

## Costa Rica's Efforts Toward an Innovation-Driven Economy: The Role of the ICT Sector

**VILMA VILLALOBOS**, Microsoft

**RICARDO MONGE-GONZÁLEZ**, Presidential Council

on Competitiveness and Innovation of Costa Rica

Costa Rica represents an interesting case study for countries looking to design national strategies to develop the information and communication technologies (ICT) sector as a driver for long-term growth and competitiveness. Indeed, the country is notable among the economies of its kind for the success obtained in this respect. According to Monge-González and Hewitt:

... relative to the size of its population ... Costa Rica's ICT sector is larger than those of most other Latin American countries, and even those of the Czech Republic and New Zealand, which have important ICT sectors and higher per capita GDPs than Costa Rica. ... Costa Rica has 156 ICT firms per million people, while Chile, Mexico, and the Czech Republic have 129, 12 and 20, respectively; available data also show that some countries, such as Uruguay and New Zealand, have relatively larger ICT sectors than Costa Rica (679 and 1,840 firms per million people, respectively).<sup>1</sup>

The country also scores remarkably well in different international assessments benchmarking national performances in a number of aspects related to ICT development. The World Bank's *World Development Indicators 2010* placed Costa Rica as the fourth-largest technology-exporting country in the world,<sup>2</sup> with high-tech exports representing 39 percent of its total exports in 2008,<sup>3</sup> surpassed only by the Philippines (66 percent), Singapore (51 percent), and Malaysia (40 percent). It also ranked 4th out of 139 countries in the foreign direct investment (FDI) and technology transfer components of the Global Competitiveness Index (GCI) 2010–2011.<sup>4</sup>

To get a sense of the sector's importance for Costa Rica's economy, consider that 705 domestic and multinational firms operated in Costa Rica's ICT sector in 2007, according to data provided by the Costa Rican Trade Promotion Agency PROCOMER and the local ICT Chamber CAMTIC. These data follow the standard definition by which the ICT sector is comprised of four subsectors: Hardware/Components,<sup>5</sup> Software Products,<sup>6</sup> Direct ICT Services,<sup>7</sup> and ICT-enabled Services (ITES).<sup>8</sup> Almost half of these firms (350, or 49.7 percent) were dedicated to direct services, more than a third (255, or 36.2 percent) to software development, 9.2 percent to IT-enabled services (65), and 5 percent (35) to Hardware/Components. In 2007, they employed 2.4 percent of the Costa Rican labor force and generated US\$2.806 billion in sales; their production represented 10.6 percent of Costa Rican GDP and their exports accounted for 28.8 percent of the country's total exports.<sup>9</sup> In terms of the sector's sales, 91 percent were for exports, the components subsector represented 69 percent, 18 percent IT-enabled services; 8 percent software development and 5 percent direct services (see Table 1).

Box 1 also provides an overview of ICT firms by names and their establishment year.

**Table 1: Total annual sales of ICT subsectors, 2007**

Subsector	US\$ millions	Percentage
<b>COMPONENTS</b>	<b>1,926</b>	<b>69</b>
Domestic	0	0
Exports	1,926	100
<b>DIRECT SERVICES</b>	<b>142</b>	<b>5</b>
Domestic	84	59
Exports	58	41
<b>IT-ENABLED SERVICES</b>	<b>517</b>	<b>18</b>
Domestic	26	5
Exports	491	95
<b>SOFTWARE DEVELOPMENT</b>	<b>221</b>	<b>8</b>
Domestic	130	59
Exports	91	41
<b>TOTAL ICT SECTOR</b>	<b>2,806</b>	<b>100</b>
Domestic	240	9
Exports	2,566	91

Source: Monge-González and Hewitt, 2010.

Behind Costa Rica's success are three major public policies that have fostered the rapid and sustainable growth of the ICT sector: continuous public investment in education, a reduction of internal taxes on and trade barriers to technological products, and solid foreign trade and FDI platforms.

