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ORIENTAL REPUBLIC OF URUGUAY

INTEGRATION INTO GLOBAL VALUE CHAINS THE DAIRY INDUSTRY AND THE ICT INDUSTRY

ALBERTO CRISCUOLO, IFEYINWA UCHENNA ONUGHA, GONZALO VARELA

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INTEGRATION INTO GLOBAL VALUE CHAINS

THE DAIRY INDUSTRY AND THE ICT INDUSTRY

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PART I

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1. Executive Summary

Uruguay has much to gain from further integration with the global marketplace. Increased trade allows economies of scale and increases exposure to technological and knowledge spillovers, resulting in greater productivity. Participating in global and regional value chains is an important launchpad for international integration. Uruguay requires a multipronged strategy that targets increased sophistication of Uruguay's productive structure and diversification into specialized, high-value, modern services exports unconstrained by lack of economies of scale or distance. This report analyzes the dairy and Information & Communications Technology (ICT) and ICT Enabled Services (ICTES) value chains in Uruguay to identify opportunities for industry-specific upgrading and integration with global value chains (GVCs).

By taking the dairy and ICT/ICTES value chains as concrete cases, the analysis piloted here illustrates how a traditional industry, locked in low value added exports, such as dairy, and a new export service industry, such as ICT/ICTES, can tackle the remoteness and 'smallness' challenges of Uruguay, and pursue economic upgrading and better international integration. The analytical approach targets opportunities to both enter new international production networks and participate in higher-value-added business segments. These objectives align with the Government of Uruguay's priority to determine how the country can integrate better with global markets through GVCs.

GVCs have four key features that set them apart from traditional production and trade: (1) customization of production—with intensive contracting between parties, often subject to distinct legal systems, (2) sequential production decisions going from the buyer to the suppliers, (3) high contracting costs, and (4) global matching not only of goods and services, but also of production teams. These distinct features of GVCs have implications for the overall business environment conducive to fertile grounds for GVCs to prosper, as well as for the types of trade facilitation efforts, infrastructure, skills, and trade and investment policies that are best suited for this reality.

1.1. COUNTRY CONTEXT

Over the past decade, Uruguay's growth has been sustained, strong, and inclusive; the country has bolstered its resilience and reduced its vulnerability to external shocks. Uruguay's economy has expanded at an annual average of 5.6 percent since 2006. The

economy has recovered from the 2002 economic and financial crisis, and there has been a marked decline in growth volatility. A favorable external environment—characterized by strong foreign demand, high commodity prices, and global liquidity—has supported growth. Prudent macroeconomic policies and important policy reforms have also played key roles. The last decade bore witness to significant job creation, and unemployment has declined to historically low levels. Low corruption, good infrastructure, and sound educational and health standards are conducive to investing in Uruguay, which is now one of the top recipients of FDI in the region: amounting to 4.7 percent of GDP in 2010-2015, at par with Costa Rica, and outperforming Paraguay or Argentina.

1.2. URUGUAY'S TRADE COMPETITIVENESS PERFORMANCE

Substantial churn in Uruguay's main export products and destinations has accompanied Uruguay's economic growth over the last ten years. Although Uruguay's merchandise exports remain dominated by primary and resource-based products, there has been substantial technical change and knowledge addition in some of these export products that would typically be considered 'primary.' One example is bovine traceability from farm to consumer.

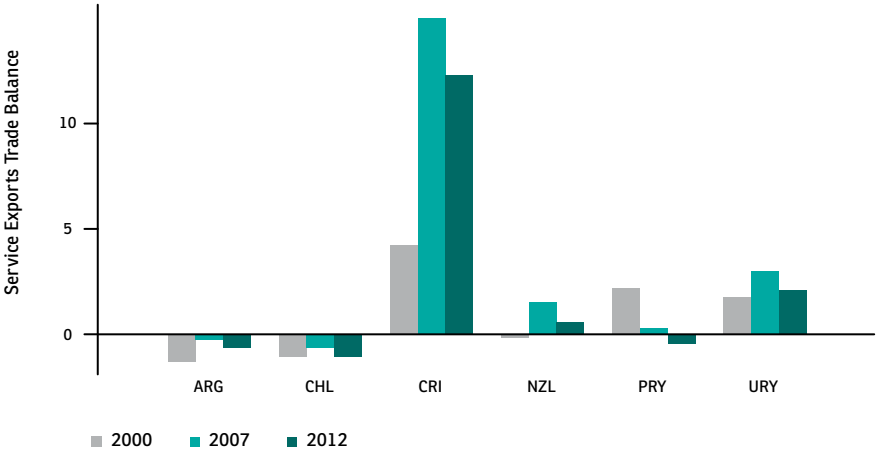
Similarly, services exports have maintained their strength, driven not only by increases in exports of traditional services (transport, travel, distribution), but also of modern services (Figure 1)—for example, business services and ICT/ICTES—to a wide variety of markets. Indeed, Uruguay has maintained a positive trade balance over the last decade. As a share of GDP, Uruguay's trade balance has been higher than those of several of its peers, including Argentina, Chile, and Paraguay (Figure 2). The services sector accounts for almost a third of total exports.

Despite Uruguay's significant achievements, its growth model now faces several challenges. Notably, Uruguay suffers from a significant productivity gap relative to aspirational comparators: labor productivity is estimated to be (35 percent of that in the U.S.).[1] Increasing productivity upgrading through improved managerial quality and a greater propensity to innovate in processes and products will be key to competing in international markets. Additionally, as Uruguay cannot easily use economies of scale to enhance its competitiveness due to its 'smallness,' it must do so by identifying high-

1 Labor productivity in Uruguay was among the highest in the region during the 2000s and has grown twice as fast since 2007 as it did during the 1990s and early 2000s. Nevertheless, Uruguay's observed labor productivity is only about 35 percent of that of US. Human capital and TFP are the main drivers of this labor productivity gap (Uruguay SCD, World Bank, 2015).

FIGURE 1. **Evolution of Uruguay's Services Exports Composition, 2000–2013**

FIGURE 2. **Services Trade Balance, Share of GDP, 2002–2012**[1]



1. WBG WITS System country codes: Argentina (ARG), Chile (CHL), Costa Rica (CRI), New Zealand (NZL), Paraguay (PRY), Uruguay (URY).
Source: Uruguay Trade Competitiveness Diagnostic, World Bank, 2015

er-value-added activities in sustainable segments in which it can compete and excel internationally. This makes issues related to human capital, skills, logistics, trade equally relevant to the competitiveness and international integration challenge.

Uruguay remains less open to international trade in both merchandise and services than would be expected given its level of economic development (Figure 3 and Figure 4).

Trade as a share of GDP in Uruguay stood at an estimated 53 percent in 2014. At the same time, trade in Panama, Chile, and Costa Rica was at 75.2, 66.5, and 58.6 percent, respectively. Uruguay's openness in commercial services is less than expected given its level of development (Figure 4), and when compared with countries with similar income levels and higher than expected service trade openness such as Estonia, Latvia, or Trinidad and Tobago.

FIGURE 3. **Merchandise Trade as a Share of GDP vs. Income, 2010–2014**

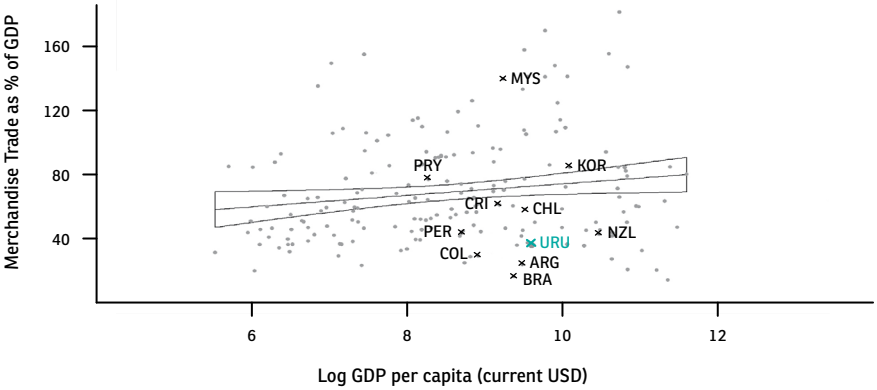
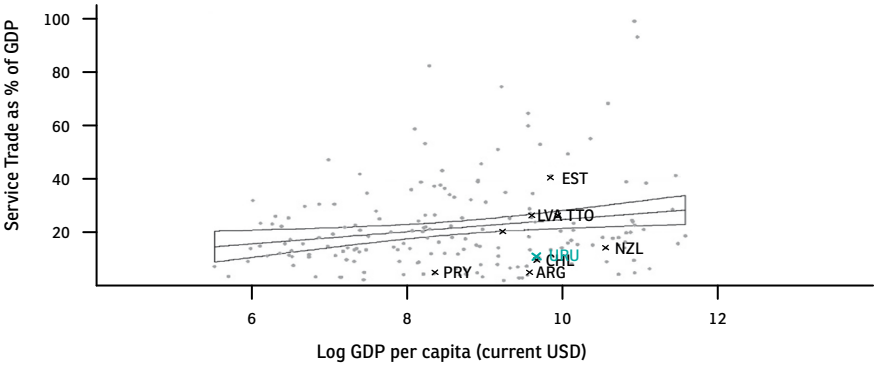


FIGURE 4. **Services Trade as a Share of GDP vs. Income, 2010–2014**



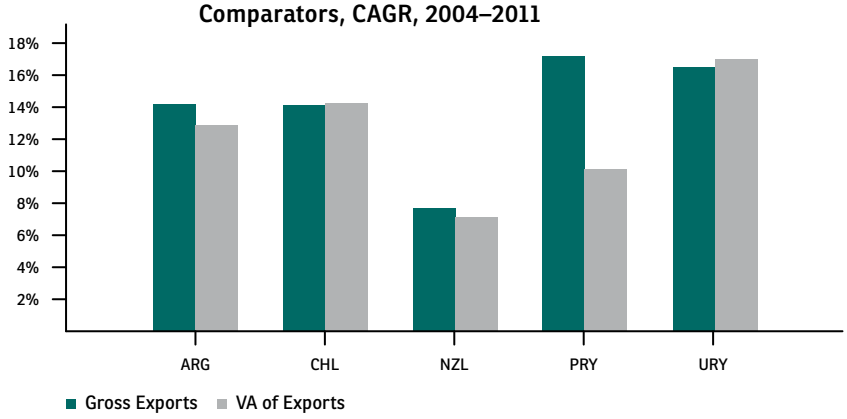
Source: Uruguay Trade Competitiveness Diagnostic, World Bank, 2015

Note: These figures use the WBG WITS System country codes (for example MYS stands for Malaysia) at: http://wits.worldbank.org/wits/wits/witshelp/Content/Codes/Country_Codes.htm

Nonetheless, there is an opportunity for Uruguay to increase its own value addition in exported goods and services. The Trade Competitiveness analysis conducted by the World Bank in 2015 (World Bank, 2015) demonstrated that between 1997 and 2011 Uruguay's gross exports of goods and services grew faster than those measured in terms of value added (Figure 5). This suggests that imported intermediates embedded in Uruguayan export products increased during that period. Still, exports measured in value added terms also expanded rapidly. Indeed, when focusing on the post-2002 crisis period and comparing

FIGURE 5. **Evolution of Exports of Goods & Services in Gross & Value Added, US$ billions**

FIGURE 6. **Growth of Exports, Gross & Value Added, Uruguay and Comparators, CAGR, 2004–2011**



Source: Calculations based on data from World Development Indicators (WDI) and the World Bank Trade in Value-Added Database, 2015.

export performance across comparator countries, Uruguay's exports of value added grew on par with gross exports and at a rate of 17 percent per annum. Argentina, Chile, Paraguay, and New Zealand also benefitted from food price increases. Chile also benefitted from mineral price increases. Yet, Uruguay has managed to incorporate value added into its export growth faster than Argentina, Chile, Paraguay, and New Zealand (Figure 6).

However, the recent decline in commodity prices that severely decelerated export growth in Uruguay in 2015, and with it, overall GDP growth, stresses the importance of increasing value added and upgrading in the value chains in which Uruguayan producers operate. Achieving these goals will require a strong institutional set up to support Uruguay's industry at the sector-level. Previous administrations have implemented several initiatives to develop institutional support and resource that could enhance productivity and innovation in Uruguay. Because several line ministries, agencies, and organizations actively contribute to Uruguay's participation in global value chains, as well as Uruguay's competitiveness and the productive transformation of Uruguayan industry, the current administration has recently established the National System of Productive Transformation and Competitiveness (*Sistema Nacional de Transformación Productiva y Competitividad - SNTPC*) under the Presidency of Uruguay.

Identifying and addressing economy-wide and industry-specific reforms that could enable the implementation of a global integration strategy remains a critical policy priority for Uruguay. Uruguay's path toward greater integration in global (and regional) value chains will require a multipronged strategy that targets increased sophistication of Uruguay's productive structure and diversification into specialized, high-value, modern service-exports that are not constrained by lack of economies of scale or distance.

Such a strategy might focus on sustained growth in value added and sophistication in upstream phases of production in resource-based agricultural chains, selectively upgrading toward downstream phases of the chain, and further diversifying the primary products export mix. It would also entail consolidating Uruguay's position as an international provider of both traditional and modern services, by broadening the portfolio and knowledge-intensity of export services not constrained by scale or geographical proximity.

The capacity of the SNTPC, the *Oficina de Presupuesto y Planeamiento* (OPP) under the Presidency, and the Ministry of Economy and Finance to align public intervention, policies, and investment around industry-specific development strategies will be critical in fostering a greater and better integration of Uruguay into global value chains.

1.3. HOW IS URUGUAY INTEGRATED INTO GLOBAL VALUE CHAINS?

Examining indicators of overall performance of Uruguayan exporters in global markets is useful as a first pass into looking at integration into GVCs. Another relevant

proxy is to look at how the country has performed in attracting foreign direct investment. In a world of GVCs, trade and investment are inextricably linked. How has Uruguay performed in joining GVCs by attracting FDI? Figure 7 shows the evolution of FDI inflows into Uruguay and comparators over the period 1997-2015.

Uruguay has positioned itself as an attractive investment destination, with FDI flows soaring in the past few years. Despite a recent decline, FDI flows have shown remarkable and relatively steady growth. As a portion of GDP, FDI inflows in Uruguay have grown from an average of 0.84 percent during 1997-2000, to 5.2 percent during 2003-2008, to fall slightly to 4.7 percent in 2010-2015, at par with Costa Rica, and outperforming Paraguay or Argentina.

FIGURE 7. **Foreign Direct Investment Inflows**

Source: Authors' calculations based on WDI and UNCTAD.

Over the last years, the highest share of FDI has originated in construction, foodstuffs and electricity gas and water. While the first sector is unlikely associated with GVC integration, the second is, and reveals the presence of the largest global grain processors and traders such as ADM, Cargill, and Louis Dreyfus, to mention a few. The forestry sector has also played a key role in GVC-linked FDI, with the set-up of pulp mill factories (World Bank, 2015).

Another proxy for measuring how integrated Uruguay is in GVCs is to look at how much foreign value added there is in exports (integration as a buyer, or backward integration), and how much of Uruguay's value added is embedded in third country's exports (integration as a seller, or forward integration). Backward integration provides access to quality inputs, which contributes to downstream competitiveness; it also has significant potential to deliver productivity spillovers through access to global frontier

technologies. As such, backward integration tends to be particularly important for countries as it links to a number of measures of structural transformation. Similarly, forward integration is an indicator of integration into value chains and provides opportunities to benefit from technology spillovers.

An international comparison shows that Uruguay's participation in GVCs through upstream linkages is above Paraguay's, on par with Argentina, and substantially lower than Costa Rica or Chile (Figure 8). The import content of Uruguay's exports measured in value added was, for the last period with available data, 2011, slightly above one-

FIGURE 8. **Foreign Value Added in Gross Exports**

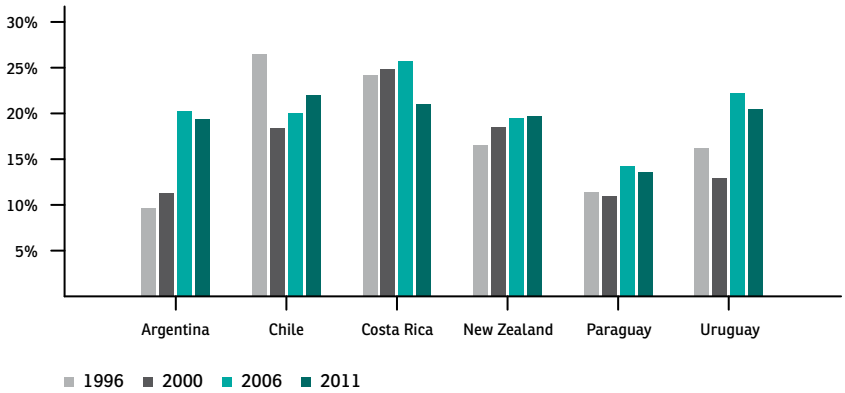
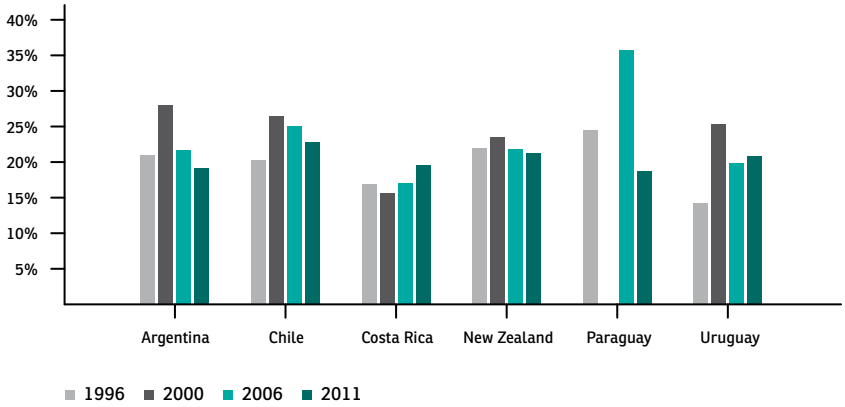


FIGURE 9. **Domestic Value Added in Third Country Exports**



Source: Authors' calculations based on EORA

fifth. Interestingly, this value increased from about 15 percent in 1996. On the other hand, the share of Uruguay's exports that ends up in foreign exports was similarly at 20 percent in 2011, up from less than 15 percent in 1996. In terms of integration as a seller, comparatively, Uruguay appears to be slightly outperformed by Chile, New Zealand, and Argentina, for most of the period considered.

BOX 1: INTERNATIONAL INTEGRATION THROUGH GLOBAL VALUE CHAINS. WHY AND HOW?

GVCs entail a number of features that set them apart from traditional production and trade. Antras (2015) mentions the following (1) the customization of production, (2) sequential production decisions going from the buyer to the suppliers, (3) high contracting costs, and (4) global matching not only of goods and services, but also production teams and ideas.

Goods and services produced in GVCs are customized to the needs of the intended buyers. In turn, customization entails sequential production and sales decisions that go from the final buyer backward to the producers of upstream inputs. Also, as production of customized goods and services is fragmented across borders, this entails intensive contracting between parties, often subject to distinct legal systems. Because of the fragmented contracting environment, a significant share of GVC trade actually happens within firms (in the US, this share reaches 50 percent, according to Antras, 2015). Importantly, because GVCs also lead to matching production teams globally, skill and knowledge transfers happen at an unprecedented rate. Yet, there are important distributional consequences as world income shifts toward countries involved in GVCs and a 'superstar effect' is generated in many countries, with the risk of domestic inequalities domestically.

To be sure, international fragmentation of production has been happening for decades, but generally, it only implied the assembly of foreign inputs to produce locally sold goods. Because these goods produced were not part of a global network, the flows of expertise and transfers of technology were less intense. Moreover, with fewer opportunities to buy and sell globally, the push for productivity upgrading was less strong.

From a development perspective, the fact that firms in developing countries have become full-fledged participants in international production networks presents some important prospects.

- Firms are not just importing parts for assembly, but absorbing foreign technology and expertise, and with vertically integrated systems of production, they share blueprints, technicians, managerial practices and productivity-enhancing tools and techniques providing access to accelerated learning.
- Fragmentation of production together with advances in ICT create new entrepreneurial possibilities for small and medium enterprises to access markets abroad, giving rise to a new category of micro-multinationals – small firms that develop global activities from their inception (Mettleer and Williams 2011).
- Competition is fierce, and developing countries face challenges to enter international production, to upgrade to higher value-added products, tasks and sectors, and to ensure social upgrading and cohesion as a consequence. With that, new policy trade-offs emerge. High growth and development potential are associated with exposure to the increasing complexity and uncertainty associated with organizing production across locations.

Opening borders and attraction of foreign direct investment is important to jump-start entry into GVCs. However, keeping them, and maximizing their benefits to the domestic economy and ensuring their sustainability require well-designed and well-targeted policies. Critical in this respect is how GVCs integrate into the economy. If GVCs are de-linked from the local context, lead firms will keep driving most decisions and governments may have limited influence and ability to leverage these decisions for domestic economic development. The policy challenge, therefore, extends to creating and strengthening links with domestic firms and ensuring that the host country benefits from technological transfers, knowledge spillovers, and increased value addition in the country.

Source: "Making GVCs Work for Development", Taglioni and Winkler (2016).

1.4. OBJECTIVES AND GVC METHODOLOGY

Overall, opportunities for better international integration and insertion into global value chains vary by industry. The opportunities also depend on a wide array of other factors, including global demand trends, sourcing and localization, the strategies of multinational corporations, specific competitive dynamics within each phase and strategic segment of the chain, and the type and rate of innovation within the industry. Some of the factors at least partially under a country's control are alignment of resource endowments and

provision of complementary public goods with the required cost structures and minimum efficient scale to compete in a specific phase nationally, regionally, or globally.

Uruguay is no exception, and the objective of this report is to share and pilot (in the dairy and ICT industries) with the Government of Uruguay a common methodology utilized by the Finance, Competitiveness, and Innovation Global Practice of the World Bank to identify opportunities to better support industry and sector-specific upgrading, integration and participation in global value chains (see Box 2).

The dairy and ICT/ICTES industries have been identified, in consultation with the Government of Uruguay, as two illustrative cases of how a traditional industry, locked in low value added exports, such as dairy, and a new export service industry, such as ICT/ICTES, can tackle the remoteness and 'smallness' challenges of Uruguay, and pursue economic upgrading and better international integration. The selection of these two industries is illustrative only and does not reflect any prioritization of dairy and ICT/ICTES over any other industry in Uruguay by the World Bank Group. Nevertheless, the industries account for 9 percent of merchandise exports, and dairy posted an annual growth rate of 4.1 percent from 2004 to 2010, while software exports alone accounts for 1.5 percent of GDP with a 17 percent value added annual growth rate from 2004 to 2011.

The global value chain (GVC) analytical approach, piloted for dairy and ICT/ICTES in this report, aims at identifying strategic options for Uruguayan industries to retain a greater share of value added from the global industries they participate in and identify opportunities to both enter new international production networks and participate in higher-value-added business segments. This objective aligns with the Government of Uruguay's priority to understand how Uruguay can integrate better with global markets through GVCs, and to consolidate the analytical tools available to the OPP to strengthen the policymaking process of the *Sistema Nacional de Transformación Productiva y Competitividad*. The ultimate development goal is an increase in growth and job creation due to a stronger insertion, and better repositioning, of Uruguay into global value addition networks.

BOX 2. A SNAPSHOT OF THE GVC ANALYTICAL METHODOLOGY

Acknowledging the great potential for development that GVCs entail, the World Bank Group has established a Global Solutions Group with a specific mandate to improve the development outcomes of programs and projects incorporating Global Value Chains (GVCs). The Finance, Competitiveness, and Innovation Global Practice (FCI) of the WGB provides evidence-based policy options to formulate and implement context-specific GVC strategies, and it has developed an integrat-

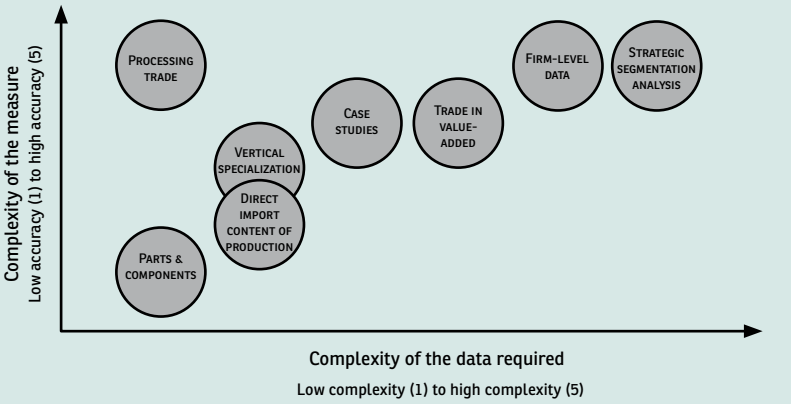
ed quantitative and qualitative GVCs modular analytical methodology that has informed the preparation of this report.

To guide policymakers in achieving development through integration into GVCs, an initial quantitative assessment of a country's position in GVCs is usually conducted by assessing performance across a wide range of indicators and concepts to measure 1) GVC participation measures by country and sector (including trade in value added), 2) network analysis of international trade, and 3) firm-level measures of direct links in GVCs.

With the caveat that no single measure or concept can be used to determine success or failure in GVC integration, the WBG's GVC quantitative assessments combine different perspectives: a) gross trade vs. value added trade perspectives, b) buyer's vs. seller's perspectives, c) development perspective (economic, social and environmental upgrading), and d) policy perspective.

This entails different levels of analysis, with different data sources and methodologies: i) macro (traditional econometrics, network analysis of trade/investment relationships), ii) meso (traditional econometrics, network analysis of I-O tables), iii) micro (firm-level analysis, segmentation by business models). While a detailed explanation of the quantitative techniques utilized in this report is provided in Annexes A, B, and C of Part II, Figure A below provides an overview of the analytical approaches based on the complexity of the measure utilized and of the complexity of the data required.

FIGURE A. **Different Methodologies to Capture GVC Integration**



Source: Modified from Amador and Cabral (2014)

Once quantitative analysis tools have provided the overall framework and accurate measures (depending on data availability and quality) of the degree and type of GVCs participation of a specific country and/or industry, then more qualitative and in-depth industry and strategic segmentation analyses allow moving beyond trade data which usually quantifies 'how much value' is created by each country participating in a GVC, toward 'how the value' is created and 'where in the chain' to help policymakers promote shared value and prosperity.

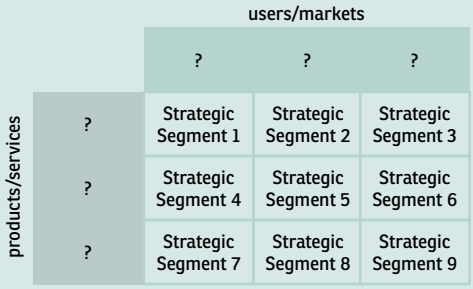
The methodology used for the strategic analysis has been developed by the Finance, Competitiveness, and Innovation Global Practice of the WBG. It is based on the concepts developed by Professor Michael E. Porter[1], and implemented by the European Foundation for Cluster Excellence (in association with the European Commission and IESE Business School), in Europe and Latin America in the last 15 years. In particular the methodology uses the following steps:

a. Identification of existing and emerging business segments (and associated value chains) that exist globally in the sectors of study

1. Background and contextual industry research is conducted to identify industry dynamics and trends related to global supply (historical reason for success in certain countries/regions, ways in which markets are responding to changes in demand), evolution in demand (geography and product/service), industry cost structure and margins, recent evolution in value chain structure (e.g. localization, specialization and integration amongst firms).
2. The industry is grouped into strategic segments that reflect not only the mix of products and services that are offered, but also the users and markets that are served. As can be seen in Figure B, the Matrix of Strategic Segmentation contains all the strategic segments of an industry. The strategic segmentation provides a global overview of the different businesses that exist in a particular sector, and is not country specific.

1 Porter's seminal books include "Competitive Strategy" (1980), "Competitive Advantage" (1985), "The Competitive Advantage of Nations" (1990) and "On Competition" (1998). The *Five Forces*, the *Value Chain*, and the *Diamond*.

FIGURE B. **Matrix of Strategic Segmentation**

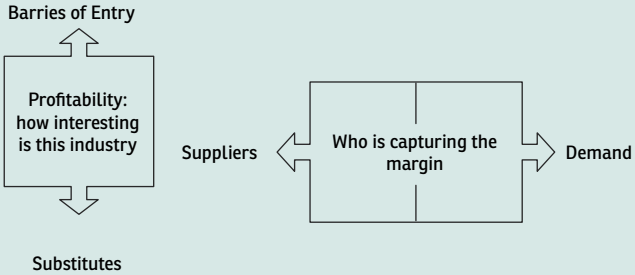


Each strategic segment is a function of both the product and/or service and the user or market group that this product/service serves.

b. Industry Attractiveness assessment

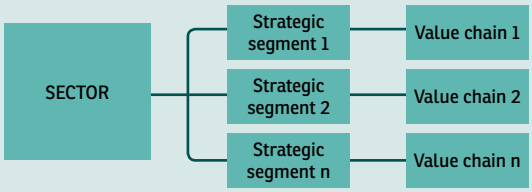
Porter's 'Five Forces'analytical tool is used to assess industry attractiveness by determining the profitability of the industry and identifying the actors within the industry with the most bargaining power (thereby determining which actors appropriate the bulk of the available profits). Additionally, the analysis includes some assessment of the evolution (historical and future) of this attractiveness.

FIGURE C. **Strategic Segment Attractiveness**



The strategic segments are distinct from one another because the Porter's Five Forces are different (Figure C); therefore the value chain of each segment is also different. As such within a sector, each strategic segment will have its own value chain (see Figure D).

FIGURE D. **Strategic Segments and their Value Chains**

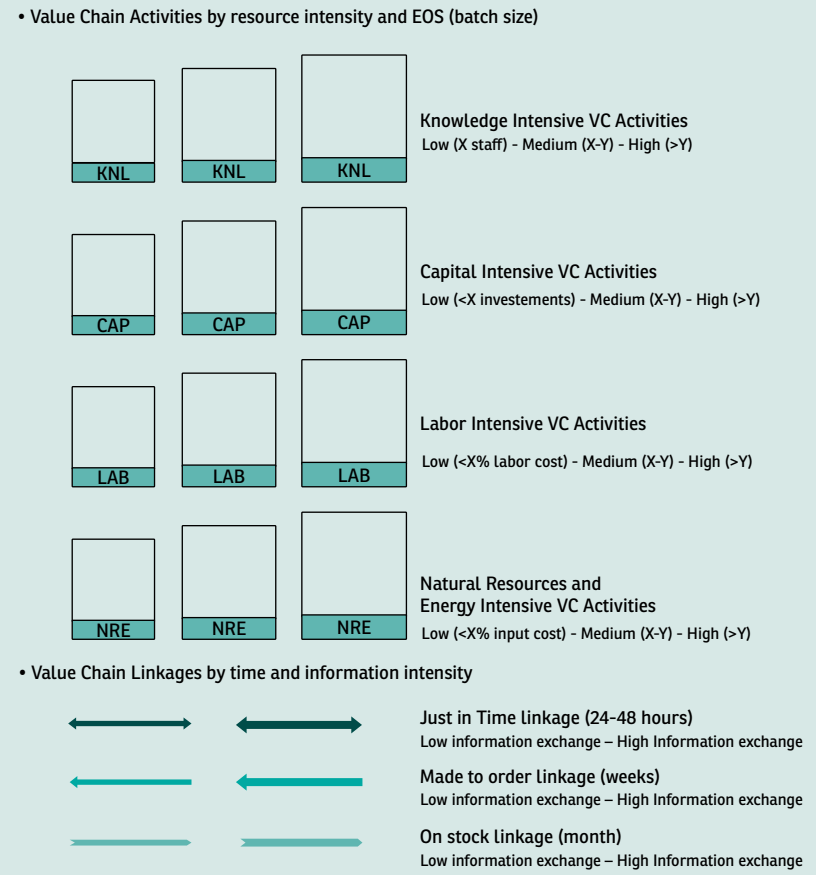


c. Ideal Value Chain 'mapping'

The competitive dynamics within each strategic segment of any industry require a specific "ideal" value chain configuration for firms and networks of firms to successfully compete and operate in that segment. The ideal value chain configuration is determined according to (see Figure E):

3. the optimal distribution of activities between the local, regional, and global levels of the value chain in terms of minimum efficient scale of operation and production runs,
4. the type (knowledge intensive, capital intensive, labor intensive, natural resources and energy intensive) and level of intensity (low-medium-high) of each value chain activity, and
5. the typology of value chain linkages (just-in-time – made-to-order – on-stock) by time (24-48 hours – weeks – months) and information exchange (high or low information exchange) that are required to compete effectively in a specific strategic segment.

FIGURE E. **Value Chain Activities and Linkages Typologies**



d. Current Positioning

In this step, those segments in which a specific country or industry is currently participating are identified. The specific industry's performance in those segments is assessed (vis-à-vis regional as well as global competitors) and the 'ideal value chain' for those segments is compared to the country context. Specific policy,

investments and/or institutional interventions that might be required in order for the specific industry to better compete in those segments and appropriate more value are identified.

e. Benchmarking and Feasible Strategic Repositioning Options

More attractive, higher-value added segments that could allow the industry to appropriate more value are highlighted in this step. The 'ideal value chain' for those segments will be compared to the country context which will itself be compared to leading countries in the highlighted segment(s) to assess the industry/country's potential capacity to compete. Specific policy, investments, or institutional interventions that would be required in order for the specific industry and/or country to 'leap' to those segments are detailed.

