

# Services and Innovation for the Competitiveness of the Ecuadorian Economy

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## Abstract

Ecuador is one of the least diversified countries in Latin America and the Caribbean, depending heavily on oil and agriculture. This policy paper examines how services and innovation can play a role in transforming the Ecuadorian economy from one based on natural resources to one based on knowledge and services. The paper assesses the performance of the services sector and its contribution to other sectors. The paper shows that services make a significant contribution to the country's economic growth (albeit below the average for the region). However, the services sector in Ecuador performs poorly in productivity and trade competitiveness. Further, services do not add enough value for export providers and users over time. The deficit in the integration of business services, especially knowledge-intensive business services, is particularly high, affecting the competitiveness of all sectors and their value chains. Among

the drivers of productivity and competitiveness, innovation is the key quality and differentiation factor (as distinguished from price-related, regulatory, and competition factors). Innovation in Ecuadorian services firms does not significantly affect performance (for example, sales and exports), although innovation in manufacturing does improve the performance of manufacturing firms. Finally, the paper provides some conclusions and meaningful crosscutting policy recommendations for a services-related policy aimed at fostering competitiveness and innovation. Services need action in innovation policy (innovation programs could be better adapted to services innovation specificities), but also in areas such as coordination at the institutional level; internationalization and foreign direct investment; and quality, regulatory, and competition issues affecting the investment climate.

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# **Services and Innovation for the Competitiveness of the Ecuadorian Economy<sup>1</sup>**

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**Trade and Competitiveness Global Practice  
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**The World Bank Group**

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## 1. Introduction

Despite improvement of social and welfare conditions since 2000,<sup>2</sup> Ecuador still faces economic problems. Low productivity (in both levels & growth) is most challenging. Total factor productivity (TFP) in Ecuador is below the LCR average—as it is in Paraguay, Bolivia, Peru, Honduras and Nicaragua (Daude and Fernandez Arias, 2010, among others). Compared to the most productive country in LAC (Chile), productivity gaps in Ecuador are substantial across all sectors and types of companies. For example, in the “garments” sector, the gap between the most productive firms in Ecuador and the most productive firms in Chile is around 300% (Ferro et al, 2013).<sup>3</sup> Furthermore, TFP differences between the most productive 10% and the least productive 10% of firms within the same major economic sector in Ecuador range from 110% to 2,000%.

A second major challenge has to do with the presence of unfavorable business conditions, which are a burden on firms, discourage investment, and reduce productivity. Entrepreneurs and businesses in Ecuador face numerous bureaucratic hurdles and outdated regulations that restrict firm creation and growth. Ecuador ranks 117 of 189 countries in the ease of doing business indicator of the 2016 *Doing Business* report, where the average for LCR is 104. Regulatory restrictions on entry, exit and growth of firms affect the overall competitiveness of the country. These pressures on framework conditions include economy-wide constraints on business entry and operations (e.g., licenses and permits).<sup>4</sup>

Informality and low access to finance reduce firms’ productivity and growth opportunities. Particularly critical is the high share of informal economy in the country (33% of establishments) of which 90% are in non-tradable sectors (retail and food mainly). Survival of firms is equally low (only 63% of enterprises survive their first year and only 35% survive for 5 years). Gaps also exist in other areas such as access to finance, regulatory frameworks and credit information infrastructure. Some of these hurdles consist of ineffective regimes for the use of movable collateral to obtain credit and lengthy bankruptcy procedures. They reduce access to credit and, in turn, reduce opportunities to invest and become more productive. Resources used by the firms to cope with administrative burdens and an unfavorable business climate further reduce efficiency in labor and capital utilization.

Ecuador’s exports are a further challenge given that they are among the least diversified in the region, still with extremely high dependencies on oil and some agricultural products.

To address some of the former challenges, the Government of Ecuador embarked on the Agenda for Productivity and Territorial Transformation (ATP) (2010–2013), followed by the National Strategy for the Change of Productive Matrix (2014–2017). The aim of the transformation of the productive matrix is

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<sup>2</sup> The economic stability of the Ecuadorian economy since 2000 has relied on the adoption of full dollarization, the increase in oil prices and strong remittances. Annual growth has averaged 4.4% (2002–2012), placing Ecuador near the average of countries in LCR, and Ecuador has had relatively low inflation (<5%). Social conditions have also improved recently. GDP per capita increased to among the top six in LCR, and the Gini Index fell from 54 in 2007 to 46 in 2011—a much larger drop than average in LCR. Furthermore, Ecuador lifted 10% of its population out of poverty (from 37.6% in 2006 to 27.3% in 2011), and the middle class in Ecuador rose from 14% of the population in 2003 to 27% in 2011.

<sup>3</sup> The phrase “most productive” here means the top 10% of firms in terms of labor productivity.

<sup>4</sup> In Ecuador, new firms spend more than 55 days to obtain all the official approvals to operate, compared to the 26, 11 or 30 days in Peru, Colombia and the LCR average respectively. Property transfer takes 39 days compared to 6.5 days in Peru or 16 days in Colombia.

to increase Ecuador's specialization in value added products in order to improve overall competitiveness and welfare, as well as driving the transition from a resource-based economy to a knowledge-based economy.

Services have a predominant role to play in the transformation of the productive matrix because they contribute decisively both to productive transformation and to the rise of a knowledge-based economy. Services are a transformative source and a key to competitive advantage in the 21<sup>st</sup> century (Teboul, 2006), because they favor the introduction of technological, human and intangible capital within an organization involving any type of function, either primary or supportive. This is especially relevant in developing countries, which are increasingly exporting a diversified range of services both within their own regions and to high-income countries. Services are important for a number of reasons. For one, improving services improves traditional competitive advantages in services sectors such as tourism or transport. For another, improving services creates new competitive advantages in new services sectors such as services offshoring, environmental services, and digital services. Finally, improving services can improve competitive advantages in any economic sector, agriculture and manufacturing in particular. This is because services are heavily integrated into every stage of the value chain—they provide input not only to domestic trade but, especially, to exports.

The objective of this paper is to examine how improving services can support the transformation of the Ecuadorian economy. We focus particularly on the role services play in overall competitiveness, using input-output analysis (value added export methodology). This study provides an in-depth analysis of the role of services in a country that is in the process of a structural change, provides a diagnosis of the key challenges Ecuadorian services confront, and presents policy recommendations to improve services' performance, with a focus on competitiveness and innovation policies. We consider competitiveness in a wide sense, including both productivity growth and international trade performance (trade competitiveness).<sup>5</sup>

Among the factors that drive competitiveness, innovation is paramount and, hence, a main focus of the study. Innovation plays an essential role in providing sustainable comparative advantages and product and quality differentiation. Other factors tend to have greater effects on prices and costs. We consider innovation in a wide sense, not limited to technological or radical innovation, but also including incremental innovation. (Incremental innovation is innovation that happens with the adoption and adaptation of technology, knowledge and organizational schemes that are new to particular firms and sectors).<sup>6</sup> The paper also proposes a menu of nuanced policies for future action.

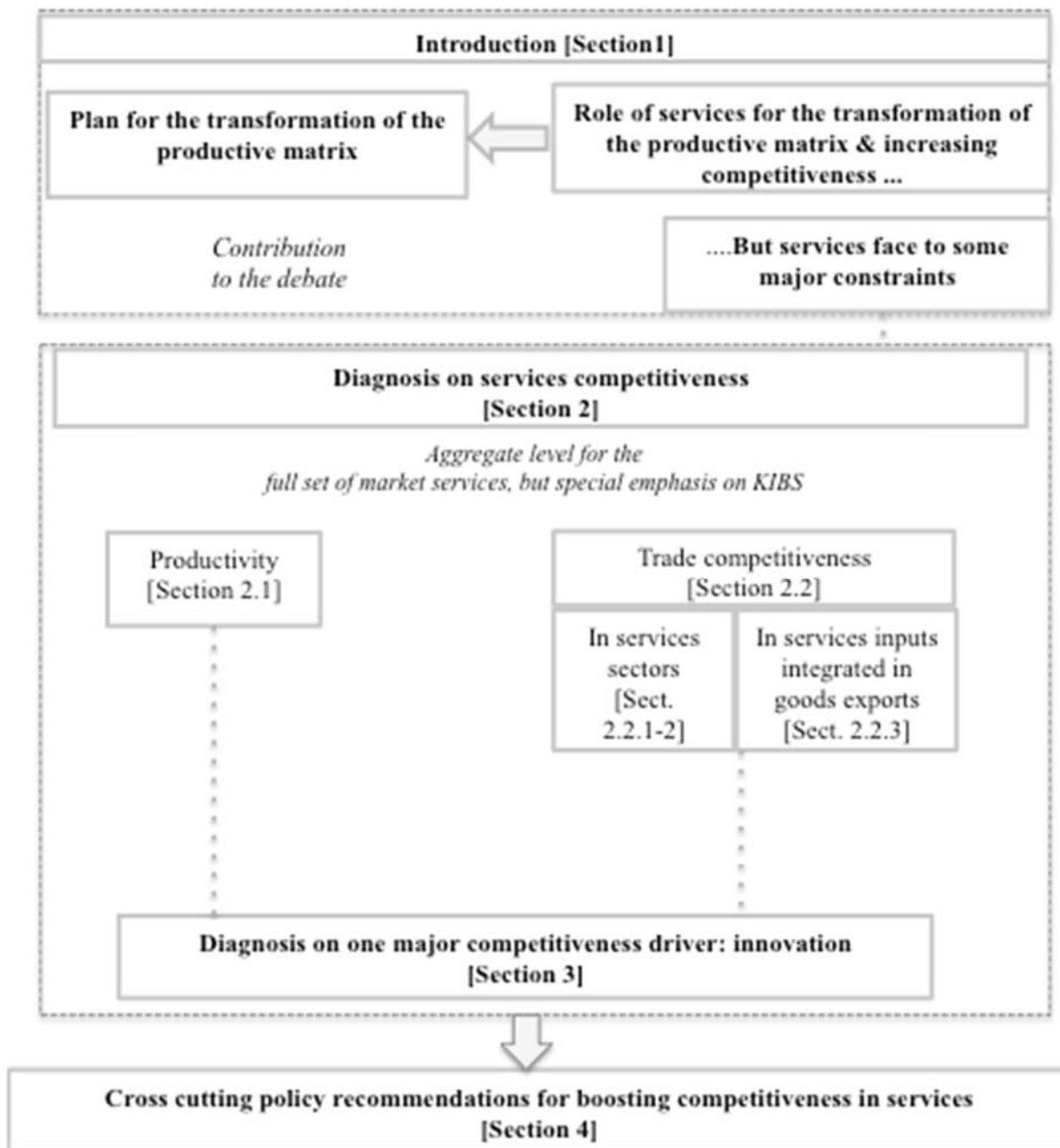
Figure 1 depicts the overall rationale for this paper. Two research questions guide the work undertaken. The first is, “how do Ecuadorian services perform in terms of competitiveness?” The second is, “what policy changes to foster services competitiveness and the role of services in improving overall competitiveness would have the greatest impact on the transformation of the productive matrix?”

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<sup>5</sup> Productivity is the core element of competitiveness, for example, as defined by the *World Competitiveness Report* (WCR) (Sala-i-Martin *et al.*, 2014). In addition, all competitiveness studies pay particular attention to international trade issues, which we call “trade competitiveness.”

<sup>6</sup> Innovation in this way is defined in line with international standards (Oslo Manual, 2005) as “the implementation of a new or significantly improved product (good or service) or process, a new marketing method or a new organisational method in business practices, workplace organisation or external relations.”

**Figure 1. Story line and rationale**



The paper is organized as follows: section 2 measures the performance of Ecuadorian services in terms of productivity and trade competitiveness, and assesses the role played by services in promoting competitive advantages in the overall economy. Section 3 selects innovation as a key competitiveness driver, and thus describes, based on empirical evidence, some service innovation specificities and differential impact of innovation support programs between services and manufacturing firms. Finally, building upon previous evidence from sections 2 and 3, section 4 provides some conclusions and meaningful crosscutting policy recommendations for a services-related policy aimed at fostering both competitiveness and innovation.