This case study aims to provide an overview of the ICT sector in Costa Rica, its progress over time, and its contribution to the national economy. It examines the success factors for its rapid and sustainable growth, the current challenges, and the agenda addressed by the Presidential Council on Competitiveness and Innovation.

### Success factors in the evolution of the ICT Sector

Costa Rica started building the foundations for its ICT sector development in the late 1980s with the creation of the National Program of Educational Informatics (NPEI), the reduction of internal taxes on computers, and, later, by signing the Information Technology Agreement (ITA), a multilateral trade liberalization instrument. By the end of the 1990s, ever since Costa Rica made it a priority of its FDI policies to be a desirable location for ICT companies, the country has demonstrated a competitive advantage in its ability to attract ICT companies.

In comparison with other nations that focused their competitiveness and development strategy on ICT development (such as Singapore, Ireland, China, Malaysia, and India), Costa Rica's approach to developing its ICT sector has been more one of indirect policies,<sup>10</sup> implementing general public policies rather than specific

### Box 1: ICT firms established in Costa Rica in recent years

#### Firms

- Components Manufacturing Plant: INTEL Costa Rica (1997).

#### IT-enabled Services (Shared services)

- Procter & Gamble GBS (1999), Western Union Global Service Center (GSC) (1998), Baxter (2004), Astra Zeneca (2008), British American Tobacco (2006), Chiquita Brands (2003), Citi Business Services (2008), DHL (2007), Dole (2005), INTEL SS (2006).

#### Back offices

- Hewlett Packard (BPO) 2004, IBM (2004), LL Bean (1989), Pacific West (2000).
- Entertainment & Media (E&M): AvVenta (2005), Software Design: Align Technologies (2001).

#### Contact services

- SYKES (1999), Hewlett Packard (ITO) (2004), Teletech (2006), Amazon 2008, ACE (2008), BA Continuum (2007), Convergys (2004), Dell (2002), Fujitsu (2006), Stream International (2002).

Most IT companies have operations and offices in Costa Rica: Microsoft, Oracle, CISCO, IBM, and many others.

Source: CINDE, 2010.

ones from the very beginning. These policies created a favorable environment for the emergence of the ICT sector, building on and fostering some of the country's competitiveness strengths. First, investing in human capital created a pool of healthy and qualified laborers, who are key for attracting FDI and for ICT companies. Second, foreign trade liberalization policies, export promotion, and FDI attraction represented key incentives for the establishment of many ICT companies in Costa Rica. Third, early pioneering measures to facilitate the population's access to informatics (including the creation of the NPEI and the reduction of internal taxes on and trade barriers to technological products) promoted ICT readiness and diffusion in the country. Fourth, the country's political stability, favorable business climate, and central location were crucial elements for attracting FDI.

**Table 2: Costa Rican labor force by educational level, 1976 and 2008**

Educational level	1976 (percent)	2008 (percent)
College degree	5.2	19.7
Completed secondary school	5.2	11.7
Partial secondary school	16.3	25.1
Completed primary school	28.5	27.6
Partial primary school	34.6	13.1
No formal education	10.2	2.8

Source: Jimenez et al., 2010, pp. 198–99.

### Human capital policies

Costa Rica is well known for its high human development levels—as reflected in its Human Development Index (HDI) score for 2011—0.725, higher than the average worldwide and regional (Latin American and the Caribbean) ones (which are 0.624 and 0.706, respectively).<sup>11</sup>

The country has consistently invested in health and education as a part of its development strategy, strongly believing in the key role these play as basic competitiveness enablers. It ranked 22nd out of 139 countries on the health and primary education pillar of the GCI 2010. Its HDI subindex scores for health, education, and income in 2010 were 0.936, 0.630, and 0.646, respectively, out of 1. In 1980, its HDI was 0.599, already higher than the Latin American average of 0.578 that same year. Since then, it rose by 0.6 percent annually.

