Republic of Ecuador
Improving firms' innovation to foster productivity and diversification

Innovation for productivity growth in Ecuador: Unlocking constraints through horizontal and cluster development policies

Executive Summary

July 24, 2017
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### Selected Abbreviations

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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>APL</td>
<td><em>Arranjos Productivos Locais</em></td>
</tr>
<tr>
<td>CDM</td>
<td>The Crepon, Duguet and Mairesse model</td>
</tr>
<tr>
<td>CDP</td>
<td>Cluster Development Program</td>
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<tr>
<td>CMC</td>
<td>Calibration and Measurement Capabilities</td>
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<tr>
<td>ECLAC</td>
<td>Economic Commission for Latin America and the Caribbean</td>
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<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
</tr>
<tr>
<td>GCR</td>
<td>Global Competitiveness Report</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GERD</td>
<td>Gross Expenditure on Research and Development</td>
</tr>
<tr>
<td>GII</td>
<td>Global Innovation Index</td>
</tr>
<tr>
<td>GVCs</td>
<td>Global Value Chains</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technologies</td>
</tr>
<tr>
<td>IPR</td>
<td>Intellectual Property Rights</td>
</tr>
<tr>
<td>KIBS</td>
<td>Knowledge-Intensive Business Services</td>
</tr>
<tr>
<td>MCPEC</td>
<td>Ministry of Production, Employment, and Competitiveness</td>
</tr>
<tr>
<td>MIPRO</td>
<td><em>Ministerio de Industrias y Productividad</em> (Ministry of Industry and Productivity)</td>
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<tr>
<td>NIS</td>
<td>National Innovation Survey</td>
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<tr>
<td>NQI</td>
<td>National Quality Infrastructure</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
<tr>
<td>SAE</td>
<td><em>Siste de Acreditación Ecuatoriano</em></td>
</tr>
<tr>
<td>SME</td>
<td>Small and Medium Enterprise</td>
</tr>
<tr>
<td>WBG</td>
<td>The World Bank Group</td>
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</tbody>
</table>
I. The productivity challenge in Ecuador

1. Over the last decade, Ecuador experienced inclusive growth fueled by a favorable external environment that financed a vast expansion of the public sector. The country’s economy grew at an average of 4.2 percent over the 2006-14 period, above the Latin America and Caribbean (LCR) regional average. Poverty rates fell from 37.6 percent to 23.3 percent between 2006 and 2015, mostly due to labor income growth. The bottom 40 percent of the population experienced nearly 7 percent of annualized income growth rates, higher than the national average of about 4 percent, reducing inequality. Government spending more than doubled, from 20 percent of GDP in 2004 to 43 percent of GDP in 2014, supported by high oil prices until mid-2014.

2. The country is now facing severe external and fiscal challenges due to the significant extended fall in oil prices and the appreciation of the U.S. dollar. Since mid-2014, Ecuador has lost almost half of its merchandise export income due to the decline in oil prices. Oil revenues averaged 13.2 percent of GDP between 2011 and 2014 and one-third of total fiscal revenues. The fall in oil and other commodity prices on global markets has opened broad macroeconomic imbalances and exposed Ecuador’s pre-existing vulnerabilities. As a fully dollarized economy with limited savings from the boom years, Ecuador cannot soften adjustment via a nominal depreciation or a drawdown of macroeconomic buffers. The strengthening of the U.S. dollar and the major currency depreciations in neighboring trading partners also place pressures on external competitiveness. Furthermore, access to foreign borrowing has become more limited. Consequently, the burden of the adjustment falls on fiscal and income policies.

3. Stagnating private investment, among which low Foreign Direct Investment (FDI), did not follow the public sector expansion. In fact, it seems that public investment occurred at the expense of private investment. Private investment declined from a peak of 16.6 percent of GDP in 2006 to 14.1 percent in 2015. The inward FDI stock has stagnated since 1995 at 16 percent of GDP. Inward FDI flows have been below 1 percent of GDP almost every year since 2006, among the lowest levels in LCR. Since 2011, more than 40 percent of Ecuador’s FDI flows went to oil and mining, capital-intensive sectors with weak links to the rest of the economy, limiting prospects for diversification. The domestic market is too small to attract market-seeking FDI; and low productivity gains relative to the increase in wages, trade costs, and investment climate factors hamper Ecuador’s capacity to attract and retain efficiency-seeking FDI.

4. Increasing productivity through innovation and diversification is urgent and critical for economic growth in Ecuador. This recent macroeconomic and external context has created the need for improvements in private sector competitiveness to foster private investment, which will require productivity gains. Total Factor Productivity in Ecuador has explained less than one-fifth of the GDP growth since the 1970s, one of the lowest ratios in Latin America. In contrast with other countries in the region, Ecuador’s services contributed less than industry to labor productivity growth between 2001 and 2011. The level and growth of services labor productivity remain below the LCR average. In light of the challenging macroeconomic environment and structural vulnerabilities, this report focuses on achieving productivity improvements through innovation and diversification into higher-value-added products and services.

5. The transformation of the productive matrix has been a policy priority of the Ecuadorian government over the past seven years. From 2010 to 2013, the Coordinating MCPEC led the
preparation of “Productive Territorial Transformation Agendas.” These aimed, among other things, to improve productivity, the quality of national production, and to diversify products and services with increased value-added, in particular for export. Then, in 2014, the Vice President’s Office published the flagship report called the “National Strategy for the Change of the Productive Matrix,” which is the seminal policy statement and vision for economic diversification during the second term of President Correa. In 2015, Bain & Company produced the “Ecuador Productivo 2025” document, which analyzed productive chains in agricultural, agro-forestry, fishing industries, and intermediate industries and presented investment strategies for their growth. In 2014, the Economic Commission for Latin America and the Caribbean (ECLAC) undertook studies on the tourism, software, cocoa, shrimp, capital goods, medicine for human consumption, and solid waste value chains for the Vice President’s Office. Finally, in 2016, the President approved—and the government adopted—an industrial policy the Ministry of Industry and Productivity (MIPRO) had prepared.

6. This report builds on previous World Bank Group studies that have identified significant gaps in productivity, knowledge-intensive business services, and regulation. Previous WBG studies have demonstrated the productivity struggle in Ecuador. Ferro, Iacovone, et al. (2013) found that productivity can be up to 300 times higher in Chile than in Ecuador in some sectors. Moreover, the highest rates of firm entry in Ecuador are in low value-added sectors (such as retail). Finally, most businesses grow slowly and remain small, with limited innovation. The impact of the 2009 global trade collapse on Ecuadorian exports and the decrease in the number of products exported since the mid-2000s (Rekas, 2015) are further evidence of poor business performance and competitiveness. Rekas also highlighted the essential drivers of private sector development issues in Ecuador, including exports and integration into global value chains, knowledge-related constraints (innovation and managerial skills), access to finance, and the investment climate. Previous WBG work on services (Rubalcaba et al., 2015, 2016) has shown that knowledge and technology can contribute to the growth of Ecuadorian companies through knowledge-intensive services (KIBS). KIBS are powerful productivity drivers in the country but face constraints both in demand (too little use) and in supply (few providers and poor quality). The Investment Climate Reform Memorandum for Ecuador (Franco-Temple and Victor, 2015) documents major obstacles and regulations affecting the investment climate, which is another limiting factor to innovation.