## 2. Services in Ecuadorian growth: Productivity and trade competitiveness

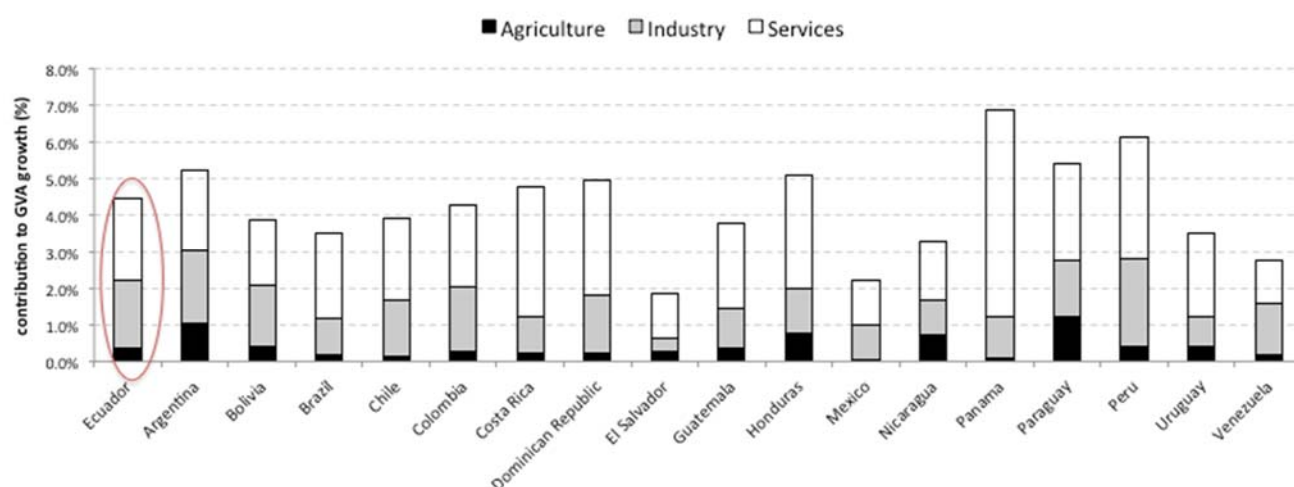
This section explains how services play an important role in driving productivity and trade competitiveness in Ecuador. Building on previous work and existing literature on other LAC countries, our analysis shows several important things. (1) In Ecuador, the contribution of services to productivity growth is significant but smaller than the contributions of other sectors (e.g., Aboal et al., 2015). (2) The market share of services as an indicator of trade and competitiveness will likely decline similar to other countries in LAC (e.g., Rubalcaba, 2013). Finally, (3) the role of services in the input-output matrices and in value added exports in particular indicates gaps in the integration of services (e.g., business services, which most LAC economies incorporate only to a limited extent).

### 2.1. Productivity performance in services: Levels, growth, and overall contribution

Services have made up more than 50% of Ecuador's GDP since 1970, but services account for a lower share of GDP in Ecuador than in many other countries in LCR. The GDP share of services in Ecuador during the period 1970–2013 is about 4 percentage points below the average across 41 countries in LCR. This is because Ecuador is one of the most industrial countries in the region (along with the República Bolivariana de Venezuela, Peru and Bolivia).

Despite this relatively more industrial orientation of the country, services contributed 2.3% to aggregate gross *value added* growth in Ecuador over the period 2001–2011, outpacing industry, which contributed 1.6%. In LCR (see graph 1 for a selection of countries in LCR), the average contribution of services to gross value added growth is even stronger, almost twice the industry contribution (2.5% from services, in contrast to 1.3% from industry and 0.4% from agriculture).

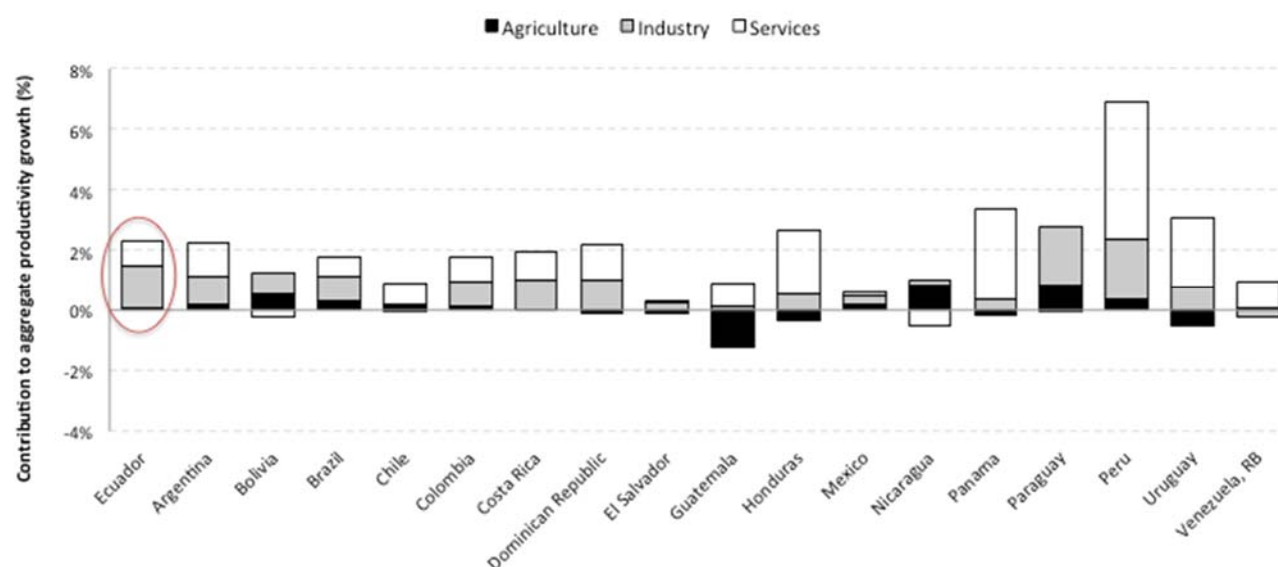
**Graph 1. Sector contribution to gross value added growth (2001–2011)**  
Selected countries in LAC



Source: UNCTAD Stats (2014)

Services also contributed less than industry to aggregate *productivity* growth in Ecuador during the period 2001–2011. This contrasts with the average across LCR countries, where the services sector accounted for more aggregate productivity growth than industry. (See graph 2.) The contribution of the services sector to aggregate productivity growth in Ecuador during 2001–2011 (0.83%) was lower than industry (1.47%). By contrast, the tertiary sector led the contribution to aggregate productivity growth in the LCR country sample (services average of 1.08% vs. industry average of 0.72%). Thus, leveraging services productivity may be necessary to raise overall productivity, and, hence, country economic growth.

**Graph 2. Sector contribution to aggregate productivity growth (2001–2011)**  
**Selected countries in LAC**

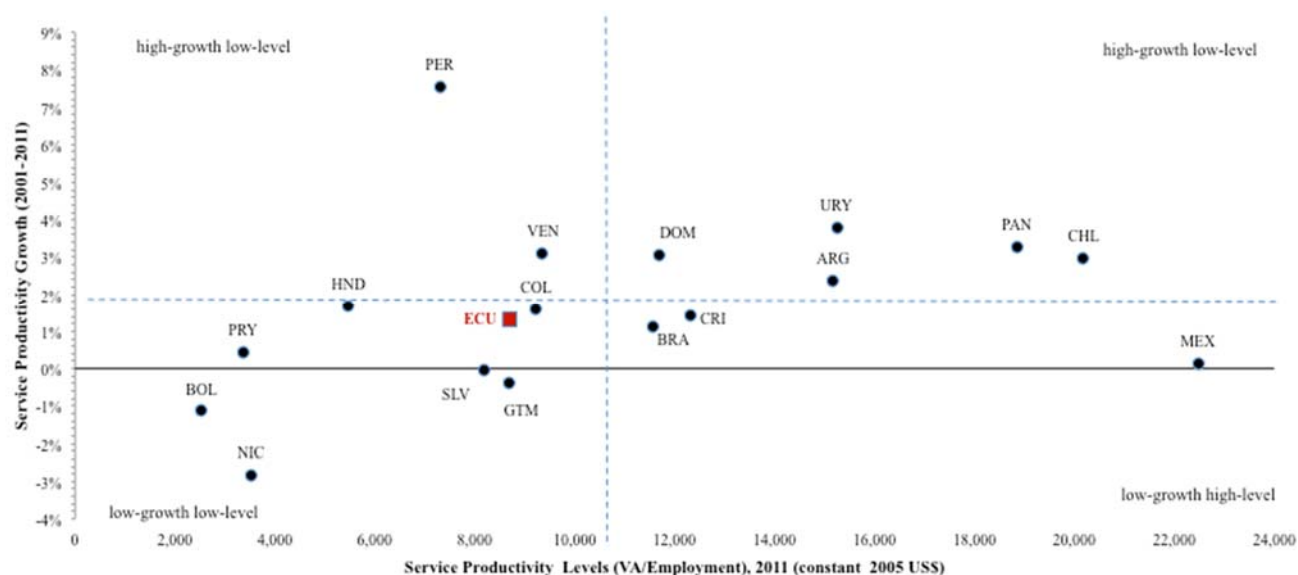


Source: World Bank WDI (2014), UNCTADstat (2014) and ILOstat (2014). NOTE: Data for Peru refers to the period 2004–2011.

In fact, both the level and the growth of services productivity in Ecuador are below the LAC average. (See graph 3.) Ecuador’s average annual services labor productivity growth rate for 2001–2011 was 1.30%, in contrast to the 1.64% average across LCR. The value of Ecuador’s services productivity in 2011 was US\$8,696 per worker, below the LCR average of US\$10,767 per worker. Productivity problems affect the overall economy of the country (Weller and Kaldewei, 2013, Daude and Fernandez Arias 2010), even though the picture in industry is not as grave as in services.



**Graph 3. Services productivity levels in 2011 and growth rates, 2001–2011  
Selected LAC countries**



Source: Based on the World Bank World Development Indicators (2014), ILOstat (2014) and UNCTAD Database (2014).

Lack of innovation and misallocation of resources are the key causes of low productivity in the Ecuadorian services sector. As Carrillo (2013) pointed out, the low productivity in Ecuador is most probably due to a variety of factors, such as the misallocation of resources (i.e., the failure to allocate economic resources toward the country's most productive firms), the lack of innovation, and the high proportion of small enterprises frequently operating informally in non-tradable services activities<sup>7</sup> with low entrance costs. Regarding the misallocation of resources and the lack of innovation, the difficulties of creating, absorbing, and diffusing knowledge in a truly innovative environment and the inefficient allocation of workers across firms in Ecuador, as suggested by Arias-Ortiz et al (2014), are widely recognized. Poor productivity in LCR is aggravated because many employees work in low-productivity firms in the services sector. If the allocation of workers across firms in the services sector were as efficient as that in the manufacturing sector, the productivity of the services sector in a typical country in LCR would be 27% higher. Ecuador has an especially pronounced misallocation of resources in services. The productivity of the services sector in Ecuador would be nearly 40% higher if it could allocate resources as efficiently as in manufacturing.

Indeed, low TFP reflects the inefficient allocation of resources in Ecuador. Despite high TFP growth during the period 2001–2011 (1.73%), TFP in Ecuador is low (75.53) when compared to other LCR countries. Hence, it is relevant that Ecuador could make a major effort to catch up with regional counterparts such as Argentina (105.1), the Dominican Republic (107.6) and Panama (134.3), which have high levels of TFP and high growth in TFP. Based on the Fernandez Arias (2014) TFP data and the

<sup>7</sup>According to Ferro *et al* (2013), 90% of the informal establishments fall in the non-tradable sector.

services labor productivity build figures (VA/Employment in services) using World Bank WDI, high level TFP countries in general have higher services productivity.<sup>8</sup>

## **2.2. Trade competitiveness in the services sector**

### **2.2.1 Trade competitiveness: Volumes of exports and imports and coverage rates (exports/imports)**

Services trade in Ecuador increased substantially over the long period 1980–2012, but not enough to put a dent in the balance of payments deficit. Services and the other components of the current account (incomes and transfer remittances) have only changed slightly.<sup>9</sup> On average, for every US\$1 of services exported from Ecuador, US\$2 of services were imported, and this pattern remained more or less stable between 1980 and 2012. Ecuador has traditionally performed well as a services importing economy, but the gap between imports and exports (quotient of exports/imports, or coverage rate), has not increased notably in the long run. The causes include the low performance of Ecuadorian exports in services, coupled with the recent increases in incomes in the country, favoring imports<sup>10</sup>, and a favorable services trade regime. Furthermore, the services trade deficit is largely concentrated in some services subsectors, especially transportation.<sup>11</sup>

### **2.2.2 Trade competitiveness: Market shares (Ecuadorian exports/world exports)**

Analysis of the trade competitiveness of Ecuadorian commercial services, based on an analysis of market shares, comparing Ecuador to its closest competitors, Peru and Colombia, Chile and the LCR average, reveals a relative decline of Ecuadorian commercial services market share during 1980–2013. (See graph 4.) During the period 1980–2013, world market share of Ecuadorian commercial services exports plummeted by 50%, from 0.09% to 0.04%, even though it remained rather stable since 2005–2006. In addition, the coverage ratio (ratio of exports/imports) has been relatively stable (around 0.54%). This is in sharp contrast to the evolution of goods' market shares, which increased slightly from 0.12% in 1980 to 0.13%, even though the coverage rate dropped from 110% in 1980 to 95% in 2013. The commercial services market share in Ecuador is substantially below its closest competitors (Colombia and Peru), let alone Chile. Services market share in Ecuador in 2012 is around one-third of the services market share in Colombia (31.6%) and Peru (32.2%). Chile experienced a profound decrease in services' market share, running parallel with the economic crisis of 1982, but recovering vigorously afterwards. These results confirm the relatively low degree of internationalization of Ecuadorian services and do not show any

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<sup>8</sup> Recent work from CEPAL (2014) on growth and productivity suggest that the average contribution of TFP to growth in LCR has been low compared to factor accumulation. This result has been especially evident in Ecuador, where the contributions of labor (1.2%) and capital (1.6%) are notably higher than the contribution of TFP (0.5%). In comparison to the LCR average (1.5%), the contribution of TFP in Ecuador has been even lower. This limited contribution of TFP to growth highlights one of the major challenges in LCR: the need to increase the productive contribution of the workforce, both through improvements in education (skills and competences) and through other factors affecting productivity (innovation, investment climate, infrastructure, etc.). Therefore, these results support promoting high quality (knowledge intensive) services in order to increase the TFP by improving the workforce quality and its contribution to growth.