### Healthcare and social security

Costa Rica has a universal healthcare system and a strong social security structure, established by law in 1941 with the creation of the Costa Rican Social Security Fund Institute (Caja Costarricense de Seguro Social, or CCSS). The system is financed by mandatory contributions of the state, employers, and employees. The health system includes medical treatment (illness and maternity) and retirement (disability, old age, and death).

The CCSS has the primary responsibility of providing healthcare services to the population and has a coverage of 89.7 percent. Its network is comprised of more than 30 hospitals and more than 250 clinics throughout the country.

In 2009, life expectancy at birth in the country was 79.1 years; the infant mortality rate (under 12 months) was 8.8 (per 1,000 population).<sup>12</sup>

### Education

In the 19th century, Costa Rica embarked on a pioneering reform to change its educational system, its funding, and its coverage. By 1869, the political constitution already stated that primary education was mandatory

**Table 3: Labor force by educational level: Costa Rica vs. developed countries, 2001–05 average**

Educational level completed	Developed countries (percent)	Costa Rica (percent)	Developing countries (percent)
College degree	28	17	13
Secondary school	52	18	23
Primary school	19	58	50

Source: Jimenez et al., 2010, pp. 198–99.

and free. The country allocated resources to build up an educational system, and its illiteracy rate dropped from 90 percent to 58 percent by the end of the 19th century. Investment in education continued during the 20th century, and Costa Rica achieved universal primary education by the 1950s. After this, efforts focused on secondary school. However, the economic crisis of the early 1980s undermined the country's educational achievements. It took 20 years of systematic investments to return to pre-crisis levels.

In the 1990s, a constitutional reform guaranteed that public expenditure on education should be no lower than 6 percent of GDP. As of today, the political constitution mandates that primary and secondary education is free until 11th grade and mandatory until 9th grade.

As a consequence, Costa Rica can count on more educated workers than it could two decades ago. In 1976, 5.2 percent of Costa Ricans had a university degree compared with 19.7 percent in 2008, while 5.2 percent had completed high school in 1976 versus 11.7 percent in 2008 (see Table 2).

Costa Rica's competitive advantages in primary education are also reflected in the GCI 2010–2011 rankings out of 139 countries for primary education enrollment (where the country ranks 1st), the quality of the educational system (22nd), and the quality of primary education (33rd).

Notwithstanding the above, the country faces educational challenges as it moves toward becoming an innovation-driven economy. Costa Rica's labor force has lower educational levels than developed countries. Almost half of developed countries' labor forces have high school degrees, while this is only a fifth (18 percent) for Costa Rica. More than a fourth of developed countries' work forces (28 percent) have university degrees versus 17 percent in Costa Rica. Its labor force structure is still closer to that of developing countries (Table 3).

### Foreign trade and FDI promotion policies

After the debt crisis of the early 1980s, Costa Rica started to move from an economic development model based on import substitution to one based on export

promotion. It adopted several measures to liberalize trade, deregulate the economy, and reduce the anti-export bias.

Over the last 25 years, the country has created a solid platform of institutions and regulations to consolidate these processes, as follows:

- the establishment of the Ministry of Foreign Trade (1986);
- the creation of the investment promotion agency (Coalición Costarricense de Iniciativas para el Desarrollo, or CINDE), the first in Latin America;<sup>13</sup>
- the establishment of the free trade zone (FTZ) regime (1990);
- accession to the General Agreement on Tariffs and Trade (GATT, 1990),
- membership in the World Trade Organization (WTO) and an active participant since the mid 1990s; and
- eight free trade agreements (FTAs) are currently in force (the United States-Dominican Republic-Central America Free Trade Agreement, or US-DR-CAFTA, and the FTAs with Canada, Mexico, Chile, and Panama, among others).