Source: "Making GVCs Work for Development," Taglioni and Winkler (2016), and "Industry Specific Global Value Chains Project," WBG (2015).

1.5. SUMMARY OF STRATEGIC REPOSITIONING OPTIONS AND RECOMMENDATIONS

Gains from participation in GVCs are neither instantaneous nor automatic, and they call for enabling or mediating policies. **Section 2** shows that economy-wide policies can influence Uruguay's value added gains from increased participation into GVCs in terms of backward and forward integration. For example, behind the border trade barriers have a crucial impact, and, for Uruguay, improving port, road, and rail infrastructure remains a policy priority to increase the gains from integration into GVCs. Logistics plays a stronger role in Uruguay. Openness to foreign investments positively affects value added gains and Uruguay's ability to participate into GVCs. Similarly, the quality of institutions in Uruguay plays a crucial role in economic development through GVC participation, especially for building backward linkages, whereas political stability drives forward linkages. Human capital upgrading and labor markets that facilitate reallocation of workers into high productivity activities are crucial to build the skills needed by Uruguay to increase the share of value added domestically, foster forward integration of domestic firms into GVCs as net sellers to foreign countries, and facilitate growth of high productivity firms.

Section 3 shows that Uruguay has promising opportunities in two strategic segments in the dairy industry. One is the "Tradeable, Stockable, Global (TSG)" seg-

ment, which provides dairy products that can be internationally traded due to their inherent 'non-perishability.' Such commodities include whole milk powder, cheddar, lactose, butter milk powder, and rennet casein. Uruguay's performance is optimal across most local, national, and regional activities of this value chain but does not stretch far from its borders.

The second dairy segment in which Uruguay has a good opportunity for upgrading is the "Perishable Premium Local – PPL" segment, which provides locally produced perishable products for which local consumers will pay a premium. Artisanal cheese is an intrinsic part of the history and culture of Uruguay. Uruguay's performance in the artisanal cheese segment is suboptimal in some important parts of the value chain. However, Uruguay's stagnant domestic demand suggests strategic repositioning based on pursuing a collective upgrading and formalization strategy by groups of artisanal cheese producers.

Section 4 illustrates that Uruguay also has two ICT/ICTES strategic segments with promise for upgrading. The most viable in the short term is providing highly complex, customized ICT products and services by small dynamic firms with a highly specialized workforce (the "Boutique" segment). Firms in this segment follow nimble and adaptive business models. Products and services might include mobile application development, gaming software design, digital animation, visual effects, or highly specialized knowledge process outsourcing.

Over the longer term, Uruguay could reposition into a second strategic segment that includes large, global ICT firms that support large-scale innovation and high-volume introduction of new products and services (the "Powerhouse" segment). Firm entry in this segment may at times require relatively small initial investment and human capital, but sustainable growth requires high capital costs and investment in product development, marketing, branding, distribution, and customer service. Products tend to be highly specialized and customized to the needs of specific industries. Whilst sustained success in the "Powerhouse" strategic segment requires a vast, highly skilled workforce a number of strategic options may be open to Uruguay to overcome its 'smallness' challenges in terms of a small pool of skilled workforce and factors shortages. Addressing these challenges could enable Uruguay's participation into the "Powerhouse" strategic segment.

Section 5.1 identifies a strategically repositioning for Uruguay within the TSG segment, with a focus toward the international organic dairy powder market to fetch the almost fivefold price premium it provides. Investing directly in the downstream phases of the dairy GVC to gain a foothold in end markets and focusing on product differentiation in the organic dairy milk powder niche market would help Uruguay strategically reposition itself in this segment. This would require Uruguay to (1) harmonize national legislation and regulations with international standards, (2) audit

organic dairy farm practices, (3) introduce organic accreditation and certification schemes, and (4) establish temporary non-distortive organic farmer support schemes.

Section 5.1 also identifies a strategic repositioning option for the PPL segment, through a collective upgrading and formalization strategy for artisanal cheese producers in the regions of Colonia and San Jose. This would require strengthening the milk collection, distribution, and retail phases of the value chain and creating a collective product quality and food safety control mechanism. Significant efficiency gains and firm-level upgrading can be achieved by: (1) developing voluntary yet enforceable product standards for artisanal cheeses; (2) strengthening food safety, sanitary, and phytosanitary controls; (3) enabling investment in a distribution network; and (4) investing in developing a nationally recognizable brand for Uruguayan artisanal cheese.

For the ICT/ICTES GVC, **Section 5.2** identifies the strategic repositioning option for the "Boutique" segment of increasing Uruguay's foothold in export markets by: (1) refocusing ICT/ICTES export promotion programs on dynamic start-ups and mid-sized firms with reasonable prospects of successful internationalization; (2) reducing double taxation and barriers to trade for ICT/ICTES exporters; and (3) engaging pre-emptively in tailored STEM education policies and programs.

In the longer term, **Section 5.2** proposes that Uruguay establish the enabling conditions for strategically repositioning its ICT/ICTES industry into the "Powerhouse" segment, comprising large global software firms. This would require (1) increasing the skilled workforce through a coordinated package of policy changes on immigration, secondary and tertiary education, on-the-job specialization, continuous training, and aftercare for ICT/ICTES FDI. It would also require (2) consolidating Uruguay's regional leadership in ICT/ICTES infrastructure by adopting a pro-competitive policy and enabling entry to private investment, (3) increasing access to catalytic financing and early stage investing to foster ICT/ICTES entrepreneurship, and (4) leveraging algorithmization to overcome the lack of a large pool of ICT/ICTES talent.

Finally, **Section 5.3** stresses that high-quality data is crucial for evidence-based policymaking. Two improvements could make the data available in Uruguay better suited for the analysis of participation in international production networks: (1) matching firm-level survey data from the National Economic Activities Survey with customs transactions data and (2) collecting information on firms' linkages.

Table 1 provides an overview of the strategic repositioning options identified for each of the strategic segments prioritized in the dairy and ICT/ICTES industries (presented in **Section 5**). It summarizes the mix of policy and private sector initiatives enabling each strategic repositioning options, by using the relevant public policy and market failures as filters to identify the rationale for intervention. It also identifies the main stakeholder/s potentially in the lead for implementation.

TABLE 1. Summary of Recommendations

Priority Strategic Segments Identified for Dairy and ICT/ICTES in Uruguay	Recommendations on Strategic Repositioning Options for each Prioritised Strategic Segment	Mix of Policy and Private Sector Initiatives Enabling each Strategic Repositioning Option	Rationale for Intervention	Lead Stakeholder/s for Implementation
Dairy GVC				
Policy Focus on the Tradable Stockable Global (TSG) Segment	In the long term, directly invest in downstream phases of the dairy value chain in end markets.	Develop a medium term internationalization and outward investment strategy	Increase access to international markets and reduce "upstreamness"	Private Sector
	In the short term, reposition the TSG value chain in Uruguay toward the organic dairy powder international market.	Harmonize sector-specific legislation and regulations with international standards on pasture management, seed certification, food safety, maximum residues fertilizers, pesticides, livestock feed regulation, livestock health care practices, and traceability. Audit organic dairy farms in Uruguay to assess implementation gaps and investment needs for temporary support schemes for conversion to organic. Introduce organic accreditation and certification for service providers and farms to facilitate compliance with international standards. Consider temporary non-distortive organic farmer support schemes to provide incentives for converting to, or maintaining, organic status.	Public good provision Imperfect information, public good provision Reduce information asymmetries Non-full appropriability of returns (externalities), deep uncertainty.[1]	Public Sector Public-Private Public-Private Public Sector
Focus on the Perishable Premium Local (PPL) Segment	Consolidate Uruguay's position in the Perishable Premium Local (PPL) segment, and prepare the groundwork both in terms of regulation, product standards, and investment, for entry into enter the Perishable Global Premium (PGP) strategic segment in the medium term.	Develop voluntary yet enforceable product standards for cheeses to obtain artisanal certification for cheeses to obtain artisanal geographical certification of origin, with compliance monitored and sanctioned by local industry associations or cooperatives. Strengthen food safety, sanitary, and phytosanitary control mechanisms, both by consolidating public veterinary and sanitary service provision, and by supporting the introduction of good agricultural practices and food safety management practices Enable investment in a collective distribution network, with cold chain as necessary. Invest in developing a nationally recognizable brand for Uruguayan artisanal cheese to reap the benefits from the regulatory changes and investments proposed above.	Information asymmetries, negative externalities, coordination failures Public good, negative externalities Monopoly power and market dominance by retailers on local markets Public good, positive externalities, coordination failures	Industry producers groups with Public Sector Public Sector Private Sector Public-Private
ICT/ICTES GVC				

1. Firms' under-investment due to: incomplete information and uncertainty of market discovery, positive externalities, coordination failures.

Priority Strategic Segments Identified for Dairy and ICT/ICTES in Uruguay	Recommendations on Strategic Repositioning Options for each Prioritised Strategic Segment	Mix of Policy and Private Sector Initiatives Enabling each Strategic Repositioning Option	Rationale for Intervention	Lead Stakeholder/s for Implementation
Focus on the ICT/ ICTES "Boutique" Segment	Consolidate Uruguay's software industry position in the "Boutique" strategic segment by increasing its foothold in main export markets, namely the U.S. and Latin America, in terms of direct marketing channels, B2B client management services, and geographical co-location and co-production.	Recalibrate the focus of export promotion programs for ICT/ICTES from micro and small enterprises to dynamic start-ups, and mid-sized firms with reasonable prospects of successful internationalization Reduce barriers to trade for Uruguayan ICT/ ICTES exporters through a clear strategy of integration into the global marketplace, including negotiating market access on a bilateral basis and double taxation agreements. Engage in tailored STEM education policies and programs to address the projected skills shortage (see specific recommendations for the Powerhouse segment).	Externalities, coordination failures. (mismatch between support programs and target population due to imperfect market information) Public good, Reduce entry barriers and transaction costs on international markets for exporters Public good and provision of merit goods in incomplete markets	Public Sector Public Sector Public Sector, and joint Public-Private
Focus on the ICT/ICTES Powerhouse Segment	Create the enabling conditions for a strategic repositioning of the ICT/ ICTES industry to the "Powerhouse" strategic segment in the medium to long term.	Increase the critical mass of skilled workforce through a coordinated package of policy changes on attracting returnees and foreign talent, secondary and tertiary education, on-the-job specialization and continuous training, and aftercare for ICT/ICTES FDI. Promote diversity in STEM education and increase the participation of women and lower income Uruguayans. Enable proactive global recruitment policies by firms to attract and retain returnees and foreign talent. Enhance skills policies and curricula, jointly with the ICT/ICTES industry, for continuous learning and on-the-job specialized-skills training programs. Focus on tailored FDI aftercare policies to facilitate the relocation of knowledge-intensive function by MNCs as a mechanism to increase the pool of ICT/ICTES skills in Uruguay. Consolidate Uruguay's regional leadership in ICT/ICTES infrastructure by adopting a pro-competitive policy and enabling entry to private investment. Increase access to catalytic financing and early-stage investing to foster the ICT/ICTES entrepreneurship ecosystem. Leverage algorithmization trends to overcome the shortage of a large pool of ICT/ICTES talent.	Public good and provision of merit goods in incomplete markets Public good. Increase access to STEM education to enlarge the ICT/ ICTES skills pool Reduce information asymmetries and transaction costs Reduce mismatch between labor demand and supply in ICT/ICTES through continuous learning Reduce information asymmetries by foreign investors and foster knowledge spillovers Imperfect competition Financing gap and underinvestment due to intangibility, technological and market uncertainty of ICT/ICTES Address scalability challenge through technological advances	Public Sector, and joint Public-Private Public Sector Public Sector Public Sector, Industry, and Academia Public Sector Public Sector Public Sector ICT/ICTES industry and Public Sector
Recommendations on data and statistical tools	Match firm-level survey data from the National Economic Activities Survey with customs transactions data. Collect systematic information on the nature of firms' linkages.			

2. GVCs and Development, the GVC Strategic Policy Framework, and Economy-wide Policies for Participation[2]

The concept of Global Value Chains (GVCs) is defined as value addition processes associated with a given product that go from upstream R&D to downstream marketing and customer services. These value addition processes are fragmented across national borders, with processes and standards typically governed by a lead firm. Despite usually being called "GVCs," these are typically regional rather than truly global, and they are complex networks rather than linear chains.

Uruguay's development prospects inevitably depend upon its ability to leverage international markets. Consequently, GVCs have become crucial for the growth of the country. They are a key platform for integration into the marketplace, increasing opportunities for value added and productivity gains, as well as increasing the challenges associated with participation into them, transforming trade, leading to changes in trade- development links, trade competitiveness links, and trade-governance options.

Section 2 explores how GVCs can affect the development outcome of a specific country, and it illustrates the main channels through which integration into global production networks may affect economic growth. It provides a strategic policy framework to devise the relevant policies to enter, expand participation, and ensure sustainability of GVCs. Finally, Section 2 provides an overview of the relevant economy-wide policies that influence entry into and participation in GVCs. Using cross-country empirical analysis, it highlights non-causal conditional correlations between specific policy variables and GVC-associated gains, which are then further investigated through business strategy analyses in the rest of the report.

2 The complete quantitative analysis of how economy-wide policies influence Uruguay's participation into GVCs is provided in Annex A.

2.1. GLOBAL VALUE CHAINS AND ECONOMIC DEVELOPMENT

GVCs are a key platform for integration into the marketplace, increasing opportunities for value added and productivity gains, as well as increasing the challenges associated with participating in them. GVCs are—in effect—factories crossing borders. As a result, intra-factory-flows of goods, know-how, investment, training, ideas, and people are now international commerce. This increases the scope for knowledge spillovers associated with integration. GVCs also denationalize comparative advantage, with implications for the options available to all nations. In the past, a country would need to build the whole value chain for an industry domestically in order to become competitive in that industry internationally. In the new GVC world, middle income or new high income countries can join GVCs to become competitive. They can subsequently industrialize by densifying their participation. Firms or countries that do not participate in GVCs struggle to compete.

However, gains from participation in GVCs are neither instantaneous nor automatic. Enabling or mediating policies may be needed. To realize the full gains from integration into global production networks, policymakers need to adapt public policies to the increased interconnectedness across countries and sectors. Taglioni & Winkler (2016) provide the strategic policy framework and the strategies to maximize gains from participation in GVCs in (i) entering GVCs, (ii) expanding and strengthening GVC participation, and (iii) turning GVC participation into sustainable growth.

The new GVC reality requires fresh policy thinking. Countries that want to take advantage of GVCs need to ensure that their overall business environments are fertile for GVCs to prosper. This requires acknowledging that GVCs have four key features that set them apart from traditional production and trade: (1) customization of production—with intensive contracting between parties, often subject to distinct legal systems, (2) sequential production decisions going from the buyer to the suppliers, (3) high contracting costs, and (4) global matching not only of goods and services, but also of production teams.[3] These distinct features of GVCs have implications for the types of trade facilitation efforts, infrastructure, skills, and trade and investment policies that are best suited for this reality.

Enhancing competitiveness and thereby raising living standards and achieving sustainable growth are at the top of the policy agenda in many countries. The concept of competiveness, however, is still debated.[4] For microeconomists, competitiveness is usually associated with firm productivity, a well-established concept that is relatively easy to quantify empirically, both at the firm and sectoral level. On the other hand, for

3 See Antras (2015).

4 Fontagné and Santoni (2015) survey the related literature and tentatively clarify the concept of competiveness, within a policy perspective.

macroeconomists, the concept can be captured through the evolution of relative prices or current account balances (the underlying idea being that equilibrium factor prices are lower in competitive economies).

Even if the two approaches relate to different economic motivations, it is crucial to understand that macro- and microeconomic determinants of competitiveness are linked.[5] Recent literature on firm heterogeneity illustrates how aggregate performance relates to firm-level factors like organization and technological capacity as well as to the environment in which firms operate. See, for example, Melitz and Ottaviano (2008), Ottaviano et al. (2009), and Corcos et al. (2012). To stay in the market, firms need to reach a performance cut-off, that is, a minimum level of productivity. The value of the cut-off is market specific and depends on demand conditions, remoteness, and the quality of the business environment or the country's ability to generate low-cost (high productivity) firms.

The ability of firms to compete successfully depends on public institutions, the educational system, and the overall macroeconomic stability of the country. These macro factors alone, however, are not sufficient if firms themselves are not productive (e.g., if firms do not produce valuable goods or do not employ inputs efficiently)

Participation in global production networks may help firms improve their productivity and thereby raise production, value added and jobs. GVC integration has two main channels: backward and forward. Backward integration refers to integrating with GVCs as a buyer of foreign value added. Forward integration refers to integrating with GVCs as a seller of domestic value added. Not all firms in every country have been able to internalize those externalities, however, as recent empirical evidence shows (Kummritz 2015). Consequently, national policies play an important role in successful economic upgrading within GVCs.

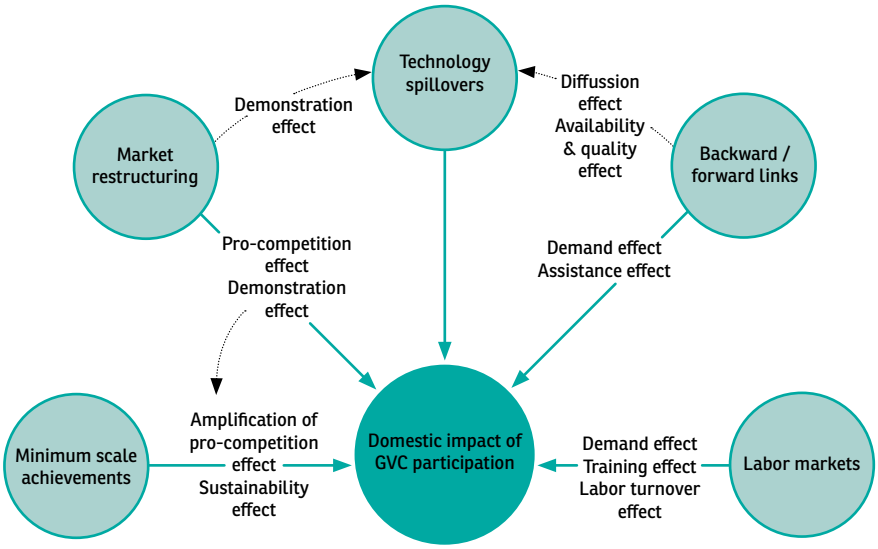
How do GVCs affect a country's development outcomes? Taglioni and Winkler (2016) provide a comprehensive assessment of the role GVCs play in economic development. It includes a detailed analysis of how public policy may strengthen ties between firms involved into global production networks and the domestic economy to maximize the likelihood of positive externalities through diffusion of knowledge, technology and expertise from foreign investors.

Figure 10 illustrates the main channels through which integration into global production networks may affect economic growth. Through backward linkages, lead firms (both foreign and domestic) may generate an increase in demand for domestic inputs as well as help local suppliers overcome financial or technological constraints. Inte-

5 Sala-i-Martin and Artadi (2004) developed the World Economic Forum's "Global Competitiveness Index" (GCI) framework based on this observation.

gration into international production networks may generate pro-competitive effects beneficial for both participant and non-participant businesses, leading to an increase in the average productivity of the economy. Finally, other effects associated with GVC participation take place through changes in labor market dynamics. For example, lead firms may provide training directly, and increased demand for skilled workers may raise the expected returns of human capital investments. It is important that the market supply the skills in demand to prevent bottlenecks.

FIGURE 10. **GVC Transmission Channels**



Source: Taglioni and Winkler (2016)

2.2. THE GVC STRATEGIC POLICY FRAMEWORK

Country involvement in complex international production networks creates opportunities. It may allow countries to overcome their traditional comparative advantages, moving to higher value added activities and benefiting from knowledge spillovers, improving overall productivity and growth potential (Cattaneo, et al. 2013). However, participation in GVCs may also expose countries to risks, in particular those related to

imported crisis through trade (Escaith, Lindenberg and Miroudot 2010) or the transmission of natural shocks - as for the earthquake that hit Japan in 2011 and whose effects spread over other Asian countries (Fujita 2013).

To fully internalize the potential gains from integration into global production networks, authorities need to adapt public policies to the increased interconnectedness across countries and sectors. Cattaneo, et al. (2013), for example, identify four main paradigm changes in public policies due to international fragmentation of production:

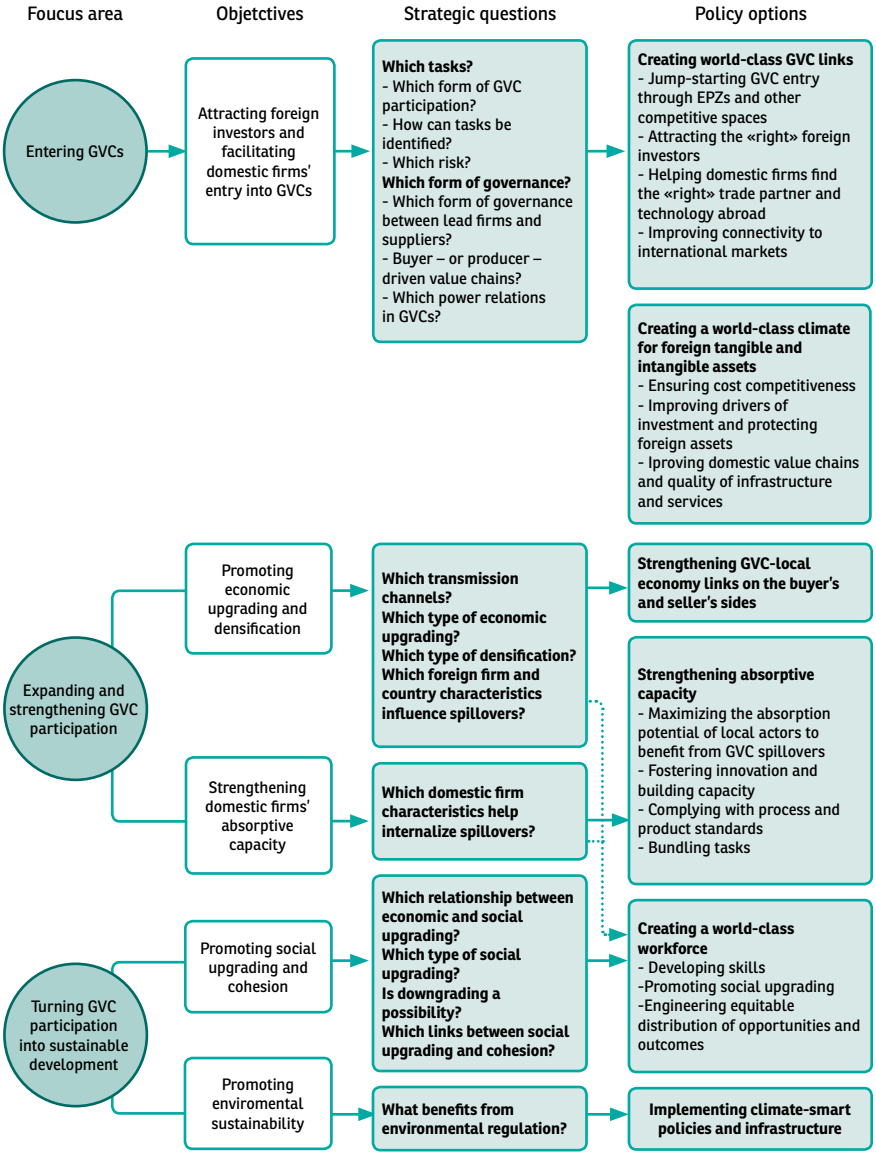
1. **Strategic framework:** from country to firm-relevant intervention. Imports are interpreted as a means for firms to access efficient inputs. The need to look at both inward and outward flows (either for trade or FDIs) in an integrated framework.
2. **Economic framework:** identify country most competitive supply of tasks; recognize the role of services (financial, R&D, logistics) to product high value added manufactures.
3. **Relevant economic assets:** from stock to flows; firms are both competitors and sources of inputs for each other, and GVCs may act as a valuable channel of transmission for knowledge, capital and services.
4. **Relevant barriers:** requires international cooperation and public-private discussion to identify winners and losers from trade policy and behind the border measures.

The changes in international trade relations induced by the increasing international fragmentation of production also require a review of specific barriers and an *ad hoc* framework for designing public policies for competitiveness.

Taglioni and Winkler (2016) provide a full assessment of the different policy options that may help economic upgrading and densification by improving the quality and quantity of labor skills, technological capabilities and redressing market failures to ensure more inclusive growth. Figure 11 reports the strategic policy framework and the strategies to maximize gains from participation in GVCs. During this process, it is necessary to identify the most binding constraints on integration at the firm level and design regulatory interventions and capacity building that allow economic actors to address specific objectives to increase the share of value added from domestic productive factors.

At the country level, those objectives change with the degree of integration in international production chains: entering GVCs, expanding participation, or turning participation into sustainable growth. On one hand, a country that is not yet integrated into global production chains must identify on which tasks it should focus and which types of governance options are suitable to attract the "right" foreign investors and facilitate domestic firms' entry into GVCs. On the other hand, a country that is already integrated into global production chains must carefully evaluate the sources of potential risks to its survival in the market as well as the transmission channels through which external shocks may propagate to the domestic economy.

FIGURE 11. **Strategic Policy Framework**



Source: Taglioni and Winkler (2016)

Finally, because GVC integration is closely related to FDI, countries that have the objective of turning integration into a source of sustainable growth must evaluate to what extent FDI generates positive externalities for the domestic economy (and whether local economic actors have the capability to internalize them). They must also ensure strategic skills improvements in the local labor force, an equitable distribution of economic opportunities, and environmental sustainability.

2.3. ECONOMY-WIDE POLICY REFORMS AND INSERTION INTO GVCS[6]

Gains from participation into GVCs are neither instantaneous nor automatic. Enabling or mediating policies may be needed. What are the set of policies that can help Uruguay gain more from participation into GVCs in terms of increased domestic value added? There are at least two streams of literature that have emphasized the role of national policies for welfare gains. A first set of studies has looked at the role of country characteristics for economic growth and for escaping the middle-income trap (for recent contributions, see, e.g., Eichengreen, Park, and Shin 2013; Pritchet and Summers 2014; Bulman, Eden, and Nguyen 2014; for a literature review, see Raiser 2014). Another stand of literature has examined the role of policies for the productivity spillovers from trade and from FDI (see for example, Coe, Helpman and Hoffmaister, 2008; Javorcik, 2004; or, for a literature review, see, e.g., Farole and Winkler, 2014).

Broadly speaking, and based on both theoretical and empirical evidence, there are five groups of mediating factors that are bound to mediate the effects of integration into GVCs and gains associated with increased value added. These are:

1. **Factors that affect how easily can goods, services or ideas cross international borders.** The unbundling of stages of production across borders creates new forms of cross-border policy spillovers a time-inconsistency problems. This, in turn, creates demand for deeper forms of integration that include traditional market access, but also harmonization of certain national policies to help GVCs operate more smoothly, including reductions of restriction services trade, cross-border capital movements, or restrictions to foreign investment, among others. In sum, liberal and deep trade policies become particularly important in a world of GVCs (see, for example Osnago, Rocha and Ruta, 2016).

6 The complete quantitative analysis of how economy-wide policies influence Uruguay's participation into GVCs is provided in Appendix A.

2. **Factors that affect transport and logistics costs.** Good logistics performance is crucial because key components of GVC production are time sensitive, and reliable connectivity allows firms to connect factories across borders more efficiently (Taglioni and Winkler, 2016).
3. **Factors that affect how input and output markets operate.** Much of the gains arising from GVC participation, imply reallocation of resources into products, or tasks in which firms in a given country have a comparative advantage. For these gains to materialize, the reallocations need to happen at relatively low costs, implying that both input and output markets function efficiently. This implies, for example, that firms can access financing at competitive rates, and that they can hire workers in times of expansions, and hire them in times of contractions also at reasonable costs.
4. **Factors that affect the skills or innovative capacity of the labor force.** A skilled workforce is recognized as an important determinant of countries' success in GVCs because it allows producing at the high standards of productivity, efficiency, sophistication and timeliness required to serve global markets (Oliveira Martins et al, 2007).
5. **Factors that affect the institutional quality under which firms operate.** Cross border production linkages creates new policy externalities that require deeper forms of integration, harmonizing, for example, schemes of intellectual property protection, or, more generally, convergence of institutional quality between lead firms' countries, and connected firms' countries (Antras and Staiger (2008), Park and Lippoldt, 2005).

Economy-wide policies can influence Uruguay's value added gains from increased participation into GVCs in terms of backward and forward integration[7]. While the following results that emerge from a cross-country empirical analysis are not causal in nature, they provide information on conditional correlations between specific policy variables and GVC-associated gains that warrant further investigation in the following sections of this report.

We focus the analysis on the policies that would enable Uruguay to enter and strengthen participation into GVCs. In particular, we examine how economy-wide policies on infrastructure, connectivity, investment and trade, investment climate and quality of institutions, financial development, labor market regulation, education, and innovation contribute to Uruguay's economic upgrading and participation in GVCs. We turn now to the empirical analysis of the role of specific mediating policies for internalizing spillovers from participation in GVCs for Uruguay and comparators. The empirical strategy—described in Appendix A—closely follows Kummritz et al. (2016) and aims to identify the role of selected public policies for economic development through GVC participation, from a macroeconomic perspective.

7 Backward integration refers to integrating with GVCs as a buyer of foreign value added. Forward integration refers to integrating with GVCs as a seller of domestic value added.

Behind the border trade barriers have a crucial impact on potential value added gains from GVC participation. Looking at Uruguay and a relatively more homogenous group of countries reveals a much stronger role for port, road and rail infrastructure for both gains through backward and forward participation. This suggests that behind the border trade barriers (e.g., an inefficient transport sector) have important roles in shaping gains from integration into GVCs. For example, the results suggest that improving road infrastructure by 10 percent is associated with increased value added by 2.3 percent. Back of the envelope calculations suggest that for Uruguay (score 1.43, in logs) moving from the actual level of road infrastructure to the one of France (best performer with an average score of 1.89) would translate, other things being equal (e.g., for a given level of backward GVC integration) to a value added gain of around 10 percent (in average for all sectors of the economy).

Openness to foreign investments positively affects value added gains through both forward and backward participation. Logistics plays a stronger role in Uruguay and comparator countries. Better management of cross-border operations and customs administration play a crucial role in ensuring a stronger integration of Uruguay in GVCs through backward linkages, with a 3.5 percent increase in value added associated with a 10 percent improvement of customs, and through forward linkages, with a 3.45 percent increase in value added. Among the full sample of countries, openness to foreign investments seems to be the main driver for participation. Logistics has a small effect on backward linkages only.

Institutional quality plays a crucial role in economic development through GVC participation, especially for building backward linkages, whereas political stability in the home country drives forward linkages. For Uruguay's backward GVC integration, well-enforced property rights are the main drivers for successfully adding more value domestically, suggesting that protecting assets is a primary concern for international investors. Political stability remains central in location decisions of FDI and multinational companies considering investing in Uruguay. For forward linkages, by contrast, all key dimensions of the Uruguayan investment climate in terms of property rights, political stability, the degree of corruption, and financial development are statistically significant determinants of value added gains through participation.

Human capital upgrading and the availability of a large enough pool of talented employees are crucial to build the skills to increase the share of value added domestically and foster forward integration of domestic firms into GVCs as net sellers to foreign countries. The direction of policy over time in Uruguay has been to increase social security provision for employees. This combined with balancing the need on the side of employers for a flexible workforce will be important for the development of GVCs and forward linkages in the economy.

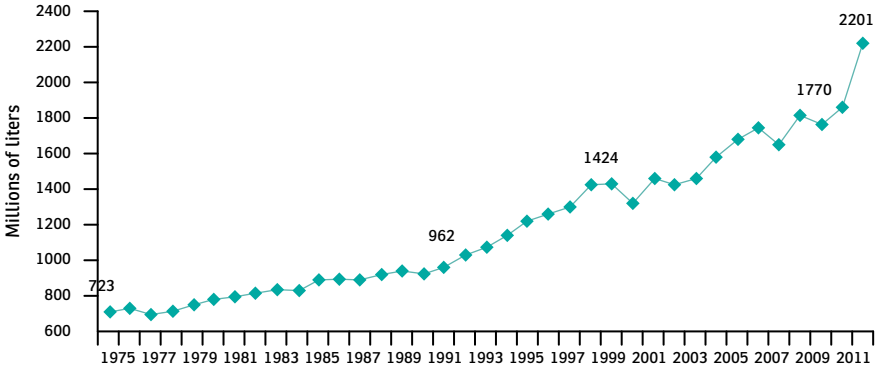
3. The Uruguayan Dairy Industry: Export Competitive, but Locked in Low-Value Added Strategic Segments of the Dairy Global Value Chains[8]

3.1. EVOLUTION AND HISTORY

The dairy industry generates nearly 9 percent of Uruguay's exports of goods and 70 percent of its production flows to international markets, mainly Venezuela, Brazil, China and Argentina. Uruguay's commercial dairy industry began in the late 1930s following a sharp increase in the number of dairy farms and amount of land dedicated to dairy farming. With the creation of the *Cooperativa Nacional de Productores de Leche (Conaprole),* a dairy cooperative, farmers could take advantage of favorable factor conditions. In the 1970s and 1980s, productivity improved greatly, primarily through technology adoption and better use and increased availability of food. Productivity growth continued through the late 1990s and early 2000s using quality fodder reserves (silos), strategic land use (such that fodder production could be increased without expensive irrigation), and increased concentrates. (Uruguay XXI 2012). In 2014, Uruguayan dairy farms achieved an average productivity of 3,500 liters per hectare per year (INALE 2015) and total annual production of approximately 2.3 million liters (0.3 percent of the world's production) (IFCN 2015). Figure 12 shows yearly total milk production for Uruguay from 1975 to 2012.