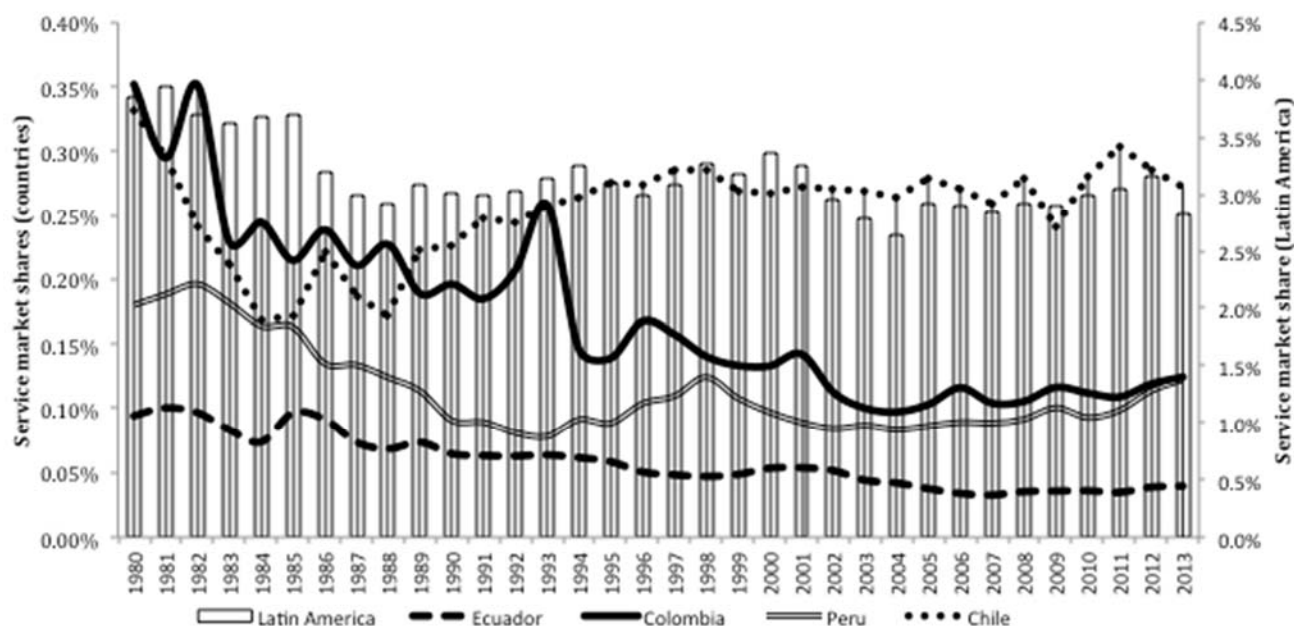
<sup>9</sup> Following what we presented in the first section on the economic context, two thirds of such a rise is explained by the strong recovery of oil exports, which proves the vast dependence of Ecuador's economy on this resource (around 60% of total exports and 14% of GDP) and the high level of volatility associated with price shifts.

<sup>10</sup> Nevertheless, data for 2015 reveals a rather different landscape, as a sharp contraction of service imports (-9.1%) did occur in parallel to a relevant economic standstill (GDP growth: 0.29%) and a positive performance of service exports (+3.2%). Source: Central Bank of Ecuador.

<sup>11</sup> Transportation imports make up more than 55% of total commercial services imports in 2012, and have largely driven the commercial deficit in services in Ecuador.

signs of improvement. A strong performance of services trade competitiveness would help to improve the trade competitiveness of goods.

**Graph 4. Services market shares 1980–2013 (%exports/world exports).  
Comparative performance: Latin America, Ecuador, Colombia, Peru and Chile**



Source: Based on WTO Database. NOTE: Countries included: Argentina, Bolivia, Chile, Brazil, Costa Rica, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Uruguay and Venezuela. Cuba only reports data from 1990 onwards.

### 2.2.3. Trade competitiveness from services into goods exports: An input/output approach<sup>12</sup>

Services are not only a source of export growth themselves; they also enter into the production of many downstream products. This means that access to services is as important as access to raw materials in sustaining the competitiveness of most goods exported to global markets. Exports from other economic activities embody a high share of services, as recent literature has pointed out (see, for example, Escaith, 2008, or Francois, Manchin and Tomberger, 2013). However, these services are unobservable in trade statistics, because many are packaged with goods and thereby regarded as goods. According to Francois et al (2015), the gross value of cross-border services trade made up almost 50% of total world trade in 2011 when measuring transactions in terms of the activities embodied in final products for export. By comparison, when measured in the traditional manner (in terms of the gross value of exports by final category crossing borders), services made up only 18.6% of world trade.

This means that, by facilitating the transit of intermediate inputs in other economic activities' exports, services are playing a crucial role in determining the international competitiveness of national economies. By doing so, services may also contribute to transforming the export-based matrix in those economies lacking sectorial diversification, as in the case of Ecuador. Thus, input/output (I/O) analysis is an ideal

<sup>12</sup>This section is based on inputs and data provided by Sebastian Sáez and Claire H. Hollweg (World Bank).

instrument to assess how services interact with other economic activities (especially with manufacturing) and how they fit into the productive matrix influencing overall competitiveness. In fact, a recent strand of literature using I/O methodology has emerged, envisioning how the services sector is increasingly being traded and its global implications for the competitiveness and productivity of national economies. Early contributions focused on OECD countries. One major example is Francois and Reiner (1996), who showed that exports have become producer (business) services intensive when including both direct and indirect linkages. Another is Robinson et al (2002), who stressed the indirect effects from services sector trade liberalization on the efficiency and output of other sectors in the economy. A third is Francois and Woerz (2008), who showed that services sector openness is important in fostering competitiveness in technology and skill intensive industries in the OECD. Recent research provides further evidence on both developing countries and regional trade blocs, as in Francois et al. (2013) and Amador et al. (2014).

The theoretical underpinnings of these contributions are mainly in the global value chains (GVCs) framework.<sup>13</sup> Since the late 1980s, the GVC framework has changed the nature of international trade, not only in developed but also in developing countries. In developing countries, it has given rise to new production and trade opportunities (Escaith, 2013). In this setting, economists have primarily used I/O methodology to explore two different (and complementary) dimensions of GVCs. The first type of I/O methodology measures international division of labor through “vertical specialization” considering both direct and indirect foreign value added content of exports (but with sectorial issues assuming a non-priority role). Hummels et al. (1998) and Hummels et al. (2001) originally formulated this view, with more recent contributions by Koopman et al. (2010) and Amador & Cabral (2014). The second dimension of I/O analysis aims at highlighting sectorial contributions to export value added, especially when they come from the services sector, as in Low (2013), Francois et al. (2013) and Egger et al. (2015). The recent availability of more robust and homogenous datasets has also contributed to the popularity of the I/O methodology for measuring value added content in exports. There are two main sources of data: the Global Trade Analysis Project (GTAP) dataset<sup>14</sup> and the more recent OECD-WTO Trade in Value Added (TiVA) initiative.<sup>15</sup>

The analysis in this subsection aligns entirely with the second dimension of I/O analysis. We performed it using the GTAP data set, covering the years 2001 and 2011. The study benchmarks Ecuador with

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<sup>13</sup> I/O methodology is but one of the three main methodologies used to empirically assess GVC, as described in Amador and Cabral (2014). In fact, according to these authors, the three main methodological approaches to map and measure GVCs have been: international trade statistics on parts and components, customs statistics on processing trade, and international trade data combined with input-output tables.

<sup>14</sup> This global dataset measures and describes domestic consumption, production, intermediate input use, and trade patterns of goods and services across sectors of an economy. It covers not only key OECD countries, but also a wide range of developing countries. Hence, the data set represents an advanced input-output panel—also known as a social accounting matrix—of incomes and expenditures for the domestic economy and is linked to trade over intermittent years between 1992 and 2011. The data set is available at and produced by a consortium of institutions that include the World Bank, US International Trade Commission, World Trade Organization, OECD, UNCTAD, UNFAO and a number of universities and independent research institutes.

<sup>15</sup> The joint OECD – WTO Trade in Value-Added (TiVA) initiative addresses this issue by considering the value added by each country in the production of goods and services consumed worldwide. TiVA indicators are designed to better inform policy makers by providing new insights into the commercial relations between nations. The 2015 edition of the TiVA database includes 61 economies covering OECD, EU28, G20, most East and South-east Asian economies and a selection of South American countries. The industry list has been expanded to cover 34 unique industrial sectors, including 16 manufacturing and 14 services sectors. The years covered are 1995, 2000, 2005 and 2008 to 2011.

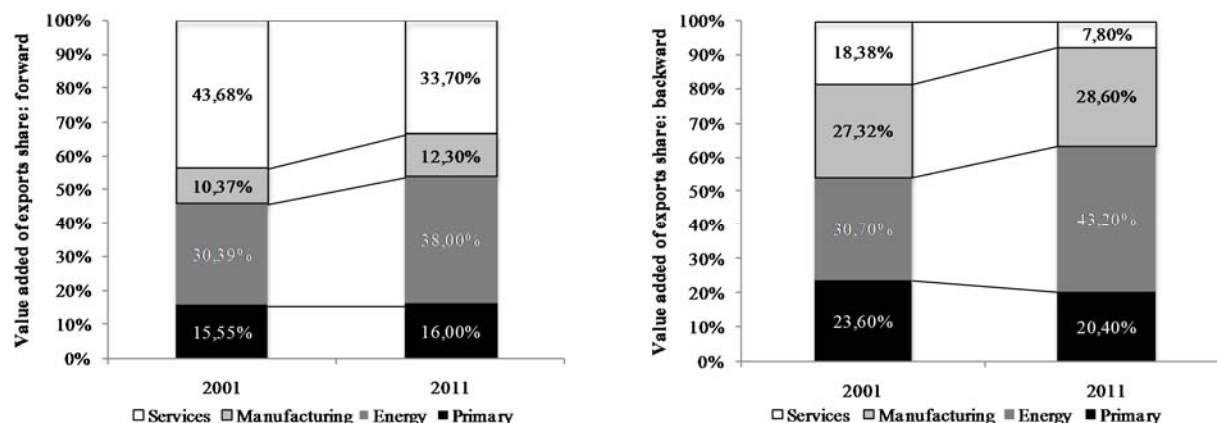
respect to Colombia and Peru (i.e., neighboring countries), Chile (i.e., the LAC's "frontier" economy) and the US (i.e., the world's "frontier" economy). To our knowledge, what follows is the first analysis of this kind specifically devised for Ecuador using the GTAP database. We also enriched it by using the 2007–2013 I/O tables to gain sectorial insights on the degree to which services activities provide more or less balanced inputs throughout the economy. Such result is extraordinary important in the case of Ecuador, where diversification of the productive matrix is desirable and the support to those activities "providing the conveyor belt that keeps supply chains moving" could be more than appropriate.

There are different ways to understand the role of services in fostering competitiveness through I/O methodology. Fostering competitiveness should take into account not only the high levels of inputs that services provide to the exports of other economic activities, but also the way in which such inputs are delivered. A first approach has to do with the relevance of total services exports (i.e., the sum of direct and "unobservable" exports) with respect to total exports and, similarly, the relevance of direct services exports plus other sectors' inputs embodied in such exports. This gives a measure of services' forward and backward linkages according to the I/O methodology. A step forward in the analysis involves assessing the extent to which services and manufacturing intertwine. Explaining this requires distinguishing between two concepts. The first is "services to manufacturing" (that is, the share of manufacturing on services' forward linkage). The second is "services in manufacturing" (that is, the share of services on manufacturing's backward linkage). In order to provide meaningful evidence, this paper compares Ecuador's results to those of other countries. Furthermore, the analysis proceeds by emphasizing not only providing high levels of inputs to other economic activities but also the way the inputs spread out. Inputs may influence only a few sectors or affect a wide array of sectors, benefitting most areas of the economy and, ultimately, favoring economic diversification.