These FTAs, which regulate trade with 13 partners, have allowed for total exports of US\$9.323 billion, according to 2010 Ministry of Trade data. Once the most recent FTAs signed with China, Singapore, and the European Union come into force, Costa Rica will have 42 preferential trade partners, representing 85.3 percent of Costa Rica's total exports and 79.5 percent of total imports covered by preferential trade schemes.<sup>14</sup>

Companies are encouraged to start up operations under the FTZ regime (export manufacturing, export trade, and export service companies or organizations engaged in scientific research). Benefits can include exemption on import duties, raw materials, components and capital goods, corporate income tax, export taxes, local sales and excise taxes, taxes on profit repatriation, capital taxes, and no restrictions on profit repatriation or foreign currency management. In addition, this regime offers expedited on-site customs clearance and the possibility of selling to exporters within Costa Rica.

#### Facilitating citizens' access to informatics: The NPEI, the Omar Dengo Foundation, and measures to facilitate imports and use of ICT products

In 1986, a presidential mandate created a high-level committee with the purpose of studying best practices for introducing computers in public schools in Costa Rica. In 1987, the NPEI and the Omar Dengo Foundation

(ODF) were created to meet several goals. These included improving the quality of teaching, familiarizing the population with informatics, creating better-prepared Costa Ricans for the future, reducing the country's technological gap with respect to developed nations, democratizing access to science and technology, promoting the development of cognitive processes, and stimulating creativity and logical thinking.<sup>15</sup> Although most educational informatics experiences throughout the world have been at the secondary school level, the program in Costa Rica started at the primary school level, a groundbreaking decision for those times. The reason for this was to stimulate the logical thinking of students from primary school onward.

In 2010, the NPEI and the ODF covered 62.3 percent of the public educational system: 60.2 percent in primary education and 68.3 percent in secondary school.

On a related note, in 1987, the government significantly reduced the internal taxes imposed on computers, as one of the measures designed to facilitate the population's access to informatics. In the 1990s, Costa Rica joined GATT. It also became a founding member of the WTO and an early supporter and signatory of the Information Technology Agreement (ITA), a multilateral trade liberalization instrument. ITA covers a wide range of IT products, including computers and computer peripheral equipment, electronic components including semiconductors, computer software, telecommunications equipment, semiconductor manufacturing equipment, and computer-based analytical instruments. ITA's original participants eliminated tariffs as of January 1, 2000, on a wide range of IT products, and modified their WTO schedules of tariff concessions accordingly.

Moreover, the US-DR-CAFTA's E-Commerce Chapter introduced the digital product concept along with important measures to impede the creation of trade barriers to this type of product. The Singapore FTA and Mexico FTA amendments are replicating these measures.

#### Political stability and business-friendly climate

Since the army was abolished in 1948, Costa Rica has peacefully celebrated 17 democratic electoral processes as well as 17 changes of administration. As indicated by the World Bank's Worldwide Governance Indicators 2009, Costa Rica's position on the percentile rankings is 65.1 on political stability, 62.7 on rule of law, and 70 on control of corruption, where 0 is the lowest ranking and 100 the highest. The country ranks 3rd out of 17 Latin American countries in all three indicators. Political stability, rule of law, and human capital are vital determinants of the business climate, and these factors are key differentiators that have made Costa Rica unique in Central and Latin America since the 1970s. As a result, many multinational companies established their Central America regional headquarters in Costa Rica—technol-

ogy suppliers as well as demanders of technology—and this occurred outside the FTZ incentives regime. This is the case for Microsoft and Coca Cola, among others.