8 The complete analysis of the dairy industry in Uruguay and of the strategic repositioning options in the dairy GVC is provided in 3.4.2.

FIGURE 12. **Total Milk Production in Uruguay, millions of liters**



Source: Uruguay XXI (2012)

FIGURE 13. **Map of Major Stakeholders in Uruguay's Dairy Industry**

Source: Author's Elaboration (IG = Industry Groups, SPs = Service Providers)

The following sections describe the main characteristics of the industry, including the most important firms and the relations among main stakeholders. Figure 13 maps the major stakeholders in Uruguay's dairy industry.

3.1.1. Dairy Processing

There are approximately 40 dairy processors in Uruguay. Three of the largest processors—Conaprole, CALCAR and CLALDY—are cooperatives owned by the producers that supply milk to them for processing. Conaprole is by far the largest (Box 3). Foreign ownership and vertical integration into dairy farming by FDI processors is an emerging trend in this phase of the value chain in Uruguay.

While the presence of a dominant processor might have led to a downward pressure on farm-gate milk prices, the fact that Conaprole is a cooperative means it is highly motivated to prioritize the needs of its member producers (84 percent of all deliverers in Uruguay). Not only do Conaprole's own members benefit from relatively high farm-gate prices, Conaprole's milk prices are a reference for the rest of the sector. Although some larger foreign processors have tried to attract milk producers by paying higher prices than Conaprole, smaller firms with longer histories in the country (and who cannot afford to pay higher prices) try to leverage long-standing relationships with producers, stability and trust in order to retain suppliers.

Conaprole has also helped sustain high wages for workers and technicians in dairy processors across Uruguay. Elected representatives negotiate wages annually, and the wages are then mandatory for all registered processors. Conaprole, which has a strong negotiating position and can absorb the cost of higher wages, has pushed the industry to pay higher wages.

BOX 3. CONAPROLE MARKET AND PRODUCTION DOMINANCE

In 2015, Conaprole...
...processed 72 percent of all Uruguay's processed milk
...received milk from 84 percent of producers that supply processors with milk[1 2]
...achieved a market share of 79 percent of local fresh milk sales
...exported 75 percent of all Uruguay's dairy products

1. Total does not include processors that process milk themselves.
2. Author's calculations based on interviews with Conaprole and INALE
Sources: INALE (2015), Euromonitor (2014), and Dirección Nacional de Aduanas del Uruguay (2016).

Between 1936 and 1984, Conaprole had a monopoly on the supply of fresh milk to Montevideo while smaller firms were limited to supplying their own local regions. Although the supply of other dairy products (e.g., cheese and yoghurt) is more diverse (Table 2 and Table 3), there are still high barriers to entry for smaller firms in the fluid milk market in Montevideo. As an example, *Supermercado* Disco, the biggest retailer in Uruguay, has exclusive agreements with Conaprole for fresh milk (D. Lalanne 2016).

TABLE 2. **Percent Share of Yoghurt and Sour Cream Sales in Uruguay, 2011–2015**

	2011	2012	2013	2014	2015
Cooperativa Nacional de Productores de Leche	58.7	58.3	59.7	59.8	66.0
Fort-Masis SA**	15.2	15.2	14.9	13.4	14.4
CLALDY SA	6.7	6.6	6.6	6.8	7.1
Ecolat Uruguay SA	10.9	10.3	10.0	10.6	2.2
Yakult Uruguay SA**	0.6	0.7	0.7	0.7	0.7
Others	7.8	8.9	8.1	8.7	9.7
Total	100.0	100.0	100.0	100.0	100.0

**international ownership, produced abroad (Argentina)

Source: Euromonitor International (2015)

TABLE 3. **Percent Share of Cheese Sales in Uruguay, 2011–2015**

	2011	2012	2013	2014	2015
Cooperativa Nacional de Productores de Leche	15.1	15.7	15.7	16.0	16.1
Naturalia Srl	12.1	11.8	11.8	11.9	12.0
Noliman SA	10.4	11.1	11.0	10.9	10.8
Quesería Helvetica SA*	9.1	10.8	10.9	10.5	10.6
Selgar SA	9.4	10.2	10.4	10.2	10.5
Granja Brasetti SRL	9.7	10.0	9.3	9.2	9.2
Lactosan Uruguay SA*	6.1	6.2	6.0	5.8	5.8
Dicasold SA**	1.0	1.1	1.9	2.1	2.2

	2011	2012	2013	2014	2015
Supermercados Disco SA	2.5	2.2	2.0	1.8	1.8
Fort-Masis SA**	0.9	0.6	0.7	1.2	1.3
Mondelez Uruguay SA **				1.0	1.1
Henderson & Cía SA (Tienda Inglesa)	0.9	0.8	0.8	0.8	0.8
Devoto Hnos SA	0.8	0.7	0.7	0.7	0.6
Mimatec SA***	0.2	0.2	0.2	0.1	0.0
Kraft Foods Uruguay SA*	0.5	1.0	0.9		
Others	21.3	17.7	17.8	17.9	17.2
Total	100.0	100.0	100.0	100.0	100.0

* international ownership
** international ownership, produced abroad (Argentina)
*** importer only
Source: European Commission (2015)

Associations and Interest Groups

The managers of Uruguay's dairy processors belong to an industry association called the *Cámara de la Industria Láctea del Uruguay*. The *Asociación Uruguaya de Pymes Lácteas* (AUPYL) was created in 2014, with the aim of representing the small processors. Employees and processing technicians are part of a trade union called the *Federación de Trabajadores de la Industria Láctea*. Conaprole's employees also have their own worker's association, the *Unión de Empleados y Obreros de Conaprole*. Conaprole's influence is significant in both organizations. The percentage of members who work for Conaprole is far greater in the trade union than in the industry association, where all processors have an equal number of representatives. Before the revitalization of labor unions in 2005, the labor affiliation and influence of other dairy processors in the trade union was low. The centralized wage negotiation has typically led to tensions between the association and Conaprole. There have also been frictions at times over firings or sanctioning of co-workers (El Observador 2015). These frictions have at times affected exports as well as domestic activity.

3.1.2. Dairy Farm Production

Production in agriculture and related sectors contributed 8 percent of Uruguay's GDP and 30 percent of Uruguayan exports in 2014, employing 16 percent of the economically active population. The total production area is 16.4 million hectares. The main activities are cattle and wool production (12.8 million hectares), forestry (1.8 million hectares),

agricultural production (1.5 million hectares) and dairy production (817,000 hectares). According to the latest Agriculture, Cattle and Fisheries Ministry figures, there are nearly 45,000 establishments in the agro industry. The dairy industry specifically generates nearly 9 percent of Uruguay's exports of goods and 70 percent of its production flows to international markets, mainly Venezuela, Brazil, China and Argentina.

The number of registered dairy farms fell from 5,000 in 2000 to 4,000 in 2015 (DIEA MGAP 2000). The decrease is mainly due to ongoing concentration of capital and competing options for land use (INALE 2015). Lack of intergenerational relay may also contribute to the reduction in the number of dairy farms. The average age of producers is relatively high, and young people that would otherwise take over from older relatives have difficulty accessing land due to lack of effective markets and financial instruments. Competing activities, such as agriculture or forestry, have different business structures and are amenable to a broader variety of land property schemes (Mondelli and Gorga 2015).

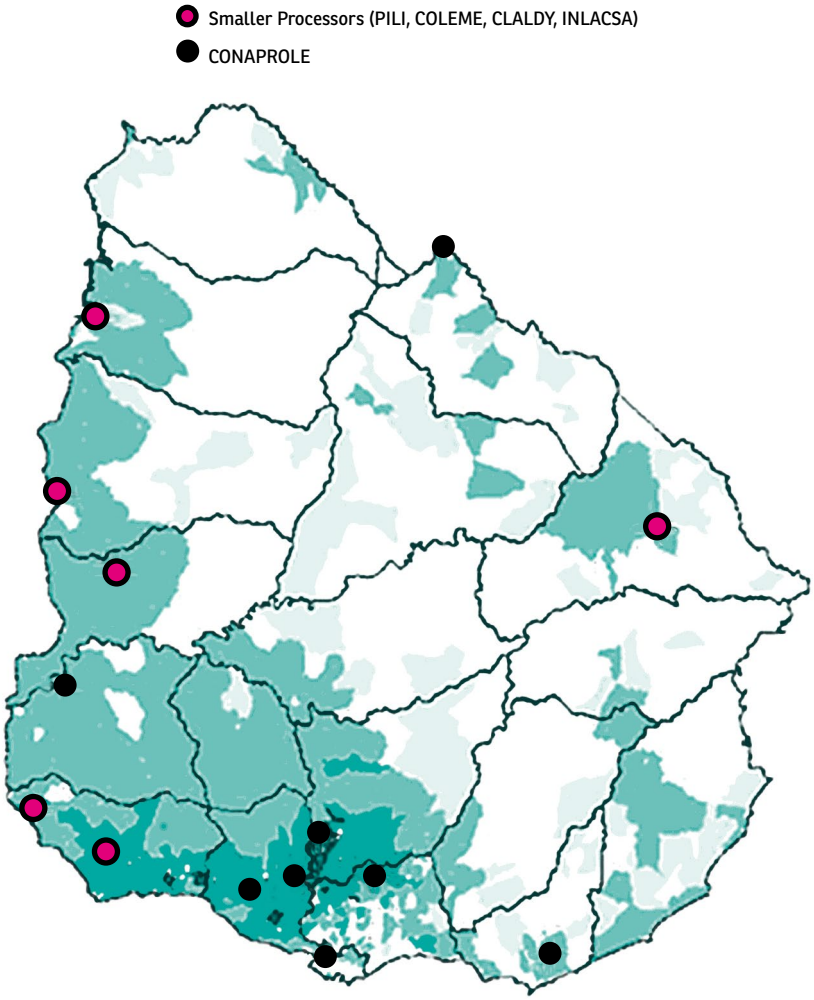
Milk farming was the principal activity of the Department of San Jose and the second highest activity (in terms of land-use) in Colonia, Florida and Canelones (DIEA MGAP 2011) (Figure 14). The Department of Florida is the highest producer of milk in Uruguay, followed by San Jose and Colonia. Despite their proximity, the method of production is different in Florida as compared to San Jose and Colonia. In Florida, farms are relatively large, with 35 percent higher productivity than the national average (source: 2011 Agro Census). 95 percent of Florida's dairy farms supply directly to processors. Conversely, in San Jose and Colonia, only 65 percent of producers supply processors with their milk. The rest are almost all artisanal producers of cheese and other dairy products. Across the country, 11 percent of Uruguayan farmers produce less than 300 liters per day. 50 percent of farmers produce between 300 and 1,400 liters, while 20 percent produce over 1,400 a day (over 50 percent of Uruguay's milk).

Foreign ownership and vertical integration into dairy farming by FDI processors is an emerging trend in this phase of the value chain in Uruguay. Two major producers have vertically integrated some processing activities. *Estancias del Lago*, located in Durazno (which is not a traditional dairy production region), started production in 2016. It is the biggest dairy farm in Uruguay with 37,000 hectares. Estancia has announced plans to build a herd of 13,000 cows to support the production and export of 20,000 tons of powdered milk annually. Another dairy producer with vertically integrated processing is Talar, located near Punta del Este. Talar has a relatively large dairy farm (by Uruguayan standards) with over 2,000 cows. Both farms manufacture their own grain.

Associations and Interest Groups

The *Cámara Uruguaya de Productores de Leche* (CUPL) represents the interests of the biggest dairy farmers while the *Asociación Nacional de Productores de Leche* (ANPL) represents about 1,500 producers. Conaprole and ANPL maintain a very close relation-

FIGURE 14. **Land Area Devoted to Milk Production and Location of Main Dairy Processors**



0% del rubro □ 0,1 - 1 ■ 1,01 - 25 ■ 25,01 - 50 ■ 50,01 - 75 ■ 75.01 - 100

Source: Adapted from DIEA MGAP 2011 Census

ship. Not only does ANPL have formal control of the board, it also exerts considerable influence over Conaprole's board composition because candidates nominated by ANPL traditionally receive the most votes. A smaller group of big producers, known as "*El Grupo de los 29*" plays a major role in the strategic decisions of the firm. Several other local associations and interest groups have varying levels of informal influence on ANPL. The most powerful are the *Sociedad de Productores de Leche de Florida* and the *Sociedad de Fomento Rural de la Industria Lechera de Salto*. Nationally, in addition to the ANPL, the *Intergremial de Productores de Leche* (IPL) represents the interests of small producers.

Artisanal Production

Artisan producers supply 50 percent of all cheese consumed in Uruguay (Cirisola and Gago 2012). The *Asociación del Queso Artesanal* represents more than 300 of these producers. The association promotes quality and sanitation in artisan production, collaborative development strategies, and new marketing and distribution channels. The lack of controls and the prevalence of informal production, channels of distribution, and retailing of the products hurt the potential for growing the industry. Unsophisticated local demand, with consumer preferences for unpackaged hard cheese and the consequent lack of brand positioning make it difficult to develop the industry.

3.1.3. Public Institutions for the Dairy Industry and Public—Private Sector Relations

The public sector has played a direct role in the dairy sector in Uruguay. After founding Conaprole by government decree in 1936, the government granted Conaprole a monopoly on the supply of fresh milk to Montevideo from 1936 to 1984. While other fixed milk price policies have since been abandoned, the government still sets the price of pasteurized fresh milk, the most widely consumed dairy product in Uruguay. Conaprole, by its size and dominance, has always enjoyed an open communication channel with the government. However, there now exist several public support institutions, mechanisms and vehicles for public-private dialogue and collaboration (Box 4).

Dairy Inputs Supply

In sourcing inputs, suppliers to Conaprole operate in a different environment from other producers. Conaprole created PROLESA in 1994 to buy inputs (including grains and concentrates, fertilizers, seeds, agrichemicals, veterinary services, nutrition products, and building materials) in aggregate and sell them to member producers at competitive rates. The significant bargaining power that PROLESA derives from its size allows it to buy at much lower prices than individual producers. The firm employs 120 workers across 22 sales points.

BOX 4. OVERVIEW OF PUBLIC INSTITUTIONS ON THE DAIRY INDUSTRY

- In 2008, the Uruguayan government strengthened institutional support for the dairy sector with the creation of *Instituto Nacional de la Leche* (INALE). INALE was created in to increase the quality of milk production in Uruguay and to strengthen the industry's commercial domestic and export potential. INALE also facilitates cooperation and collaboration among industry stakeholders to increase value added activity in Uruguay. INALE's board comprises government representatives, processors, producers and artisanal producers. Its main goals are to advise the government on dairy issues, promote public-private dialogue, coordinate and development the value chain, generate public information about the sector, and participate in all trade, financial or other policy discussions that pertain to the dairy sector.
- *The Fondo de Financiamiento de la Actividad Lechera (FFAL)* is a mechanism through which producers can get some financial support. The scheme affords lines of credit to producers through the state-owned *Banco República*.
- *The Instituto Nacional de Investigaciones Agrícolas (INIA)* has five regional centers around the country. One, *La Estanzuela* in Colonia, is devoted to agriculture, bovine cattle and dairy farming. INIA has a close relationship with producers in the region. Among their activities is the research and promotion of good practices, the diffusion of technology and the preservation of environment.
- *The Instituto de Colonización* supports new land-access for small producers and owns several breeding farms. Collective farms send heifers to the institute, where an association of dairy farmers manages them. More than 600 producers use 15 breeding farms.

Most dairy regulation is related to hygiene and phytosanitary standards. Dairy farms and dairy processors are obligated to register. In addition, producers must obtain an annual Certificate Sanitary of Dairy Farms and Cheese Production from the General Division of Livestock Services in the Ministry of Agriculture, Livestock and Fishing.

In recent years, concern has been growing around the quality of the fresh water in the Metropolitan Area of Montevideo and in Maldonado. The National Authority of Environment (DINAMA), is particularly preoccupied by pollution of the basin of the Santa Lucia River, the main source of fresh water in Montevideo. Dairy farmers and other producers have been blamed for the pollution and contamination. As a result, DINAMA has announced that some additional regulation will be introduced to try and curb the trend.

PROLESA does not directly import most of the products that it sells but sources them in the domestic market. Producers who send milk to other processors often receive less support.

Feed Concentrates. Recent technical advances have led to sustained productivity growth. One of the main changes has been the increased use of concentrates in feed. INALE (2015) estimates that concentrates are a third of total cost. However, there are no domestic producers of concentrates. Instead, they are principally provided by TALCOL, SUPRA, TIMAC AGRO, and PGG WRIGHTON PAS. Most are medium-sized enterprises based in the Latin America.

Fertilizers. Uruguay's domestic fertilizer production has grown rapidly in recent years and is dominated by large, traditional firms. Both ISUSA and *Grupo Maccio* import raw inputs before mixing fertilizers in Uruguay. ISUSA also exports fertilizer to Bolivia. Foreign suppliers include Nidera, Bunge, and ASP (Agrium).

Seeds. Domestic seed development has grown in recent years. Suppliers include foreign companies (such as Monsanto, Syngenta, Agar Cross, Nidera, LDC, and Wrightson Pas) and national firms (Agroterra, Fodere, and Barraca Erro). The *Cámara Uruguaya de Semillas* is an industry association for all Uruguayan seed producers and importers. The *Instituto Nacional de Semillas* (INASE) is an entity similar to INALE that regulates the market of seeds.

Equipment. Machinery contributes 9 percent to the total cost of milk production. Larger providers of sowing, fertilization, and harvest equipment are typically members of the *Cámara Uruguaya de Servicios Agropecuarios* (CUSA), an industry association created to represent the interests of machinery services providers.

Milk Collection

Effective and efficient collection and transport of milk from farms to processors is a critical part of the dairy value chain. Conaprole has an exclusive relationship with TRALE, a holding company of 33 milk transporters. Other processors may use other transporters, but it is a part of the value chain that is typically outsourced (although in some cases Conaprole transports its own milk).

3.2. RECENT PERFORMANCE OF THE DAIRY INDUSTRY IN URUGUAY

The Uruguayan food sector increased the share of value added in total output. In 2006, value added accounted for less than one in every 5 dollars produced. This increased to about one in every 4 dollars produced in 2010. During the same period, the sector reduced its international exposure on the output side, and increased it on the input side. Foreign sales accounted for 64 percent of total sales in 2006 but 54 percent in 2010. The share of imported raw materials in total output, by contrast, more than doubled—from 4 percent in 2006 to 9 percent in 2010 (Figure 15).

FIGURE 15. **Food Sector Performance, 2006–2010**

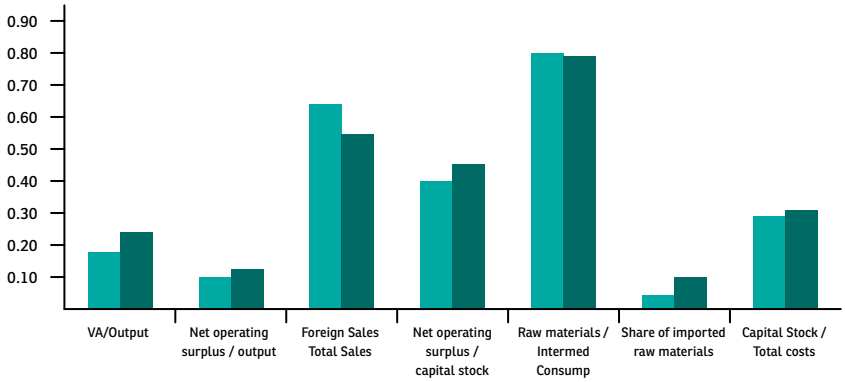
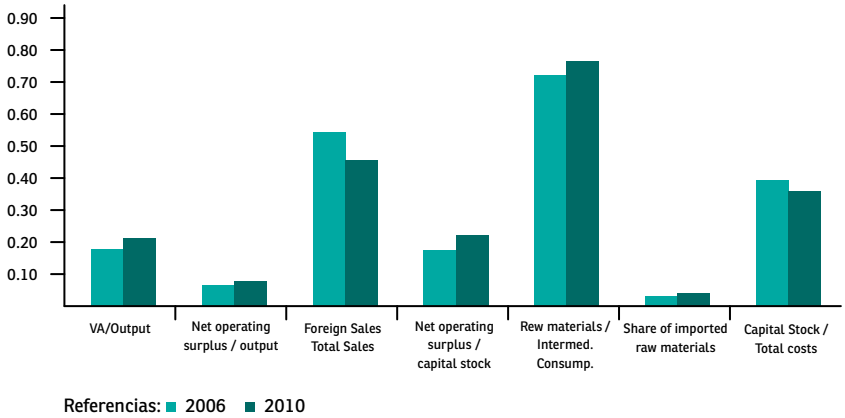


FIGURE 16. **Dairy Sector Performance, 2006–2010**

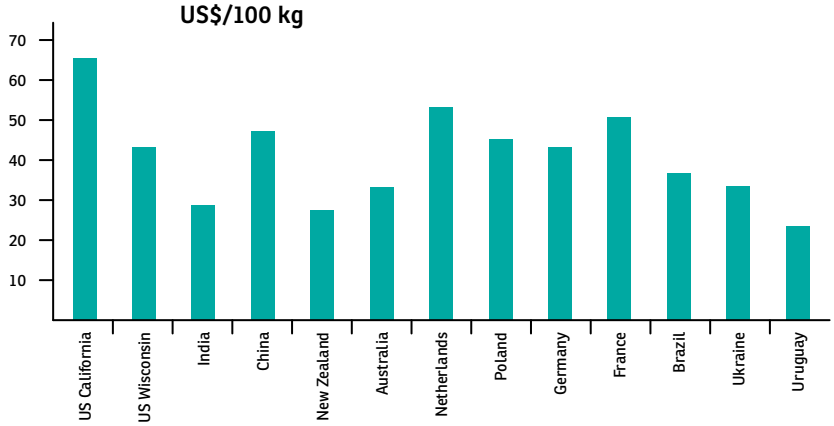


Source: Authors' calculations using National Economic Activities Surveys from 2006 and 2010.

The dairy sector reflects the trends in the food sector. Value added increased from 18 percent of output to 21 percent of output. While international exposure declined on the output front, it increased on the input front. In 2006, foreign sales accounted for 55 percent of total sales, decreasing to 46 percent in 2010. Instead, the share of imported raw materials in total output increased mildly, from 3 to 4 percent over the same period (Figure 16).

The Uruguayan dairy industry is cost-competitive on international markets. The overall cost of producing milk in Uruguay is low (Figure 17). Moreover, Uruguay's selling price for whole milk powder is very competitive relative to other regional and major global powder sellers, with only the EU narrowly beating Uruguay on price (Table 4). Uruguay's milk production increased by 4.1 percent from 2004 to 2010 while major developed market production centers of Australia and the EU are negative and the U.S. and New Zealand slightly below average world growth rate (Figure 18). China (not shown in the chart) was the only country with more growth at 17 percent. This growth in Uruguay is due to its solid international position from a cost of production point of view as well as size of the regional market for powdered milk.

FIGURE 17. **Cost of Producing Milk in Uruguay and Comparators, US$/100 kg**



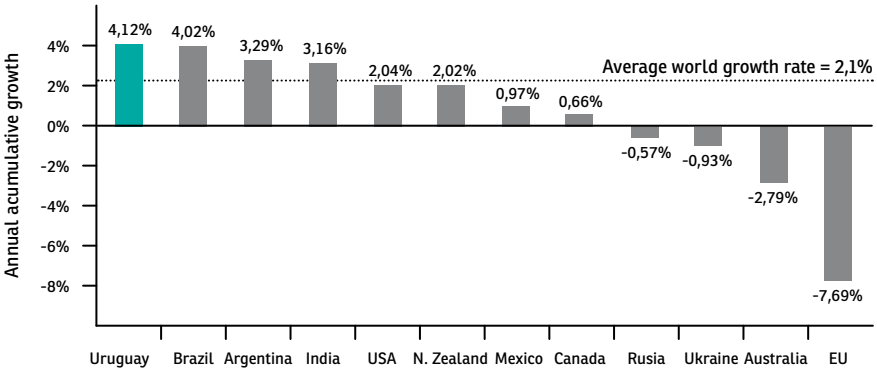
Source: IFC 2015.

TABLE 4. **Selling Cost of Whole Milk Powder, Uruguay and Comparators, US$/MT, 2011**

Economy	Cost	Economy	Cost
European Union – 27	3,426	United States	3,955
Uruguay	3,500	New Zealand	4,084
Argentina	3,725	Australia	4,156
Brazil	3,802	China	5,440
Mexico	3,901		

Source: IFC 2015

FIGURE 18. **Milk Production Growth Rates, Uruguay and Comparators, 2004–2010**



Source: IFC 2013

TABLE 5. **Resource Intensity (per US$1,000 of Value Added) for the Food and Dairy Sector, 2011, US**

2007 NAICS	Industry	Labor intensity hours worked	Capital intensity gross surplus	Energy intensity fuel and electricity cost
U.S. Annual Manufacturing Survey (2011)				
311	Food manufacturing	8.2	792.1	41.9
3115	Dairy product manufacturing	6.1	784.0	40.4
31151	Dairy product (except frozen) manufacturing	5.7	790.4	41.2
31152	Ice cream and frozen dessert manufacturing	9.0	726.3	33.5
311513	Cheese manufacturing	8.6	729.8	54.4
311514	Dry, condensed, and evaporated dairy product	3.0	876.4	34.8
311520	Ice cream and frozen dessert manufacturing	9.0	726.3	33.5
31151N	Fluid milk and butter manufacturing	5.4	783.3	36.1

Source: Authors' calculations based on U.S. Annual Manufacturing Survey (2011).

However, Uruguayan dairy production is far more labor and energy intensive than that of the U.S. (Table 5 and Table 6). Uruguay needs five times more labor to produce US$1,000 of value added, pays two to three times more for energy than the US, and is 40 percent less capital intensive. The dairy industry in Uruguay shows on average a 25 percent lower return on capital than the US. However, despite higher resource intensity and lower returns on capital, Uruguayan dairy has posted a production growth rate of 4.1 percent from 2004 to 2010, second to China with a 17 percent growth rate. Also, the quality of Uruguayan dairy products has been improving since 2000, with fluid milk, milk powder, and butter moving from the bottom quarter to the middle of the global distribution of prices by 2014.

TABLE 6. **Resource Intensity (per US$1,000 of Value Added) for the Food and Dairy Sector, 2010, Uruguay**

2007 ISIC4rev	Industry	Labor intensity hours worked	Capital intensity gross surplus	Energy intensity fuel and electricity cost
Uruguay Annual Manufacturing Survey (2010)				
10	Food manufacturing	45.7	555.4	141.3
105	Dairy product manufacturing	29.8	467.0	102.8

Source: Authors' calculations using National Economic Activities Surveys year 2010. Note that differences in energy costs may reflect differences in electricity intensity, in costs or in both.

3.2.1. Quality in International Markets

The quality of Uruguayan dairy products has been increasing since 2000. Two complementary indicators, the weighted average of the income of Uruguay's dairy importing countries and the relative unit values that Uruguayan exporters fetch in international markets, suggest that export quality in dairy has been increasing for Uruguay's most important dairy products (Figure 19 and Figure 20). In fluid milk (fat content between 1 and 6 percent), for example, Uruguay moved from selling to countries in the bottom quintile of the income distribution to selling to those in the second quintile. (Income over the period is held constant, implying this shift in the distribution is related to penetrating higher income countries.) This was matched with higher unit values received for its products, relative to those received by competitors, moving from the bottom quartile of the price distribution to the middle. A similar process occurred for milk in powder (both for fat content below 15 percent, and for that without sugar) and for butter.

FIGURE 19. **Weighted Average of Income of Importers of Dairy Products—Uruguay's Position on the Ladder**

URY Milk (1%<Fat<6%) (2000 & 2014)

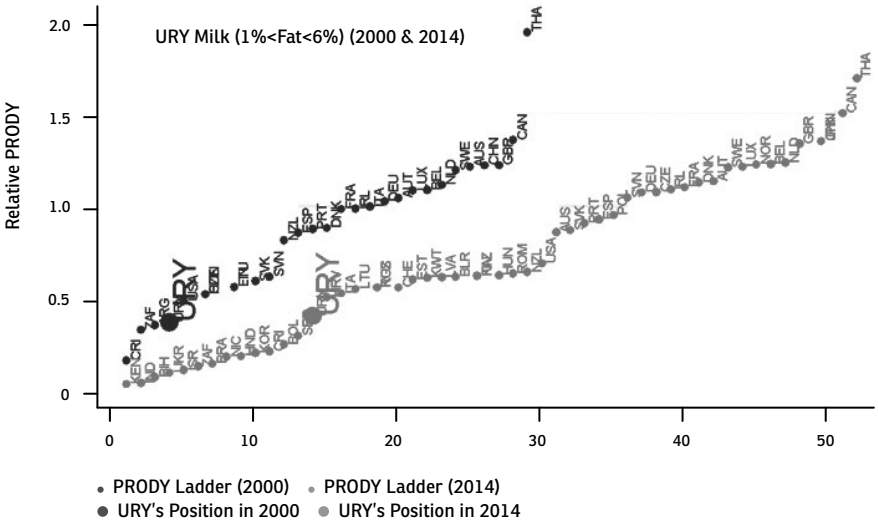
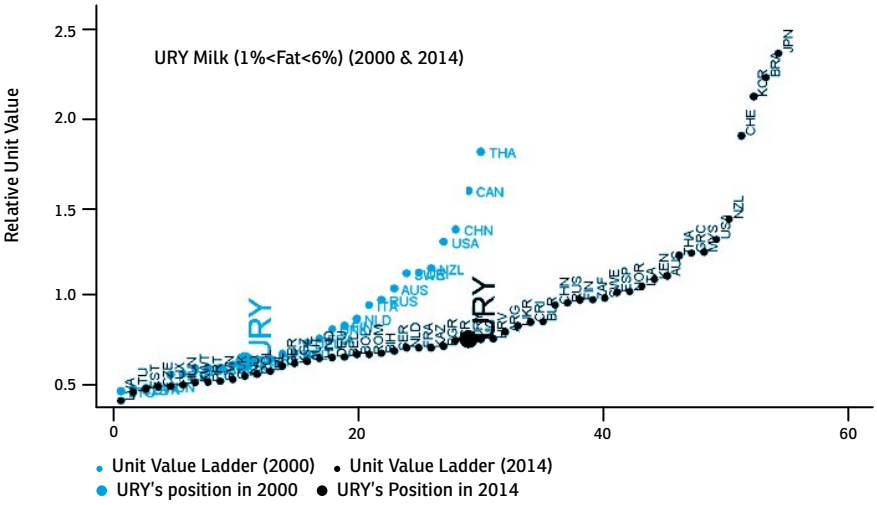


FIGURE 20. **Relative Unit Values that Dairy Products Fetch in International Markets—Uruguay's Position on the Ladder**



Source: Authors' calculations based on UN Comtrade and WDI

Instead, Uruguay only exported yoghurt, whey, low fat milk and processed cheese later during the period — whey, low fat milk and processed cheese to relatively low income countries, fetching relatively low prices, while yoghurt was sold to high income countries for relatively high prices (see Appendix B for a complete analysis).

3.3. ANALYSIS OF RESOURCE MISALLOCATIONS AFFECTING THE PERFORMANCE OF THE DAIRY AND FOOD INDUSTRIES IN URUGUAY

3.3.1. How Do Markets Work in Food and Dairy Sectors In Uruguay? An Analysis of Misallocation

Productivity is critical for firms to internationalize, particularly through participation in international production networks, and resource allocation has been productivity enhancing for the Uruguayan dairy industry. In a competitive market, resources are gradually reallocated away from the least productive firms, into the most productive ones. This process helps increase aggregate productivity in an economy. A comparative analysis of the Uruguayan dairy industry vis-à-vis the overall food industry and manufacturing shows that resource allocation has improved over the time, with the most productive dairy firms gaining significant market shares in both value added and overall production. This has led to an increase in the overall productivity of the dairy industry. Conversely, the allocation of resources in manufacturing and the overall food industry has negatively contributed to productivity growth: the market shares of the least productive grew relative to those of the most productive, likely due to increased market frictions, for the period analyzed.

