Competitiveness in Central America

The Road to Sustained Growth and Poverty Reduction

José Luis Guasch, Liliana Rojas-Suarez, and Veronica Gonzales

Center for Global Development

Competitiveness in Central America

The Road to Sustained Growth and Poverty Reduction

José Luis Guasch, Liliana Rojas-Suarez, and Veronica Gonzales

Center for Global Development

Liliana Rojas-Suarez is a senior fellow at the Center for Global Development and chair of the Latin American Shadow Financial Regulatory Committee (CLAAF). From 1998 to 2000, she served as managing director and chief economist for Latin America at Deutsche Bank; before that, she was the principal advisor in the Office of Chief Economist at the Inter-American Development Bank. José Luis Guasch is senior regional advisor on regulation and competition for the Latin America and Caribbean Region at the World Bank and has been professor of economics at the University of California–San Diego since 1980. Veronica Gonzales is a former research assistant at the Center for Global Development.

CGD is grateful for contributions from the Seattle International Foundation in support of this work.

ISBN: 978-1-933286-72-3
Center for Global Development
1800 Massachusetts Ave. NW
Washington DC 20036
www.cgdev.org

Contents

Boxes

Figures

Tables

Preface

Central America is poor. It's not as poor as Africa, but except for Costa Rica, the region is still heavily reliant on grants and highly concessional loans from the official donor community. It is also plagued by the high inequality typical of much of the rest of Latin America, by the volatility common to tiny economies that are heavily reliant on a single market (in this case, the U.S. market), and by high levels of criminality associated with the drug war. What should the official donors do better and differently to kick start an increase in growth; and what role should the U.S. business sector, with existing and potential interest in the region, play?

Senior fellow Liliana Rojas-Suarez (former managing director for Latin America at Deutsche Bank and principal advisor in the Office of the Chief Economist at the Inter-American Development Bank) and José Luis Guasch, senior regional advisor on regulation and competition at the World Bank, ask that question. With the support of Veronica Gonzales, they build on CGD's earlier work on growth and inequality in Latin America, including *Fair Growth: Economic Policies for Latin America's Poor and Middle-Income Majority* (Birdsall and Augusto de la Torre), which focused on growth-friendly policies to reduce inequality, and Liliana's own *Growing Pains in Latin America*, which focused on country-specific institutionally feasible growth policies.

This report benefited from the support and encouragement of the Seattle International Foundation (SIF). Mauricio Vivero in particular encouraged the authors to think deeper and further on the major problems that Central America faces in achieving sustainable economic growth. Discussions at a CGD/SIF roundtable held in the spring of 2011 in Washington, D.C., provided further valuable inputs to the authors' work. Perhaps the origins of the report help explain its focus on private-sector productivity and on politically practical proposals for policy fixes to address the challenge.

The authors report that Central America underwent robust economic growth from 2003 to 2008. But they counsel that that growth will not be sustained and inclusive unless it is grounded in increased overall competitiveness in the region. Given the small size of their domestic markets, these countries have put placed the expansion of international trade at the center of their plans for economic and social development. But for these plans to work, the countries must increase their international economic competitiveness. The report makes specific recommendations in five areas where public-private partnerships and donors' support can help foster competitiveness: (1) innovation, knowledge transfer, and quality systems; (2) infrastructure and logistics; (3) mainstreaming the activities of small and medium enterprises; (4) education and human capital; and (5) reduction of crime and violence and strengthening of overall governance.

The proposals, while innovative and challenging, are also doable. Their practicality reflects broad consultation with high-level policymakers, private-sector representatives, academicians, and other regional experts. I look forward to seeing leaders and policymakers take up their recommendations.

Nancy Birdsall
President
Center for Global Development

Acknowledgments

This was report would not have been possible without the collective effort of many individuals and organizations who contributed their time, extensive knowledge and support. We would first like to thank the Seattle International Foundation (SIF) for its generous financial support. We are grateful to Mauricio Vivero for his interest in the subject and for encouraging us to think deeper and further on the major problems that Central America faces in achieving sustainable economic growth. We would like to give special thanks to Roberto Fabian of the Fundación Nacional para el Desarrollo El Salvador (FUNDE) and to SIF for their invaluable comments and suggestions. We are also grateful to the participants of the SIF roundtable held in the spring of 2011 in Washington. These participants included distinguished researchers from the Fundación Nacional para el Desarrollo (FUNDE), Centro Internacional para el Desarrollo Humano (CIDH), Fundación para el Desarrollo de Centroamerica (FUNDESCA), Instituto de Estudios Estratégicos y Políticas Públicas (IEEPP), laRED, and INCAE Business School among others.

We would also like to thank Nancy Birdsall for her support and deep belief that Central America can indeed rise to its full potential. Finally, we thank the excellent CGD communications team, especially Lawrence MacDonald and John Osterman, for their guidance and assistance.

Introduction

Over the last decade, Central American countries—Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua—have made significant progress in social and economic areas. In particular, they have stabilized their economies after decades of civil war and the economic volatility that plagued the region through the 1990s. Most countries in Central America have taken important steps to improve their business climates, particularly by enhancing macroeconomic stability, improving the soundness of their financial systems, making improvements in infrastructure services and trade facilitation, reducing red tape, and simplifying their regulatory and tax frameworks. As a result, before the 2008 financial crisis, GDP per capita in Central America grew at an average rate of 3 percent per year from 2003 to 2008, which, albeit modest, was the most robust and stable period of growth the region had witnessed since the early 1990s. However, despite this achievement, Central American economies are still lagging behind the rest of Latin America and other middle-income countries by per-capita growth rates of 0.5 to 2 percentage points. Even more worrying are the levels of poverty and inequality, which show the lack of inclusiveness in their growth models. Moreover, recent developments in the region show a number of red flags that are weakening macroeconomic and democratic stability. Significant structural changes are urgently needed to secure sustained and inclusive growth.

Given its small domestic markets, Central America has put the promotion of international trade at the center of its development agenda. In recent years, the region has witnessed the successful conclusion of negotiations for a significant number of free trade agreements (FTAs), most notably the Dominican Republic–Central America Free Trade Agreement (DR-CAFTA) with the United States and the Association Agreement (AA) with the European Union. However, the extent to which Central American countries take full advantage of the opportunities and benefits offered by these trade initiatives will depend on whether they address a number of pending issues that are hampering their international competitiveness.

Securing sustained growth, alleviating poverty, and reducing inequality are indeed tall orders and complex undertakings. While we of course recognize that there are many relevant factors (political, socioeconomic, as well as those related to natural disasters and external shocks) affecting those objectives, in this paper we identify five critical areas where improvements need to be made if Central American countries are to become more competitive and consequently achieve significant economic growth and poverty alleviation. Thus, the concentration of the analysis on a few key areas should not be interpreted to mean that other socioeconomic and political factors are not important and relevant; instead, it should be clear that the focus of this report is on areas where technical recommendations can be advanced to promote growth and poverty alleviation. The five identified areas are as follows:

1. Innovation, Knowledge Transfer, and Quality Systems
2. Infrastructure and Logistics
3. Mainstreaming the Activities of Small and Medium Enterprises (SMEs)
4. Education and Human Capital
5. Crime, Violence, and Weak Governance

In all five areas we find that international donors can play an essential role in complementing the efforts of countries' authorities and the local private sectors.

One clarification is in order: This report does not attempt to explore and analyze all five identified areas in equal depth. For example, our coverage of the issues related to crime and violence is rather limited, since the complexities of this topic deserve a report of their own. Also, we address only indirectly—through the strengthening of specific institutions—issues of governability, transparency, and democracy of the political systems, which indeed are critical if Central American countries are to secure sustainable private investment. However, the reader should not be confused by the short amount of space assigned to the section on SMEs. Indeed, the theme of mainstreaming SMEs permeates the other sections and is cross-referenced in them as well.

The rest of the paper is organized as follows: Section II presents a brief overview of key economic and social characteristics of the Central American countries. Section III shows that the five key areas identified as priorities for dealing with growth and development problems in the region can be derived from analyzing the existing literature and surveys on the region. Sections IV through VII analyze each of the five key areas in turn. In each section, we first describe the problems and shortcomings in the priority area and then provide specific recommendations for improvement. In making these recommendations, we emphasize the positive role that donors can play.

Outline of Recommendations

Our recommendations are outlined below. All are explored in much greater detail in the pages that follow.

Innovation, Knowledge Transfer, and Quality Systems

- Strengthen Institutions
  - Assign a top priority to innovation at the highest levels of the government
  - Centralize and coordinate efforts
- Facilitate Knowledge Transfer
  - Implement Centers for Knowledge and Technology Transfer (CITES)
  - Develop a technology transfer broker (and managers) program
  - Implement a technology transfer offices (TTOs) program.
- Create and strengthen international linkages and regional cooperation for knowledge transfer
- Establish a sector-specific matching funds program
- Promote and assist in knowledge generation
- Link the supply of and demand for innovation

Infrastructure and Logistics

- Increase investment in infrastructure to at least 4 percent of GDP
- Foster private-sector participation (PPP)
- Set up public-private logistics councils
- Improve the software of logistics
- Institute efficient pricing and subsidy policies
- Improve operations and maintenance of infrastructure
- Improve power generation
  - Increase generation capacity through PPPs
  - Improve the quality, pricing, cost recovery, and administrative efficiency of energy utilities
  - Promote regional interconnections

Mainstreaming the Activities of Small and Medium Enterprises

- Establish centers for knowledge and technology transfer
- Establish articulation programs that allow small firms to benefit from economies of scale
- Encourage assistance by donor and multilateral organizations in the financing and implementation of effective articulation programs
- Establish consortia and supplier programs
- Implement innovative programs to facilitate access to financial services
- Implement Programs to facilitate SMEs' exports

Education and Human Capital

- Implement Cash on Delivery (COD) Aid applied to secondary education
- Further institutionalize assessment systems through the dissemination of information regarding education performance
- Improve teachers' performance
  - Implement full-scale teacher certification systems
  - Create incentives to improve teachers' efforts
  - Regulate teachers' education programs
- Increase instructional time
- Establish a Council for the Evaluation, Accreditation, and Certification of Educational Quality
- Provide financial incentives for keeping youth in schools
  - Provide more financial aid to low-income students
  - Promote the enrollment of a larger number of students in the technical branches of secondary education
  - Facilitate reforms of universities' curricula
- Improve Vocational Education and Workers' Training
  - Develop a publicity strategy for vocational and training programs
  - Align educational inputs with required competencies by implementing a continuous consultation process to address labor market needs.
  - Foster strategic partnerships with the private sector that will provide internships with companies, thereby improving education
  - Establish a public policy focused on providing technical training that responds to the competitiveness challenges of the country
  - Develop a national labor skills certification system

Crime, Violence, and Weak Governance

- Expand support from multilateral organizations for establishing job training, education, and rehabilitation programs
- Modify the U.S.-promoted Central America Regional Security Initiative (CARSI) to support a large-scale police reform
- Invest in early childhood development programs and programs targeting the at-risk population
- Increase enrollment in and completion of secondary education
- Administer security through local authorities
- Separate juvenile and adult jail facilities

A Brief Overview of Central American Economic and Social Performance

As mentioned in the introduction, Central America has made substantial progress in regaining macroeconomic stability. It has also continued to integrate at both the global and regional levels. It has controlled inflation and made progress in reducing fiscal deficits. Economic growth accelerated in Central America during the 2003–07period, when the region benefited from global economic expansion and, in particular, the U.S. economy's dynamism, which spurred demand for exports and increased remittances. Driven initially by a pickup in exports and rising commodity prices, the economic expansion spilled over into domestic demand. Overall, the region's per capita GDP growth increased to about 3 percent per year (Table 1). The U.S. financial crisis hit the region hard in 2008–09, but economic activity recovered somewhat by 2010, and the IMF forecasts a continuation of the recovery, albeit at a modest pace.

Notwithstanding improvements in economic policies in the region, Central America still lags behind the rest of Latin America, East Asia, and middle-income countries in growth performance. As shown in Figure 1, the difference in per capita income growth in Central America relative to other developing regions of the world has remained large during the 2000s. This underperformance may be explained by the rise in global raw materials prices, including oil, and the lack of significant productivity growth. In addition, Central American light manufacturing exports may have lost some dynamism in the face of competition from China and other Asian countries (SIECA 2007). Growth also remains volatile, continuing the pattern of previous decades and reflecting the region's vulnerability to external economic shocks (commodity price increases), natural disasters (El Niño, hurricanes, and earthquakes), and domestic policy reversals (pre-election spending). In the short run, regional growth remains vulnerable to the behavior of U.S. growth.

Perhaps more telling is the productivity performance of Central American countries. A number of studies have shown very disappointing growth of Total Factor Productivity (TFP), which was very low or even negative for some of the Central American countries for a large part of the 2000's (Figure 2) (see Pagés 2010). Given the links between TFP growth and GDP growth, this is quite worrisome because of the implications it has for Central American countries in diversifying

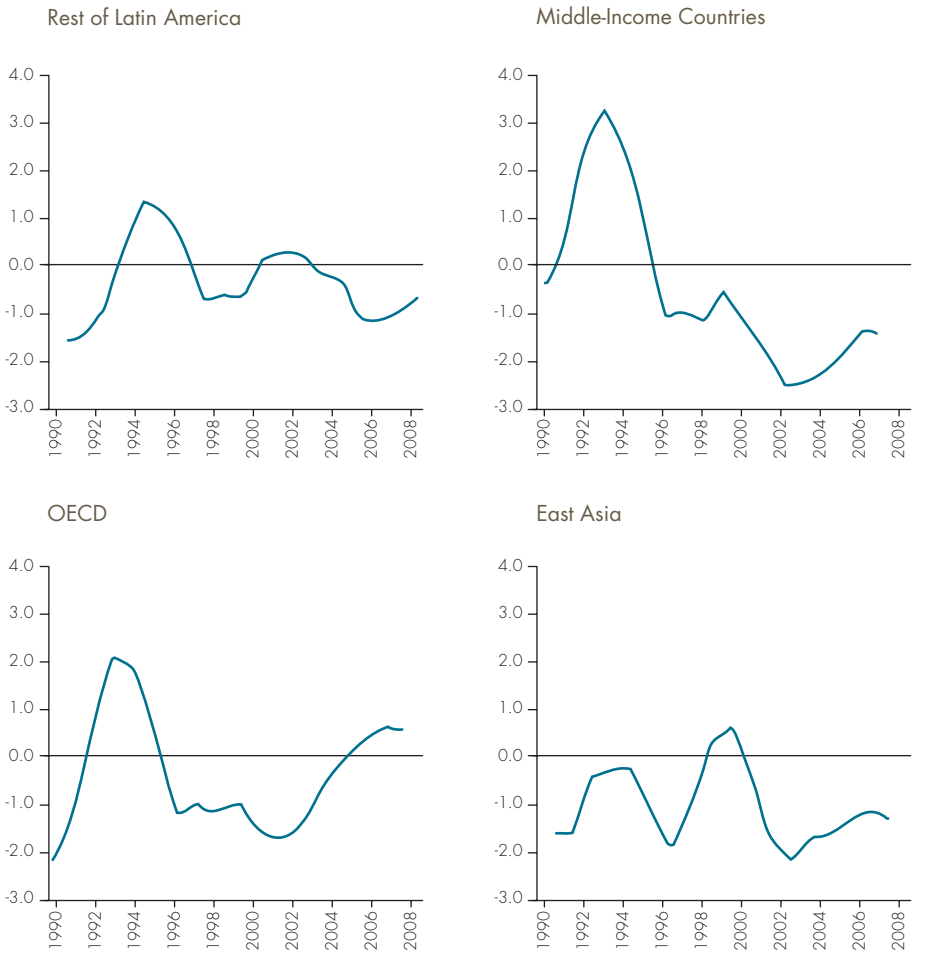
Table 1: Per Capita GDP Growth in Central America, 2000–2009 (Percentage)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Costa Rica	- 0.5	- 1.0	0.8	4.3	2.4	4.1	7.1	6.4	1.5	- 2.3
El Salvador	1.6	1.2	1.9	2.0	1.5	2.9	3.8	3.9	2.0	- 4.0
Guatemala	1.2	- 0.1	1.3	0.0	0.6	0.7	2.8	3.7	0.8	- 2.0
Honduras	3.5	0.6	1.7	2.5	4.1	3.9	4.5	4.2	1.9	- 4.9
Nicaragua	2.4	1.4	- 0.6	1.2	4.0	2.9	2.5	1.8	1.9	- 2.8

Note: per capita GDP growth based on per capita GDP in constant dollars of 2000.

Source: 2000–2008 from WDI, 2009 estimated by CEPAL based on WDI data.

Figure 1: Deviation of per Capita Growth in Central America with Respect to Selected Country Groups, 1990–2008

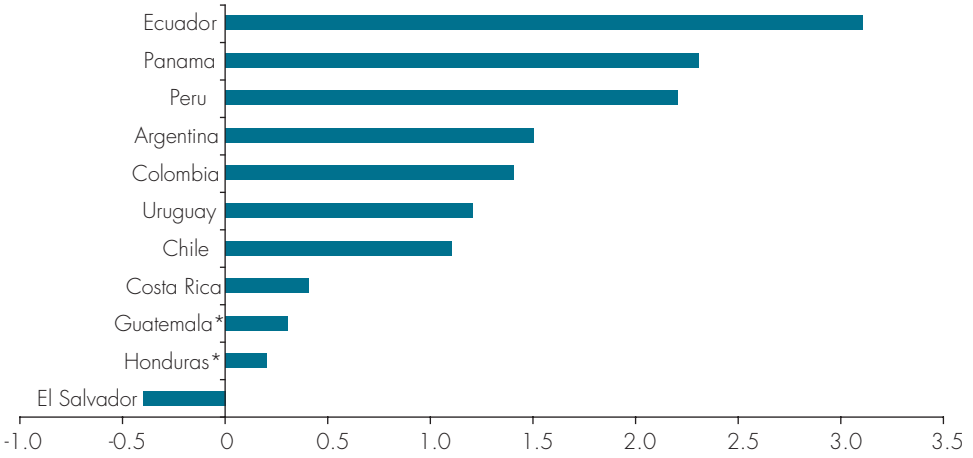


Note: Deviations with respect to selected country groups are computed as Central America's annual median growth rate minus the reference group's annual median growth rate. All series have been smoothed with a backward-looking 3-year moving average.
Source: World Bank (2008).

production away from the primary sector toward making high-value-added goods and progressing toward the creation of knowledge-based economies. SMEs are especially lagging in productivity, remain fragmented, and are usually not connected with the production and export chains (particularly with the high-value-added goods for export).

With the exception of Costa Rica and El Salvador, Central American countries still remain highly dependent on the primary sector (agriculture is the key source of exports), with insufficient diversification taking place toward manufacturing or toward the processing of agricultural products. Structural change toward the production of value-added products is critical to accelerating economic growth in the region. Additionally, advancements in technology and export performance imply shifts from one sector to another. Although Central American countries show some changes

Figure 2: Growth of TFP in Selected Countries, 2001–2007 (in Percentages)



Source: Fajnzylber, Guasch, and Lopez (2009).
*Author's calculation based on the Enterprise Survey (2010).

in the composition of GDP by sector over time, suggesting that technological or terms-of-trade changes have influenced the structures of their economies (Montobbio and Rampa 2005; Yuki 2007), these shifts have been modest. For example, while the manufacturing sector has shown some growth in all countries, in Guatemala, Honduras, and Nicaragua, agriculture and food remain the sectors with the highest percentage of exports, albeit with a declining trend (Table 2). Moreover, the Central American region remains highly dependent on the U.S. economy, its most important trading partner.