### Externalities from ICT multinational firms: Knowledge spillovers and ICT knowledge transfer in Costa Rica

The economic literature has paid increasing attention to the role of FDI in fostering the productivity of domestic firms in developing countries. A widely accepted argument in this regard is that foreign firms from developed countries typically enjoy technological superiority and strong management capabilities, and their technologies and management practices can be transferred to or imitated by domestic firms in emerging markets. There is some empirical evidence that multinationals might have generated knowledge transfer and spillovers to the Costa Rican economy, notably labor turnover spillovers.<sup>16</sup> Monge-González found that 32 percent of ex-workers of FTZ multinationals were hired by local companies.<sup>17</sup> This is 15,139 out of 46,864 workers during the 2001–07 period who moved from FTZ multinational firms to domestic firms. Half of those workers (49 percent) were absorbed by large local companies and the other half (51 percent) by small- and medium-sized enterprises. Another study found that a significant number of workers have moved from multinational firms located in the country either to work in a domestic ICT firm or to start an ICT business of their own.<sup>18</sup> According to the authors, 47 percent of the domestic ICT firms examined have at least one owner who previously worked for a multinational firm in Costa Rica. In the case of employees currently working at local ICT companies, 26 percent of managers, 9 percent of engineers, and 5 percent of developers surveyed had previously worked for multinationals in Costa Rica. More than half of domestic ICT firms have multinationals as clients in Costa Rica, and 27.6 percent of local suppliers of multinationals have at least one owner who worked for a multinational before.

Four types of commercial relationships between multinationals and local ICT firms can be observed in Costa Rica. These involve the local firms acting as ICT wholesalers or distributors; retailers to final users; value-added resellers (VARs), which provide third-party products and services to final users as parts of packages that also include the VAR's own products and services; or representatives—usually not selling directly but providing local points of contact for firms and individuals. Wholesalers and VARs tend to be associated with the widest range of benefits.

Domestic companies report important benefits from these commercial relationships with MNC [multinational corporation] ICT companies, such as training in sales and marketing techniques and information about current or possible clients, special events for network formation between domestic ICT companies

involved with the same multinational ICT companies and increased visibility for local partners.<sup>19</sup>

### Target ICT public programs and policies

In contrast to some other countries, Costa Rica does not have public policies guaranteeing access to financial instruments other than loans (notably seed capital, venture capital, and equity markets) for ICT firms, a demand-driven educational system, or government-funded technology parks. There are, however, a few initiatives funded by the Inter-American Development Bank or the World Bank, such as those that provide incentive for ICT startups and incubator programs for ICT companies. Examples are ParqueTec, Yo Emprededor, CIETEC, and Link Inversiones (venture capital).

The regulation to facilitate innovation and access to credit to small and medium technology-based businesses (Law 8262) has not produced significant results yet.

### Key challenges going forward

After a careful analysis of Costa Rica's strengths and weaknesses when it comes to moving from an efficiency-driven to an innovation-driven economy,<sup>20</sup> the new Costa Rican authorities adopted a structured strategy to ensure the coordination of efforts needed to successfully tackle the pending challenges in this field. Thus, in May 2010, Executive Decree 36.024 created the Presidential Council on Competitiveness and Innovation (PCCI), with an agenda for 2010–14 focused on the following five areas:

1. human capital and innovation,
2. foreign trade and FDI,
3. capital markets and financial reforms,
4. infrastructure (telecommunications, electricity, transportation, ports, and airports), and
5. regulatory reform and red tape reduction.

The PCCI provides guidance, advice, and coordination of public policies in the above areas. It also designs plans, goals, and objectives; and ensures the monitoring of the progress made. Its functions include, in the areas for which it is responsible, proposing strategic objectives, sectoral targets, and indicators of achievement; developing specific action plans; collaborating in the implementation of specific action plans defined by the government; designing policies and guidelines that regulate the activities of the institutions involved, upon approval of the executive branch or the President of the Republic. The PCCI is also in charge of proposing mechanisms for controlling and following up on action plans and assisting in their implementation; coordinating the respective technical secretariats and establishing



mechanisms to integrate the views of various stakeholders on issues of importance and linked to its areas of responsibility in a participatory manner.

The remainder of this section will examine in detail the main measures adopted in the framework of the PCCI agenda for 2010–14.