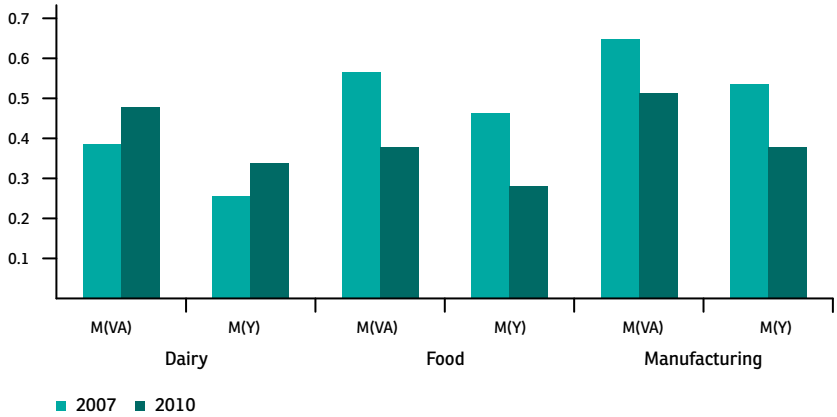
3.3.1.1. Input Misallocation: evidence from Uruguay's Dairy and Food Sectors

In what follows, we apply the Bartelsman et al. (2009) approach to measure misallocation in Uruguay's food and dairy sector. (See Appendix B for details.)

Figure 21 shows the allocation of resources for Uruguayan firms in the survey years 2007 and 2010. For the dairy sector, the allocation index, which captures the covariance between firm productivity and firm size, has increased significantly over time, and the evidence is robust to the different weighting scheme. This implies that the most productive Uruguayan firms in the analyzed sector have gained significant market shares both in terms of value added and overall production.

For the food sector and the manufacturing industry as a whole, however, the result is reversed. In both cases, the covariance between firm productivity and size decreased significantly over the period 2007–2010. The allocation of resources index for the overall

FIGURE 21. **Index of Resource Allocation for Uruguayan Firms**



Source: Authors' calculations using National Economic Activities Surveys from 2007 and 2010

manufacturing industry is slightly lower than the one for Indian manufacturing (Duranton, et al. 2015) but in line with the one of U.S. firms (Bartelsman, Haltiwanger and Scarpetta 2013). Such evidence suggests that frictions in the market are preventing more productive firms from becoming bigger or that less productive firms are relatively over-sized.

3.3.2. From Factories to Consumers: Positioning along the Production Chain

Increased productivity in the dairy industry has not been associated with a significant diversification of exports – it may have been associated with increased specialization, with 74 percent of dairy exports in 2014 concentrated only in three products: milk and cream powder (34 percent), cheese (25 percent), and low fat milk powder (12 percent). The degree of export competitiveness often has to do with the relative position of a country, industry, or firm within a value chain. The ability to retain value added often relates to distance from the final demand. Economists refer to this distance from the final consumer as the degree of "upstreamness" (further from the final consumer) or "downstreamness" (closer to the final consumer).

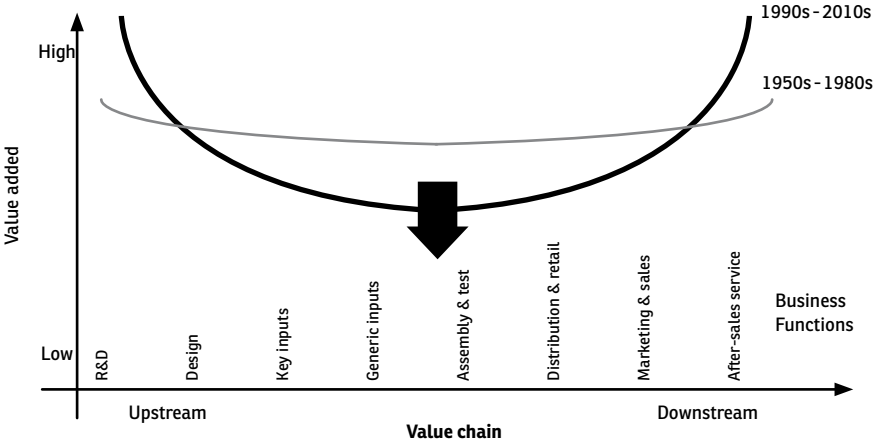
This measure is a proxy for the number of "transactions" a dollar's worth of a product will participate in before final consumption. Intuitively, a general input like "petrochemicals" enters into many production processes before it reaches final consumption. A final product like an automobile is much closer to final demand. Antras et al. (2012) and Fally (2012) developed a methodology for measuring the distance to final demand,

called upstreamness (see Appendix C). The upstreamness measure (UPS) ranges from a minimum value of 1 for an automobile (once assembled, it is only one step away from final—consumer—retail) to a maximum of 4.65 for petrochemicals. Upstreamness, the distance to final demand (i.e., consumption), is a useful metric to assess a sector's position along the production chain. Lower upstreamness (that is, distance from final markets) presents greater opportunities for higher value addition.

There is a non-linear relationship between the upstreamness of a task and the value added associated with it. High upstream, with R&D and design, value added is high. Value added is also high close to the consumer, downstream, with marketing, distribution, sales, and post-sales customer services. But it is lower in the middle. Empirically, this is described as a 'smiley curve' (Figure 22) This smiley curve became more pronounced with the 'second unbundling' process of the 1990s—2010s as competition in the intermediate segments increased, and the processes associated with R&D, design and marketing increased in complexity. The example of the iPhone is paradigmatic, with the knowledge clusters appropriating about fifth-sixths of the value created, and those of production only one-sixth (Figure 23).

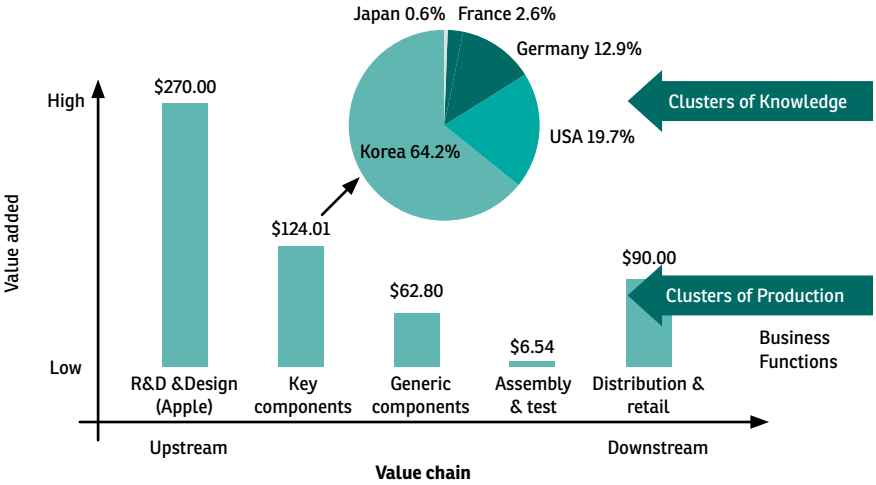
The difference between the import and export upstreamness is also informative regarding the length of the domestic production chain. For a country like China, imports are persistently more upstream than exports: this reflects the tendency of Chinese

FIGURE 22. **Smiley Curve—Before and After the Second Unbundling**



Source: Making Global Value Chains work for Development

FIGURE 23. **Smiley Curve—iPhone 4**



Source: Dedrick et al (2009).

firms to use imported inputs (high upstreamness) when producing final goods (low upstreamness) for foreign markets and it is consistent with the important role played by processing trade in the country. This pattern is usually reversed in countries rich in natural resources, such as Russia, that export these raw materials (high upstreamness) while importing mostly final goods (low upstreamness).

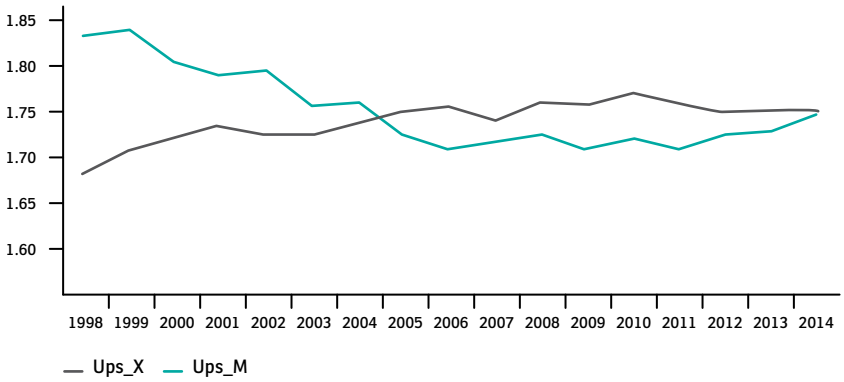
3.3.2.1. Distance to Consumers: Uruguay and Peer countries[9]

Uruguayan dairy firms are closer (more downstream) to final consumers than the rest of the economy. However, their domestic value chains have shortened and value added domestically has decreased over the past two decades. This trend is evidenced by a comparative analysis combining product- and firm-level data on exports and imports to measure the position of the dairy industry in GVCs in terms of distance from the final consumer (upstreamness/downstreamness). We also measured the length of the dairy and food industry chains in Uruguay, and looked at factors at the firm level that are associated with increased or reduced length of activities within the chain that are performed by the

9 See Appendix C for a complete analysis.

firms. Our analysis shows that Uruguayan dairy firms operate closer to final demand than the food industry and the overall economy. Figure 24 plots upstreamness in exports and imports for Uruguay's dairy industry. It reports lower values for both import and export upstreamness, with respect to the same figures for the overall economy; reflecting the fact that dairy products are relatively closer to final consumption. However, the relative length of the domestic value chain and value added domestically (measured as the gap between import and export upstreamness) has been decreasing since 1998. In Argentina, Brazil, Chile, and Paraguay, instead, it has increased over the same period.

FIGURE 24. **Uruguay Export (X) and Import (M) Upstreamness (Ups) for the Dairy industry**



The composition of imported products in the dairy sector changed substantially over the last 15 years. Import upstreamness declined steeply between 2000 and 2006, whereas export upstreamness has increased steadily since 1998. This evidence suggests that the composition of imported products within the sector changed over the period: imports of final products increased faster than imports of intermediates.

A handful of products drove the observed changes. The bundle of imported products (Table 7), evidence that the change in import upstreamness between 1998 and 2014 was driven by the sharp decline in imports of HS 210500 (Ice cream and other edible ice, UPS 1.86) and HS 40630 (Cheese processed, not grated or powdered, UPS 1.87). Those products alone accounted for 56 percent of country total imports in the dairy industry in year 1998, whereas they accounted for only 5.2 percent in 2014. The import share of HS 170211 (Lactose & syrup, 99 percent milk), HS 40310 (Yoghurt) and HS 40210 (Milk powder < 1.5 percent fat) increased significantly to 18 percent, 12 percent and 8 percent respectively. Over 71 percent of exports in 2014 are concentrated in only three products:

HS 40221 (Milk and cream powder; 34 percent of sectoral exports); HS 40690 (Cheese; 25 percent) and HS 40201 (Milk powder < 1.5 percent fat; 12 percent).

TABLE 7. **Top 5 Imported Dairy Products, 2014 and 1998**

UPS	hs96	lib_hs6_96	Import Share (2014)
1.87	40690	Cheese except fresh, grated, processed or blue-veined	0.27
1.76	170211	Lactose & syrup,99 percent milk	0.18
1.62	40310	Yoghurt	0.11
1.76	40210	Milk powder < 1.5 percent fat	0.08
1.47	40510	Butter	0.08
1.70		Top 5	0.72
UPS	**hs96**	**lib_hs6_96**	**Import Share (1998)**
1.86	210500	Ice cream and other edible ice	0.38
1.87	40630	Cheese processed, not grated or powdered	0.18
1.87	40690	Cheese except fresh, grated, processed or blue-veined	0.14
1.87	40640	Cheese, blue-veined	0.05
1.76	40410	Whey	0.05
1.85		Top 5	0.80

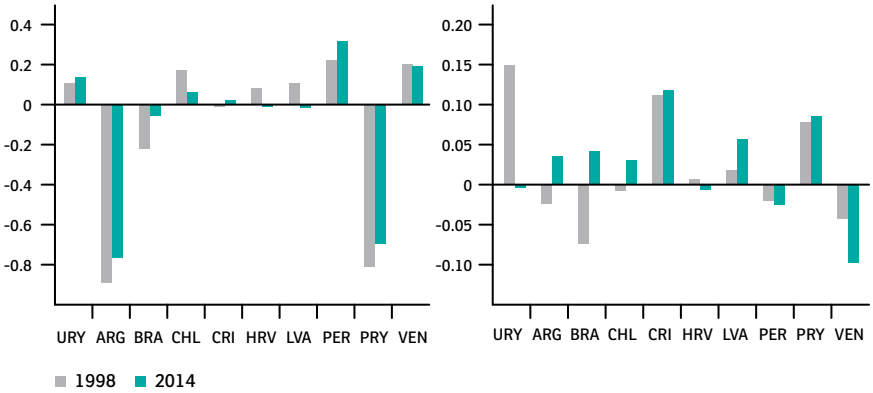
Source: Authors' calculations using BACI data (CEPII).

3.3.2.2. Distance to Consumers: Shifting the Focus from Products to Firms: Uruguay Firm-level Evidence

During the last two decades, international trade has been a key source of growth in many developing countries. However, the sharp increase in production fragmentation requires continuously evaluating a country's position along global production and trade networks to fully internalize welfare gains from trade and insure against cross-border transmission of shocks. During the same period, and in particular during the last 15 years, Uruguayan firms became more internationalized, and participated to some extent in these new global networks.

Where are Uruguayan food and dairy producing firms in the production chain? In this section, we use transaction data to evaluate the position of Uruguayan firms along the production chain for food and dairy products by computing the average upstreamness

FIGURE 25. **Import-Export Upstreamness Gap, Uruguay and Peers, Food (left) and Dairy (right)**



Source: Authors' calculations using BACI data (CEPII). Positive GAP indicates that imports are more upstream than exports.

index for the export and import bundles at the firm level. (See Appendix C for details on the empirical strategy.) This measure is a proxy for the number of production stages that separate the import/export mix of a firm from final consumers. By measuring the "gap" between import and export UPS it is possible to infer the number of production stages that an exporter-importer firm can perform internally.

The evolution over time of the composition of the export and import mix and the "gap" between the two (Figure 25) is informative for policy, such as strategies to maximize gains from trade and GVC participation. For example, how can Uruguay design trade and investment policy interventions to ensure that Uruguayan firms add more value, or upgrade within these production networks? What is the potential welfare effect of such policies given the underlying firm characteristics?[10]

10 One caveat is in order. Data constraints make it impossible to link directly firms' characteristics (from the National Economic Activities Surveys) with firms' export and import transactions (from customs registries). This limits the insights that the analysis can provide for policy design. One example of a consequence of this limitation is that, given the lack of a common identifier across customs and firm-level survey data, it is impossible to isolate producers from retailers. Instead, if one used information on the firm cost/revenue structure, it would be possible to evaluate how internal factors are shaping the import/export composition at the firm level and by that its position along the value chain. Information on firm balance sheet structure coupled with detailed international

Both theoretical and empirical research has identified the importance of imported inputs for economic growth. Theoretical work dates to endogenous growth theory, where imported inputs act as a channel for the diffusion of technology fostering long-term growth (Romer 1990, Aghion and Howitt 1998). More recent empirical studies at the micro level confirm that access to imported intermediate inputs positively affect firm productivity (Halpern, Koren and Szeidl 2015, Pierola, Fernandes and Farole 2015). Using Hungarian firm-level data, Halpern, Koren and Szeidl (2015) show that imported inputs are responsible for more than a quarter of the observed productivity increase between 1992 and 2002. The economic rationale is that foreign inputs are usually of higher quality and incorporate superior technology; eventually leading to higher firm productivity, export volumes and quality. For example, using highly disaggregated firm-level customs transaction data, Pierola, Fernandes and Farole (2015) study the relationship between imports of intermediate inputs and firm export performance in Peru over the period 2000–2012. Their findings confirm that, at the firm level, greater use, variety, and quality of imported intermediate inputs is associated with higher exports, faster growth, greater diversification of destination markets and higher quality exports.

The robust evidence regarding the relation between imported inputs and firm performance suggests some scope for trade policy measures to boost firm performance and improve participation into global production networks: in particular, for policies and interventions that target the reduction of trade costs, so that firms can access inputs from wherever it is more convenient to source them. As Pierola et al. (2015) suggested, imported inputs are not only a channel for technology transfers but also a "ticket" to participate in GVCs.

Figure 26 shows the evolution of direct foreign content added in the industrial stage. Note there can also be foreign inputs in the domestic inputs, mostly in primaries. Lalanne (2015) estimates the total direct and indirect content of imports in the food and dairy sector for Uruguay in 2012 at 18.2 percent and 17 percent respectively.

Considering the emergence of increasingly complex and fragmented production chains during the last two decades, trade barriers, like tariff and non-tariff measures (such as custom clearance procedures) may have second order effects and affect the ability of firms to compete on international markets and integrate into global production networks.

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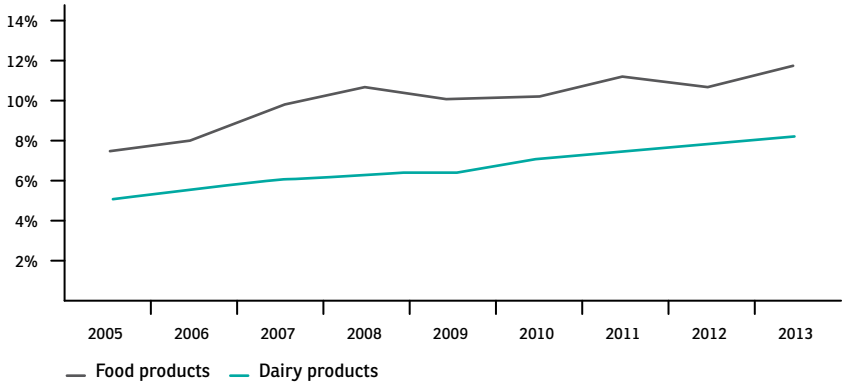
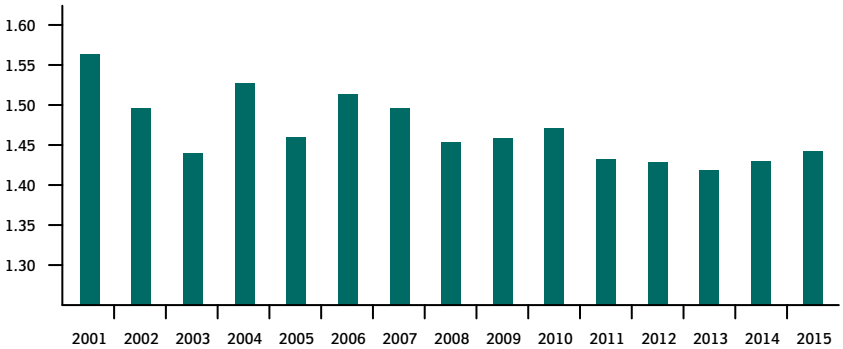
transactions would greatly expand the scope of the analysis, ensuring a deeper understanding of firm-level determinants of GVCs participation and the associated policy implications. For example, richer data may help understand: How financial constraints affect the ability of a firm to access to imported inputs? How do capital intensity and productivity affect the likelihood that a given firm will expand the range of production stages it performs? An analysis that touches upon some of these issues can be found, for example, in Manova and Yu (2014).

FIGURE 26. **Share of Direct Imported Inputs on Output, Dairy and Food Sectors, 2005–2013**



Sorce: Authors' calculations using BACI data (CEPII).

FIGURE 27. **Average Import Upstreamness for Uruguayan Firms (Exporter Sample) Conditional on Firm Characteristics**



Note: Authors' calculations. The graph reports the Import upstreamness for the average Uruguayan firm, obtained from Equation (2) keeping all covariates at their mean.

Firms have been importing a higher share of final goods. There has been a significant decrease in the import upstreamness of Uruguayan firms, suggesting that firms have been importing a higher share of final goods during the last decade.

The evolution of import upstreamness for a representative Uruguayan firm (Figure 27) confirms a significant decrease in import upstreamness once we control for firm characteristics. Combined with data on the gap between import and export upstreamness (Appendix C), the results suggest that the decrease in import upstreamness has

FIGURE 28. **Average Import Upstreamness and Gap for Uruguayan Dairy Exporters Conditional on Firm Characteristics**

Note: Authors' calculations. The graph reports the import upstreamness and gap applied to firms in the dairy sector; keeping all covariates at their mean. Number of observations: 516.

been associated with a further decrease in the gap (i.e., the difference between import upstreamness and export upstreamness).

Firms may have shortened the set of production stages they perform internally. Figure 28 reports the average import upstreamness (blue bars) and the average GAP (dark orange points) for the representative firm in the dairy sector. The results suggest that firms in the sector may have shortened the set of production stages they perform internally, having increased the share of imports of products closer to final demand (low upstreamness).

3.3.3. Quantitative GVC Analysis and Inter-Sectoral Linkages: Analysis of the Linkages between the Dairy Industry and Other Industries in Uruguay

Availability of appropriate macro and micro information is crucial to design sound integration and upgrading policies. With respect to data requirements, it is essential to differentiate business and trade statistics by enterprises with inward and outward international linkages. It is also important to ensure that trade statistics can be linked to firm characteristics to address firm heterogeneity and firms' internal factors driving GVC integration. It would also be advisable to include enterprise characteristics related to GVC participation in business registers to profile firm heterogeneity, especially for large and complex enterprises.

Recent economic research shows how firm-level efficiency and total factor productivity distribution are linked to macroeconomic factors. A significant consequence of the macro and micro interdependence is that productivity shocks (R&D, investment behavior, management changes, etc.) affecting large firms or a sector can have a non-negligible impact on the state of the overall economy due to the characteristics of firm distributions (granularity) and input-output linkages.

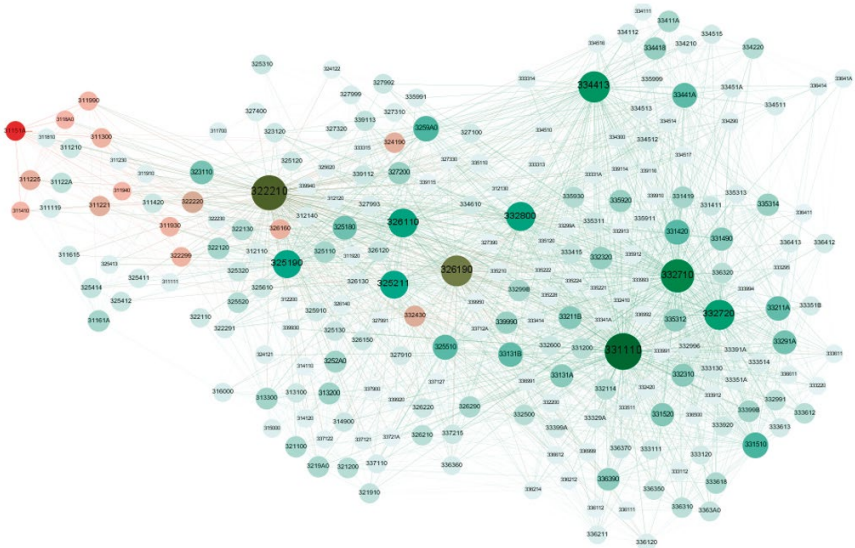
The "granular" hypothesis, for example, shows how an idiosyncratic shock to large firms affects aggregate fluctuations and, through general equilibrium channels, all other firms as well (Gabaix 2011). The distribution of firms tends to be highly skewed. (Sales of the top 100 firms in the United States, for example, are equal to almost 30 percent of country GDP.) On this basis, Gabaix demonstrates that the effect of firm-level shocks does not cancel out as the number of firms increases. For the U.S. economy, shocks to the top 100 firms are responsible for one-third of the country's GDP fluctuation.

Sectoral linkages may act as another channel through which microeconomic shocks may affect to the macroeconomic outcomes and generates a "cascade effect" (Acemouglu at al. 2012). Localized sectoral shock may propagate to the whole economy through intermediate supplies linkages. Where production structure shows inter-sectoral dependence (via input-output mechanisms), the microeconomic shocks do not average out. Firms and sectoral interconnections may propagate the fluctuations to the whole economy.

As a graphical example of the linkages across economic sectors and the potential channel of transmissions for shocks and know how, Figure 29 shows the inter-sector links for the sectors in manufacturing, using the highest available disaggregation provided by the U.S. input-output (IO) tables (388 products) for 2007. Each node size is a manufacturing product, and links from sector *i* to sector *j*, are proportional to the share of *i* in the overall input demand of *j*, excluding *j*'s inputs sourced from *j*. The dairy sector is highlighted in red and, not surprisingly, appears to be relatively small and peripheral to the overall manufacturing production network.

Table 8 and Table 9 focus on the supply and demand inter-industry linkages for the dairy sector. The peripheral position within the overall manufacturing network is motivated by the relative concentration of IO linkages of the sector. From the supply side, most of the (non-manufacturing) inputs from the sector are from the cattle and milk production (47.7 percent of total inputs). The supply side patterns, however, also highlight the relevance of the retail sector (9.3 percent) and logistics (4.5 percent), improving the efficiency of these sectors then may have significant effects on the efficiency of dairy firms. The distribution of buyers reveals the key role of services as a source of demand for the dairy sector, with the main share of production sold to governments (17.6 percent) and restaurants (12 percent and 10.6 percent).

FIGURE 29. **Inter-Industry Linkages, Manufacturing Sector, Dairy Highlighted in Red**



Source: Authors' calculation using US Input-Output tables, detailed version 2007. To improve the readability of the graph, the dairy sector (node highlighted in red) is obtained by aggregating the following NAICS codes: 311513, 311514, 311520, 31151N0.

TABLE 8. **Input-Output Linkages, Dairy Products (based on USIO, year 2007)—Main Input Suppliers**

NAICS	Non-Manufacturing Suppliers	Input Share (%)
112120	Dairy cattle and milk production	47.75
420000	Wholesale trade	9.27
484000	Truck transportation	4.55
550000	Management of companies and enterprises	1.44
221200	Natural gas distribution	0.77
	Top 5	63.8
NAICS	Manufacturing Suppliers	Input Share (%)
3115	Dairy Manufactures	18.81
322210	Paperboard container manufacturing	1.75

NAICS	Non-Manufacturing Suppliers	Input Share (%)
311930	Flavoring syrup and concentrate manufacturing	1.22
311300	Sugar and confectionary product manufacturing	0.84
326190	Other plastics product manufacturing	0.70
	Top 5	23.32

Source: Authors' calculation using U.S. Input-Output tables, detailed version 2007.

TABLE 9. **Input-Output Linkages, Dairy Products (based on USIO, year 2007)—Main Buyers of Dairy**

NAICS	Non-Manufacturing Buyers	Input Share (%)	Dairy Sale Share (%)
S00700	State and local general government	1.32	17.62
722211	Limited-service restaurants	4.68	12.00
722110	Full-service restaurants	4.05	10.62
622000	Hospitals	0.68	3.73
721000	Accommodation	1.77	2.95
	Top 5	12.50	46.92
NAICS	**Manufacturing Buyers**	**Input Share**	**Dairy Sale Share (%)**
3115	Dairy Manufactures	18.81	31.75
311410	Frozen food manufacturing	6.91	3.14
311300	Sugar and confectionary product manufacturing	2.92	1.26
311810	Bread and bakery product manufacturing	2.53	1.25
3118A0	Cookie, cracker, pasta, and tortilla manufacturing	3.77	1.18
	Top 5	34.94	38.58

Source: Authors calculation using US Input-Output tables, detailed version 2007.

Based on a 2008 Input Output table, Table 10 and Table 11 show the same calculus for Uruguay. Several similarities and differences can be highlighted. First, the importance of fresh milk is higher in Uruguay. This can result from less value added in the industry,

due to less diversification. In Uruguay, the foreign demand for milk powder is remarkable. Second, the importance of the own sector as demand is much less remarkable in Uruguay than in the US.

TABLE 10. **Input-Output Linkages, Dairy Products (based on Uruguay, year 2008) – Main Input Suppliers**

CNAE*	Non-Manufacturing Suppliers	Input Share (%)
A.0121.1	Dairy farming and production manufactured in farm	63.14
I.60RT.0	Truck transportation	5.07
J.	Financial intermediation	2.92
G.	Wholesale and retail trade	2.38
E.	Electricity, gas and water supply	2.27
	TOP 5	75.78
CNAE	**Manufacturing Suppliers**	**Input Share (%)**
D.1520.0	Dairy products	5.29
D.210T.9	Paper and paper products	3.26
D.23TT.0	Manufacture of coke, refined petroleum products and nuclear fuel	1.94
D.25TT.0	Manufacture of rubber and plastics products	1.45
D.154S.0	Manufacture of sugar, cocoa, chocolate and other food products	1.12
	TOP 5	13.08

*Based on International Standard Industry Classification Rev 3

TABLE 11. **Input-Output Linkages, Dairy Products (based on Uruguay, year 2008)—Main Buyers of Dairy**

CNAE	Non-Manufacturing Buyers	Input Share (%)	Dairy Sale Share (%)
H.5520.0	Restaurants, bars and canteens	3.73	2.72
A.0121.1	Dairy farming and production manufactured in farm	2.87	0.55
N.85TT.0	Health and social work	0.37	0.39

CNAE	Non-Manufacturing Buyers	Input Share (%)	Dairy Sale Share (%)
H.5510.0	Hotels; camping sites and short-stay accommodation	1.92	0.18
L.75TT.0	Public administration and defense	0.29	0.16
	TOP 5	9.18	4.00
CNAE	**Manufacturing Buyers**	**Input Share (%)**	**Dairy Sale Share (%)**
D.1520.0	Dairy products	5.29	3.67
D.154R.0	Manufacturing of bakery products	5.59	2.18
D.24UT.0	Manufacture of chemicals and chemical products except pharmaceutical	0.17	0.10
D.154S.0	Manufacture of sugar, cocoa, chocolate and other food products	0.06	0.02
D.RRTT.0**	Manufacturing of basic metal, metal product, machinery and equipment	0.02	0.00
	TOP 5	11.13	5.97

*(ISIC Rev3: chap 27 to 33

3.4. GLOBAL TRENDS SHAPING THE DAIRY INDUSTRY, AND STRATEGIC SEGMENTATION OF THE DAIRY GLOBAL VALUE CHAIN

3.4.1. Trends Affecting Global Dairy Value Chain Structure

Overall, seven trends and industry dynamics are shaping the structure and future evolution of the dairy industry globally (see Appendix C for a complete analysis):

1. New consumer groups have emerged based on demand preferences for basic nutrition needs, health and nutraceutical properties of dairy products, or leisure consumption.
2. Rising incomes in emerging markets are shifting demand toward pre-prepared, convenience varieties of dairy-based foods.
3. Perishable dairy products, with a limited shelf life and complex logistics chain, increasingly command price premia on healthiness grounds vis-à-vis processed, canned, or frozen products.
4. Dairy substitutes such as soy, rice, and almond based drinks are becoming increasingly popular, reaching a US$5.8 billion market size.
5. The dairy industry is undergoing a structural consolidation with the top 10 global firms accounting for 24 percent of the market in 2014 as opposed to 17 percent in

TABLE 12. **Top 20 Global Dairy Companies, 2016**

2016		2015	Company	Country of headquarters	Dairy turnover, 2015*	
					USD billion	EUR billion
1		1	Nestlé	Switzerland	25.0	22.5
2		2	Lactalis	France	18.3	16.5
3		3	Danone	France	16.7	15.1
4	▲	5	Dairy Farmers of America	USA	13.8	12.4
5	▼	4	Fonterra	New Zealand	13.1	11.8
6		6	FrieslandCampina	Netherlands	12.3	11.1
7		7	Arla Foods	Denmark/ Sweden	10.5	9.4
8	▲	10	Yili	China	9.3	8.4
9	▼	8	Saputo	Canada	8.6	7.8
10	▼	9	Dean Foods	USA	8.0	7.2
11		11	Mengniu	China	7.9	7.1
12		12	Unilever	Netherlands/UK	7.0**	6.3**
13	▲	16	Kraft Heinz	USA	6.5	5.9
14	▼	13	Sodiaal	France	5.7	5.1
15	▲	20	Müller	Germany	5.6**	5.0**
16	▼	14	DMK	Germany	5.5	5.0
17		17	Meiji	Japan	5.2	4.6
18		18	Schreiber Foods	USA	5.0**	4.5**
19	▼	15	Savencia	France	4.9	4.4
20	▲	-	Agropur	Canada	4.6	4.1

* Turnover data is dairy sales only, based on 2015 financials and M&A transactions completed between 1 January and 30 June 2016. Pending mergers/ acquisitions not incorporated include Nestle's JV with R&R Ice Cream, Danone'sacquisition of WhiteWave Foods, FrieslandCampina's acquisition of a 51% stake in Engro Foods and Mengniu's acquisition of a 79% of stake in Burra Foods.