As indicated before, services have lost ground as value added of exports providers and users over 2001–2011 in Ecuador. Thanks to I/O methodology, it is possible to capture the total (direct and indirect) contributions of the main sectors to a country's value added of exports. Exploring forward linkages (see graph 5.a) gives not only "observable" value added of services exports (that is, the direct contribution), but also "unobservable" services value added (as embodied in all sectors' exports). Analysis of forward linkages shows that export shares with respect to total exports in Ecuador have eroded over the years, shrinking from 43.7% in 2001 to 33.7% in 2011. In other words, in 2011, one-third of the total value added of exports came from the services sector. In 2011, energy made up the highest total value added share of exports (38%) and reported a major increase over 2001–2011 (26.6% growth). Analysis of backward linkages in addition gives both value added of services exports (that is, the direct or "observable" contribution) and value added of other economic activities embodied in services exports (that is, the indirect or "unobservable" contribution). Exploring backward linkages confirms the declining pattern (the share of services in 2011 is about half that in 2001). These results mean not only that services exports (both "direct" and "unobservable") lost importance between 2001 and 2011 but also that "direct" services exports embodied fewer inputs from other economic activities in 2011 than they did in 2001.

**Graph 5 (a-b). Ecuador: distribution of forward & backward linkages among main economic sectors, 2001–2011.**

(a) Forward linkages (b) Backward linkages

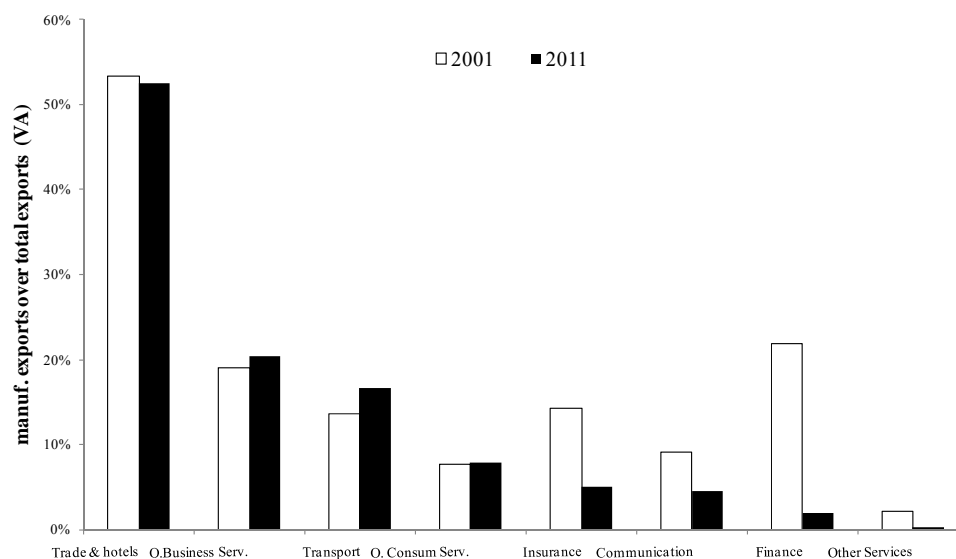


Source: Based on the World Bank *Value Added Database*

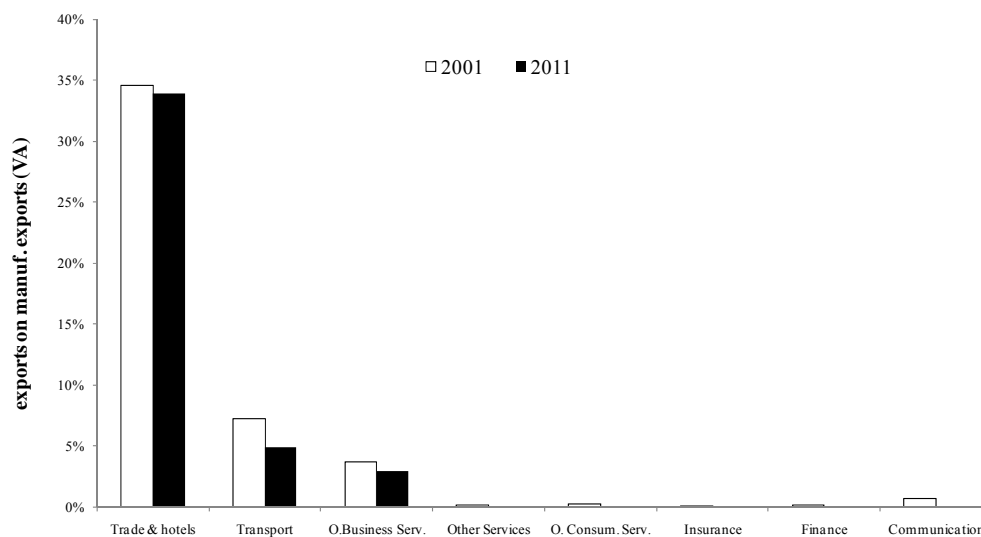
Services embodied in manufacturing value added of exports are concentrated on trade and distribution services, which is another manifestation of the unbalanced character of the Ecuadorian economy. Another point of primary interest is that trade and distribution services are highly integrated with manufacturing, whereas other services sectors, including business services, play a minor role. In fact, manufacturing is the major recipient of trade and distribution services value added for exports, amounting to more than 50% (see graph 6a, “services to manufacturing”). In other words, more than a half of the value added of trade and distribution is destined to be embodied in manufacturing exports, both in 2001 and 2011, well above the second highest (other business services: around 28% in 2011). Furthermore, value added of trade and distribution services embodied in manufacturing exports (that is, its share in manufacturing’s total backward linkage, which we refer to as “services in manufacturing”) makes up around 34% of manufacturing value added of exports both in 2001 and 2011 (see graph 6.b). This figure is about seven times larger than the second highest (transport: 5% in 2011). What is more important, it implies that value added of trade and distribution embodied in manufacturing exports (34%) was almost as high as the value added of “direct” manufacturing exports themselves (38%) in 2011, which is a rather striking result. The central role of trade and distribution services in all fronts proves that the lack of economic diversification in Ecuador, which this report has highlighted several times, is also visible from the export matrix standpoint.

**Graph 6 (a-b). Relationship between total services and manufacturing exports (value added).  
Comparison 2001–2011**

(a) Services to manufacturing = share of manufacturing on services' forward linkage.



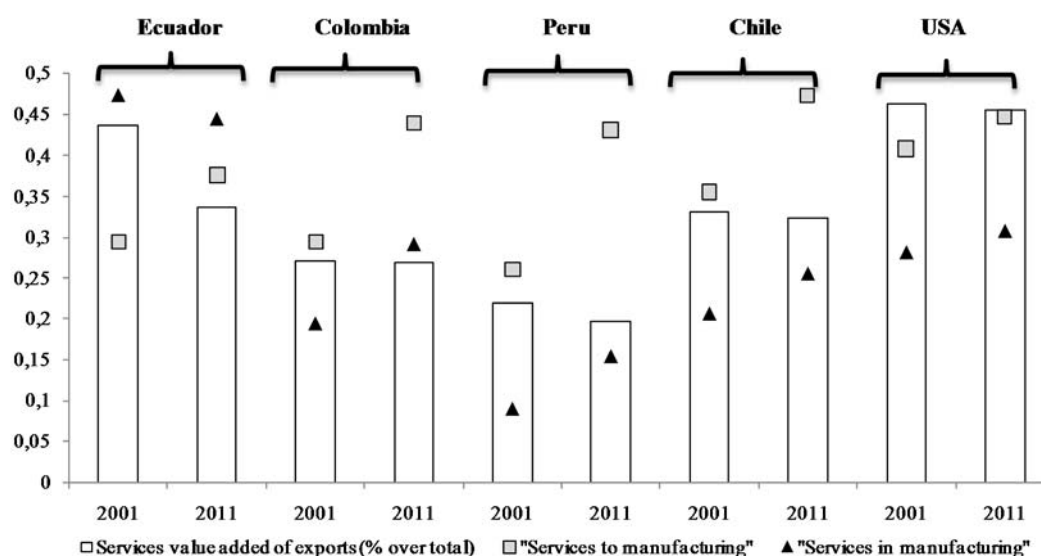
(b) Services in manufacturing = share of services on manufacturing' backward linkage.



Source: Based on the World Bank *Value Added Database*

While Ecuador reports the largest decrease in services value added of exports' share between 2001 and 2011 among the sample countries under comparison, services value added of exports' share is still above Colombia, Peru and Chile. According to graph 7, services' share of export value added in Ecuador was at US' levels in 2001, but had plummeted ten years after. Such a patchy performance is in sharp contrast to Colombia, Peru, Chile and the US, where figures remained more stable. Notwithstanding this, Ecuador retained the second highest share (33.7%) in 2011, only behind the US (45.5%) and ahead of Chile (32.4%). From a comparative standpoint, Ecuador's sharp decrease entails being more aligned with figures of neighboring countries. Even more important are the dynamics within the services sector, especially those taking place between services and manufacturing.

**Graph 7. Relevance of services exports and services-manufacturing relationships in exports**



Source: Based on the World Bank *Value Added Database*

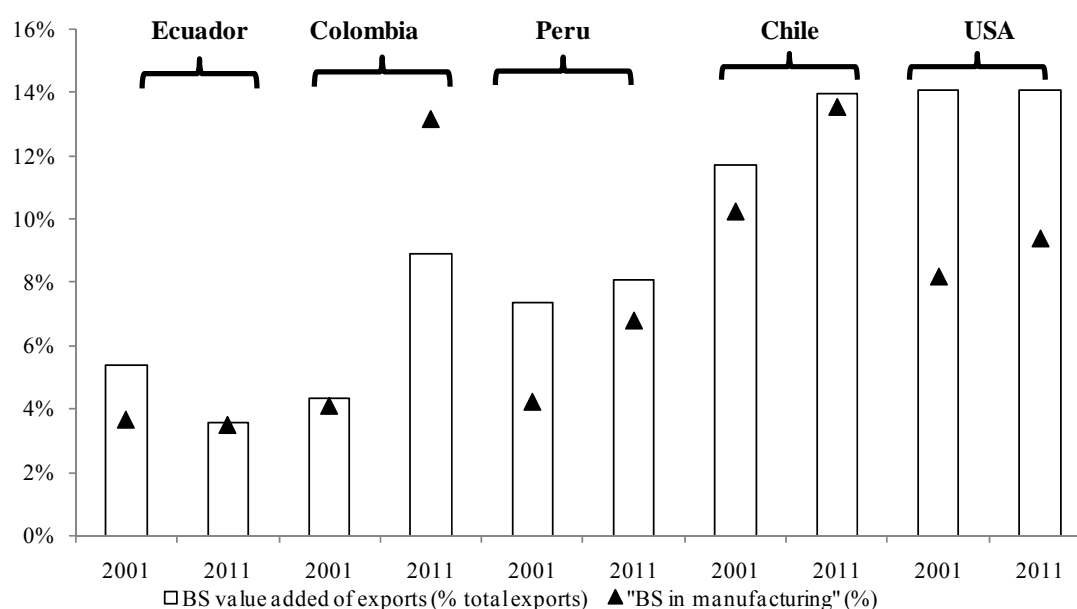
Services-manufacturing integration in Ecuadorian exports is remarkable in terms of services inputs used by manufacturing (“services in manufacturing”). However, services inputs are eroding and notably biased toward trade and distribution services. As graph 7 shows, “services to manufacturing” (i.e., the share of manufacturing on services’ forward linkage) in Ecuador increased over the period 2001–2011, but less so than in the other four countries. As a result, Ecuador’s 2011 figures are the lowest among the countries compared. In contrast, “services in manufacturing” (i.e., the share of services on manufacturing’s backward linkage), is quite positive in Ecuador. Despite the fact that Ecuador is the only country where services inputs embodied in manufacturing value added of exports (i.e., “services in manufacturing”) has decreased, it was still largely above the rest of the countries analyzed. This striking conclusion deserves further attention. The overwhelmingly disproportionate contribution of trade and distribution services again explain the results. Trade and distribution services make up around 75% of total services inputs and 34% of total inputs in manufacturing. In fact, if the share of trade and distribution services were near the average for the other four countries, Ecuador would be “last in line.” Furthermore, the input/output tables show that the huge demand from the highly export-based “processed food” sector mostly drives trade and distribution within manufacturing. Processed food consumes about 50% of total trade and distribution inputs in manufacturing. From this detailed analysis of services and manufacturing



integration, we conclude that the performance of specific sectors, rather than by a more balanced performance across sectors, explains the dynamics.

In contrast to the disproportionate weight of trade and distribution services, business services<sup>16</sup> are scarcely providing inputs for manufacturing exports in Ecuador. The result is particularly evident when compared to the other four countries, from a twofold perspective. As for the share of other business services value added of exports, Ecuador reports the lowest (3.7% in 2001; 3.5% in 2011, which is roughly half that of Peru). The same holds as for the share of business services embedded in manufacturing exports, which have also experienced a sharp decline between 2001 and 2011 (–1.8 percentage points). This is in fact a challenging result that demonstrate the weak incorporation of business services in manufacturing exports in the Ecuadorian economy and, what is more relevant, that no signs of improvement are reported over the years.