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4 Previous studies have shown that the export growth of innovation-intensive industries across a variety of countries is faster relative to the export growth of other industries in countries with stronger economic institutions and better investment climate (EBRD Transition Report 2014, Chapter 2).
7. **Scope of this study.** This Executive Summary complements previous WBG works by providing a better understanding of how innovation and value chain development\(^5\) can contribute to productivity growth. It presents findings and policy options from the “Innovation in Ecuadorian sectors for productivity growth” and the “Competitive Reinforcement of Value Chains” reports, both produced under the non-lending technical assistance for the Government of Ecuador (see reports for more information). The first report on value chains presents 12 sectors identified by MIPRO using a cluster screening methodology—textiles and apparel; furniture and wood products; cocoa; coffee; fish; palm; meat products; dairy; fresh fruit; fresh vegetables; conserved fruit and vegetable; and banana and plantain. The report highlights the importance of strategic analysis (e.g. five forces analysis; segment analysis) in order to determine how value is distributed along the value chain and uses the example of the coffee sector to illustrate this. It also discusses opportunities for Ecuadorian firms to upgrade into high value-added agricultural value chains; the different types of public and private investments needed to support firms and then presents cluster development program, as one tool that can be used by the public sector to spur competitiveness and innovation among firms. The second report on innovation uses the same 12 sectors identified by MIPRO but also analyzes the software and consultancy sectors to complement previous WBG work on services. The work is partly based on existing statistics and partly based on fieldwork in Ecuador. Firms, chambers of commerce, associations, and policy makers all provided essential input to this work. The work on innovation shows the main gaps between Ecuador’s innovation performance vis-à-vis regional peers, the different innovative profiles of each major Ecuadorian sector and the overall positive impact of innovation activities, such as ICT and not only research and development, on productivity growth. It also highlights the positive and robust relationship between different types of firm-level innovation and productivity in Ecuador and examines potential causes for the innovation paradox in the country (high public expenditure on R&D and innovation, but little innovation activity and outcomes reported by firms). The innovation work focuses on sectoral barriers to derive policy implications for addressing innovation barriers. The value chain development work highlights the 12 sectors MIPRO identified in a screening exercise in 2016 and then goes on to discuss how the public sector can support firms in clusters to overcome coordination failures and, among other things, integrate into global value chains (GVCs). It highlights lessons learned from previous Cluster Development Programs (CDPs) in other countries and discusses how Ecuador could upgrade into higher-value-added agricultural GVCs (because of its natural competitive advantage in agriculture), which could be an important part of Ecuador’s diversification strategy. The innovation work integrates with the value chains work, because both are synergetic ways of business development: value chain clusters create the right business framework for correctly diagnosing and addressing innovation needs. The report ends with policy options for MIPRO and related Ecuadorian institutions.

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\(^5\) At the national level, we use the term “sector.” At the local level, we use “cluster” and “value chain” interchangeably (e.g., cluster development would be the same as value chain development).
II. Innovation for productivity growth

A. Impacts of innovation on productivity

8. Applying econometric techniques to the national innovation survey data elucidates Ecuadorian innovation within firms and its effects on firm productivity. This section of the report uses data from the 2013 national innovation survey covering 2,808 manufacturing and services firms. The background report describes the detailed features of the econometric model.

9. All types of investment in innovation by firms in Ecuador produce innovation, which in turn leads to significant and sizable increases in firm-level labor productivity. Investments in all three innovation inputs (R&D, ICT, and non-ICT) increases productivity. However, R&D-derived innovation has the strongest effects.

10. ICT drives innovation in Ecuador. The econometric model demonstrates that Ecuadorian firms’ adoption of ICT increases productivity substantially. ICT also plays vital roles not only in facilitating innovation but also in driving innovation independent of R&D. In addition, within services firms, ICT drives more technological innovation than R&D does. Moreover, companies can adopt ICT independently; compared to R&D, adopting ICT depends less on collaborating with other firms and innovation organizations. Finally, (due to economies of scale), large enterprises are more likely to invest in R&D, ICT, and non-ICT activities.

11. Cooperation with other firms and innovation agents is also important both for innovation and for strengthening its impact on productivity. Firm-level cooperation in R&D activities consistently and strongly correlates with more firms investing in innovation and higher R&D expenditure overall. This association indicates that public policies should aim at alleviating information gaps and encouraging the establishment of innovation networks of firms (both domestic and foreign), R&D outfits and research centers, laboratories, and other relevant players.

12. The quality of human capital and the availability of information about innovation activities and programs—both public and private—boost firm-level innovation expenditure and performance. So do better intellectual property rights (IPR) regulations in the form of patent and other protections as well as more competitive markets in which firms operate. The significance of human capital for both generating innovation and boosting productivity is robust to different specifications of the model. Equally, the absence of qualified technical and managerial skills within firms reduces the likelihood of innovation. Among the barriers to innovation, Ecuadorian firms perceive only market barriers as affecting innovation outcomes negatively. Firms’ emphasis on market barriers to innovation suggests that competition policy could be a tool not only to open up markets and resolve failures but also to spur innovation.

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6 The 2015 sectoral data were not available at the time of writing.
7 Detailed results are included in Rubalcaba, L., Slavova, Kim, Merino, Franco, Victor (2017) “Innovation in Ecuadorian sectors for productivity growth,” World Bank Group and are based on a classic augmented CDM (Crepon, Duguet and Mairesse approach, 1998), econometric model for evaluation of firm innovation in productivity.
B. Critical data and challenges for R&D and innovation in Ecuador

13. Ecuadorian performance in innovation is rather modest according to international indicators and is especially weak for business innovation-related performance indicators. According to the 2016 Global Innovation Index (GII), Ecuador ranks 100 out of 128 countries, among the lowest of countries in LCR, placing them way behind the regional leaders, Chile and Costa Rica, and also behind its neighbors, Colombia and Peru. Ecuador’s low position in this ranking is due to its medium or low performance in three main business innovation pillars in the index: market sophistication (rank 82 of 128), business sophistication (103), and knowledge & technology outputs (118). Therefore, innovation is important for Ecuador, but the country is underperforming, and the situation did not improve between 2011 and 2016 (Figure 1). The Global Competitiveness Report (GCR) Innovation pillar gives Ecuador a better ranking, near the LCR average, explained by the type of survey the GCR undertakes and the sensitivity of its results to R&D indicators. Other innovation performance indicators in which the country has had no significant relative gains include intellectual property trade (small and negative balance) and patents (annual growth rate of 10% for the period 2004-2013 vs. 22% in Colombia and 27% in Chile).