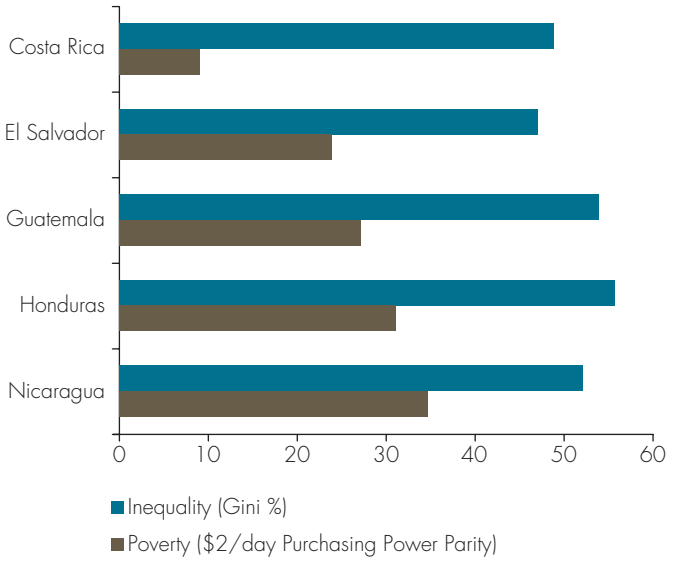
Additionally, an important source of concern is Central American performance on various social indicators. Despite some improvements in the 2000s, inequality and poverty in Central

Table 2: Structure of Merchandise Exports, 1996–2009 (Percentage)

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Manufacturing					
1993–2000	41.68	40.88	31.26	18.51	15.91
2001–2008	63.88	46.41	41.25	23.98	11.67
Agriculture and food					
1993–2000	55.41	47.44	64.89	77.38	81.51
2001–2008	33.89	16.95	50.17	76.09	76.09
Fuel and metals					
1993–2000	1.47	4.56	3.85	4.08	2.35
2001–2008	1.72	3.90	8.57	6.61	2.28

Source: WDI.

Figure 3: Poverty (Percentage of Total Population) and Inequality (Gini %) Ratios in Central America



Notes: Poverty: average 1999–2007, except Nicaragua (1999–2005); Inequality: latest available year (2005–2007).
Source: WDI 2009.

America still remain high (with the exception of poverty ratios in Costa Rica). Finally, using the World Bank's Doing Business indicators as a barometer to reflect the investment climate, rule of law, and governability in Central America, the region does not fare well in the global economy and, even more worrisome, there has been little progress over time. All of the countries are in the bottom half of the rankings, with the exception of El Salvador, which ranks just barely above the middle, while Honduras and Costa Rica are among the worst performers. The worst performance issues for Central American countries include the difficulties of starting and closing a business, the deficiencies in protecting investors, the burden of taxes, the cumbersome processes and long delays in issuing construction permits, and the difficulties in trading across borders.

Overall, the economic and social performance of Central America, while positive, has not been stellar by any means. Indeed, it shows a number of red flags that convey a need for significant structural changes if Central American countries are to secure sustained, inclusive high growth and address the relatively high levels of poverty and inequality. Getting the most from ongoing trade initiatives—a potential key driver for growth and poverty reduction—will therefore depend on the ability of policymakers and countries' donors to assure implementation of adequate policies and the establishment of an enabling institutional environment capable of addressing a number of critical bottlenecks that stifle significant productivity growth.

Table 3: Investment Climate in Central America (Ranking out of 183 Countries: 2010–2011)

	Rankings[a]									
	El Salvador		Guatemala		Honduras		Nicaragua		Costa Rica	
	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010
Overall Position in the Ranking	86	84	101	110	131	141	117	117	125	121
1. Starting a Business	129	121	162	156	145	144	97	95	116	127
2. Issuing Construction Permits	124	128	144	150	73	74	138	137	131	128
3. Registring Property	49	46	23	24	89	91	142	143	52	49
4. Getting Credit	46	43	6	4	32	30	89	87	65	61
5. Protecting Investors	120	119	132	132	167	165	93	93	167	165
6. Paying Taxes	137	134	116	108	147	145	158	165	155	154
7. Trading Across Borders	65	61	122	119	110	114	85	99	69	60
8. Enforcing Contracts	51	50	101	103	175	175	66	67	130	132
9. Closing a Business	87	81	94	93	120	118	75	70	114	101

a. A lower number indicates a better position in the ranking.
Source: Own elaboration based on World Bank 2011 data.

Identification of Key Areas for Policy Action

In countries such as those in Central America that have adopted an export-led growth strategy as a means to foster development, it is essential to have in place the factors needed to ensure an adequate degree of competitiveness in global markets. Based on the existing research and analysis (Guasch 2007), these factors are:

- Macroeconomic stability; otherwise, significant investment will not take place.
- Access to markets: Because of the small size of the Central American economies, it is critical to secure access to markets by maintaining minimal tariff barriers, particularly through bilateral free trade treaties, given the failure of the Doha round.
- Adequate supply of exportable goods: To be competitive, Central America's supply of exports needs to meet the desired characteristics in terms of price and quality demanded by foreign markets. In this regard, improving productivity levels is essential. The basic ingredients for productivity improvement lie in the areas of the quality of human capital and education, the availability of adequate innovation and knowledge transfer, and adequate access to export financing.
- Effective logistics and infrastructure to prevent logistics costs from becoming an obstacle for productivity and competitiveness. The two major sources of logistics costs for Central American countries are infrastructure (hardware) and associated services, (software), particularly those related to trade logistics, transport, and energy.
- Mainstreaming SMEs (which are the majority of firms in Central American countries) into the value and export chain.
- A secure environment to foster investment, with controlled crime and a low incidence of violence; otherwise the additional costs to provide needed security eat away at competitiveness.
- An overall investment climate conducive to doing business and reducing transaction costs and unnecessary regulations.
- An adequate set of institutions and programs (governance) to provide leadership and coherent support to ensure that the factors mentioned above are in place.

To increase their chances of success, Central American countries need to reach a minimum level of development in each of these areas. Free trade agreements that open markets for local producers are unlikely to secure the expected benefits of increased commercial access if they are not complemented by policies and interventions (the so-called complementary agenda) that support the supply of exportable goods, logistics, and infrastructure. Also, without supporting initiatives to mainstream SMEs, the quality of growth and its inclusiveness will be wanting, and inequality can even increase. The lessons from the North American Free Trade Agreement (NAFTA) illustrate the importance of developing a complementary agenda.

Of the listed elements, which ones should Central American countries and donors prioritize in order to promote sustained growth and poverty reduction? A number of studies have evaluated the extent to which these areas have developed in Central American countries in order to identify

the key weaknesses and bottlenecks so as to guide policymakers and help them set priorities. These studies, some of which are regional and some country specific, have focused on identifying the determinants of growth and productivity in Central America and the causes of the region's lackluster performance. The variety of those studies is great and includes surveys of investors, detailed benchmarking data, impact analysis based on both macro and firm-level data, the growth diagnostic methodology, based on market information about prices and return on investments (Hausmann, Rodrik, and Velasco 2005), and value chain analysis.

While there is some slight variance across countries, there is a fair amount of consensus on the identification of factors that are key bottlenecks and that therefore should be priority areas for policy action. The problem areas are practically the same for all Central American countries. Table 4 presents an aggregation of the studies, identified by type, and indicates the bottlenecks and priority areas for most countries in the Central American region.

Overall, and perhaps not surprisingly, most of the studies point to a common set of factors as being responsible for the lackluster performance of Central America in both economic growth and poverty alleviation. As indicated in the introduction, the five critical and priority areas in the region that need to be improved are as follows:

1. Innovation, Knowledge Transfer, and Quality Systems
2. Infrastructure and Logistics
3. Mainstreaming the Activities of Small and Medium Enterprises
4. Education and Human Capital
5. Crime, Violence, and Weak Governance

Table 4: Key Bottlenecks for Growth in Central America: Results from Diagnostics

Analytical Tool	Source	Priority Areas for Policy Action
Surveys	Investment Climate Survey (ICS)	Macroeconomic instability, anticompetitive and informal practices, cost and access to financing, infrastructure, innovation and quality, crime and violence (security)
	Unión Costarricense de Cámaras y Asociaciones del Sector Empresarial Privado (UCCAEP)	Infrastructure (energy and transport, logistics), innovation, security, education, government processes
Benchmarking	Doing Business (World Bank)	Starting a business, getting credit, trading across borders (logistics)
	Global Competitiveness Report (World Economic Forum)	Infrastructure (logistics), innovation, inefficient government processes
Impact Analysis	Productivity Analyses[a]	Inefficient government processes, human capital innovation, investment climate, infrastructure/logistics, crime and violence
Growth Diagnostic	Hausmann/Rodrik/ Velasco (2005) Methodology	Infrastructure, innovation, quality, human capital, micro risks (such as deficiencies in property rights and other institutional factors that weaken governance)
Value Chain Analysis	Value Chain Studies[b]	Infrastructure, quality of goods (innovation)

a. Examples of these studies are Fajnzylber, Guasch, and López (2009), Investment Climate Assessment, World Bank (2007), and Escribano and Guasch (2005).

b. "Value chain analysis involves examining all activities from the concept stage through production, delivery, marketing, and even disposal. As based on Porter's influential work, analysis should also consider support services, such as human resources, that play an important role in the chain. Examination of all aspects of a value chain allows one to see the intersections of private and public policy and the challenges that should be addressed to improve the quality of products and reduce costs." (World Bank, 2009). Some value chain studies includes those by: Foreign Investment Advisory Service (2007), Zúñiga-Arias (2007), and Diaz (2003).

Each of the next five sections deals with these areas in turn. After presenting summary statistics describing actual conditions in Central American countries for each key area, we identify major problems and advance specific recommendations that address these problems. Throughout the discussion, we emphasize the role that donors and the multilateral international institutions can play to work toward bringing about sustainable solutions.

The proposed policy actions include those that need to be handled at the country level as well as those that are best addressed regionally. The issue of improving regional integration, while not treated as a separate theme, is indeed also relevant and is discussed throughout our analysis. For example, customs harmonization to facilitate and reduce the cost of goods transport is an issue that is inherently regional. Likewise, without a regional focus on energy generation and logistics investment (for example, in ports), there is a risk of duplicating investments and missing opportunities to build on potential synergies. In many cases, the relatively small size of the countries in Central America necessitates regional actions to capture economies of scale, but there is a trade-off between the benefits and costs of coordination.

Innovation, Knowledge Transfer, and Quality Systems

There is ample evidence that innovation and knowledge are critical to increasing competitiveness and to the success of an export-led growth strategy—a key element for growth and development in the small, open economies of Central America. Not surprisingly, therefore, the diagnostics studies presented above forcefully argue that Central American governments and donors should maximize efforts to foster an innovation- and knowledge-transfer-friendly environment.[1]

But gains from innovation and knowledge transfer cannot fully materialize without sound national quality systems. A national quality system is defined as the array of public and private entities required to establish and implement standardization, inspection, testing, product and system certification, and accreditation. These quality systems services are necessary to provide evidence that products and services meet requirements imposed by authorities (and by markets where firms desire to penetrate). New products and processes (innovations) often require exact measurements and analyses during the development and production stages. Foreign measuring and testing facilities usually are not feasible because the necessary oversight has to be performed locally. Hence, reliable local quality systems are essential. Furthermore, standards that contain technical specifications for methods or products can smooth technology transfer. In doing so, international standards may be adjusted to fit local or regional needs, a process best undertaken by a competent standards institute.

This section is divided in two parts. The first part discusses the status of innovation in Central America and advances policy recommendations. The second part follows the same methodology for analyzing national quality systems in the region. In both parts, the recommendations include ways to expand opportunities for regional cooperation and increase the role of donors in achieving the desired goals.

Innovation and Knowledge Transfer

We use the term "innovation and knowledge transfer" in the broadest sense, going beyond traditional sources of innovation such as research and development (R&D). Innovation also encompasses technology absorption and the adopting and upgrading of existing products and processes.

1. Using firm-level data from investment climate surveys, Escribano and Guasch (2005a, 2005b) find that, in most countries of Latin America and Asia covered by their study, variables related to innovation, quality, and training are critical determinants of productivity. Easterly and Levine (2001) argue that productivity differences largely explain global income gaps. Lederman and Maloney (2003) examine the relationship between the R&D effort and the development process and find that on average not only the share of GDP dedicated to R&D increases with income per capita, but also that several high-growth small countries (such as Finland, Korea, and Israel) had dramatic take-offs relative to the benchmark, a path that China and India have recently followed. In addition, several studies have estimated economic gains to the firms investing in R&D to be in the range of 25–30 percent, a return far above the average return on capital, which is estimated around 7 percent. Furthermore, if one considers the impact of firms' R&D spending on the economy through knowledge spillovers, the returns to R&D increase several-fold. Lederman and Maloney (2004) in a panel of countries estimate that the social returns to R&D exceed the return to investments in physical capital by a factor of 6 to 10, depending upon the initial level of income per capita. For Mexico, the calculations suggest a social return to R&D above 60 percent.

Table 5: Innovation Indicators in Central America					
2010–2011 Rankings Out of 139 Countries	**Costa Rica**	**El Salvador**	**Guatemala**	**Honduras**	**Nicaragua**
Quality of Scientific Research Institutions	31	133	94	114	126
University/Industry Research Collaboration	28	114	54	91	118
Government Procurement of Advanced Technology Products	55	113	120	89	125
Company Spending on R&D	31	122	65	98	112
Intellectual Property Protection	68	96	121	80	115
Utility Patents[a]	38	90	90	90	90

a. Many countries in the world share the maximum value of this ranking, which equaled 90 in 2009. Thus, a rank of 90 means that 0.0 number of patents per million population were granted in 2009.

Source: World Economic Forum, Global Competitiveness Report 2010–2011.

According to this definition, changes that a firm makes to improve a production process to meet a quality standard would be considered an innovation.

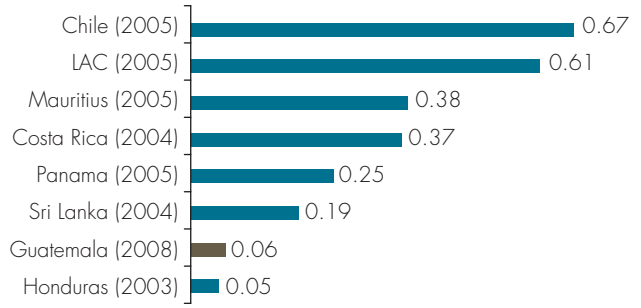
The Status of Innovation in Central America

Central America as a whole underperforms the rest of Latin America on measures of innovation and skills development, albeit with large differences among countries. Costa Rica is ahead of other countries in Central America but still well behind the leaders in Latin America and even farther behind East Asian countries. Indicators on innovation from the World Economic Forum (WEF) show that, with the exception of Costa Rica, Central American countries rank in the bottom half (among the large majority of countries in the world); and in some variables, such as the quality of research institutions, most countries in the region rank in the bottom 10 percent (Table 5). Globally, governments have often taken active measures to promote an environment that facilitates innovation and technology absorption because of the presence of market failures. For example, individual firms often do not reap the full societal benefits of their private investments in innovations. These spillover effects mean that, without some form of incentive, firms invest less in R&D than would be socially optimal. Central America's governments lag significantly in this type of support.

Based on data from 60 countries, Lederman (2007) shows that R&D expenditures tend to be significantly associated with product innovation—i.e., nonpatentable innovation—in developing countries. As shown in Figure 4a, on average, Latin America spends 0.54 percent of GDP on R&D. With the exception of Costa Rica, Central American R&D expenditures are quite low by Latin America's standards. Honduras, Nicaragua, and Guatemala do not exceed 0.06 percent of GDP. This is consistent with the very low percentage of the population dedicated to activities related to R&D in Central America (Figure 4b).

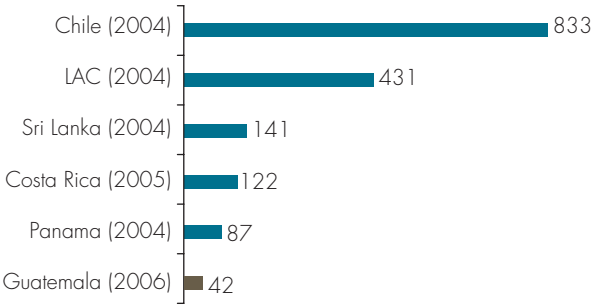
The WEF reached similar conclusions when ranking company spending on R&D (Table 5). Out of 139 countries, the WEF ranked Costa Rica 31st (lower rankings mean higher R&D spending). El Salvador, Nicaragua, and Honduras all ranked close to or above the 100th position. Surprisingly, Guatemala ranked 65th, which somewhat contradicts the low values of R&D spending reported for this country by other sources. There is some evidence that Central American countries' low levels of R&D are consistent with their low income levels (Rodriguez-Clare 2005). This finding suggests that focusing on less sophisticated measures of innovation—such as technology adoption, knowledge transfer, and quality adoption and support—might make more sense in the Central American context.

Figure 4a: Expenditure on R&D as a Percentage of GDP, Latest Year Available



Source: SENACYT (2009) for Guatemala; World Bank, Development Data Platform (2009) for all others.

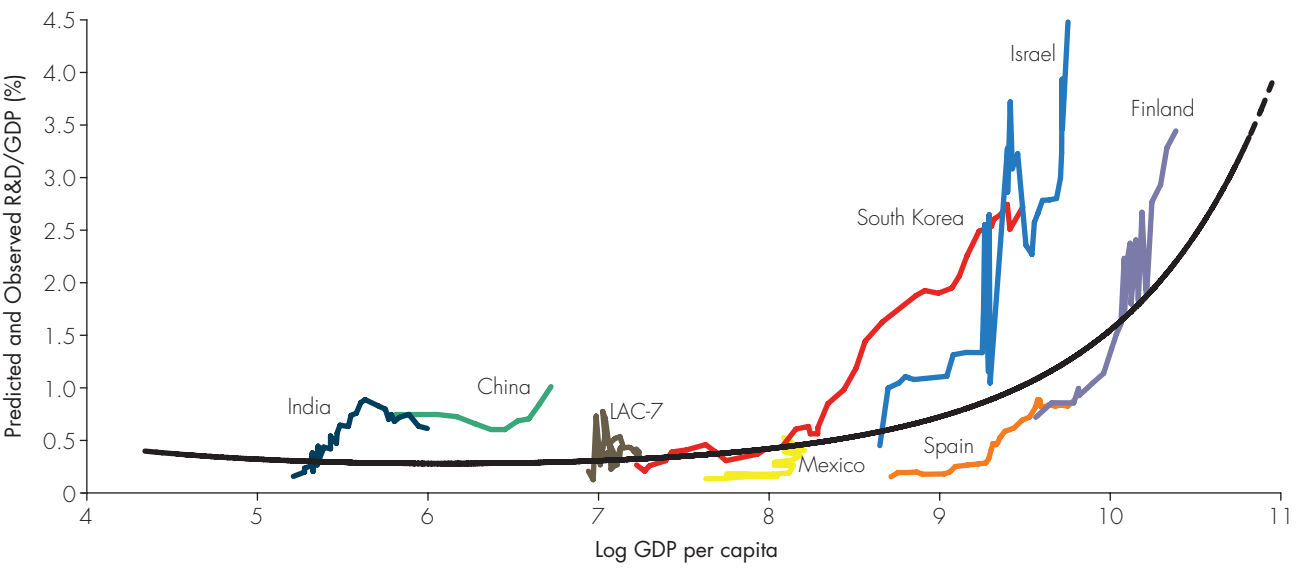
Figure 4b: Researchers in R&D per Million People, Latest Year Available



Source: SENACYT (2008) for Guatemala; World Bank, Development Data Platform (2009) for all others.

