Chapter 7

Competition and innovation-driven inclusive growth

Mark A. Dutz, Ioannis N. Kessides, Stephen D. O'Connell and Robert D. Willig*

We investigate the strength of innovation-driven employment growth, the role of competition in stimulating and facilitating it, and whether it is inclusive. In a sample of over 26 000 manufacturing establishments across 71 countries (both OECD and developing), we find that firms that innovate in products or processes, or that have attained higher total factor productivity, exhibit higher employment growth than non-innovative firms. The strength of firms' innovation-driven employment growth is significantly positively associated with the share of the firms' workforce that is unskilled, debunking the conventional wisdom that innovation-driven growth is not inclusive in that it is focused on jobs characterized by higher levels of qualification. We also find that young firms have higher propensities for product or process innovation in countries with better Doing Business *ranks (both overall and ranks for constituent components focused on credit availability and property registration). Firms generally innovate more and show greater employment growth if they are exposed to more information (through Internet use and membership in business organisations) and are exporters. The empirical results support the policy propositions that innovation is a powerful driver of employment growth, that innovation-driven growth is inclusive in its creation of unskilled jobs, and that the underlying innovations are fostered by a pro-competitive business environment providing ready access to information, financing, export opportunities, and other essential business services that facilitate the entry and expansion of young firms.*

* Mark Dutz and Ioannis Kessides are at the World Bank, Stephen O'Connell is at the Graduate Center at City University of New York, and Robert Willig is Professor of Economics and Public Affairs at Princeton University. The authors thank Jørgen Elmeskov and Federico Giammusso for useful comments on an earlier draft.

Introduction

This paper brings enterprise-level empirical evidence to bear on the important policy debate regarding whether innovation-driven growth is inclusive.[1] The conventional view is that the force of economic innovation mainly creates and commercialises sophisticated new-to-the-world frontier products. As such, the benefits of innovation are traditionally perceived to flow disproportionately to the investors in and managers of larger, technically sophisticated corporations; highly skilled workers; stakeholders with control over channels of distribution of inputs and outputs that are needed by technically sophisticated enterprises; and ultimately higher-income households as consumers of innovative products. From this perspective, innovation-driven growth is not inclusive, at least not until that growth generalises to portions of the economy beyond the sectors involved directly in innovation.

We empirically explore an alternative view that innovation, especially in the context of development, should be recognised as applying to a broader range of non-replicative entrepreneurial accomplishments. Value and productivity-enhancing activities that commercialise ideas embedded in product, process, and organisational and marketing technologies that are new-to-the-firm and possibly new to the local economy, are apt to drive enterprise growth, even if they are not new-to-the-world. Such innovation-driven growth is indeed far more likely to be inclusive, in the sense of providing new employment and consumption opportunities for the segments of the population that are without secure prior participation in the organised developing economy. Local innovation and its consequent inclusive growth are apt to be enabled and spurred by the type of market competition that ensures opportunities for grass-roots entrepreneurs to access essential business services, as well as other required local inputs and distribution outlets. A secure, competitive market environment is especially important for vulnerable young firms, which may well have the most powerful collective potential for fast growth and job creation that is genuinely inclusive.

This paper analyses key linkages between competition, innovation, productivity and inclusive growth, both conceptually and empirically, using firm-level data across OECD and developing countries. The paper's principal empirical finding is that innovation and the resulting increases in productivity do lead, when spurred by a competitive business environment, to more inclusive growth. While much of our policy focus here is on the ramifications for vulnerable young firms of a competitive business environment, we also find empirical indications of the efficacy of the policy agenda in support of innovation that includes encouragement of skills and capacity development, knowledge access and networking, and risk finance. In addition, but

unexplored here, may be the complementary importance of demand-side policies such as standards setting and pro-innovation public procurement.[2]

A first empirical finding of ours, over all countries, or just over developing countries, is that enterprise employment growth is substantially greater for innovating than for non-innovating firms, after controlling for many other characteristics of the firms including their sector and country of activity. There is no indication in the data of offsetting negative externalities on the employment growth of other firms in the same sector and country. These findings are certainly confirming of policy support for enterprise-level innovation as a force for overall growth, but they leave open the controversial question of whether that growth would be inclusive.

Our empirical results proceed to show that innovation-driven growth is inclusive in that its job creation is as powerful and generally more powerful for enterprises with larger proportions of unskilled jobs. These findings are evidence against the hypothesis that innovation or knowledge-based growth does little for poorer segments of society, while generally aggrandising the already established and prosperous.

The chain of causality that we study begins with R&D investment and other sources of knowledge, which contribute to process and product innovations and other forms of within-firm productivity upgrading that are reflected in higher levels of enterprise total factor productivity (TFP). When enterprises experience the positive spur that comes from the ability to expand by accessing competitive markets and winning through market rivalry, product and process innovation and increased TFP make expansion profitable and practical. It is dramatically striking that the ensuing output expansion creates job growth that is not biased away, but rather is generally tilted towards inclusion of the unskilled. Across all countries, unskilled workers constitute a larger share of the employees of innovative firms than of non-innovative firms. We estimate that where the share of unskilled workers is greater by 10 percentage points, the employment annual growth rate of innovating firms is one percentage point greater, while the corresponding increase for non-innovating firms is only six-tenths of a percentage point. This difference between innovating and non-innovating firms is statistically significant and quantitatively important over time. Moreover, this finding, coupled with the increasing empirical support in the literature for the view that low-wage jobs are a stepping stone for the integration of the jobless into employment and better-paid work in the future, provides a key underpinning to innovation-driven inclusive growth.[3]

A complementary connective between innovation and inclusive growth is that innovation-driven growth is also inclusive in its impact on the employment of women. Across all countries, innovative firms' employment

growth is significantly more responsive to the fraction of female workers than that of non-innovative firms. We estimate that for innovating firms, a 10 percentage point increase in the share of their female workers is associated with an increase of two-tenths of a percentage point in the employment growth rate. This is contrasted with no statistically significant relationship between employment growth and the gender balance of the work force for non-innovating firms in our sample.

Our system of equations highlights and confirms some meaningful additional foundations. Among them, export competition and international exposure are powerful correlates of the progressive forces that promote inclusive growth. Use of the Internet is a dramatically important enterprise characteristic at every stage of the flow from ideas to employment growth. Participation in business associations, job training programmes and management certification are also shown in the data to make significant contributions along the entire chain leading to inclusive growth.

Finally, we have found some stimulating econometric results on the subject of the roles played by competition in innovation-driven inclusive growth. We find for our sample of non-OECD countries that national policies that further the competitive flexibility and fluidity of the business environment are, in a composite aggregate (as well as in key components reflecting access to essential business services such as getting credit and registering property), positively correlated with the proclivity of the country's young enterprises to innovate and thereby foster inclusive growth. Young enterprises are particularly important in their higher general levels of employment growth, and it is they whose ability to grow in response to innovation is particularly sensitive to the openness to competition of their business environment. On the other hand, at the level of the enterprise, neither employment growth nor the proclivity to innovate is positively correlated, given the controls in our framework, with the self-reported number of competing firms or presence of a foreign competitor. Evidently, while more actively-competing firms may mean that there are more sales in the market that the enterprise may aspire to divert through innovation-driven growth, the fact that these firms are identified as competitors signifies that there is active resistance to such diversion, and the result is on net no stimulus to the incentives for innovation.

Conceptual framework

In recent years, a large number of countries have actively sought to promote innovation policies to enhance long-run productivity, international competitiveness and economic growth.[4] Although innovation is considered vital for firm survival and a nation's economic well-being, especially in the

context of the globalised economy, careful and persuasive empirical evaluation of the actual impacts of innovation policies is still largely lacking. One area in particular that has not received sufficient empirical attention is the potential link between innovation and employment, especially in developing countries. Vital empirical questions arise here because of the revolutionary technological changes in several sectors of the global economy and the persistently high rates of unemployment that have plagued advanced industrial and developing countries alike.

It has long been recognised that innovation impacts employment through multiple channels of varying time scales and complexity, and that the overall effect is sensitive to the character of innovation (process versus product, radical versus incremental, etc.) and its setting. While economic theory does not generate unambiguous predictions for this relationship, many particular effects and insights can be articulated.

Process innovation can lead to productivity gains which enable firms to produce the same level of output with fewer inputs, or more output with the same inputs. Thus, process innovation can have direct labour-saving impacts ("displacement effects"). These negative effects of process innovation on employment can be counterbalanced by indirect expansion impacts when the cost reductions from the innovation spur price reductions to drive higher demand and greater output ("compensation effects"). The employment effects of product innovation, on the other hand, are somewhat less ambiguous. Product innovation generally stimulates demand (both domestic and foreign) for the firm's outputs and can lead to market expansion. At the same time, like process innovation, product innovation can cause demand diversion from substitute products of other firms (cannibalisation or business-stealing effect). Thus, while product innovation will likely enhance the labour demand of the innovating firm, its impact on aggregate employment is less clear, depending on the relative strengths of the market expansion and business-stealing effects. How these countervailing influences of innovation on employment balance in practice is an empirical question whose answer logically depends on the nature of the technology employed and the substitutability of input factors, the own and cross-price elasticities of demand, the degree of competition in the relevant product market, the nature of the business environment, the type of process innovation, the degree of novelty of the new product, and a host of other factors.[5]

Competition and innovation

It is fundamental economic theory that idealised competition impels productivity for enterprise survival (Syverson, 2011). In a dynamic setting, market-leading levels of productivity are set by innovation. By offering to

successful suppliers the full necessary rewards from investment and marketing initiatives and from relative efficiency, competitive markets provide full incentives for these elements of desirable dynamic behaviour. By presenting no impediments to firms following their incentives to vie with each other to meet customers' needs and thereby create business, undistorted competitive markets assure that customers will be served by the suppliers best able to innovate and to satisfy demands at the lowest possible cost. It is therefore widely recognised that idealised competition weeds out inefficiency, encourages productivity and technological progress, and generally benefits society by providing a combination of goods and services whose qualities and attributes are adapted to the demands of consumers using up as small a quantity of resources as possible in the supply of these products. Competition also makes enterprise expansion profitable due to the productivity gains that it stimulates.

Although many markets in reality are not entirely characterised by such idealised competition, they may well share at least some of its attributes that are critical for dynamic efficiency and innovation. Markets that enable their enterprise participants to expand their outputs with flexibility and fluidity, that is, without magnified costs or compressed revenues, when they have gained a competitive advantage, are conducive to incentives and ability for innovation, enhanced productivity, and consequent growth.

In such a competitive market, innovation that raises TFP likely lowers the marginal cost to a new level that creates or increases profit margins, thereby stimulating more output. Similarly, innovation that results in new or enhanced products may raise the value of firm output due to higher margins or more demand, and thereby induce expansion. The higher margins expected to result from successful innovation and elevated TFP alone provide incentive for business activities that are anticipated to promote dynamic progress, but especially high-powered incentives arise where the innovation is also expected to lead to significant growth of sales at the enlarged margins, and thus to substantially enlarged profits. Hence, markets that permit firms to expand with efficiency and flexibility foster heightened incentives for expenditure of efforts and investment to innovate and raise TFP, as well as fostering enterprise growth in response to their successful innovations.

For development to occur, innovation does not need to be focused on new-to-the-world technologies. In addition to the creation of new technologies, entrepreneurship facilitation can spur diffusion and adaptation of existing product, process, organisation and marketing technologies. In general, innovation can be profitable without the growth of tangible outputs and inputs, including by higher-value design products, and by lowered fixed production costs that raise profit but not output.

There are many ways that different imperfectly competitive markets in different settings can fail to accord enterprises access to the resources and market opportunities needed for their expansion in response to innovation. The general business environment can lack competitiveness, namely sufficient responsiveness on the part of the existing physical and other business infrastructure, legal system and governmental support that would yield to young or otherwise vulnerable enterprises access to essential local business services such as banking and related financial services, communications, transport and required energy services, gateways to export markets, open real estate markets, and professional and administrative support services providing needed business information and training.[6] Access to financial investment and credit may well be the most problematic among essential business inputs for vulnerable enterprises in developing economies.[7]

Government regulations can be sources of entry barriers, mobility barriers, excessive business costs, heightened entrepreneurial risks and distortionary incentives that impede innovation and the opportunities for enterprise expansion that would motivate innovation. Even seemingly well-intended regulations can have powerfully negative unintended consequences, like a legal rule that protects workers by requiring employers to pay a year's salary upon severance. Such a rule would much discourage an enterprise from hiring in order to launch a new uncertain line of business. Other regulatory rules in many countries require large numbers of permits and licenses and bureaucratic approvals for a business launch or expansion, and the resulting inordinate costs and delays are daunting to growth and stifling of incentives to invest in expansion and entrepreneurship. Recent empirical work suggests that the most important negative impacts of regulation on economic performance are through its negative effects on the incentives of firms to invest and innovate (Crafts, 2006).

Another source of limitations on the ability of an innovator to grow is lack of output market opportunity. There may be few distribution channels available to or even known by a local enterprise, powerful interests may block market access, or the country may not have organised the institutions necessary for an efficient portal to international trade.[8] Within the limitations of an enterprise's market access there may be no other rival suppliers. As a result, the enterprise may have market power, but also may find that it cannot expand output without significantly dropping price. While even monopolists have incentives to expand output when they innovate, these incentives are systematically less than those experienced in a highly competitive market inasmuch as price need not necessarily fall very far for an innovator to divert sales from rivals. However, it must be recognised that if the rivals are oligopolists rather than price-takers, then their resistance to diversion of their sales may make the innovator's expansion less profitable than if it were a

monopolist in the local relevant market. As such, there is no clear and general prediction from economic theory on whether the existence of a few rivals in such a relevant market is stimulating or repressing of innovation.

Finally, the competitiveness of the business environment is likely to have ambiguous impacts on innovation too. Above, we articulated why incentives to innovate are heightened by opportunities to expand in response to progressive success, and how these opportunities are affected for vulnerable firms by the business environment. However, for firms that are not vulnerable, the business environment may have far less of a direct impact on their ability to expand. For such firms, a difficult or repressive business environment may be, at least in part, an encouragement to invest in innovation and expansion due to the entry barriers that the environment creates. The protection from entry that the difficult business environment creates can raise the expected profitability of innovation and expansion. Of course, from the perspective of social welfare, this spur to investment no doubt comes at too high a social cost from the repressed activities of would-be entrepreneurship, and the monopoly power exercised by the less vulnerable firms with or without their innovations. Nevertheless, with this in mind, there is no expected general relationship predicting more innovation from firms in markets with a competitive business environment.

It is worthwhile to dig deeper into the characteristics that may make a firm vulnerable to a repressive business environment. We hypothesise that young firms are more likely to be vulnerable, and that mature firms are less likely to be vulnerable. The first reason is survivorship selection. By definition, mature firms have shown by their age that they have adapted to the business environment and survived inevitable vicissitudes of performance, so they are likely to have found ways to attain their needed financing, market access and governmental permissions. It is not much of a reach to extend that inference to their ability to move forward, even if that were to involve expansion or a new line of business. Obversely, young firms have shown much less such success at adaptation, given their shorter time in the market. Second, many of the barriers posed by difficult market environments are particularly applicable to newer entrants. Frequently-observed regulatory requirements are particularly onerous for start-ups and businesses that have not yet formed convenient relationships with government regulators nor learned how to navigate the regulatory process. Third, mature firms are more likely to be able to self-finance, or to get financing from outsiders who have seen their track record, while young firms are less likely to have a cash flow for investment purposes and less likely to secure outside funding in an environment without effective financial institutions.

With this said, our hypothesis is that, as the more likely vulnerable firms, it is the young enterprises whose proclivity for successful innovation will be

most sensitive to the competitiveness of their business environments. The entry barrier factor discussed above leaves us with ambiguous expectations about the impact of the business environment on innovation by the less vulnerable mature firms. And we have no foundation for a prediction on the impact of the number of active rivals (given our controls) on the proclivity of an enterprise of any age to innovate.