Figure 1. Ecuador and comparators in the GII

![Global Innovation Index](https://www.globalinnovationindex.org/)


14. This low business innovation performance contrasts with the fact that public spending in R&D has increased about five times between 2003 and 2013. In 2003, Ecuador was one of the LCR countries with the lowest rates of R&D investment (0.07% of GDP vs. 0.56% in LCR); however, between 2003 and 2013, Ecuador increased its spending on R&D to 0.35% of its GDP. A significant part of the R&D growth in Ecuador can be attributed to public investment in researchers, translating into a rapid increase in the number of scientific publications (2.5 times more in 2013 compared to 2003), allowing Ecuador to reach the LCR average on this indicator. However, the increase in R&D has not been enough to improve Ecuador’s innovation rankings measured by the GII. Ecuador has not gained relative to other similar economies, remaining more or less in the same position since 2012, as shown in Figure 1.
15. The fact that public spending on R&D has risen fivefold over the period 2003-2013, with no relative improvement in Ecuador’s standing vis-à-vis other countries, suggests that government investment in R&D is less effective at generating innovation and productivity gains than private investment in R&D. (Similar studies in ECA countries, for example, corroborate this fact.) In other words, government investment in R&D does lead to more publications and patents, but due to less collaboration between research institutes, universities, and industry, may not necessarily lead to more firm-level innovation and gains in productivity. Similar studies for ECA countries have shown that, while both government and business investment in R&D increase patent registrations, only private sector R&D raises the innovation intensity of exports.

![Figure 2. Spending on R&D as % of GDP (2003 and 2013)](image)

Source: RICYT, UIS UNESCO, and MSTI OECD.
Note: Data for Chile (2007-2013), Ecuador (2003-2011), and Bolivia (2002-2010) refer to different periods.

16. The low impact of public R&D spending on business innovation indicators is due in part to the minor role and declining share of private R&D in Ecuador: the private sector is not the engine of the Ecuadorian innovation system. The business sector in Ecuador contributed about 1% to R&D funding in 2011 (down from 9% in 2008, and 18% in 2003), while the LCR average accounted for around 40% in the same years. The drop in Ecuador is related to both the lack of collaborative public-private R&D policies (public investments have not pushed private ones), and to the innovation struggles in the private sector (the small size of firms and lack of capabilities, internationalization and investment climate). As it is normally the case all over the world, business innovation in Ecuador also concentrates on exports rather than domestic markets, so sectors with higher competitive exposure in the global markets are closer to the innovation frontier. However, the opposite is not true in Ecuador: some exporting industries are not very innovation-oriented since their competitive advantage is mainly cost and they do not need to innovate to sell abroad, even if the commodities crisis has alerted them to the risk associated with the cost-based strategy. That means that some companies operating in international markets try to be more innovative, but this is the exception rather than the rule. The private sector is not a principal actor in the Ecuadorian science and technology system. Instead, it is heavily oriented
toward the public sector (minor role of the private sector), supply-driven (as opposed to demand-driven) and science-based (rather than business innovation based), which contrasts with the characteristics of best innovation systems in the world.

Figure 3. GERD – financed by business enterprise %

Source: RICYT, UIS UNESCO, and MSTI OECD.

17. The small share of private R&D is not due to the number of self-declared innovative companies in Ecuador (which is high, according to the national innovation survey, NIS), but rather to the quality and ambition of their innovations. According to the NIS 2013 (by INEC, the National Statistical Institute of Ecuador), innovative Ecuadorian companies comprised about 58% of all businesses, higher than the European Union average, which is about 50%, and also higher than Chile in most economic sectors. However, Ecuador’s low engagement in R&D (1% on engagement in R&D) and its poor performance on the GII and other indicators (such as patents or royalties trade) suggest that many companies innovate, but with limited investment and limited impact. The NIS shows that Ecuadorian innovation mostly happens within firm processes (innovations are mostly new to the firm but not new to the market or the country), is incremental, and is not radical. What is more, problems related to technology transfer, absorption, and adoption also exist, although the NIS can not appropriately capture them. (Innovation surveys are useful for approaching technological innovations but not for providing good metrics on technology and knowledge adoption and absorption.)

C. Barriers to innovation in Ecuador

18. The main obstacles to innovation according to Ecuadorian firms relate to the cost of innovation and access to financing, so this is a critical constraint in the country. The primary
results of the study\(^8\) indicate that cost and access to financing are the most significant barriers (Figure 4), while market information, skills, and IPR issues are relatively minor.\(^9\) As with the national data, the most significant obstacles to innovation are innovation costs and availability of internal and external financing. Still, according to responses of surveyed firms within the identified sectors, innovation funding programs do not seem to have a significant impact. Most of these companies report small or non-existent effects of the R&D policies on their business innovation, which is at odds with some positive experiences that have benefitted some innovative private businesses. Among knowledge obstacles, factors that are especially relevant for innovation—like employee qualification and availability of technology—generally received little consideration. In contrast, firms consider lack of market information and lack of innovation partners more important. The “all-purposing” (“todólogo”) culture (the same workers doing everything with no specialization) is present in Ecuadoran companies affecting innovation activities, which partly explains the low development of KIBS and the limited use of collaboration and external sources for innovation across all sectors.

\(^8\) Based on the NIS data for the innovation profile of 59 industrial and services sectors with comparable, self-reported data based on the National Survey of Innovation Activities 2013.

\(^9\) Ecuador’s weak innovation culture impacts results on perception of barriers, but this affects international comparisons more than inter-sectoral comparisons inside Ecuador. Results on barriers are consistent but biased by the kind of self-reported data by firms, so the perception of barriers varies by sector and by international benchmarking, due in part to each country or industry’s culture of innovation. For example, companies in more innovative countries like Chile give much more importance to innovation barriers than Ecuadorian companies do—between two and four times more companies in Chile than in Ecuador, depending on the sector and type of barrier. However it is unrealistic to assume barriers are less harmful in Ecuador than in Chile. Therefore, this suggests there are perception biases related to the lack of an innovation culture in many Ecuadorian sectors. Nevertheless, this bias seems not be significantly affecting inter-sectoral differences. Meetings with stakeholders in Ecuador have confirmed that the data from the national innovation survey are right in general terms. In short, the lack of innovation culture in Ecuador leads to some misperceptions about barriers, but even so, cost and access to finance factors are major constraints in Ecuador.
19. **The findings on the main barriers to innovation should be interpreted with caution.** The univariate results, shown in Figure 4, are at odds with the conclusions of the CDM econometric model in the report. In fact, the model finds that both human capital and IPR protection, which rank low on the scale in Figure 4, are major drivers for the decision to invest in innovation and the intensity of this investment. Access to finance issues are also less of a problem in the recursive estimation model – in fact, cost barriers appear positively correlated with innovation outcomes in most of the equations. As mentioned in the previous paragraph, cost barriers are also at odds with the fact that firms can apply to various public support programs for innovation. These results need further analysis and a detailed review of access to finance issues and how they affect Ecuadorian companies in different sectors and industries.