Central America's R&D expenditures are even lower than one would expect given the countries' GDP per capita. Statistical results from Lederman and Maloney (2006), presented in Figure 5, show the predicted level of R&D that would correspond to alternative levels of GDP per capita. Although the relationship is not linear, the results (dotted curve) show that higher levels of GDP per capita are associated with higher levels of R&D. Data for Guatemala (taken here as the representative Central American country) fall below the curve. This indicates that Guatemala's GDP per capita is not a central constraint for reaching higher ratios of R&D as a percentage of GDP.

Figure 5: Predicted and Observed R&D Based on GDP per Capita



Source: Lederman and Maloney (2006).

The number of patents granted is often used as an (imperfect) proxy for innovation levels. Table 5 illustrates the severe underperformance of Central America in this area.

A well-functioning national innovation system requires fluid interactions between universities and scientific research institutions (the supply of knowledge) that can generate or adapt knowledge from abroad, as well as firms (the demand for knowledge) that can transform this knowledge into innovative products and processes. When ranking the indicator *University/Industry Research Collaboration*, Table 5 shows that three out of the five Central American countries under study are ranked in the bottom half of the sampled countries. Indeed, interviews with stakeholders in the public and private sectors of Central American countries indicate that linkages between universities/research centers and the private sector are considered to be quite weak and underdeveloped.

In the Central American region, supply and demand for knowledge and innovation tend to be disconnected. Supply emerges from the universities and public research institutions that generate knowledge, and demand comes from private enterprises that use the knowledge to boost productivity and profits. Linkages facilitate the sharing of costs and risks, as well as human resources, between the public and private sectors. They also allow for the transfer of tacit knowledge through personal interactions, research projects, networks, and clusters, or by means of mobility between the public and private sectors. Without such linkages, firms are much less likely to undertake innovation on their own. Successful national innovation systems are characterized by interaction among all players.

Inadequacies in secondary and tertiary education (discussed in Section VII) also hamper the transfer of knowledge to the private sector, as well as technology adoption. Government-sponsored initiatives to facilitate knowledge transfer—such as creating centers for product-specific knowledge transfer and technology transfer offices—can strengthen university-industry linkages. In addition, it is worth considering improving the intellectual property rights regime and the incentives of academic researchers so that they can benefit more from collaborating with the private sector.

Recommendations to Improve Innovation and Knowledge Transfer

Based on the assessment above, we recommend that Central American countries develop a coherent *national innovation system*, focused on five critical components: (1) building appropriate institutions; (2) creating knowledge transfer programs, including creating international linkages and regional cooperation programs;(3) developing specific funding programs for key sectors and for targeting eligible SMEs; (4) supporting knowledge generation programs; and (5) facilitating links between the supply and demand for innovation. As discussed below, development agencies from advanced economies (including the United States), multilateral organizations, and private donors can play an important role in achieving these goals.

Strengthen Institutions

Strong institutions with clear mandates and support at the highest levels, within a *national innovation system*, are critical if Central American countries are to improve productivity, innovation, and technology transfer. Some institutional structures do exist in the Central American countries, but they are relatively weak (not sufficiently coherent and with ambiguous mandates and jurisdiction), underfunded, and not strongly linked to other relevant stakeholders in the economy. To strengthen the system, two central actions are recommended:

Box 1: Institutions for Innovation and Competitiveness: The Case of Chile

In 2007, Chile created the National Council for Innovation for Competitiveness *(Consejo Nacional de Innovación para la Competitividad)*. The council is a consultative body for the president on areas related to innovation, science and technology, the training of specialized human resources, and technology transfer. At its inception, the council was also responsible for proposing a strategy for "innovation for competitiveness" for the next 12 years. The council includes representatives from the private sector, academia, and five ministries (education, finance, agriculture, public works, and economy). "Competitiveness" was included in the title of the council to emphasize that the ultimate goal of innovation is to allow the country to compete in the world economy, rather than just undertake academic research.

The council has been very active in generating and promoting innovation policies. It has already submitted two volumes of the National Innovation Strategy to the president, with the aim of doubling the country's GDP by 2020 through the creation of a knowledge economy. The strategy defined what the public sector should and should not do to promote innovation, with a focus on public-private partnerships. It also established how the government should operate in each strategic area—human capital, science, and business innovation—with the aim of maximizing the potential of the private sector. The strategy also includes specific lines of action and goals, the entities in charge of each action, and measurable indicators to monitor advances. The council also submitted a detailed action plan for the development of eight high-potential clusters. In preparing the strategy, the council undertook a wide variety of consultations with think tanks, academic institutions, and business associations. Through this process, a consensus for the strategy was obtained among the relevant stakeholders.

- ***Assign a top priority to innovation at the highest levels of the government.*** This should include clear signals that innovation is a top priority for the president and relevant ministries. Strong leadership of the national innovation system is crucial, given that coordination across a variety of ministries—e.g., economy, agriculture, energy, and education—as well as with universities and the private sector, is required.
- ***Centralization/coordination of efforts.*** Governments would be well served to coordinate efforts to promote innovation and technology adoption. One useful idea involves channeling all related programs through a single agency with a strong mandate to think strategically. This ensures that programs are part of a coherent plan, rather than a disjointed mix that misses potential opportunities for complementarities between, for example, agriculture and industry.

To improve the coordination of policies within the government and with the private sector, much can be learned from similar experiences in other countries. One example is the case of Chile, whose model was adopted from the Finnish experience (see Box 1).

Facilitate Knowledge Transfer

Given that most firms (particularly SMEs) are operating well below the (domestic) production possibility frontier, the key emphasis should be on transferring knowledge to those firms. Also, given the small size of Central American countries, there are clear advantages for collaboration among countries in the region to identify and secure the needed knowledge. In this regard, **donors and multilateral organizations can sponsor and promote a regional Central** American **public-private Innovation Council to provide counsel, leadership,** and **harmonization of innovation policies and programs across Central American countries and to promote intercountry collaboration among firms, governments, and agencies.**

- ***Implement Centers for Knowledge and Technology Transfer (CITES).*** One very effective instrument to facilitate technology transfer to productive sectors of the economy is through technology innovation centers (a.k.a. centros de innovación tecnológica or CITEs). The aim would be to create new (or upgrade existing) centers to: (a) facilitate the transfer of existing technologies (off-the-shelf) to SMEs in CA; (b) address sector-specific quality issues; (c) identify bottlenecks and opportunities for further innovation of products and processes in different productive sectors; (d) conduct R&D to develop such products and processes; and (e) facilitate the commercialization of new products. The activities above could occur in collaboration with other research centers and existing institutions where appropriate. Technology innovation centers should be sector/industry specific and located geographically where the firms for these sectors are concentrated. They should employ technology brokers who understand available technologies and can facilitate linkages between the supply of knowledge/technology—be it foreign suppliers or local universities or research centers—and SMEs. Technology brokers with the right skills would likely have to be trained because they may not exist in the country. Technology centers could also facilitate the development of matching grant proposals (see below), provide information about markets for SME products and services (both foreign and domestic), and help integrate SMEs into larger value chains. Technology centers would require public support for the first few years of operation, but the aim would be for them to become self-sufficient through user fees or contributions from firms in the sector (See Appendix I for functions and services of CITEs). **Given the challenges of setting up such centers, donors and multilateral organizations could support pilot initiatives that would begin with two or three centers in sectors with a demonstrated demand from the private sector.**
- ***Develop a technology transfer broker (and managers) program.*** Successful commercialization of technology in Central America requires establishing and strengthening linkages between technology developers and those who commercialize the technology. These linkages are generally created by technology brokers. In the broadest sense, these professionals or organizations are intermediaries who carry out the functions of finding technical solutions for users, finding users for new technologies, and sometimes assisting with technology packaging. While technology brokers focus on the creation of new deals, technology managers create links between research centers and companies and help firms manage technology and innovation projects. They both need strong managerial and business training, together with a solid understanding of technology. Public policy that includes programs to train individual technology brokers and technology managers is worth considering. These programs typically provide skills on: (a) portfolio management of R&D projects in an organization/firm; (b) the development of business ideas and strategic visions based on the identification of new technologies; and (c) the creation of linkages among the production sector, the financial sector, and the scientific-technological world.
- ***Implement a technology transfer offices (TTOs) program.*** These programs can help the academic community with intellectual property (IP) management and play an important role as articulators between the knowledge generators and the business community, e.g., by providing consulting services and facilitating technology solutions for firms. While large research universities in the United States and Europe often have their own TTOs, smaller universities have benefited from TTO networks to take advantage of

economies of scale.[2] In Central America, technology transfer activities at universities across the region should be coordinated and services shared to make the provision of such services cost-effective. This is particularly important given the relatively small amount of R&D undertaken and the limited demand for IP management services in each individual country.

Create and Strengthen International Linkages and Regional Cooperation for Knowledge Transfer

Focusing on the discovery, transfer, and adaption of technologies that exist internationally generally makes more sense for firms in Central America (particularly for SMEs) than does investing in cutting-edge R&D. To this end, strong linkages with international institutions are needed. Examples of international institutions include CONACYT in Mexico and Chile, Colciencias in Colombia, and the National Academies in the United States. Linkages with these types of institutions can help Central American countries learn about policies and programs that have been successful elsewhere, and can provide a starting point for connecting with international research centers and experts related to key clusters in Central America.

Central American countries could also benefit from regional cooperation to collect knowledge from abroad and disseminate it to relevant industries. This is particularly relevant because the countries' small size and overlapping challenges make the exploitation of economies of scale highly desirable. Regional cooperation can stimulate not only knowledge transfer but also knowledge generation (discussed below), since in many sectors it is hard for individual small countries to create world-class research capacity on their own. Costa Rica, for example, is well positioned to take a leadership role in collaboration initiatives. One possibility would be to establish a regional organization with a clear mandate. It could begin by focusing on sectors with high cross-country relevance, such as agro-industry, maquilas, and software. The organization would serve as a base of technical knowledge, collecting information from abroad and disseminating it to firms in the region. Other functions could include collaborating with existing knowledge centers in the region and elsewhere, including the INCAE Business School in Costa Rica and the *Escuela Agrícola Panamericana* (better known as Zamorano) in Honduras.

The advantages for regional cooperation in the area of knowledge transfer can be supported by **donors and multilateral organizations in a variety of ways, including: (a) sponsoring the development of regional hubs for the dissemination of technical knowledge; (b) facilitating the development of a network of leading knowledge institutions such as INCAE Business School in Costa Rica, Zamorano in Honduras, FUSADES in El Salvador, and Think Tank in Guatemala, with links to other leading knowledge institutions in Latin America; (c) sponsoring and setting up a regional TTO for the Central America region; (d) sponsoring a network of CITEs or a cluster across Central America; (e) sponsoring a technology brokers training program; and (f) assisting in implementation of an effective IPR regime.**

2. One example is the University Technology Enterprise Network (UTEN) in Portugal. UTEN built an integrated national system of technology transfer offices to support all the country's research universities. The initiative was launched by the Ministry for Higher Education and Science as part of a broader strategy to increase the quality and research orientation of the universities through strategic alliances with prestigious research groups in leading global universities and research centers, especially in the United States. Alliances are being built inter alia with Harvard, Carnegie Mellon, and the University of Texas, Austin. The UTEN component draws on the expertise in technology commercialization at the University of Texas, Austin, and the Austin Technology Incubator and IC2. The strategy includes upgrading professional skills and exchanging personnel to achieve international connectivity.

Establish a Sector-Specific Matching Funds Program

Sector-specific funds, if properly designed, hold promise for facilitating both knowledge transfer and knowledge generation. Central American countries should consider implementing them in matching grant schemes.

In particular, we recommend that countries implement a Fondo ProSME, similar to what exists in Costa Rica. Countries could, however, improve upon the Costa Rican model. Costa Rica's fund includes a matching funds program, but suffers from some deficiencies such as ineffective targeting and lack of incentives for promoting associations between firms and knowledge centers.

To be successful, a matching grant program needs to have the following characteristics:

- Focus explicitly on innovation that furthers competitiveness. Matching grant applications should require that proposed R&D, innovations, or technology transfer activities that are to be financed have a tangible application.
- Greatly increase publicity and advertising efforts to reach a wide range of qualified applicants to the program.
- Create a technical assistance unit that can help firms develop proposals, guiding them through each step of the process. Technology and research centers and technology brokers can be enlisted to help SMEs develop proposals. These entities can also help build linkages between SMEs and researchers for joint proposals.
- Dedicate part of the matching grants funds to activities that help make projects more attractive to seed and venture capitalists.
- Create a monitoring and evaluation system to track the success of the matching grant mechanisms.

This recommendation can be enhanced if donors sponsor and facilitate the implementation of a regional venture capital fund and the creation of an angel investor regional network. In addition, donors can sponsor an Impact Evaluation Program for assessing the success of matching grants initiatives.

Promote and Assist in Knowledge Generation

While the critical emphasis of Central American countries should be on knowledge transfer, it is also essential to have a program (albeit small) to assist in and promote the generation of knowledge and the creation of innovative new firms and innovative projects within existing firms. Such programs should start small and evolve gradually. Eventually, they should include the following elements, *inter alia*:

- Incubators
- Seed capital and venture capital, and angel investor networks
- Matching grant programs for R&D investment projects
- Tax benefits for R&D investments
- Impact Evaluation Programs.

Investments in innovation and R&D should be clearly driven by private sector investors, given that they usually have stronger incentives and capabilities than governments to assess risk and return. That said, governments can play a role in catalyzing such investments. Central America could learn from the experiences of Chile and Mexico, both of which have government-sponsored venture capital funds. One key to success is combining public money with private funds to ensure discipline in the selection of investments. To stimulate a market for seed and venture capital, the

demand side is just as important as the supply side. In other words, for venture capital to be successful, there must be a critical mass of firms with viable business plans competing for financing. A frequent complaint from early-stage investors is that there is a lack of promising projects to be financed. Government programs can help firms that are in the "pre-investment" stage get to the point where they can attract private capital. This can be done through technical assistance, financing prefeasibility studies and matching grants programs, and other mechanisms.

Donors could support knowledge generation by (a) sponsoring the development of regional hubs for technical innovation (most likely as an additional function of the hubs in charge of disseminating technical knowledge) and (b) sponsoring and facilitating the implementation of regional venture capital funds and the creation of an angel investor regional network. In addition, and quite central when public and donors' funds are involved, donors can sponsor an Impact Evaluation Program to track the early accomplishment of new initiatives and pilot projects and attract private investment.

Linking the Supply of and Demand for Innovation

Linkages facilitate the sharing of costs, risks, and human resources between the public and private sectors. They also allow for the transfer of tacit knowledge through personal interactions, research projects, networks, and clusters, or by means of mobility between the public and private sectors. Without such linkages, firms are much less likely to undertake innovation on their own. Successful national innovation systems are characterized by interaction among all players. In some countries, programs to foster public-private partnerships constitute a significant share of public R&D funding (OECD 2005). In Latin America, a few countries are beginning to test the benefits of such partnerships. In 2004, Chile launched its first consortia program to bridge the gap between public research centers and the productive sector. Mexico and Uruguay are launching similar initiatives.

It is critical that incentives to perform the research be provided by the public research institutions' award processes, their subsidies for the research, and their oversight. The aim should be to leverage public expenditures by requiring as much private cofinancing as possible. Just enough public funding should be supplied to allow each project's private rate of return to exceed its hurdle rate, despite the externalities and spillover effects that limit the private sector's ability to appropriate returns for socially valuable projects.

Donors' involvement in this area could center on supporting the creation of an innovation and entrepreneurship culture in Central America. Mechanisms to achieve this goal include: (a) implementation of a regional training program for staff of the respective National Innovation Systems and (b) establishment of an advisory group at the regional level to support public research institutions' granting of awards and subsidies to private sector research. The creation of an Impact Evaluation Program, proposed above, could also serve well in supporting public sector efforts in this area.

Quality Systems

As discussed above, national systems for measuring and certifying product quality are critical for trade, innovation, and competitiveness. The services provided by the quality system institutions help boost the private sector's competitiveness and facilitate exports. Standards embody technology, and they can act as a channel for technology transfer for firms that adopt them.[3]

In the case of Central American countries, two of the most importance reasons for achieving sound quality systems are:

- Recent trade agreements, including DR-CAFTA, which give Central American countries increased opportunities to sell their products around the world. Exports must meet consumer expectations, of course. Just as important, they must fulfill target markets' increasingly stringent legal, health, safety, and environmental requirements. Deficits in quality systems can constitute technical barriers to trade, an issue that is gaining importance as DR-CAFTA eliminates formal barriers. Similarly, domestic consumers are becoming increasingly quality conscious, meaning that Central American firms must compete with high-quality imports to maintain local market share.
- SMEs can meet international quality standards only if they have local access to competent, integrated, and recognized quality infrastructure (QI). Important features include: access to national, regional, and international standards and technical regulations; participation in related international working groups; internationally recognized calibration of measuring instruments; internationally recognized testing; and the certification of products and quality management systems. Quality certification is often the entry point of SMEs into innovation and knowledge acquisition. Additionally, quality management systems must be introduced to SMEs, especially those not directly linked to multinational activities or companies. As a rule, these interlocking services are provided by a nationally organized, yet internationally integrated, QI.

Overall, the Central American countries' quality systems are highly underdeveloped, with limited capacity for issuing and monitoring standards and for supporting calibration, metrology, and quality certification. The low recognition of accreditation institutions is also a significant issue. As a result, very few firms have quality and standards certifications, which are critical for penetrating export markets. As an indication, Central America scores quite low on International Organization for Standardization (ISO) 9001:2000 quality certifications. The scores in the region are the lowest among a group of other small developing countries. Specifically, Guatemala had only 10 ISO certifications per US$ billion industry value added in 2006, Honduras had 14, and El Salvador had 22. This is in sharp contrast to Chile, which had 55.

In addition, Central America's widespread lack of coordination between competent authorities and

Table 6. ISO 9001: 2000 Certifications per US$ Billon

Guatemala	10
Honduras	14
El Salvador	22
Panama	28
Costa Rica	39
Bolivia	43
Sri Lanka	51
Chile	55
Mauritius	155

Source: ISO (2007) and World Bank (2009), Development Data Platform.