Competition, innovation and inclusive growth

The enterprise output growth that arises from innovation and high TFP is inclusive if it provides employment and consumption opportunities for large segments of the population, rather than having the opportunities to participate in the growth process and its benefits less widely shared.[9] In the empirical analyses reported in this paper, innovation is defined as inclusive if it raises employment for less skilled workers, rather than just for higher-skilled workers, professionals and executives. The interpretation of formal low-skilled jobs as a gateway to inclusiveness is premised on the maintained hypothesis that low-wage jobs are a stepping stone for the integration of jobless people into employment, and possibly even to better-paid work in the future, rather than a poverty trap that leads to a re-exit to unemployment and a no-pay low-pay cycle. That low-wage jobs are indeed a means for employment integration of the unemployed over time, and are on average good for an individual's or household's economic progress has been receiving increased empirical support (Gruen, Mahringer and Rhein, 2011; Knabe and Plum, 2010).

Economic theory provides some insight into the role that competition plays in the distinction between impacts of innovation that are inclusive in this sense, versus impacts of innovation that are positive for aggregate social welfare without additional benefits of providing uplift for those in greatest need. In a market environment where enterprise expansion is stultified and repressed by the absence or distortions of needed business inputs, by limitations on access to pertinent output market opportunities, or by regulatory limitations on business flexibility and returns, a firm can profit from lower costs or higher value products, but not nearly as much as it could in a more competitive business environment. Without the practical ability to expand, a firm that has attained lower costs or higher value products through innovation and heightened TFP can gain by maintaining output and (quality-adjusted) price and adapting its production technology to its cost-saving or value-enhancing opportunities. The result is likely more and better-paying jobs for those with skills appropriate to the technological advance, fewer jobs for those without, and greater returns for the managers and investors. Such a result is perhaps consistent with growth, but not directly consistent with inclusive growth.

In contrast, a firm that operates in a competitive business environment is strongly motivated by higher returns to expand aggressively when it has attained lower costs or higher value products from innovation and heightened TFP. Not only does the innovative firm profit by adapting its production technology, but it profits all the more by selling more intensively and more widely through the lower prices or better marketing and distribution that its lower costs and better products make commercially possible. This innovation-driven growth is likely inclusive in that the expansion of the firm's production needs unskilled labour as well as labour with advanced skills, and the firm's enhanced market opportunities provide the needed financial impetus for more and better jobs across the spectrum.

Firms with the ability to expand in reaction to their advances in TFP and process and product innovation are more able to profit from their technological progress, and hence are more likely to make the effort and to commit the funding needed to succeed with innovation. And economic logic indicates that firms with that ability to expand are more likely to grow inclusively as a result of innovations or gains in TFP they may accomplish. Thus, we hypothesise that, on average, there is a selection bias that favours inclusive growth from innovation. Our empirical analyses below seem to confirm that hypothesis, along with the more direct logic that innovation tends to be expansionary at the level of the enterprise.

In all market environments, and particularly in developing economies, management upgrading is now appropriately perceived as a crucial innovative technology, and one with additional connections to inclusive growth. It was only with the recent quantification of specific improvements in management practices, such as better ways to monitor production information, to set binding operations, inventory and quality control targets, and to incentivise workers with merit-based pay and promotion, that it has become possible for economists to rigorously compare management technologies across firms. Based on data across 17 countries, Bloom and Van Reenen (2010) rank average Indian, Chinese and Brazilian management practices of domestic firms (the only developing countries in the sample) as significantly below those of OECD countries, with a large lower tail of very badly-managed firms; foreign multinationals residing in these countries, on the other hand, are well managed across all countries. Robust positive associations are found between the average firm management score and labour productivity (sales per employee), profitability, Tobin's q, sales growth and survival, controlling for country and industry fixed effects and general firm-level controls. And in a follow-on randomised experiment on large multi-plant Indian textile firms, Bloom *et al.* (2011a) show the causal impact of adopting better management technologies: five months of extensive consulting to upgrade management practices raised average TFP by 11% in the first year, increased the use of

computers, and increased decentralisation of decision-making. One consequence of such decentralisation is the spread of better paid employment opportunities and less inequality of compensation through a production hierarchy, that is, more inclusion in the gains from productive expansion.

In related work on the implications of innovation in management technologies, Bloom *et al*. (2011b) highlight a subtle but important difference between advances in information and communications components. Better information technologies that empower and spur learning by workers such as ERP (Enterprise Resource Planning) for plant managers and CAD/CAM (Computer Aided Design and Manufacturing) for production workers are associated with more autonomy and wider span of control. One key implication is more inclusive growth opportunities by the elevation of local labour productivity and reduction in wage inequality. In contrast, communication technologies like data networks are apt to decrease autonomy for plant managers and workers, substituting away from local knowledge in favour of directives from centralised headquarters, and leading to less inclusive growth by stifling learning and accentuating wage inequality. Despite these differences in types, innovation in management is highly associated with gains in productivity and output-growth opportunities. As such, we hypothesise that these forms of innovation are also, like product and process innovation, likely on average to be inclusive in their overall impacts on enterprise employment.

Data and empirical specification

We use establishment-level, cross-section data that are based on the World Bank Enterprise Surveys (ES) collected between 2002 and 2006. We have information on 26 108 manufacturing establishments from 71 countries.[10] Most of the establishments represented in the data are registered in the formal/organised sector, and are urban. Sampling is typically stratified by size, sector and location. Any accounts collected in local currency units are converted to constant 2005 US dollars at purchasing-power-parity. Rates of growth are scaled to an annual basis. Table 7.1a reports sample counts by country and Table 7.1b reports the means and standard deviations of our main variables of interest for two separate country samples based on OECD membership. Table 7.1c contains a detailed listing of the Enterprise Survey questions underlying the establishment-level business environment indicators used in this study.

Country-level data on the competitiveness of the business environment are taken from the IFC/World Bank Doing Business (DB) reports. Strongly positive correlations among the major DB variables and among their categorised aggregated indicators suggest that national regulation policies

come in "packages." In line with recent work by Loayza, Oviedo and Serven (2010) and Djankov, McLiesh and Ramalho (2006), we examine the effects of business regulations on economic growth by using synthetic summary indices of a relevant range of regulation areas, and the aggregate national ranks of the corresponding Doing Business indicators.

It should be noted that many of the DB variables are indicative of competition-related entry barriers and hurdles, so that their impacts are apt to be different over subsamples of firms sorted by size and age. Hoped-for new business expansions that may result from opportunities created by R&D and by product, process, organisational and marketing innovations might also be vulnerable to the same barriers and hurdles that afflict new and small firms. On the other hand, well-established firms may benefit from an environment with more entry barriers. Increased difficulty and riskiness in getting started, and impediments to access to credit and skilled employees could be advantageous for well-established firms, so DB variables reflecting the lack of competitiveness of the business environment can also be interpreted as correlates of entry barriers that protect them, inasmuch as well-established firms are over the hurdles that these variables also indicate.

Our conceptual theory of inclusive growth from entrepreneurial innovation and competition is tested to explore whether it is consistent with available data through a triangular (or trapezoidal, to be more precise) system of four equations, recognising possible roles of both enterprise and sector level influences over the key dependent variables. To focus on enterprise-level correlates, we include fixed effects for country of establishment and for the sector of the establishment's main product. To explore the impacts of the competitiveness of the business environment (including the elements reflecting the ease of administrative regulations), we assess the rank-order correlations among the estimated country-level fixed effects of key outcome variables and aggregate rankings of countries' DB indicators.

Table 7.1a. Descriptive statistics on Enterprise Survey dataset

	2002	2003	2004	2005	2006	Number of observations (establishments)	Mean employment (persons)	Standard deviation, employment
OECD member countries								
Chile			x			675	137	262
Czech				x		123	169	683
Estonia				x		66	166	559
Germany				x		448	111	433
Greece				x		141	135	312
Hungary				x		326	104	255
Ireland				x		216	107	334
Mexico					x	2118	105	344
Poland				x		473	47	113
Portugal				x		164	232	665
Slovakia				x		46	307	1394
Slovenia				x		80	179	296
Korea				x		267	178	478
Spain				x		206	115	354
Turkey				x		870	138	244
OECD accession country								
Russian Federation				x		167	189	485
OECD enhanced engagement countries								
Brazil		x				1575	124	321
China		x				1601	261	787
India					x	2072	89	314
Indonesia		x				667	587	1148
South Africa		x				564	330	1098
Developing countries								
Albania				x		71	86	243
Algeria	x					460	59	128
Arab Republic of Egypt			x			955	122	469
Armenia				x		222	50	96
Belarus				x		98	110	209
Benin			x			150	22	58
Bosnia Herzegovina				x		55	171	333
Bulgaria				x		69	157	215
Cambodia		x				60	409	985
Costa Rica				x		298	60	229
Croatia				x		88	164	503
Dominican Republic				x		131	72	159
Ecuador		x				380	84	287
El Salvador		x				465	98	251
Ethiopia	x					418	107	419
Former Yugoslav Republic of Macedonia (FYROM)				x		39	194	538
Georgia				x		37	92	124
Guatemala		x				435	120	376
Guyana			x			155	40	93
Honduras		x				428	92	252

Table 7.1a. Descriptive statistics on Enterprise Survey dataset (continued)

	2002	2003	2004	2005	2006	Number of observations (establishments)	Mean employment (persons)	Standard deviation, employment
Jamaica				x		50	61	88
Kazakhstan				x		303	82	154
Kyrgyz Republic		x				101	103	179
Kyrgyz Republic				x		73	174	357
Latvia				x		43	129	194
Lesotho		x				35	409	831
Lithuania			x			82	94	144
Lithuania				x		71	103	152
Madagascar				x		238	166	416
Malawi				x		306	325	1265
Mali		x				93	43	147
Mauritius, Republic of				x		152	147	393
Moldova		x				96	108	177
Moldova				x		135	125	288
Mongolia			x			170	72	184
Morocco			x			125	106	203
Nicaragua		x				452	45	170
Niger				x		75	41	120
Oman		x				69	31	23
Peru	x					134	51	128
Philippines		x				665	314	851
Romania				x		370	105	229
Senegal		x				149	41	63
Serbia Montenegro				x		74	205	332
Sri Lanka			x			408	375	630
Syrian Arab Republic		x				172	25	48
Tajikistan		x				107	23	54
Tajikistan				x		83	150	225
Tanzania		x				145	64	133
Thailand			x			1385	372	843
Ukraine				x		201	106	380
Uzbekistan		x				99	125	357
Uzbekistan				x		98	174	329
Vietnam				x		1370	340	869
Zambia	x					100	210	842

Source: World Bank Enterprise Surveys. Establishments reporting zero employment or zero sales have been excluded from all analysis.

Table 7.1b. Summary statistics on business environment indicators

	OECD member countries		OECD accession and enhanced engagement countries; developing countries	
Variable	Mean	SD	Mean	SD
Growth and innovation				
Annual compound employment growth rate	5.66	21.54	6.00	23.48
ln (Total Factor Productivity)	3.28	2.49	3.19	2.40
Whether firm introduced a new process (0/1)	29.6%	45.6%	36.7%	48.2%
Whether firm introduced a new product (0/1)	34.7%	47.6%	43.1%	49.5%
Whether the firm does R&D (0/1)	18.9%	39.2%	23.0%	42.1%
R&D spending/total sales	0.4%	2.8%	0.7%	4.1%
Establishment-level business environment				
Whether the firm exports (0/1)	28.1%	44.9%	28.0%	44.9%
Whether the firm uses Internet (0/1)	77.8%	41.6%	59.8%	49.0%
Whether the firm is part of a business association (0/1)	59.9%	49.0%	59.2%	49.2%
Whether the firm has ISO certification (0/1)	26.1%	43.9%	21.1%	40.8%
Whether the firm offers formal training programmes (0/1)	47.2%	49.9%	47.3%	49.9%
Fraction of borrowing in foreign currency	23.0%	33.5%	11.9%	29.7%
Fraction of investment capital from local banks	13.9%	25.4%	20.1%	30.9%
Log of (average annual wage)	9.54	0.89	8.08	1.79
Whether the firm established a new foreign joint venture (0/1)	6.6%	24.8%	6.4%	24.5%
Whether the firm established a new licensing agreement (0/1)	8.4%	27.8%	9.0%	28.7%
Enterprise characteristics				
Whether the firm is government owned (0/1)	1.6%	12.6%	6.8%	25.2%
Whether the firm is foreign owned (0/1)	9.5%	29.4%	12.4%	32.9%
Whether the firm is incorporated (0/1)	57.8%	49.4%	52.6%	49.9%
Fraction of workforce comprised of management employees	5.4%	12.0%	9.9%	14.7%
Fraction of workforce comprised of skilled production employees	51.5%	30.3%	38.9%	30.1%
Fraction of workforce comprised of unskilled production employees	23.0%	28.9%	34.3%	31.6%
Fraction of workforce comprised of female employees	17.4%	23.9%	28.2%	30.1%
Sectoral and country business environment				
US 4 digit ISIC sector average R&D intensity	1.7%	1.8%	1.6%	1.4%

Source: World Bank Enterprise Surveys. Establishments reporting zero employment or zero sales have been excluded from all analysis.

Table 7.1c. Questions underlying establishment-level business environment indicators

Variable	Underlying survey question
Growth and innovation	
Annual compound employment growth rate	The following table refers only to permanent workers of your plant: {Average number of workers}, {Average number of workers 3 years ago}
Whether firm introduced a new process (0/1)	Has your company undertaken any of the following initiatives in the last three years? {Introduced new technology that has substantially changed the way that the main product is produced}
Whether firm introduced a new product (0/1)	Has your company undertaken any of the following initiatives in the last three years? {Developed a major new product line}
Whether the firm does R&D (0/1)	How much did your establishment spend on design or R&D last year? {>0}
R&D spending/total sales	How much did your establishment spend on design or R&D last year? / Please provide the following information on your establishment's production, sales and expenses. {Total sales}
Establishment-level business environment	
Whether the firm exports (0/1)	What percent of your establishment's sales are:{exported directly}+{exported indirectly (through a distributor)}
Whether the firm uses Internet (0/1)	Does your enterprise regularly use e-mail or a website in its interactions with clients and suppliers?: {E-mail}, {Website}
Whether the firm has external auditor (0/1)	Does your establishment have its annual financial statement reviewed by an external auditor?
Whether the firm is part of a business association (0/1)	Is your establishment/firm a member of a business association or chamber of commerce?
Whether the firm has ISO certification (0/1)	Has your firm received ISO (e.g. 9000, 9002 or 14000) certification?
Whether the firm offers formal training programs (0/1)	Do you offer formal (beyond "on the job") training to your permanent employees?
Fraction of borrowing in foreign currency	What share of your total borrowing (loans, accounts payable) is denominated in foreign currency?
Fraction of investment capital from local banks	Please identify the contribution over the last year of each of the following sources of financing for your establishment's: ii) New investments (i.e. new land, buildings, machinery and equipment): {Local commercial banks}
Average annual wage	The following table refers only to permanent workers of your plant: {Total wages} / {Average number of workers}
Whether the firm established a new foreign joint venture (0/1)	Has your company undertaken any of the following initiatives in the last three years? {Agreed to a new joint venture with foreign partner}
Whether the firm established a new licensing agreement (0/1)	Has your company undertaken any of the following initiatives in the last three years? {Obtained a new licensing agreement}
Enterprise characteristics	
Whether the firm is government owned (0/1)	What percentage of your firm is owned by: {Government/State}
Whether the firm is foreign owned (0/1)	What percentage of your firm is owned by: {Private Sector: a) foreign}
Whether the firm is incorporated (0/1)	What is the current legal status of your firm? {Publicly listed company; Private held, limited company}
Fraction of workforce comprised of management employees	Average number of workers: {Management}, {Total}
Fraction of workforce comprised of skilled production employees	Average number of workers: {Skilled production workers}, {Total}
Fraction of workforce comprised of unskilled production employees	Average number of workers: {Unskilled production workers}, {Total}
Fraction of workforce comprised of female employees	The following table refers only to permanent workers of your plant: {Average number of workers of which: % female}

Note: Specific wording of survey questions may vary across countries.
Source: World Bank Enterprise Surveys.

