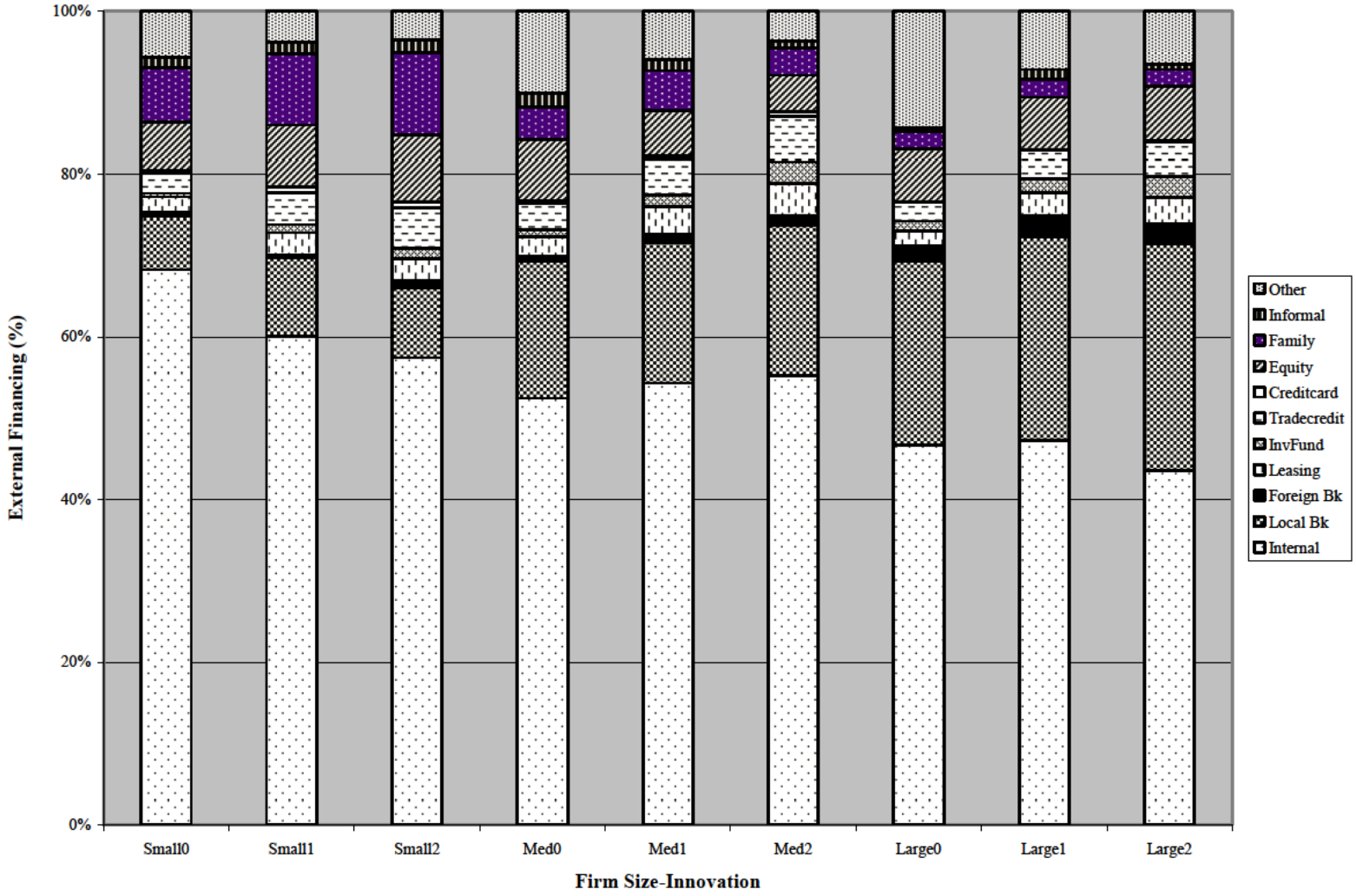
Table 10: Interaction of Competition with Firm Characteristics

This regression model estimated is Innovation = α + β_1 Log (GDP/Capita) +β_2 Firm Size Dummies + β_3 Age + β_4 Legal Status Dummies +β_5 Number of Establishments + β_6 Capacity utilization Dummies +β_7 Percentage of sales sold domestically +β_8 Percentage of sales sold domestically X Age + β_9 Percentage of sales sold domestically X Micro/Small Dummy +β_{10} Percentage of sales sold domestically X State + β_{11} Percentage of sales sold domestically X Foreign + β_{12} Percentage of sales sold domestically X Corporations + β_{13} Industry Dummies + β_{14} Country Dummies + ε. The variables are described as follows: GDP per capita is real GDP per capita in US dollars in 2000. Innovation is one of the following variables: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Discontinued at least one product (not production) line, Opened a new plant, Closed at least one existing plant or outlet, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsource, INDEX8, INDEX2* and *Core.* Each of the first ten innovation indicators is a dummy variable that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise. INDEX8 is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the ten different innovative activities except *Discontinued at least one product (not production) line* and *Closed at least one existing plant or outlet*. INDEX2 is formed by adding 1 if the firm has *Discontinued at least one product (not production) line* or *Closed at least one existing plant or outlet*. CORE is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line* or *Introduced a new technology*. Log (GDP/capita) is the logarithm of GDP per capita in 2000. Firm Size Dummies consist of three dummies corresponding to small, medium, and large firms. Small firms employ 1-19 employees, Medium firms have 20-99 employees, and Large firms have above 100 employees. Age is the year of the survey (2000) - year established. Number of establishments is the number of separate operating facilities a firm has. Corporations is a dummy variable that takes the value 1 if the firm is legally incorporated and 0 if the firm is organized as a cooperative, sole proprietorship, partnership or has another legal form. Capacity Utilization Dummies consist of three dummies corresponding to capacity utilization levels below 50%, between 50% and 80% and above 80%. Percentage of sales sold domestically is the percentage of establishment sales that are sold in the domestic market rather than being exported. State Ownership is a dummy variable that takes the value 1if the state owns 50% or more of the company and 0 otherwise. Foreign Company is a dummy variable that takes the value 1 if the foreign private sector owns more than 50% of the company. Logit regressions are used for the individual indicators (columns 1-10) and Ordered Logit regressions are used for the aggregate indices (columns 11-13). All Detailed variable definitions and sources are in the appendix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Technology	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Corporations	-0.197[c]	-0.024	0.239[b]	-0.074	0.068	0.151	-0.344[b]	-0.12	-0.201	-0.078	0.042	-0.052	-0.034
	[0.117]	[0.131]	[0.119]	[0.131]	[0.164]	[0.200]	[0.168]	[0.162]	[0.156]	[0.169]	[0.106]	[0.102]	[0.126]
Percentage of sales sold domestically	-0.003[a]	-0.003[a]	-0.001	-0.001	-0.002	0.002	-0.019[a]	-0.006[a]	-0.005[a]	-0.003[c]	-0.002[b]	-0.006[a]	0