** estimate

Source: Rabobank, 2016

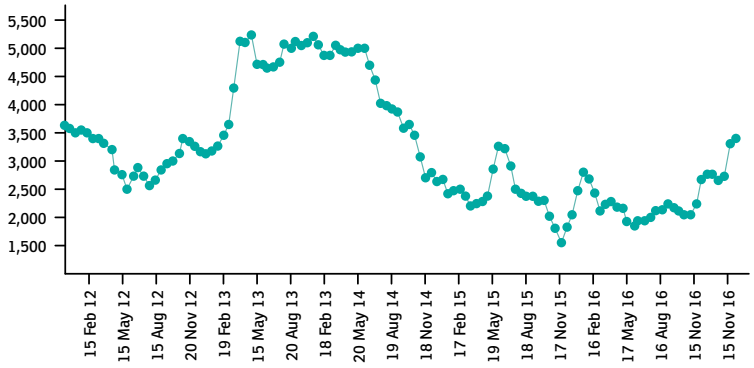
BOX 5. INVESTMENT CRITERIA AND MINIMUM EFFICIENT SCALE IN DAIRY PROCESSING

Institutional investors usually use the following investment criteria and scale requirements to invest in dairy processing:

- The company must have a processing capacity of 100,000 liters per day of raw milk (value added) to 1 million per day (powder).
- Revenues must be a multiple of 2.0 to 3.0 of the cost of raw milk.
- Gross margin must be 20% percent or above.
- Preferably, the company must not depend on export subsidies, tariff protections, or imported milk powder. Nor should the cost of milk be so high that the firm cannot compete on a par with imports.
- The location of the plant for the milk production area is key to delivering fresh, safe and quality milk to consumers. Depending on the ambient temperature outside, the rule is to process the milk such that, in no more than 4 hours from the time of milking, the milk should be cooled to 4 degrees Celsius.
- The loss of milk (shrinkage) is generally between 0.5% percent (developed markets) and 2.5% percent (less developed markets).

Source: IFC 2016. Team's interviews with IFC Industry Specialist.

FIGURE 30. **Global Whole Milk Powder Prices, 2012–2016**



Source: Global Dairy Trade:

2009 (Table 12). Box 5 highlights the minimum investment requirements demanded by institutional investors to engage in dairy processing in emerging economies.

6. The globalization of the dairy industry—which traditionally has been mostly domestic—is increasing exposure to shocks on international commodities markets and downward pressure on prices (Figure 30).
7. Environmental and sustainability concerns increasingly drive global demand and redesign the regulatory environment for the industry.

3.4.2. Strategic Segments in the Global Dairy Industry[11]

The Finance, Competitiveness, and Innovation Global Practice of the WBG incorporates a qualitative approach to global value chain analysis that goes beyond quantifying '*how much*' value is created by each country participating in a GVC, and instead focuses on "*how*" value is created and "*by whom*". It is based on concepts developed by Professor Michael E. Porter, and implemented by the European Foundation for Cluster Excellence (in association with the European Commission and IESE Business School), in Europe and Latin America in the last 15 years. The methodology uses the following steps (for a more complete description of the methodology please refer to **Box 2**):

1. Existing and emerging business segments (and associated value chains) that exist globally in the sectors of study are identified. (see Section 3.4.1)
2. Porter's 'Five Forces' analytical tool is used to assess industry attractiveness by determining the profitability of the industry and identifying the actors within the industry with the most bargaining power (thereby determining which actors appropriate the bulk of the available profits).

The combination of global trends, user needs, market structures, mix of product and service attributes, perishability and logistical requirements lead to the identification of four groups of strategic segments for the dairy industry (World Bank 2015). Each strategic segment is said to be distinct as the relative strength of the "Five Forces" that shape competitive strategy were found to be different in each case. (The relative strengths of the five forces on each segment is discussed later in this chapter). As such, each strategic segment has unique competitive dynamics and demands adherence to the structures and requirements of its respective ideal value chain (Figure 31). Note that the strategic

11 The analysis provided in this section is not an exhaustive list of all strategic segments in the global dairy industry, but a high-level codification of those segments that may be relevant to the development of Uruguay's dairy industry (see Appendix C).

FIGURE 31. **Strategic Segments in the Global Dairy Industry**

A. Tradable (Stockable) Global	B. Perishable Non-Premium	C. Perishable Premium Global	D. Perishable Premium Local
This includes dairy products that can be internationally traded (usually due to their stockability or the fact that they can be made from milk powder). They are exemplified by those products that inform the Global Dairy Trade index. E.g. Whole milk powder, cheddar, lactose, butter milk powder, rennet casein.	These are dairy goods produced and sold locally for which consumers would be unwilling to pay a premium. In HICs this might include 'generic' mass-produced fresh milk. Is LICs this might include milk that is consumed directly by the farmer's family and associates.	These are premium dairy brands that can be traded internationally despite their perishability due to brand recognition. Such products include Roquefort cheese (France), Parmigiano-Reggiano cheese (Italy), Haagen Dazs ice-cream	These are perishable products that local consumers are willing to pay a premium for perhaps because of local flavor (e.g. Kefir), bias towards locally-produced products (e.g. artisan trend in US), desire for 'freshness' (e.g. rejection of preservatives/additives in California) or any other attribute property that increases local consumer's willingness-to-pay.

Source: Adapted from World Bank (2015) Industry-Specific Global Value Chains

FIGURE 32. **Porter's Five Forces Analysis—"Tradable, Stockable, Global" Strategic Segment**

NB: Analysis relates to five forces as they apply to producers (rather than dairy processors)

Source: Author's Analysis

segmentation exercise is not intended to identify "market niches" but rather to identify how a value chain should be ideally structured in order to serve a specific combination of end users, needs, products and services, and markets within the dairy sector.

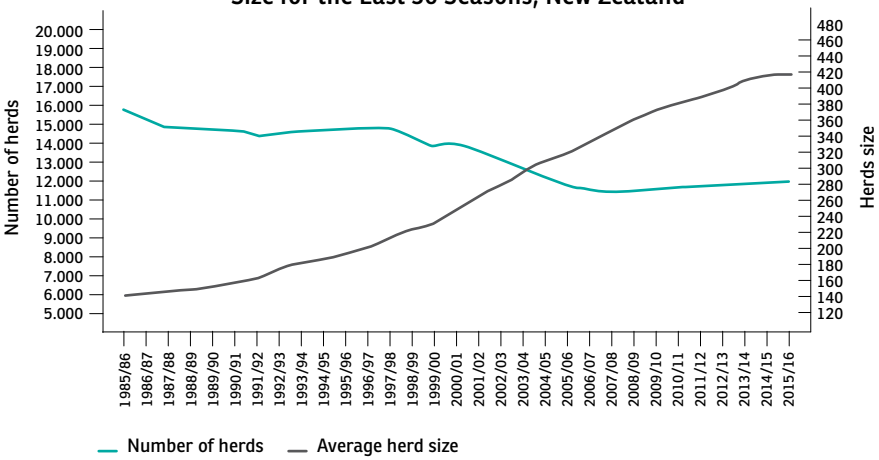
Group A: The Tradable, Stockable, Global Strategic Segment

The **Tradable, Stockable, Global (TSG)** group of strategic segments (Figure 32) includes dairy products that can be internationally traded due to their inherent 'non-perishability.' They include the commodity dairy products that inform the Global Dairy Trade index. Examples include whole milk powder—which has a shelf life of up to 18 months—cheddar, lactose, butter milk powder, and rennet casein. Products in this segment are typically difficult to differentiate, and competition is global. Therefore, milk prices are low and volatile. Processors have a lot of power vis-à-vis farmers and retain much more of the value added.

Threat of New Entrants—Increasing

The global trend in dairy farming is toward both consolidation (a decrease in the total number of dairy producers as production shifts to fewer and larger firms) and concentration (an increase in the extent to which a small number of firms control most of the sales). Farmers are producing more milk by managing larger herds and increasing per-cow milk production. Such increases in milk production are due to advances in equipment, access to higher quality feed, and changes in herd sizes and management, among other factors. Increased automation and new technology have resulted in greater efficiencies and econ-

FIGURE 33. **Trend in the Number of Dairy Cow Herds and Average Herd Size for the Last 30 Seasons, New Zealand**



Source: LIC / DairyNZ (2016)

omies of scale at large dairy farms. These advances are making it harder for smaller, less technologically sophisticated farms to stay competitive. Increased herd sizes around the globe have given way to so-called mega-farms where herds of a few thousand cows are typical and herds can number in the tens of thousands. Saudi Arabia operates one of the world's largest mega-dairy farm with 38,000 cows, China is the current record-holder with 40,000 cows, and Russia plans to build a 100,000 cow mega-dairy farm. Herd sizes are growing at dairy farms in many regions around the globe, overtaking traditional smaller, family-run, dairy operations (PMMI 2013). Figure 33 shows an illustrative example of this trend.

At one end of the spectrum, global processors have also shown a growing interest in vertical integration in primary production by investing in large dairy farms in developing markets to expand dairy production volumes (and open new markets). Market access, land area, access to feed, skilled labor, machinery, and quality certification are strong barriers to entry, and traditionally, small dairy farms cannot overcome them and provide sufficient volumes to supply a processing plant on their own. At the other end of the spectrum, cooperative farming has made it possible for small producers to achieve the minimum efficient scale to overcome entry barriers and compete in the segment, with cooperatives such as Fonterra from New Zealand being a prominent global player in the dairy industry.

Bargaining Power of Suppliers—Increasing

The bargaining power of suppliers of dairy inputs is increasing as they are usually multinational agribusiness and agrochemical companies with a global footprint and a dominant presence in the markets they operate. Small and medium dairy producers and processors are price takers. The cost of feed (including supplementary feed and concentrates) is the biggest driver of dairy profitability (Table 13). Other inputs, including genetics and artificial insemination, are increasingly sophisticated and expensive. Similarly, machinery and logistics systems are increasingly complex and costly.

Bargaining Power of Buyers—Increasing

Global dairy processors have a lot of power vis-à-vis farmers and retain much more of the value. Very large processors dominate the segment, as critical success factors such as 1) access to global markets, 2) the ability to negotiate local, national, and regional supply agreements, 3) advertising and branding prowess, 4) and state-of-the-art risk management strategies, require large scale economies. Large dairy processors have very low switching costs.[12] Milk powder and supplies are commodities. Thus, low cost

12 Switching costs are the costs that a buyer incurs from changing brands, suppliers or products. Here, they are the costs that dairy processors incur from switching producers.

TABLE 13. **World Average of Individual Input Costs to the Cost of Milk Production**

World Average Cost of Milk Production Only (n=104): 42 US/100 kg ECM (from Figure 1)			
Rank	Individual Components of Cost of Milk Production Only	Ave. Cost (n= 104)	R^2
1	Feed (purchased feed, fertilizer, seed, pesticides, etc.)	18.15	0.03
2	Total labour costs	11.98	0.18
3	Machinery (maintenance, depreciation, contractor)	4.81	0.34
4	Total land costs	3.29	0.02
5	Total capital costs	3.1	0.28
6	Buildings (maintenance, depreciation)	2.52	0.17
7	Fuel, energy, lubricants, water	2.41	0.13
8	Veterinary and medicine and insemination	2.09	0.26
9	Other inputs (dairy enterprise)*	1.64	n.a***
10	Other inputs (whole farm enterprise)**	1.26	n.a
11	Insurance taxes	0.91	n.a
12	Animal Purchases	0.81	n.a
13	VAT Balance (if negative)	0.11	n.a

* Other inputs dairy enterprise: Milk supplies, herd testing, fees for pedigree records, bedding, fees for disease prevention board, hauling, promotion, milk quota-not
** Other inputs: Fees for accounting and book keeping, advisory costs, phone & utilities
*** n.a = not applicable.
Source: Hemme et al. (2014)

milk is a major determinant of competitiveness. Because of this and 'stockability' of products (meaning that reserve stock can be sold when manufacturing costs are high), dairy processors are very price sensitive. Large procurement volumes also increase the negotiating power of buyers.

Competitive Rivalry—Increasing

The competitive dynamics in the TSG segment are characterized by a consolidated market with a few powerful players, each active in expanding into new global markets (Figure 34). The industry is becoming more globalized—total world dairy exports grew

FIGURE 34. **Market Share of Top 10 Dairy Firms Compared to the Rest of Global Dairy, 2009 and 2014**

Note: Top 10: Danone Groupe, Nestlé, Lactalis Groupe, China Mengniu Dairy Co Ltd, Inner Mongolia Yili Industrial Group Co Ltd, Kraft Foods Group Inc, Royal FrieslandCampina NV, Arla Foods Amba, Yakult Honsha Co Ltd, General Mills Inc

Source: Euromonitor International

4.6 percent per year, on a milk equivalent basis, between 2010 and 2014 (Vitaliano 2016). In this environment, dairy producers supplying Group A compete with all other dairy producers selling raw milk into the supply chain. Although some reputational aspects can affect competition, it is difficult to differentiate products in this group of segments. The competitive landscape for milk-based drinks in this segment group is also increasing, especially in terms of product differentiation and targeting of specific consumer groups. However, this differentiation typically takes place at the processor level.

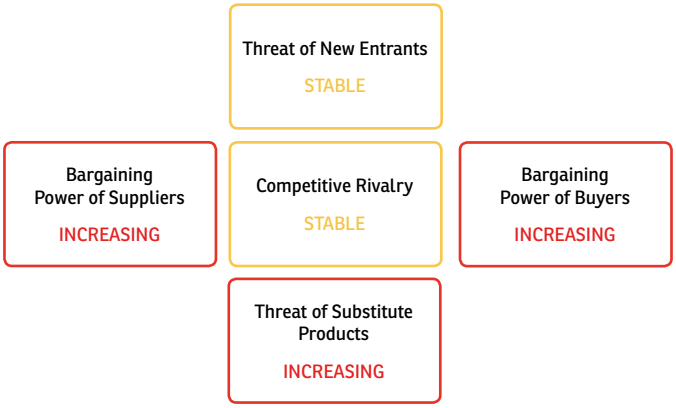
Threat of Substitute Products—Increasing

The marked increase in the production and consumption of milk alternatives made from rice, almond, soy, coconut, hazelnut and other non-animal products threatens milk producers (see previous section on global trends). However, raw milk is still necessary for producing milk powder.

Group B: The Perishable, Non-Premium, Local Strategic Segment

The Perishable, Non-Premium, Local (PNPL) strategic segments (Figure 35) include locally produced dairy goods for which consumers would be unwilling to pay a premium. In high-income countries, these might include pasteurized 'generic' mass-produced fresh milk. In low-income countries, they might include milk consumed directly by the farmer's family and associates (also known as 'loose' milk), often raw. The relative

FIGURE 35. **Porter's Five Forces Analysis—"Perishable, Non-Premium, Local" Strategic Segment**



Note: Analysis relates to five forces as they apply to producers (rather than dairy processors)
Source: Author's Analysis

strengths of the competitive forces vary across the segments in this group depending on the sophistication of the consumer. However, in all cases, barriers to entry are low, returns are minimal (to none), value chain actors are local, and there are only minimal product quality requirements. Moreover, consumers are neither discerning nor demanding. Thus, the product is difficult to differentiate and vulnerable to substitution from products in the "Tradable, Stockable, Global" group of segments.

Threat of New Entrants—Stable

This is the segment with the lowest barriers to entry. Local markets often require compliance with the lowest safety and quality standards for sale/consumption. In rural markets, producers often sell directly to consumers without pasteurizing (or chilling) the milk.

Bargaining Power of Suppliers—Increasing

Also in this segment, the bargaining power of suppliers of dairy inputs is increasing as they are usually multinational agribusiness and agrochemical companies with a global footprint and a dominant presence in the markets they operate. Feed prices are a main driver of industry profitability. Grass-fed dairy farms are the least dependent on feed. However, they often still need concentrated supplemental feeds (e.g., soy bean meal for protein or corn for energy).

Bargaining Power of Buyers—Increasing

Increasing concentration of retailers and processors in sophisticated markets has resulted in higher bargaining power of buyers. In some cases, the sale of fresh milk has become almost commoditized. As an example, in some markets, milk is sold as a "lost leader" (i.e., sold at prices below its cost to attract consumers). At the same time, the bargaining power of final consumers, in the case of direct sales by producers in local markets, remains stable

Competitive Rivalry—Stable

The perishable nature of products means that competition is local. Mature markets for fresh milk (UK, EU, and Oceania) are stagnating but middle-income countries are seeing an increase in production and consumption. Family-consumption of milk and sale of raw milk is also relatively stable.

Threat of Substitute Products—Increasing

Products are vulnerable to substitution from products in "Tradable, Stockable, Global" group of segments. As technological advances bring the taste of shelf-stable dairy products closer to that of fresh (pasteurized) milk, they increasingly gain market share. Necessary high-volume production of shelf-stable dairy products also means they can be sold at cheaper prices—increasing their attractiveness to undiscerning consumers. Substitute products also include other cheap drinks like juice and sodas.

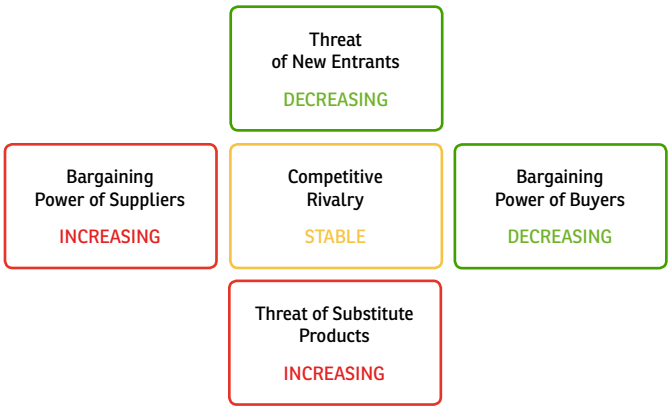
Group C: The Perishable, Premium, Global Strategic Segment

The Perishable, Premium, Global (PPG) strategic segments (Figure 36) include premium dairy products traded internationally, despite their perishability, due to international brand recognition. High barriers to entry limit competition and margins are high because quality and authenticity of products stem from a specific place of origin (provenance, e.g., Roquefort cheese from France and Parmigiano-Reggiano cheese from Italy), tight quality certification requirements, or the strength of a recognizable brand (e.g., Haagen-Dazs ice cream). Products are often characterized by very specific production processes that need to be adhered to or very specific types of inputs (e.g., herds) whose authenticity needs to be certified. Markets are often international. Therefore, to reach maximum potential, producers must have access to high quality logistics that will not threaten the quality, viability, or integrity of the product. Where branding or certification depends on farming characteristics, producers enjoy stronger bargaining power. Where the source of competitive advantage comes from final brands or processing technologies, processors enjoy higher margins.

Threat of New Entrants—Decreasing

Specified production techniques may require advanced techniques that take time, skill, and financial investment to cultivate. In some cases, production must take place in a

FIGURE 36. **Porter's Five Forces Analysis—"Perishable, Premium, Local" Strategic Segment**



Note: Analysis relates to five forces as they apply to producers (rather than dairy processors)
Source: Author's Analysis

limited geographical area (acutely limiting entry) or depends on certification that requires significant investment to obtain. Producers must also have access to high quality logistics that will not threaten the quality or integrity of the product.

Bargaining Power of Suppliers—Increasing

Also in this segment, the bargaining power of suppliers of dairy inputs is increasing, as they are usually multinational agribusiness and agrochemical companies with a global footprint and a dominant presence in the markets they operate. Feed prices are one of the main drivers of industry profitability. Grass-fed dairy farms are the least dependent on feed. However, they often still need concentrated supplemental feeds (e.g., soy bean meal for protein or corn for energy) Production of products in this segment may require access to very high quality inputs that are scarcer or more expensive.

Bargaining Power of Buyers—Decreasing

Where the premium is derived from the farming activity and production, producers in this group of segments are relatively powerful vis-à-vis the processor. Where the emphasis is on the processing or processors' branding and marketing (e.g., luxury ice-cream), producers have less power.

Competitive Rivalry—Stable

Although products are perishable, competition is global because high consumer prices can support international transport costs. However, high barriers to entry limit the number of competitors in the segment. Rather than cost, competitors differentiate products through the levers of marketing, branding, selective distribution strategies, customer fidelization, or quality certification.

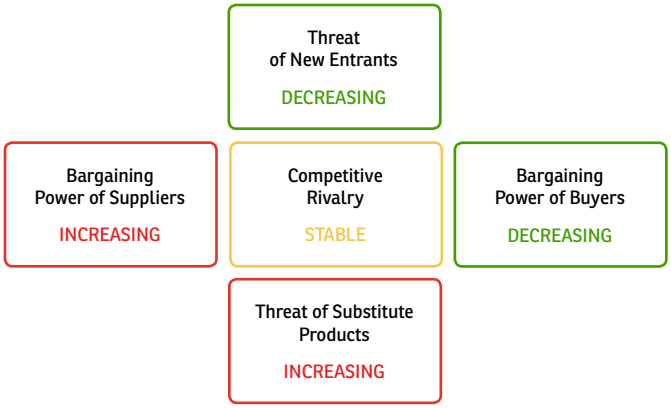
Threat of Substitute Products—Increasing

Threat of substitution of the products in this segment is increasing and it comes from luxury food and drinks products within other high-end product families, and they are driven by sociocultural preferences and dietary styles of consumers (e.g., nuts, caviar, and luxury deserts). Luxury 'dairy' products based on milk-alternatives (e.g., almond and rice milk) also constitute and emerging threat.

Group D: The Perishable, Premium, Local Strategic Segment

The Perishable, Premium, Local (PPL) group of strategic segments (Figure 37) includes locally produced perishable products for which local consumers will pay a premium. This may be because of local preference for local flavor (e.g., Mtindi in Tanzania), bias toward locally produced products (e.g., fashionable support for locally produced products in the

FIGURE 37. **Porter's Five Forces Analysis—"Perishable, Premium, Local" Strategic Segment**



Note: Analysis relates to five forces as they apply to producers (rather than dairy processors)

Source: Author's Analysis

USA), desire for 'freshness' (e.g., rejection of preservatives and additives in California), or any other attribute that increases local consumers' willingness to pay for local products. Firms are typically artisanal and entrepreneurial because they can differentiate the product within the local community through product-notoriety or small-scale marketing. Producers can vertically integrate higher-value-added activities (e.g., cheese making or small scale processing). The presence of forward integration processes indicates that producers are more powerful than in the other strategic segments and may have some negotiation power with retailers even where the concentration of retailers is high.

Threat of New Entrants—Decreasing

The threat of new entrants in the PPL segment is decreasing. Premium may come from advanced farming and production techniques, which requires capabilities that take time and skill to cultivate (as well as financial investment). Similarly, depending on the origin of the premium, producers may need to breed a specific breed of cattle to produce high quality yields (high solid content of milk) or high volumes, or rear the animals in a manner that is acceptable to potential consumers. Because products are perishable, there are high barriers to entry to foreign firms.

Bargaining Power of Suppliers—Increasing

Also in this segment, the bargaining power of suppliers of dairy inputs is increasing as they are usually multinational agribusiness and agrochemical companies with a global footprint and a dominant presence in the markets they operate. Feed prices are one main driver of industry profitability. Grass-fed dairy farms are the least dependent on feed. However, they often still need concentrated supplemental feeds (e.g., soybean meal for protein or corn for energy).

Bargaining Power of Buyers—Decreasing

High quality products differentiated by origin, treatment of livestock, traceability and type of feed increase the bargaining power of producers within this segment. Producers can vertically integrate higher-value-added activities (e.g., cheese making or small scale processing). The presence of forward integration processes indicates that producers are more powerful than in the other strategic segments and may have some negotiation power with retailers even where the concentration of retailers is high. Competitive Rivalry - Stable / Decreasing

Competitive Rivalry—Stable

Firms are typically artisanal and entrepreneurial because they can differentiate the product within the local community through product-notoriety or small-scale marketing. Competition is local.

Threat of Substitute Products—Increasing

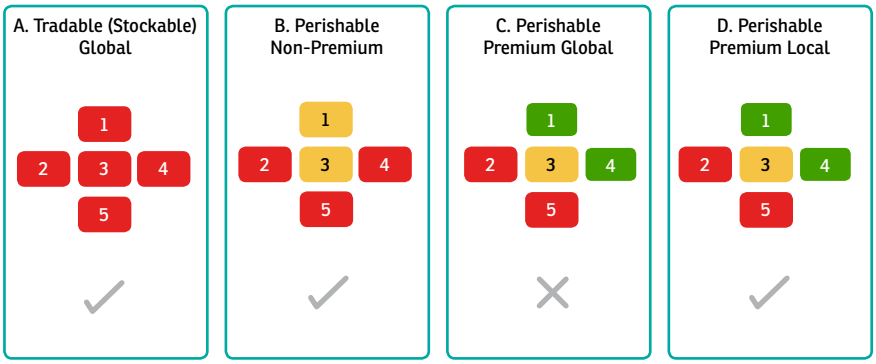
Substitutes include other drinks and food products commonly consumed in the local community. In some cases, products in these segments are less threatened because they have cultural significance and cannot be easily replaced.

3.5. DEEP DIVE ON THE DAIRY STRATEGIC SEGMENTS RELEVANT FOR URUGUAY

3.5.1. Strategic Segments Comparison and Uruguay's Participation

A comparative overview of all strategic segments analyzed (Figure 38) suggests that Uruguay participates in the "Tradable Stockable, Global" strategic segment, the "Perishable Non-Premium Local" segment, and in the "Perishable, Premium Local" segment. The analysis also suggests that the Tradable, Stockable, Global segment poses significant challenges to firms operating in it, as threats of entry and of substitution are increasing, as is the bargaining power of suppliers and buyers. Firms have a global market for high volumes of production, but price competition puts an intense downward pressure on margins. Both the Perishable Premium Global and the Perishable Premium Local segments present significant opportunities for firms to differentiate their products. Of the two, the Perishable Premium Global segment benefits from access to a large market potential on global markets, but it has much higher barriers to entry. Historically, firms and dairy

FIGURE 38. **Uruguay's Participation in the Dairy Strategic Segments**



Note: 1—Threat of new entrants, 2—Bargaining power of suppliers, 3—Competitive Rivalry, 4—Bargaining power of buyers, 5—Threat of Substitutes

Source: Author's analysis

value chains have transitioned to the Perishable Premium Global segment through strong performance in the Perishable Premium Local segment, especially when the premium is derived from factors relating to geographic origin. The Perishable Non-Premium Local is the least profitable of all segments with the weakest opportunity for growth.

The following sections closely examine factors that influence competitiveness in the Tradable Stockable Global and the Perishable Premium Local segments. This report does not further analyze the Perishable Non-Premium segment because it has very little opportunity for value-chain upgrading. There is no further analysis of the Perishable Premium Global segment in this report, although it might bear entry prospects for the Uruguay's dairy industry in the long term.

3.5.2. Deep Dive: Tradable, Stockable, Global (TSG) Strategic Segment

Uruguay's dairy exports are concentrated in the Tradable Stockable Global (TSG) segment and Uruguayan firms participate in dairy GVCs by exporting intermediate products, such as milk powder, to global dairy players in large volumes at low margins. The "Tradable Stockable, Global" (TSG) segments include dairy products that can be internationally traded due to their inherent 'stockability' or extended shelf life. Liquid milk is made 'tradable' by removing water to the greatest extent possible, such that microbial growth is prevented and refrigeration is no longer necessary. The resulting milk powder also has a far longer shelf life (of 18 months to 2 years) than liquid milk. Products can then be 'reconstituted' at destination by adding water in controlled environments. The natural comparative advantage in primary production, good level of productivity in both production and processing, and fact that Uruguay dairy has one of the lowest production cost structures ensure the competitiveness of the Uruguayan dairy industry in the TSG segment. However, limited product differentiation opportunities of dairy commodities, the strong bargaining power of input suppliers and global dairy processors, and exposure to the vagaries of international commodity markets keep downward pressure on margins and the long-term profitability of Uruguayan firms in the TSG segment.

3.5.2.1. Characteristics of the Ideal Value Chain for the TSG Segment

Climatic Conditions and Environmental Factors

Although 'milk production' and 'supplemental feed production' are the only value chain activities that rely heavily on natural resources (Figure 44), the global value chain is disproportionately reliant on climatic conditions and environmental factors. Commercial dairy herds typically thrive in temperate climates (5–20°C) and in lowlands where naturally fertile soils and good grass growth mean that herds are principally pasture-fed. Good rainfall is preferred.

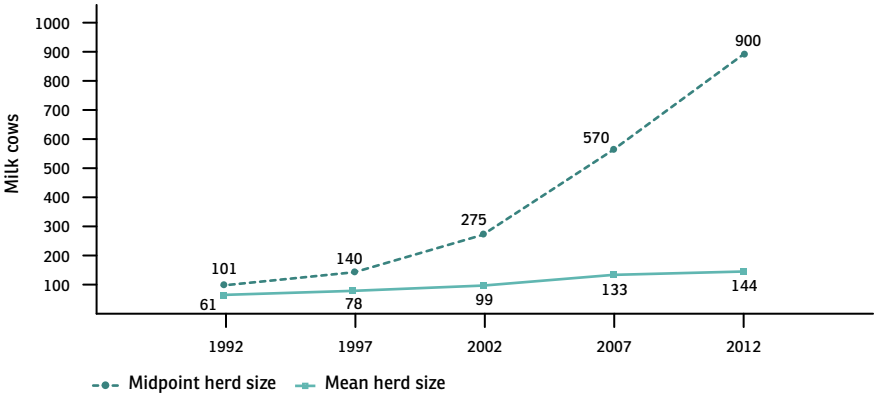
Milk Production

High volumes of milk production are critical to success in TSG Segments. However high volume alone is not enough; India has 301,600,000 cows—30 percent of the world's cattle population—and is one of the world's largest producers of fluid milk, butter and cheese. In 2015, India only exported 66,000 MT of 152,575,000 MT (0.04 percent) of its production, and although India produced 540,000 MT of nonfat dry milk, only 25,000 MT was exported (4 percent) (USDA 2016). Conversely, the United States and the European Union—two of the world's top three exporters of dairy products each have less than 10 percent of the world's cattle population and New Zealand, the 3rd major exporting power, has just 1 percent of the world's cattle population.

Major exporters have higher average herd sizes than India, Brazil and China (all high producers with low export volumes). While India's average herd size in 2014 was 1.7, Argentina and USA had an average of 157 and 181 cows per farm respectively in 2014; Australia had an average of 268 cows per farm. New Zealand had the largest average herd size with 410 cows per farm in 2014 (IFCN 2015). Moreover, herd sizes are growing (Figure 39).

This growth in herd size is primarily driven by the ever-increasing necessity to achieve economies of scale in dairy farming. "Ownership costs" (including housing, milking facilities, and machinery) fall sharply as herd sizes increase, implying that use of capital equipment and infrastructure is more intensive on larger farms. Labor costs per hundredweight of milk also fall quite sharply, and larger farms incur much lower feed costs.

FIGURE 39. **Trend toward Larger Herds in Dairy Farming**



Source: USDA, Economic Research Service, using USDA, National Agriculture Statistics, Census of Agricultural Data (MacDonald and Newton 2013)

Smaller farms are in many cases unable to generate enough value milk production or other sources of revenue to update their capital. Hence, production continues to shift away from smaller farms toward much larger dairy farms. Overall, to compete in the TSG segments processors need a supply of at least 100,000 liters per day and would usually be served by a herd of at least 500,000 cows.

Cooperative farming can allow smallholders to participate in the TSG segment. Significant economies of scale can be achieved in collection, local storage and transportation of milk. However, consolidation among cooperatives is also important (due to the volume of milk producers must supply processors to remain competitive).

Dairy Processing

Firm Size and Structure

The dairy processing industry in the TSG segment is characterized by large multinational corporations with a wide range of diversified products not always limited to dairy.

Nestlé (Switzerland), Danone and Lactalis (France), New Zealand (Fonterra), Dairy Farmers of America (USA) and FrieslandCampina (Netherlands) dominate the industry with turnovers of US$27.8 billion, US$19.5 billion, US$19.5 billion, US$18.5 billion, US$17.9 billion and US$14.8 billion respectively. However, every dairy processor featured on Rabobank's list of "Global Dairy Top 20" had a turnover of over US$5 billion in 2014 (Rabobank 2016). More than a third of the USA's top 100 dairy processors have annual revenues of more than US$1 billion (Carper 2015).

The global footprint of leading dairy processors is equally significant: Nestlé has 447 factories in 86 countries, directly employing approximately 333,000 people (Nestle 2016). Fonterra collects 20 billion liters of milk every year from 100 countries around the world, relying on a workforce of 16,000 people (Fonterra 2016). The global expansion of dairy processors is a relatively recent phenomenon. In 1996, Danone had only 5 percent of its operations in the Asia Pacific, Latin America, the Middle East, and Africa. In 2014, the same regions housed 38 percent of its operations. Today, Danone employs 100,000 people in over 140 countries around the world, 60 percent of them outside Europe (Danone 2016).

Minimum Efficient Scale Investment and Operational Requirements in Dairy Processing for the TSG Strategic Segment

At the time of writing, the minimum cost to install a processing plant to process 100,000 liters of milk per day is around US$700,000–1 million. This figure is on the low end because it assumes the use of lower quality or second-hand equipment. A brand-new facility would have an average cost of approximately US$10–15 million.