### Human capital and innovation goals

Important strides have been made in recent years in the field of education, including an increase in high school enrollment rates, particularly for lower-income groups. The Ministry of Education's Plan (MEP) for 2010–14 aims to universalize pre-school and high school education, to double the number of technical high schools, to continue investment in English-speaking skills, to increase Internet access in schools up to 85 percent, and to develop students' attitudes toward knowledge and problem solving, including math and science education.

### Foreign trade and FDI

The Costa Rican authorities continue to make progress on the foreign trade front. This is clear in the pending legislative approval of FTAs with China, Singapore, and the European Union as well as with Korea and Peru. In addition, stronger efforts to fully leverage the treaties that have already been signed, as well as strategies for attracting FDI, have been put in place. Costa Rica has envisioned, as one of its goals for the period 2010–14, the attraction of US\$9 billion in FDI.

### Capital markets and financial reforms

The country has begun to create new financial instruments to support entrepreneurial endeavors, especially for technology-based firms. In particular, the creation of seed capital is being fostered, based on the new law of the Banking System for Development (Law 8634) adopted in 2008. This law allows the Costa Rican authorities to use resources in a trust for the development of small- and medium-sized enterprises and the creation of capital seed and venture capital (Chapter III, Article 16). In addition, the country is working on changes to the institutional framework and incentives to improve the general functioning of its capital market.

### Telecommunications

The telecommunications market was opened in 2008. A 1963 law granted the concession to a state-owned company, which was the sole operator. The 2008 Opening Telecommunications Law created a National Telecommunications Fund (FONATEL) out of concessions fees with the purpose of promoting universal access to ICT and reducing the digital divide. In particular, the law focused on providing broadband Internet to underserved communities (either urban or rural areas) and to public schools and high schools of the NPEI, public healthcare institutions, and public entities. In 2009, the Telecommunication Strategic Plan estab-

lished two major priorities for FONATEL: connectivity to rural schools and technical secondary schools. In 2010, a memorandum of understanding between the Telecommunications Regulation Authority SUTEL and MEP detailed specific goals.

The current administration is committed to continuing with the implementation of telecommunications reforms. On January 2011, an executive decree granted mobile phones concessions to two private companies, allowing private participation for the first time. It also has the goal of universalizing citizens' access to broadband Internet and reducing the divide among regions. Between the second half of 2005 and the second half of 2009, Costa Rica's broadband connections increased from 48,570 to 308,520. This represented 95 percent of the 2010 goal of 325,000 connections. Costa Rica achieved a broadband penetration of 6.9 accounts per 100 inhabitants.<sup>21</sup> The country still lags behind other more connected countries and regions: for instance, in 2010 broadband penetration was 30 percent in the United States and Europe and around 25 percent in South and East Asia.

### Conclusion

Costa Rica has been no doubt successful in developing its ICT sector, benefitting from its comparative advantages such as its high level of human development, appropriate trade policies, favorable business environment, and political stability. In order to confront the important competitiveness challenges ahead, the country has created a Competitiveness and Innovation Council led by the President. Its structure and its operations are based on international best practices. This effort is a key element for the coordination of activities among public and private institutions to overcome the deficiencies identified in infrastructure (mainly telecommunications), human resource development (secondary and tertiary education enrollment), financial market development (new financial instruments), and deregulation (excessive red tape).

The experience of Costa Rica in promoting the development of a dynamic ICT sector suggests that it is important to work on the fundamentals in order to attract foreign companies and develop local enterprises in the sector. Among the main policies adopted over the years in this field, the development of human resources, free access to technologies, political and macroeconomic stability, and trade liberalization and access to international markets, as well as continuously ensuring a favorable business climate should all be noted. Any country that wishes to venture into this sector should focus on these elements.

### Notes

<sup>1</sup> Monge-González and Hewitt 2010, p.7.