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]	[0.001]
Percentage of sales sold domestically x Corporations	0.004[a]	0.003[b]	0	0.003[b]	0	-0.003	0.008[a]	0.005[a]	0.005[a]	0.003[c]	0.002	0.004[a]	0.002
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]
Age	-0.003	0.009[b]	-0.001	0.006	-0.014[a]	0.011[b]	-0.016[a]	-0.007	-0.001	-0.009[c]	-0.002	-0.004	0.009[a]
	[0.003]	[0.004]	[0.003]	[0.003]	[0.005]	[0.004]	[0.005]	[0.005]	[0.004]	[0.005]	[0.003]	[0.003]	[0.003]
Percentage of sales sold domestically	-0.001	0.001	0	0.001	-0.003[b]	0.001	-0.018[a]	-0.004[a]	-0.001	-0.001	-0.001	-0.003[a]	0.002[c]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Percentage of sales sold domestically x	0	-0.000[a]	0	0	0	0	0.000[a]	0	0	0	0	0	0
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

	1	2	3	4	5	6	7	8	9	10	11	12	13
	New product line	Upgraded existing product line	New Techno logy	Discontinued at least 1 product	Opened a new plant	Closed at least one existing plant	New JV with foreign partner	New Licensing Agreement	Outsourced a major activity	Brought in-house a previously out-sourced activity	CORE	INDEX8	INDEX2
Age													
State	0.417	0.22	0.084	0.361	-0.219	0.774[b]	-0.328	-0.829[b]	0.790[b]	0.37	0.23	0.166	0.673[b]
	[0.268]	[0.285]	[0.267]	[0.287]	[0.367]	[0.330]	[0.342]	[0.370]	[0.347]	[0.374]	[0.239]	[0.238]	[0.262]
Percentage of sales sold domestically	0	-0.001	-0.001	0.001[c]	-0.002[c]	0	-0.015[a]	-0.003[a]	-0.001	0	-0.001	-0.002[a]	0.002[b]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Percentage of sales sold domestically x State	-0.009[a]	-0.008[b]	-0.005[c]	-0.006[c]	-0.005	-0.007[b]	-0.002	0.005	-0.011[a]	-0.005	-0.007[a]	-0.008[a]	-0.008[a]
	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.003]	[0.003]	[0.003]
Foreign	0.032	-0.055	0.109	0.066	-0.252	-0.398[c]	-0.145	-0.091	-0.016	0.02	0.064	0.07	0.009
	[0.122]	[0.140]	[0.123]	[0.135]	[0.166]	[0.224]	[0.169]	[0.164]	[0.154]	[0.167]	[0.111]	[0.104]	[0.130]
Percentage of sales sold domestically	0	-0.001	0	0.002[c]	-0.003[b]	-0.001	-0.017[a]	-0.004[a]	-0.001	0	0	-0.002[a]	0.001[c]
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Percentage of sales sold domestically x Foreign	0.001	0.003	-0.001	0	0.005[b]	0.003	0.012[a]	0.004[c]	0.003[c]	-0.002	0	0.001	-0.001
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.002]
Small/Medium Dummy	-0.218[c]	-0.280[b]	-0.561[a]	-0.218[c]	-0.294[c]	-0.582[a]	0.164	-0.252	0.116	0.133	-0.466[a]	-0.349[a]	-0.318[a]
	[0.112]	[0.125]	[0.114]	[0.127]	[0.160]	[0.205]	[0.161]	[0.160]	[0 148]	[0.161]	[0.102]	[0.098]	[0.122]
Percentage of sales sold domestically	0	-0.001	-0.002[b]	0.002	-0.001	-0.001	-0.010[a]	-0.002[c]	0	0.001	-0.002[c]	-0.002[a]	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Percentage of sales sold domestically x Small/Medium	-0.003[c]	-0.002	0.001	-0.002	-0.005[a]	0	-0.011[a]	-0.003	-0.005[a]	-0.005[a]	-0.001	-0.003[b]	-0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]

Figure 1: Sources of External Financing Used by Firms of Different Size Groups and Innovation Types



Appendix A1: Variable Definition and Sources

Variable	Definition	Source
Innovation Indicators		
New product line	Has your company developed a new product line in the last three years? Yes (1) No (0)	Investment Climate Survey
Upgraded existing product line	Has your company upgraded an existing product line in the last three years? Yes (1) No (0)	Investment Climate Survey