3. For more information on the importance of quality system, see Guasch et al. (2007).

quality systems establishments frequently creates institutional conflicts that, in turn, lead to user uncertainty and less interest from the private sector. It also encourages the growth of informal services, which lack such features as traceability of measurements and harmonization of regulations, and which also exhibit an inefficient duplication of quality systems activities.

Recommendations to Improve Quality Systems in Central America

Central American governments and their donors should be cognizant of the importance of quality systems and try to enhance their development. They should create the relevant legal and institutional conditions and consider making the necessary resources available to set up quality systems. Countries should also involve their national institutions in regional and international bodies, such as the Pan American Standards Commission (COPANT); the ISO, and the International Electrotechnical Commission (ISO/IEC); the Society for Information Management (SIM); the International Bureau of Weights and Measures (BIPM); the InterAmerican Accreditation Cooperation (IAAC); and the International Laboratory Accreditation Cooperation and the International Accreditation Forum (ILAC/IAF).

Attention should be paid to the basic development of all quality systems components, in terms of identifying whether key industries have access to the following: (a) relevant standards, (b) accredited organizations that can award quality certifications, and (c) entities that can calibrate specialized equipment, among others. Individual quality systems components are highly interrelated and can be provided by a mix of public and private entities. Increasing competitiveness requires the availability and application of standards. Accreditation is based on solid quality management and reliable measurements. Product certification demands reliable lab testing. Therefore, a key development goal should be a functioning, basic quality system that is complete and relevant for sectors with the greatest demand. Complete, basic systems are preferable to highly developed, isolated solutions that are not integrated in a whole and thus have limited economic impact. Moreover, systems should be tailored to the needs of specific sectors, with an eye toward providing services in areas with high concentrations of producers.

To sustain integrated quality systems, a critical mass of demand for quality services is necessary. Yet, such a critical mass can be difficult to obtain, especially in small, less-developed economies. Regional cooperation can reduce the need for services in each country. An approach that includes not only harmonization but also sharing resources and quality services providers could help reach a critical mass. A promising example is the Foro Centroamericano de Acreditación (FOCA). Another possibility could be in the field of metrology. Each national metrology institute could provide measurement services for things that require lower accuracy, which would mean that lab conditions are less expensive. At the same time, one national metrology institute in the region could house more sophisticated equipment and apply regional standards with internationally recognized traceability.

In this regard, there are a number of interventions form the donor community that can significantly enhance the quality of infrastructure in Central America. The public good nature of many components of a quality system makes them highly appropriate for donor support. **Some of the measures that represent fertile ground for donors' support include:**

- Facilitating the implementation of a regional Central American Metrology Center
- Supporting and strengthening, through technical assistance, the Foro Centroamericano de Acreditación
- Facilitating the integration of all of the accreditation bodies in the region as full IAAC members
- Providing assistance to develop a comprehensive and standardized system, to be used by competent authorities, for assessing food safety, consumer protection, health, environmental and natural resources management, and security
- Facilitating the compilation of information on standards and technical regulations required by major trading partners (EU and USA) so that interested firms have easy access to such knowledge. Providing support to harmonize regional standardization and technical regulations, as required for the "Union Aduanera"
- Provide financing and technical assistance for SMEs as incentives for the adoption of quality standards and certification by these firms.

Infrastructure and Logistics

The lack of adequate physical infrastructure, including reliable energy supplies and an effective transport network with associated logistics services, remains a key constraint for sustained growth and poverty alleviation in Central American countries. Poor infrastructure harms productivity and overall competitiveness. Infrastructure comes out as an important constraint in the ICS surveys, the Decalogo Empresarial, and the Global Competitiveness Index. Poor infrastructure associated with roads, ports, electricity, and telecommunications is particularly damaging to firms. The similarity of results between the hard data and opinions of business executives on the quality of infrastructure points to this factor as a major binding constraint on economic growth.

That infrastructure matters for development is no longer questioned. A plethora of studies have shown its impact on growth, productivity, competitiveness, and poverty alleviation (i.e., Canning 1998; Reinikka and Svensson 1999; World Bank 2004; Calderon, Easterly, and Serven 2003a,b; Andres et al. 2009). Moreover, concerning trade, the impact on growth of a trade expansion is estimated to be much lower in countries with poor infrastructure than in countries with good-quality infrastructure.[4]

The Status of Infrastructure and Logistics in Central America

Despite its critical importance, Central America's infrastructure remains wanting, if not deficient. Despite some advances in the stock and quality of infrastructure during the last two decades, the infrastructure needed (in terms of coverage, quality, and reliability) to support high sustained growth and poverty reduction in Central America is substantial. Further, the inadequate supply of infrastructure services (particularly in the transport and energy sectors) is perceived to be one of the top productivity bottlenecks and a major challenge for doing business. While the status of Central America's infrastructure was comparable to if not higher than East Asia's in the 1970s, by 2010, East Asia's quality and quantity of infrastructure had surpassed Central America's. Developments in infrastructure are among the factors that have contributed to East Asian's growth in the last three decades. Indeed, from 1970 to 2010, East Asian output grew 250 percent more than that of the Central America region.

Central American highway coverage is quite low, reaching only 0.20 highway kilometers/km2. It is estimated that between 30 and 40 percent of municipal roads are in poor condition, and several public services at the municipal level are insufficient and inefficient. In addition, in most Central American countries potable water coverage is below 80 percent and sewerage coverage below 60 percent.[5]

In the energy sector, in the short run, Central America urgently needs to increase its effective electrical generation capacity and security margins. High energy costs (and unreliable supply) are

4. Calderon and Poggio (2010).

5. "Coverage" refers to the percentage of the population with access to the service (water or sewerage).

common complaints by Central American businesses and a constraint on firms' competitiveness. The erratic supply of fuel has led to price manipulation and queues at gas stations and has increased the cost of manufactured products. To a large extent, high energy costs (particularly in electricity) are explained by: (a) the current energy matrix, which relies heavily on bunkers, and (b) inefficiencies in the institutional and regulatory frameworks of several countries that negatively affect the financial sustainability of power utilities and their operations. While efforts to integrate the distribution of electricity in the region are laudable, the solution rests on each country bolstering its supply capabilities. A regional integrated network could be useful as a backup in the case of a crisis in an individual country. However, since no country enjoys a significant energy surplus, an integrated network cannot be the solution to the problem of an unreliable supply of electricity.

Central America's coverage of mobile phones, fixed telephone lines, and internet services is also rather low given the region's income levels. Finally, in the medium term, ports and airports are also needed to increase the capacity of Central American countries to provide services.

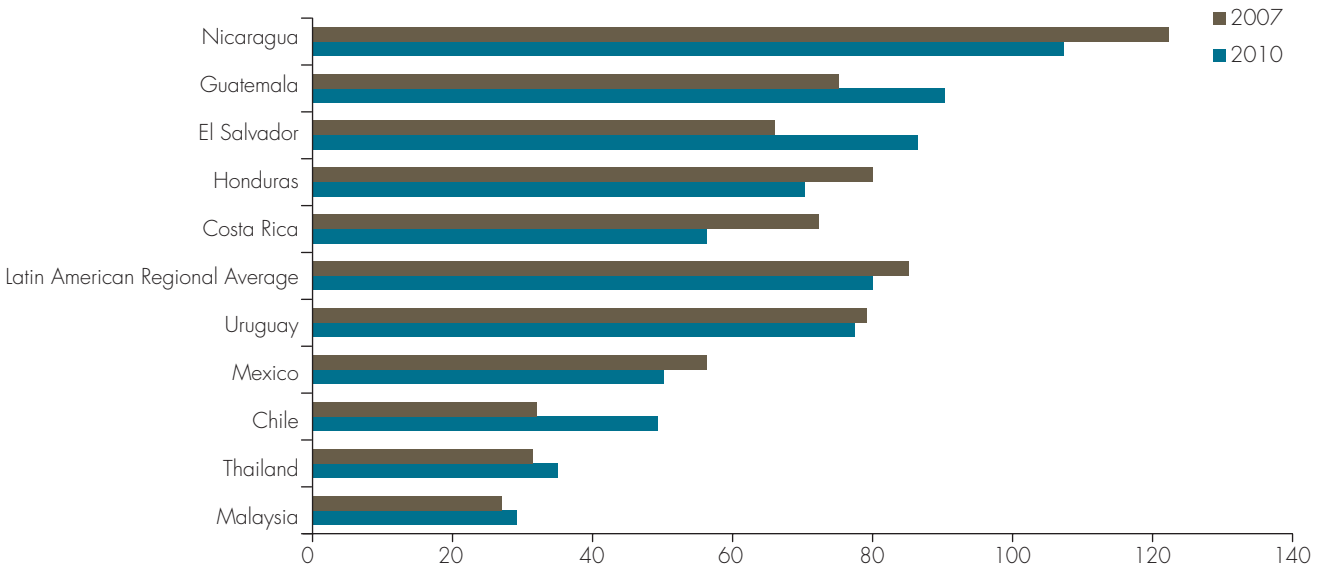
Central American countries' infrastructure predicament is captured by the World Economic Forum's rankings. Table 7 shows the relative position of the quality of Central America's infrastructure services in a sample of 139 countries. Information on a sample of East Asian countries is also included in the table. On average, Central American countries rank 79 in the quality of their infrastructure. Among the various kinds of infrastructure services, railroads, ports, and electricity show the most acute weaknesses relative to other countries in the world. In comparison to East Asian countries, railroads, roads, and ports lag the most among different types of physical infrastructure (WEF 2010). These gaps in infrastructure services increase production and trade costs, adversely affecting Central America's growth potential and competitiveness.

Table 7: Infrastructure (Rank)

	Quality of overall infrastructure	Quality of roads	Quality of railroad infrastructure	Quality of port infrastructure	Quality of electricity supply	Mobile telephone subscriptions
Central America						
Costa Rica	77	111	100	132	43	119
El Salvador	44	29	110	71	86	31
Guatemala	50	61	114	57	61	30
Honduras	82	82	105	32	82	54
Nicaragua	114	95	n.d.	126	113	110
Average	73	76	107	84	77	69
East Asia						
Korea	12	14	10	25	19	62
Singapore	3	1	6	2	9	17
Malaysia	27	21	20	19	40	47
Thailand	46	36	57	43	42	32
Average	22	18	23	22	28	40

Source: Competitiveness Report 2010–2011, WEF.
Rankings Out of 139 Countries.

Figure 6: LPI Rank 2007 and 2010



Source: WDI and SEDLAC.

The main cause of Central American countries' deficiencies in infrastructure is the low investment undertaken by them during the last three decades. Annually, investment in infrastructure has remained below 2 percent of GDP. This compares with an investment of 5.8 percent of GDP in Chile and more than 6 percent of GDP in most East Asian countries (and 12 percent in China). Not surprisingly, therefore, in the last 45 years, productivity rates in Central America grew 50 percent less than in Chile and 75 percent less than in South Korea, Ireland, and Singapore; all of which, along with implementing structural reforms, adopted an aggressive infrastructure investment strategy. The costs of such low productivity growth in Central America are also reflected in the countries' growth in income per capita. While in the 1960s income per capita in Central America was about one-fourth of that in the United States, as of 2008 it had fallen to one-fifth (IDB 2010).

Logistics costs in Central American countries are also extremely high, ranging from 15 to 50 percent of a product's value (and almost twice as large for small firms). By contrast, Organisation for Economic Co-operation and Development (OECD) benchmarks hover around 8 percent. High logistics costs hamper Central American countries' competitiveness and export performance (Guasch 2006; Jordan et al. 2009). Indeed, according to the World Bank's comprehensive Logistics Performance Index (LPI) and the results of a number of value chain analyses in Central America, the region is performing quite poorly. Figure 6 shows that in 2010 Central American countries ranked between 56 and 107 out of a total of 155 countries.

The low position of Central American countries in the LPI can be explained by a number of factors. Performance was poor on border management and international shipping. Customs and border management are weakest at border crossings, and there is a lack of coordination among government agencies (customs control, narcotics, and agricultural/public health control) that leads to duplicated efforts. Surface transportation is another area of concern, particularly because of the high costs of crime and violence. The quality of road infrastructure is also low, mostly because of inconsistent maintenance. The ports are a major access point for international trade, but many are unable to accommodate large vessels. Last, insufficient infrastructure and policies to support

SMEs prevent their participation in global supply chains. Table 8 (taken from Barbero 2010) summarizes the major problems in logistics performance in Central American countries. Linked to all these problems, and a key source of concern, are the high spoilage rates, particularly of perishable products, which reach over 30 percent. This has a very strong financial impact, particularly on small producers.

Weaknesses in transportation and logistics have been a recurring theme cited in numerous diagnostics studies of obstacles to trade and economic growth in Central America. Particularly burdensome are the deficient trade corridors from the agro-industry products markets and borders/ports, as well as the lack of effective associated logistics services (the software of logistics). Given the key role of international trade in these economies, routes in and out of the countries are critical to improving competitiveness. The availability and efficiency of complementary services, such as warehousing, cold chain, silos networks, scale consolidation, licensing services, and border-crossing procedures, remain questionable, adding to logistics costs, high spoilage rates, and hampered competitiveness.

In light of the discussion above, it is not surprising that formal barriers to international trade (such as tariffs and quotas) in Central America are small when compared to the costs imposed on the production and movement of goods by physical and logistics bottlenecks. Indeed, studies on the share of logistics costs in the final price of delivered goods reveal that these costs represent a greater barrier to trade than import tariffs, especially in light of Central America's free trade and preferential agreements (World Bank 2010). For example, the World Bank[6] has estimated that on average ad valorem tariffs for food imports decreased from 2005 to 2008 in the Latin America and Caribbean region, and currently range from 3 to 12 percent of product value. On the other hand, transport and logistics costs, measured by the international maritime and road haulage components alone, total about 20 percent of the freight -on-board (FOB) value of goods. By the time other logistics costs such as handling, storage, and distribution are accounted for, costs can add up to more than 50 percent of the final price of a good. Additionally, studies at the country level have also highlighted the impact of logistics costs on trade. The World Bank calculates that a 10 percent reduction

Table 8: Assessment of Main Factors Affecting Logistic Performance

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Roads and Highways	poor	fair	poor	poor	poor
Ports	poor	fair	fair	fair	deficient
Airports	acceptable	good	acceptable	acceptable	fair
Border-Crossing Facilities	fair	fair	fair	fair	poor
International Transport and Multimodalism	acceptable	acceptable	acceptable	acceptable	acceptable
Domestic and Regional Transport Services	poor	poor	poor	poor	poor
Firms' Supply-Chain Organization	acceptable	acceptable	acceptable	acceptable	acceptable
Logistics Operators and Agents	acceptable	good	acceptable	good	acceptable
Border Management	acceptable	fair	acceptable	fair	poor
Surface Freight Security	poor	poor	poor	poor	poor

Source: Barbero 2010.

6. The World Bank (2009). Schwartz et al. ***Logistics, Transport,*** *and Food Prices in LAC: Policy Guidance for Improving Efficiency and Reducing Cost;* See also Blyde, J.S., M. Moreira, and M. Volpe (2008); Hummels, D. (2001); and Baier, S., and J. Bergstrand (2001).

in transport costs would increase trade by 3.6 percent in Uruguay, 5.5 percent in Brazil, 3.3 percent in Argentina, and 3.9 percent (on average) in Central America.[7] It is noteworthy that Latin America as a whole (and not only Central America) fares poorly by comparison with industrialized countries. On average, logistics costs in Latin America (including the Central America region) are estimated at about 24 percent of gross product value, which is more than double the numbers for the EU, the United States, and Singapore.

Recommendations to Improve Infrastructure/Logistics

Improvements in ports and domestic transport services and associated logistics services (including customs modernization) need to be among the top policy priorities for Central American countries. The poor quality of transportation services and associated logistics services can effectively increase the "real distance" that needs to be covered to deliver goods to export markets, and may be a barrier to increasing both inter-regional trade and trade with the rest of the world. Given its size, Central America's ports and road quality and capacity become a driving factor for logistics efficiency. A strategy to improve infrastructure and reduce logistics costs in the region should, therefore, address inefficiencies and inadequacies in a variety of areas, including ports, transport services, freight security, cold chain, packaging, permits, and customs modernization.

Key policy recommendations include actions at both the country and regional levels. They include:

- ***Increasing investment in infrastructure to at least 4 percent of GDP.*** This is the minimum amount needed to support modest economic growth and begin improving coverage rates and quality (Fay and Yepes 2008). That level should be secured by a combination of public investment and public-private partnerships (PPPs).
- Fostering private sector participation (PPP) in ways that: (a) reduce the financial requirements for the public sector, (b) reduce investment and implementation constraints, (c) improve competition and the contestability of markets, and (d) contribute to overall efficiency. **Donors and multilateral organizations can assist in implementing effective PPP programs in Central American countries through a technical assistance program** that focuses on: (a) implementing the proper institutional framework to guide the entire PPP process, (b) establishing and financing a staff secondment program, where experts from donor countries assist and facilitate the implementation and development of PPP programs in Central American countries, (c) developing model PPP contracts and key clauses that should be common for all Central American countries, and (d) facilitating the implementation of a Central American supranational body to oversee and regulate PPP contracts. Initially, the obligations of the supranational body could be limited to providing advisory services. **In addition, donors and multilateral organizations can provide a comprehensive training program for Central American staff in charge of designing and managing PPP programs.**
- ***Set up public-private logistics councils*** to advocate, lead, and monitor interventions and investments that will help to reduce logistics costs. These councils would also serve as observatory bodies that assess advances in infrastructure, issuing yearly evaluations and

7. The World Bank (2009). Uruguay Trade and Logistics: An Opportunity.

recommendation reports. In addition to the establishment councils at the country level, it would be advisable to set up a regional council for Central America. **It is recommended that donors consider sponsoring the creation and implementation of a regional Central American Logistics Council. Such a council would foster the effective interconnection and integration of logistics in Central America and identify policies and measures that Central American countries need to take in order to advance toward the effective integration of physical infrastructure and the harmonization of procedures that facilitate logistics, especially cross-border procedures.**

- ***Improve the software of logistics,*** particularly customs procedures and trade facilitation, promoting the development of a cold chain, a network of silos and hub markets for consolidation, and efficient pricing and packaging
- ***Institute efficient pricing and subsidy policies*** that: (a) require public utilities to self-finance a part of their investment programs as well as cover operating expenses, interest, and depreciation expenses; (b) target the needs of an area on a holistic basis, especially as it concerns poor urban and rural subareas; and (c) streamline mechanisms for the periodic adjustment of infrastructure prices.
- ***Improve operations and maintenance*** by fully establishing road maintenance funds and using private contractors that are awarded contracts through a public bidding process. This recommendation is critical to preserving the current stock of infrastructure and improving its quality (which, because of significant underinvestment during the last two decades, has deteriorated).
  - *Set priorities for infrastructure investment,* for example, in the road sector, by looking at: (a) the overall investment requirements for meeting growth and competitiveness goals, (b) the implementation and capacity constraints to undertaking the specific investment, (c) the potential role of the private sector, and (d) the availability of financing. Given its relevance, a special focus on the transport sector is needed, particularly in the following areas:
    - *Port operations improvement,* in both the hardware and software of port operations, including port access, warehousing, implementation of a single window for customs, and dedicated lines for inspection.
    - Developing effective logistics zones within port areas, through PPPs.
    - Facilitating the increase of cold chain supply through targeted financial incentives, which should be phased out over a period of time.
    - Implementing a CITEs on packaging, which should be managed by the private sector to address the high rate of losses resulting from deficient packaging (which are in the range of between 15 to 40 percent).
- The other sector in infrastructure that is critical for productivity impact is energy. Addressing the high costs of electricity will require investments in infrastructure to expand power generation (hopefully renewable), but also actions to benefit from the opportunity offered by the Sistema de Interconexión Eléctrica de los Países de América Central (SIEPAC) project, which connects Guatemala with Panama and aims to create a true regional energy market. Donors can play an important role in supporting the movement forward of the SIEPAC initiative to integrate electricity networks throughout Central America.[8] Additional key recommended interventions in the electricity sector are:

8. However, in the energy sector, a caveat is needed on the potential benefits from integration. While integration is highly desirable, it

- *Increase generation capacity through PPPs.*
- *Improve the quality, pricing, cost recovery, and administrative efficiency of energy utilities,* for example, by implementing enhanced customer and load management procedures (such as improved metering, increasing collection rates in order to reduce commercial losses), and reviewing subsidies policy to reduce leakages.
- *Promote regional interconnections* that expand the role of regional institutions in developing and putting in place a framework that would bolster private investors' confidence and ease constraints on each Central American country's public infrastructure investment budget.