**Graph 8. Share of business services value added of exports and “business services in manufacturing” (%)**



Source: Based on World Bank *Value Added Database*

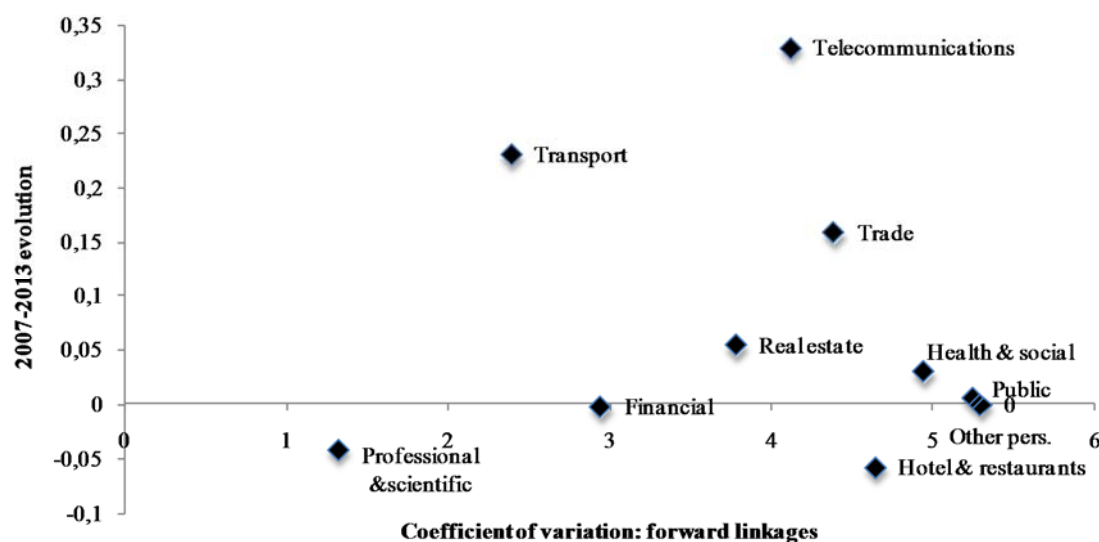
Linkages analyses are also useful for measuring whether services linkages are biased (or not) toward a few sectors, which is of crucial importance in obtaining evidence on the degree (and the character) of services integration within the economy. To that end, we have calculated a coefficient of variation *à la Boucher* (see annex I) and 2007–2013 changes<sup>17</sup> for forward linkages. A low coefficient of variation in a particular services activity means that investment in that particular sector would stimulate other sectors’

<sup>16</sup>Business services as “Other business services”. Other business services comprise ISIC Rev. 3 section K (real estate, renting and service activities).

<sup>17</sup> In this case, we have obtained forward and backward linkages directly from the Leontief inverse matrix (see 1.a) and not from equation (3) of annex I, which include sectors’ “direct” exports. The sole objective here is assessing concentration/dispersion patterns in input provision.

activity in a balanced manner. Conversely, a high coefficient of variation means that the benefits of investment in a particular sector accrue unevenly across sectors. The category “professional, scientific, technical services, and other administrative and support services,” which may be interpreted as a proxy for business services<sup>18</sup> and, more roughly, for knowledge-intensive business services (KIBS, hereafter), has the lowest coefficient of variation (1.32). This means that KIBS has a relatively balanced economic impact throughout the economy. Furthermore, this coefficient has slightly declined from 2007 to 2013, indicating that input provision is becoming even more widespread across sectors.

**Graph 9. Degree of dispersion/concentration in services inputs provision 2013 & 2007–2013 evolution**



Source: Based on the Ecuador Input-Output Tables 2007–2013, Central Bank of Ecuador.

The degree of dispersion in input provision for exports is relevant for Ecuador, because both its productive and its export matrices are concentrated, and Ecuador wants to diversify. Thus, development of services providing more dispersed inputs (i.e., capacity to provide balanced inputs throughout the economy) is desirable in Ecuador. Consequently, policy strategies focused on diversification of the productive matrix should take into consideration the development of services providing more dispersed inputs. Business services, which has the greatest dispersion in input provision, is a case in point. Hence, developing business services is a priority for diversifying the Ecuadorian economy. We explain this in more detail in the policy section.

Business services in Ecuador, in particular KIBS, are underdeveloped compared to LAC. Based on employment statistics, the supply of KIBS in Ecuador is 21% lower than the already underdeveloped

<sup>18</sup> This is the sector as defined in the Input Output Tables from Ecuador 2007-2013. “Professional, scientific and technical activities. Administrative and support service activities” are ISIC Rev. 4 Sections M (Divisions 69-75) and N (Divisions 77-82).

supply of KIBS in LCR.<sup>19</sup> (KIBS account for 3% of total jobs in Ecuador versus 3.8% in the group of countries analyzed.) The broader category of business services (i.e., including also administrative and support services activities) employs 5.8% of the workforce in Ecuador, as compared to an average of 6.3% across the region, only 8% less. This means that the most significant gap in Ecuador is in KIBS.

Given both the relatively significant business services (especially KIBS) supply gaps in Ecuador and their important role as agents promoting diversification and adding value added of exports to other economic activities, measures aimed at fostering them are needed.

### **3. The services competitiveness drivers: The case of innovation in services<sup>20</sup>**

Services are nowadays components of all primary and support activities where services innovation is possible in an integrated system. The value chain and knowledge value system is the outcome of both value generated within organizations (firms or other organizations, public and third sector) and value generated by services facilitators (providers of the interconnected technology, knowledge and human resources inputs through services). Final users (clients) and the full regional and national ecosystems play roles (co-productions at different levels of inter- and intra- organization linkages). As such, innovation using services results from interactions and coproduction between organizations, providers and facilitators in a given eco-innovation system. The allocation of services (and innovation through services) at every step of the value chain increases the value in firms and the knowledge in the whole system. The use of services in the value chain creates new competitiveness advantages and promotes diversification. Economists have already demonstrated the importance of innovation services for productivity in LAC (Aboal et al, 2015). In this context, this section analyzes the performance of services innovation in Ecuador. Given the interrelations between services innovation and innovation in manufacturing, the point of this section is not to compare whether innovation in services matters more or less than innovation in manufacturing. (It matters to both equally.) Rather, the point is to find performance gaps that policy makers may want to address.

#### **3.1. Overall performance in innovation**

Innovation gaps partly explain productivity and trade competitiveness gaps in the services sector in Ecuador. Ecuador is a low innovation performer as reported by most global innovation indexes. For example, according to the Global Innovation Index (GII), Ecuador ranks 119 out of 141 countries in the world.<sup>21</sup> According to this index, gaps are particularly important with regard to knowledge diffusion (136 out of 141 countries), knowledge creation (129) and innovation linkages (139), but there are also challenges on the input side, as, for example, in human capital and research (98) and business environment (131). Looking at some detailed indicators in the areas of business sophistication and

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<sup>19</sup> Data are available for 11 countries from the LAC region, which have been used for the comparison: Costa Rica, Uruguay, Paraguay, Argentina, Panama, Mexico, Ecuador, Peru, El Salvador, República Bolivariana de Venezuela and Guatemala. Data are from the International Labor Organization (ILO Stat, 2014).

<sup>20</sup> This section presents some key data on innovation. A different report would be necessary to present an assessment of other drivers of competitiveness in services, such as the market composition, international trade in services, regulatory aspects for services or competition policy.

<sup>21</sup> 2015 figures are even worse than 2014, where Ecuador ranked 115 out of 143 countries.

knowledge and technological outputs, Ecuador is not performing as well in knowledge creation and diffusion as could be wished. Gaps are rather substantial according to these indicators, revealing structural issues in the country regarding knowledge transfer. Other major challenges for innovation in services are financial constraints, limited creation of creative assets and scarce access to information and communications technology (ICT).

### **3.2 Innovation in services**

National survey data indicate that around 60% of Ecuadorian enterprises innovate, but we must interpret the figure with caution due to a variety of issues.<sup>22</sup> We need to contrast the high share of innovative enterprises, according to the survey, with the poorer results in terms of productivity and overall innovation performance, as reported above. Firms are innovating to some extent, but the quality and the performance of the innovation are low.

The challenge regarding innovation in Ecuador is not exclusively in services, but across all sectors. The share of services enterprises engaged in innovation in Ecuador accounts for 63.5%, which is even higher than the share for the whole economy (58.8%).<sup>23</sup> Again, we must interpret these results with caution.<sup>24</sup> Still, they suggest that services are not necessarily less innovative than manufacturing, supporting ongoing research on services innovation versus old theories considering services as non-innovative activities.<sup>25</sup>

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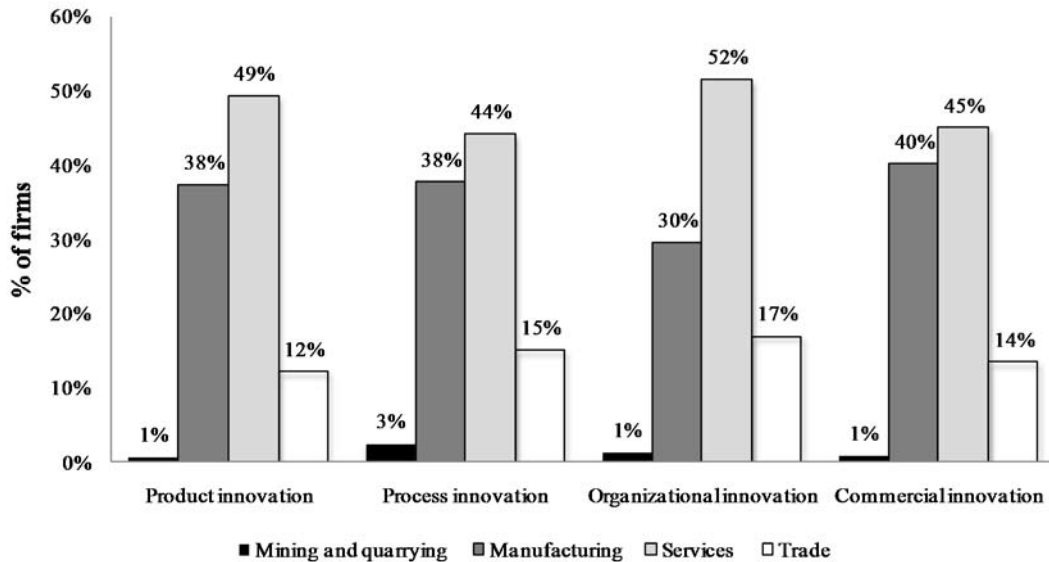
<sup>22</sup>Among other issues, the results of different innovation surveys may not be comparable, as the OECD (2005a) has pointed out. Even though surveys could share the same methodological framework, comparability is not straightforward due to a wide array of factors, such as the different coverage of surveyed enterprises, or, what is more important, a rather heterogeneous interpretation of what the term “innovation” could refer to. For example, this could lead to counterintuitive results, as explained in Rubalcaba and Gallego (2013). The authors analyzed an innovation survey in the Dominican Republic and concluded that the percentage of innovative enterprises in the Dominican Republic outstripped that in highly innovative countries such as Finland or Germany because different surveys interpreted the concept of innovation in different ways.

<sup>23</sup>The ACTI survey covers four different sectors: mining and quarrying, manufacturing, services and trade. According to the results, 37.4% of Ecuadorian innovative enterprises stem from services (27.7% from services other than trade, and 9.7% from trade), which is above the enterprises coming from manufacturing (20.3%) and mining and quarrying (1.2%). The relevant share of services in the Ecuadorian economy could explain the relevant innovative performance of the service sector on this regard. Thus, in order to ascertain the truly innovative character of the service sector enterprises, it seems necessary to estimate the share with respect to the total number of service sector enterprises.

<sup>24</sup> Three aspects related to the use of survey as the methodological framework of analysis should be considered here: a) Perceptions do matter: people from LCR countries tend to be more optimistic and happier than any other region in the world (see <http://www.gallup.com/poll/159254/latin-americans-positive-world.aspx>), and it could be reflected in the answers; b) business change is often interpreted as innovation, even though they are not the same; c) a kind of “leapfrogging effect” may take place in backward businesses (i.e., it is easier to introduce novelties).

<sup>25</sup>Since Adam Smith (1776) put forward the negative view of services as generating no value added, services have been largely neglected and the general view of services as nonproductive, non-innovative and not tradable is still alive. Analyses explaining the specificity of service innovation have been necessary to dispel the myths about services (Gallouj, 2002).

**Graph 10. Innovation uptake in Ecuadorian enterprises by sector**  
 (% of companies doing innovation; total innovative firms=100%)



Source: Main Indicators on Science, Technology and Innovation Activities (ACTI 2009–2011). NOTE: the services category covers services other than trade.