New Technology	Has your company introduced new technology that has substantially changed the way that the main product is produced, in the last three years? Yes (1) No (0)	Investment Climate Survey
Discontinued at least 1 product	Has your company discontinued at least one product (not production) line in the last three years? Yes (1) No (0)	Investment Climate Survey
Opened a new plant	Has your company opened a new plant in the last three years? Yes (1) No (0)	Investment Climate Survey
Closed at least one existing plant	Has your company closed at least one existing plant or outlet in the last three years? Yes (1) No (0)	Investment Climate Survey
New JV with foreign partner	Has your company agreed a new joint venture with a foreign partner in the last three years? Yes (1) No (0)	Investment Climate Survey
New Licensing Agreement	Has your company obtained a new licensing agreement in the last three years? Yes (1) No (0)	Investment Climate Survey
Outsourced a major activity	Has your company outsourced a major production activity that was previously conducted in-house in the last three years? Yes (1) No (0)	Investment Climate Survey
Brought in-house a previously out-sourced activity	Has your company brought in-house a major production activity that was previously outsourced in the last three years? Yes (1) No (0)	Investment Climate Survey
Aggregate Innovation Indicators		
INDEX8	An aggregate measure of firm innovation that is formed by adding 1 for each of the following cases: if the firm has developed a new product line, upgraded an existing product line, introduced new technology, opened a new plant, signed a new joint venture with a foreign partner, obtained a new licensing agreement, outsourced a major production activity or brought in-house a previously outsourced activity in the past three years. The Index ranges from 0 to 8 with 8 indicating the firm is most innovative.	Own Calculations
INDEX2	An aggregate measure of firm innovation that is formed by adding 1 if the firm has discontinued at least one product, or closed at least one existing plant. The Index ranges from 0 to 2 and is meant to capture activities that do not require external financing	Own Calculations
CORE	An aggregate measure of innovation that is formed by adding 1 if the firm has developed a new product line or introduced a new technology. The Index ranges from 0 to 2 and is meant to capture activities constitute core innovation	Own Calculations
Firm Size Dummies	Firm Size Dummies consist of three dummies corresponding to small, medium, and large firms. Small firms have 1-19 employees, Medium firms have20-99 employees, Large firms have over 100 employees.	Investment Climate Survey

Variable	Definition	Source
Number of establishments	The number of separate operating facilities of a firm.	Investment Climate Survey
Age	Age is the year of the survey (2000) - year established	Investment Climate Survey
Corporations	Corporations is a dummy variable that takes the value 1 if the firm is organized as a corporation and 0 if the firm is organized as a Cooperative, Sole Proprietorship or Partnership or some other legal form.	Investment Climate Survey
Capacity Utilization Dummies	Capacity Utilization Dummies consist of three dummies corresponding to the establishment's average capacity utilization levels below 50%, between 50% and 80% and above 80%, over the last year. Capacity utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts.	Investment Climate Survey
Competition		