- 2 World Bank 2010, p. 340.
- 3 *High-tech exports* is defined as products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. World Bank 2010, p. 343.
- 4 World Economic Forum 2010.
- 5 *Hardware/Components* is defined as firms that carry out activities related to the design, manufacture, assembly, and/or sale of ICT hardware (for computers, telephones, network devices, etc.).
- 6 *Software Products* is defined as firms that carry out activities related to the creation and sale of relatively standardized software applications and tools, which may be designed to be used by organizations operating in specific sectors of the economy ("vertical" applications), by a wide variety of organizations ("horizontal" applications), or by individuals.
- 7 *Direct ICT Services* is defined as firms that offer consulting, support, training, development of custom-made software components, systems integration, and configuration, or any one of a large number of other services related to the creation, implementation, and maintenance of information and/or telecommunications systems.
- 8 *ICT-enabled Services* is defined as firms that provide services that are not necessarily directly related to ICT services and products (such as "business processes outsourcing"), but whose delivery to clients is enabled by telecommunications and computer networks.
- 9 Monge-González and Hewitt 2010, p. 47.
- 10 The economic literature distinguishes two types of science, technology, and innovation policies: explicit and implicit policies. The first group includes research and development (R&D) grants, R&D tax credits, university-industry collaboration projects, public research labs, and intellectual property. The second type refers to more general measures such as trade, fiscal, financial, competition, and labor market policies. Countries can either rely on one type or combine both approaches.
- 11 The HDI is a composite indicator that serves as a frame of reference for both social and economic development elaborated by the United Nations Development Programme and published since 1980 in the *Human Development Report*. It combines indicators of life expectancy, educational attainment, and income into a composite human development index. The HDI sets a minimum and a maximum for each dimension, called *goalposts*, and then shows where each country stands in relation to these goalposts, expressed as a value between 0 and 1.
- 12 MIDEPLAN 2010, p. 50.
- 13 CINDE was established and funded by USAID in 1982 as a private, nonprofit organization.
- 14 Ministerio de Comercio Exterior, COMEX 2010, Exposición Ministra Anabel González.
- 15 ODF 2007.
- 16 According to Saggi (2002), there are three potential channels of knowledge spillovers: demonstration effects, labor turnover, and vertical linkages. Demonstration effects happen when local firms adopt technologies introduced by multinational firms through imitation or reverse engineering. Labor turnover occurs when workers trained or previously employed by the multinational transfer important knowledge to local firms by switching employers or when they contribute to technology diffusion by starting their own firms. Vertical linkages occur when multinationals transfer technology to firms that are potential suppliers of intermediate goods or buyers of their own products. See Zhang et al. 2010.
- 17 Monge-González 2010.
- 18 Monge-González and Hewitt 2010.
- 19 Monge-González and Hewitt 2010, pp. 20–26.
- 20 For a detailed explanation of different stages of economic development, see Sala-i-Martin et al. 2010.
- 21 CAATEC 2010.