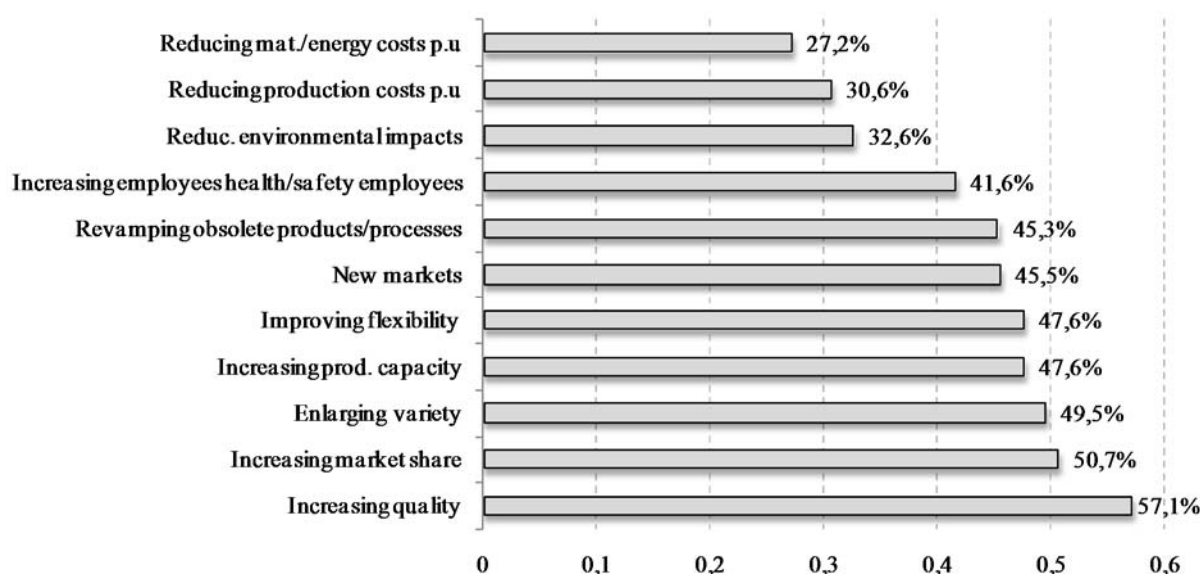
Innovation in services has some specificities vis-à-vis innovation in manufacturing. For example, the national survey shows that services sector enterprises in Ecuador are more willing to engage in organizational innovation than in product or process innovation, even though they devote fewer resources to promoting such types of innovation. The most widespread type of innovation in the services sector enterprises (trade and other services) is organizational. The literature provides overwhelming evidence that organizational innovation plays a major role in services.<sup>26</sup> The 2009–2011 survey data show that the number of firms engaged in innovation, not their innovation expenses, demonstrate the importance of organizational innovation. In terms of expenses, organizational innovation is not as important in services as it is in manufacturing (41.5% of total organizational innovation expenses, whereas manufacturing accounts for around 52%). By contrast, services spend more on product/process innovation (55.2% vs. 37.2%). These results point out that there is plenty of room in Ecuadorian services for non-technological innovation, which is particularly important for increasing trade competitiveness in services.

The main impact of innovation in Ecuadorian services enterprises is to increase quality. Some 57% of innovative enterprises consider services quality to be the main impact achieved by innovation, far above increasing market share (50.7%), enlarging the variety of services (49.5%) and increasing production capacity (47.6%). The notion that quality is the main impact of services innovation aligns precisely with the intangible nature of the output of the services sector, and its importance has been widely stressed by

<sup>26</sup>See, among others, Gallouj, 1994, 2002; Gallouj & Gallouj, 1996; Gadrey *et al.*, 1995; Sundbo, 1998; Rubalcaba *et al.*, 2010.

the literature.<sup>27</sup> By comparison, reducing material, energy costs (27.2%) and production costs (30.6%) per unit of production are the least relevant innovation impact indicators in Ecuadorian services.

**Graph 11. Main impacts of innovation on Ecuadorian services**  
(% of firms declaring innovation impacts)



Source: Main Indicators on Science, Technology and Innovation Activities (ACTI 2009–2011).

According to Ecuadorian services enterprises, the high costs of innovation (24.9%) and lack of enterprise funds (22.5%) are the main bottlenecks when introducing innovation. Challenges related to access to information are also relevant. In fact, Ecuadorian services firms are eager for further information on both technologies that could foster innovation (20.6%) and markets (20.6%). New technology is also important for most Ecuadorian services firms. Ecuadorian services firms are increasingly embracing the Information Society, but there is still some way to go. ICT uptake is undoubtedly one of the most important sources of innovation in a networked, global and technological world. Across the whole Ecuadorian economy, only 48.6% of firms had their own Web sites in 2010 according to a World Bank Survey (2013), which means that Ecuadorian enterprises seem to have not yet fully reaped the benefits of the Information Society.

### 3.3 Innovation and firm performance in services

The Enterprise Survey data for Ecuador<sup>28</sup> show that the percentage of services firms that have been involved in services and programs to support innovation is slightly higher than in the manufacturing

<sup>27</sup>See, for example, Gago, 2010, or Rubalcaba, 2011 on the different nature of innovation impacts in manufacturing and services. Results confront with the Ecuador's results from the Enterprise Survey (2010), where only 6.2% of the surveyed firms have an internationally recognized quality certification in Ecuador, whereas the LCR average is 16.8%.

<sup>28</sup>The Enterprise Survey data from the World Bank make possible a firm-level analysis between business performance and only one innovation variable in the case of Ecuador. (The other innovation variables are strictly for manufacturing.) The only innovation variable available for a firm-level analysis in Ecuador is a proxy for innovation in services: "Over the last three years, did this establishment use any services or programs to support innovation?" (item LACp7). The obvious fact that innovation may occur independently of services or

sector (table 1). However, the Enterprise Survey does not request information about the public or private character of such programs. Ecuadorian services companies could themselves presumably promote a wide set of innovation activities as reported in the national survey analyzed in the previous section. The key question remains whether or not these innovation activities are effective for improving firm performance.

**Table 1. Ecuadorian firms using services or programs to support innovation**

Sector	Yes	No	Total
Manufacturing	70 (56.4%)	53 (43.1%)	124
Services	141 (58.3%)	101 (41.7%)	242
Total	211 (57.8%)	154 (42.2%)	365

Source: Based on the Enterprise Surveys (<http://www.enterprisesurveys.org>), The World Bank

Ecuadorian firms using services or programs to support innovation (private or public) have higher “average” sales per worker than firms not using or participating in programs (table 2). For the whole sample, firms involved in such programs show sales per worker more than 30% higher than counterparts that do not participate in those programs. However, the benefits are quite different across sectors. Manufacturing firms that use services or programs to support innovation have sales nearly 90% higher than those that do not. By contrast, services firms that use services to support innovation have sales only 16% higher than those that do not. Hence, the results of innovative activities in manufacturing firms and services firms are different—participating in programs that support innovation results in a notably greater increase in sales among manufacturers than it does among services firms. In fact, our results are in line with evidence found in studies in industrialized countries (Griffith et al, 2004; Griffith et al, 2006; Mairesse and Mohen, 2010) showing a positive relationship between R&D, innovation and productivity. Taking this into consideration, studies on manufacturing firms in LCR countries based on the Enterprise Survey (Arias-Ortiz, Tacsir and Vargas, 2014) have shown that LCR manufacturing firms are innovative (have introduced a new product, process, invested in R&D or intellectual property rights, IPR), hence, suggesting an effort to improve firm performance. Crespi and Zuñiga (2012) also demonstrated a positive econometric relationship between manufacturing and firm productivity for six manufacturing economies in Latin America. The evidence in services is not as conclusive.

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support programs is a coverage problem of the proxy variable. However, the innovation linked to programs is more robust and less vulnerable to the sorts of changes that happen in the very open questions of innovation surveys in many countries. Therefore, we may consider the restricted coverage of the variable a positive attribute and the variable itself an even better proxy than classical variables. Regarding firm performance, the Enterprise Survey offers three main types of variables: sales, sales per employee (a proxy for productivity, although especially in services, it would be better to measure productivity in value added per hour worked), and exports. These performance measures are not proper indices of productivity index like TFP or the service labor productivity discussed in section 2.1, because the sales are the reference instead of the value added. However, they were the best alternatives available.

**Table 2. Average sales per worker of Ecuadorian firms using services or programs to support innovation**

Sector	Yes	No	Total	ANOVA Results	
				F	Prob> F
Manufacturing (sales/worker)	42,015.48	22,171.54	32,388.83	7.71	0.0063
Services (sales/worker)	63,642.18	54,745.82	59,769.65	1.51	0.32
Total (sales/worker)	56,139.04	42,259.01	49,757.26		

Source: Based on the Enterprise Surveys (<http://www.enterprisesurveys.org>), The World Bank.

NOTE: The number of observations for manufacturing and services firms is 121 and 240 respectively. The Kolmogorov-Smirnov test confirms the above results.

In order to assess the extent to which involvement in programs to support innovation can explain the differences between sales per employee among firms, we conducted a simple analysis of variance (ANOVA).<sup>29</sup> The results show that having participated in such programs explains a statistically significant part of the variability of the observed values of the sales per employee figure in manufacturing firms, but it does not do so in the case of services firms. In other words, there is an actual (in statistical terms) increase in sales only for manufacturing firms that participate in innovation programs.

**Table 3. Percentage of exporters among Ecuadorian firms using services or programs to support innovation**

Sector	Yes	No	Total	ANOVA Results	
				F	Prob> F
Manufacturing	41.4%	22.6%	33.1%	4.90	0.0287
Services	9.2%	5.0%	7.4%	1.56	0.2136
Total general	19.9%	11.0%	16.1%		

Source: Based on the Enterprise Surveys (<http://www.enterprisesurveys.org>), The World Bank.

NOTE: The number of observations for manufacturing and services firms is 123 and 242 respectively. A Kolmogorov-Smirnov test confirmed the above results.

The percentage of exporters among firms that participate in programs to support innovation is almost double the percentage of exporters among firms that do not participate in such programs. As table 3 shows, this is nearly the same among manufacturers and among services providers, although the percentage of exporters in the manufacturing sector is quite a bit higher, due to some of the inherent characteristics of the output of the services sector. Besides, results of the ANOVA<sup>30</sup> (to determine the different effect that participating in a program for innovation has among manufacturers than among services sector firms) show a different behavior for manufacturers than for services firms. In the manufacturing sector, participation in innovation programs helps to explain a part of the variability of the export behavior, which does not happen among services providers.

In short, participation in innovation support programs implies significant positive results in manufacturing, but not in services. A combination of reasons may explain this surprising result. For one thing, it confirms previous evidence on the mismatch between so many services firms declaring doing

<sup>29</sup>See Annex III for details

<sup>30</sup>*Ibidem*.



innovation, the low innovation performance confirmed by other indicators (e.g., the GII), and the low performance on productivity. Firms are innovating, but the quality and performance of their innovations are poor. A second reason for this result is that programs and services for innovation may not be well addressing the needs of services companies in Ecuador. Private innovation programs may include “small change” activities (conflating “innovation” and “change”) and process innovations that generally do not correlate with productivity in services. Unfortunately, there is no data in the Enterprise Survey on product innovation for services, which often leads to greater impacts on productivity and performance (Aboal, et al., 2015). Public innovation programs are not well oriented toward services firms (many do not take into account the specificities of services), as we know because this is a phenomenon observed all over the world, both in developed and developing economies (Rubalcaba et al., 2010, 2014), excluding the low performance of those programs. The third reason for this result relates to the multiplicity of impacts from services innovation. Such impacts are often wider than productivity improvements or cost decreases, and relate to differential, range of products, quality, and other factors that existing statistics do not cover. Policy implications are clear on the measurement side, on the design of programs for services, on the promotion of an innovation culture in firms and on considering long-term impacts from services innovation. Ecuador needs a further assessment of its public expenditure on innovation, as we propose in the policy section.

#### **4. Conclusions and policy implications<sup>31</sup>**

Economic conditions and social welfare have improved in Ecuador in the last decade, mainly due to an increase in public spending coupled with a significant contribution by the private sector. Today, the country is in the process of a so-called “transformation of the productive matrix” for economic diversification. Competitive services play a key role in this transformation, because they have significant weight in the economic structure and are able to generate new competitive advantages in every sector and improve the value chain of every firm. This paper has shown some of the key challenges for services in Ecuador. Among countries in LCR, Ecuador has relatively low productivity and relatively slow productivity growth. Ecuador’s declining trade competitiveness reflects the low productivity in its services sectors; export market shares dropped by almost 60% between 1980 and 2013, compared to average drop of 26% across LCR. Ecuador’s services trade deficit is large, albeit concentrated in specific services subsectors. Consistently, from 1980 to 2013, for every US\$1 of services Ecuador exported, it imported US\$2 of services. In addition, I/O analysis has shown that services lost ground as value added for export providers and users during the period 2001–2011. Despite a sharp decrease in this period, services still play a pivotal role as input providers for other economic activities exports, mainly driven by trade and distribution, which make up around 75% of total services inputs embodied in manufacturing exports. Indeed, linkages analysis confirms that gaps are quite relevant in some services subsectors in Ecuador, such as in KIBS. These subsectors are strategically fostering greater matrix diversification by providing inputs throughout the economy and are thus driving manufacturing and overall competitiveness. High sector concentration in input/output dynamics makes the Ecuadorian economy relatively vulnerable to possible adverse shocks. Furthermore, innovation is not a sufficiently strong driver of competitiveness in Ecuadorian services. Services firms innovate but, on average, doing so does

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<sup>31</sup> This section deals with the policy implications coming from the previous analysis and diagnosis and also benefits from the priorities expressed by stakeholders, mainly during seminars in Quito in May 2014.

not improve performance significantly. It is possible that existing programs are not addressing the needs of services companies in Ecuador, because the innovations are of poor quality and insufficiently novel, or because current statistics do not capture the multiplicity of intangible impacts from services innovation.