In addition to the recommendations above, there are two important contributions donors can make to promote regional integration:

1. Finance and implement a program to improve and harmonize customs and inspection procedures for all Central American countries. Procedures that need to be harmonized include best practices in single windows, dedicated lines, profiling customers, and performing informed random inspections. The goal would be to move toward a single bill of lading that would be valid for all Central American countries.
2. Through financial support and technical assistance, facilitate the interconnection and integration of physical infrastructure across Central American countries. Promote and facilitate the creation of a Central American regional infrastructure investment fund to facilitate financing of PPP projects, particularly those focused on Central American integration (as the United States did with the Integración de la Infraestructura Regional Suramericana [IIRSA] program).

must be recognized that Central America is not likely to observe a significant increase in intraregional power trade unless significant policy actions are implemented on the political, institutional, regulatory, and physical capacity fronts. Also, since no country has a significant energy capacity surplus, regional integration ought to be considered as insurance against crisis situations in individual countries rather than as a solution to the region's reliability and capacity issues.

Mainstreaming SMEs

Low Productivity of SMEs in Central America

In Central America, SMEs provide the vast majority of employment. Estimates for 2009 indicate that SMEs contributed 30 to 50 percent of GDP and 75 to 90 percent of employment. This is because the large majority of SMEs operate in labor-intensive industries. The *State of the Region* (2008) report (produced by Costa Rica's think tank, Estado de la Nación) estimated that 80 percent of employment is accounted for by firms with fewer than 20 employees. Yet most SMEs operate far below the domestic possibility frontier in terms of productivity and are not plugged into the economy's value and export chain.

SMEs in Central America face several challenges. They are less productive and less able to compete in external markets than larger firms. They typically do not reach economies of scale alone, and they **often lack the networks with larger firms, brokers, and other actors that would allow them to reach new markets efficiently.** Information for developed countries indicates that, without adequate support systems, between 40 and 50 percent of SMEs fail in the first 3 years. Although there are no comparable data for Central American countries, there is no reason to expect that the failure rate is lower in these countries (and, indeed, one would expect the ratio to be higher because of overall institutional deficiencies in Central America). The need for adequate systems and programs to support SMEs' activities is justified by a number of factors, including:

- Poor management skills and workplace practices
- Lack of information on market opportunities
- Difficulty in accessing affordable, reliable financial services
- Problems obtaining quality inputs at competitive prices
- Lack of information and access to innovative technologies and certification services, which makes it difficult to meet international quality standards (Hallberg and Konoshi 2003)

Improving the performance of SMEs and increasing their participation in local and global markets can have enormous and positive consequences for the entire economy. For example, measures that increase productivity, lower logistics costs, and stimulate access to existing knowledge and new technology can all generate employment, raise incomes, and reduce inequality and poverty. **Thus, it is critical to mainstream SMEs into the value and export chain.**

Mainstreaming SMEs: Solutions

The following policy actions and activities are recommended to mainstream SMEs into the value added and export chain:

- ***Establish Centers for Knowledge and Technology Transfer*** that are geographically (in situ support) and thematically (product) targeted. This recommendation has already been advanced in Section IV of this document. CITEs have proven quite effective in a number of countries, including Spain (the pioneer), Peru, and Colombia. In the countries where this recommendation has been implemented, the range of services offered has been shaped by the specific needs of the producers, and the services offered are evolving along with the sector. CITEs are private-public undertakings managed by the private sector, but with initial seed money from governments to help set them up. Operating costs are covered by users' fees. In addition to the recommendations for donors' interventions advanced in Section IV, we propose that **donors could implement a program to finance and staff the managing positions of selected CITEs for Central American countries (similar to the U.S. Treasury program to assign experts on secondment for PPP assistance).**
- ***Establish Articulation Programs,*** to bring scale, quality focus, and linkages (and often financing) with intermediary producers. These programs can have an extraordinary impact on micro-enterprises and SMEs. For example, in the context of this type of program, in Peru, 67,000 small producers (located mainly in the country's highlands) were articulated within 24 months. Producers in this program increased their sales by US$65 million and exported over 50 percent of their products (tripling their earnings). The profile of the involved firms indicates that they were small and micro-enterprises, and that the following sectors were represented: farming (about 1-hectare holdings), animal husbandry (meat, cheeses, and fibers), art crafts, fishing, timber, tourism, and mining. Another example is the articulation of 111 small producers of organic bananas in Tongorrape, in Lambayeque, Peru (specifically, The Association of Small Producers of Tongorrape [APPT]). Results from this articulation program include: exporting a container with 18 tons of bananas per week to South Korea, securing an organic certification for exporting to South Korea, and acquiring the knowledge required to subject the bananas to a special treatment in the cold chain, which involved everything from packing them to delivering them to their final destination (a month-long process).[9]
- Donors and multilateral organizations can assist in the financing and implementing of effective articulation programs in Central America. There are a number of precedents (such as the Poverty Reduction and Alleviation [PRA] project in the Andean countries, which was financed and implemented with USAID) that were a significant success. Similar programs could be implemented in the Central American countries.
- ***Establish consortia and supplier programs*** to link SMEs with larger firms in the respective sectors where SMEs operate to address common problems and provide solutions. **In this regard, donors could facilitate the linkages of SMEs in Central America with large companies from donors' countries.**

9. Another successful case in Peru is the case of white moss. White moss grows above 3,900 meters (retains humidity and is antibacteria naturally) and is used in gardening flower beds and filters for pool waters. Peruvian white moss is exported to Japan, Korea, Taiwan, and the United States by INKA MOSS and involves more than 250 small producers in communities Toldocampo, Curimarca, Carrizales, Chuquisunga, Tambilo, Comas, Macon, Palca, and Puno. In 3 years exports have reached 92 tons per annum (US$280,000). Small producers sell the white moss to the intermediary firm INKA MOSS, which dries the product up and selects and packs it in 5-kilo packages at US$8 export price. INKA MOSS provides in situ assistance to small producers.

- ***Implement innovative programs to facilitate access to financial services.*** One example is the implementation of a *reverse factoring program* in Mexico. For example, under the Nacional Financiera (NAFIN) program, a second-tier development bank created a website (portal) where large firms provide information on the requirements that SMEs need to meet to be considered their suppliers. SMEs that meet the requirements are listed by large firms as their suppliers on the website. This has facilitated the integration of SMEs into the value chain and, most important, it has increased SMEs' access to credit from financial institutions.
- ***Implement an "Easy Export" (Exporta Facil) Program.*** This program allows for the export of goods by mail in an easy and friendly manner, eliminates most of the common logistics problems, and is focused on micro and small enterprises. The program has been highly successful in the countries where it has been implemented. One of the major advantages of the program is that it has expanded the benefits of trade liberalization to micro and small enterprises. The case of Peru serves as an illustration. The program in Peru allows exporting by post from any part of the country and avoids all intermediation and logistics costs, including dealing with customs agents. All that is needed is to file a one-page form that is available on the internet. There are limitations in terms of both value (limited to around US$5,000) and weight (limited to between 30 and 50 kilograms), but it allows an unlimited number of mailings, and insurance is also available. The impact has been outstanding. For example, within 3 years of the program beginning in Peru, 2,000 firms have become exporters, and most of them are micro-enterprises and SMEs. Indeed, 40 percent of exports have come from the provinces and 60 percent from the greater metropolitan area of the capital. Further, through this program, 50 new products have been exported and Peruvian products have reached an additional 20 new countries. Additionally, the program has contributed about US$1 million per year in exports. **An important role that donors and multilateral organizations can play in this area is to provide technical assistance to Central America's post offices so that they can implement a standardized Easy Export program in all Central American countries.**

Another role for donors is to assist in the internationalization of SMEs by strengthening institutions. An example of a program that furthers this end is the EU Al-Invest IV Program, which in Peru is implemented through the Chamber of Commerce of Lima, the National Chamber of Commerce, and the Industry National Society.[10]

10. EU Al-Invest IV program is a European Commission initiative to support the internationalization of Latin American SMEs.

Education and Human Capital

The extent and effectiveness of education and human capital are a source of concern for Central American countries; they are a critical bottleneck to securing a sustained path of economic growth and poverty alleviation, and are essential for moving up the value added chain. A sound education system is a key element in allowing the vast majority of the population to take advantage of economic opportunities. Moreover, the availability of skilled workers is an important factor in a country's capacity to undertake research, adopt foreign technologies, and induce significant productivity gains. De Ferranti et al. (2003) find that upgrading workers' skills and increasing technology transfer reinforce each other. Innovation raises the demand for skilled workers, and the improved job and earnings prospects increase students' incentives to stay in school. In turn, a better educated workforce can further stimulate firms' demands for new technologies. Some countries may enter a virtuous cycle of upgrading both technology and workers' skills, resulting in higher productivity and growth rates.

In contrast, countries where the overall skill level of the workforce is low, as is the case for Central American countries, may not be able to absorb much technology through trade and may not attract much foreign direct investment (FDI). These countries may also be unable to upgrade their level of technology through domestic R&D, another skill-intensive process. Therefore, countries with very low skill levels may be trapped in a vicious cycle of little technology transfer, insignificant domestic innovation, low returns to education, low productivity, and stagnant growth prospects.[11] Adequate levels of secondary schooling and tertiary education are crucial to breaking out of this cycle.[12] Consistent with this argument, Rodriguez-Clare (2005) finds a strong positive correlation between R&D spending and education levels.

Adequate levels of human capital[13] are crucial for adapting to new circumstances in a changing world. Overall, skilled workers can adapt to change and learn new skills faster than uneducated workers. Companies need workers who are willing to update their skills and who are capable of continuing to learn throughout their working lives. However, low levels of education are frequently pointed out as a principal obstacle to greater productivity in Latin America (Gill et al. 2005; World Bank 2003; Duryea and Pagés 2002).

Problems in Education Systems in Central America

Overall, human capital is a key factor for the growth and productivity of SMEs. Studies in Central America estimate that an increase of 1 percent in the average number of years of schooling would increase productivity by about 0.33 percent.[14] Furthermore, education/human capital has been identified as one of the main constraints to growth in Central American countries (see Stein

11. De Ferranti et al. (2003).

12. Jaramillo and Lederman (2006).

13. Human capital can be defined as the mix of innate skills and abilities of people, as well as the skills and learning that they acquire through education and training (OECD 2007).

14. Loening (2005).

2008 and Table 4 above). Despite some advances, the conclusion is that the educational systems in Central America have not been able to meet the challenges posed by the knowledge-based global economy.

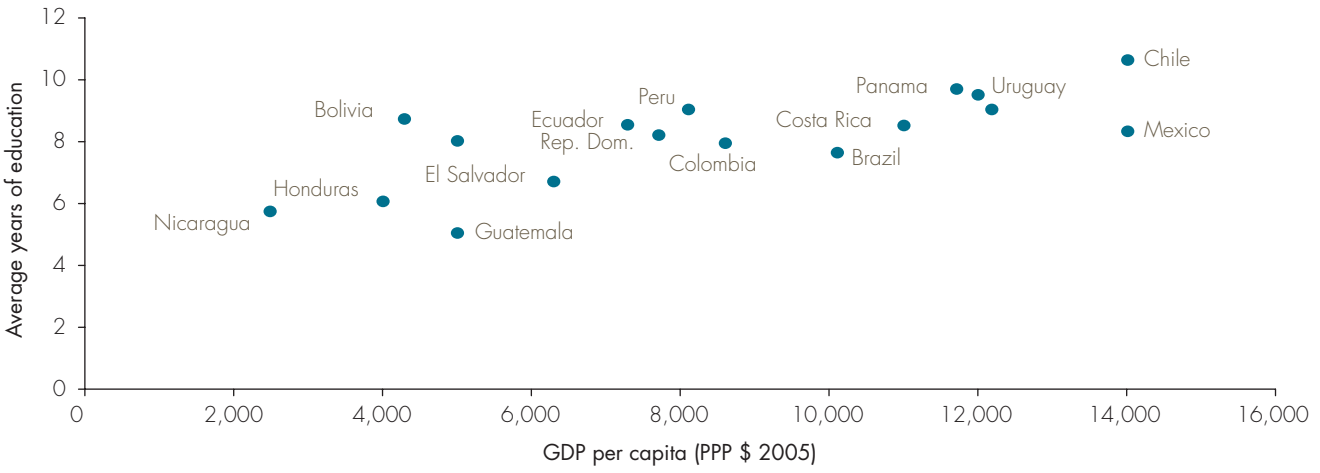
Indeed, Central American countries perform poorly in the area of education. Even though the average number of years of schooling has increased in recent years, Central America is still more than 2 years below the world average and the quality is wanting. As shown in Figure 7, Central America's average years of schooling is also significantly below that of other Latin American countries. This is particularly striking in the cases of Guatemala, Nicaragua, and Honduras. Available information also indicates that the average number of years of schooling in Central America lags significantly behind the average of East Asian countries.[15]

At the level of primary education, net enrollment rates are high, but with the exception of Costa Rica, the quality of primary education remains very low. As shown in Table 9, most countries get a score below 3 in an indicator that goes from 1 to 7, where a higher value denotes a higher quality of primary education. Guatemala and Nicaragua get the lowest scores among the Central American countries. These two countries also show the lowest completion rates of primary education.

In spite of the high enrollment rates in primary school education, the low quality of education at this level is a big impediment for children to continue on to higher grade levels. Indeed, as shown in Figure 8, secondary enrollment rates in Central American countries are dismal. Three Central American countries[16] (El Salvador, Guatemala, and Nicaragua) have among the lowest net secondary enrollment ratios (a typical measure of human capital) in the Latin American region, and even Costa Rica, which by regional standards has a high per capita income level, sits in the lower range of the ranking.

But even the worrisome secondary enrollment rates do not reflect the seriousness of the situation. Attrition rates from secondary schooling are atrocious, ranging in most of the countries from

Figure 7: Average Years of Schooling for Population Ages 25–65 (2005/2007)



Source: WDI and SEDLAC.

15. PREAL-CIEN (2008).

16. The World Development Indicators do not report net enrollment data for Honduras, but the country is also likely to rank quite low.

Table 9: Assessment of Primary Education			
	Net Enrollment Rates[a] (% of relevant age group)	Quality[b]	Completion Rate[c] (% of relevant age group)
Costa Rica	100.00	4.70	92.87
El Salvador	94.00	2.70	89.73
Guatemala	95.10	2.20	80.01
Honduras	96.60	2.60	89.35
Nicaragua	91.80	2.40	74.54

Source: Unesco (2009), WEF Opinion Survey (2010–2011), WDI (2010).

a. Ratio of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age.

b. Based on responses to the question: "How would you assess the quality of primary schools in your country?" The scores go from 1 to 7; 1 = poor and 7 = excellent

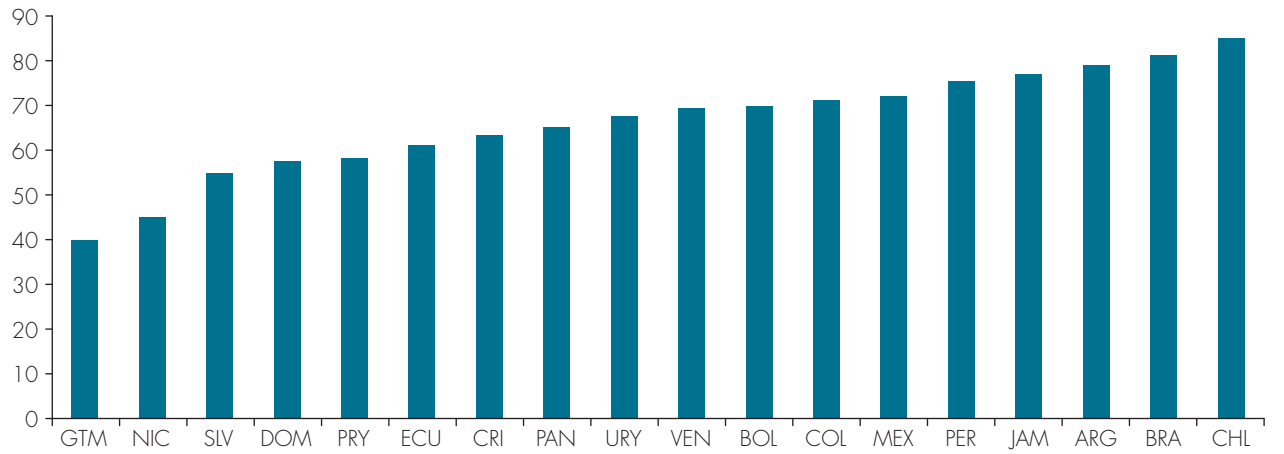
c. Percentage of students completing the last year of primary school. It is calculated by taking the total number of students in the last grade of primary school, minus the number of repeaters in that grade, divided by the total number of children of official graduation age.

30 to 70 percent. A large number of students in Central America do not find enough motivation to finish secondary school given the low quality of education they receive and the high rates of unemployment they will likely face. Failure to complete secondary school is, later, a limitation for these students because it makes them less likely to obtain a university or other higher education degree, further limiting their opportunities in the job market.

Moreover, in Central American countries the supply of secondary and university graduates with skills in science, engineering, and technology is limited. This makes it difficult for all types of firms, but particularly for SMEs, to find workers with the skills necessary to adapt knowledge and new technologies and undertake innovative projects.

As expected, the impact of these deficiencies in schooling is significant. Youth in Central American countries appear to have more access to drugs and other diversions than to opportunities that will allow them to advance their careers, like a good education. This contributes to increased crime, social exclusion, and emigration, as well as to other social and economic problems. Moreover, a

Figure 8: Secondary Enrollment Rates in Latin America



Source: WDI—World Bank 2010.

recent report by the World Bank (2010) and the United Nations (2009–10) shows that secondary school completion is one of the most important preventive investments a country can make for young populations exposed to violent environments like those that exist in Central America. This is because young people who attend and remain enrolled in secondary school acquire skills they can use later in life to improve potential wages; it also gives them options for acquiring income that is not related to illegal activities. Moreover, a good secondary education helps keep young people off the streets by giving them responsibilities. It also connects them to a social process that, if well conducted, can instill values, cooperation, and productivity.