20. **The importance of barriers to innovation varies across Ecuadorian firms, depending on the sector.** Table 5 reports innovation barriers affecting selected sectors and the Ecuadorian economy as a whole. Manufacturing industries such as wood and textiles indicate that obstacles are more important than agroindustry sectors. High innovation costs are the most significant innovation barrier in the country, particularly for wooden furniture and professional services, less than the national average for the agroindustry sector. Information on technology is a relevant problem for the wood industry and professional services, but not that much for textiles of software. Among the sectors in the table, the textiles industry faces greater problems finding qualified employees for innovation. Therefore, different sectors have distinct innovation profiles and unique issues to solve.
### Table 1. Barriers affecting innovation in selected Ecuadorian sectors (% of affected firms)

(in bold and red, cases where importance is 50% higher than the total national)

<table>
<thead>
<tr>
<th></th>
<th>Total Survey</th>
<th>Agro-industry</th>
<th>Textiles</th>
<th>Wooden Furniture</th>
<th>Professional Services</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>High innovation costs</td>
<td>23.5</td>
<td>22.8</td>
<td>20.0</td>
<td><strong>40.9</strong></td>
<td>34.5</td>
<td>21.9</td>
</tr>
<tr>
<td>Lack of financial resources within the firm</td>
<td>15.9</td>
<td>11.4</td>
<td><strong>30.0</strong></td>
<td>33.3</td>
<td>20.1</td>
<td>17.1</td>
</tr>
<tr>
<td>Established firms dominating markets</td>
<td>13.0</td>
<td><strong>20.3</strong></td>
<td>15.0</td>
<td>28.8</td>
<td>20.1</td>
<td>10.5</td>
</tr>
<tr>
<td>Lack of financial sources from external sources</td>
<td>12.9</td>
<td><strong>19.0</strong></td>
<td>25.0</td>
<td>21.2</td>
<td>18.6</td>
<td>15.2</td>
</tr>
<tr>
<td>Uncertainty of demand for innovative products</td>
<td>11.0</td>
<td>12.7</td>
<td><strong>20.0</strong></td>
<td>16.7</td>
<td>21.6</td>
<td>12.4</td>
</tr>
<tr>
<td>No need for innovation due to previous innovations introduced by the firm</td>
<td>10.9</td>
<td>6.3</td>
<td>5.0</td>
<td>0.0</td>
<td>9.3</td>
<td>12.4</td>
</tr>
<tr>
<td>Lack of information on technology</td>
<td>10.4</td>
<td><strong>10.1</strong></td>
<td>5.0</td>
<td><strong>19.7</strong></td>
<td><strong>23.7</strong></td>
<td>5.7</td>
</tr>
<tr>
<td>Difficult to find partners for collaborating</td>
<td>9.3</td>
<td>11.4</td>
<td><strong>25.0</strong></td>
<td>13.6</td>
<td><strong>16.5</strong></td>
<td>8.6</td>
</tr>
<tr>
<td>Lack of information on markets</td>
<td>9.1</td>
<td>11.4</td>
<td><strong>20.0</strong></td>
<td>16.7</td>
<td><strong>20.6</strong></td>
<td>7.6</td>
</tr>
<tr>
<td>Lack of qualified employees within the country</td>
<td>8.6</td>
<td>3.8</td>
<td><strong>25.0</strong></td>
<td>12.1</td>
<td><strong>19.1</strong></td>
<td>10.5</td>
</tr>
<tr>
<td>Lack of qualified employees within firms</td>
<td>8.8</td>
<td>7.6</td>
<td>10.0</td>
<td><strong>16.7</strong></td>
<td><strong>20.6</strong></td>
<td>5.7</td>
</tr>
<tr>
<td>No need of innovation due to lack of demand</td>
<td>7.0</td>
<td>3.8</td>
<td>0.0</td>
<td>0.0</td>
<td>7.2</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Source: Based on the national innovation survey, 2013

21. **There are some sectoral differences in the importance of barriers to innovation, but the barriers reported by the NIS do not necessarily determine innovation outcomes.** Ecuador should also pay attention to obstacles that are not in the official data. The report has grouped sectors based on innovation outcomes and constraints according to their importance for innovation (Table 2). Some innovative industries may face more obstacles than less innovative ones and vice-versa, and the importance of specific barriers may not directly correlate with the impacts of innovation on sales and exports\(^{10}\). Some sectors not profoundly affected by barriers are relatively innovative and oriented to exports (e.g. agroindustry). Conversely, other innovative industries (such as furniture) suffer from substantial obstacles that do not impede the transmission of positive impacts from innovation into their local sales and international exports. Barriers not included in the survey, such as poor innovation culture, lack of technology transfer, or non-conducive investment climate, may play a more significant role in explaining the low innovation performance at the sector level than those barriers included in the survey.

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\(^{10}\) Econometric results show non-significant relationships between most barriers and effects on domestic and foreign sales, with a few exceptions: access to financial markets affects domestic sales, and access to information on foreign makers affects exports.
Table 2. Clustering of Ecuadorian sectors affected by barriers, innovation outcomes, and impact outcomes—number of sectors in each cluster and the place of agroindustry and furniture (examples) (total sectors = 59; NIS, 2103)

<table>
<thead>
<tr>
<th>Outcome degree</th>
<th>Low importance of barriers</th>
<th>High importance of barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological innovation</td>
<td>High</td>
<td>32 (incl. Agroindustry)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>17</td>
</tr>
<tr>
<td>Non-technological innovation</td>
<td>High</td>
<td>31 (incl. Agroindustry)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>19</td>
</tr>
<tr>
<td>Product innovation for the market</td>
<td>High</td>
<td>14 (incl. Agroindustry)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>35</td>
</tr>
<tr>
<td>Process innovation for the market</td>
<td>High</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>42 (incl. Agroindustry)</td>
</tr>
<tr>
<td>Impacts on sales in national markets</td>
<td>High</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>20 (incl. Agroindustry)</td>
</tr>
<tr>
<td>Impacts on exports in national markets</td>
<td>High</td>
<td>11 (incl. Agroindustry)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>37</td>
</tr>
</tbody>
</table>