In this context, there is a clear justification for competitiveness and innovation services-related policies in Ecuador. Services can play a key role in the policy debate on the transformation of the productive matrix because, as discussed in this paper, there are opportunities to improve Ecuadorian services to improve the country's productivity, trade competitiveness and innovation.

As such, we have identified a menu of four major crosscutting policies to make services more innovative and competitive: (1) coordinating different institutions dealing with services and assessing how existing policies affect the performance of services and their competitiveness, (2) promoting international trade and trade competitiveness, including the role of exports through the use of services, (3) creating a framework for innovation in services and innovation through services, improving services quality, and (4) addressing regulatory issues and competition in services. These crosscutting issues come from the need to deal with different market and systemic failures reported in the field, mainly associated with information asymmetries and related lack of market transparency in services markets, the externalities generated by knowledge transfer in innovative services, and network and coordination failures.

The proposed four major crosscutting policy areas relate to the challenges discussed in previous sections as follows. (See figure 2.) The productivity deficit, where services perform at low levels and low growth in the LAC context, is the major challenge presented up front in the report. It also affects trade competitiveness, and justifies policy actions toward services and coordinated action in the context of the transformation of the productive matrix. Linked to the productivity deficit, the paper has analyzed the international trade in services, showing major deficits in balance of payments and non-positive trends in market shares. This calls for the adoption of policies in the area of internationalization and international trade in services, but also in the areas of innovation, regulations, and competition that affect internationalization. The analysis of innovation as a particular driver revealed that innovation does exist in Ecuadorian services but has a low impact on firms' performance. This calls for action in order to improve the innovation policy in services, which can be a synergistic policy with the international, regulations, and competition areas.

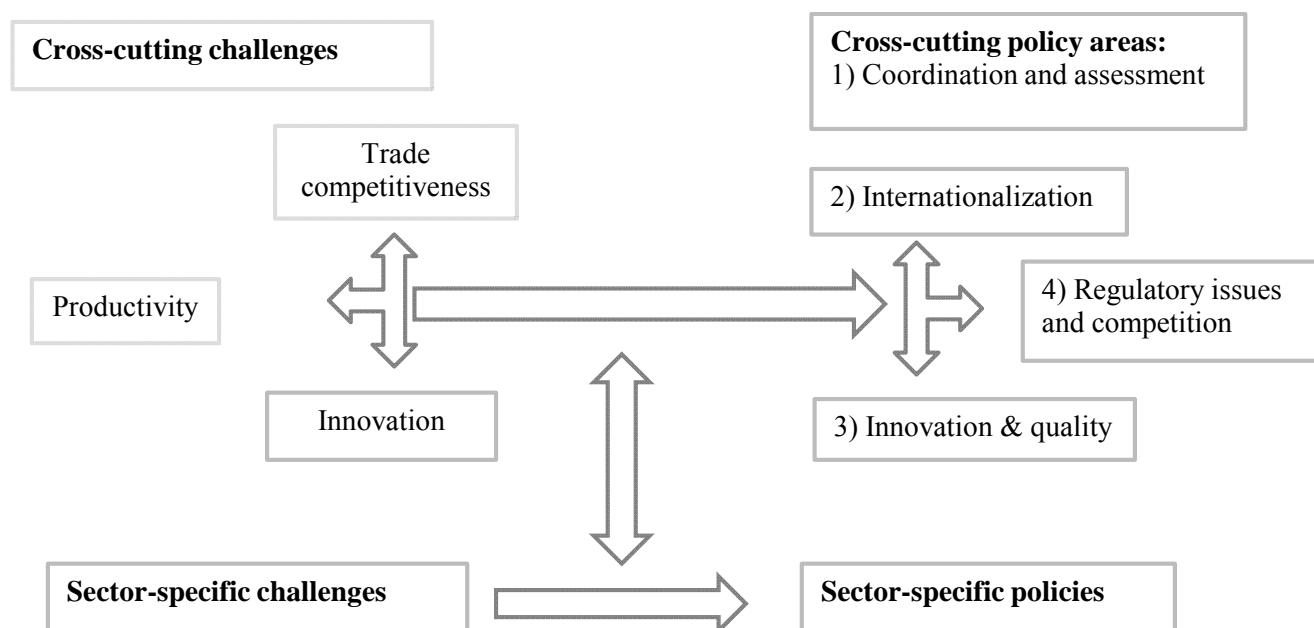
The objective in terms of coordination and assessment is to place services at the center of the policy debate on the transformation of the productive matrix and to assess how ongoing policies affect services dynamics in the country. Ecuador could develop a coordinated inter-ministerial working agenda for services to promote synergies, efficiency and effectiveness in the policy making for competitiveness and innovation. The Ministry Coordinator of Production, Employment and Competitiveness (MCPEC) and the Ministry of Industries and Productivity could play major coordinating roles. For example, they could include services on the main policy agenda for the transformation of the productive matrix and raise awareness of the importance of services. They could also reinforce synergies and reduce overlap between different institutions regarding services in coordination with the main ministry ("Ministerio Rector") for each sector. Finally, they could promote services quality in the country, support the transfer of knowledge and best practices between services sectors, coordinate the screening of existing policies, and monitor the impact of policy changes on an ongoing basis.

On the other hand, policies for services internationalization apply, including policy design for services competitiveness and support to services internationalization (i.e., actions to promote innovation and

export of services). The relatively open condition in the market should be a comparative advantage for developing strong services export, not just to import services. Ecuador may find new competitive advantages in areas such as offshoring of services, environmental services, and energy services. In this way, Ecuador could follow other successful examples of services exports around the globe (see Goswami, Mattoo and Sáez, 2012). The models include some Latin American countries, such as Chile, and some Central American countries that have been successful in services offshoring, BPO and some KPO in the case of Chile (Fernandez-Stark, Bamber and Gereffi, 2011). This is all occurring in a context where Latin America is emerging in global services (Hernández et al, 2014). Some of these services have grown because of specific national strategies promoting special sectors in the countries, often including the attraction of FDI in those services. Existing regulatory barriers against foreign suppliers of services can hamper not only services trade but also local firm productivity.

Besides policies toward the internationalization of the services sectors, other policies may address the integration of services within the exports of goods. Diversification of services embodied in manufacturing exports in Ecuador seems necessary to reduce dependency on some services activities (particularly trade and distribution services) as input providers. As emphasized in section 2.3.3, the declining share of services as export providers between 2001 and 2011 has to do with the disproportionate performance of trade and distribution services, which account for around 75% of services embodied in manufacturing exports. This implies a dramatic challenge to find hypothetical changes or circumstantial factors that could affect these sectors. Consequently, Ecuador could progressively reduce high levels of dependency by promoting a varied use of services in the value chains of other economic activities, especially manufacturing. Promoting policies directed to influence transversal services (e.g., business services) in Ecuador may also help sustain more balanced growth of exports and foster competitiveness both in the manufacturing sector and across the overall economy. Business services are a case in point.

**Figure 2. Major challenges and policy areas for Ecuadorian services**



As a third pillar, services innovation policy could help increase services productivity and trade competitiveness for Ecuador. To promote services innovation policies in the region, we recommend raising awareness of the advantages of services innovation, promoting further analysis of the topic among all relevant stakeholders, and assessing the efficiency and the impact of existing policies and programs. Before Ecuador designs a detailed plan for services innovation, it needs to undertake these preliminary actions as well as understand the framework and alternative approaches for services innovation policies.

Education and training are extremely important for services. Most services require particular skills related to the increasing role ICT plays in the global economy, the importance of sound management practices in business, and the key role of mastering languages in an open and global world. To this respect, the lack of engineers in Ecuador and lack of qualifications in many KIBS services are worth emphasizing. Moreover, education is also essential to favor a services culture both in the students and in the workers. Services innovation often involves coproduction between managers, front-line workers, providers and clients, which requires reducing mismatches between skills and competences.

Furthermore, the analysis reported in this paper has confirmed the need for a services quality policy. Policies in this area may tackle (1) the lack of accreditations and certifications (beyond the traditional ISO9000), (2) the high costs of access to international certifications in sectors such as software, (3) the outdated state of some of the existing accreditations, for example, in the hotels industry, (4) the lack of a services quality culture in both manufacturing and services industries, and (5) the lack of training programs for services quality.

Improving the regulatory environment is a priority. Potential improvements include streamlining the processes and requirements to start a business, simplifying other processes (such as the processes for property transfers), reducing possible duplications in activities undertaken by different public bodies, improving contract enforcement, and strengthening the financial regulatory framework and credit information infrastructure. In a related vein, fighting informality in services may comprise measures such as: (1) raising awareness through information campaigns regarding the benefits of formalization, (2) introducing more flexible contractual categories (e.g., temporary contracts), and (3) offering information and mentoring to interested informal firms so that they could connect and expand their activities with formal firms.

Furthermore, the lack of a service-oriented guarantee and collateral system for firms that do not have physical assets on which to base their loans is hampering services firms' access to finance. Addressing this issue requires policies targeted at estimating the magnitude of the issue, using benchmarking, and increasing firms' access to credit, especially by: (1) easing liquidity and finance constraints faced by firms and (2) promoting development of financial instruments targeted at startups and innovative services for SMEs.

Ecuador may also want to improve public procurement. The system in Ecuador often keeps the essential traits of the traditional goods public procurement system (e.g., orientation to price and not to quality, lack of interaction, problems of the accreditation system for consultants). Finally, Ecuador could do more to foster competition. Despite growing openness to trade in LAC, services sectors are marked by low competition because they are mostly non-tradable and product market regulations (as defined by OECD; economic and administrative regulation) restrict effective competition in domestic markets. In any case, there is a need to differentiate between services sectors with network effects (which competition policies have largely focused on) and other services sectors (some of which are to a certain extent tradable), where

there is an increasing role being played by competition policy (e.g., professional services, distributive trades, digital services and financial services).

Further research is needed on the role services play in the Ecuadorian economy. More evidence at the sub-sectorial level and more firm level analysis are necessary to capture the dynamics of particular services subsectors and firms. Moreover, research on the regulatory issues affecting the investment climate for services, on markets and their degree of competition, and on issues related to international trade of services and services globalization, is particularly important.

A final comment must be devoted to the importance of services sector policies, which necessarily accompany crosscutting policies. Even though this paper has not explicitly analyzed the particular role of KIBS-enhancing policies, KIBS are important drivers of innovation and economic diversification. In this regard, the first policy action related to KIBS has to do with improving statistics and information as well as to developing further research to formulate specific well-defined policy implications. Furthermore, two main policy areas require specific actions: (1) promotion of KIBS supply and (2) KIBS supply/demand interactions. KIBS supply policies cover areas such as human capital, quality, entrepreneurship and new services exports (in services like services offshoring, energy services and environmental services). KIBS demand- and supply-based policies may focus on removing bottlenecks in the markets for KIBS and, in particular, stimulating demand for KIBS. For this purpose, it would be advisable that Ecuador explores types of financial support, such as vouchers or matching grants along with the adoption of venture capital, seed funding or other innovative financial mechanisms. In KIBS, as in tourism and other services sectors, there is room for policy development and for certain policy experimentations as in the case of technological platforms, involvement of diaspora and innovation awards. We recommend that Ecuador introduce an eco-innovation system to make the transformative role of services innovation through KIBS efficient and effective. More and better quality KIBS supply and demand can generate higher productivity in Ecuadorian companies, creating more jobs, more welfare and shared prosperity in the population.

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## ANNEX I: Input-Output Analytical Framework

### 1.a. The Input-output model

In an input-output table the following identity applies:

$$Q = X * u + F \quad (1)$$

Where:

$Q$ : Output vector

$X$ : Intermediate demand matrix.

$u$ : Identity matrix

$F$ : Total final demand vector

$X$  matrix captures inter-sectorial relationships. The rows of the table describe the deliveries of the total amount of a product or primary input to all uses, both intermediate and final. The columns of the table describe the input requirements to produce the gross output totals. By definition, the value of the total demand for the output of any sector (representing the total expenditures) must equal the value of the total supply (indicating the total cost of the output).

Thus, the input/output table can be described mathematically as a set of equations that must be satisfied simultaneously for the gross output of each sector to balance the intermediate and final demand for its product.

In input/output analyses, a fundamental assumption is that the inter-industry flows from  $i$  to  $j$  (recall that these are for a given period, say, a year) depend entirely and exclusively on the total output of sector  $j$  for that same time period. Consider the variable that represents intermediate use,  $X_{ij}$ .

The  $j$ th sector produces some gross output,  $X_j$  itself. It uses many intermediate inputs to produce that output, including what it requires from the  $i$ th sector,  $X_{ij}$ . Let's define a new number,  $a_{ij} = X_{ij} / X_j$ . This new number, called a input/output coefficient can be interpreted as the amount of input  $i$  used per unit output of product  $j$ .