In sum, the three core problems in the area of education in Central American countries are: low quality at all levels, low enrollment rates (mostly at the secondary and tertiary levels), and high attrition rates. All of these problems are also compounded with concerns about the relevance and content of school curricula.

Recommendations for Improving Education Systems and the Quality of Human Capital

Investing in people through education has the potential to deliver high economic and social returns to Central American countries. As mentioned above, policy interventions should focus on achieving three objectives: improving educational quality, increasing enrollment rates, and reducing attrition. The recommendations presented in this section are divided into three categories. In the first category we advance a specific proposal, the implementation of Cash on Delivery (COD) aid (as a complement to other forms of aid), for the purpose of dealing with the severe deficiencies observed in secondary education. The second category advances other recommendations to improve the overall quality of the education system and increase enrollment and graduation rates. The third category focuses on proposals to improve technical education and workers' training.

A Proposal for Implementing Cash on Delivery Aid and Applying It to Secondary Education

Traditional aid for secondary education does not seem to have been very successful in Central America. Even innovative approaches like gang prevention and social programs for at-risk youth, which have been components of the Mérida Initiative and now the Central American Regional Security Initiative (CARSI) initiative, have not kept students in secondary school as desired. It may be that success has not been achieved because foreign approaches are inappropriate to the local context, because the country lacks ownership of the particular policies, or because incentives are not aligned with achieving the objectives. These are problems that are addressed by a new form of aid, called Cash on Delivery Aid (COD Aid). With COD Aid, donors commit to pay for incremental progress toward development outcomes that represent a shared objective. The idea of applying COD Aid to the primary education systems of several countries as a way to help them achieve universal schooling has been analyzed in detail, and is currently being considered by a number of donors. The UK Department for International Development (DFID) is currently incorporating the approach in its education strategies for several African countries. The concept can be applied to different sectors as long as the goals can be defined, measured, and verified.

COD Aid is a funding mechanism that involves a contract between a donor and a recipient country government in which both parties agree on a specific payment for achieving a mutually desired goal (See Box 2 for the key features of COD Aid). The implementation of COD Aid starts when donors and recipients negotiate and sign a contract. Applying COD Aid for secondary

Box 2: The Key Features of COD Aid

COD pays for outcomes and not inputs. These outcomes need to be related to an objective shared by the funder and recipient country. It also needs to be measurable and continuous, so that incremental progress can be awarded over time.

Funders commit to a hands-off approach; they can only verify progress and pay for outcomes. Recipients need to assume full responsibility for the design and strategy that will allow them to achieve the objectives. Recipients may choose to ask for technical assistance from the funding agency or another agency.

An independent third party should verify the progress made. Both parties need to have confidence in the way progress is measured, since progress triggers a COD payment. The independent verification should take the form of a financial and performance audit or an independent survey paid for by the funder.

Transparency increases the credibility and accountability of the arrangement and encourages more social engagement in aspects of progress that are not part of the contract. Therefore, the contract should be straightforward, progress should be simple to measure, and information must be made publicly available.

COD is complementary to other aid programs. The idea of COD Aid is to facilitate the more effective use of available resources. It complements other aid programs without disrupting ongoing programs that provide other kinds of support.

education implies that the donor agree to pay for each additional child (beyond an established baseline) who finishes secondary school and takes a standardized test. Birdsall and Savedoff (2010) suggest 5 years as a minimum contract period in order to give the recipient time to design, develop, evaluate, and adjust the strategy to achieve noticeable progress. Once the contract is signed, the recipient has the responsibility to take actions toward achieving the goal agreed to and to encourage learning by doing without the intervention of the donor. This also allows the country government to focus on where the problem is and to create adequate incentives in the appropriate institutions. After a certain period of time, the recipient measures the outcomes and makes the information public. However, an independent third-party organization would verify the reported gains. Finally, after outcomes are confirmed, the donor pays the agreed-upon amount to the recipient.

By paying for outcomes and allowing donors to adopt a hands-off approach to the implementation of final projects, COD Aid decreases the administrative burden on aid donors and recipients alike. And by emphasizing the comprehensive measurement of a critical development outcome, COD Aid creates a stream of information that can help governments and donors use their resources better. It can also help civil society play a greater role in holding the public sector accountable for services delivery.

In general, COD Aid payments do not need to be related to the costs of service provision, but the amounts should represent incentives that attract the attention of policymakers. Research from Birdsall and Savedoff (2010) suggests that a payment of US$200 for each additional student (above a defined baseline) who takes a competency test in the final year of secondary school would be an appropriate incentive.

Secondary education in Central America has not received much foreign assistance. Table 10 shows amounts and percentages of Official Development Assistance (ODA) assigned to secondary education in Central America. Furthermore, in this sector, the amounts received have not been shown to be effective enough to achieve the desired objectives. COD Aid could attract new funding to this sector as an innovative outcome-focused approach.

As discussed before, in the education sector both access and quality are critical goals that the measured indicator should capture. However, a quality indicator is usually easy to manipulate and

Table 10a: ODA Assigned to Secondary Education: Gross Disbursement in Current Millions of US Dollars				
Countries	**2006**	**2007**	**2008**	**2009**
Costa Rica	0.7	0.7	0.5	0.4
El Salvador	1.8	1.7	10.8	2.3
Guatemala	2.8	2.8	5	7
Honduras	17.6	13.3	5.9	4.8
Nicaragua	8.1	7.3	11.6	17.1

Source: OECD-DAC Creditor Reporting System.

Table 10b: Percentage of ODA Assigned to Secondary Education				
Countries	**2006**	**2007**	**2008**	**2009**
Costa Rica	1.24	0.59	0.45	0.44
El Salvador	0.96	0.77	3.88	0.68
Guatemala	0.54	0.53	0.88	1.65
Honduras	1.12	3.13	1.01	1.06
Nicaragua	0.54	1.14	1.77	1.43

Source: own calculations using OECD-DAC Creditor Reporting System.

hard to verify. We propose to use the indicators suggested by Birdsall and Savedoff (2010) in their example of primary education: The recipient governments would be paid for each "assessed completer." In this case, that would be a child who completes secondary school[17] (*access* indicator) and takes a standardized test of learning (*quality* indicator), regardless of performance on that test. The public dissemination of results would presumably create pressures from the local community for schools to raise their students' scores, thereby strengthening the accountability of the education system to civil society.

In this context, in order to have an accurate measurement of the assessed completers, a robust test that can be applied at the national level needs to be designed. The design and implementation or upgrading of the test have to be done on a country-by-country basis, depending on the systems already in place. Since accurate reporting of outcomes is necessary for the COD Aid payment to work, it will require an upfront expenditure that should be included in the COD contract. The donor will agree to pay a certain part of the costs, subject to a predetermined ceiling. The amount of this payment will vary with each country and will include the costs for administrative reporting and information management. The recipient will be in charge of contracting the proper services to develop the test, and both donor and recipient need to be involved in the design and approval of the exam. Note that this is the only time in the COD Aid agreement where there is upfront funding. It is necessary because, without an acceptable exam, reporting system, and verification process, it is not possible to have a credible indicator for calculating the COD Aid payments.

By making the aid received more effective, we believe that COD Aid could be an attractive strategy for both donor and recipient governments that share the same goals of improving the enrollment and quality of secondary education.

17. Only students enrolled in the last year of secondary education are eligible to be counted as assessed completers, and the donor will pay only once for each student, even if they repeat and retake the test.

Other Recommendations for Improving Education Quality, Enrollment, and Completion Rates

- ***Further institutionalize assessment systems through the dissemination of information regarding education performance.*** This includes starting evaluation in the first grade. Several innovative dissemination methods are currently used internationally. One example is school report cards published in local newspapers or laminated and posted at school entrances. Likewise, the performance of higher education institutions (also applicable to secondary school) should be published. In the case of universities, their rankings in terms of R&D, quality and placement of graduates, efficiency, accreditation, and related items should be revealed.
- ***Improve teachers' performance.*** There are three areas that need to be considered:
  - ***Teachers' education and preparation:*** This includes developing selection criteria and such diagnostic tools as accreditation exams. It may require implementing full-scale teacher certification systems, like the ones in El Salvador and Costa Rica.
  - ***Incentives to improve teachers' efforts:*** Incentive mechanisms that could be included are: (a) carefully designed team-based merit pay, (b) salary scales that promote more effective hours of work, (c) decentralized systems of teacher monitoring, and (d) fixed-term contracts or local authority to hire and fire teachers. An analysis of school-based management with community participation in El Salvador, Guatemala, Honduras, and Nicaragua suggests that empowering parents to hire, fire, and monitor teachers' results in greater teacher effort, as measured by hours at work.
  - ***Regulate teachers' education programs:*** These currently have very different formats with varied outcomes in terms of quality. New teachers should be required to have a degree from an accredited teacher training program. To this end, it is crucial to implement a system for the certification and accreditation of teacher training programs. It is also necessary to modify the university accreditation system in order to have unified assessment criteria and mechanisms to accelerate the universities' accreditation process. A number of countries, including Canada, the United States, Colombia, and Chile, have achieved significant success in the accreditation of universities by offering incentives (i.e., requiring accreditation for access to specific financing, such as competitive funds, and for hiring teachers and public employees) and imposing sanctions.
- ***Increase instructional time.*** This includes lengthening the school year to 200 days and developing better ways of recording and monitoring teacher absences and school closings, perhaps by involving community stakeholders.
- ***Establish a Council for the Evaluation, Accreditation, and Certification of Educational Quality.*** It should be composed of representatives from both the public and private sectors and should issue a yearly evaluation of its findings and recommendations. It could also function as an Observatory of Educational Performance. This will allow the educational system to respond better to the changing needs of the labor market. Chile and Colombia are examples of countries that have implemented this recommendation. **Donors can support this effort by sponsoring the development of a Regional Observatory of Educational Performance.**
- ***Provide financial incentives for keeping youth in schools.*** In addition to the COD Aid proposal for secondary education discussed above, additional incentives that should be considered are:

- ***Providing more financial aid to low-income students,*** favoring students located in areas of strategic importance with a significant gang presence.
- ***Promoting the enrollment of a larger number of students in the technical branches of secondary education,*** illustrating to parents the market value of such an education. Convincing parents of the value of these programs would make them more attractive and probably increase enrollment.
- ***Facilitating reforms of universities' curricula*** by allocating part of government funding to universities to support results-based mechanisms. Historically, the mechanisms for financing education in Central America, combined with the autonomy of universities, have limited the government's ability to influence the programs offered by these institutions. Thus, to foster the curriculum reforms that the higher education system needs, it makes sense to combine different financing mechanisms (including results-based mechanisms) based on the objectives being pursued (see Box 3). **Donors could support the implementation of these results-based financing mechanisms**

Box 3: Results-Based Financing Mechanisms

Many countries have been shifting from the kind of traditional financing mechanisms used in most Central American countries to what are referred to as results-based mechanisms. These mechanisms provide incentives to make the kinds of reforms that the education system requires. Some of these mechanisms are described below.

Performance Agreements: These are agreements between governments and institutions that help promote innovation, academic quality, and the building of institutional capacities. These agreements require the use of performance indicators that reflect institutional and public policy objectives. Performance agreements have been applied in Chile, France, Finland, Denmark, Austria, and the U.S. states of Colorado and Virginia.

Competitive Funds: Institutions and/or faculties compete through transparent and clear processes, presenting projects that meet specific criteria. These are flexible instruments that allow the criteria used for project selection to be easily modified. They are appropriate for promoting quality, relevance, innovation, and better management. They can also be applied to research projects.

In Costa Rica, competitive funds can be useful as an incentive to promote areas of study that are in high demand in the labor market (sciences, engineering, technical and technological training); to increase the supply and specialization of graduate programs; to promote partnerships between universities, research centers, and the productive sector; to promote research; to increase private sector participation, and to diversify funding sources (with counterparts).

Competitive funds have been applied in Argentina (FOMEC), Bolivia, Bulgaria, Chile, United States (FIPSE), Ghana, Hungary, Indonesia (with projects supported by the WB since 1993), Mozambique, Sri Lanka, Egypt (1990: fund for education in engineering and more links with industry), and others.

Reducing resistance to change. When performance agreements are established through legislation, it is recommended that a transitional phase be implemented first. Initially, a basic level of funding for institutions should be guaranteed, which should correspond to the minimum amount of funding they received under the old financing arrangement. Also, studies about the reform's political impact should be carried out, and interested parties should be consulted. Public debate should be generated and transmitted in the media. To reduce resistance among the affected universities in Pakistan, for example, there was a 2-year transitional period in which the Council on Education applied the new formula only to additional funds. Later, in 2006, the entire system for financing higher education was reformed. In Chile, a similar pragmatic transitional period was implemented, rather than instituting radical and immediate reforms.

Source: Salmi and Hauptman, "Innovations in Tertiary Education Financing: A Comparative Evaluation of Allocation Mechanisms," World Bank, September 2006.

through financial support as well as by facilitating a revision of the curriculum with special emphasis on science, engineering, and business.

Improving Vocational Education and Workers' Training

Technical and vocational education and training can also play an important role in upgrading workers' skills. In this area, Central America has a variety of training institutions and has implemented a number of policies to increase their effectiveness. For instance, Panama's recent efforts to modernize its worker training system include the incorporation of international best practices, such as the accreditation of providers and programs and certification for workers participating in competency-based standard training. The modernization effort is also expected to allow the supply of training services to respond to the labor market's current and emerging needs. However, certain other Central American countries have public training institutions that do not respond well to the private sector's requirements. This is often the case where public training institutions are financed by taxes, which usually means that the incentives for these public training institutions are not entirely demand driven.

Governments can be proactive in the following areas related to technical and vocational education and training by doing the following: (a) developing policies, setting standards, investing in training materials and instructors, improving public information about the training system, and carrying out evaluations of training; (b) financing training to meet equity objectives and to increase the proportion of workers with strategic skills; and (c) providing skills training in priority areas where nongovernment providers are reluctant to invest (but exercising caution to avoid crowding out nongovernment providers). Additionally, finding the right balance between government and nongovernment provisioning and financing of training is important to ensure that public resources are available for other spending priorities, such as basic education. Further, economic analysis of job markets—including both their supply and demand—is needed to inform decisions regarding the government's optimal role in providing training. Chile's efforts in this direction (presented in Box 4 below) illustrate some characteristics of a successful training program.

To expand access to vocational and training programs and to consolidate links with the production sectors, the following initiatives should be considered:

- ***Develop a publicity strategy.*** Provide companies with information about the availability of courses and their schedules.
- ***Align educational inputs with required competencies by implementing a continuous consultation process to address labor market needs.*** Matching job-related competencies with curriculum, educational materials, teaching, the training of teachers, and evaluations would help students see education as relevant to their future success at work. This would likely reduce school drop-out rates. In order to institutionalize a permanent feedback process, a forum is needed to allow all stakeholders to identify the present and future needs of companies and students and to promote cooperation among participants.
- ***Foster strategic partnerships with the private sector that will provide internships with companies, thereby improving education.*** This recommendation is aimed at improving the transition from school to the labor environment, promoting more relevant teaching, and increasing the hiring of recent graduates. In particular, the development of study programs that combine education with work experience should be promoted, and the possibility of shared financing among employers, students, and governments should

be explored. It is also recommended that these partnerships encourage extensive participation from the private sector in defining the course offerings and performance norms, including the definition of indicators and goals, as well as the evaluation procedures. These partnerships should also have a business relations unit within each training center that is responsible for maintaining ongoing contact with the private sector, providing information about courses offered, and developing cooperation agreements that help improve student practices, for instance, or that help design customized courses so that students who complete their studies can be hired directly by companies.

- ***Establish a public policy focused on providing technical training that responds to the competitiveness challenges of the country.*** The Ministry of Labor, in its role as the ruling body with authority over occupational training standards, should make explicit and public the labor training policy of the country. The formulation of public policies should be an ongoing process with the participation of stakeholders, particularly the private sector, and should allow for dynamism and flexibility. This should include clear objectives, goals, structure, responsibilities, and an estimate of the financing required. Given the limited public budget of Central American countries, public-private financing modalities could be explored.

Box 4: Improving the Technical Education System in Chile

Chile implemented the Training and Continuing Education Program for 2002–2007 (*Chile Califica* or "Chile Makes the Grade"),[a] which involved the Ministers of Education, Finance, and Labor. The program seeks greater quality, relevance, and flexibility in a lifetime training system, through the following actions:

- Competitive funds to create incentives for projects that set up networks, including the productive sectors and the training institutions, with a focus on job skills. Preference is given to the relevant regions and programs. In addition, competitive bidding was conducted for programs that link remedial school programs with vocational training. To date, 37 network-building projects have received support through a nationwide competition. These networks have been able to connect training programs with the productive world through onsite practicums for students with companies and teaching and student internships, and workers have received training based on their specific needs.
- Creation of the National Vocational Skills System. With participation from a range of actors (including businesspeople, workers, and trainers), the standards for vocational skills and employability in the main sectors that impact the nation's competitiveness have been defined.
- Expansion of the "on-the-job training" modality. This process is being implemented in 200 technical schools, with participation from 7,500 companies and 18,000 students.
- Creation of a public information system (www.futurolaboral.com) about the labor market. This system allows graduates to find information about jobs and educational opportunities, salaries, and work sectors. Additionally, the information system provides a specific Internet page with information about tertiary education (including technical education), statistics, programs, institutions, standards and the accreditation status of technical training centers, applications for different types of financial aid, etc.
- To promote access, equity, and quality, the government of Chile offers scholarships and credit to low-income students who wish to study at technical institutes that are already accredited. Also, workers who receive technical training or update their skills at accredited centers receive a tax exemption.

Source: Mazeran et al.,, "Short-term vocational higher education." CIEP, The World Bank, Paris, 2007.
a. "Chile Califica" (2002–2007): Programa de capacitación y educación permanente, at: http://www.chilecalifica.cl/prc/n-0-REVISTA%20EDUCACION%20SUPERIOR.pdf.