## References

- Alfaro, L. and A. Rodriguez-Clare. 2004. "Multinationals and Linkages: An Empirical Investigation." *Economica* 4 (2): 113–69.
- CAATEC (Comisión Asesora en Alta Tecnología). 2010. *Barómetro Cisco de Banda Ancha para Costa Rica*, VIII Report.
- CAMTIC (Cámara de Tecnologías de Información y Comunicaciones de Costa Rica). 2010. *Estrategia del Desarrollo del Sector Digital "Costa Rica: Verde e Inteligente 2.0."* CAMTIC.
- Cordero, J. and E. Paus. 2008. "Foreign Investment and Economic Development in Costa Rica: The Unrealized Potential." *Foreign Investment and Sustainable Development: Lessons from the Americas. Working Group Discussion Paper Number 13*. Working Group on Development and Environment in the Americas, Tufts University.
- Crespi, G. 2010. "Competitividad e Innovación en el Contexto Internacional: Éxitos, Fracasos y Lecciones de Algunos Países." Presentation to the Academia de Centroamérica Seminar *Políticas para el Desarrollo de Costa Rica: Competitividad y Progreso Social*. San José, Costa Rica, December 8.
- Garnier, L. 2010. "Nuestras diez líneas estratégicas." Education National Plan by Costa Rica's Minister of Public Education Leonardo Garnier. *Administración Chinchilla: 2010–2014*. San José, Costa Rica: MEP.
- Jiménez, R., E. Robles, and G. Arce. 2009. "Educación y Crecimiento en Costa Rica." In *Obstáculos al Crecimiento Económico en Costa Rica*, ed. O. Céspedes and L. Mesalles. San José, Costa Rica: Academia de Centroamérica. 181–219.
- Liberma, L., Vice President of Costa Rica. 2010. "Retos de la Política Económica 2010–2014." Presentation to the Consejeros Económicos y Financieros CEFSA Seminar. San José, Costa Rica, December 2.
- MEP (Ministerio de Educación Pública de Costa Rica). 2010. *Educando en tiempos de cambio, Memoria Institucional*. San José, Costa Rica: MEP.
- MIDEPLAN (Ministerio de Planificación Nacional y Política Económica de Costa Rica). 2010. *Plan Nacional de Desarrollo 2011–2014 del Gobierno de Costa Rica*. San José, Costa Rica: MEP.
- Monge-González, R. 2010. "Transmisión de conocimientos en Costa Rica." In *Ensayos en honor a Cecilia Valverde*, ed. O. Céspedes and A. Pacheco. San José, Costa Rica: Academia de Centroamérica. 213–53.
- Monge-González, R. and J. Hewitt. 2010. "Innovation, R&D and Productivity in the Costa Rican ICT Sector: A Case Study." *Inter-American Development Bank Working Paper Series No. IDB-WP-189*. Washington DC: IADB.
- ODF (Omar Dengo Foundation) 2007. *Multi-stakeholder Partnerships and Digital Technologies for Development in Latin America and the Caribbean: Three Case Studies*. Canada International Development Research Centre IDRC and Global Knowledge Partnership. San José, Costa Rica: Ediciones Innov@, IDRC.
- Saggi, K. 2002. "Trade, Foreign Direct Investment and International Technology Transfer: A Survey." *World Bank Research Observer* 17 (2): 191–235.
- Sala-i-Martin, X, J. Blanke, M. Drzeniek Hanouz, T. Geiger, and I. Mía. 2010. "The Global Competitiveness Index 2010–2011: Looking Beyond the Global Economic Crisis." *The Global Competitiveness Report 2010–2011*. Geneva: World Economic Forum. 3–55.
- UNDP (United Nations Development Programme) 2010. *Human Development Report 2010: 20th Anniversary Edition: The Real Wealth of Nations: Pathways to Human Development*. Published for the United Nations Development Programme (UNDP). Hampshire and New York: Palgrave Macmillan.
- Villalobos, V. 2004. "Educación, equidad y competitividad: el caso de Costa Rica." In *Hacia visiones renovadas del financiamiento educativo en América Latina y el Caribe*, ed. Navarro and Rodríguez-Braña. Banco Interamericano de Desarrollo (BID), Monterrey, Mexico: Cumbre de las Américas. 179–87.
- World Bank. 2010 *World Development Indicators: State and Markets*. Washington DC: World Bank. Available at: <http://data.worldbank.org/data-catalog/world-development-indicators/wdi-2010>.

- 
- World Economic Forum. 2009. *The Global Information Technology Report 2009–2010*. Geneva: World Economic Forum.
- . 2010. *The Global Competitiveness Report 2010–2011*. Geneva: World Economic Forum.
- WTO (World Trade Organization). 1995, 2001, 2007. *Costa Rica Trade Policy Reviews*. Geneva: WTO.
- Zhang, Y., H. Li, Y. Li., and L. Zhou. 2010. "FDI Spillovers in an Emerging Market: The Role of Foreign Firms' Country Origin Diversity and Domestic Firms' Absorptive Capacity." *Strategic Management Journal* 31 (9): 969–89.