The energy intensity of dairy processing activities also contributes significantly to the high operating costs of dairy processing. Refrigeration is not only used extensively (to

BOX 6. DAIRY PROCESSING IN THE TSG SEGMENT IS A HIGH-VOLUME LOW-MARGIN BUSINESS

Figure 40 **shows Dean Foods' financial condition and results of operations for 2013, 2014 and 2015. Although net sales in 2015 totaled US$8.1 billion, net income was US$93.4 million, an operating margin of 1.2 percent. In 2014, Dean Foods' profit margin was 0.1 percent on net sales of US$9.5 billion. Parmalat retained more profit with a profit margin of 5 percent in 2014 and 2.5 percent in 2013** (Parmalat 2014)**. Fonterra's operating margin was 2.2 percent in 2014 on record revenues of US$22.3 billion** (Fonterra 2014)**.**

FIGURE 40. **Dean Foods Financial Condition and Results of Operations for the Years Ended December 31, 2015, 2014, 2013**

	Year Ended December 31					
	2015		2014		2013	
	Dollars	Percent	Dollars	Percent	Dollars	Percent
	(in millions)					
Net sales	$ 8,121.7	100.0%	$ 9,503.2	100.0%	$9,016.3	100.0%
Cost of sales	6,147.3	75.7	7,829.7	82.4	7,161.7	79.4
Gross profit(1)	1,974.4	24.3	1,673.5	17.6	1,854.6	20.6
Operating costs and expenses:						
Selling and distribution	1,379.3	17.0	1,355.1	14.3	1,337.7	14.8
General and administrative	350.3	4.3	288.7	3.0	310.5	3.5
Amortization of intangibles	27.7	0.3	2.9	—	3.7	—
Facility closing and reorganization costs	19.8	0.2	4.5	—	27.0	0.3
Litigation settlements	—	—	(2.5)	—	(1.0)	—
Impairment of intangible and other long-lived assets	109.9	1.3	20.8	0.2	43.4	0.5
Other operating (income) loss	—	—	(4.5)	—	2.5	—
Total operating costs and expenses	1,881.0	23.1	1,665.0	17.5	1,723.8	19.1
Operating income	$93.4	1.2%	$8.5	0.1%	$130.8	1.5%

Source: (Dean Foods 2015)

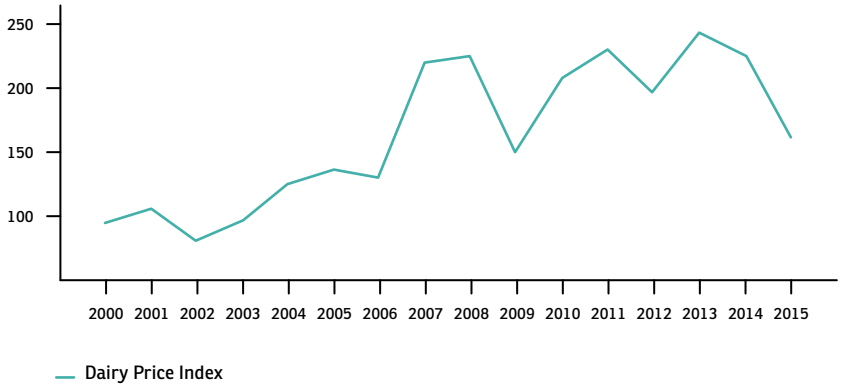
maintain the condition and integrity of milk, in cheese aging and in yoghurt, ice-cream and frozen dessert production) but 'cooking'—another energy intensive activity—is also frequently required in dairy processing. The required heat energy is usually provided by steam, as is the hot water widely used for plant sanitation and system cleaning. Evaporating and drying milk (especially for drying whey concentrates and solids) are also highly energy intensive activities common to dairy processing.

The significant costs of dairy processing entail that the dominant business model in the segment is based on high volumes in which revenues may be high while profit margins are low. (See Box 6 for a specific example).

Risk management capabilities are critical to compete in the TSG segment. Due to the commoditized nature of the sector, profitability depends heavily on the spread between global milk prices and those of the region. Unfortunately, global milk prices are volatile. Dong et al. (2011) demonstrate this volatility is affected by not only the corn futures market and global financial markets but also seasonality, market demand and supply conditions, and exchange rate variations. Raw materials and other inputs that affect milk prices are also vulnerable and can be affected by adverse weather conditions, natural disasters, problems with suppliers' businesses, finances, labor relations, costs, production, insurance, reputation, and international demand and supply characteristics.

The severe collapse in global milk prices toward the latter half of 2014 (Figure 41) is representative of the global milk price's susceptibility to macroeconomic shocks and geopolitical factors. Since a record high in February 2014, the milk price decreased 59 percent in 18 months, reaching approximately US$21.5 per 100 kg in August 2015 (IFCN 2015).

FIGURE 41. **FAO Dairy Price Index, 2000–2015**



Note: FAO Dairy Price Index consists of butter, SMP, WMP, and cheese price quotations; the average is weighted by world weighted average export trade shares for 2002–2004.

Source: FAO (2016)

Exposure to global factors outside their control forces processors to rely increasingly on financial instruments to lock in input costs and futures trading to fix the sales price. Global dairy firms usually enter forward purchase contracts and other purchase arrangements with suppliers or may purchase exchange-traded commodity futures contracts for raw materials and inputs. Such strategies require sophisticated understanding of basis risk, the capability to forecast component costs (using futures) and good estimates of per unit packing, overheads and conversion costs. They also require the firm to track all derivatives (futures, options, derivatives, swaps, fixed forwards) through their life cycles. Additionally, qualified banking partners, internationally trustworthy trade exchanges (or at least the ability to facilitate over-the-counter swaps or non-exchange arrangements) must be accessible in the country or region (IFCN 2015).

Finally, diversification is also used as a risk-management strategy. Table 14 shows Danone's business units and associated turnover in 1996 and 2014. Although Danone has clearly sought to consolidate, its range of business units is still wide and diverse including early life nutrition, medical nutrition, waters, and fresh dairy products.

TABLE 14. **Business Units and Percent Turnover, Danone, 1996 and 2014**

Business units, Danone 1996	Turnover (%)
Fresh dairy products	26
Biscuits	20
Waters	10
Cheeses	9
Prepared and frozen food	9
Beers	8
Glass packaging	7
Sauces	5
Pasta	3
Baby nutrition	3
Fresh dairy products	52
Early life nutrition	21
Waters	20
Medical nutrition	7

Source: Danone *(2016)*

Packaging

Packaging is a significant cost driver in the TSG segment. Packaging is the largest direct cost outside the raw material (milk) for all milk varieties. For full-cream, packaging costs are 40 percent of costs after the raw material itself. Cost of import (e.g., tariffs, transportation) can further increase costs. Therefore, the ability to compete in the TSG segment can be significantly enhanced by having domestic production of shelf-stable packaging as shown in Figure 44.

Logistics (including Milk Collection, Port Services, Freight Forwarding and Distribution)

Logistics strategies in the TSG segment and global dairy industry are increasingly important to the competitiveness of a dairy producing company, country or region. The perishability of milk during early collection phases and its susceptibility to temperature and humidity, container materials, and compliance with phytosanitary standards common to the storage and transportation of all food products mean that efficiency in dairy logistics is critical. Even products eventually processed so they are 'shelf-stable' are initially perishable and must be well managed.

In remote areas with large numbers of small farms, producers often rely on door-to-door milk collection. Frequent stops make the process slow, vehicles experience significant wear and tear on rural roads, and the full capacity of the truck cannot be used because the quality of the milk in each container may be different for each farm. In areas where producers are more closely grouped together, producers deliver their own milk to central collection centers. This greatly improves efficiency. As indicated in Figure 44, however, refrigeration costs make collection centers expensive. To optimize the collection process and minimize cost, they must have a dairy capacity equal to the daily production capacity of the region.

In addition to supply chain optimization decisions related to the cold chain for processed shelf-stable products in the TSG segment, companies need to make strategic decisions about logistics. They include, whether to use dry or temperature-controlled storage, whether to employ customized storage and delivery programs, ocean container handling options, and whether to use cross docking (as opposed to warehousing or direct shipment). Transportation can be 5-6 percent of a global dairy firm's operating costs. Volatile fuel prices and economic and geopolitical risks can make estimating costs and lead times difficult. In response to price volatility, and to reduce transportation overheads, many global producers require a centralized view of all transportation activities to monitor the impact on product inventory (Adal 2012).

Branding and Marketing Functions in the TSG Segment

Product branding and marketing are critical for global processors in the TSG segment. The wide range of global brands and labels may give the impression there are many dairy

processors. In reality, a handful of large corporations own many brands. Dean Foods, for example, owns over 40 brands (Murray 2015). Critically, competition dynamics in the TSG segment demands that global players invest in branding and marketing in *destination markets*.

To some degree, the wide range of brands is a function of the increasing long-life characteristic of products in the TSG segments (Whalen and Rodriguez Bas 2015). Because global processors are not limited by perishability, they are able to differentiate products by producing dairy varieties that are low fat, fat-free, reduced in sodium or sugar, lactose-free, organic, probiotic, or fortified with nutrients, calcium and proteins (PMMI 2013). This trend becomes self-fulfilling; as products become more segmented, consumer expectations rise.

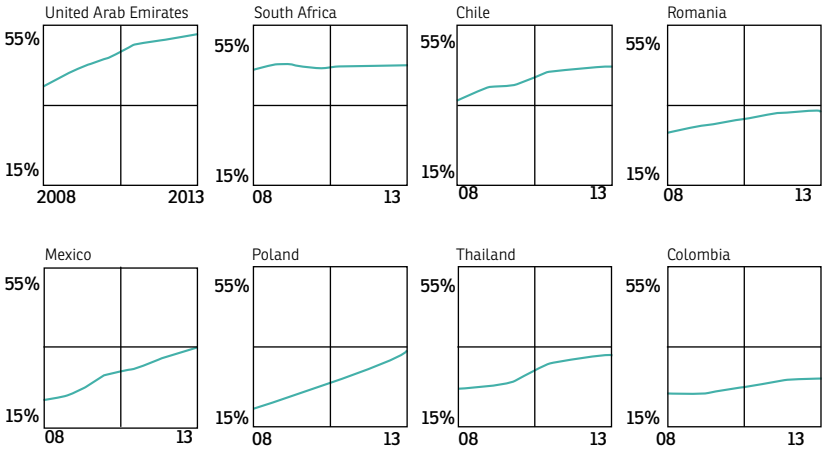
Distribution and Market Penetration – Dominance of Global Retailers

In the TSG segment, even domestic processors may face aggressive competition from cheaper imports. Large global processors are increasingly entering foreign markets through joint ventures. Such deals provide a means to develop new areas of business and thereby develop local knowledge and enhanced distribution capabilities with which local processors struggle to compete.

However, market entry is not the only market access hurdle for global dairy processors. Once a local presence has been established, reaching the consumer at point of sale requires firms to negotiate supply contracts with retailers. Over the last 30 years, supermarkets in both developed and developing economies have acquired an increasing share of grocery markets (Emongor and Kirsten 2009, Starmer n.d.). As a result, the bargaining power of global retailers vis-à-vis dairy processors and other suppliers has increased significantly. Figure 42 shows the combined share of the top three grocery retailers 2008–2013 in eight emerging markets. The combined share of the top three grocery retailers is rising in all eight (geographically and economically disperse) cases.

In general, dairy processors have only limited access to final consumers except through global supermarket chains such as Carrefour, Tesco, Nakumatt, and Walmart. The supermarkets' dominant position allows them to define supply terms including sources, quantity, quality, delivery schedules, packaging, return policies, and above all, price and payment conditions (Consumers International 2012). As an illustration, global retailers often give discounts to suppliers that can provide goods in high volumes, indirectly discriminating against smaller suppliers. Suppliers are also often required to pay a fee—a slotting allowance—to be permitted to introduce a new product into the store (Starmer n.d.). Box 7 lists several other effects of this bargaining power on dairy processors. Reduced bargaining power increases the risk borne by dairy processors and in turn increases costs and uncertainty.

FIGURE 42. **Combined Share of Top Three Grocery Retailers, 2008–2013 (Percent Company Shares by Global Brand Owner)**



Source: Euromonitor (2014)

BOX 7. EFFECTS OF BARGAINING POWER OF RETAILERS ON DAIRY PROCESSORS

- Additional costs to dairy processors
- Risk of stocking new products forced on to dairy processors
- Cost and risk of shrinkage and/or retailers' forecasting errors passed back to dairy processors
- Risk and cost of product changes borne by dairy processors; increasing costs and uncertainty

Source: Adapted from (*Consumers International 2012*)

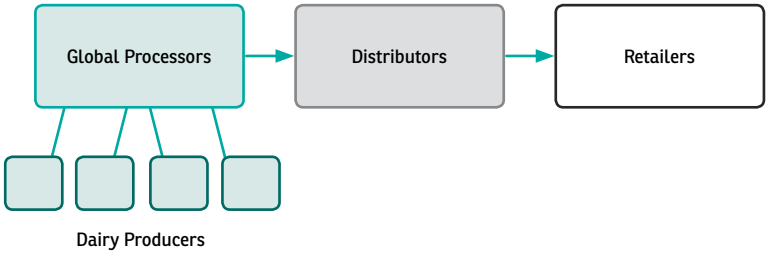
3.5.2.2. Power Relationships in the TSG Segment

The international trade of commodity dairy products in the TSG segment might be described as "producer-driven commodity value chains," defined as those value chains in which "large, usually transnational, manufacturers play the central roles in coordi-

nating production networks (including their backward and forward linkages)" (Gereffi 1999). The global dairy industry is also typical of producer-driven value chains in that the industry is highly concentrated, and lead firms leverage the scale advantages of integration to maximize profitability and create barriers to the entry of new firms. While retailers exert considerable power on global dairy processors, they rarely play pivotal roles in setting up decentralized production networks.

The international trade of TSG dairy products has a 'market' structure according to the GVC taxonomy developed by Gereffi, Humphrey and Sturgeon (2005) because transactions are simple, information is easily transmitted, and producers can make products with minimal input from processors (Figure 43). Little or no formal cooperation between producers and processors is needed, so the cost of switching to new producers is low. Because low cost is derived from economies of scale, processors exert significant power over producers through a concentrated market presence and from acute price-sensitivity (due to their ability to stockpile products). While some reputational aspects (e.g., quality, fat content, reliability) may affect competition among producers, it is difficult to differentiate products. (No matter how high the quality of the product, it is mixed indiscriminately with milk from other farms.) This reduced ability to differentiate the product further reduces the power of producers in TSG segments.

FIGURE 43. **Producer-Driven Commodity Value Chains in Global Dairy**

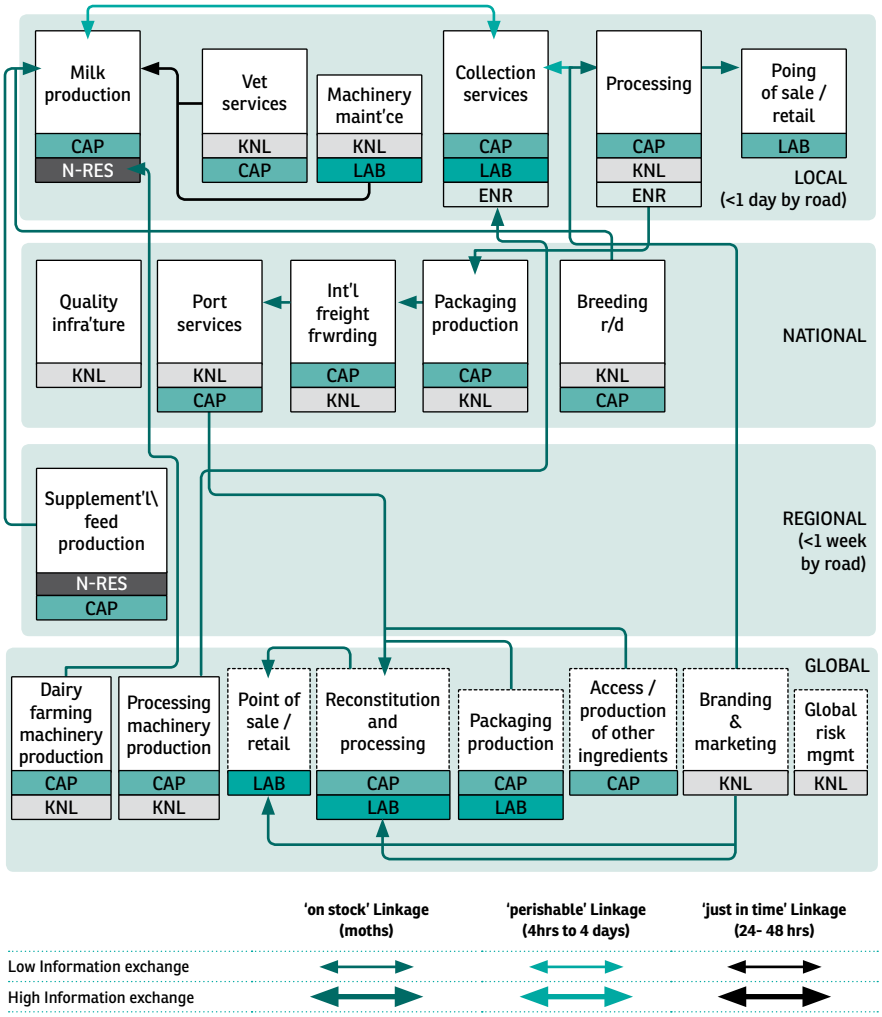


Source: Adapted from Gereffi (2001)

3.5.2.3. Ideal Value Chain for the TSG Strategic Segment

This section presents a stylized description of the structure of the ideal value chain necessary to compete in the TSG segment, and it builds on the in depth analysis of the critical activities and functions for each phase of the value chain provided in the previous sections. Figure 44 maps the value chain required to deliver products and services in TSG segments from the producer to the consumer. Veterinary services, maintenance services for on-farm machinery equipment, collection services and a dairy processor

FIGURE 44. **Minimum Requirement to Compete / Ideal Value Chain in the TSG Segment**



Source: Adapted and developed from World Bank (2015)

KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity;
CAP = Capital intensive activity; N-RES = Natural Resource.

Note: Box size indicates scale of activity and significance to value chain structure (qualitative judgment).

must all be accessible within 24 hours (by road) of milk producers. Veterinary services and machinery maintenance services (processing and production machinery) are more knowledge intensive, while collection services and processing activities are also capital intensive in the TSG segment.

An internationally-recognized national quality infrastructure is also a critical support asset to firms' competitiveness in the TSG segment. Producers may need access to systematic breeding programs if they can produce milk of the consistency and quality that will allow them to compete in this segment. High quality and reliable logistics service including port service, international freight forwarding are also necessary as all products in TSG segments are shipped by sea. Finally, as a high cost driver, the availability of shelf-stable packaging can greatly affect the competitiveness of a country or locality participating in TSG segments.

Reliance on feed concentrates depends heavily on the type of dairy farming (feed-lot versus grass-fed). However concentrates are usually fed to herds (in some measure) in both cases, especially in TSG segments, where high-volume, high-fat-content milk is key to sustainability. Having relatively close and access to supplemental feed will reduce import costs.

Dairy farming equipment and processing machinery are usually purchased from global markets. Therefore, local expertise in manufacture is not necessary to compete in TSG segments.

3.5.3. Uruguay and the Tradable Stockable Global Strategic Segment

The deep dive analysis of the TSG segment shows that Uruguay's dairy exports are concentrated in this segment and Uruguayan firms participate in dairy GVCs by exporting intermediate products, such as milk powder, to global dairy players in large volumes at low margins. The natural comparative advantage in primary production, good level of productivity in both production and processing, and fact that Uruguay dairy has one of the lowest production cost structures ensure the competitiveness of the Uruguayan dairy industry in the TSG segment. However, the limited product differentiation opportunities for dairy commodities, the strong bargaining power of input suppliers and global dairy processors, and exposure to the vagaries of international commodity markets keep downward pressure on margins and the long-term profitability of Uruguayan firms in the TSG segment.

3.5.3.1. Performance and Trends

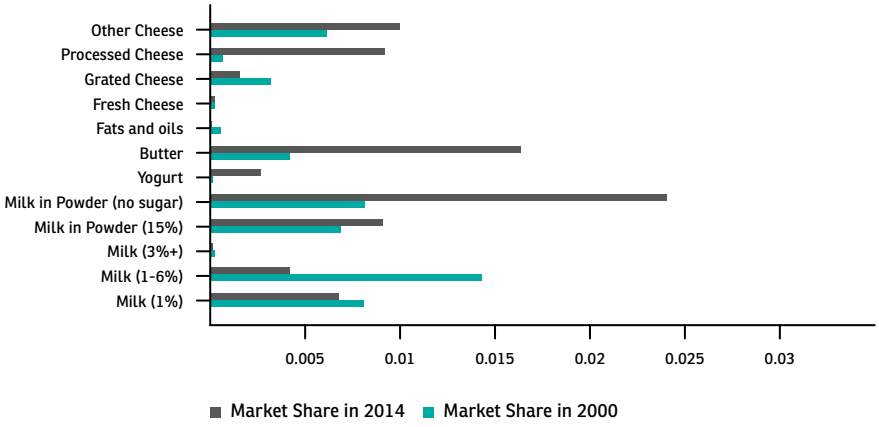
Uruguay has a strong fresh (pasteurized) milk culture resulting in little domestic market for powdered milk or reconstituted derivatives. Domestic sales of milk powder amounted to less than 1 percent of sales of Uruguay's total volume of dairy products sold (Euromonitor International 2015).

Uruguay has been exporting commercial dairy products relevant to the TSG segment since 1942. As the pasteurized milk market became saturated, Uruguayan dairy companies turned to foreign markets to develop business. Low production costs meant that Uruguayan dairy farms have been able to compete in the global market, even with highly subsidized competitors (e.g., EU and USA) peaking at US$924 million—70 percent of Uruguay's dairy output—in 2013 (Uruguay XXI 2012, Uruguay XXI 2015). Uruguay's main exports are in the TSG segment and include WMP, skimmed milk powder, cheese, and butter. Uruguay also exports several types of whey and some liquid UHT milk and long-life milk. WMP and cheese lead Uruguay's dairy exports, reaching US$284 million and US$345 million in 2014, while butter and skimmed milk powder reached US$127 million and US$94 million respectively.

Shares in International Markets – TSG Segment

Despite the drop in export orientation that firm-level data reveals, Uruguayan dairy exporters have more than doubled their export market share over the last 20 years, primarily in the TSG segment. Uruguayan exports in the segment increased substantially faster than those of competitor countries, leading to a sustained increase in export market shares during a period of fast global export growth. Uruguay's market share in dairy increased from less than half of a percentage point in 2000 to almost 0.9 percent in 2014). Butter and powdered milk have seen the largest increases in international market shares (Figure 45).

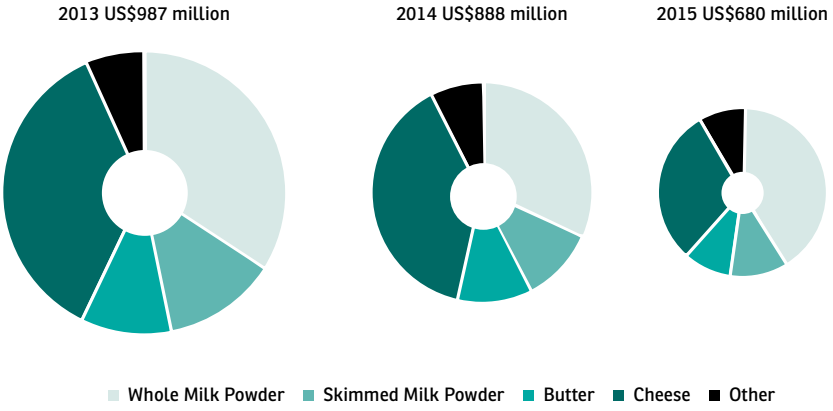
FIGURE 45. **Export Market Shares by Product**



Source: Authors' calculations based on UN Comtrade

Such a high percentage of exports concentrated in the TSG strategic segment has made Uruguay particularly vulnerable to macroeconomic shocks. Geopolitical factors have contributed to a 40 percent fall in exports of Uruguayan dairy products between 2013 and 2015, except for WMP, which fell approximately 15 percent (Figure 46). The fall in exports is also attributable to Uruguay's high reliance on Venezuela and, to a lesser extent, Brazil and Russia as export partners until 2014. In 2014, as with previous years, Venezuela, Brazil and Russia absorbed 66 percent of all exports. However, political uncertainty in Venezuela has sharply reduced demand. As a consequence, while total export sales to Venezuela of WMP, skimmed milk powder, butter and cheese were US$320 million and US$278 million in 2013 and 2014 respectively, export sales to Venezuela in 2015 were just US$135 million.[13] Deep recession in Brazil has also adversely affected Uruguayan dairy exports (see table 15, table 16, table 17 and table 18)

FIGURE 46. **Export Sales, 2013–2015**



Source: Dirección Nacional de Aduanas del Uruguay (2016).

13 These figures also reflect outstanding payments (at time of writing) for dairy products shipped to Venezuela in 2014.

TABLE 15. **Export Sales of Whole Milk Powder by Destination, 2013–2015**

	2013		2014		2015	
Destination	US$, millions	%	US$, millions	%	US$, millions	%
Venezuela	139	41	117	41	98	34
Brazil	87	26	29	10	90	31
Algeria	26	8	45	16	65	23
China	59	17	42	15	1	1
Cuba	11	3	26	9	11	4
Chile	2	1	7	2	8	3
Colombia	0	0	8	3	0	0
Egypt	4	1	0	0	4	2
Russia	5	2	1	0	2	1
Vietnam	0	0	5	2	0	0
Others	6	2	4	1	7	2
TOTAL	339	100	284	100	286	100

Source: Dirección Nacional de Aduanas del Uruguay (2016)

TABLE 16. **Export Sales of Skimmed Milk Powder by Destination, 2013–2015**

	2013		2014		2015	
Destination	US$, millions	%	US$, millions	%	US$, millions	%
Brazil	63	51	54	57	50	71
Venezuela	5	4	24	26	0	0
Russia	17	14	8	8	2	3
Algeria	16	13	0	0	4	6
Chile	1	1	7	7	3	5
China	9	7	0	0	0	0
México	0	0	0	0	9	12
Cuba	7	5	0	0	0	0
Bolivia	2	1	1	1	1	2
Singapore	2	1	1	1	0	0
Others	4	3	0	0	1	2
TOTAL	125	100	94	100	70	100

Source: Dirección Nacional de Aduanas del Uruguay (2016)

TABLE 17. **Export Sales of Butter by Destination, 2013–2015**

	2013		2014		2015	
Destination	US$, millions	%	US$, millions	%	US$, millions	%
Russia	66	65	81	82	30	50
Venezuela	8	8	8	9	1	2
Algeria	7	7	4	4	5	8
Morocco	5	5	3	3	8	13
Brazil	5	5	0	0	0	0
Egypt	1	1	0	0	4	7
Argentina	5	5	0	0	0	0
Georgia	1	1	1	1	2	3
Canada	0	0	0	0	3	5
Iran	1	1	0	0	2	3
Others	2	2	1	1	6	10
TOTAL	102	100	99	100	60	100

Source: Dirección Nacional de Aduanas del Uruguay (2016)

TABLE 18. **Export Sales of Cheese by Destination, 2013-2015**

	2013		2014		2015	
Destination	US$, millions	%	US$, millions	%	US$, millions	%
Venezuela	168	47	129	37	36	18
Russia	69	19	110	32	46	23
Brazil	41	12	33	10	32	16
México	24	7	31	9	40	19
Argentina	17	5	11	3	4	2
USA	6	2	6	2	5	3
Algeria	7	2	4	1	5	2
Morocco	5	1	3	1	8	4
China	5	1	2	1	4	2
Chile	1	0	2	1	5	3
Others	13	4	14	4	19	9
TOTAL	357	100	345	100	204	100

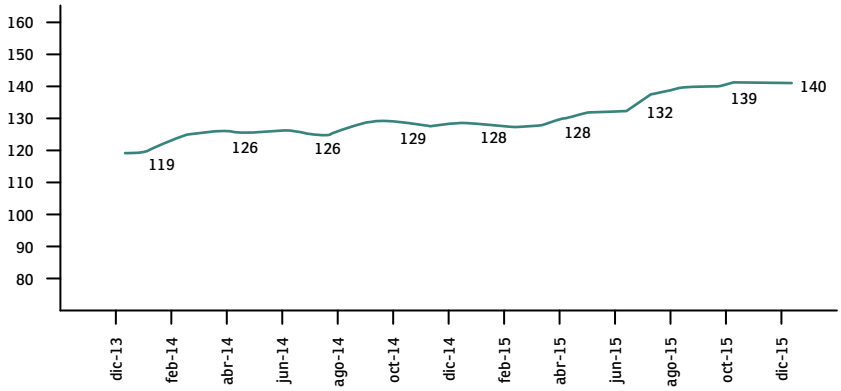
Source: Dirección Nacional de Aduanas del Uruguay (2016)

Rising Cost of Production in the Uruguayan TSG Segment

Uruguayan governments have historically supported milk prices by regulating the prices of "quota milk" (prices payable to producers, fixed based on production costs in dairy farms) and "industry milk" (prices payable to processors). Deregulation of "industry milk" in 1976—allowing producers to set their own prices—led to an expansion of the industry. The government deregulated "quota milk" in 2008.

Uruguayan dairy has one of the lowest production cost structures in the world. In 2012, INALE cited Uruguay's average cost of production as US$0.20 per liter (PWC 2012). This was among the lowest costs of production globally and allowed exporters to compete with heavily subsidized global competitors as farmers relied on low-cost inputs and continuous improvements in productivity. However, in recent years the cost of production has started to increase (Figure 47), primarily due to an increase in feed prices and the rising cost of land. While ominous, the effect on milk producers was dulled by the fact that until 2014, milk prices were also increasing steadily; a function of increased scarcity of raw material and inputs due to significant foreign direct investment in recent years and the resulting widening of industrial processing capacity. Venezuela's dominance as an export market also amplified this phenomenon; in recent years, Venezuela has consistently paid for milk at prices far above the market price (Uruguay XXI 2015). The recent fall in milk prices has therefore finally exposed this weakness.

FIGURE 47. **Uruguay Milk Cost of Production Index**



Source: (INALE 2015)

Climate Change and Environmental Factors affecting the Uruguayan TSG Segment

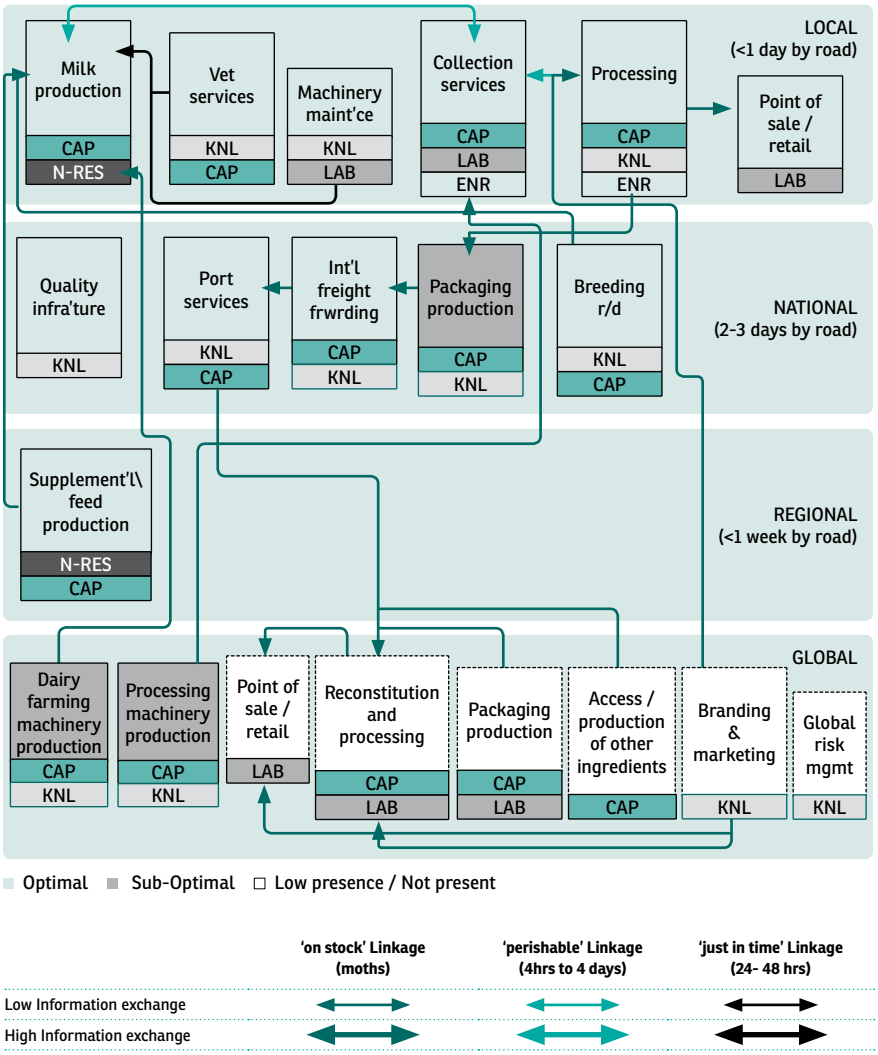
Uruguay's climate is conducive to dairy farming. The country has a uniformly temperate climate. Extensive flat pastureland is inexpensive and productive. Annual rainfall is typically good, albeit uneven (PWC 2012). Intermittent rainfall and uncertain climate continue to threaten Uruguay's dairy industry. Uruguay has experienced severe droughts and other atypical weather patterns in recent years. Country projections have predicted increased frequency and intensity of these extreme weather events including rainfalls, intense winds, and intense hail storms. Projections also warn that rising temperatures and the associated fall in frost could lead to more pests and diseases (World Bank 2009). Drought in 2015 severely affected margins and profitability of producers and processors in the TSG segment, forcing producers to use fodder reserves (meant for the winter) far earlier in the season than usual. The cost of purchasing extra feed was felt sharply by dairy producers although government measures may have mitigated some of the impact.