The first of our four equations is an enterprise R&D investment equation, estimated using a probit estimator:

$$R\&D_{i,j,k} = \beta_0 + \beta_1[rel.to\ bus.env.]_{i,j,k} + \beta_2[controls]_{i,j,k} + \beta_3[industry]_k + \beta_4[country]_j + \varepsilon_{i,j,k} \quad (1)$$

Here, $R\&D_{i,j,k}$ indicates whether firm *i* in country *j* and sector *k* was actively engaged in research and development. The vector $[rel.to\ bus.env.]_{i,j,k}$ includes a set of variables describing the firm's relationship to its business environment including the firm's ability to fund investment and access capital as measured by its share of investment capital from local banks and the share of the firm's borrowing in foreign currency. This vector also includes an indicator of whether the firm competes in export markets, as a proxy correlate of the firm's opportunities to expand if its innovation is successful. We also include measures of the firm's roles in partnerships, which may expand access to both knowledge and input and output markets, via indicators of whether the firm established a new foreign joint venture and whether it entered into a new technology licensing agreement in the past three years.[11] The vector $[controls]_{i,j,k}$ includes variables indicating the firm's ownership (foreign, government), level of organization/legal status (whether the firm is incorporated), size class and age group.[12] The vector $[industry]_k$ contains a measure of the progressivity of the firm's sub-sector in terms of the US R&D intensity of that sub-sector, as calculated in Sharma *et al*. (2010). The vector $[country]_j$ is comprised of country fixed effects.

The second set of equations aims to explain the incidence of enterprise product and process innovation, estimated using a probit estimator:

$$\mathrm{Innovate}_{i,j,k} = \beta_0 + \beta_1[rel.to\ bus.env.]_{i,j,k} + \beta_2[controls]_{i,j,k} + \beta_3[industry]_k + \beta_4[country]_j + \varepsilon_{i,j,k} \quad (2)$$

Here, $\mathrm{Innovate}_{i,j,k}$ indicates whether the firm introduced a new product or process innovation in the last three years. The vector $[rel.to\ bus.env.]_{i,j,k}$ now includes a broader set of variables describing the firm's relationships to its business environment including the firm's R&D intensity as a correlate of its ability to innovate,[13] access to capital, access to implementation skills (proxied by whether the firm has a formal training programme), access to ideas (use of the Internet and whether the firm is part of a business association), as well as opportunities for expansion if the innovation is successful. The vector $[controls]_{i,j,k}$ contains the firm-level

controls as in specification (1), $[industry]_k$ contains a vector of two-digit industry fixed effects, and $[country]_j$ is the same as in specification (1).

The third equation seeks to explain variation among levels of the enterprises' TFP,[14] and is estimated via OLS:

$$\ln(\mathrm{TFP})_{i,j,k} = \beta_0 + \beta_1[rel.to\ bus.env.]_{i,j,k} + \beta_2[controls]_{i,j,k} + \beta_3[industry]_k + \beta_4[country]_j + \varepsilon_{i,j,k} \quad (3)$$

The regressor sets are nearly identical to those in specification (2), though they exclude a few of that specification's independent variables (R&D intensity, foreign JV, new licensing agreement; including them in the specification does not change our results).

Finally, the fourth equation is aimed at explaining variations among the rates of the enterprises' employment growth, with OLS estimation:

$$\begin{aligned}\text{Employment Growth Rate}_{i,j,k} = {} & \beta_0 \\ & + \beta_1[innovation]_{i,j,k} \\ & + \beta_2[workforce]_{i,j,k} \\ & + \beta_3[rel.to\ bus.env.]_{i,j,k} \\ & + \beta_4[controls]_{i,j,k} \\ & + \beta_5[industry]_k \\ & + \beta_6[country]_j + \varepsilon_{i,j,k}\end{aligned} \quad (4)$$

In this equation $[innovation]_{i,j,k}$ is comprised of the vector of the innovation variables (ln[TFP], introduced new product, introduced new process) studied in equations (1), (2) and (3) above, and $[workforce]_{i,j,k}$ characterizes the composition of the firm's workforce along the dimensions of skills (*e.g.* percentage of employees who are low-skilled) and gender (share of workforce comprised of females). Other vectors of independent variables are similarly defined as in equation (3).

We estimate these specifications using establishment-level data from all available countries, as well as separately using the subset of establishments located in OECD accession and enhanced engagement countries and developing countries, for all firms and for various subsamples of firms sorted by their age, size and innovating status.

Empirical findings

Innovation is an important driver of enterprise employment growth

Enterprise innovations, which are here reflected by the level of TFP and by self-reports of process and product innovation, are very strong positive correlates of employment growth among firms across our entire sample. The first column of Table 7.2 displays the results of estimating the employment growth equation (4) over the entire sample. Firms that introduce a process or a product innovation, for example, exhibit an annual employment growth rate respectively 2.1 and 2.9 percentage points higher than firms that do not, holding other factors equal.[15] Given that the mean annual employment growth rate of all enterprises in our sample is just below 6%, these impacts of process and product innovation on employment growth are quantitatively important. Moreover, a unit increase in the log of TFP is associated with nearly 2% higher employment growth. In principle, the level of TFP is likely persistent for a firm, unlike the concept of the variables indicating a recent product or process innovation, so that a persistently repeated annual boost of 2% to the employment growth rate of a firm can become quite substantial in total impact.

These results are particularly pronounced for smaller firms: in the case of process and TFP innovation, the results are statistically significant for the relatively small size classes of firms (micro, small and medium-size enterprises), but are not statistically significant for large established firms employing more than 200 employees.[16] On the other hand, product innovation is a strong and statistically significant correlate of employment growth for the largest size class of enterprises, as well as the smaller ones.

Table 7.2. Inclusive growth, innovation and business environment: econometric evidence

Full sample (OECD member, accession and enhanced engagement countries, and developing countries)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Model	Base	Base	Base	Base	Base	Base	Base	Base
Sample	Full	Micro	Small	Medium	Large	Young	Mature	Old
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Dependent Var	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate
ln[Total Factor Prod.]	1.933+++	2.357+++	2.412+++	2.116+++	0.304	2.904+++	2.468+++	1.272+++
	(0.107)	(0.287)	(0.167)	(0.204)	(0.209)	(0.566)	(0.170)	(0.126)
Introduced new process	2.114+++	2.671++	2.664+++	2.629+++	0.138	1.269	3.007+++	1.582+++
	(0.386)	(1.102)	(0.596)	(0.676)	(0.699)	(2.011)	(0.592)	(0.462)
Introduced new product	2.873+++	2.810+++	2.605+++	1.688+++	3.360+++	3.698+	3.293+++	2.152+++
	(0.358)	(0.969)	(0.549)	(0.643)	(0.676)	(1.916)	(0.549)	(0.426)
Fraction of workforce unskilled	8.374+++	22.455+++	9.229+++	8.378+++	4.586+++	29.713+++	8.276+++	4.417+++
	(0.828)	(2.239)	(1.324)	(1.601)	(1.614)	(4.303)	(1.259)	(1.008)
Fraction of workforce female	1.486+	2.365	3.143++	3.474++	-2.436+	8.373++	0.256	-0.217
	(0.814)	(2.321)	(1.263)	(1.481)	(1.455)	(4.065)	(1.267)	(0.978)
Firm exports	3.020+++	8.593+++	2.463+++	1.203+	4.100+++	5.443++	3.463+++	2.252+++
	(0.425)	(1.473)	(0.672)	(0.677)	(0.752)	(2.379)	(0.669)	(0.492)
Fraction of investment capital from local banks	0.017+++	0.032+	0.012	0.012	0.021++	0.021	0.023++	0.016++
	(0.006)	(0.019)	(0.009)	(0.010)	(0.010)	(0.034)	(0.009)	(0.007)
Fraction of loans in foreign currency	2.687+++	10.529+++	4.636+++	3.891++	3.070++	6.894	2.569+	2.427++
	(0.885)	(3.040)	(1.629)	(1.543)	(1.256)	(4.417)	(1.391)	(1.037)
Fraction of workers skilled	3.634+++	9.454+++	4.263+++	6.310+++	5.035+++	18.168+++	3.332+++	1.185
	(0.804)	(1.884)	(1.314)	(1.663)	(1.669)	(4.066)	(1.189)	(1.009)
Firm uses Internet	3.624+++	6.694+++	2.725+++	2.665+++	1.061	9.344+++	2.933+++	2.540+++
	(0.428)	(1.043)	(0.626)	(0.893)	(1.092)	(2.142)	(0.648)	(0.528)
Firm has ISO certification	2.061+++	9.794+++	1.603++	0.874	0.942	4.037	2.503+++	1.529+++
	(0.467)	(1.837)	(0.780)	(0.740)	(0.762)	(2.786)	(0.751)	(0.528)
Firm has formal training programme	3.837+++	6.718+++	3.798+++	3.652+++	0.310	6.998+++	3.578+++	3.135+++
	(0.392)	(1.079)	(0.577)	(0.706)	(0.817)	(2.021)	(0.604)	(0.468)
Firm is part of a business association	0.643	-0.206	1.415++	-0.116	1.141	-1.092	0.852	0.866+
	(0.413)	(1.061)	(0.614)	(0.791)	(0.917)	(2.234)	(0.610)	(0.513)

Table 7.2. Inclusive growth, innovation and business environment: econometric evidence (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Model	Base	Base	Base	Base	Base	Base	Base	Base
Sample	Full	Micro	Small	Medium	Large	Young	Mature	Old
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Dependent Var	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate
>10% Government-owned	-2.711+++	0.404	-1.382	-4.490+++	-3.783+++	-5.491	-4.186+++	-2.287+++
	(0.784)	(4.238)	(1.677)	(1.258)	(1.043)	(4.309)	(1.444)	(0.886)
>10% Private foreign owned	1.840+++	3.771	3.740+++	2.285+++	0.605	3.253	1.810++	0.143
	(0.556)	(2.533)	(1.041)	(0.859)	(0.773)	(2.810)	(0.840)	(0.704)
Size dummy: >200 employees	-26.901+++					-50.078+++	-28.839+++	-19.038+++
	(0.703)					(4.111)	(1.119)	(0.835)
Size dummy:51-200 employees	-19.644+++					-40.059+++	-20.456+++	-12.951+++
	(0.568)					(2.954)	(0.871)	(0.701)
Size dummy: 11-50 employees	-12.154+++					-25.962+++	-11.888+++	-7.988+++
	(0.452)					(2.233)	(0.656)	(0.587)
Age dummy: 5-15 yrs old	-10.677+++	-15.374+++	-7.654+++	-4.958+++	-8.394+++			
	(0.582)	(1.281)	(0.908)	(1.145)	(1.458)			
Age dummy: 15+ yrs old	-13.210+++	-20.074+++	-10.520+++	-6.708+++	-9.275+++			
	(0.600)	(1.382)	(0.941)	(1.137)	(1.449)			
Firm is incorporated	1.031++	3.639+++	0.837	0.740	0.692	3.602	0.142	1.568+++
	(0.454)	(1.328)	(0.699)	(0.857)	(0.915)	(2.287)	(0.685)	(0.577)
Constant	22.265++	33.955	25.302	-12.309	2.046	9.126	17.891	33.231
	(9.558)	(32.782)	(17.218)	(12.787)	(21.211)	(34.244)	(13.516)	(21.840)
Observations	24585	5875	9206	5470	4034	2169	10817	11305
Adjusted R-squared	0.150	0.190	0.145	0.120	0.126	0.202	0.131	0.110

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.
Source: Author's estimations.

Table 7.3. Inclusive growth, innovation and business environment: econometric evidence

OECD accession and enhanced engagement countries, and developing country sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Model	Base	Base	Base	Base	Base	Base	Base	Base
Sample	Full	Micro	Small	Medium	Large	Young	Mature	Old
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Dependent Var	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate
ln[Total Factor Prod.]	1.913+++	2.339+++	2.623+++	2.270+++	0.025	3.159+++	2.417+++	1.095+++
	(0.126)	(0.354)	(0.195)	(0.251)	(0.238)	(0.600)	(0.195)	(0.151)
Introduced new process	1.864+++	1.541	2.663+++	2.664+++	-0.491	1.387	2.734+++	1.020+
	(0.451)	(1.407)	(0.686)	(0.805)	(0.794)	(2.126)	(0.666)	(0.556)
Introduced new product	3.033+++	3.224+++	3.043+++	1.770++	3.412+++	4.313++	3.847+++	1.816+++
	(0.418)	(1.197)	(0.634)	(0.781)	(0.765)	(2.024)	(0.619)	(0.511)
Fraction of workforce unskilled	8.219+++	24.565+++	9.563+++	8.724+++	3.024+	32.127+++	7.505+++	3.488+++
	(0.939)	(2.673)	(1.482)	(1.904)	(1.801)	(4.522)	(1.384)	(1.169)
Fraction of workforce female	1.539+	3.740	2.019	3.602++	-2.536	8.464++	-0.562	-0.019
	(0.906)	(2.682)	(1.410)	(1.710)	(1.580)	(4.248)	(1.375)	(1.101)
Firm exports	2.963+++	8.943+++	2.165+++	1.580+	4.563+++	5.407++	3.178+++	2.279+++
	(0.498)	(1.900)	(0.779)	(0.816)	(0.855)	(2.516)	(0.764)	(0.587)
Fraction of investment capital from local banks	0.012+	0.011	0.011	0.009	0.022+	-0.002	0.019+	0.014+
	(0.007)	(0.023)	(0.011)	(0.012)	(0.011)	(0.035)	(0.010)	(0.008)
Fraction of loans in foreign currency	3.406+++	9.091+++	4.682++	4.682++	3.262++	9.120++	3.131++	2.635++
	(1.015)	(3.426)	(1.905)	(1.906)	(1.383)	(4.619)	(1.532)	(1.227)
Fraction of workers skilled	3.930+++	10.285+++	4.743+++	7.453+++	4.729++	19.027+++	3.387++	1.340
	(0.928)	(2.289)	(1.497)	(2.003)	(1.871)	(4.314)	(1.335)	(1.196)
Firm uses Internet	3.914+++	7.295+++	2.812+++	2.743+++	1.536	8.974+++	3.073+++	2.914+++
	(0.494)	(1.353)	(0.707)	(1.002)	(1.164)	(2.287)	(0.728)	(0.620)
Firm has ISO certification	1.439++	6.679+++	1.127	1.093	1.132	2.325	1.683+	1.236+
	(0.571)	(2.496)	(0.968)	(0.941)	(0.877)	(3.019)	(0.875)	(0.667)
Firm has formal training programme	3.024+++	6.265+++	3.392+++	3.277+++	-0.277	5.097++	3.270+++	2.187+++
	(0.466)	(1.408)	(0.681)	(0.861)	(0.910)	(2.147)	(0.696)	(0.572)

Table 7.3. Inclusive growth, innovation and business environment: econometric evidence (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Model	Base	Base	Base	Base	Base	Base	Base	Base
Sample	Full	Micro	Small	Medium	Large	Young	Mature	Old
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Dependent Var	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate
Firm is part of a business association	1.024++	-0.048	1.571++	-0.147	1.201	-1.407	1.231+	1.394++
	(0.464)	(1.264)	(0.682)	(0.908)	(0.989)	(2.329)	(0.668)	(0.586)
>10% government-owned	-2.794+++	0.640	-1.547	-4.868+++	-4.154+++	-5.470	-4.748+++	-2.203++
	(0.848)	(4.558)	(1.839)	(1.390)	(1.136)	(4.345)	(1.536)	(0.960)
>10% private foreign owned	1.802+++	6.674++	2.463++	3.029+++	0.924	2.626	1.370	0.247
	(0.646)	(3.050)	(1.193)	(1.046)	(0.890)	(2.932)	(0.928)	(0.870)
Size dummy: >200 employees	-28.101+++					-48.795+++	-28.959+++	-20.417+++
	(0.831)					(4.269)	(1.268)	(1.028)
Size dummy:51-200 employees	-20.735+++					-38.799+++	-20.505+++	-14.341+++
	(0.688)					(3.121)	(1.017)	(0.883)
Size dummy: 11-50 employees	-12.790+++					-24.856+++	-11.693+++	-8.975+++
	(0.551)					(2.419)	(0.778)	(0.741)
Age dummy: 5-15 years old	-10.749+++	-15.506+++	-7.979+++	-6.108+++	-8.939+++			
	(0.657)	(1.554)	(1.005)	(1.322)	(1.544)			
Age dummy: 15+ years old	-12.948+++	-18.914+++	-10.993+++	-7.611+++	-9.244+++			
	(0.683)	(1.713)	(1.055)	(1.328)	(1.540)			
Firm is incorporated	0.356	4.472++	0.736	0.671	0.610	2.984	-0.619	1.202+
	(0.538)	(1.777)	(0.822)	(1.011)	(1.030)	(2.436)	(0.776)	(0.727)
Constant	9.626++	13.935	-27.335++	-21.099++	-4.986	22.397	-19.467+	10.974
	(4.572)	(13.757)	(12.000)	(8.848)	(10.213)	(28.432)	(10.625)	(9.558)
Observations	18564	3921	7169	4159	3315	1900	8378	8090
Adjusted R-squared	0.150	0.187	0.143	0.122	0.140	0.196	0.131	0.104

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.
Source: Author's estimations.