Source: National innovation survey, 2013

22. Regulatory and investment climate barriers are important because they affect the ex-ante profitability of spending on R&D or ICT and thus influence the firm’s decision about whether to invest in innovation. While the national innovation survey data does not allow a detailed analysis of the investment climate and implementation gaps challenges to firm innovation, it hints that some of its features, such as competition or lack thereof in the market and the quality of IPR regulation and protection, have direct negative impacts on innovation. Furthermore, the regulatory framework at the national and subnational levels may affect firms in different localities and sectors differently. For Ecuador, dealing with some important regulatory challenges, such as intellectual property regimes and competition policy, rent-seeking practices and weaknesses in the governance and rule-of-law systems could provide better incentives for firms to innovate. While the NIS data does not provide a clear-cut or exhaustive nomenclature of the investment and regulatory problems in Ecuador, the analysis of Enterprise Survey data for Ecuador and other countries point to innovative firms being potentially more affected by a poor investment climate.
III. Reinforcement of value chains for enhanced productivity, innovation, and competitiveness

23. Using a cluster screening methodology, MIPRO identified 12 sectors (derived from the 2016 Industrial Policy) that Ecuador could support to become more innovative and competitive. The main criteria used by MIPRO in the screening exercise were employment, export levels, critical mass of firms per province, and level of innovation. The 12 sectors identified are: Textiles and apparel; furniture and wood products; cocoa; coffee; fish; palm; meat products; dairy; fresh fruit; Fresh vegetables; conserved fruit and vegetable; and banana and plantain. The strong representation of agro-industrial sectors among the 12 sectors, points to Latin America’s (and Ecuador’s) natural competitive advantage in agriculture due to its water and land resources. Latin America has approximately 28% of the potential new arable land (second only to Sub-Saharan Africa) and holds the highest share of renewable water resources (World Bank Group, 2013). Figure 5 below presents a cluster mapping of these 12 sectors.

![Cluster mapping of 12 sectors identified by MIPRO](image)

Source: author’s elaboration

24. Recent value chain studies in Ecuador have not shown how value is distributed along the value chain nor prioritized poverty reduction. The absence of clusters in prioritized value chains in the eastern region of the country, from Sucumbíos all the way down to Zamora

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11 MIPRO did not include KIBS to avoid duplicating the Action Plan for KIBS developed for MIPRO in 2015. MIPRO did not select other services, like logistics, because of their horizontal nature and the fact that they are more likely to be parts of other value chains rather than constituting value chains in themselves.
Chinchipe, is notable Figure 5. This heterogeneity does not mean that MIPRO cannot undertake initiatives to reinforce clusters in these provinces. If desired, cluster screening can include government priorities or regional development strategies, such as targeting the provinces with the highest poverty levels.\textsuperscript{12} In Ecuador, the highest poverty rates are in Napo, Chimborazo, and Morona Santiago, followed by Sucumbíos, Orellana, Pastaza, Zamora Chinchipe, Esmeraldas, Bolivar, and Cotopaxi. These provinces also tend to have high inequality. The 2010 Productive Territorial Transformation Agendas (ATPT) revealed existing businesses in the eastern provinces, including essential oils/natural cosmetics and tourism in Napo, essential oils/natural cosmetics in Orellana, and ten different companies in Morona Santiago. The businesses in Morona Santiago included dairy products, Amazonian fruit pulp, meat products, wood furniture, wood for construction, and tourism. Recent value chain studies stop short of showing the distribution of value along the country’s value chain. Value chain analysis/programs can focus on poverty reduction by targeting initiatives in the poorest regions.

\textbf{25. The five forces analysis can be used to determine how attractive a market segment is, based on its profitability and who retains the margin.} In other words, it shows the distribution of value along the value chain. This framework also allows demonstrating where an industry creates and captures value. This analysis varies from one segment to another within the same industry. For example, the coffee industry has several segments related to consumption of caffeine (i.e. commercial coffee) and other segments related to consumption for flavor (i.e. specialty coffee). Ecuador competes in the instant coffee market segment (one of the consumption for caffeine segments). Five industry giants control approximately 50\% of the market for commercial coffee. These are Nestle, Kraft, Procter and Gamble, Sara Lee and Tchibo. These companies are large, multinationals with strong negotiating power. As such, the bargaining power of buyers is strong in comparison with the coffee producers in the countries or regions where the coffee grows. Therefore, the five industry giants will retain most of the profit (“value”) of this business, not the coffee growers. By comparison, coffee shops sell specialty coffee to consumers seeking flavor and experience. The barriers to entry are relatively high because there are investments in equipment and expertise to open a coffee shop. As such, this is a positive force for the attractiveness of this segment. There are no substitute products; as such, this force has a positive effect on the attractiveness of this segment. Because this is a high-quality product and there are no substitutes, there is a lot of margin in this segment. There are many fewer producers in this segment, so rivalry is weak. The negotiating power of suppliers is low, and the buyers are shrewd consumers ready to pay the high price for the product. As such, the margins are better distributed in this segment, which is to the advantage of the coffee growers.

\textbf{26. Integrating into GVCs in which Ecuadorian firms can add the most value, can increase firms’ value of exports, employment, learning, and technology spillovers.} There are three specific areas that Ecuador’s private sector would need to improve to increase exports and integration into GVCs:

\textsuperscript{12} See 2014 Poverty and Inequality Map by Consumer, by the national Statistics and Census Institute (INEC) and the World Bank Group.
A. One is market information on demand in end markets, including on market trends, the characteristics of products demanded in end markets, the types of technology employed to produce such products, and the level of quality required – is not reaching Ecuadorian firms.

B. A second is that coordination and inter-firm linkages: coordination failures hamper agglomerations economies and can lead to suboptimal allocation of resources if not properly addressed by policy interventions. Types of coordination failures include weak inter-firm linkages, poor resource allocation/investment choices, inefficient local labor markets, and poor knowledge diffusion and innovation. Although enterprise agglomerations often arise naturally, and linkages already exist, they are often not sufficiently structured, and firms fail to exploit their full potential beyond the realization of market transactions. Public intervention can strengthen inter-firm linkages, exchange of information and the development of a shared diagnosis of problems affecting the sector, the coordination of firms’ and organizations’ actions and the identification of the essential public and collective inputs, and sometimes the provision of these inputs to improve their performance.

C. The third is that under-investment in common (cluster-level) facilities and services to enhance quality. Coordination failures and externalities drive this under-investment, making the investment decision of one agent interrelated to those of others. Many investments to improve quality take the form of common or cluster-level interventions. Examples include cold chain equipment, logistics centers or services (such as joint facilities for washing or drying coffee or cocoa beans), traceability systems, testing laboratories, design centers, joint design of packaging and labeling appropriate for foreign markets.

27. **CDPs are public interventions that foster the beneficial effects of agglomeration economies by creating a set of incentives to overcome coordination failures that hamper the development of some industries in specific locations.** These coordination failures could be private-private, private-public, and public-public. Types of coordination failures include weak inter-firm linkages, poor resource allocation/investment choices, inefficient local labor markets, and poor knowledge diffusion and innovation. CDPs are “designed to improve firms’ performance through the strengthening of the firms’ network to foster coordination and allow collective actions and the provision of public and club goods” (Alfaro, 2016). CDPs first try to fix coordination failures, after which a change in resource allocation and investment is usually expected.