3.5.3.2. Comparing Uruguay to the Optimal TSG Value Chain

Figure 48 compares the ideal value chain required to deliver products and services in the TSG strategic segment with the actual value chain in Uruguay operating in this segment. Uruguay's performance is optimal across most local, national and regional activities. There is no packaging manufacturer in Uruguay; and processors import packaging from Argentina. This is still within an acceptable radius (2-3 days by road), but trade policies could significantly affect the cost of this crucial input.

In summary, benchmarking the Uruguayan value chain against the GVC for the TSG segment shows that Uruguay's performance is optimal across most local, national, and regional activities of the value chain. However, Uruguay's participation in the TSG value chain does not stretch far from its borders. Although it has good access to dairy farming and processing machinery, the country does not participate in the global functions and downstream activities performed in destination markets. This is not surprising given Uruguay's size compared with the economies of scale necessary to enter these activities and their high-risk profiles. These global functions (such as branding, marketing, and global risk management) and downstream activities (such as milk reconstruction, final products processing, distribution, and retail) retain most of the value added in the GVC and ensure high margins. **Investing directly in the downstream phases of the dairy GVC to gain a foothold in end markets, and focusing on product differentiation in the organic dairy milk powder niche market are two strategic repositioning options** (see Section 5).

FIGURE 48 . **Comparing Uruguay to the Ideal TSG Value Chain**



Source: Adapted and developed from World Bank (2015) KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity;
CAP = Capital intensive activity; N-RES = Natural Resource N.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).

3.5.4. Deep Dive: The Perishable Premium Local (PPL) Strategic Segment

The Perishable Premium Local (PPL) strategic segment includes locally produced perishable products for which local consumers are willing to pay a premium, perhaps because of local preference for local flavor (e.g., Mtindi in Tanzania), bias toward local production (e.g., increasing support for locally-sourced products in U.S. (Porjes 2015), desire for 'freshness' (e.g., rejection of preservatives and additives in the U.S. (Watson 2016) or any other attribute that increases local consumers' willingness to pay for local products.

PPL segments are characterized by high value-added dairy products such as hard cheese, soft cheese, yoghurt (including flavored and drinkable varieties), butter and ice-cream (including ice-cream mix, ice-cream "cones", sundaes and shakes) and cream (e.g., clotted cream, whipped cream) and dairy desserts. This strategic segment also includes probiotic drinks with a limited shelf life[14]. Table 19 shows the approximate rate of conversion from whole milk for selected dairy products, including the ones for the PPL segment.

TABLE 19. **Whole Milk Conversion for Value-Added Dairy Products**

One pound of ...	Requires ... pounds of whole milk
Butter	21.2
Whole Milk Cheese	10.0
Evaporated Milk	2.1
Condensed Milk	2.3
Ice-Cream	12.0
Cottage Cheese	7.5

Source: Hammarlund *(2003)*

While large international dairy processors also dominate the PPL segment globally, economies of scale are not as critical as for milk-powder and other products in the TSG segment. This is in particular the case for cheese, organic milk and ice cream. The growth of the PPL segment dates to the 1990s, when many dairy farmers in the industry exited on-farm dairy processing (a customary activity over the previous 30 to 40 years). While some dairy producers reoriented themselves toward the supply of fresh milk

14 Note that specific probiotics with freeze-dried organisms (which may includes supplements sold in tablet or capsule form) are not included in this segment.

to dairy processors in the TSG segment, others repositioned themselves in the PPL segment by focusing on processing local premium products to earn greater returns. By meeting the needs of local consumers, dairy producers continue to compete in the PPL segment selling higher value added processed dairy products on a small scale, without increasing herd size (Penn State Extension 2004). Dairy farmers can integrate vertically into processing and enter the PPL segment through the use of modern technology, advanced operating skills, and expanding their portfolio of dairy products through the use of locally tailored marketing channels (Mutura, et al. 2006).

3.5.4.1. Characteristics of the Ideal Value Chain for the PPL Segment

Climatic Conditions and Environmental Factors

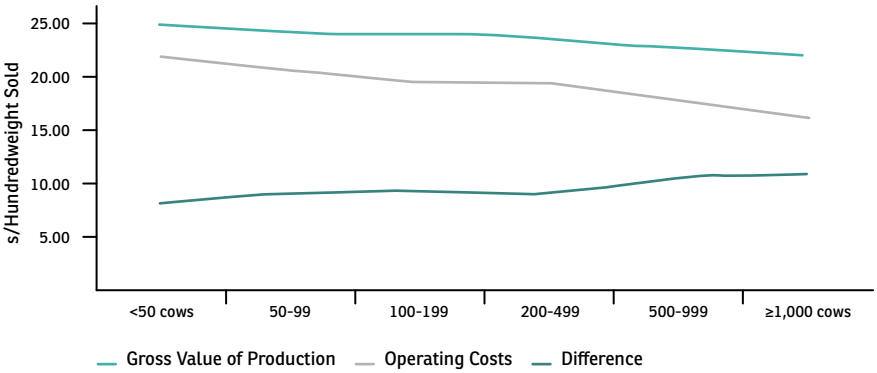
As with the TSG strategic segment, agroclimatic factor conditions are paramount to the competitiveness of the dairy industry. Dairy herds typically thrive in temperate climates (5–20°C) and in lowlands where naturally fertile soils and good grass growth mean herds are principally pasture-fed, grazed directly. Good rainfall is preferred to limit the costs of irrigation alternate feed. Severe or prolonged cold weather, or excessive heat and dryness in summer, are the most usual causes of low dairy yield.

An interesting, yet paradoxical, finding from field consultations on the PPL segment is that it is often the *lack* of optimal climatic or factor conditions that encourage (or force) dairy producers toward higher value added segments. Where space and climate are optimal, incremental cost savings can be realized over time (through technological improvements, access to cheap feed and by expanding herd sizes). Thus, continuing to simply supply liquid milk to processors remains the default and encourages producers to enter the TSG value chain. However, where imperfect agroclimatic conditions exist (e.g., due to the harshness of the winters or limited land availability), there is a natural incentive for producers to vertically integrate into dairy processing to preserve the milk and try to absorb higher-value added activities. This is usually the entry point into the PPL segment.

Milk Production and Processing

Success in the PPL segment depends on access to and quality of land, location, labor, capital, management skills, and experience. The production of perishable value-added dairy products is not as dependent on economies of scale as commodity dairy product production. Therefore dairy production is less capital intensive and more accessible to smaller-scale producers. This is not to imply that operational costs are not inversely proportional to herd size; economies of scale still exist (Figure 49). Operating costs might include feed (purchased, homegrown harvested, or grazed feed), veterinary and medical costs, bedding and litter, marketing, energy costs and repairs, other (non-milk) ingredients, testing, utilities, packaging, insurance, licenses, permits, transportation and administration.

FIGURE 49. **U.S. Dairy Value of Production**



Source: Moss, et al. (2014)

Ideally, producers and processors seek to break milk down into its constituents (water, fat, and nonfat solids) and add value to each. However, some constituents use more expensive equipment or have higher energy requirements than others. Cheese, butter and ice-cream have some of the highest conversion rates among dairy products, producing the least 'by product' for re-use. Of the three, cheese is particularly popular to produce because it is one of the least perishable value-added products. This not only reduces potential transportation costs (because cheese is less likely to need refrigeration in transit) but also widens the potential market (because the product can travel farther without degrading).

Producers of value-added dairy products can use different milk production practices to differentiate their products. These might include grass-fed production, certified organic production, variations in animal diet, or milk produced with or without growth hormones (Moss, et al. 2014). Traditionally, producers sought to differentiate their dairy products by increasing the fat content of the milk (which typically creates a smoother taste). However, as consumers have become more health conscious, increasing fat content has become less viable as a route to commanding a premium price. Producers might instead use other premium methods of production or cater to niche markets (e.g., natural, fair trade, kosher, or allergen free) to realize some incremental sale value. Organic production and processing methods have become a common means of differentiating products; consumers that prefer organic varieties demand high quality and safety and often perceive organic milk to have positive environmental, animal welfare, and ethical impacts.

Production and Processing Machinery

As Figure 53 on the ideal structure of the value chain to compete in the PPL segment shows, dairy processing and production need not occur in the same country. However,

access to appropriate machinery is important. Processing equipment requirements depend on the product. Site, facilities, equipment, and plant layout and design might all be subject to individual approval systems depending on the country's own regulations. Typically processing will include raw storage to hold the volume of milk typically received in one day only. Separation is always required (no matter the product to be produced) to isolate water, fats and nonfat solids. The removed fat can be re-blended at varying levels to suit the producer's purposes. Excess fat solids can also make ice creams, creams, or other secondary products for other food applications. Depending on the range and type of products to be produced, a range of blending options can then be employed before the products can be condensed, pasteurized, and homogenized for bottling. Cheese processing options might follow separation once starter cultures and other ingredients (calcium chloride, enzymes and salt) have been added (Hammarlund 2003).

Packaging and Labelling

Dairy producers and processors are increasingly using packaging to differentiate their products. Yoghurt packaging is particularly sophisticated and frequently subject to innovation and redesign. Innovations may include environmentally responsible packaging solutions, re-sealable options, more portable options, packaging that is appealing to children, packaging that protects the integrity or purity of the products, or space saving packaging. Glass bottles are also sometimes used in dairy to convey quality. This is a strategy usually backed by premium prices because glass is typically more expensive than plastic and so will squeeze margins absent price increases.

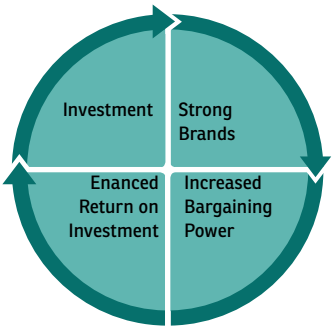
Labelling might be location-oriented (e.g., "locally-grown") or process-oriented (e.g., "natural" or "grass-fed"). Location oriented labelling can be particularly powerful because clear definitions for "local" rarely exist, yet research suggests that "buying local" has moved from being a consumer trend to a central growth driver for grocery retailers and restaurants (A T Kearney 2015) and is associated with freshness, quality, safety and additional nutritional value. Process-oriented labelling is more regulated. "Organic" is a defined label that has grown in the wake of rejection of genetically modified produce in some markets. However, there remains some confusion among consumers as to the definition of "organic" (which can be different in different countries). Organic milk can also be UHT, for example. "Natural" and "grass-fed" also commonly lack stringent definition but imply higher nutritional value and better taste (Moss, et al. 2014).

Marketing and Branding

Marketing and branding strategies are critical for small processors in the PPL strategic segment. They exploit the "4Ps" of marketing; product, placement, price and promotion to better target consumers. In this way, producers can factor key aspects into their decision making ex-ante. These decisions might include deciding which characteristics

the products must have to meet the needs of the target market, what the packaging will look like, what the product/brand should be called, which distribution channels should be used, appropriate price points and advertising strategies. Producers are best positioned to build loyalty and brand recognition among their customer base.While brand positioning commonly emphasizes product features (e.g., high fat, low fat, or whipped), there is also an opportunity to differentiate. For example, products and marketing campaigns can target consumers of a certain lifestyle, an occasion or time of day (e.g., breakfast yoghurts), a specific purpose (e.g., encourage bowel movement or lower cholesterol), creating a sense of satisfaction (e.g., making mothers feel good about nourishing their families through the product), or the image conscious consumer (i.e., conveying that the product is trendy or stylish) (Wilson 1991). Figure 50 illustrates the "virtuous circle" of brand strength.

FIGURE 50. **Brand Strength: The Virtuous Circle**

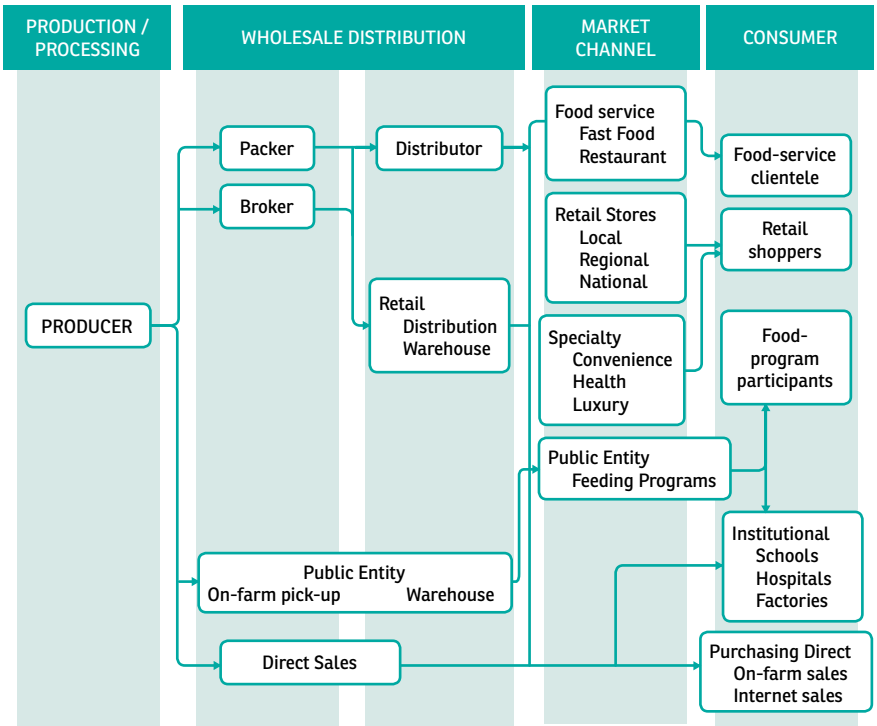


Source: Wilson (1991)

Sophisticated Local Demand

The main difference between the Perishable, Non-Premium strategic segment and the Perishable, Premium, Local segment is not only the level of sophistication of the products but also the sophistication of the final consumer. As UHT and longer-life milk products are produced at high volume in the TSG segment, they can be sold at lower costs and may threaten products in PPL segments. Therefore, for firms in the PPL segment to thrive, the consumer must be discerning and must demand differentiating attributes, qualities and characteristics for which they will pay a premium. In markets with a strong historical fresh milk culture (e.g., UK, USA and New Zealand) there is significant consumer demand for high quality, fresh (pasteurized) milk, and thus UHT and powdered milk have not achieved the same market penetration as in many other countries.

FIGURE 51. **Distribution Channels in the PPL Segment**



Source: Penn State Extension (2004)

In developing economies, the risk is higher that global players entering from the TSG segment will cannibalize the PPL segment. High cost of refrigeration and intermittent power supply in developing countries have encouraged the growth of shelf-stable products. As a response to the threat of cannibalization from the TSG segment, firms in the PPL segment need to focus on a niche customer loyalty strategy tailored to local middle-class non-price-sensitive consumers.

Distribution and Retail

By nature of their perishability, products in the PPL segment are limited in the distance they can travel from the dairy farm to the consumer (or point of retail) for sale. Proximity to a market that can readily absorb the products will greatly affect the competitiveness of the producer or processor.

Figure 51 illustrates the distribution channels for firms in the PPL segment. Direct sales allow the producer to negotiate directly and maximize bargaining power. Producers can sell directly to smaller or niche supermarkets, to restaurants, or through specialty outlets, farmer's markets, on-farm sales or Internet sales. Producers might need to rely on distributors for market access, in which case bargaining power will likely be reduced. Where producers assume responsibility for distribution, significant labor and capital commitment might be required depending on product characteristics and volume. These attributes will also affect the delivery transit time, delivery frequency as it relates to shelf life, and transportation mode (Penn State Extension 2004).

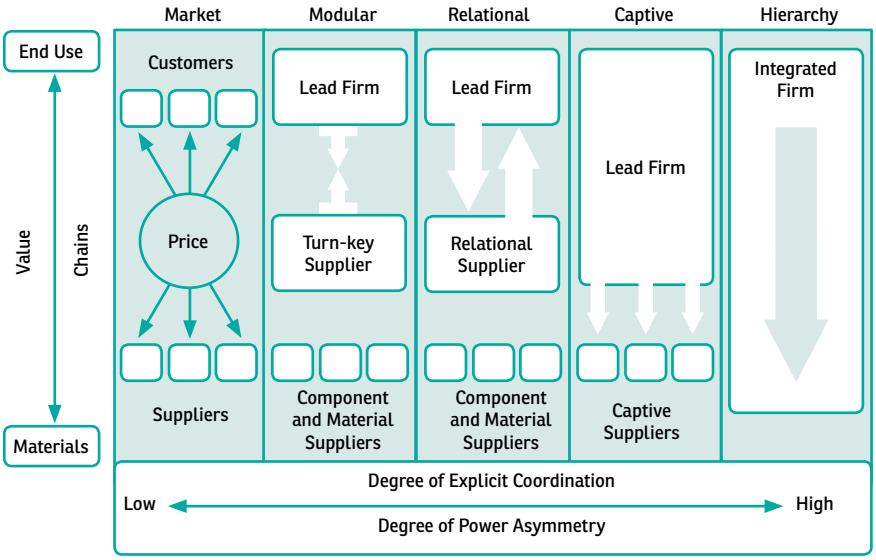
Where products are sold through retailers, shelf space allocation can prove difficult and expensive, especially when the shelf space must be refrigerated (as it is typically scarcer). Retailers commonly institute slotting fees requiring payment to carry certain products. Larger processors will better placed to negotiate discounts and premium in-store locations. Institutional food markets are often served by large food distribution companies. These channels have some advantages in that brand identification is less critical than in retail-driven distribution. Specialty or gourmet food stores might also provide opportunities to supply value-added products; however, this channel requires differentiated product of uniquely high quality. Finally, direct sales can be made directly from the farm or via the Internet (Moss, et al. 2014).

3.5.4.2. Power Relationships

While the milk *production* costs of small-scale producers are often similar to those of large-scale dairies (FAO 2016), the economies of scale in *processing* products in PPL segments are not as acute as in TSG segments (making PPL segments more accessible to small-scale producers). Small-scale producers (or small cooperatives) can develop value-added products from their own milk supply and thereby diversify their revenue streams and insulate them from the volatility of commodity milk markets (Ellerby 2010), increasing their power in the value chain. Small-scale producers also have stronger bargaining power in the PPL segment than in the TSG segment because the perishability of products in the PPL segment means that only co-located producers and processors can serve the local market, this providing natural protection from wide global competitors.

Referring to the GVC taxonomy by Gereffi, Humphrey and Sturgeon (2005) (Figure 52), the ideal value chain serving the PPL segment can be described as "relational." Suppliers in relational value chains (producers in PPL segments) typically supply differentiated products based on unique characteristics. Because linkages in relational value chains take time to build, switching costs are higher. Frequent interactions and knowledge sharing are common in relational GVCs because linkages require trust and generate mutual reliance, which are regulated through reputation, social and spatial

FIGURE 52. **Five Global Value Chain Governance Types**



Source: Gereffi and Fernandez-Stark (2011)

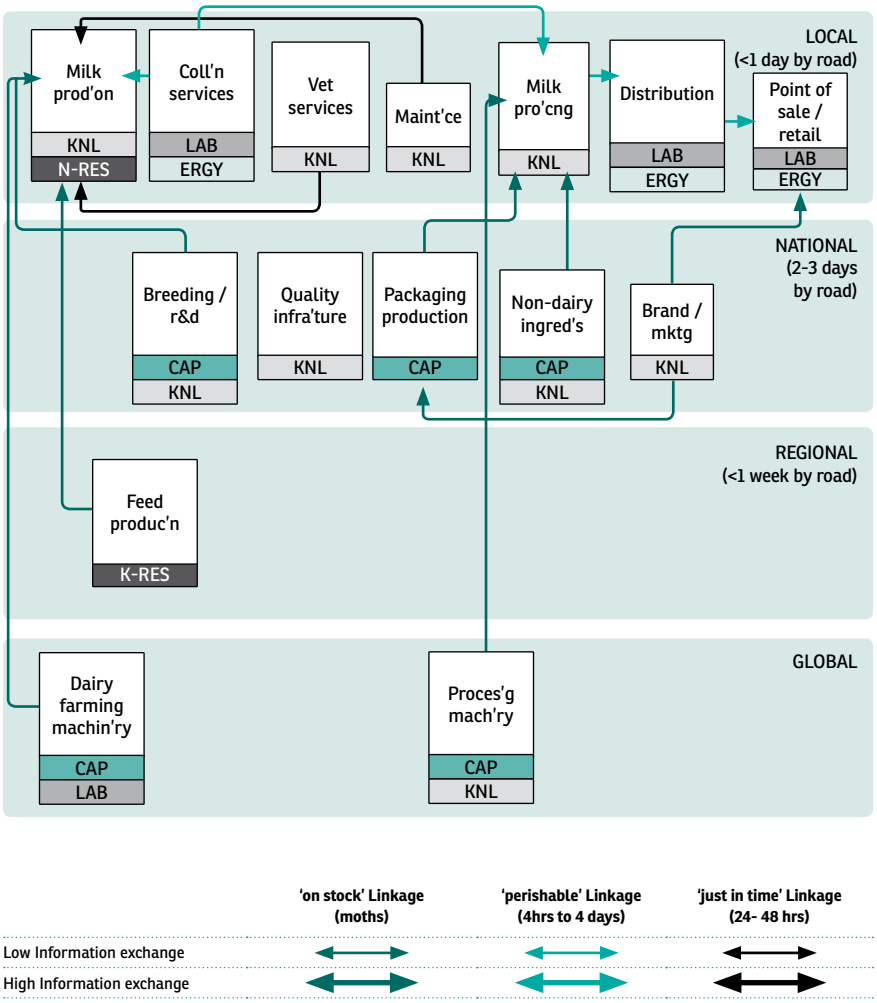
proximity. While dairy producers in relational GVCs have more power than dairy producers in market GVCs (due to mutual dependence), processors still specify what is needed, and can exert some control over producers (Gereffi and Fernandez-Stark 2011).

3.5.4.3. The Ideal Value Chain for the PPL Strategic Segment

Production and processing volumes are less critical to competitiveness in the PPL segment than in the TSG segment (Figure 53) and indeed the necessary scales of all activities in the value chain are smaller. Point of sale (and distribution) are co-located with milk production, as are collection services, veterinary services, machinery maintenance and milk processing.

Good national quality infrastructure is still central, but the sophistication of the requirements may not be equally stringent (nor need they be internationally-recognized). Depending on the origin of the 'premium,' strong branding and localized marketing capacity and/or breeding and R&D programs contribute significantly to the competitiveness of a specific cluster or region. Non-dairy ingredients are still a necessary input, but they are usually sourced domestically.

FIGURE 53. **Minimum Requirement to Compete / Ideal Value Chain in the PPL Segment**



Source: Adapted from World Bank (2015) KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity;
CAP = Capital intensive activity; N-RES = Natural Resource N.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).

Access to high quality feed and feed supplements is equally important as it is in the TSG segment. Perishable products do not always require high-technology packaging options needed for shelf-stable products, but packaging still adds significant cost, and the presence of a competitive domestic supply helps reduce it As with TSG segment, machinery (both for dairy production and processing) need not be manufactured domestically to compete.

As with the TSG segment, all linkages are 'on stock' (i.e., supply-driven), except veterinary and maintenance services, which are 'just in time' demand-driven activities. Similar to the TSG segment, the collection of milk and delivery of milk to processors is a perishable, time critical linkage, but unlike TSG, post-processing activities are also time-critical and distribution and point-of-sale activities require refrigeration.

3.5.5. Uruguay and the Perishable Premium Local Strategic Segment

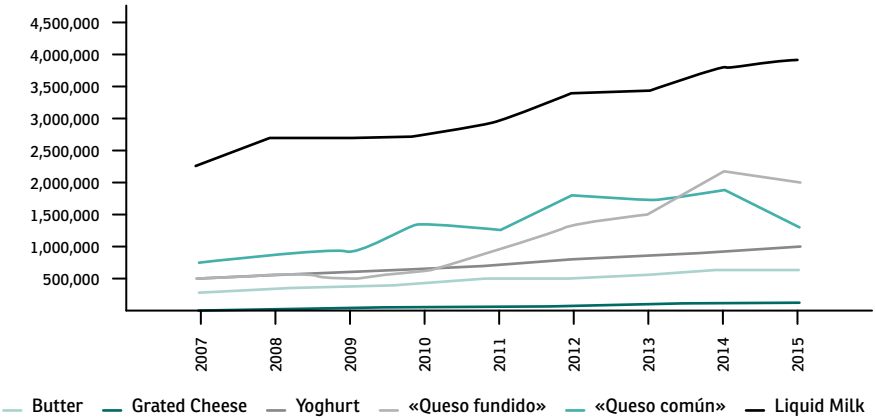
The deep dive analysis of the Perishable-Premium-Local (PPL) segment shows that Uruguay has a strong historical milk culture, and its participation in this segment is strong. It has one of the highest per capita milk consumption rates in Latin America (230 liters per year, compared to 220 in Argentina, 110 in Brazil, and 100 in Chile). Consumer preferences for locally produced traditional niche products such as hard cheeses, semi-hard cheeses, soft cheeses (*Queso Común* and *Queso Fundido*), ice cream, and yoghurt are strong. Overall, Uruguay's participation in the PPL strategic segment remains strong, importing only 5 percent of dairy products sold in the domestic market.

The PPL segment includes locally produced perishable products that local consumers are willing to pay a premium (over and above generic milk). The PPL segment is characterized by value-added dairy products such as hard cheese, soft cheese, grated cheese yoghurt, butter, ice cream and organic milk. Uruguay has a strong historical milk culture. It has one of the highest per capita milk consumption rates in Latin America. Consumer preferences for locally produced traditional niche products are strong. Uruguay's participation in the PPL strategic segment remains solid. However, the domestic market is small and saturated. Conaprole occupies an absolute leadership position. Thus, neither entry in the generic PPL segment nor rapid expansion plans by other small domestic players would bring substantial business rewards. At the same time, the market niche of traditional artisanal Uruguayan cheeses offers upgrading opportunities for small producers. They currently sell in bulk, without brand, and mostly through local informal distribution channels. In fact, 23 percent (800) of the 3,600 registered milk producers are artisanal cheese producers, while another 47 percent (1,700) produce less than 1,400 liters of milk a day (INALE 2015) to supply milk to processing plants at no price premium.

3.5.5.1. Recent Performance and Trends

Figure 54 shows domestic sales of dairy products between 2007 and 2015. Fluid milk dominates sales, reaching US$3.9 billion in 2015. "*Queso Común*" (including hard cheeses, semi-hard cheeses and soft cheeses) has traditionally enjoyed strong sales in Uruguay. However, sales have dropped drastically in recent years most likely due to plant closures due to the closure of processors Ecolat in February 2015 and SchreiberFoods in June 2015. This is also the case for "*Queso Fundido*" which includes cheeses that would typically require more processing either due to their complexity (e.g., pasteurized cheeses, spreadable cheeses and cream cheeses) or slightly higher economies of scale (e.g., mozzarella and cheddar). "*Queso Fundido*" also includes "*Queso Sándwich,*" which is made by melting down (low quality) cheese sold to processing plants by local cheesemakers. The melted cheese is formed into bars, which are then sold at a reduced rate in comparison with other products. Yoghurt and butter sales have been growing steadily, the latter experiencing only a very slight fall in sales. Meanwhile, grated cheese—which is only just gaining in popularity in Uruguay as more women join the work force (Instituo Nacional de Las Mujeres 2014) and traditional food preparation trends evolve—remains one of the least popular profiled dairy products.

FIGURE 54. **Domestic Sales - Uruguay Dairy Products of the PPL Segment (US$, thousands)**



Source: INALE based on data from National Institute of Statistics

Liquid Milk

Conaprole dominates domestic sales of liquid milk in Uruguay, capturing even greater market share in 2015 following closure of Ecolat Uruguay SA. There is little differentiation, and most products and brands have only small differences in price and quality as companies continue to rely on brand recognition and consumer loyalty. However, some international brands perform well in niche products such as flavored drinks or milk alternatives (e.g., soy). Very few premium or value-added milk products are available and are largely limited to two products: one commercialized by Lisley SA (The Bridge) and the second by Talar SA (Talar Leche Premium) (Euromonitor International 2015).

Yoghurt / Sour Milk

Sales of yoghurt and sour milk products grew by 16 percent to UYU4.6 billion in 2015, while volume rose by 1 percent to 38,000 tons. This growth was largely driven by drinkable yoghurts, which increased by 23 percent (in comparison with flavored yoghurts which only increased by 1 percent in the same period). As with liquid milk, Conaprole dominates production and sales, although less aggressively, with 66 percent of the value share. Competition is fierce in the sector as 'second-tier' producers CLALDY, Granja Pocha SA, Calcar and Noliman SA jostle for position. As a result, local processors accounted for almost 83 percent of yoghurt retail value sales in 2015. International companies perform strongly in yoghurt-based products (comparatively speaking). Fort-Masis SA, owned by Groupe Danone commands a 14 percent market share in 2015, dominating so-called nutraceutical products (e.g., Activia, Actimel and Vidacol). Diversification strategies are almost exclusively limited to the release of new flavors. However, this seems to be an unpromising strategy because the flavored yoghurt subsector continues to stagnate.

In terms of domestic consumers' preferences, yoghurt is not a 'traditional' Uruguayan foodstuff but its consumption is popular and growing. Yoghurt is commonly consumed in the morning as part of breakfast, while others consume yoghurt during the traditional mid-afternoon meal, especially during summer. Thicker, spoonable varieties are increasingly used as light desserts or as cooking ingredients to substitute for cream.

Some small and artisanal dairy producers sell limited volumes of unpackaged yoghurt but the practice is not as common as in cheese (see next section). Traditional grocery retailers and independent small grocers remain the principal sales points for yoghurt-based products, accounting for 99 percent of sales.

Cheese

As price increases have stayed below the general rate of inflation over recent years (8.3 percent), cheese has become more popular with consumers. Thus, this subcategory of PPL products now offers several flavors and options (e.g., salt-free and low-fat). Premium brands are niche and are principally imported from Europe and Argentina (less so

in the latter case) however there remains little advertising or promotion in cheese in Uruguay (Euromonitor International 2015).

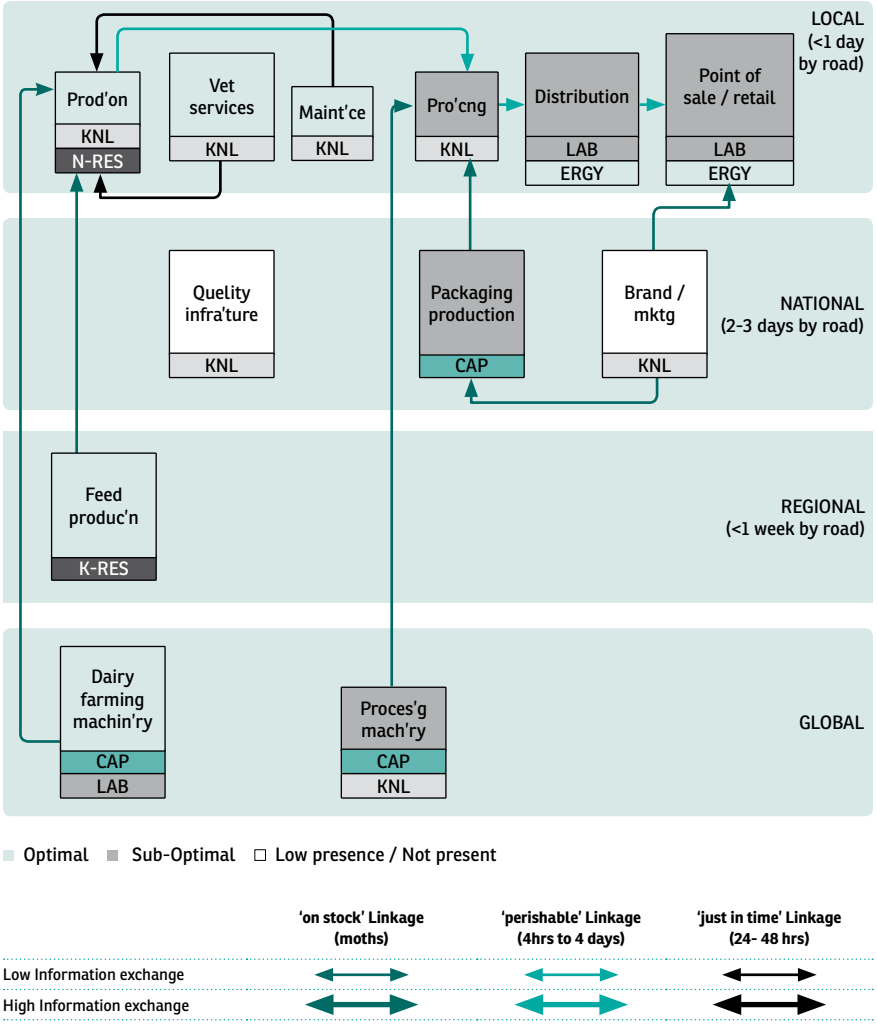
While Conaprole remains the market leader for cheese products, it does not have a dominant position as the economies of scale to compete on cheese products are not as pronounced as the ones for products in the TSG segment such as liquid milk and shelf-stable products. Conaprole has a 16 percent market share (compared to 82 percent in liquid milk and 66 percent in yoghurt (Euromonitor International 2015)) and four other companies enjoy double-digit market shares. Five of the top six companies are Uruguayan, and Quesería Helvetica SA manufactures its products in Uruguay although it has foreign ownership. At the same time, three international brands (with production outside Uruguay) that launched new brands in 2015 gained market share relatively quickly (Euromonitor International 2015).