Table 7.3 highlights that these results are just as significant, and comparable in magnitude, for the restricted sample of OECD accession and enhanced engagement countries and developing countries.

As we discussed above, the stimulating impacts of an enterprise's innovation on its employment might, or might not, as a matter of economic logic, be offset at the national level by corresponding declines in the output and employment of its domestic competitive rivals. To assess this possibility empirically, we construct variables to represent aggregate average innovation by firms in the same country, sector and size class as each given firm. We run regressions like those reported in Tables 7.2 and 7.3 that are augmented to include these constructed variables. If there were an offset to an innovating firm's employment growth from a corresponding negative impact on "neighbouring" firms' employment, we would expect to see significant negative correlations in the augmented employment growth regressions between an enterprise's employment growth rate and the constructed variables indicating aggregate innovation by its "neighbours". We did not find this result in the all-inclusive sample, nor over the size and age specific subsamples. In short, no negative offset to enterprises' innovation-driven employment growth shows up significantly in our data.[17]

Innovation-driven employment growth is inclusive

The data we study show that innovation-driven growth is inclusive. Descriptively, across all countries in our sample, innovative firms hire a larger share of unskilled workers than non-innovative firms: the mean employment share of unskilled workers for innovative firms (the combined groups of process and product innovators) is 34%, versus 30% for non-innovative firms.[18] Comparisons of the employment growth regressions in Tables 7.4 and 7.5 over the subsamples of enterprises with and without innovation confirm that unskilled workers are a major plus factor for employment growth associated with innovation. In Table 7.4, over all the countries studied, the share of the workforce that is unskilled contributes more to employment growth for the combined group of process and product innovators, as well as for process and product innovators separately, than for non-innovators. In the full sample across all firms, a 10 percentage point increase in the share of unskilled workers is associated with an employment growth rate that is almost one percentage point higher, all else equal. Given that the mean annual employment growth rate of all enterprises in our sample is just below 6%, the contribution of unskilled labour to employment growth is quantitatively important. When the estimation is run on sub-samples split by innovation status, the coefficient is larger for the joint group of process and product innovators (10.0) than for non-innovators (6.4). The effects of the share of unskilled workers on employment growth estimated on the separate

sub-samples of process-innovating firms and non-innovators are 9.0 versus 7.8, while for product-innovating firms and non-innovators they are 10.4 versus 7.2. The null hypothesis that the effect of the share of unskilled workers on employment growth is the same when estimated over the two sub-samples to be compared is rejected at conventional levels of significance for the process- or product-innovators/non-innovators sub-sample split, but not for the product-innovators/non-innovators and process-innovators/non-innovators splits.[19]

The same relationship holds over just the non-OECD countries for the regressions estimated over the combined group of process and product innovators, and over product innovators, as reported in Table 7.5, although the differences are not as large as for the sample of all countries. The coefficient on the share of the unskilled workforce across all firms is 8.2. When the estimation is run on sub-samples that are split by innovation status, the coefficient is again larger for the group of firms with either process or product innovations (9.1) than it is for non-innovators (6.8). For the sub-sample of only process innovators, the coefficient is estimated to be 7.6, versus 8.2 for non-process innovators. Comparing the sub-samples split by product innovation, the coefficient is 9.4 for innovators versus 7.6 for non-innovators.

One additional dimension of inclusiveness that we can demonstrate with our enterprise data is the participation by the female workforce in innovation-driven growth. Across all countries, innovative firms hire larger shares of female workers than non-innovative firms: the mean employment share of female workers by innovative firms (the combined group of process and product innovators) is 29%, versus 22% for non-innovative firms.[20] In the employment growth rate regressions of Tables 7.4 and 7.5, the positive contributions of the share of female employees to employment growth associated with innovation are statistically significant (at the 5 and 10% levels, respectively) for the combined group of process and product innovators, but not for non-innovators. Our findings suggest that a 10 percentage point increase in the share of female workers at an establishment is associated with an employment growth rate that is two-tenths of a percentage point higher. Based on findings reported in Tables 7.2 and 7.3, female participation contributes significantly to employment growth for young and medium-size firms across all countries, and across the non-OECD countries where this relationship is estimated to be more than twice the magnitude of the same relationship when it is estimated for the sample of all firms.

Table 7.4. Differential effects of determinants of growth for innovators and non-innovators

Full sample (OECD member countries, accession and enhanced engagement countries, and developing countries)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	Full	Process innovators	Not process innovators	Product innovators	Not product innovators	Product/ process innovators	Non-innovators
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country FE	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y
Dependent Var	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate
ln[Total Factor Prod.]	1.933+++	1.956+++	1.888+++	2.258+++	1.736+++	2.149+++	1.735+++
	(0.107)	(0.199)	(0.128)	(0.176)	(0.136)	(0.156)	(0.149)
Introduced new process	2.114+++			1.702+++	2.396+++		
	(0.386)			(0.575)	(0.540)		
Introduced new product	2.873+++	2.852+++	2.879+++				
	(0.358)	(0.578)	(0.462)				
Fraction of workforce unskilled	8.374+++	9.008+++	7.761+++	10.390+++	7.204+++	9.973+++	6.385+++
	(0.828)	(1.401)	(1.033)	(1.357)	(1.047)	(1.162)	(1.186)
Fraction of workforce female	1.486+	1.965	1.008	1.665	1.519	2.383++	0.569
	(0.814)	(1.355)	(1.027)	(1.255)	(1.077)	(1.109)	(1.214)
Firm exports	3.020+++	2.916+++	3.082+++	3.087+++	2.883+++	2.776+++	3.434+++
	(0.425)	(0.665)	(0.556)	(0.621)	(0.590)	(0.549)	(0.685)
Fraction of investment capital from local banks	0.017+++	0.010	0.022+++	0.015+	0.019++	0.017++	0.017+
	(0.006)	(0.009)	(0.008)	(0.009)	(0.008)	(0.008)	(0.010)
Fraction of loans in foreign currency	2.687+++	2.427+	2.734++	3.564+++	2.356+	2.235++	3.936+++
	(0.885)	(1.392)	(1.152)	(1.309)	(1.211)	(1.138)	(1.431)
Fraction of workers skilled	3.634+++	3.897+++	3.448+++	5.379+++	2.708+++	4.864+++	2.510++
	(0.804)	(1.379)	(0.994)	(1.333)	(1.008)	(1.141)	(1.133)
Firm uses Internet	3.624+++	4.617+++	3.253+++	4.587+++	2.977+++	4.827+++	2.621+++
	(0.428)	(0.783)	(0.516)	(0.731)	(0.533)	(0.629)	(0.591)
Firm has ISO certification	2.061+++	2.490+++	1.726+++	2.193+++	1.942+++	2.111+++	2.379+++
	(0.467)	(0.715)	(0.624)	(0.685)	(0.650)	(0.598)	(0.769)
Firm has formal training programme	3.837+++	3.286+++	3.950+++	3.447+++	4.119+++	3.426+++	4.259+++
	(0.392)	(0.649)	(0.495)	(0.611)	(0.516)	(0.529)	(0.592)

Table 7.4. Differential effects of determinants of growth for innovators and non-innovators (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	Full	Process innovators	Not process innovators	Product innovators	Not product innovators	Product/ process innovators	Non-innovators
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country FE	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y
Dependent Var	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate
Firm is part of a business association	0.643	0.448	0.770	0.591	0.706	0.873	0.414
	(0.413)	(0.690)	(0.518)	(0.656)	(0.535)	(0.569)	(0.606)
>10% Government-owned	-2.711+++	-3.273++	-2.662+++	-2.668+	-2.772+++	-2.829++	-2.830+++
	(0.784)	(1.336)	(0.973)	(1.387)	(0.954)	(1.142)	(1.082)
>10% Private foreign owned	1.840+++	2.496+++	1.557++	1.777++	1.756++	1.904+++	1.555+
	(0.556)	(0.865)	(0.731)	(0.824)	(0.760)	(0.722)	(0.886)
Size dummy: >200 employees	-26.901+++	-29.509+++	-25.139+++	-31.057+++	-24.511+++	-29.438+++	-24.132+++
	(0.703)	(1.203)	(0.888)	(1.121)	(0.918)	(0.976)	(1.050)
Size dummy:51-200 employees	-19.644+++	-21.760+++	-18.796+++	-23.292+++	-17.768+++	-21.775+++	-17.945+++
	(0.568)	(1.026)	(0.692)	(0.935)	(0.723)	(0.818)	(0.802)
Size dummy: 11-50 employees	-12.154+++	-13.716+++	-11.816+++	-14.534+++	-11.092+++	-13.740+++	-11.182+++
	(0.452)	(0.876)	(0.530)	(0.790)	(0.551)	(0.687)	(0.599)
Age dummy: 5-15 years old	-10.677+++	-8.939+++	-11.580+++	-10.443+++	-10.701+++	-10.099+++	-11.166+++
	(0.582)	(1.006)	(0.715)	(0.954)	(0.735)	(0.828)	(0.819)
Age dummy: 15+ years old	-13.210+++	-12.195+++	-13.679+++	-13.293+++	-12.841+++	-13.150+++	-13.015+++
	(0.600)	(1.046)	(0.734)	(0.982)	(0.759)	(0.856)	(0.842)
Firm is incorporated	1.031++	0.838	1.138++	0.840	1.225++	0.849	1.114+
	(0.454)	(0.792)	(0.557)	(0.763)	(0.567)	(0.652)	(0.636)
Constant	22.265++	28.399++	15.943	18.325	29.024++	23.291++	26.400
	(9.558)	(13.696)	(13.526)	(14.001)	(13.137)	(11.495)	(18.058)
Observations	24585	8759	15826	10192	14393	13390	11195
R-squared	0.154	0.179	0.145	0.166	0.150	0.161	0.148
Adjusted R-squared	0.150	0.169	0.139	0.157	0.144	0.154	0.140

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.
Source: Author's estimations.

Table 7.5. Differential effects of determinants of growth for innovators and non-innovators

OECD accession and enhanced engagement countries, and developing country sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	Full	Process innovators	Not process innovators	Product innovators	Not product innovators	Product/process innovators	Non-innovators
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country FE	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y
Dependent Var	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate
ln[Total Factor Prod.]	1.913+++	1.804+++	1.936+++	2.207+++	1.721+++	2.041+++	1.796+++
	(0.126)	(0.221)	(0.155)	(0.199)	(0.164)	(0.176)	(0.183)
Introduced new process	1.864+++			1.488++	1.921+++		
	(0.451)			(0.641)	(0.649)		
Introduced new product	3.033+++	3.448+++	2.726+++				
	(0.418)	(0.640)	(0.555)				
Fraction of workforce unskilled	8.219+++	7.637+++	8.158+++	9.363+++	7.558+++	9.149+++	6.795+++
	(0.939)	(1.523)	(1.198)	(1.489)	(1.212)	(1.276)	(1.396)
Fraction of workforce female	1.539+	1.535	1.285	1.617	1.757	2.145+	1.024
	(0.906)	(1.456)	(1.167)	(1.350)	(1.231)	(1.192)	(1.415)
Firm exports	2.963+++	3.402+++	2.711+++	2.619+++	3.253+++	2.749+++	3.444+++
	(0.498)	(0.741)	(0.673)	(0.705)	(0.708)	(0.624)	(0.838)
Fraction of investment capital from local banks	0.012+	0.003	0.019++	0.010	0.013	0.013	0.010
	(0.007)	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)	(0.012)
Fraction of loans in foreign currency	3.406+++	2.899+	3.600+++	3.728+++	3.676++	2.887++	5.105+++
	(1.015)	(1.549)	(1.345)	(1.439)	(1.437)	(1.270)	(1.702)
Fraction of workers skilled	3.930+++	3.316++	4.040+++	5.399+++	3.016++	4.861+++	2.831++
	(0.928)	(1.515)	(1.180)	(1.474)	(1.198)	(1.265)	(1.374)
Firm uses Internet	3.914+++	4.404+++	3.871+++	4.903+++	3.091+++	4.890+++	2.990+++
	(0.494)	(0.851)	(0.616)	(0.790)	(0.641)	(0.686)	(0.727)
Firm has ISO certification	1.439++	1.825++	1.066	2.143+++	0.805	1.770++	1.342
	(0.571)	(0.817)	(0.801)	(0.800)	(0.826)	(0.700)	(1.010)
Firm has formal training programme	3.024+++	2.361+++	3.272+++	2.182+++	3.843+++	2.302+++	4.094+++
	(0.466)	(0.722)	(0.612)	(0.691)	(0.635)	(0.600)	(0.748)
Firm is part of a business association	1.024++	0.720	1.041+	0.983	0.987	1.260++	0.542
	(0.464)	(0.737)	(0.600)	(0.706)	(0.620)	(0.615)	(0.717)

Table 7.5. Differential effects of determinants of growth for innovators and non-innovators (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	Full	Process innovators	Not process	Product innovators	Not product	Product/process	Non-innovators
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country FE	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y
Dependent Var	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate	Employment growth rate
>10% Government-owned	-2.794+++	-3.431++	-2.682++	-2.741+	-2.949+++	-2.981++	-2.844++
	(0.848)	(1.390)	(1.077)	(1.441)	(1.058)	(1.194)	(1.220)
>10% Private foreign owned	1.802+++	2.484+++	1.552+	1.789+	1.598+	1.910++	1.490
	(0.646)	(0.949)	(0.882)	(0.936)	(0.895)	(0.812)	(1.075)
Size dummy: >200 employees	-28.101+++	-29.501+++	-26.802+++	-32.147+++	-25.581+++	-29.820+++	-26.106+++
	(0.831)	(1.361)	(1.074)	(1.282)	(1.101)	(1.117)	(1.276)
Size dummy:51-200 employees	-20.735+++	-21.337+++	-20.510+++	-23.982+++	-18.926+++	-21.896+++	-19.831+++
	(0.688)	(1.173)	(0.865)	(1.073)	(0.906)	(0.942)	(1.028)
Size dummy: 11-50 employees	-12.790+++	-13.232+++	-12.851+++	-14.744+++	-11.860+++	-13.451+++	-12.605+++
	(0.551)	(1.012)	(0.665)	(0.905)	(0.697)	(0.794)	(0.772)
Age dummy: 5-15 yrs old	-10.749+++	-8.793+++	-11.851+++	-10.477+++	-10.675+++	-10.058+++	-11.352+++
	(0.657)	(1.062)	(0.837)	(1.016)	(0.863)	(0.884)	(0.986)
Age dummy: 15+ yrs old	-12.948+++	-11.567+++	-13.642+++	-13.349+++	-12.134+++	-12.860+++	-12.588+++
	(0.683)	(1.114)	(0.868)	(1.053)	(0.902)	(0.922)	(1.025)
Firm is incorporated	0.356	0.393	0.282	0.137	0.703	0.167	0.472
	(0.538)	(0.879)	(0.686)	(0.861)	(0.693)	(0.736)	(0.798)
Constant	9.626++	6.339	11.196+	-1.017	-5.363	3.319	3.173
	(4.572)	(10.902)	(6.535)	(10.743)	(9.544)	(10.239)	(7.565)
Observations	18564	6965	11599	8092	10472	10547	8017
R-squared	0.155	0.181	0.149	0.175	0.149	0.164	0.152
Adjusted R-squared	0.150	0.171	0.141	0.165	0.141	0.156	0.142

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.