28. **To support value chains, the Government of Ecuador and the private sector require different combinations of public and private investment.** Certain investments, like infrastructure such as cold chains, need public or public-private investment. Others, like quality systems, testing laboratories, traceability system, require policy changes (such as improving the national quality system, including laws, policies, and relevant institutional framework). They may also require public investment for some infrastructure (such as metrology centers), public-private investment in other infrastructure (e.g. accreditation centers), and private investment for certification and testing labs. Business development services for firms (including marketing, export plans, and the design of packaging and labeling) may require that firms take out loans, or if there is a market failure, a possible matching grants facility managed by the public sector.

29. **An impact evaluation of the Arranjos Productivos Locais (APL) policy in Brazil from 2004-2009 showed increased employment of beneficiary firms by 17%, an increase in the**
value of exports by 90% and the likelihood of exporting by around eight percentage points. The APL policy followed the structure and tools of a CDP. Evaluations of CDPs consider the time dimension (short-, medium-, and long-term) and their spillover and intermediate to long-term effects. Examples of positive spillover effects can include the value of total exports and the likelihood of exporting, as found in the impact evaluation of the APLs in Brazil. These benefits seem constant or even increasing over time during the years after receiving the policy benefits (Garrone, 2016). Figure 6 illustrates the effects of CDPs. Business performance (i.e., productivity) is affected last—in the medium to long term.

**Figure 6. Effects of Cluster Development programs (CDPs)**

![Figure 6](image)

Source: Authors’ elaboration.
Notes: Network density is the number of actors (“nodes” in a network); network intensity is the value and relevance of linkages.

30. Because Ecuador has a natural competitive advantage in agriculture, economic diversification should focus on integrating into higher value-added agricultural value chains. Strategies for integrating into agricultural GVCs can occur through functional, product, or process improvement (Ahmed and Hamrick, 2016). However, higher-value-added GVCs are complex and require upgrading, productivity improvements, technology adoption, certification, and standardization. While Ecuador has the necessary elements of a National Quality Infrastructure (NQI) to support the private sector, gaps still exist. The two most important NQI bodies are the Servicio Ecuatoriana de Normalización (INEN) and the Servicio de Acreditación Ecuatoriano (SAE). The recent industrial policy stated that Ecuador lacks the NQI to support industries: local quality infrastructure for obtaining certifications supports only a third of products. Firms must send the rest outside Ecuador for certifications to meet international standards, which increases costs for the firms. NQI institutions report a limited culture of quality in the private sector. So, while companies necessarily require certifications to comply with quality certifications demanded in certain markets, international experience shows the adoption of quality and continuous improvement as business practices benefits productivity revenues and growth.
IV. Policy options

31. Ecuador needs to address its macroeconomic situation but should focus on a number of microeconomic constraints at the same time. Only coordinated action on the two fronts would result in a sustainable recovery and, most important, on the employment generation and recovery of incomes that Ecuador needs to continue to make strides on poverty reduction. Macroeconomic constraints to be addressed include the uncertainties related to the fiscal situation (including future tax hikes) and the external sector (whether rationing of foreign exchange rather than an “internal” devaluation would address the significant deterioration of the balance of payment). All fall outside the scope of this report. As such, the innovation and value chains reports focus only on microeconomic constraints on private investments and innovation (the recent Country Economic Memorandum\(^\text{13}\) deals with macroeconomic issues).

32. The diagnosis in this report leads to policy options to improve innovation through horizontal and cluster development policies in Ecuador, including the following:

A. Structural reforms affecting innovation and value chains development should go hand in hand with macroeconomic stability, sustainability policies, and private investment mobilization. Implementing a public expenditure rationalization and a revenue mobilization strategy more resilient to external shocks is a priority. Leveraging private investment is critical to activate the recovery process. In particular, facilitating the rapid reallocation of resources in the economy from firms and sectors that are no longer viable toward new ventures is needed, which implies lifting barriers to firm entry and exit. It also requires enabling a better investment climate for FDI, implementing pro-competition policies and reducing tariff and non-tariff barriers to trade.

B. There is an urgent need for private sector engagement and involvement, for which collaborative public-private R&D and innovation policies can be useful channels. The private sector plays a very limited role of in the national science and technology system (e.g. only 1% private of total R&D funding, one of the lowest in the region). R&D policies in Ecuador have been too oriented toward the public sector, and there is a need to bring the private sector on board for the design and implication of innovation policies.

C. Some concrete examples of how to achieve this goal are:

- collaborative R&D schemes that link public R&D funding to the participation of firms (It is important to reduce the distance between academia, the government, and the private sector to make significant advances in R&D investment)
- moving forward of existing proposal from the private sector (like the one the textile industry promoted jointly with a North Carolina university in the US and Yachai)
- follow up of discontinued collaborative projects (such as the plastics lab at ESPOL)

• participation of business people (or their representatives) in the selection committees for R&D programs
• the involvement of professional associations, chambers of commerce in the managerial structure and funding of technological centers and research institutes
• open and social innovation initiatives, such as innovation awards, to bring the private sector together with the third sector, NGOs, and the public sector to design R&D and innovation programs and disseminate an innovation culture in the country

D. Finally, benchmarking programs could encourage public-private R&D cooperation and sharing of successful international experiences. These possible actions for R&D policies can also extend to the full range of innovation policies beyond R&D. For example, Colombia’s Colosciencias program to support university-private sector innovation work and the World Bank program for technology extension could be of particular interest for Ecuador.

33. Shift toward a more demand-driven model based on collaborative innovation policies. The limited role of the private sector in the innovation system is due to the dominance of an STC system that is too public sector oriented, leading to a top-down, supply-driven and R&D driven model. Modern innovation policies are much more demand based and try to adapt to the local productive endowments and potentialities giving a lead role to local actors (private sector, third sector, local communities, and final users). Ecuador can orient innovation policies toward demand through programs promoting collaboration and co-innovations between different actors (e.g. through clusters and innovation networks). Collaboration for innovation, when it exists, is a factor for obtaining positive impacts on productivity, as shown by both econometric results from existent quantitative data and evaluations of the effects of CDPs. Despite the evidence showing this to be so important, the collaborative schemes in the country are marginal, indicating market coordination failures all over the country. These market coordination failures justify policy action in this field. Promoting collaboration in R&D and innovation policies is a way to convert supply-driven and top-down driven policies into policies more based on the real needs and potentiality of local producers. Another way would be to assess the managerial structure and incentive systems in the STC system, to allow more room for non-public actors in decision-making.