- ***Develop a national labor skills certification system.*** To improve the quality and relevance of training, a system could be implemented to certify student/worker labor competencies and to accredit training service providers. Certified competencies would allow workers to signal to employers that they have proven skills in specific areas that are relevant to the job. In contrast, traditional diplomas and degrees do not necessarily guarantee mastery of the knowledge and skills required by the marketplace. Certifications and accreditations should be administered by credible independent agencies that follow rigorous evaluation processes. **Donors could sponsor a skill certification process at the regional level.**

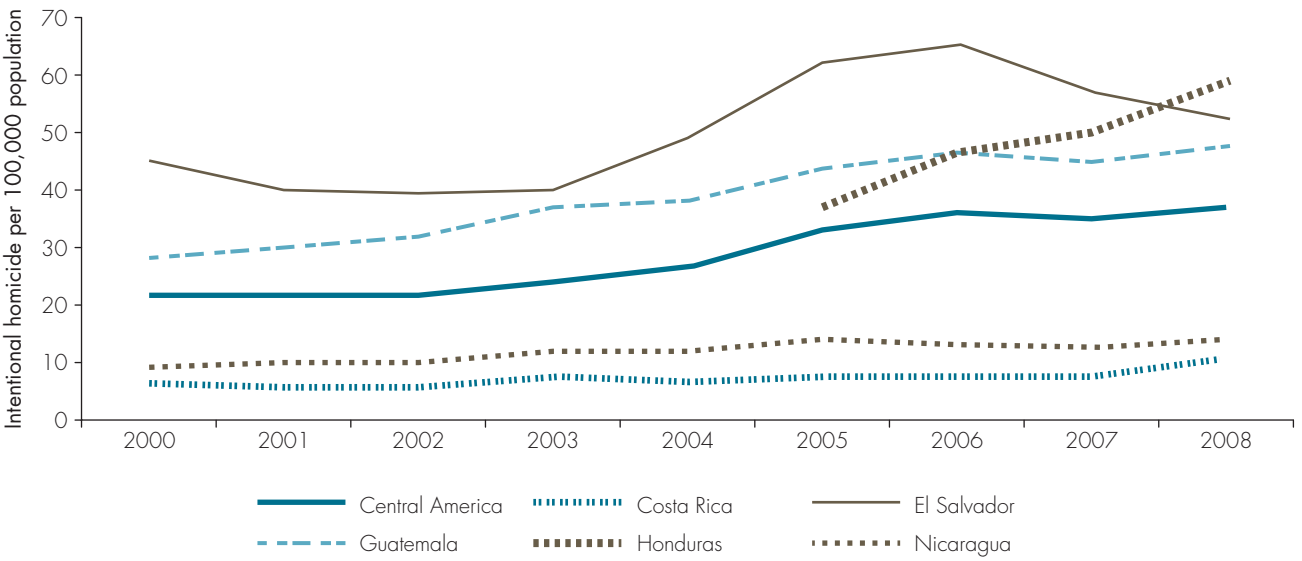
Crime, Violence, and Weak Governance

The Evidence on Crime and Violence in Central America

In recent years, there has been ongoing concern about the increasing rates of violent crimes taking place in Central America. Combating crime and violence has become a top priority in the agendas of the governments and citizens of Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua. Linked to the crime/violence problem are the high levels of drugs and firearms trafficking, as well as the activities of youth gangs. It is well documented that elevated levels of crime and violence impose significant costs at the household, firm, and national levels. In environments with high levels of violence, resources are usually diverted from productive and social purposes toward financing increased security, health care, and law enforcement. This negatively affects the fiscal budget and has adverse effects on firms' productivity and competitiveness levels. Moreover, productive investment (from both local and foreign sources) becomes scarcer because of the uncertain environment.

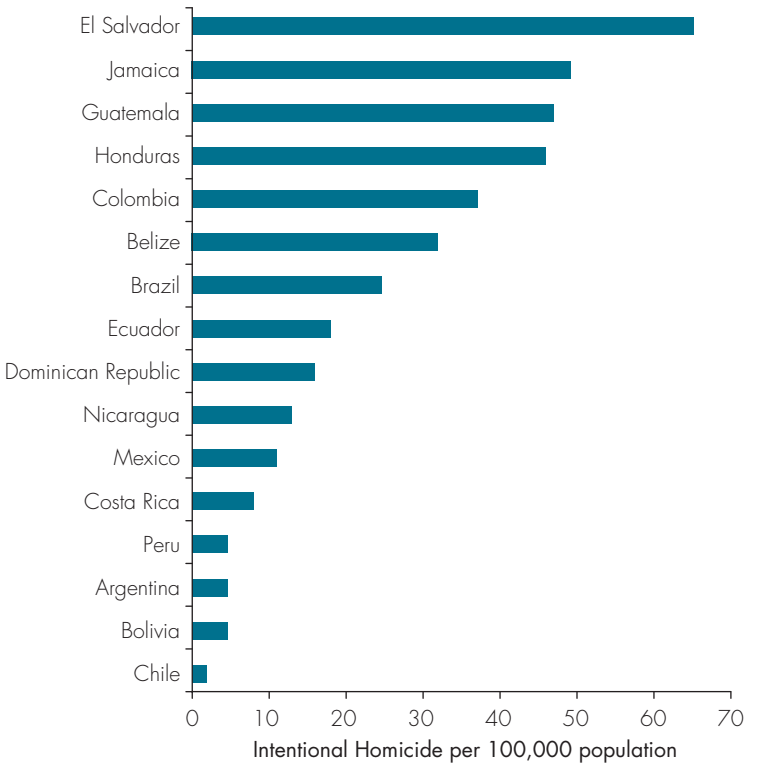
As shown in Figure 9, in the 2000s the homicide rates for most Central American countries began scaling up, in this case to almost 40 per 100,000 inhabitants. Looking at the countries individually, specifically El Salvador, Guatemala, and Honduras (the so-called Northern Triangle of Central America), one can observe homicide rates that are significantly higher than the average rate in the Central American region.

Figure 9: Evolution of the Homicide Rates in Central American Countries, 2000–2008



Source: UNODC (2003–2008) and HDRCS 2009–2010 (2000–2002).

Figure 10: Homicide Rates for Selected Latin American Countries, 2006*



*Year with most available data for the countries in the sample.
Source: UNODC and HDRCA 2009–2010.

Homicide rates in El Salvador, Guatemala, and Honduras (together with Jamaica) are also the highest in Latin America and Caribbean Region (see Figure 10). Similar results can be found in the Latin American Public Opinion Project (LAPOP) survey for statistics on armed robbery and house burglaries. Moreover, there is increasing fear that the countries in the Northern Triangle might be spreading their cultures of violence to their southern neighbors. As reported by the United Nations Development Program (HDRCA 2009–2010), criminality is the most serious concern for citizens in the five countries of the sample: 83 percent of Salvadorans; 76 percent of Nicaraguans, Guatemalans, and Costa Ricans; and 47 percent of Hondurans perceive this insecurity to be the most important threat to their futures. Indeed, crime and violence in Central America is a serious constraint on economic growth and human development.

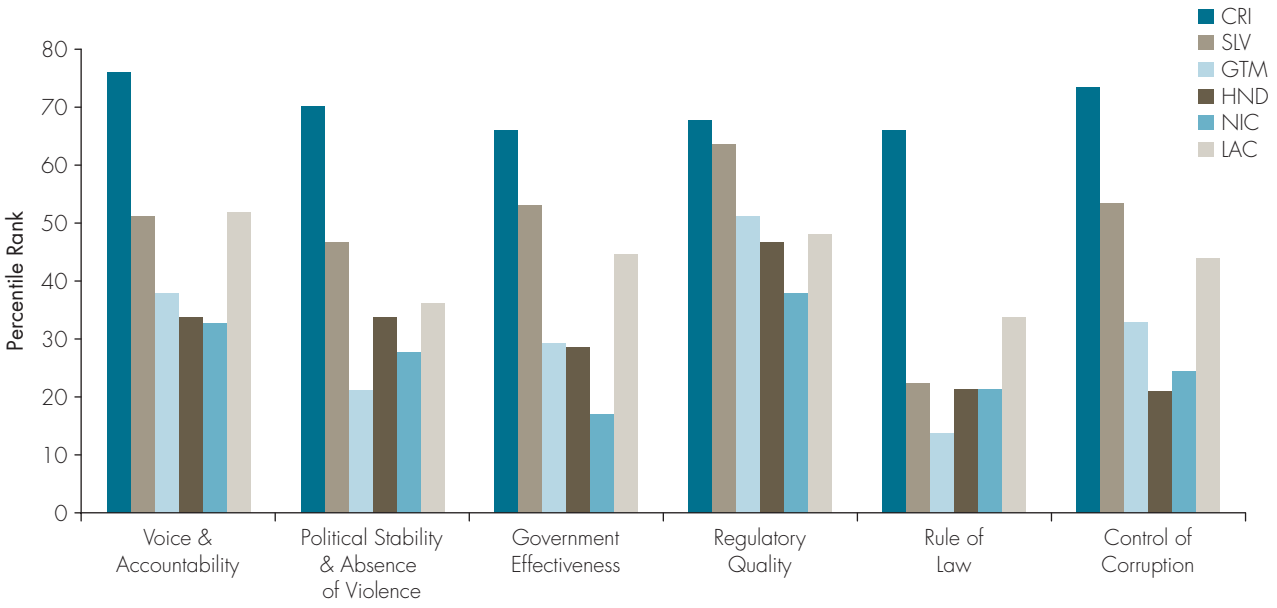
As Mexican drug trafficking organizations have been expanding their reach for illicit drugs throughout the supply chain (from South America to North America), their presence has become even more relevant to Central American countries, where most of these groups have started to clash against each other because they are competing for market share. The vast majority of Central American gangs are in Honduras, Guatemala, and El Salvador. It has also been suggested that the leaders of local drug organizations are ex-gang members. Individual gang members are mainly involved in small-scale crimes and acts of delinquency. Gangs also create a climate of fear in their communities in El Salvador, Honduras, and Guatemala and are involved in the extortion of local businesses.

More broadly, a top challenge for Central America is governance in its multiple dimensions—strengthening institutions, improving/enforcing the *rule of law*, and confronting crime and violence. Governance was identified as a top constraint by businesses in the region and is confirmed as a key obstacle through empirical analysis linking the level of governance indicators to firm-level productivity in Central America.

Figure 11 shows that, with the exception of Costa Rica, Central American countries are worse performers than the average country in Latin America and the Caribbean in terms of the quality of their institutions. Consistent with the discussion above, respect for the rule of law stands out as the indicator where Central American countries perform the worst.

Weak governance also affects firms adversely through the costs of regulatory and legal uncertainty, as well as the security costs needed to prevent theft. These costs have a direct impact on reducing domestic investment as well as in dissuading foreign investment. Thus, in the context of greater market openness, the benefits to improving the governance framework are amplified.

Figure 11: Percentile Ranking of Central American Countries and LAC Average on Governance Dimensions—2009



Source: UNODC (2003–2008) and HDRCS 2009–2010 (2000–2002).

The Impact of Crime in Central America

Crime and violence affect victims and their families physically and emotionally, they affect businesses through increased costs and reduced sales and productivity, and they affect local and national governments through the allocation of resources used to address the problems they create. Several studies have identified the costs of crime to society by dividing them into direct, indirect, and intangible costs. In some cases, these costs have been assessed with the aim of evaluating the cost-effectiveness of crime-fighting interventions (see Table 11).

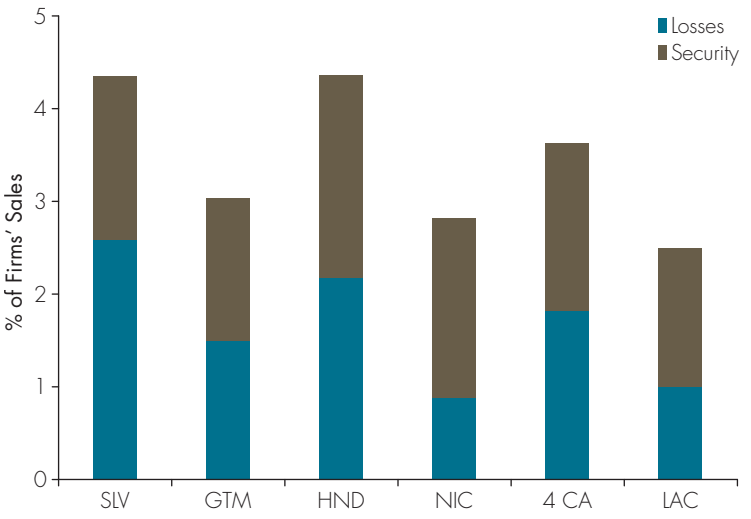
Information from the World Health Organization (WHO) provides a measure of economic losses that are the result of health effects on victims from violent acts. In an effort to calculate the threats to health for the population, the WHO developed a measure of overall disease burden called

Table 11: Costs of Crime and Violence, by category

Direct Costs	Indirect Costs	Intangible Costs
■ Physical and emotional effects on the victim ■ Security expenditure (private security, vigilantism, insurance) ■ Loss of money or assets ■ Health expenses (doctor's bills, disability, funeral) ■ Loss of life ■ National expenditure in security strategies (police, law enforcement, judicial system)	■ Loss of investment ■ Reduction of productivity (absenteeism, incapacity) ■ Reduction in human capital (migration) ■ Reduction in savings ■ Reduction in tax collection	■ Fear and insecurity among citizens ■ Loss of trust in the authorities ■ Distrust in the rule of law ■ Long-term effects of violence (child abuse, violence inside the family)

Source: Own elaboration by compiling UNDP (2009–2010), World Bank (2009), Acevedo (2008).

Figure 12: Firms' Security Costs and Losses Due to Crime as a Percentage of Firm Sales, 2006



Source: World Bank Enterprise Survey 2008.

disability-adjusted life year (DALY) that combines mortality and morbidity. The WHO defines one DALY as 1 lost year of "healthy" life, and the sum of DALYs across a certain population is the gap between the current health situation associated with a given health condition and an ideal one.[18] DALYs resulting from violence are also calculated. Thus, it is possible to estimate their economic value by multiplying them by the GDP per capita. According to this measure, 4 of the Central American countries are among the 40 countries with the largest estimated health stemming from violence as a percentage of annual GDP. As shown in Table 13, the countries in the Northern Triangle have the biggest health burden in comparison with the Latin American average.

Crime also affects businesses by damaging the overall investment climate. The potential losses from criminal activity divert resources (and increase costs) to crime prevention. The amount of firms' losses and security costs related to crime are more than double what they spend of R&D (Amin 2009). The Enterprise Survey of the World Bank Group shows that firms' losses and security costs resulting from crime (as a percentage of firms' annual sales) in Honduras and El Salvador exceed the costs in every other country in Latin America. In Honduras and El Salvador, firms' costs and losses resulting from violence amount to close to 4.5 percent of firms' annual sales. Closely behind is Guatemala, with 3.0 percent, and Nicaragua, with 2.8 percent, while the LAC average is 2.5 percent.[19] Another cost, which is more intangible but also significant, is the loss of productivity in these countries, which results in a reduction in GDP. Compared to firms in other regions in the world, Central American firms spend the second largest amount on security and suffer the highest losses as a share of sales.

Table 12: Estimated Economic Value of DALYs Lost to Violence in Central America (2002)

Country	Economic value (in millions of US$)	Percentage of annual GDP	Rank among the 40 countries with largest percentage of economic value of DALYs
El Salvador	271.4	2.00	12
Guatemala	289.0	1.43	21
Honduras	60.6	1.31	36
Nicaragua	37.9	0.96	40
Costa Rica	96.0	0.58	n.d.
Latin America Average	25.0	1.20	

Source: Brown (2008) and WHO (2002–2004).

18. As defined in "Health statistics and health information systems" at http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/.

19. No data were available for Costa Rica in the Enterprise Survey of the World Bank Group.

Table 13: Economic Costs of Violence in Central America, 2006 (Percentage of the Total Costs)						
Type of Costs	**Guatemala**	**El Salvador**	**Honduras**	**Nicaragua**	**Costa Rica**	**Region**
Health Costs	**55.93**	**56.90**	**40.66**	**45.58**	**41.14**	**51.51**
Medical attention	3.02	4.07	2.69	8.28	1.28	3.52
Lost production	22.75	21.38	12.88	6.65	14.30	1.86
Emotional damage	30.15	31.44	25.10	30.64	25.56	29.34
Institutional Costs	**13.32**	**14.17**	**27.03**	**16.35**	**27.98**	**17.48**
Public security	9.26	7.96	16.35	9.66	10.71	10.03
Administration of justice	4.02	6.21	10.69	6.67	17.26	7.44
Private Security Costs	**20.05**	**16.36**	**19.88**	**23.44**	**19.01**	**19.04**
Households	5.90	3.58	4.97	5.86	4.75	4.92
Businesses	14.15	12.78	14.91	17.58	14.25	14.12
Material costs (transfers)	**10.70**	**12.57**	**12.43**	**14.65**	**11.87**	**11.98**
Total (US$ millions)	**2,291.00**	**2,010.00**	**885.2**	**529**	**790.8**	**6,505.90**
Total: Percentage of GDP	**7.70**	**10.80**	**9.6**	**10**	**3.6**	**7.70**

Source: Acevedo (2008).

In addition, budgetary resources need to be diverted from other priorities and allocated to legal and judicial institutions as well as to the national police. The drug trafficking violence in Central America aggravates this situation by diverting funds that go to the criminal system to fight only drug trafficking, leaving other nondrug criminal activities unattended. As an approximation, Acevedo (2008) reports that the total budget assigned to crime prevention and violence in Central America for the year 2006 reached US$1.137 million.

Acevedo (2008) also calculated the overall economic costs of crime, taking into account the health costs (medical expenses, lost production, and emotional damage), institutional costs (public security and justice), private security expenses of households and firms, and loss of assets. In his study, he shows that the economic cost of violence in 2006 was approximately 7.7 percent of the Central American countries' GDP. While the cost of violence in El Salvador and Guatemala reaches approximately 11 percent of their GDPs, the cost in Costa Rica is about 3.6 percent. In a more detailed analysis, Acevedo found that 3.9 percent of the GDP of the region goes to health, which is equivalent to 51 percent of the total cost of violence in Central America. Acevedo's results are shown in Table 13.

Beyond the economic costs that the government has to face, crime and violence also undermine legitimacy and trust in public institutions in charge of law and order in the country.

Recommendations to Deal with Crime and Violence (and Improve Governance)

Dealing with the problems of crime, violence, and governance deficiencies in Central America is a complex issue. As such, the recommendations advanced here should be taken solely as a contribution intended to motivate consultations among governments, civil society, and donors and to further the analysis of the subject. These recommendations include a mix of preventive and sanctioning policies and programs to deter, preempt, and sanction violence. The recommendations here would involve actions and support from Central American governments, donors, and multilateral organizations.