Source: Author's estimations.

Finally, it is stimulating to note that when the enterprise level wage rate is introduced as an additional variable into the regression specifications reported in Tables 7.4 and 7.5, there is a significant negative association between the average annual wage levels and the employment growth rates for the non-innovating firms. In contrast, there is no significant correlation between wage levels and employment growth rates for both process and product innovators. These correlations reflect only intra-national differences, due to the national fixed effects variables. While these differences might arise from exogenous intra-national regional variations in wage rates, inasmuch as they arise instead from differences among the jobs filled by the enterprises themselves, the resulting regressions are unsuitable for testing hypotheses about the impacts of wages on employment. Nevertheless, the estimation results are consistent with the hypothesis that innovative enterprises can afford to employ more in a manner insensitive to wage costs, due apparently to their enhanced opportunities to cover those costs with innovation-driven growth, while enterprises without fresh innovation, on average, have less compensatory opportunities for employment growth and thus employ in a manner far more sensitive to labour costs. Under this hypothesis, and in view of our finding that innovative firms hire a larger share of unskilled workers than non-innovative firms, innovation might ease concerns related to the low-wage trap for unskilled labour.

Access to export markets, finance, communications and other essential business services are key additional correlates of employment growth

In addition to innovation as a source of inclusive growth, there are a number of other significant correlates of employment growth that have strong policy implications - including support for the competition policy mandate to assure access to essential business services for entering markets and expanding outputs. Table 7.2 reports the statistically significant importance for employment growth over our most inclusive sample of access to: finance (investment capital from both local banks and foreign borrowing), communications (enterprises using the Internet grow significantly faster), export markets, and other essential business services such as ISO management certification and formal worker training programmes.[21] In addition, having less government ownership and having greater access to global know-how through foreign ownership are both positive correlates of enterprise employment growth. The same relationships hold in our non-OECD countries sample, as reported in Table 7.3, with the additional significance of the variable indicating that the firm is part of a business association, which had no statistically significant relationship with enterprise employment growth across all countries.

Notable policy implications also seem to be indicated by some significant differences between innovators and non-innovators (Tables 7.4 and 7.5), and among firms in various age and size categories. One striking example is that ISO certification is associated with more than 2.1 and 1.8 percentage points of added employment growth for product and process innovators respectively in non-OECD countries, while it is statistically unrelated to employment growth for non-innovators. The large firms (with over 200 employees) in both the all-country and non-OECD country samples are different from smaller firms in that while their employment growth is significantly affected, on average, by their product innovations, it is not significantly related to their process innovations or their TFP. In addition, large firms' employment growth is unrelated to Internet use, ISO certification, use of formal job training programmes, membership in a business association, and incorporation status. The young firms are different on average since their employment growth rates are not significantly related to process innovation (though they are significantly related to TFP and product innovation), ISO certification, membership in a business association, and their incorporation status. In contrast, Internet use and formal job training are much more important to the employment growth of young firms than they are to other categories of firms.

What are the individual characteristics of innovative enterprises?

Our regressions estimating the parameters of the R&D, product innovation, process innovation and TFP equations (1), (2) and (3) discussed above are reported in Tables 7.6 to 7.11 for the sample across all countries studied and for the non-OECD countries sample. It should be noted that these equations together have an architecture that has elements of a triangular system. Enterprise R&D that is studied in (1) is a significant explanatory variable in the set of process and product innovation equations (2).[22] Product and process innovation are themselves explanatory variables in the TFP equation (3), although only product innovation is estimated to have a significant positive coefficient. Product innovation, process innovation, and TFP are all significant explanatory variables in the employment growth equation (4), along with many of the variables indicating characteristics of the enterprises that also appear as explanatory variables in equations (1), (2), and (3).[23]

It is clear from Tables 7.6 to 7.11 that enterprise size counts for innovation. Bigger enterprises, from micro (one to ten employees) on up to over 200 employees, are more likely to invest in R&D, more likely to innovate given the intensity of their R&D spending, and more likely to have superior TFP, given their innovation performance. This is the case given all the other controls accounted for in the regressions, and irrespective of

whether the OECD-country enterprises are included in the sample. This finding comes as no surprise, since bigger firms are apt to have more resources and greater incentives to innovate, and it is unlikely that the other control variables reflect all the advantages of scale for innovation.[24] It is striking that among the firms in the largest size category (greater than 200 employees), the oldest age group is some 12% more likely to invest in R&D than young firms. In contrast, there is no age effect on innovation in our data, given controls for the size of the enterprise. Throughout the R&D, innovation and TFP regressions there are hardly any statistically significant coefficients on age group indicator variables, inasmuch as the regressions include size category variables as well, or are estimated over subsamples of firms confined to given size categories.

Enterprises that are incorporated are significantly more likely to do R&D, and incorporation is a plus factor for process innovation by old and large firms and for TFP of micro and mature firms. Government ownership stake in an enterprise (of greater than 10%) is a generally significant negative factor for innovation and for TFP. Foreign private ownership stake in an enterprise (of greater than 10%) is a significantly negative factor for innovation, especially in the non-OECD sample, and yet is a positive factor overall for TFP.

Foreign borrowing (but not investment capital from local banks) is a strong and statistically significant correlate of R&D activity and TFP for small and young establishments, but is not directly a significant correlate of their innovation (while controlling for R&D), and access to credit does not show material relationships with any of our innovation indicators for other category firms. Firms that export are significantly more likely to engage in R&D (except for large firms employing more than 200 employees) and to innovate (except for large and young firms). There is a strong and significant positive correlation in all categories of firms between export activity and TFP. Use of the Internet, access to other essential business services (ISO certification, formal worker training programmes, being part of a business association), and formal cooperation with other firms (participation in a new foreign joint venture and entering into a new licensing agreement) are all generally strong positive correlates of enterprise product and process innovation. Internet use, formal training programmes (for relatively old and large firms), and membership in a business association (for old firms particularly) are significant positive correlates of TFP.

Table 7.6. Business environment determinants of establishment-level R&D

Full sample (OECD member countries, accession and enhanced engagement countries, and developing countries)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var	R&D	R&D	R&D	R&D	R&D	R&D	R&D	R&D
Estimator	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N
Reporting	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)
Firm exports	0.063+++	0.069+++	0.070+++	0.073+++	0.023	0.065+++	0.066+++	0.059+++
	(0.007)	(0.015)	(0.011)	(0.014)	(0.020)	(0.022)	(0.010)	(0.010)
Fraction of investment capital from local banks	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)	(0.000)	(0.000)	(0.000)
US Sector R&D intensity	1.642+++	1.598+++	1.717+++	1.694+++	1.431+++	0.578	1.933+++	1.793+++
	(0.167)	(0.269)	(0.255)	(0.383)	(0.531)	(0.550)	(0.250)	(0.257)
Firm undertook a new foreign joint venture	0.051+++	0.084+++	0.024	0.077+++	0.052+	0.048	0.022	0.085+++
	(0.013)	(0.029)	(0.020)	(0.028)	(0.032)	(0.037)	(0.018)	(0.020)
Firm obtained a new licensing agreement	0.083+++	0.069+++	0.091+++	0.108+++	0.065++	0.070++	0.084+++	0.070+++
	(0.013)	(0.027)	(0.024)	(0.028)	(0.030)	(0.038)	(0.018)	(0.020)
Fraction of loans in foreign currency	-0.004	0.015	0.066+++	-0.002	-0.008	0.091+++	-0.037+	-0.006
	(0.014)	(0.021)	(0.025)	(0.034)	(0.039)	(0.035)	(0.020)	(0.023)
>10% government-owned	-0.003	0.019	0.028	-0.031	-0.046	0.072+	-0.016	0.020
	(0.012)	(0.025)	(0.029)	(0.028)	(0.028)	(0.049)	(0.019)	(0.019)
>10% private foreign owned	0.011	0.027+	0.030+	0.028	-0.017	-0.023	-0.001	0.029++
	(0.008)	(0.018)	(0.017)	(0.019)	(0.021)	(0.022)	(0.011)	(0.015)
Size dummy: >200 employees	0.270+++					0.092++	0.250+++	0.324+++
	(0.013)					(0.041)	(0.021)	(0.020)

Table 7.6. Business environment determinants of establishment-level R&D (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var	R&D	R&D	R&D	R&D	R&D	R&D	R&D	R&D
Estimator	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N
Reporting	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)
	(0.011)					(0.030)	(0.016)	(0.017)
Size dummy: 11-50 employees	0.081+++					0.045++	0.094+++	0.082+++
	(0.008)					(0.020)	(0.011)	(0.014)
Age dummy: 5-15 years old	0.008	-0.004	0.016	0.037	0.046			
	(0.009)	(0.010)	(0.014)	(0.025)	(0.040)			
Age dummy: 15+ years old	0.021++	0.004	0.010	0.037	0.116+++			
	(0.010)	(0.011)	(0.014)	(0.025)	(0.038)			
Firm is incorporated	0.046+++	0.018+	0.042+++	0.020	0.040	0.027	0.054+++	0.017
	(0.008)	(0.011)	(0.012)	(0.019)	(0.026)	(0.021)	(0.011)	(0.013)
Observations	24491	6206	8901	5339	3775	2370	10734	10989
Pseudo R-squared	0.172	0.190	0.132	0.143	0.148	0.174	0.173	0.181

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.

Source: Authors' estimations.

Table 7.7. Business environment determinants of establishment-level R&D

OECD accession and enhanced engagement countries, and developing country sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var	R&D	R&D	R&D	R&D	R&D	R&D	R&D	R&D
Estimator	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N
Reporting	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)
Firm exports	0.051+++	0.089+++	0.055+++	0.060+++	0.011	0.056++	0.060+++	0.041+++
	(0.008)	(0.021)	(0.013)	(0.017)	(0.022)	(0.023)	(0.012)	(0.012)
Fraction of investment capital from local banks	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)	(0.000)	(0.000)	(0.000)
US Sector R&D intensity	1.797+++	2.179+++	1.759+++	1.850+++	1.710+++	1.022+	2.131+++	1.778+++
	(0.211)	(0.414)	(0.315)	(0.487)	(0.596)	(0.595)	(0.309)	(0.337)
Firm undertook a new foreign joint venture	0.053+++	0.098+++	0.019	0.073++	0.068+	0.050	0.010	0.108+++
	(0.015)	(0.038)	(0.023)	(0.032)	(0.036)	(0.039)	(0.020)	(0.025)
Firm obtained a new licensing agreement	0.088+++	0.070++	0.096+++	0.123+++	0.075++	0.072++	0.098+++	0.067+++
	(0.015)	(0.035)	(0.028)	(0.031)	(0.032)	(0.040)	(0.021)	(0.024)
Fraction of loans in foreign currency	-0.002	0.015	0.072++	-0.008	-0.043	0.100+++	-0.062++	0.015
	(0.017)	(0.028)	(0.030)	(0.041)	(0.042)	(0.037)	(0.025)	(0.029)
>10% government-owned	0.002	0.032	0.028	-0.026	-0.025	0.066	-0.008	0.014
	(0.013)	(0.032)	(0.032)	(0.030)	(0.030)	(0.049)	(0.022)	(0.021)
>10% private foreign owned	0.002	0.028	0.018	0.017	-0.023	-0.022	-0.001	0.005
	(0.010)	(0.022)	(0.020)	(0.022)	(0.023)	(0.023)	(0.013)	(0.018)
Size dummy: >200 employees	0.238+++					0.080++	0.232+++	0.281+++
	(0.015)					(0.042)	(0.024)	(0.024)

Table 7.7. Business environment determinants of establishment-level R&D (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var	R&D	R&D	R&D	R&D	R&D	R&D	R&D	R&D
Estimator	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N
Reporting	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)
Size dummy:51-200 employees	0.160+++					0.097+++	0.174+++	0.176+++
	(0.012)					(0.031)	(0.018)	(0.021)
Size dummy: 11-50 employees	0.064+++					0.034	0.078+++	0.066+++
	(0.010)					(0.022)	(0.013)	(0.018)
Age dummy: 5-15 years old	0.007	-0.004	0.017	0.022	0.040			
	(0.011)	(0.013)	(0.016)	(0.028)	(0.041)			
Age dummy: 15+ years old	0.012	-0.003	0.008	0.012	0.091++			
	(0.011)	(0.015)	(0.016)	(0.028)	(0.039)			
Firm is incorporated	0.063+++	0.043+++	0.065+++	0.059++	0.096+++	0.027	0.065+++	0.051+++
	(0.009)	(0.017)	(0.014)	(0.023)	(0.028)	(0.022)	(0.012)	(0.017)
Observations	18272	4216	6793	3991	3035	2085	8244	7711
Pseudo R-squared	0.159	0.180	0.131	0.135	0.134	0.177	0.163	0.163

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.

Source: Authors' estimations.

Table 7.8. Business environment determinants of establishment-level innovation

Full sample (OECD member and accession and enhanced engagement countries, and developing countries)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Dependent Var	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process
Estimator	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Reporting	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect
Firm R&D intensity	0.414+++	0.190	0.384+++	0.680+++	0.527++	0.169	0.447+++	0.504+++	0.300+++	0.130	0.270+++	0.318	0.645++	0.108	0.455+++	0.265++
	(0.082)	(0.147)	(0.116)	(0.233)	(0.255)	(0.183)	(0.136)	(0.128)	(0.073)	(0.111)	(0.100)	(0.201)	(0.283)	(0.180)	(0.130)	(0.106)
Fraction of workers skilled	-0.017	-0.013	-0.013	0.016	-0.066++	0.002	-0.016	-0.028	0.019+	0.040++	0.009	0.030	-0.023	0.052	-0.007	0.042++
	(0.012)	(0.022)	(0.020)	(0.028)	(0.032)	(0.037)	(0.018)	(0.019)	(0.011)	(0.017)	(0.017)	(0.027)	(0.033)	(0.035)	(0.017)	(0.017)
Firm uses Internet	0.130+++	0.104+++	0.135+++	0.129+++	0.171+++	0.092+++	0.128+++	0.142+++	0.106+++	0.082+++	0.106+++	0.084+++	0.136+++	0.145+++	0.100+++	0.107+++
	(0.008)	(0.015)	(0.013)	(0.021)	(0.029)	(0.026)	(0.013)	(0.013)	(0.008)	(0.012)	(0.011)	(0.020)	(0.031)	(0.024)	(0.012)	(0.011)
Firm has ISO certification	0.107+++	0.136+++	0.087+++	0.061+++	0.119+++	0.073++	0.117+++	0.101+++	0.082+++	0.062+++	0.079+++	0.073+++	0.094+++	0.085+++	0.093+++	0.074+++
	(0.009)	(0.025)	(0.017)	(0.017)	(0.019)	(0.033)	(0.014)	(0.013)	(0.009)	(0.019)	(0.016)	(0.017)	(0.020)	(0.031)	(0.014)	(0.012)
Firm has formal training programme	0.109+++	0.114+++	0.102+++	0.116+++	0.114+++	0.094+++	0.095+++	0.124+++	0.079+++	0.064+++	0.077+++	0.104+++	0.058++	0.026	0.096+++	0.075+++
	(0.008)	(0.016)	(0.012)	(0.017)	(0.022)	(0.024)	(0.012)	(0.012)	(0.007)	(0.013)	(0.011)	(0.016)	(0.023)	(0.023)	(0.011)	(0.010)
Firm exports	0.047+++	0.147+++	0.075+++	0.001	-0.011	0.033	0.065+++	0.039+++	0.031+++	0.057+++	0.043+++	0.029+	0.006	-0.004	0.040+++	0.035+++
	(0.008)	(0.022)	(0.014)	(0.016)	(0.020)	(0.029)	(0.013)	(0.012)	(0.008)	(0.017)	(0.013)	(0.015)	(0.020)	(0.026)	(0.012)	(0.011)
Fraction of investment capital from local banks	0.000++	0.000	0.000++	0.000	0.000	-0.000	0.000++	0.000	0.000+++	0.000+	0.000	0.001+++	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)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm is part of a business association	0.034+++	0.030++	0.034+++	0.046++	0.056++	0.055++	0.039+++	0.033++	0.034+++	0.044+++	0.037+++	0.033+	-0.003	0.077+++	0.047+++	0.008
	(0.008)	(0.015)	(0.013)	(0.019)	(0.025)	(0.027)	(0.012)	(0.013)	(0.008)	(0.012)	(0.012)	(0.018)	(0.026)	(0.027)	(0.011)	(0.012)
Firm undertook a new foreign joint venture	0.123+++	0.144+++	0.097+++	0.152+++	0.121+++	0.247+++	0.077+++	0.142+++	0.044+++	0.115+++	0.008	0.012	0.110+++	0.155+++	0.036	0.031
	(0.016)	(0.044)	(0.029)	(0.031)	(0.030)	(0.051)	(0.025)	(0.024)	(0.014)	(0.037)	(0.023)	(0.028)	(0.031)	(0.050)	(0.023)	(0.020)
Firm obtained a new licensing agreement	0.220+++	0.262+++	0.198+++	0.223+++	0.210+++	0.232+++	0.204+++	0.226+++	0.190+++	0.140+++	0.194+++	0.202+++	0.214+++	0.227+++	0.195+++	0.174+++
	(0.015)	(0.039)	(0.028)	(0.027)	(0.027)	(0.047)	(0.022)	(0.023)	(0.015)	(0.033)	(0.027)	(0.029)	(0.029)	(0.048)	(0.022)	(0.023)