If each column of the  $X$  matrix is divided from output of the branch corresponding to that column, the resulting matrix is the so-called technical coefficient matrix or  $A$  matrix. This operation is expressed algebraically as follows:

$$A = X * [\hat{q}]^{-1}$$

Being  $[\hat{q}]^{-1}$  the inverse of the diagonal vector or output. Hence, every cell of the  $A$  matrix may be expressed as  $a_{ij} = \frac{x_{ij}}{q_j}$ . Every  $a_{ij}$  element of the  $A$  matrix represents the  $j$ -branch use from  $i$ -branch products for every production unit.

From the former expression, it follows:

$$X = A * [\hat{q}]$$

And given that

$$[\hat{q}] * u = q$$

Then [1] may be rewritten as:

$$q = A * q + f$$

Where, when isolating  $q$ , it follows:

$$q = (I - A)^{-1} * f \quad (2)$$

In the former expression,  $(I - A)^{-1}$  matrix' represent the inverse Leontief matrix, which is to be labeled as the B matrix onwards. Leontief inverse matrix is also known as the multiplier matrix and takes account of the fact that the total effect on output will vary, depending on which sectors are affected by changes in final demand. The total output multiplier for a sector measures the sum of the direct and indirect input requirements from all sectors needed to fulfill the final demand requirements of a given sector. Therefore once the initial change in final demand is known, the values of all inputs and outputs required to supply it can be determined.

### ***Backward & forward linkages***

Backward linkages are defined as the sum of the elements in the  $j$ th column of the Leontief inverse matrix (B matrix) and measures the total output from all sectors generated from one unit final demand of sector  $j$ 's output. In this context, the coefficient  $b_{ij}$  indicates by how much the output of the  $i$ th sector,  $x_i$ , would increase if final demand for sector  $j$ 's output,  $y_{dj}$ , had been increased by one unit (that is,  $\partial x_i / \partial y_{dj} = b_{ij}$ ). That is,

$$b_{*j} = \sum_{i=1}^n b_{ij}$$

The coefficient  $b_{*j}$  gives the output multiplier and reflects the backward linkage of sector  $j$ . A unitary increase in sector  $j$ 's output requires  $b_{*j}$  units in increased output for the economy as a output multiplier measures the effects of one monetary unit change in the final demand for each sector on total output of all sectors (including the sector itself).

Forward linkages are the sum of the elements in the  $i$ th row of the output inverse matrix and gives the effect on total output throughout all sectors of a unit change in primary inputs for sector  $i$ . For example, a decrease of primary inputs to sector  $i$  results in a decrease in sector  $i$ 's output and in the output of all sectors that depend on sector  $i$ 's product to produce. The coefficient  $b_{i*}$  measures the effect on sector  $j$  output of one unit change in the availability of primary inputs to sector  $i$  (that is,  $\partial x_j / \partial w_i = b_{i*}$ ). Hence,

$$b_{i*} = \sum_{j=1}^n b_{*ij}$$

reflects the forward linkage of sector  $i$ . For analytical purposes, both backward and forward linkages have been obtained by using the Leontief-demand model. Notwithstanding this, it should be mentioned that some authors use a supply-driven model (also termed as Ghosh-model) in the calculation of forward linkages.

### ***Key sector analysis***

In the spirit of Rasmussen (1956), one can normalize the backward and forward linkage measures according to the overall measure for the economy as a whole (let BL and FL be the normalized measures). If  $BL_j > 1$ , then a unitary increase in final demand for sector  $j$ 's output will generate an above average increase in activity in the economy.

Similarly, if  $FL_i > 1$ , then a unitary decrease in the availability of primary inputs to sector  $i$  will lead to an above average decrease in economic activity. A sector is classified as key sector if  $BL_j > 1$  and  $FL_i > 1$ , as forward linkage oriented sector if  $BL_j < 1$  and  $FL_i > 1$  and as backward linkage oriented sector if  $BL_j > 1$  and  $FL_i < 1$ . If  $BL_j < 1$  and  $FL_i < 1$ , the sector is independent.

Additionally, as suggested by Boucher (1976), one can use of a measure of dispersion, the coefficient of variation, to assess how spread are the effects across the economy associated with individual sectors. The backward coefficient of variation of a sector is given by:

$$V_j = \frac{\sqrt{\frac{1}{n-1} \sum_{i=1}^n \left( b_{ij} - \frac{1}{n} \sum_{i=1}^n b_{ij} \right)^2}}{\frac{1}{n} \sum_{i=1}^n b_{ij}}$$

Whereas the forward coefficient of variation is as follows:

$$V_i^* = \frac{\sqrt{\frac{1}{n-1} \sum_{j=1}^n \left( b_{ij}^* - \frac{1}{n} \sum_{j=1}^n b_{ij}^* \right)^2}}{\frac{1}{n} \sum_{j=1}^n b_{ij}^*}$$

A high  $V_j$  means that sector  $j$  draws heavily on a small number of sectors while a low  $V_j$  means that it draws evenly from the other sectors. A high  $V_i^*$  means that a small number of sectors draw heavily on sector  $i$  while a low  $V_i^*$  means that the other sectors draw evenly on sector  $i$ .

### ***1.b. Value added of exports***

The starting point is the representation of the Leontief inverse matrix, also known as the multiplier matrix  $M$ .

$$Q = (I - A)^{-1} * F = M * F \quad (1)$$

The former expression implies real production activities measured by value of output. For our purposes,

it provides a means to trace, through these income flows, the flow of gross activity and value added from intermediate to final goods and services, ostensibly across borders as well as sectors. Because linkages will vary by industry, different multipliers will characterize each industry. To focus on value added, we note first that in terms of gross output values  $Q$ , some share of this involves value added within each sector.

We then define  $\hat{S}$  as the diagonal matrix indexed over  $i, j$  with diagonal elements equal to the value added shares of output  $Q$ . We then use  $M$  to provide a breakdown of the flow of value added across activities in the form of the matrix  $V$ . The  $V$  matrix identifies the inputs of value added in each sector related to a unit of final demand:

$$V = \hat{S}M \quad (2)$$

If we multiply  $V$  by the diagonal matrix  $\hat{X}$  whose non-zero elements are the national export vector, we can recover the value added content of exports  $X$  (both direct and indirect).

$$H = V\hat{X} \quad (3)$$

The  $H$  matrix gives us the set of linkages, both direct and indirect, between value added across sectors.

Note that each row of the  $H$  matrix contains each sector's direct value added contribution on the diagonal and the indirect value added contribution through forward and backward linkages off the diagonal. Summing across columns within a row provides the forward linkages, while summing across rows within a column provides the backward linkages.

*An example for easy understanding of the input/output methodology: “business services”*

How to determine the *value added of exports*?. Value added of exports is composed of:


- 1) The **direct value added of business services' exports**, that is, the gross exports less domestic and foreign intermediate inputs.
- 2) The **indirect contribution** through value chain linkages with other export activities. This indirect contribution could be considered in terms of:

- **Forward linkages (rows)**: This measure captures the value added contributions of business services to all sectors' exports. Total value added in this case is direct value of business services exports plus the value added of business services that is embodied in other sectors' exports.

- **Backward linkages (columns)**: This measure captures the value added contributions of all domestic inputs embedded in business services' exports. Total value added in this case is direct value of business services' exports plus value added of domestic inputs (coming from all sectors) that are embodied in business services' exports.

- **“Business services to manufacturing”**? → the share of inputs (expressed as value added) from business services destined to manufacturing exports with respect business services' total value added of export. Thus, it is the share of manufacturing on business services' forward linkage.


	Primary	Energy	Manufacturing	Construction	Services	Total forward linkage
Business services	0.7	1.3	1.0	0.0	0.6	3.6



*“Business services to manufacturing”* =  $1/3.6 = 28\%$

-**“Business services in manufacturing”**→ the share of inputs (expressed as value added) from business services embodied in total manufacturing’ value added of exports. Thus, it is the share of business services on manufacturing’ backward linkage.

	Manufacturing
Primary	4.3
Energy	0.8
Manufacturing	10.8
Construction	0.1
Business services	1
Services	11.7
Total backward linkage	28.7



*“Business services in manufacturing”* =  $1/28.7 = 3.5\%$

## ANNEX II: Sector contribution to GVA, employment and aggregate productivity growth for selected LCR countries: Methodological Issues

The sectorial contribution to aggregated employment growth for the period under analysis is calculated following a similar approach to the one Kox and Rubalcaba (2007) applied for analyzing the role of business services in the European economies, namely:

$$CL_{ij}^t = \frac{\Delta L_{ij}^t * LGR_j^t}{\Delta L_j^t} \quad (I)$$

where  $CL_{ij}^t$  refers to the contribution of industry  $i$  in country  $j$  to aggregate employment growth during time period  $t$  (2001–2011);  $\Delta L_{ij}^t$  refers to the absolute employment change in industry  $i$  in country  $j$  during time period  $t$ ;  $\Delta L_j^t$  refers to the absolute employment change in country  $j$  during period  $t$ , and  $LGR_j^t$  refers to employment annual growth rate in country  $j$  during time period  $t$  for the total economy.

The same approach is used for estimating the contribution of the different sectors to the aggregated country gross value added (GVA) growth between 2001 and 2011. It is important to notice that the GVA levels are expressed in current prices while the annual growth rates refer to the GVA in constant prices.

$$CVA_{ij}^t = \frac{\Delta VA_{ij}^t * VA\_GR_j^t}{\Delta VA_j^t} \quad (II)$$

Both employment and value added at current and constant prices data are used for estimating the contribution of sectors to the aggregate productivity growth. Following the same approach as Pilat (2006) and Maroto and Rubalcaba (2009), this contribution is measured on the basis of the following equation:

$$CP_{ij}^t = S_{ij}^{tVA} * \Delta VA_{ij}^t - S_{ij}^{tL} * \Delta L_{ij}^t \quad (III)$$

where  $CP_{ij}^t$  denotes the contribution of industry  $i$  to the aggregate productivity growth in country  $j$  during time period  $t$  (2001–2011);  $S_{ij}^{tVA}$  is the average share of industry  $i$  in the GVA of country  $j$  at current prices during 2001 and 2011;  $S_{ij}^{tL}$  is the average share of industry  $i$  in the total employment in country  $j$  for the same period of time;  $\Delta VA_{ij}^t$  and  $\Delta L_{ij}^t$  denote respectively the annual growth rates of GVA at constant prices and employment for every industry  $i$  in country  $j$  between 2001 and 2011.

## ANNEX III: ANOVA Results

**Table III.1. ANOVA Models for the Average Sales Per worker**

### Manufacturing Sector ANOVA

Number of obs =121 Root MSE = 37797.4			R-squared =0.0609 Adj R-squared =0.0530		
Source	Partial SS	df	MS	F	Prob> F
Model	1.1029e+10	1	1.1029e+10	7.72	0.0063
LACp7	1.1029e+10	1	1.1029e+10	7.72	0.0063
Residual	1.7001e+11	119	1.4286e+09		
Total	1.8104e+11	120	1.5086e+09		

Source: Based on the Enterprise Surveys (<http://www.enterprisesurveys.org>), The World Bank data for Ecuador (2010). The Kolmogorov-Smirnov test confirms the above results.

### Service Sector ANOVA

Number of obs = 240 Root MSE = 122493			R-squared = 0.0063 Adj R-squared = 0.0021		
Source	Partial SS	df	MS	F	Prob> F
Model	2.2717e+10	1	2.2717e+10	1.51	0.2197
LACp7	2.2717e+10	1	2.2717e+10	1.51	0.2197
Residual	3.5711e+12	238	1.5005e+10		
Total	3.5938e+12	239	1.5037e+10		

Source: Based on the Enterprise Surveys (<http://www.enterprisesurveys.org>), The World Bank data for Ecuador (2010). The Kolmogorov-Smirnov test confirms the above results.



**Table III.2. ANOVA Results for the Percentage of Exporters****Manufacturing Sector ANOVA**

			Number of obs= 123		R-squared = 0.0389
			Root MSE = .465937		Adj R-squared = 0.0310
Source	Partial SS	df	MS	F	Prob> F
Model	1.06460018	1	1.06460018	4.90	0.0287
LACp7	1.06460018	1	1.06460018	4.90	0.0287
Residual	26.2687332	121	0.217096968		
Total	27.3333333	122	.224043716		

Source: Own calculations based on the Enterprise Surveys (<http://www.enterprisesurveys.org>), The World Bank data for Ecuador (2010). The Kolmogorov-Smirnov test confirms the above results.

**Service Sector ANOVA**

			Number of obs= 242		R-squared = 0.0064
			Root MSE = .26263		Adj R-squared = 0.0023
Source	Partial SS	df	MS	F	Prob> F
Model	.107263338	1	.107263338	1.56	0.2136
LACp7	.107263338	1	.107263338	1.56	0.2136
Residual	16.5538937	240	.068974557		
Total	16.661157	241	.069133432		

Source: Own calculations based on the Enterprise Surveys (<http://www.enterprisesurveys.org>), The World Bank data for Ecuador (2010). The Kolmogorov-Smirnov test confirms the above results.