Number of Competitors	Number of competitors is the total number of competitors in the domestic market that are private domestic enterprises, state-owned enterprises or foreign-owned enterprises.	Investment Climate Survey
Percentage of sales sold domestically	Percentage of establishment sales that are sold in the domestic market rather than being exported.	Investment Climate Survey
Firm's technology compared to competitor	Considering the main product line or main line of services and comparing the production process with that of the firm's closest competitor, the following best summarizes the firm's position about its technology: Less advanced than that of its main competitor (1); About the same as that of its main competitor (2); More advanced than that of its main competitor	Investment Climate Survey
Does the firm have a foreign competitor?	Dummy variable that takes the value 1 if over the last year, in the company's main product line, the firm had at least one foreign owned firm as a competitor.	Investment Climate Survey
Does the firm have a state competitor?	Dummy variable that takes the value 1 if over the last year, in the company's main product line, the firm had at least one state owned firm as a competitor.	Investment Climate Survey
Foreign Competition had greatest influence to reduce production costs	Dummy variable that takes value 1 if foreign competition had the greatest influence on the firm to reduce production costs of existing products and services and 0 if greatest influence instead was domestic competition, customers, creditors, shareholders or government agencies.	Investment Climate Survey
Foreign Competition had greatest influence to develop new products	Dummy variable that takes value 1 if foreign competition had the greatest influence on the firm to develop new products or services and markets and 0 if the greatest influence was domestic competition, customers, creditors, shareholders or government agencies instead.	Investment Climate Survey
Human Capital		Investment Climate Survey
Top Mgr's total years of experience	How many years of experience working in this sector did the top manager have before running this establishment?	Investment Climate Survey
Mid-level experience	Dummy variable that takes the value 1 if the top manager has had between 3-10 years of experience working in this sector before running the establishment	Investment Climate Survey
Highly experienced	Dummy variable that takes the value 1 if the top manager has had more than 10 years of experience working in this sector before running the establishment	Investment Climate Survey
Skilled foreign workers	Percentage of permanent skilled workers that are foreign nationals	Investment Climate Survey

Variable	Definition	Source
% workforce with >12 yrs years education	Percentage of workforce that has more than 12 years of education defined as university or higher.	Investment Climate Survey
Highest level of education of manager	Highest education level of the manager takes values 1 to 6 according to the following categories-did not complete secondary school (1), secondary school (2), vocational training (3), some university training (4), graduate degree (5) and post graduate degree (6)	Investment Climate Survey
Ownership		Investment Climate Survey
State Ownership	State Ownership is a dummy variable that takes the value 1if the state owns 50% or more of the company and 0 otherwise.	Investment Climate Survey
Domestic	Domestic Company is a dummy variable that takes the value 1 if the domestic private sector owns 50% or more and takes the value 0 if the foreign private sector owns 50% or more.	Investment Climate Survey