Table 7.8. Business environment determinants of establishment-level innovation (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Dependent Var	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process
Estimator	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Reporting	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect	Marginal effect
Fraction of loans in foreign currency	-0.058+++	-0.023	-0.007	-0.050	-0.067++	-0.060	-0.056++	-0.082+++	-0.049+++	-0.011	-0.054+	-0.063+	-0.021	-0.176+++	-0.024	-0.051++
	(0.017)	(0.039)	(0.034)	(0.038)	(0.034)	(0.053)	(0.027)	(0.026)	(0.016)	(0.029)	(0.029)	(0.035)	(0.036)	(0.049)	(0.025)	(0.023)
>10% Government-owned	-0.071+++	0.044	-0.121+++	-0.090+++	-0.071++	0.039	-0.087+++	-0.114+++	-0.042+++	-0.031	-0.058++	-0.043	-0.052+	-0.076	-0.094+++	-0.024
	(0.015)	(0.051)	(0.034)	(0.030)	(0.028)	(0.056)	(0.027)	(0.021)	(0.013)	(0.029)	(0.027)	(0.028)	(0.029)	(0.044)	(0.021)	(0.019)
>10% Private foreign owned	-0.012	-0.078+++	-0.003	0.018	-0.010	-0.054	0.004	-0.018	-0.024++	-0.038+	-0.041++	-0.051+++	0.020	-0.058+	-0.016	-0.031++
	(0.011)	(0.027)	(0.022)	(0.021)	(0.021)	(0.033)	(0.016)	(0.017)	(0.009)	(0.019)	(0.017)	(0.019)	(0.022)	(0.029)	(0.014)	(0.015)
Size dummy: >200 employees	0.037+++					-0.000	0.024	0.066+++	0.087+++					0.164+++	0.086+++	0.101+++
	(0.014)					(0.049)	(0.021)	(0.021)	(0.014)					(0.052)	(0.022)	(0.021)
Size dummy:51-200 employees	0.023++					0.049	-0.003	0.055+++	0.043+++					0.047	0.029+	0.070+++
	(0.011)					(0.036)	(0.017)	(0.018)	(0.011)					(0.034)	(0.016)	(0.017)
Size dummy: 11-50 employees	0.003					0.016	-0.016	0.031++	0.032+++					0.036	0.020	0.055+++
	(0.009)					(0.027)	(0.013)	(0.015)	(0.009)					(0.026)	(0.013)	(0.015)
Age dummy: 5-15 years old	0.022+	0.026	0.002	0.018	0.075++				0.017	-0.003	0.026	0.049+	0.021			
	(0.011)	(0.017)	(0.018)	(0.027)	(0.037)				(0.010)	(0.014)	(0.016)	(0.026)	(0.040)			
Age dummy: 15+ years old	0.013	-0.016	0.004	0.028	0.060				-0.001	-0.026+	0.011	0.036	0.020			
	(0.011)	(0.019)	(0.019)	(0.026)	(0.037)				(0.011)	(0.015)	(0.017)	(0.025)	(0.040)			
Firm is incorporated	0.002	0.007	0.023	-0.028	-0.012	-0.028	0.013	0.023	0.011	0.003	0.011	-0.011	0.070+++	-0.017	0.005	0.036+++
	(0.009)	(0.018)	(0.015)	(0.021)	(0.024)	(0.028)	(0.013)	(0.015)	(0.008)	(0.014)	(0.013)	(0.020)	(0.026)	(0.026)	(0.013)	(0.014)
Observations	26108	6758	9558	5637	4136	2600	11412	11755	24258	6041	8976	5326	3852	2353	10693	10847
Pseudo R-squared	0.117	0.121	0.118	0.114	0.119	0.122	0.113	0.137	0.178	0.179	0.185	0.155	0.143	0.157	0.178	0.194

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.

Source: Authors' estimations.

Table 7.9. Business environment determinants of establishment-level innovation

OECD accession and enhanced engagement countries, and developing country sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Dependent Var	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process
Estimator	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Reporting	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)
Firm R&D intensity	0.376+++	0.256	0.319++	0.615++	0.446	0.344+	0.368++	0.401+++	0.331+++	0.213	0.293++	0.425+	0.418	0.323	0.470+++	0.237+
	(0.089)	(0.171)	(0.124)	(0.253)	(0.277)	(0.201)	(0.149)	(0.136)	(0.092)	(0.173)	(0.124)	(0.250)	(0.365)	(0.224)	(0.160)	(0.134)
Fraction of workers skilled	-0.000	-0.003	0.009	0.024	-0.052	0.017	-0.001	-0.016	0.035++	0.092+++	0.039+	0.011	-0.040	0.090++	0.004	0.049++
	(0.014)	(0.027)	(0.023)	(0.032)	(0.035)	(0.040)	(0.021)	(0.022)	(0.014)	(0.028)	(0.023)	(0.033)	(0.042)	(0.040)	(0.021)	(0.023)
Firm uses Internet	0.153+++	0.130+++	0.141+++	0.162+++	0.167+++	0.121+++	0.142+++	0.172+++	0.126+++	0.100+++	0.121+++	0.111+++	0.148+++	0.152+++	0.120+++	0.124+++
	(0.009)	(0.019)	(0.014)	(0.022)	(0.030)	(0.027)	(0.014)	(0.015)	(0.010)	(0.020)	(0.015)	(0.024)	(0.080)	(0.027)	(0.015)	(0.016)
Firm has ISO certification	0.123+++	0.182+++	0.087+++	0.083+++	0.137+++	0.093+++	0.115+++	0.125+++	0.098+++	0.116+++	0.073+++	0.084+++	0.102+++	0.118+++	0.106+++	0.083+++
	(0.011)	(0.031)	(0.020)	(0.021)	(0.021)	(0.036)	(0.017)	(0.016)	(0.011)	(0.028)	(0.020)	(0.021)	(0.060)	(0.036)	(0.017)	(0.016)
Firm has formal training programme	0.075+++	0.104+++	0.061+++	0.079+++	0.097+++	0.084+++	0.071+++	0.074+++	0.082+++	0.103+++	0.076+++	0.099+++	0.049+	0.028	0.108+++	0.069+++
	(0.009)	(0.020)	(0.014)	(0.019)	(0.024)	(0.026)	(0.014)	(0.014)	(0.009)	(0.020)	(0.014)	(0.020)	(0.028)	(0.026)	(0.014)	(0.014)
Firm exports	0.014	0.120+++	0.052+++	-0.054+++	-0.030	0.007	0.037++	-0.003	0.020++	0.047+	0.049+++	0.008	-0.009	-0.011	0.034++	0.024
	(0.010)	(0.026)	(0.016)	(0.018)	(0.022)	(0.031)	(0.015)	(0.015)	(0.010)	(0.026)	(0.016)	(0.019)	(0.023)	(0.030)	(0.015)	(0.015)
Fraction of investment capital from local banks	0.000++	0.000	0.000++	0.000	0.000	-0.000	0.000+	0.000	0.000+++	0.000	0.000	0.001+	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)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm is part of a business association	0.040+++	0.024	0.043+++	0.051++	0.058++	0.057++	0.049+++	0.029++	0.043+++	0.066+++	0.048+++	0.043++	-0.002	0.074++	0.053+++	0.016
	(0.009)	(0.017)	(0.014)	(0.021)	(0.026)	(0.028)	(0.013)	(0.015)	(0.009)	(0.018)	(0.014)	(0.021)	(0.028)	(0.029)	(0.014)	(0.015)
Firm undertook a new foreign joint venture	0.120+++	0.187+++	0.078++	0.137+++	0.129+++	0.269+++	0.074+++	0.136+++	0.063+++	0.191+++	0.014	0.013	0.130+++	0.163+++	0.050+	0.051+
	(0.018)	(0.053)	(0.032)	(0.035)	(0.034)	(0.052)	(0.027)	(0.028)	(0.018)	(0.053)	(0.030)	(0.034)	(0.255)	(0.054)	(0.027)	(0.027)
Firm obtained a new licensing agreement	0.210+++	0.233+++	0.187+++	0.224+++	0.206+++	0.202+++	0.198+++	0.216+++	0.199+++	0.197+++	0.204+++	0.192+++	0.207+++	0.231+++	0.197+++	0.183+++
	(0.016)	(0.045)	(0.031)	(0.029)	(0.030)	(0.050)	(0.023)	(0.027)	(0.017)	(0.044)	(0.031)	(0.030)	(0.558)	(0.050)	(0.024)	(0.027)

Table 7.9. Business environment determinants of establishment-level innovation (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Dependent Var	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new product	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process	Introduced new process
Estimator	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Reporting	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)	Marginal effect (Marg. Eff SE)
Fraction of loans in foreign currency	-0.036+	-0.017	0.035	-0.032	-0.071+	-0.049	-0.033	-0.063++	-0.066+++	-0.020	-0.092++	-0.070	-0.035	-0.191+++	-0.028	-0.077++
	(0.020)	(0.044)	(0.040)	(0.045)	(0.037)	(0.056)	(0.030)	(0.031)	(0.020)	(0.043)	(0.039)	(0.045)	(0.043)	(0.055)	(0.031)	(0.031)
>10% Government-owned	-0.049+++	0.052	-0.112+++	-0.076++	-0.036	0.041	-0.065++	-0.095+++	-0.040++	-0.060	-0.054	-0.037	-0.032	-0.088+	-0.090+++	-0.034
	(0.016)	(0.053)	(0.037)	(0.032)	(0.030)	(0.057)	(0.030)	(0.023)	(0.017)	(0.040)	(0.036)	(0.034)	(0.033)	(0.050)	(0.028)	(0.024)
>10% Private foreign owned	-0.022+	-0.086++	-0.000	-0.007	-0.003	-0.052	-0.006	-0.040+	-0.032++	-0.036	-0.047++	-0.075+++	0.027	-0.054	-0.028	-0.039+
	(0.012)	(0.032)	(0.025)	(0.024)	(0.023)	(0.035)	(0.018)	(0.021)	(0.012)	(0.031)	(0.023)	(0.023)	(0.030)	(0.034)	(0.018)	(0.021)
Size dummy: >200 employees	0.016					-0.027	0.023	0.036	0.101+++					0.166+++	0.112+++	0.102+++
	(0.016)					(0.050)	(0.024)	(0.025)	(0.017)					(0.055)	(0.026)	(0.028)
Size dummy:51-200 employees	0.016					0.020	0.000	0.042+	0.059+++					0.046	0.052++	0.076+++
	(0.013)					(0.038)	(0.020)	(0.022)	(0.014)					(0.039)	(0.021)	(0.025)
Size dummy: 11-50 employees	-0.011					-0.007	-0.023	0.014	0.035+++					0.026	0.039++	0.043++
	(0.011)					(0.029)	(0.015)	(0.019)	(0.012)					(0.031)	(0.017)	(0.021)
Age dummy: 5-15 years old	0.014	0.015	-0.001	-0.005	0.071+				0.023+	-0.014	0.047++	0.045	0.014			
	(0.012)	(0.021)	(0.020)	(0.029)	(0.039)				(0.013)	(0.021)	(0.020)	(0.030)	(0.042)			
Age dummy: 15+ years old	-0.005	-0.030	-0.008	-0.014	0.040				-0.009	-0.026	0.008	0.012	0.004			
	(0.013)	(0.023)	(0.021)	(0.029)	(0.039)				(0.013)	(0.024)	(0.022)	(0.030)	(0.041)			
Firm is incorporated	-0.002	0.014	0.015	-0.024	0.003	-0.036	0.014	0.018	0.023++	0.032	0.018	-0.004	0.088+++	-0.023	0.021	0.067+++
	(0.010)	(0.023)	(0.017)	(0.023)	(0.027)	(0.030)	(0.015)	(0.018)	(0.011)	(0.023)	(0.017)	(0.025)	(0.038)	(0.029)	(0.016)	(0.019)
Observations	19889	4736	7450	4289	3396	2282	8922	8477	18039	4016	6868	3978	3112	2028	8203	7569
Pseudo R-squared	0.117	0.120	0.120	0.125	0.130	0.123	0.111	0.141	0.160	0.175	0.171	0.127	0.137	0.147	0.160	0.180

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.

Source: Authors' estimations.