34. Technology extension centers are another vertical innovation policy that, together with promoting knowledge-intensive business services, could be useful in Ecuador given serious knowledge gaps about innovation barriers and potential of firms. Ecuador should consider technology extension projects as possible innovation promotion areas so firms can identify their real innovation needs and approach their potentialities. WBG work in the country (this report as well as previous reports on services) has shown that sector and value chain technology experts need specific technology diagnosis and innovation knowledge. These requirements also suggest a need to promote the use of KIBS, which is a horizontal need for all sectors of the Ecuadorian economy that offer solutions to industries or value chains (Rubalcaba et al., 2015). Extension services through public-private technology centers or platforms, KIBS-oriented, for strategic sectors, led by the private sector, can be highly relevant in the country. Ecuador could facilitate access to KIBS with matching grants, among others instruments. These would provide qualified diagnosis of technological and knowledge needs, appropriate business plans and effective solution implementations. (The so-called “extensionist” would play a fundamental role in these actions.) International experiences supported by the World Bank Group on technology extension programs,
35. **The government can play a catalytic role in improving firms’ ability to integrate into GVCs and innovate, through CDPs.** The documented benefits of CDPs include improved resource allocation and investments, business practices and technologies, and finally the business performance of firms. A Government of Ecuador program may support value chains where the opportunity is highest to promote backward linkages of shared facilities, equipment, and services, with a requirement for counterpart funding. Examples of possible needs include cold chain equipment; logistics centers or services; traceability systems; testing laboratories; design centers; joint design of packaging and labeling appropriate for foreign markets (World Bank Group, 2015). Successful CDPs that the Government of Ecuador can look to include Colombia’s *Impulsa/Rutas Competitivas* program and Austria’s “Cluster UpperAustria” program.

36. **Upgrading to higher value-added agricultural GVCs would allow Ecuador to increase diversification and exports, but efforts are needed to improve the National Quality Infrastructure (NQI).** To pursue upgrading strategies, particularly in agricultural GVCs, the public sector could support Ecuadorian firms by taking actions to improve the NQI. First, through strengthening the capacity of the country’s two NQI institutions (SAE and INEN). Second, Ecuador could improve metrology and standardization. Doing so would require building the capacity of the national metrology institute, INEN, to obtain calibration and measurement capabilities (CMCs) and develop a more market-oriented institution and strategy, and provide new equipment and technical support in new areas of measurement required for major industries. Third, Ecuador could institute matching grants and credit lines for the development of new private conformity assessment bodies. Third, Ecuador could provide more support for industry. Doing so would involve deploying extension services on quality and continuous improvement (including an awareness campaign), providing matching grants for technical assistance on quality and continuous improvement systems, and capacity building for quality and continuous improvement consultants. Fourth, Ecuador could promote a culture of quality within the private sector (beyond viewing quality as compliance). Such a culture could ultimately help help firms benefit from the other benefits of quality related to productivity, revenue, and growth. Finally, financial support to get access to certifications and accreditations may be considered within programs supporting knowledge-intensive business services.

37. **Ecuador should learn from its experiences and those of other countries to avoid repeating costly mistakes.** As well as from the Ecuadorian experience, Ecuador can learn from leading countries with successful industrial and innovation policy experience (for example, Tekes promoting user-driven innovation in Finland). The country can also learn from neighboring countries with positive experiences (such as in Chile, Colombia, and Peru), and countries with exciting cluster development initiatives in the region (like the on-going WBG project on cluster development in Haiti). Ecuador should learn lessons from programs in other nations, particularly Colombia and Peru as neighbors and Chile as a regional leader, to experiment and adapt relevant and fruitful initiatives. Of course, careful sectoral analysis must be done using international benchmarking; some success stories in one country may not work in another country if the two nations are not similar enough.
38. There have been Competitiveness Improvement Programs (“Programa de Mejora Competitiva” [PMC]) in Ecuador—one around 2011–2012, managed by MIPRO, and another more recently, run by the Ministry of Agriculture, Livestock, Aquaculture and Fishing (MAGAP). The adequate institutionalization of CDPs, implementation design, client capacity, and choosing the right local structure are necessary for the sustainability of such programs. A review of these programs should cover the results achieved and whether they were institutionalized or one-off programs. Ecuador could also quickly review more recent programs—such as Encadena at MIPRO—to see whether they could incorporate best practices from successful CDP experiences in other countries, such as Colombia (Innpulsa/Rutas Competitivas) and Austria (Clusterland UpperAustria).

39. The Government of Ecuador should undertake a review (PER) of recent innovation and industrial programs to assess their effectiveness. Ecuador has discontinued most of its public programs supporting innovation 4–8 years ago (Emprende Ecuador, Innova Ecuador, loans for technology absorption, tech labs in universities) due to budgetary constraints or because their success was questionable. Indeed, the econometric analysis in this report shows that public programs for technological innovation have not had significant impacts on productivity. This result complements previous findings that participating in innovation programs does not have significant effects on sales and exports in service companies (Rubalcaba et al., 2016). However, even in cases where the public program was not successful overall, the positive experiences of some individual cases (such as wood, fish or software) should be identified and analyzed in comparison with the non-successful experiences to build a repository of what worked what did not work in each program.

40. A PER analysis would provide important elements to learn from experience and design and prioritize future actions toward an efficient cost/benefit ratio. For example, a PER approach would be useful to assess why the massive investment in R&D is not leading into the significant results in terms of business innovation and which programs work better than others to maximize impacts. The WBG is performing PER analysis in differ countries in the region (including Colombia, Peru, and Mexico).

41. Ecuador could assess successful experiences in other competitiveness programs (like some of those from ProEcuador) to identify to what extent they positively affected innovation, for example, going beyond traditional export promotion. Impact assessments results may be useful to orient some export promotion programs, such as marketing and international business development, toward innovation. The country has a strong tradition of exporting commodities with little or no innovation and little tradition of exporting newly differentiated and innovative products in the markets. Therefore, adapting export-oriented policies like some of the ones from ProEcuador could promote synergies with innovation policies.

42. Because Ecuadorian companies identify access to finance for innovation as a critical challenge, policies to facilitate access to finance are important in Ecuador. The most

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14 See recommendations for institutionalizing CDPs in the background paper: “Competitive reinforcement of value chains in Ecuador” (Kim, 2017).
significant horizontal innovation activity highlighted in the innovation report is access to finance, (credit or otherwise). Improving access to finance would be most effective if combined with complementary funding for vertical initiatives in selected value chains. Firms in all sectors reported – both qualitatively and quantitatively- that the primary barriers to innovation are access to finance and high innovation costs. However, solutions do not need to be oriented toward new credit lines. Rather, they can address other financial actions like:

- Implementing partial guarantee systems for long-term investment, or venture capital (provided they are accompanied by risk mitigation mechanisms such as partial guarantees),
- Providing long-term credit to allow SMEs to make significant investments in innovation,
- Increasing tax deductions,
- Revising the interest rate cap policies, which currently benefit small businesses but sometimes prevent banks from lending to medium-size companies (because of limits on the fees they can charge), or,
- Providing innovation support, such as services supplied via a cluster development initiative or technology extension program. These actions may integrate, or complement, current emerging initiatives in Ecuador such as seed capital funds and the Ideas Bank promoted by Senescyt

43. **Another mechanism to reduce the cost of innovation is the provision of special fiscal treatment for skilled human capital dealing with innovation or the orientation of business development programs toward innovation.** However, Ecuador should also prioritize value chain funding schemes. The co-funding of the above-proposed initiatives on CDPs and technology extension is another way to get funding to innovation activities by sharing costs and benefit from grants facilitating knowledge and technology adoption and abortion, including training costs, market intelligence costs, and upgrading.