Foreign	Foreign Company is a dummy variable that takes the value 1 if the foreign private sector owns 50% or more and takes the value 0 if the domestic private sector owns 50% or more.	Investment Climate Survey
Identity of the Controlling Shareholder	Individual, Family, Financial Institution, Managers, Employees and Domestic Corporation are dummy variables which take the value 1 if the largest shareholder or owner in the firm is an individual, family, bank or investment fund, manager of the firm, employees of the firm, or domestic corporation	Investment Climate Survey
External Financing		Investment Climate Survey
External Financing	100-Percentage of new investment over the last year coming from internal funds or retained earnings	Investment Climate Survey
Equity	Percentage of new investment over the last year coming from equity, sale of stock	Investment Climate Survey
Local Bank	Percentage of new investment over the last year coming from local commercial banks (loan, overdraft)	Investment Climate Survey
Foreign Bank	Percentage of new investment over the last year coming from foreign owned commercial banks	Investment Climate Survey
Leasing	Percentage of new investment over the last year coming from leasing arrangement	Investment Climate Survey
Investment Fund	Percentage of new investment over the last year coming from investment funds/special development financing or other state services	Investment Climate Survey
Trade Credit	Percentage of new investment over the last year coming from supplier or customer credit	Investment Climate Survey
Credit Card	Percentage of new investment over the last year coming from credit cards	Investment Climate Survey
Family	Percentage of new investment over the last year coming from family and friends	Investment Climate Survey
Informal	Percentage of new investment over the last year coming from informal sources (eg: moneylender)	Investment Climate Survey

Variable	Definition	Source
Other	Percentage of new investment over the last year coming from other sources	Investment Climate Survey
Share of borrowing in foreign currency	Percentage share of total borrowing (loans, accounts payable) that is denominated in foreign currency?	Investment Climate Survey
Necessity of collateral	Did the financing require collateral or a deposit? Yes (1) No (0)	Investment Climate Survey
Historical Instruments		
English Common Law	English Common Law is a dummy variable that takes the value 1 for Common Law Countries and 0 for Civil Law and Socialist Law Countries	La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999)
Catholic	Dummy Variables that takes the value 1 if the dominant religious group in the country are Catholics	La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999)
Muslim	Dummy Variables that takes the value 1 if the dominant religious group in the country are Muslims	La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999)
Protest	Dummy Variables that takes the value 1 if the dominant religious group in the country are Protestants	La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999)
Ethnic Fractionalization	Ethnic Fractionalization is the probability that two randomly selected individuals in a country do not belong to the same ethnic group	Alesina et al. (2003)
Latitude	Latitude is the absolute value of the latitude of the country scaled between zero and one.	La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999)