- ***Expand support from multilateral organizations*** (IDB/World Bank) for establishing job training, education, and rehabilitation programs for former gang members: The stigmatization of gang members combined with their lack of job skills makes the process of reintegration into society very challenging. However, in some instances, government-sponsored programs that have focused on rehabilitation/education and job training have proven effective in the reduction of gang membership. Despite their success, most of these projects in Central America are either implemented on a small scale or are underfunded, which makes it impossible for the programs to reach enough people (Ribando 2010). Under these circumstances, we stress the importance of expanding financial support from multilateral organizations such as the IDB or the World Bank to help develop strategies aimed at overcoming youth violence and reintegrating former gang members into society. Currently, both organizations provide support to small-scale, local programs that focus on youth and violence prevention in the region, using either technical cooperation or a loan scheme. In the past few years, the IDB has also approved two different loan contracts to support the activities of the governments of Nicaragua and Panama in targeting at-risk youth under the umbrella of its national security programs.[20] Costa Rica is also being considered for a loan to help fund their Program of Citizen Security, which involves the social rehabilitation of former gang members as one of its main objectives. Among many initiatives, Costa Rica proposes a penal system focused on rehabilitation, where job training in the areas of agriculture, education, and health improvement of prisoners is included.[21]

  Nicaragua and Costa Rica also seem to be taking action in helping former gang members reintegrate into society, and the IDB is responding to those initiatives. However, as discussed above, the greatest threats in the region are still from the countries in the Northern Triangle—Guatemala, El Salvador, and Honduras—because they have the largest numbers of gang members.[22] Even when efforts are being made in El Salvador through the National Council of Public Security, rehabilitation programs don't have enough government resources, which prevents them from reaching a larger segment of the population (Ribado 2009). Furthermore, the governments of Guatemala and Honduras have still not made substantial enough investments in the rehabilitation of former gang members, leaving this task to NGOs and other private institutions.
- ***Modify CARSI to support a large-scale police reform.*** In recent years, the U.S. Department of State and the members of the 111th Congress have expressed concern about the increasing amount of violence and crime in Central America and its spillover into the United States. This concern goes beyond the fight against drug trafficking and includes increased gang activity, especially in the Northern Triangle of this region. To address this concern, at the beginning of fiscal year 2010, a new security partnership was created between the United States and Central American countries, called the Central American Regional Security Initiative. The funds allocated to CARSI are meant to contribute to combating narcotics trafficking and the shipping of arms and weapons, and helping judicial reform, law

20. In both cases, the government, in coordination with other local and national entities, implemented job training and rehabilitation programs as part of a more comprehensive national security strategy. In Panama, the IDB is funding these kinds of services, among others, in four of the country's largest municipalities, to prevent youth violence. In the case of Nicaragua, part of the loan contract with the IDB entails the support of a 5-year program to implement these programs in 11 different municipalities.

21. This loan is expected to be approved by 2011 (IADB Projects, Project Number CR-L1031).

22. The area contains 89 percent of the total gang population of Central America. *Source:* UNDP 2009–2010.

enforcement, and institution building. The aims of the initiative are also to help fight corruption, reduce gangs, and strengthen borders, maritime, and air control. However, in spite of the greater focus on and resources allocated to this new partnership, CARSI still has a long way to go. According to Ribando (2010), even when CARSI tries to address efforts to build police capacity through training, the initiative does not include the support of a large-scale police reform. The inclusion of this component in a crime-fighting strategy is of high importance given the extent of corruption within these law enforcement institutions.

- ***Invest in early childhood development programs and programs targeting the at-risk population*** (children ages 4–10), as well as their neighborhoods.
- ***Increase enrollment in and completion of secondary education.*** An important preventive investment a country can make for at-risk youths is in secondary education. It is proven that young people who attend school and complete their education earn higher wages on average and are less likely to resort to illegal means to obtain income. Furthermore, completing secondary education can help youths learn important social values and life skills before they are ever exposed to gang life. A specific proposal for improving enrollment and completion of secondary education is advanced in Section VII.
- ***Administer security through local authorities.*** Colombia's experience shows that efforts for the prevention of crime tend to be most effective when conducted at the local level.[23] In fact, the UNDP in its 2009–2010 report mentions how international experience has shown that municipalities should play a fundamental role in the guidance and management of crime prevention and that they should apply a variety of methods to reduce conflict and limit violence. This is because local authorities understand the dynamics of their communities and are better positioned than regional or national authorities to coordinate the funding and implementation of crime prevention programs. Successful security strategies are often community driven, and are focused on responding to local issues and building the capacity of community leaders. In the case of Central American countries, some progress has been made in decentralizing responsibility for ensuring the security of citizens. However, as detailed in the UNDP report, most of these municipalities are confused about what they can or should do in terms of controlling crime. Moreover, since they need to manage crime prevention strategies, municipalities also need to have budgets that will allow for the implementation and continuation of different strategies. Thus, the national governments of Central American countries not only need to be very clear about the role played by municipalities in each country in terms of crime prevention, but also need to provide municipalities enough resources. An increase in transfers from national governments to local governments or higher tax rates[24] are not always feasible options. Under these scenarios, municipalities need to have the opportunity to access additional support from organizations such as the IDB or the World Bank. These types of institutions can help boost the security strategies of local governments by using technical cooperation schemes or even by providing loan contracts.
- ***Separate juvenile and adult jail facilities.*** Evidence indicates that the process of rehabilitation is made more difficult if young offenders (gang members) are mixed with adult offenders.
- Additional support from donors could include:

23. UNDP (2009–2010).

24. This is the case in Honduras, where some cities charge a special tax rate for security that goes to the local police budget.

- Assisting Central American countries in a strategy to arrest the leadership and disrupt the operations of gangs and to undermine the logistics of the traffickers by interrupting the flow of money and guns from the United States. For this purpose, assistance is needed in training investigators and intelligence personnel. In addition, intelligence-sharing programs need to be implemented.
- Assist in programs that effectively screen and register the purchase of guns.
- Assist in effective border (roads, ports, and airports) surveillance to create a border that is both secure and fluid, where legal commerce and exchange between people is agile and the flows of illicit goods are more easily spotted. For this purpose, supporting the training of customs officers to search for guns and their components, promoting compliance with international treaties and conventions to abolish the illicit trade in firearms, and marking and tracing guns to identify illicit models and routes for gun trafficking, should be implemented.
- Assist and finance coordination efforts to engage civil society and invest in social and physical infrastructure in the cities under the greatest stress from gang-related crime and violence. This commitment includes efforts to engage citizens in defining priorities for the future of their cities; provide job training and employment opportunities for youth; and build public spaces, including parks, libraries, and sports centers, in order to improve the quality of life in these cities.

References

Agénor, Pierre-Richard, and Blanca Moreno-Dodson. 2006. "Public Infrastructure and Growth: New Channels and Policy Implications." Policy Research Working Paper 4064. The World Bank, Washington, DC.

Amin, Mohammad. 2009. "Crime, Security and Firms in Latin America." Enterprise Surveys; Enterprise Survey Notes, World Bank Group.

Andres, L., J. L. Guasch, T. Haven, and V. Foster. 2009. "The Impact of Privatization in Firms in the Infrastructure Sector in Latin American Countries." World Bank Press, Washington, DC.

Avecedo, Carlos. 2008. "Los costos economicos de la violencia en Centroamerica." Consejo Nacional de Seguridad Publica, Presidencia de La Republica.

Baier, Scott L., and Jeffrey H. Bergstrand. 2001 "The growth of world trade: tariffs, transport costs, and income similarity." *Journal of International Economics,* Elsevier, vol. 53(1).

Banco Interamericano de Desarrollo. 2004. "Programa de Seguridad Ciudadana en Nicaragua." NI-0168, Propuesta de Prestamo, Documento del Banco Interamericano de Desarrollo.

Birdsall, Nancy, and William D. Savedoff. 2010. "Cash on Delivery: A New Approach to Foreign Aid." Center for Global Development, Washington, DC.

Brown, David W. 2008. "Economic Value of disability-adjusted life years lost to violence: estimates for Who Member States." *Rev PanamSaludPublica/Pan Am J Public Health* 24(3).

Calderón, C., W. Easterly,. and L. Servén. 2003. "Latin America's Infrastructure in The Era of Macroeconomic Crises." In Easterly and Servén, Eds. The Limits of Stabilization: Infrastructure, Public Deficits and Growth in Latin America. Stanford University Press and World Bank, pp. 21–94. Washington, DC.

Calderón, C., and L. Servén. 2003. "The Output Cost of Latin America's Infrastructure Gap." In W. Easterly and Servén, Eds., The Limits of Stabilization: Infrastructure, Public Deficits and Growth in Latin America, pp. 95–118. Stanford University Press, Palo Alto, CA, and the World Bank, Washington, DC.

Calderón, C., and V. Poggio. 2010. "Trade and Economic Growth: Evidence on the Role of Complementarities for the DR-CAFTA Countries." In Getting the Most of CA Trade Agreements, Poverty Reduction and Economic Management, Latin America and Caribbean Region, World Bank. Washington, DC.

Canning, D. 1999. "The Contribution of Infrastructure to Aggregate Output." The World Bank, Policy Research Working Paper No. 2840. Washington, DC.

Corporación Latinobarometro. 2010. "Informe 2010." Banco de datos en línea, Santiago, Chile.

De Ferranti, D., et al. 2003. "Closing the Gaps in Education and Technology." World Bank, Washington, DC.

Díaz, Rafael. 2003. "A developing country perspective on policies for sustainable agribusiness chains: the case of Costa Rica." Nimejen Studies in Development and Cultural Change (NICCOS), 43.

Dollar, D., M. Hallward-Driemeier, and T. Mengistae. 2005. "Investment Climate and Firm Performance in Developing Economies." Economic Development and Cultural Change 54(1): 1–30.

Duryea, Suzanne, and Carmen Pagés-Serra. 2002. "Human Capital Policies: What They Can and Cannot Do for Productivity and Poverty Reduction in Latin America." RES Working Papers 4297, Inter-American Development Bank, Research Department.

Easterly, William, and Ross Levine. 2001. "It's Not Factor Accumulation: Stylized Facts and Growth Models." World Bank Economic Review, 15, no. 2.

Escribano, A., and J.L. Guasch. 2004. "Assessing the Impact of the Investment Climate on Productivity Using Firm-Level Data: Methodology and the Cases of Guatemala, Honduras and Nicaragua." Mimeo. World Bank, Washington, DC.

Estache A. 2004. "Emerging Infrastructure Policy Issues in Developing Countries: A Survey of the Recent Economic Literature." Background paper for the October 2004 Berlin meeting of the POVNET Infrastructure Working Group. The World Bank, Washington, DC. Processed.

Fajnzylber, Pablo, J. Luis Guasch, and J. Humberto López. 2009. "Does the Investment Climate Matter?" The World Bank, Washington, D.C.

Fay, M. 2001. "Financing the future. Infrastructure needs in Latin America, 2000–2005." Policy Research Working Paper No. 2545. World Bank, Washington, DC.

Fay, M., and T. Yepes. 2003. "Investing in Infrastructure: What is needed from 2000 to 2010?" Policy Research Working Paper No. 3102. World Bank, Washington, DC.

Fiess, Norbert. (007)."Business Cycle Synchronization and Regional Integration: A Case Study for Central America." *World Bank Economic Review,* Oxford University Press, vol. 21(1), pp. 49–72.

Garzón, Juan Carlos. 2008. "Mafia & Co. The Criminal Network in Mexico, Brazil, and Colombia." Woodrow Wilson International Center for Scholars, Latin American Program, pp. 122–124.

Geneva Declaration. 2008. "Global Burden of Armed Violence." http://www.genevadeclaration.org/ (September).

Guasch, J. Luis. 2004., *Granting and Renegotiating Concessions: Doing it Right.* WDI, The World Bank, Washington, DC.

Guasch, J. Luis. 2006., "A Framework for Competitiveness." Processed, The World Bank, Washington, DC.

Guasch, J. Luis, Jean-Louis Racine, Isabel Sanchez, and Makhtar Diop. 2007. "Quality Systems and Standards for a Competitive Edge." The World Bank, Washington, DC.

Hall, Robert E., and Charles I. Jones. 1999. "Why Do Some Countries Produce So Much More Output than Others?" *Quarterly Journal of Economics* 114: 83–116.

Hausmann, Ricardo, Dani Rodrik, and Andrés Velasco. 2005. "Growth Diagnostics." John F. Kennedy School of Government, Harvard University (Cambridge, Massachusetts).

Hummels, David L. 2001. "Time as a Trade Barrier." Paper provided by Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University in its series GTAP Working Paper 1152.

Inter-American Development Bank. Nov. 24, 2004. "IDB approves $7.2 million loan to Nicaragua for a citizen security program: Support to reduce violence and juvenile delinquency in communities."

Inter-American Development Bank. 2011. "Perfil de Proyecto: Program para la Prevención de la Violencia y la Reinserción Social."

Inter-American Development Bank 2010. "Proyecto para la Prevención de la Violencia y la Reinserción social." Perfil de Proyecto.

International Narcotics Control Board. 2009. "Analysis of the World Situation." In *Report of the International Narcotics Control Board for 2009,* pp. 59–74.

Lederman, Daniel, and William F. Maloney. 2003. "Research and development (R&D) and development." Policy Research Working Paper, Series 3024, The World Bank, Washington, DC.

Lederman, Daniel. 2007. "Product innovation by incumbent firms in developing economies: the roles of research and development expenditures, trade policy, and the investment climate." Policy Research Working Paper, Series 4319, The World Bank, Washington, DC.

Maloney William F., and Daniel Lederman. 2004. "R&D and Development." *Econometric Society 2004 Latin American Meetings 216,* Econometric Society.

Montobbio, F. and Rampa, F. 2005. "The impact of technology and structural change on export performance in nine developing countries." World Development Volume 33, Issue 4, April 2005, pp. 527–547.

OECD. 2007. "Lifelong Learning and Human Capital." Policy Brief, Organisation for Economic Co-operation and Development, Paris, France.

OECD. 2011. StatExtracts, Creditor Database, Organisation for Economic Co-operation and Development, Paris, France.

Pagés, Carmen (ed). 2010. " Productivity in Latin America and Caribbean." IDB, Washington, DC.

Ribando Seelke, Claire. 2009. "Gangs in Central America." Congressional Research Service Report for Congress, RL34112 (December 4).

Ribando Seelke, Claire. 2010. "Mérida Initiative for Mexico and Central America: Funding and Policy Issues." Congressional Research Service Report for Congress, R40135 (April 19).

Rioja, F. K. 2003. "The Penalties of Inefficiency in Infrastructure." *Review of Development Economics,* 7 (1), pp. 127–137.

Rodríguez-Clare, Andrés (2005) "Innovation and Technology Adoption in Central America." Inter-American Development Bank Working Paper # 525. Washington, DC: Inter-America Development Bank.

Rodrik, D. 1992. "Closing the Technology Gap: Does Trade Liberalization Really Help?" In G. Helleiner, ed., *Trade Policy, Industrialization and Development: New Perspectives.* Oxford, United Kingdom: Clarendon Press.

Salmi, Jamil, and Arthur M. Hauptman. 2006. "Innovations in Tertiary Education Financing: A comparative evaluation of Allocation Mechanisms." World Bank, Washington, DC.

Sanchez-Robles, B. 1998. "Infrastructure Investment and Growth: Some Empirical Evidence." *Contemporary Economic Policy* 16, pp. 98–108.

Schwartz, Jordan, José Luis Guasch, Gordon Wilmsmeier, et al. 2009. "Logistics, Transport and Food Prices in LAC: Policy Guidance for Improving Efficiency and Reducing Costs." Inter-American Development Bank and World Bank, Washington, DC.

Seelke, Clare Ribando. 2009. "Gangs in Central America." *Congressional Research Service Reports,* RL34112 (December 4, 2009).

The Americas Barometer 2008 by the Latin American Public Opinion Project (LAPOP), www.LapopSurveys.org.

Testimony of Geoff Thale, Program Director of the Washington Office on Latin America (May 8, 2008), Before the House Committee on Foreign Affairs Subcommittee on the Western Hemisphere, Hearing on "Central America and the Merida Initiative."

United Nations Development Program. 2009. "Opening spaces to citizen security and human development." *Human Development Report for Central America,* HDRCA 2009–2010 (October).

United Nations Office of Drugs and Crime. 2010. "Homicide Statistics, Criminal Justice and Public Health Sources—Trends (2003–2008)." UNODC crime and criminal justice statistics.

United Nations Office of Drugs and Crime. 2010. "World Drug Report 2010." United Nations Publication, Sales No. E.10.XI.13.

World Bank. 2005a. "Central America: Education Strategy Paper." Human Development Department, Latin America and Caribbean Region. Report No. 29946.

World Bank. 2008b. "Central America, Investment Climate Assessment." LAC2, Latin America and Caribbean Region.

World Bank. 2009. "Competitiveness diagnostic and recommendations." Vol. 1, Report No. AAA39–CR. Washington, DC: Finance & Private Sector Poverty Reduction and Economic Management Department.

World Bank. 2007. "Connecting to Compete: Trade Logistics in the Global Economy." Logistics Performance Index. The Logistics Performance Index and Its Indicators.

World Bank. 2010. "Connecting to Compete: Trade Logistics in the Global Economy." Logistics Performance Index, The Logistics Performance Index and Its Indicators

World Bank. 2008a. "Costa Rica: Competitiveness: Diagnostic and Recommendations." Report No. 43521, LACFP, Latin America and Caribbean Region.

World Bank. 2010. "Crime and Violence in Central America." Sustainable Development Department and Poverty Reduction and Economic Management Unit: Latin America and the Caribbean Region. Document of the World Bank, vol. I (July).

World Bank. 2010. "Doing Business 2011: Making a difference for entrepreneurs." World Bank, November 4, 2010.

World Bank. 2008c., "The investment climate in Central America." Washington, DC. Unpublished.

World Bank Enterprise Surveys: El Salvador, Honduras, Nicaragua, Panama, Guatemala, (2006/2007/2008).

World Bank. 2009–10. World Development Indicators (2009/2010). Washington, DC: World Bank.

World Bank. 1994. "World Development Report 1994: Infrastructure for Development." World Bank and Oxford University Press, Washington, DC.

World Bank. 2004a. "World Development Report 2005: A Better Investment Climate for Everyone." World Bank and Oxford University Press, Washington, DC.

World Bank. "World Governance Indicators 2009." World Bank, Washington, DC.

World Bank. "World Governance Indicators 2010." World Bank, Washington, DC.

World Economic Forum (2010–2011). "The Global Competitiveness Report" (2010–2011).

Yuki, Kazuhiro. 2007. "Sectoral Shift, Wealth Distribution, and Development."

Paper provided by University Library of Munich, Germany, in its series MPRA Paper 3384, University Library of Munich, Germany

Zúñiga-Arias, Guillermo E. 2007. "Quality management and strategic alliances in the mango supply chain from Costa Rica: an interdisciplinary approach for analyzing coordination, incentives and governance." Wageningen University.

APPENDIX I
Institutional Support to Firms' Technological Efforts: CITEs

Basic industrial services

- Promote inward investment
- Provide export services
- Provide management services
  - Collect marketing information
  - Collect data on exports and imports
  - Provide managerial consulting
- Provide financial services (accounting, tax assistance, investment advice)

Technology information centers

- Provide information technology to firms including networks, software, internet access, and databases
- Perform troubleshooting, assistance, and repairing services to firms
- Provide training in the application of information technology.

Metrology, standards, testing, and quality control centers

- Define domestic standards
- Assist firms in meeting international standards for standardization
  - Train firms in ISO standards and regulatory requirements
    - Test products to ensure compliance with standards and regulatory requirements
    - Provide technical assistance to firms
- Help firms with calibration of instruments
  - Maintain calibrated standards and calibration equipment
  - Calibrate firms' machinery

Productivity Centers

- Improve quality
- Improve productivity, efficiency
- Provide training

Technological Extension Agencies

- Extend available technology to businesses lacking technical capabilities
- Help firms use cleaner productivity technologies
- Provide information on available technology
- Identify problems and use access to technology sources to solve problems
- Serve as external consultants and assist firms with troubleshooting
- Promote cooperation of SMEs with larger research and cluster initiatives (South Africa MAC program)

Research and Development Laboratories

- Design new processes and products
- Train businesses through demonstration, participation, and extension
- Implement new technologies
- Import and learn foreign technologies
- Adapt foreign technologies to local needs
- In collaboration with firms, integrate these technologies into the economy