44. **It is also important for Ecuador to examine crosscutting regulations affecting the overall investment climate for entrepreneurs and reforms specific to innovation policy.** Ecuador’s cumbersome investment climate and regulatory burden limit innovation and value chain developments. The country’s overall performance in Doing Business and other international indicators shows room for improvement on investment climate areas, particularly in procedures to start a business, lengthy and costly insolvency regulations, and poor protection of minority shareholders. Other aspects of business operations, such as access to finance, red tape, some permits and labor skills and training, could also benefit from deep and far-reaching reforms (Country Economic Memorandum, 2015). By improving the climate for entrepreneurship, Ecuador can indirectly support its nascent innovation system through crosscutting reforms that create the right incentives for growth, innovation, and dissemination of knowledge.

45. **Apart from the need to improve its overall regulatory framework for investment climate in general, Ecuador needs to examine regulation and policy related to innovation in particular, such as IPR and labor laws.** Ecuador could ease regulations affecting international trade and FDI to promote the exchange of information across borders and easily integrate best practices from abroad. Ecuador should reform the intellectual property regime to protect inventors and their advances and strengthen the framework for competition policy. Another suggestion: the country could also examine labor laws to impart more flexibility for firms to respond to their business needs (particularly regarding short-term and outsourced workers). Finally, Ecuador could also consider financial markets and the possibility of reforming public procurement policies to
allow meet the needs of small businesses and entrepreneurs to have better access to market opportunities in government procurement.

46.

47. Table 3 presents a matrix of policy options based on the findings of this report.

<table>
<thead>
<tr>
<th>Evidence/finding</th>
<th>Policy actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Structural vulnerabilities due to low productivity and limited diversification and competitiveness</td>
<td>- Macroeconomic stability and sustainability, pro-productivity reforms, including trade openness as well as FDI attraction and retention</td>
</tr>
<tr>
<td>1. Uncertain macroeconomic context</td>
<td>- Innovation policies and cluster development policies to reduce structural vulnerabilities</td>
</tr>
<tr>
<td>2. Innovation model promoting public R&amp;D and human capital is not enough to boost business innovation performance</td>
<td>- Promote R&amp;D and innovation policy to ensure greater private sector participation. The private sector needs to be involved in the design and implementation of R&amp;D and innovation policies.</td>
</tr>
<tr>
<td>2. Very limited role of private sector in the national science and technology system (e.g. only 1% private of total R&amp;D funding, one of the lowest in the region)</td>
<td>- Public-private R&amp;D and public-private business-related innovation policies are needed</td>
</tr>
<tr>
<td>3. Limited impact of current R&amp;D policies.</td>
<td>- Shift toward a more demand-driven model based on collaborative innovation policies, such as public-private business-related innovation policies (e.g., special calls and programs to promote collaboration and cluster development)</td>
</tr>
<tr>
<td>3. Limits of the R&amp;D and supply-based innovation model with minor role of collaboration between public and private sectors</td>
<td></td>
</tr>
<tr>
<td>4. Lack of knowledge-intensive business service (KIBS) to facilitate innovation</td>
<td>- Technology extension services to facilitate diagnostics and the use of KIBS, including matching grant schemes</td>
</tr>
<tr>
<td>5. Many recent innovation programs have been terminated due to budgetary constraints or because their success was questionable</td>
<td>- Undertake a review or evaluation (e.g. Public Expenditure Review) of recent innovation and industrial programs to assess their effectiveness and outcomes</td>
</tr>
<tr>
<td>6. A value chains approach can show how value is distributed along the value chain nor prioritized poverty reduction</td>
<td>- Prioritize strategic analysis when undertaking value chains programs, to understand where value is created and who is capturing it</td>
</tr>
<tr>
<td>7. Evaluations of CDPs have shown increased employment of beneficiary firms, an increase in the value of exports, and the likelihood of exporting</td>
<td>- Consider Cluster Development programs as a policy for increasing employment and exports, but ensure design and institutionalization are sustainable and not one-off programs</td>
</tr>
</tbody>
</table>

15 These policy actions include institutional dimensions not in this table.
<table>
<thead>
<tr>
<th></th>
<th>MIPRO and MAGAP have implemented cluster improvement programs, but their effectiveness and outcomes are unknown</th>
<th>Assessment of past cluster programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Because Ecuador has a natural competitive advantage in agriculture, economic diversification should focus on integrating into higher value-added agricultural value chains</td>
<td>For Ecuadorian firms to compete in higher-value-added GVCs, they will require upgrading, productivity improvements, technology adoption, certification, and standardization.</td>
</tr>
<tr>
<td></td>
<td>There are gaps in the National Quality Infrastructure (NQI), in particular in terms of metrology, conformity assessment and awareness raising.</td>
<td>The public sector could support the Ecuadorian firms to integrate in higher-value-added agricultural GVCs by strengthening the National Quality Infrastructure (NQI). Specifically: (i) metrology and standardization: building the capacity of the national metrology institute, INEN, to obtain more Calibration and Measurement Capabilities (CMCs); build the capacity of INEN to develop a more market-oriented institution and strategy; new equipment and technical support in new areas of measurement required for key industries; (ii) Conformity assessment: matching grants and credit lines for the development of new private conformity assessment bodies; and (iii) Industry: Extension services on quality and continuous improvements, including an awareness campaign; matching grants for technical assistance on quality and continuous improvement systems; and, capacity building for quality and continuous improvement consultants.</td>
</tr>
<tr>
<td>9</td>
<td>Companies declare access to finance as the most important constraint to innovation</td>
<td>Implementing partial guarantee systems for long-term investment, or venture capital, provided they are linked to risk-sharing mechanisms, providing longer-term credit to allow SMEs to make significant investments in innovation, increasing tax deductions, revising the interest rate cap policies that currently favor SMEs over medium-size firms by imposing limits on the fees banks can charge for lending, or providing innovation support services supplied via a cluster development initiative or technology extension program.</td>
</tr>
<tr>
<td>10</td>
<td>Cumbersome investment climate and regulatory burden is limiting innovation and value chain development</td>
<td>Combat the main regulatory challenges related to innovation, such as improving intellectual property regimes, labor regulations, and competition policy, as well as streamlining other administrative procedures and regulation (particularly in business registration and operations) that primarily affect innovative firms.</td>
</tr>
</tbody>
</table>
References


UNCTAD (2013) Investing in innovation for development, note by the UNCTAD Secretariat, Geneva