Table 7.10. Business environment determinants of establishment-level TFP

Full sample (OECD member countries, accession and enhanced engagement countries, and developing countries)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N
Reporting	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)
Introduced new product	0.046+	0.183+++	0.037	0.002	-0.050	0.046	0.049	0.068
	(0.028)	(0.056)	(0.046)	(0.059)	(0.069)	(0.091)	(0.042)	(0.042)
Introduced new process	0.023	0.078	0.011	-0.014	0.083	-0.073	0.051	0.034
	(0.030)	(0.063)	(0.050)	(0.063)	(0.072)	(0.099)	(0.045)	(0.046)
Fraction of workers skilled	0.193+++	0.076	0.182++	0.168	0.261++	0.066	0.196+++	0.190+++
	(0.047)	(0.091)	(0.079)	(0.107)	(0.120)	(0.150)	(0.070)	(0.072)
Firm uses Internet	0.349+++	0.442+++	0.326+++	0.320+++	0.138	0.265++	0.427+++	0.303+++
	(0.033)	(0.061)	(0.052)	(0.082)	(0.113)	(0.105)	(0.049)	(0.052)
Firm has ISO certification	-0.202+++	-0.047	0.017	-0.296+++	-0.366+++	-0.295++	-0.291+++	-0.155+++
	(0.035)	(0.094)	(0.064)	(0.065)	(0.075)	(0.131)	(0.055)	(0.051)
Firm has formal training programme	0.075++	0.104	0.017	-0.056	0.274+++	0.054	0.058	0.106++
	(0.031)	(0.064)	(0.048)	(0.064)	(0.084)	(0.099)	(0.046)	(0.046)
Firm exports	0.479+++	0.498+++	0.328+++	0.459+++	0.538+++	0.468+++	0.443+++	0.464+++
	(0.033)	(0.083)	(0.055)	(0.061)	(0.074)	(0.115)	(0.050)	(0.047)
Fraction of investment capital from local banks	-0.000	-0.001	-0.000	0.000	-0.001	0.001	-0.000	-0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Firm is part of a business association	0.070++	0.068	0.050	0.140+	0.155	-0.066	0.088+	0.105++
	(0.032)	(0.060)	(0.051)	(0.073)	(0.095)	(0.108)	(0.046)	(0.050)
Fraction of loans in foreign currency	-0.023	-0.218	0.387+++	-0.149	0.084	0.461++	-0.193+	0.042
	(0.069)	(0.169)	(0.136)	(0.143)	(0.129)	(0.216)	(0.105)	(0.102)

Table 7.10. Business environment determinants of establishment-level TFP (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N
Reporting	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)
>10% Government-owned	-0.214+++	-0.233	0.060	-0.247++	-0.233++	0.241	-0.039	-0.210++
	(0.061)	(0.189)	(0.140)	(0.116)	(0.107)	(0.220)	(0.109)	(0.085)
>10% Private foreign owned	0.152+++	0.179	0.058	0.147+	0.141+	0.098	0.213+++	0.080
	(0.043)	(0.125)	(0.085)	(0.078)	(0.078)	(0.136)	(0.062)	(0.068)
Size dummy: >200 employees	1.579+++					1.498+++	1.541+++	1.524+++
	(0.053)					(0.196)	(0.082)	(0.078)
Size dummy:51-200 employees	1.067+++					0.989+++	1.087+++	0.991+++
	(0.043)					(0.142)	(0.064)	(0.067)
Size dummy: 11-50 employees	0.570+++					0.417+++	0.586+++	0.515+++
	(0.035)					(0.108)	(0.049)	(0.057)
Age dummy: 5-15 yrs old	-0.064	-0.010	-0.015	-0.080	-0.186			
	(0.043)	(0.071)	(0.071)	(0.101)	(0.143)			
Age dummy: 15+ yrs old	0.032	0.141+	0.033	-0.062	-0.169			
	(0.044)	(0.077)	(0.074)	(0.100)	(0.142)			
Firm is incorporated	0.158+++	0.291+++	0.034	0.043	0.015	-0.017	0.151+++	0.061
	(0.035)	(0.073)	(0.058)	(0.078)	(0.094)	(0.111)	(0.051)	(0.056)
Constant	3.402+++	3.764+++	4.221+++	4.214+++	5.706+++	6.478+++	3.143+++	3.581+++
	(0.279)	(0.566)	(0.417)	(0.614)	(0.915)	(1.139)	(0.309)	(0.891)
Observations	26104	6761	9554	5645	4144	2610	11410	11755
R-squared	0.367	0.403	0.335	0.319	0.318	0.393	0.381	0.358
Adjusted R-squared	0.364	0.395	0.328	0.307	0.303	0.371	0.376	0.353

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.
Source: Authors' estimations.

Table 7.11. Business environment determinants of establishment-level TFP

OECD accession and enhanced engagement countries, and developing country sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Reporting	(SE)	(SE)	(SE)	(SE)	(SE)	(SE)	(SE)	(SE)
Introduced new product	0.011	0.160++	0.022	-0.082	-0.067	0.055	0.008	0.026
	(0.032)	(0.066)	(0.051)	(0.067)	(0.075)	(0.097)	(0.046)	(0.049)
Introduced new process	-0.014	0.072	0.000	-0.047	0.010	-0.134	0.048	-0.014
	(0.034)	(0.077)	(0.056)	(0.070)	(0.079)	(0.104)	(0.050)	(0.054)
Fraction of workers skilled	0.227+++	0.050	0.191++	0.105	0.275++	0.055	0.201++	0.282+++
	(0.053)	(0.109)	(0.087)	(0.120)	(0.129)	(0.159)	(0.078)	(0.084)
Firm uses Internet	0.306+++	0.382+++	0.285+++	0.271+++	0.149	0.294+++	0.407+++	0.200+++
	(0.038)	(0.076)	(0.057)	(0.087)	(0.116)	(0.112)	(0.055)	(0.059)
Firm has ISO certification	-0.226+++	-0.026	-0.016	-0.282+++	-0.359+++	-0.260+	-0.348+++	-0.142++
	(0.041)	(0.113)	(0.077)	(0.077)	(0.082)	(0.142)	(0.062)	(0.062)
Firm has formal training programme	0.060+	0.128	0.001	-0.066	0.309+++	0.080	0.038	0.084
	(0.035)	(0.079)	(0.055)	(0.074)	(0.090)	(0.105)	(0.052)	(0.055)
Firm exports	0.506+++	0.548+++	0.383+++	0.468+++	0.515+++	0.457+++	0.478+++	0.495+++
	(0.037)	(0.100)	(0.062)	(0.069)	(0.081)	(0.122)	(0.056)	(0.055)
Fraction of investment capital from local banks	-0.000	-0.001	0.000	-0.001	-0.000	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Firm is part of a business association	0.134+++	0.112+	0.103+	0.151+	0.202++	-0.071	0.133+++	0.219+++
	(0.035)	(0.068)	(0.055)	(0.079)	(0.098)	(0.111)	(0.050)	(0.056)
Fraction of loans in foreign currency	0.019	-0.340+	0.272+	0.002	0.127	0.374+	-0.219+	0.185
	(0.077)	(0.183)	(0.155)	(0.166)	(0.137)	(0.226)	(0.114)	(0.119)

Table 7.11. Business environment determinants of establishment-level TFP (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)	ln(TFP)
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Sample	ALL	Micro	Small	Medium	Large	Young	Mature	Old
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	N	N	N	N
Reporting	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
>10% Government-owned	-0.174+++	-0.231	0.088	-0.145	-0.269++	0.249	-0.047	-0.172+
	(0.064)	(0.196)	(0.149)	(0.120)	(0.112)	(0.221)	(0.114)	(0.090)
>10% Private foreign owned	0.131+++	0.259+	-0.004	0.141	0.082	0.087	0.201+++	0.050
	(0.048)	(0.140)	(0.095)	(0.089)	(0.086)	(0.142)	(0.068)	(0.082)
Size dummy: >200 employees	1.446+++					1.456+++	1.382+++	1.414+++
	(0.060)					(0.204)	(0.091)	(0.094)
Size dummy:51-200 employees	0.925+++					0.941+++	0.949+++	0.845+++
	(0.051)					(0.150)	(0.074)	(0.082)
Size dummy: 11-50 employees	0.482+++					0.374+++	0.482+++	0.465+++
	(0.041)					(0.117)	(0.058)	(0.070)
Age dummy: 5-15 years old	-0.043	0.017	-0.014	-0.083	-0.191			
	(0.047)	(0.083)	(0.077)	(0.110)	(0.147)			
Age dummy: 15+ years old	-0.027	0.037	-0.004	-0.171	-0.183			
	(0.049)	(0.091)	(0.081)	(0.110)	(0.145)			
Firm is incorporated	0.109+++	0.156+	-0.010	0.074	0.139	-0.059	0.115++	-0.008
	(0.040)	(0.091)	(0.066)	(0.087)	(0.101)	(0.118)	(0.057)	(0.069)
Constant	3.258+++	3.553+++	4.023+++	4.055+++	5.609+++	6.222+++	3.086+++	3.447+++
	(0.281)	(0.581)	(0.420)	(0.611)	(0.904)	(1.143)	(0.311)	(0.890)
Observations	19885	4738	7446	4297	3404	2284	8920	8477
R-squared	0.353	0.407	0.328	0.320	0.304	0.383	0.373	0.345
Adjusted R-squared	0.351	0.397	0.321	0.308	0.288	0.361	0.367	0.338

Note: In all regression tables, '+' denotes 10% significance level, '++' denotes 5% significance level '+++' denotes 1% significance level.
Source: Authors' estimations.

Table 7.12. Pairwise correlations, rank of country fixed effects and Doing Business rank indicators

Sample restricted to non-OECD, young firms (2284 observations)

	Overall ease of doing business (rank)	Employing workers (rank)	Starting a business (rank)	Construction permits (rank)	Registering property (rank)	Getting credit (rank)	Protecting investors (rank)	Paying taxes (rank)	Trading across borders (rank)	Enforcing contracts (rank)	Closing a business (rank)	New product specification: rank of country FE
Employing workers (rank)	0.44***											
Starting a business (rank)	0.69***	0.52***										
Construction permits (rank)	0.58***	0.38***	0.42***									
Registering property (rank)	0.68***	0.29**	0.3**	0.37***								
Getting credit (rank)	0.66***	0.14	0.34***	0.15	0.4***							
Protecting investors (rank)	0.63***	0.34***	0.52***	0.29**	0.24*	0.44***						
Paying taxes (rank)	0.45***	0.12	0.12	0.21	0.25*	0.14	0.3**					
Trading across borders (rank)	0.49***	0.01	0.22*	0.37***	0.17	0.35***	0.23*	0.11				
Enforcing contracts (rank)	0.52***	0.24*	0.32**	0.11	0.49***	0.26**	0.15	0.16	0.02			
Closing a business (rank)	0.39***	0.29**	0.19	0.16	0.26**	0.03	-0.04	0.11	0.11	0.35***		
New product specification: rank of country FE	***0.22****	***0.11***	***-0.02***	***0.14***	***0.34*****	***0.29****	***0.05***	***0.21***	***-0.1***	***0.21***	***0.03***	
New process specification: rank of country FE	***0.23****	***0.09***	***0.05***	***0.17***	***0.3****	***0.27****	***-0.02***	***0.12***	***-0.11***	***0.23****	***0.15***	***0.48*****

Note: *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Source: Authors' estimations.

The roles of competition in innovation-driven growth

How important is product market competition in stimulating innovation-driven growth? We explore this important policy question at two levels given our available data: the first based on firm-level proxies for the intensity of active competition; and the second based on national-level assessments of the openness of the business environment to competition.

Firm-level intensity of competition variables

We test whether two measures of firm-level competition—the self-reported number of competitors faced by a firm and whether the firm faces a foreign competitor—are correlated with R&D investment, product and process innovation, TFP and employment growth. Unfortunately, however, these variables were not collected in all the country surveys that comprise our full sample. Accordingly, we restrict our analysis of these firm-level competition variables to the sample of firms for which they are available, constituting less than 50% of our full all-country sample. We do not find any statistically significant effects at the level of the enterprise in any of the four firm-level R&D, innovation, TFP, and employment growth equations for either the self-reported number of competitors, the log of this measure or an indicator of the presence of a foreign competitor, given the controls in our framework.[25] This empirical result is not unexpected - in light of our discussion above of the logically ambiguous and countervailing effects of the degree of active competition on R&D investment and the resulting innovation.

National-level business environment competitiveness variables

To explore the importance of national-level measures of the openness to competition of the business environment, we follow the spirit of Loayza, Oviedo and Serven (2010) and Djankov, McLiesh and Ramalho (2006) by examining the associations between our innovation variables and the aggregate national rank across regulations that affect all 10 stages of the life of a business, as covered by the Doing Business indicators (see the discussion above).

Rather than replace the country-level fixed effects with the DB rank order variables as additional explanatory variables in the existing firm-level regressions, we examine the rank correlation between the country-level fixed effects from the firm-level regressions and the DB variables. A key advantage of this approach is that it overcomes the challenging interpretation problem, both economically and statistically, of including a rank order variable in

regressions having a mix of discrete and continuous variables. This approach also allows the relative importance of the 10 constituent DB sub-indices to be examined, as the collinearity of the individual DB variables does not conflate the econometric results when correlations are examined one-by-one. We report correlation results only for innovation outcomes, as the fixed effects from employment growth and TFP reflect a broader and more various range of factors - including important cross-country differences in macroeconomic facets of growth in the case of employment growth, and firm-specific knowledge and other assets that have built up over time in the case of TFP. We focus on the more vulnerable young enterprises for several reasons. We articulated above why incentives to innovate are heightened by opportunities to expand in response to progressive success, and how these opportunities are affected by the business environment particularly for young firms. For older, more established firms that are not so vulnerable, the business environment may have far less of a direct impact on their ability to expand; for older firms, a difficult or repressive business environment may be, at least in part, an encouragement to invest in innovation and expansion due to the entry barriers that the environment creates. In addition, young enterprises are particularly important in their higher general levels of employment growth: for non-OECD countries, the average employment growth of young firms (less than 5 years of age) is 27%, versus 10% for mature firms (between 5 and 15 years of age) and 3.5% for old firms (greater than 15 years of age).[26]

Table 7.12 reports correlation results for young firms in the non-OECD countries. Higher fixed-effect values mean more progressive country-level innovation outcomes on average, holding constant enterprise-level variables. In the reported rank correlations, the largest fixed-effect value is given the lowest numerical rank. Similarly, for the DB indicators, the country assessed to have the most competitive business environment (both overall and with regard to the subjects of the specific constituent sub-indices such as getting credit, protecting investors and trading across borders) is given the lowest numerical rank. So a positive correlation between country fixed-effects and the DB variables indicates that the competitiveness of the business environment matters for our key outcome variables, and that the aggregate DB indicator and/or specific attributes of the business environment are importantly salient in characterising the countries with the business environments that are the most successful in stimulating enterprise innovation.

We find that the overall DB variable has significant positive rank-order correlations with the country fixed-effects from both the product and process innovation regressions. The constituent components of DB that focus on getting credit and on registering property have significant positive associations with the country fixed-effects from both the product and process

innovation regressions. And the constituent component that focuses on enforcing contracts has a significant positive association with the country fixed-effects from the process innovation regression.

Thus, the data show that the openness to competition of the various countries' economies is stimulating of innovation achieved by the group of young firms that is of particular importance to employment growth. As shown above, the innovation fostered by the economies' openness to competition drives employment growth, and that growth is decidedly inclusive.

Conclusions

In this paper we present evidence that innovation - as proxied by the level of TFP and enterprise self-reports on their introduction of new products and processes - is an important driver of employment growth at the enterprise level. For the cross-section (mentioned above in the section on "Data and empirical specification"), we find that firms that innovate in products and in processes, and that have attained higher total factor productivity, exhibit higher employment growth relative to non-innovative firms. While our finding that product innovation makes a strong positive contribution to employment growth is broadly consistent with previous work in this area, past studies found no contribution to employment growth from process innovation. In contrast, our controls for the size heterogeneity of our studied enterprises enable us to show that process and TFP innovation have statistically significant positive effects on employment for relatively small firms, but not for establishments employing more than 200 employees. We note that most previous firm-level studies on the innovation-employment link did not address the net effect on aggregate employment, as they were not designed to test whether the employment gains of innovating firms are achieved at the expense of their domestic competitive rivals. In this paper, we design such a test and find no evidence of national-level negative offsets of enterprises' innovation-driven employment gains.

There is a widespread perception, based largely on casual empiricism rather than careful empirical testing, that innovation-driven growth is not inclusive in that it tends to replace low-skilled jobs with jobs characterised by higher levels of qualification. Our findings decidedly reject this view. Indeed, our data suggest that more innovative firms hire a larger share of unskilled workers relative to non-innovative firms. And our econometric estimates indicate that the share of the workforce that is unskilled contributes more to employment growth for firms that innovate (in products and/or processes) than for non-innovators. Our finding that, on average, there is a selection bias that favours inclusive growth from innovation is comforting in view of the world-wide concerns about rising income inequalities and claims that the

substantial benefits of economic growth have not been shared by the poor and unskilled.

Our results support the importance of microeconomic framework policies that actively enable competition by boosting access to efficient productive inputs, crucial information, needed credit and risk capital, domestic and export distribution channels, flexible employment opportunities, and commercial freedom as determinants of innovation, productivity and employment growth. The findings highlight how important elements of business, legal and physical infrastructure can facilitate productive entrepreneurship, which in turn can significantly affect economic growth and poverty alleviation because of the important linkages between entrepreneurial activity and the creation of productive jobs, new output, and new demand for inputs of all kinds. Indeed our results indicate that access to finance, export markets, Internet communication and other essential business services (*e.g.* ISO management certification, formal worker training programmes, and opportunities for licensing and joint ventures) are strong positive correlates of enterprise employment growth that is inclusive, especially for small and young firms in non-OECD countries. Our analysis confirms the importance of a country's business environment in determining the incentives behind competition and innovation outcomes. We find that the country-level "Doing Business" indicators (including access to credit, registering property, and enforcing contracts) summarising the overall business environment are significant positive correlates of both product and process innovation for young firms in the non-OECD countries.

Far more empirical research is needed to go beyond the indicative correlations presented here that are enabled by our cross-sectional data set towards more sure and detailed identification of causal links between elements of innovation and competition policy and resulting advances in growth and poverty elimination. Tracking enterprises over time could create a panel data set with more opportunities for strong instruments from exogenous changes in the economic environments to identify robustly the directions of causality suggested by the system of equations. Ideally, data following the workers as well as following the enterprises and their environments could be analysed jointly to ascertain with more specificity just what policies best contribute to innovation-driven inclusive growth.

Notes

1. Although the concept of 'inclusive growth' has received considerable attention in the economics literature, there is no widely accepted definition for it. Because of increasing concerns about rising income inequalities and claims that the poor in many parts of the world have not been benefitting much from economic growth, the term inclusive growth is often used interchangeably with a host of other terms, including 'broad-based growth,' 'shared growth,' and 'pro-poor growth.' For some of the pertinent definitional issues see Tang (2008).

2. See Dutz (2007) for a broad definition of innovation and a description of four areas that provide key levers for innovation policy.

3. A number of recent papers have sought to ascertain empirically whether low-wage employment is a static phenomenon or a transitory experience, that is, whether low-paid jobs enhance the future occupational advancement prospects of unemployed persons (stepping-stone effect) or give rise to adverse signals related to these persons' true productivity, thus increasing the probability for a low-pay-no-pay cycle (poverty trap). Although the evidence is somewhat mixed and subject to debate, there seems to be greater support for the stepping-stone effect. For analysis of the pathways of upward mobility for low-wage workers, see among others Booth *et al*. (2002), Knabe and Plum (2010) and Mosthaf (2011).

4. The *OECD Reviews of Innovation Policy* offer a comprehensive assessment of the innovation system of individual OECD member and non-member countries, focusing on the role of government.

5. Using data on German manufacturing and service-sector firms from the third Community Innovation Surveys (CIS3) for the period 1998-2000, Peters (2005) finds that product innovations have a net positive impact on employment while process innovations are associated with employment reduction for manufacturing but not service firms. These findings are largely confirmed by Harrison *et al*. (2008) in a study that is also based on CIS3. Using comparable firm-level data across four European countries - France, Germany, Spain, UK - they find that process innovation has significant displacement effects that are partially counteracted by

compensation mechanisms. The displacement effects of process innovation are most pronounced in manufacturing. On the other hand, product innovation is associated with employment growth and these results are similar across countries. Based on a firm-level comparison across provinces and cities in China, Mairesse *et al.* (2009) find that the market expansion effects of product innovation more than counterbalance the displacement effects of process innovation, the net result being that innovation makes a strong positive contribution to total employment growth. Alvarez *et al.* (2011) find that in the case of Chile, process innovation is generally not a relevant determinant of employment growth, and that product innovation is positively associated with employment growth.

6. Dutz, Ordover and Willig (2000) make the case for a pro-innovation competition policy that facilitates the entry and expansion of vulnerable (typically young and small but potentially fast-growing) firms led by grassroots entrepreneurs by focusing on access policies on the supply side. Such a more activist supply-side competition policy emphasizes: preserving rewards from productive innovation through the protection of commercial freedom, property rights and contracts; eliminating barriers to grassroots entry; and promoting access to essential business services by opening 'strategic bottlenecks' to competition. According to this view, advocacy for improving the competitiveness of the business environment is one of the most important roles for competition agencies.

7. Gorodnichenko and Schnitzer (2010) show how financial constraints restrain firms' innovation and export activities. Ayyagari, Demirgüç-Kunt and Maksimovic (2007) show that positive factors for firms' innovations in emerging markets include external finance, private ownership without control by a financial institution, export activity, and in a separate paper, freedom from unfortunately pervasive corruption. Aterido, Hallward-Driemeier and Pages (2009) focus on how enterprise size is crucial to the impact of finance on its employment growth.

8. Melitz (2003, 2008) pioneered the view that firms' trade activities are themselves endogenous and heavily influenced by productivity. Gorodnichenko, Svejnar and Terrell (2010) emphasize how exposure to globalization promotes firms' innovations in products and technology.

9. The approach taken in this paper falls within the ambit of inclusive growth analysis as it explicitly analyzes growth through firm-level data and the overall statistical distribution of innovation, TFP and employment growth outcomes rather than only economy-wide aggregates and the statistical mean of outcome variables. It also explicitly explores whether growth has the potential to raise the living standards of broad segments of the population and the reasons why this is so. See Ianchovichina and

Lundstrom (2009) for a variety of definitions for inclusive or more shared growth.

10. OECD: 15 member countries, 1 accession country (Russian Federation) and 5 enhanced engagement countries (Brazil, China, India, Indonesia, South Africa); 50 developing countries.

11. As summarized in Table 7.1c, these indicators are constructed based on responses to the following questions asked in the Enterprise Surveys: "Has your company undertaken any of the following initiative in the last three years: Agreed to a new joint venture with foreign partner?" and "Has your company undertaken any of the following initiative in the last three years: Obtained a new licensing agreement?"

12. We classify firms into four size categories based on the number of full-time permanent employees: micro (1 to 10), small (11 to 50), medium (51 to 200) and large (more than 200). Establishment age is determined by responses to "In what year did your firm begin operations in this country?" and is used to separate firms into three age classes: young (less than five years old), mature (five to 15 years old) and old (more than 15 years since started operations).

13. We use R&D intensity in the innovation equations as it may more accurately capture the differential effect of additional spending on R&D on the likelihood of innovation. Using an R&D indicator variable (as is estimated in equation 1) in place of R&D intensity in the innovation equations does not substantively alter our results or conclusions.

14. We calculate TFP by estimating a Cobb-Douglas production function from our enterprise data separately for each two-digit ISIC industry. Output is the real value of enterprise sales and inputs are the real value of fixed assets, total labour costs (actual or ILO wages) and materials expense. All variables are in logs. Each firm's residual from its industry regression is the natural logarithm of its TFP - higher values imply lower average and marginal costs of producing value.

15. Our measure of employment growth is defined in annual percentage terms rather than in logs, so the estimated coefficients can be interpreted directly as the change in the percentage employment growth rate given a unit increase in the regressor. These findings, especially the positive impact of product innovation on employment at the firm level, are consistent with the estimates presented in some recent papers - see for example, Peters (2005), Mairesse *et al*. (2009), and Alvarez *et al*. (2011)

16. Note that comparing coefficient estimates across different size categories does not yield much new information, as the average employment growth rate is starkly different between micro and large firms. However, the finding that product and TFP innovation has no statistically significant

effect on employment growth for large firms, while it does for smaller firms, is informative.

17. In fact, we see, but do not further explore here, evidence of statistically significant positive employment spillover effects of aggregate neighbouring firm process innovation on firm-level employment growth in the non-OECD developing countries sub-sample.

18. The null hypothesis that the means are the same across the two sub-samples is rejected at the 1% level of significance, based on a two-sample t-test.

19. For testing the equality of the coefficients on the variables measuring the shares of unskilled workers: for the process-innovators and non-innovators equations, we find z = (9.008-7.761)/(1.4012+1.0332)1/2 = .716 < 1.96 (5% for two-tailed test); and for the product-innovators and non-innovators equations, we find z = (10.390-7.204)/(1.3572+1.0472)1/2 = 1.856 < 1.96 (5% for two-tailed test). Thus, in both cases the maintained hypothesis that the two coefficients are equal cannot be rejected at the 5% level. For the regressions run over the process- or product-innovators/non-innovators, z = (9.973-6.385)/(1.1622+1.1862)1/2 = 2.161 > 1.96 (5% for two-tailed test). In this case, there is a statistically significant sub-sample difference in the estimated coefficients of the share of unskilled workers.

20. The null hypothesis that the means are the same across the two sub-samples is rejected at the 1% level of significance, based on a two-sample t-test.

21. ISO management certification refers to a family of internationally recognized management quality standards. The certification status of surveyed establishments is ascertained directly in the Enterprise Surveys. Formal training programs refer to "beyond the job" training opportunities offered to employees of the respondent establishment. Table 7.1c contains a detailed listing of the definition of these and other enterprise-level business environment indicators used in this study.

22. However, in (1), R&D is a binary variable, while in (2), the explanatory variable is the continuous non-negative R&D intensity.

23. We have not estimated these equations nor analyzed the total treatment effects of variations in the explanatory variables in ways that take the system architecture and mixture of binary with continuous variables into account. Precise methods for calculating such treatment effects are not well-established although there is a growing literature in this area (see: Heckman and Vytlacil (2001, 2005), Das (2005), Hall and Horowitz (2005), Imbens and Newey (2009), and Vytlacil and Yildiz (2007), among others). Data constraints in the present context limit the availability of valid exogenous identifying instruments typically required to estimate such models.

24. In addition, it might be the case that the proclivity of individual firms to innovate is persistent so that recent innovation is indicative of past innovation that led to past growth and the present larger sizes of the innovating firms.

25. While Ayyagari *et al*. (2007) find that the presence of a foreign competitor matters for innovation, their specification is quite different from ours: they test for the correlation of different business environment variables separately rather than controlling for a number of key variables simultaneously as we do.

26. This result is not driven by a positive correlation in the data between age and size: our finding of faster growth for young firms holds within size categories, with micro-sized young firms growing faster than micro-sized mature and old firms, and small-sized young firms growing faster than small-sized mature and old firms, with the differences in means between young and mature firms' growth rates statistically significant at the 1% level for both non-OECD and OECD countries.

References

Alvarez, R., J.M. Benavente, R Campusano and C. Cuevas (2011), "Employment Generation, Firm Size and Innovation in Chile: The Microeconometric Evidence", Centro INTELIS, Universidad de Chile.

Aterido, R., M. Hallward-Driemeier and C. Pages (2009), "Big Constraints to Small Firms' Growth? Business Environment and Employment Growth across Firms", *Policy Research Working Paper* 5032, The World Bank, Washington, DC.

Ayyagari, M., A. Demirgüç-Kunt and V. Maksimovic (2007), "Firm Innovation in Emerging Markets", *Policy Research Working Paper* 4157, The World Bank, Washington, DC.

Bloom, N. and J. Van Reenen (2010), "Why Do Management Practices Differ across Firms and Countries?", *Journal of Economic Perspectives*, Vol. 24(1), Winter, pp. 203-24.

Bloom, N., B. Eifert, A. Mahajan, D. McKenzie and J. Roberts (2011a), "Does Management Matter? Evidence from India", mimeo, Stanford University, Stanford, CA.

Bloom, N., L. Garicano, R. Sadun and J. Van Reenen (2011b), "The distinct effects of Information Technology and Communication Technology on firm organization", mimeo, Stanford University, Stanford, CA.

Booth, A., M. Francesconi and J. Frank (2002), "Temporary Jobs: Stepping Stones or Dead Ends?", *The Economic Journal*, Vol. 112(480), pp. F189-F213.

Crafts, N. (2006), "Regulation and Productivity Performance", *Oxford Review of Economic Policy*, Vol. 22(2), pp. 186-202.

Dachs, B. and B. Peters (2011), "Innovation, Employment Growth and Foreign Ownership of Firms: A European Perspective," Mimeo. Austrian Institute of Technology and Center for European Economic Research.

Das, M. (2005), "Instrumental Variables Estimators of Nonparametric Models with Discrete Endogenous Regressors," *Journal of Econometrics*, Vol. 124(2), pp. 335–61.

Djankov, S, C. McLiesh and R. Ramalho (2006), "Regulation and Growth", *Economics Letters*, Vol. 92(3), pp. 395-401.

Dutz, M.A. (2007), *Unleashing India's Innovation: Toward Sustainable and Inclusive Growth*, World Bank, Washington, D.C.

Dutz, M.A., J.A. Ordover and R.D. Willig (2000), "Entrepreneurship, Access Policy and Economic Development: Lessons from Industrial Organisation", *European Economic Review*, Vol. 44(4-6), pp. 739-47.

Gorodnichenko, Y. and M. Schnitzer (2010), "Financial Constraints and Innovation: Why Poor Countries Don't Catch Up", *ISA Discussion Paper* No. 4786.

Gorodnichenko, Y., J. Svejnar and K. Terrell (2010), "Globalisation and Innovation in Emerging Markets", *American Economic Journal: Macroeconomics*, Vol. 2(2), pp. 194-226.

Gruen, C., H. Mahringer and T. Rhein (2011), "Low-wage Jobs: A Means for Employment Integration of the Unemployed? Evidence from Administrative Data in Germany and Austria", *IAB Discussion Paper*, Vol. 1/2011.

Hall, P., and J. Horowitz (2005), "Nonparametric Methods for Inference in the Presence of Instrumental Variables," *The Annals of Statistics*, Vol. 33(6), pp. 2904-29.

Harrison, R., J. Jaumandreou, J. Mairesse, and B. Peters (2008), "Does Innovation Stimulate Employment? A Firm-level Analysis Using Comparable Micro-data from Four European Countries", *NBER Working Paper* 14216.

Heckman, J.J. and E.J. Vytlacil (2001), "Instrumental Variables, Selection Models, and Tight Bounds on the Average Treatment Effect". in M. Lechner and F. Pfeier (eds.), *Econometric Evaluations of Active Labor Market Policies in Europe*, Physica-Verlag, Heidelberg and New York.

Heckman, J.J. and E.J. Vytlacil (2005), "Structural Equations, Treatment Effects, and Econometric Policy Evaluation". *Econometrica*, Vol. 73(3), pp. 669-738.

Ianchovichina, E. and S. Lundstrom (2009), "Inclusive Growth Analytics: Framework and Application", *Policy Research Working Paper* No. 4851, The World Bank, Washington DC.

Imbens, G.W. and W.K. Newey (2009), "Identification and Estimation of Triangular Simultaneous Equations Models without Additivity". *Econometrica*, Vol. 77(5), pp. 1481-512.

Knabe, A. and A. Plum (2010), "Low-wage Jobs - Stepping Stone or Poverty Trap", S*OEP papers on Multidisciplinary Panel Data Research*, No. 337.

Loayza, N., M. Oviedo and L. Servén (2010), "Regulation and Macroeconomic Performance" in N. Loayza and L. Servén (eds.), *Business Regulation and Economic Performance*, The World Bank, Washington, D.C.

Mairesse, J., Y. Zhao and F Zhen (2009), "Employment Growth and innovation in China: A Firm Level Comparison across Provinces and City Districts", www.merit.unu.edu/MEIDE/papers/2009/1235915501_FZ.pdf.

Melitz, M. (2003), "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica*, Vol. 71(6), pp. 1695-1725.

Melitz, M. and G. Ottaviano (2008), "Market Size, Trade and Productivity", *Review of Economic Studies*, Vol. 75(1), pp. 295-316.

Mosthaf, A. (2011), "Low-wage Jobs - Stepping Stones or Just Bad Signals?" *Institute for Employment Research, Discussion Paper* No. 11/2011.

Peters, B. (2005), "Employment Effects of Different Innovation Activities: New Microeconometric Evidence", *ZEW - Centre for European Economic Research, Discussion paper* No. 04-73.

Sharma, S. and S. Straub (2010), "Intellectual Property Rights and Firm-Level R&D Spending", Mimeo, June.

Syverson, C. (2011), "What Determines Productivity", *Journal of Economic Literature*, Vol. 49(2), pp. 326-65.

Tang, M. (2008), "Inclusive Growth and Poverty reduction in the People's Republic of China", *Asian Development Review*, Vol. 25 (June-December), pp. 81-99.

Vytlacil, E. and N. Yildiz (2007), "Dummy endogenous variables in weakly separable models", *Econometrica*, Vol. 75(3), pp. 757-79.