3.5.5.2. Benchmarking the Uruguayan Artisanal Cheese Value Chain against the Ideal Value Chain for the PPL Segment

Artisan producers supply 50 percent of all cheese consumed in Uruguay (Cirisola and Gago 2012). In 2015, unpackaged cheese (the principal cheese produced by artisan producers and small processors) accounted for 72 percent of total retail volume sales of hard cheese in Uruguay in 2015 (Euromonitor International 2015). Artisan cheese is cheese produced on the same property as the milk used to produce it (Uruguay 2003). Artisan producers supply the internal market with approximately 10 million kg of cheese each year (LATU 2010). Artisanal cheese production in Uruguay has its origins in the 19th century immigration of Swiss and German, French, Italian and Austrian families who brought with them their knowledge and tradition of cheese making. These families principally settled in Colonia and surrounding areas, where the climate and extensive pastures were conducive to dairy farming and, by extension, cheese production. By 1890, a population of 300 families in Colonia Suiza supported 100 *queserías* that exported their products, notably to Buenos Aires. Since this time, cheese production in the region has grown considerably (Instituto de Competitividad 2008). According to INALE (2015), there are now 800 *queseros* out of 3600 dairy producers. Other estimates (Production Artesanal 2009) suggest there are up to 2000 establishments—perhaps a reflection of the high level of informality in the sector. Artisanal producers typically produce Colonia cheese, hard cheese and 'semi-hard' cheeses, mozzarella and grated cheese. Artisanal producers also supply processors with cheese (usually sub-optima batches) to be melted down into *Queso Fundido*.

Benchmarking the Uruguayan value chain against the GVC for the PPL artisanal cheese dairy segment shows that Uruguay's performance is suboptimal in production, milk collection, and compliance with phytosanitary and food safety standards (For example, 31 percent of cheese samples from ten different artisanal producers failed to meet food safety

FIGURE 55. **Comparing Uruguay to the Ideal Artisanal Cheese PPL Value Chain**



Source: Adapted from World Bank (2015) KEY: KNL = Knowledge intensive activity;
LAB = Labor intensive activity; CAP = Capital intensive activity; N-RES = Natural Resource
Note: Box size indicates scale of activity and significance to value chain structure (qualitative judgment).

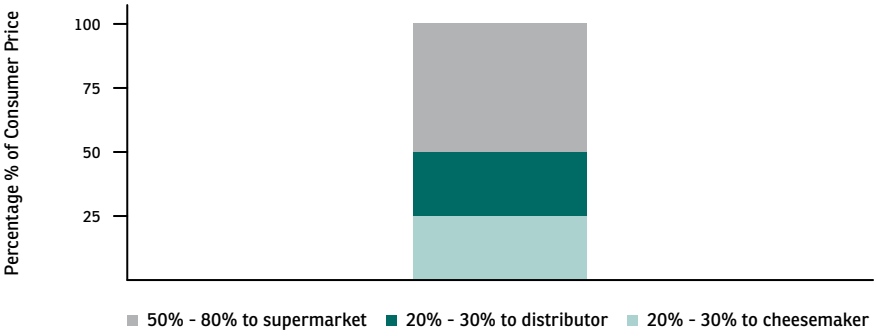
requirements in 2012.) Artisanal cheese producers also lack shared production protocols and product standards in the cheese processing phase and rely on local informal distribution channels. They also lack product brands and brand recognition among consumers.

Figure 55 depicts the ideal value chain for the artisanal PPL subsegment alongside the Uruguayan value chain. Although the value chain is much simpler (and the economies of scale are much smaller) than the more general PPL segment, Uruguay's performance is weaker.

At the processing stage, very few artisanal producers pasteurize milk before beginning cheese production. This is partly because pasteurization is expensive, but also because pasteurization affects the flavor, texture and smell of the cheese—factors that the small producers claim are part of the unique selling point of their cheeses. The prevalence of raw milk in artisanal cheese production coupled with less sophisticated infrastructure and reduced phytosanitary control has led to safety concerns. While raw cheese will likely continue to have its appeal, significant improvements might be necessary in the artisan production process to ensure the safety and quality of Uruguayan artisan cheeses.

Distribution channels of the value chain are also sub-optimal. The large majority of consumer sales of artisan cheeses are made through local markets, which are typically informal with little or no regulatory control. However, distribution is also common through supermarkets, at cheese events, restaurants and catering services, and to tourists. In almost all cases, producers work with distributors or intermediaries to make sales. These distributors typically buy cheese directly from individual cheese producers for resale to supermarkets. Often, these distributors "re-brand" the product with their own labelling and branding before re-sale. Artisan cheese producers typically capture

FIGURE 56. **Approximate Percentage of Artisanal Cheese Consumer Price Retained by Value Chain Actors**



Source: Project team interviews

only 20–30 percent of the consumer price. Distributors retain a similar percentage. Supermarkets or establishments at the final point of sale retain the bulk of the value, sometimes retaining 80 percent of the consumer price (Figure 56).

In terms of sophistication of the local demand, Uruguayan cheese consumers are not typically discerning. Outside the principal cheese producing regions (e.g., Colonia and San José)—where taste, texture, and smell are all important—the most important factor in consumers' buying decisions is price. Consequently, the cost of the products are relatively low (Instituto de Competitividad 2008). The products are sold 'anonymously' (i.e., not branded or catalogued), —a significant departure from the traceability that characterizes Uruguay's export markets and higher-end domestic segments[15]. Without demand in the local market for a more sophisticated product, *queseros* have limited incentives to upgrade production processes and make the necessary investments.

High informality in artisan cheese production has meant that producers often operate at reduced cost (particularly with respect to taxes and regulatory non-compliance). Informality not only undermines the efforts of compliant firms but also reduces the potential for collaborative and sector-wide responses to opportunities and challenges in the market.

The attraction of artisan cheese production vis-à-vis simply supplying milk to plants for processing rests on the assumption that cheese producers can command some incremental sales value for their cheese (per liter of milk used in its production). However, Conaprole's dominant position in the Uruguayan dairy processing landscape, and its institutional mandate to pay fair farmgate prices to its large cooperative membership keeps an upward pressure on prices, thus discouraging milk producers from vertically integrating value added activities such as cheese production (Spend Matters 2016).

Overall, producing and consuming artisanal cheese is part of the culture of Uruguay. The existence of a stable domestic demand points to a strategic repositioning option based on pursuing a collective upgrading and formalization strategy by groups of producers of artisanal cheese. Pursuing this option requires focusing on strengthening the milk collection, distribution, and retail phases of the value chain and creating a collective product quality and food safety control mechanism as presented in Section 5.

15 Uruguay's *Sistema Nacional de Información Ganadera* (SNIG) or National Livestock Information System become fully operational in 2013. The program has as its objective to ensure the traceability of cattle from the establishment of origin of the animal to the slaughterhouse, both individually and by groups of animals, according to government regulations (SNIG 2017). The system's implementation has allowed full transparency and traceability of Uruguay's beef and beef products to the farm of origin and indeed the animal itself. In so doing, Uruguay has been able to differentiate itself from other exporters leveraging an increasing social responsibility, environmental awareness and health awareness in western markets especially.

4. The Uruguayan Information Communication Technology (ICT) and ICT-Enabled Services (ICTES) Industry[16]: from "Export Discovery" to Global Niche Player in the ICT/ICTES GVC[17]

Uruguay is an ICT/ICTES leader in the region according to a variety of measures. The number of households with computers has grown rapidly since 2004 and today surpasses peers (such as Mexico, Brazil, Argentina, Chile, and Colombia) and is on a par with Italy. Similarly in terms of mobile telephony, the number of telephones per 100 persons surpasses that in regional peers (with the exception of Argentina, which has a similar figure) as well as a number of OECD countries (such as the US, Spain, and Germany). Uruguay also leads regional peers in ICT/ICTES development. Data services stand out globally for their high speed and low price. With high literacy rates and widespread computer availability, Uruguay is one of the world's leading software exporters and South America's outsourcing hub. In terms of computer penetration, Uruguay tops all other countries in the region by a considerable margin.

16 The Information and Communication Technology (ICT) industry can be broadly defined as that which "provides goods and services for the transmission, storage and processing of information" (World Bank 2015). Three aspects of the ICT industry have made classification difficult. One is that the industry is comparatively 'recent' when compared to traditional tradable industries (e.g., furniture manufacturing). A second is that it is evolving at such a rate that it has been difficult to codify and agree on classifications before they become obsolete. Finally, ICT pervades other industries, blurring demarcations between ICT and other industries. This report uses ICT and ICT-enabled services (abbreviated as ICT/ICTES throughout the report) in reference to any products or services whose output can be delivered remotely. This includes classic ICT software products and services, and professional and back office services, but might also include many other industry-specific services such as R&D, health, biotechnology, agri-services and engineering services.

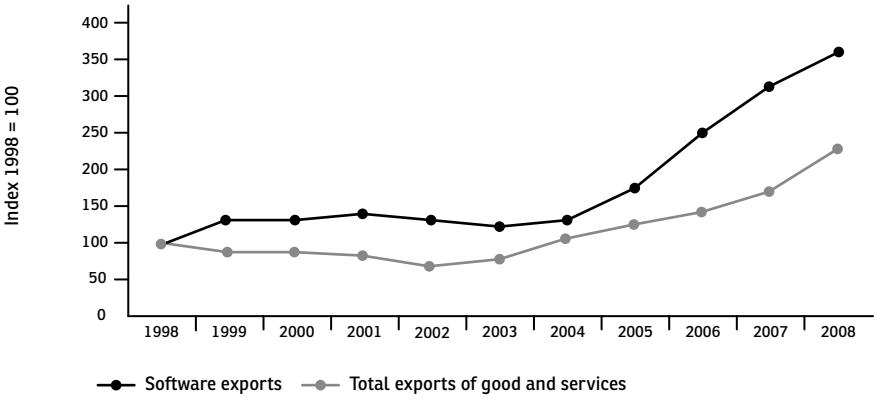
17 The complete analysis of the ICT and IT-Enabled Services industry in Uruguay and of the strategic repositioning options in the GVC is provided in 4.3.2

4.1. EVOLUTION AND PERFORMANCE OF THE ICT/ICTES INDUSTRY IN URUGUAY

Uruguay's strong performance on ICT/ICTES dates back to 1968, when the Faculty of Engineering of the *Universidad de la República* launched a three-year course in Computer Engineering. As the first waves of graduates entered the workforce, Uruguay's fledgling ICT/ICTES industry began providing services to Uruguay's state-owned enterprises. Given the limited domestic market, Uruguay's IT firms soon began exporting, providing consultancy services to Brazil, Argentina, and later other Latin American countries. Domestic expansion continued in the meantime and, in 1980s and 1990s, Uruguay's IT sector grew in large part by designing and supporting bespoke systems for the country's banks and financial institutions. By the end of the 1990s, exports exceeded US$90 million, making Uruguay the number one exporter of ICT/ICTES products and services in Latin America. Uruguay's comparatively early entry in this area has contributed to the survival of firms in this sector that have been able to withstand international competition and today are some of Uruguay's largest and most successful ICT/ICTES firms.

From inception through the year 2000, Uruguay's ICT/ICTES industry grew organically without any tailored policy support. Yet, software exports grew much faster than total exports (Figure 57). "Non-traditional" exports (including ICT/ICTES exports) also grew faster than other categories of exports, including other categories of services exports

FIGURE 57. **Comparison of Growth between Uruguay's Software Exports and Total Exports, 1992–2008**



Source: Snoek & Pittaluga (2012) based on data from Cámara Uruguaya de Tecnologías de la Información (CUTI) and Banco Central del Uruguay (BCU)

FIGURE 58. **Structure of Uruguay's Exports, 1990–2013**

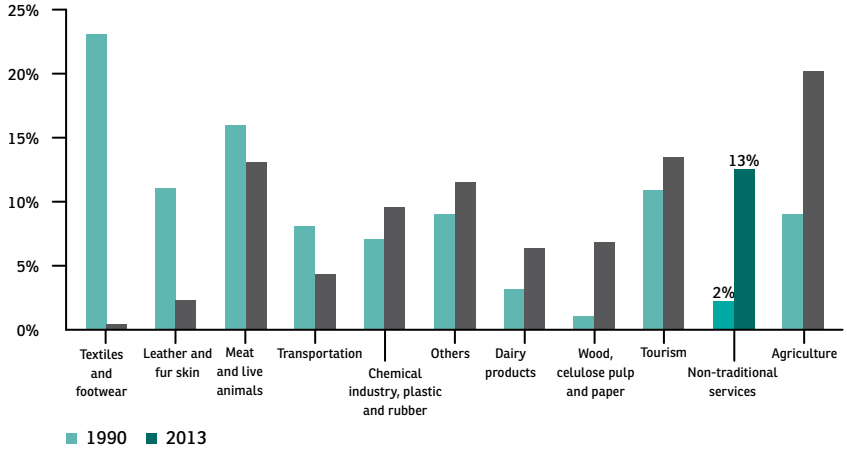
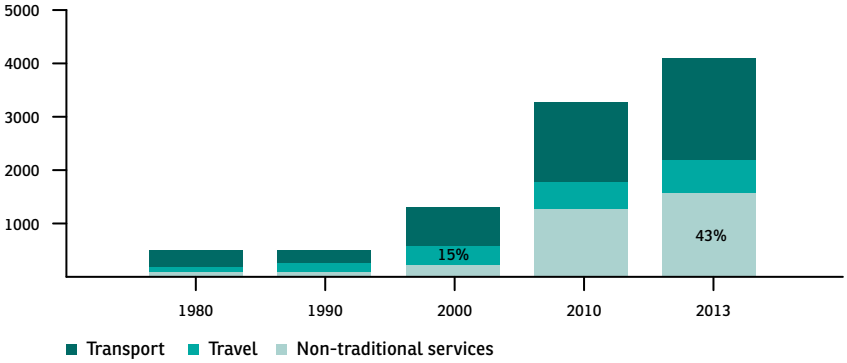


FIGURE 59. **Exports of Services from Uruguay (US$ millions and percent share), 1980–2013**



Source: Uruguay XXI (2015) based on data from BCU, MEF and Free Zone Census 2010.

(Figure 58). By the end of the 1990s, exports exceeded US$90 million, making Uruguay the number one exporter of ICT/ICTES products and services in Latin America (Facultad de Ingeniería - Universidad de la República 2012) also in terms of per capita software exports (Snoeck and Pittaluga 2012). In 2013, total turnover was US$923.4 million. (Universidad Católica del Uruguay 2015) (Figure 59). Around 39 percent of the companies in the industry offer ITO services, while 37 percent of companies offer BPO services, 18 percent provide industry-specific services, and 6 percent provide IT Infrastructure (CUTI 2015).

According to the Uruguayan Chamber of Information Technologies (CUTI), there are approximately 500 firms in Uruguay's ICT industry (not including ICTES). Some 60 percent of CUTI's members export—to about 55 different markets—and about one-third of total sales (including sales from subsidiaries abroad) are in foreign markets (Table 20). US$307.4 million of the sales in 2013 were to clients outside the country, some from offices of Uruguayan companies abroad (Universidad Católica del Uruguay 2015). These figures underestimate sales because they do not include freelance workers or small, unregistered firms. At least 1,400 professionals work as freelancers (Universidad Católica del Uruguay 2015). Yet virtually none of Uruguay's ICT firms (not including ICTES) feel that access to markets is easy, and they rate access to markets as the second most important factor for the success of the sector, narrowly behind human capital (Universidad Católica del Uruguay 2015).

TABLE 20. **Uruguay ICT Sales by Destination, in millions of US$ and percentage growth rate, 2000–2013**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2013[a]
Domestic Sales (mill US$)	142.7	147.9	153.2	133.1	136.8	160.1	193.0	232.0	288.0	355.5	390.1	484.4	616.0
Domestic Growth (%)		4	4	−13	3	17	21	20	24	23	10	24	27
Exports(mill US$)	79.4	83.6	80.1	74.5	88.7	104.5	151.0	188.0	219.2	207.0	225.3	265.7	307.4
Export Growth (%)		5	−4	−7	19	18	44	25	17	−6	9	18	16
Total Sales (mill US$)	222.1	231.5	233.3	207.6	225.5	264.6	344.0	420.0	507.2	562.5	615.4	750.1	923.4
Total Growth (%)		4	1	−11	9	17	30	22	21	11	9	22	23

Source: CUTI, Informe Anual del Sector TI, 2014

a/Biannual growth rate

The value of exports increased by 12 percent annually between 2004 and 2014. However, as the domestic market has expanded, exports as a percentage of total sales have fallen. (If ANTEL's sales are disregarded—IT infrastructure being a domestically oriented activity—the percentage of foreign sales rises significantly.) Half of foreign sales of horizontal software come from subsidiaries abroad (Table 21). Export is growing steadily, with increasing employment. Within Uruguay's ICT industry (not including non-ICT specific ICTES), most firms provide IT services or horizontal application software. In 2014, 30 firms exported more than US$5 million and accounted for 78 percent of total sales. Another 60 firms exported between US$1 million and US$5 million. The remaining 68 percent of firms exported less than US$1 million, accounting for just 6.4 percent of total output.

TABLE 21. **Total Sales 2014 (US$, millions)**

	Domestic sales	Exports	Sales from subsidiaries abroad
Horizontal	155	33	33
Vertical	68	72	8
IT Services	138	118	15
IT Infrastructure	169	3	0
TOTAL	530	226	56

Note: ICT only (does not include ICTES)

Source: Own elaboration, based on CUTI (2015)

The initial service partnership with the first wave of FDI in the financial and distribution sectors fostered the entry in regional export markets. As multinational clients have consolidated their operations throughout Latin America, they have brought with them their Uruguayan software services providers. At the same time, Uruguay has been able to ride the wave of global business services offshoring and attract key players in the industry (such as TATA Consulting and others), exporting up to US$1 billion in 2013. The availability of a skilled workforce, relatively low capital investments, good communications infrastructure, and an overall good investment climate largely explain the location decisions of foreign investors. The export dynamism of ICT/ICTES is mostly attributable to the growth of the software and global business services industries over the last decade. Both industries have endowment requirements, cost structures, global industry dynamics, business models, and both 'soft' and 'hard' infrastructure needs that are compatible with the 'small' and 'remote' characteristics of the country. During the period 2004–2011, their value added exports grew at 17 percent per year and accounted for 5.4 percent of domestic value added embedded in Uruguayan exports in 2011.

Latin America is Uruguay's principal export region, accounting for about 60 percent of global sales, although with 23 percent of sales, the USA is the country to which Uruguay exports the most (Table 22). Within Latin America, Brazil is Uruguay's highest export destination. Although Argentina does not rank highly as a direct importer, when sales of subsidiaries are considered, its significance rises. Some medium sized firm exports exclusively to this market. Europe is not a major export destination for Uruguayan ICT/ICTES firms, with difference in time zones and Eastern Europe's increasing competitiveness as strong barriers to access to the European market.

TABLE 22. **Principal ICT Export Destinations, 2014**

Ranking	Country	Percent of Exports
1	USA	23.1
2	Brazil	17.4
3	Peru	9.5
4	Chile	8.0
5	Columbia	6.7
6	Paraguay	5.4
7	Argentina	5.3
8	Panama	4.4
9	Ecuador	3.2
10	Mexico	3.1

Source: CUTI (2015)
Note: ICT only (does not include ICTES)

Almost all of Uruguay's international ICT/ICTES clients are private firms. Large firms purchased the most—45 percent of sales—with 35 percent to medium and small firms and 11 percent to banks. Most clients are from the banking and finance sectors (25 percent of firms indicated that most of their sales went to banking and finance clients), followed by 14 percent to logistics and 7 percent to the agricultural industry. Just 2 percent indicated that health or education was a principal market.

Total employment in Uruguay's ICT/ICTES industry grew from around 800 at the beginning of the 1990s (González and Pittaluga, 2007) to more than 11,000 in 2013 (Table 23). Again, this is likely an underestimate due to some informality in the sector. Men are 70 percent of employees, more in higher-skilled jobs. However, the share of women in the ICT workforce is increasing in Uruguay (does not reflect employment in ICTES).

According to CINVE-CENIT (2014), the 'Computer programming, consultancy and related activities' industry (62 ISIC Rev4) had the third highest R&D expenditure to sales ratio across the industry (primary, manufacture and services). Only 'Architectural and engineering activities, technical testing and analysis' (71 ISIC Rev4) and 'Scientific research and development' (72 ISIC Rev4) were higher. The ICT industry accounted for one-third of R&D of services in Uruguay in 2009 in absolute terms (does not include ICTES). In 'Computer programming, consultancy and related activities,' R&D share of output was 2.83 percent. This was much higher than the average R&D share of output in services (0.28 percent) or manufacturing (0.14 percent).

TABLE 23. **Jobs, number of workers, and percentage growth rate, ICT sector, Uruguay, 2000-2013**

	Employment	Growth rate (%)
2000	6.786	
2001	7.126	5%
2002	7.183	1%
2003	7.629	6%
2004	8.319	9%
2005	8.879	7%
2006	9.440	6%
2007	10.000	6%
2008	11.729	17%
2009	9.1970	-22%
2010	9.355	2%
2011	10.575	13%
2013	11.200	6%

Source: Universidad Católica del Uruguay (2015)
Note: ICT only (does not include ICTES)

Uruguay XXI (2017) identifies four other types of services in the areas of ICTES that Uruguayan firms are providing. These are creative services, financial services, business services and trade.

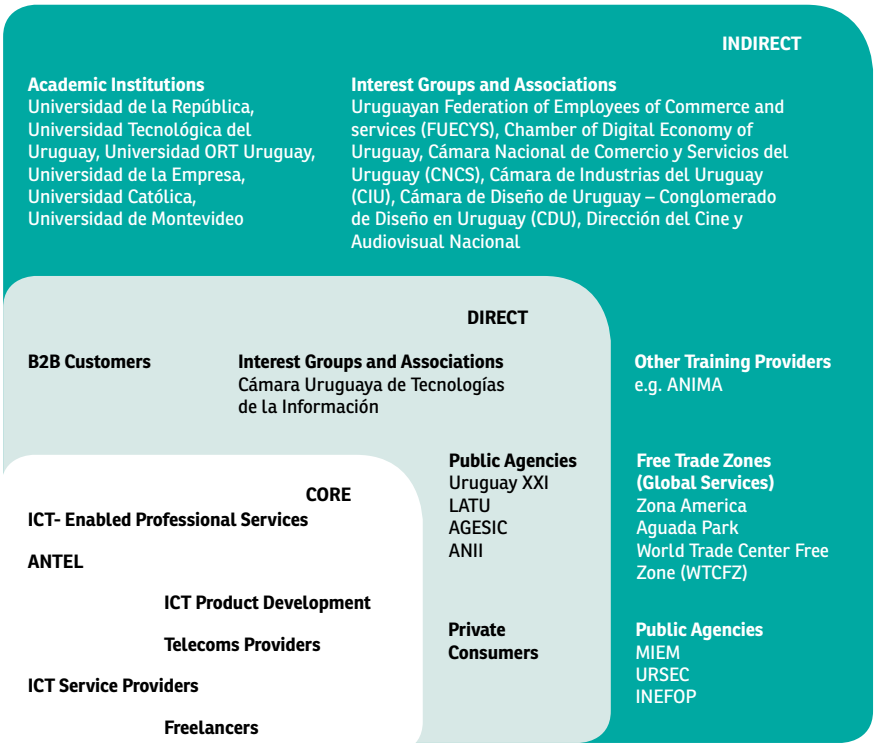
Creative services may include architectural services, engineering services and design services (including graphic design, web design and product design). Audiovisual production and post production is also included in this service area. Uruguay has approximately 1000 registered architectural studios and the estimated gross production value for both architecture and engineering combined in 2016 was approximately US$300 millon. Local demand accounted for 90% of these services, and Uruguay XXI (Uruguay XXI 2017) estimates that approximately 10% of design services are exported. Financial service provision in Uruguay includes firms providing market analysis, risk analysis and business consulting. Uruguay has a large footprint of companies providing business process outsourcing services as well as knowledge process outsourcing. These services include back-office administration (especially in the case of large multinationals with a significant presence in the country - e.g. Tata Consulting Services), as well as legal process outsourcing, accounting, business analytics. Uruguay also has a strong R&D

outsourcing capability especially in the area of medical research and biotecnics. Trading services in Urugugay typically includes commodity trading activity.

4.2. INDUSTRY STRUCTURE, STAKEHOLDER MAP, ICT/ICTES INFRASTRUCTURE, AND EDUCATION

This section provides an overview of the industry structure, main providers of ICT/ICTES infrastructure, higher education institutions and ICT/ICTES training programs, industry associations and interest groups, ICT/ICTES public support institutions and incentives

FIGURE 60 . **Stakeholder Map of Uruguay's ICT/ICTES Industry**



Source: Team's Elaboration

framework, and of the provision of shared services such as incubation or SEZs in Uruguay. A stakeholders map of the Uruguay's ICT/ICTES industry is provided in Figure 60.

Industry Structure

The Uruguayan ICT/ICTES industry includes some large firms, with more than 400 employees, and small and medium sized firms, as well as freelancers. Small companies, defined by sales volume, are the majority. In fact, in 2013, 69 percent of firms invoiced less than US$1 million, 21 percent billed between US$1 million and US$5 million, and 10 percent more than US$5 million. These larger companies generate about 60 percent of the jobs (Universidad Católica del Uruguay 2015). While national firms dominate the industry, foreign firms also have a strong presence. Foreign firms have three ways of entering the Uruguayan productive ICT/ICTES industry. Some (e.g., VeriFone) enter through acquisition. Others directly invest in 'greenfield' opportunities to take advantage of local skills, tax incentives or other advantages particular to Uruguay. In other cases, large foreign firms use Uruguay to provide themselves (and others) with offshore services. Examples include IBM del Uruguay, providing back office and IT services, Oracle in association with Quanam, and Microsoft in association with Infocorp. In 2010, this global offshore services industry accounted for US$252 billion in revenues and employed more than 4 million people, mostly in developing countries (Fernandez-Stark, Bamber and Gereffi 2011).

ICT/ICTES Infrastructure

At the crossroads of public and private interest, ANTEL, Uruguay's giant state-owned telecommunication firm, plays a defining role in the sector's development. ANTEL has a monopoly on most ICT/ICTES infrastructure in Uruguay, except for mobile telephony (not including data), wireless services, and cable television. Thus, ANTEL exclusively supplies Uruguay's homes and businesses with fixed telephone lines, Internet over landline (ADSL), broadcast television over landline, Internet and telephone services over coax cable, and Internet, television, and broadcast television over fiber optic cable. There is some competition in the provision of mobile phone services. Despite the risks that ANTEL's monopolistic position poses to quality of service, consumers and clients appear to be consistently happy with ANTEL's services. Internet penetration in Uruguay in 2014 was 50.1 percent, among the highest in the region (Universidad Católica del Uruguay 2015). In 2011, ANTEL launched a strong campaign to equip and position Uruguay as the first Latin American country to provide 4G / LTE broadband to all households. In 2016, 95 percent of the Montevideo metropolitan area and 82 percent of the total population of the country have permanent access to 4G / LTE. Also in 2016, ANTEL completed construction of a new data center with state-of-the-art technological specifications. This hub will be used both for data storage of local firms and for regional business of international firms. The investment also complements ANTEL's recent investment in

two submarine cables, one linking Maldonado, Uruguay with Santos, Brazil and another linking Santos, Brazil with Miami, USA. The latter, a connection to Google's "Monet" submarine cable, provides more efficient and secure transmission between Uruguay, Brazil, and the United States (Universidad Católica del Uruguay 2015). These investments should position Uruguay as regional provider of ICT/ICTES infrastructure rather than a net importer. The investments will also likely attract firms with needs for high-technical specifications infrastructure (e.g., Google, Netflix, Disney, or BBC).

Education and Human Resource Development

Although all six universities offer courses in formation for the ICT/ICTES industry, most professionals graduate from *Universidad de la República* (a public university) or *Universidad ORT* (a private university) across all qualification classes. While a course in Systems Engineering requires five years of study, Uruguay's academic institutions have begun to offer shorter courses in response to the flexibility demanded by the industry and the differing profiles of students wishing to enter the sector. As a result, all six institutions offer two-year courses (e.g., in programming and basic computation), three-year courses (e.g., analyst in computation and systems), four-year courses (full degree in systems and computation), and five-year courses (engineering in systems and computation).

In recent years, the *Universidad de la República* and the technical *Universidad del Trabajo del Uruguay* launched several three-year courses in IT in medium size cities outside Montevideo. The recently created *Universidad Tecnológica del Uruguay* (UTEC) also launched a two-year course in Technical in IT outside Montevideo.

Outside traditional tertiary academic institutions, there have been several other initiatives to expand the potential ICT/ICTES labor force. *Anima* offers a technological baccalaureate in business and IT that focuses on young people from low-income families and aims to enhance their employability. *Anima* uses a dual educational system that integrates class-based teaching with internships and apprenticeships. In other cases, private firms have their own training initiatives. As an example, Bantotal, a provider of banking and finance specific software, recruits and trains software developers in Guichon, a small town 375 kilometers northwest Montevideo, and Casavalle, one of the poorest neighborhoods in Montevideo. As an illustration of collaboration between public and private sector entities, the Software Testing Center (CES), a private firm that provides testing services to the software industry, is a joint venture between CUTI, the Faculty of Engineering of *Universidad de la República,* and *Fundación Ricaldoni*.

Despite these educational opportunities, 82 percent of ICT firms (does not include ICTES) in Uruguay disagree or strongly disagree when asked whether they can easily find employees with the skills that they need (Universidad Católica del Uruguay 2015). Moreover, the difficulty with finding the right workers is not limited to issues with the educational system. Some 47 percent of ICT firms agree or strongly agree that labor mar-

ket regulations (such as hiring, firing, and hours of work) in Uruguay are very restrictive (Universidad Católica del Uruguay 2015). Indeed, ICT firms in Uruguay perceive that the biggest obstacles facing the sector are (1) labor costs and regulations, and (2) the availability of an educated labor force. They also rank the quality of human capital and universities committed to the needs of the sector as the factors most important to the development of the sector (Universidad Católica del Uruguay 2015).

Associations and Interest Groups

La Cámara Uruguaya de Tecnologías de la Información (CUTI) is an industry association for the Uruguayan ICT sector. Founded in 1989 as the Uruguay Software Chamber, it was later renamed. Although three associations of chambers exist in Uruguay, representing the 'services', 'agribusiness' and 'manufacturing' sectors, CUTI is not a member of any of the three. In centralized negotiation of IT branch of Councils of Wages, CUTI represents the private sector.

In 2015, CUTI supported the launching of the Chamber of Digital Economy of Uruguay (CEDU). This organization comprises of firms dedicated to e-commerce. The association includes regulators, IT service provider, online payment service providers, couriers, financial institutions, online advertising companies, retailers, and developers. The objective of the association is to promote the good use of the technology in online and digital transactions. Despite being relatively unknown, its relevance could be growing at a time when the government is under a lot of pressure to regulate emerging ICT-enabled services in 'traditional' industries such as retail, transport and accommodation (e.g., Uber and Airbnb).

ICT workers do not have their own dedicated trade union. In centralized negotiation of Councils of Wages, the Uruguayan Federation of Employees of Commerce and Services (FUECYS)—belonging to *Plenario Intersindical de Trabajadores–Convención Nacional de Trabajadores* (PIT-CNT)—represents them in a general way. Due to lack of unemployment in the sector, labor conditions are favorable. However, one major concern is that competition for labor not only occurs between domestic and locally-situated foreign firms but also with foreign firms that hire labor offshore and who need not comply with the same labor requirements as the first two groups.

In the area of ICTES, the *Cámara de Diseño de Uruguay - Conglomerado de Diseño en Uruguay* (CDU) has as its mission to promote and strengthen the development of the country's design sector, through the promotion of sustainable competitiveness and a strategic positioning of Uruguayan production, culture and identity, contributing to the local development of the country (CDU 2017). Similarly, the *Dirección del Cine y Audiovisial Nacional* (ICAU) is a public organization in charge of designing the National Policies of the audiovisual sector of Uruguay. Since its inception in 2008, it has designed its strategy working together with the public and private sector, combining direct and indirect management mechanisms, both local and international (ICAU 2017).

Shared Services

Many firms in the Uruguayan sector locate themselves in 'free zones' to take advantage of shared services. There are three free zones in Montevideo particularly focused on infrastructure for ICT and ICT-enabled services. The biggest and oldest is Zonamerica, located 10 minutes from International Airport. More recently, Aguada Park and World Trade Center Free Zone (WTCFZ) also host international firms. Aguada Park is more oriented toward bigger projects and hosts some global firms such as Globant or Mercado Libre. WTCFZ hosts trading and finance firms. Free Zones have proven very valuable to firms that will pay a premium for reduced local administration. Despite there being no tax advantages for exports, the legal status, infrastructure, and environment of free zones are also highly appreciated among the firms.

For smaller firms, other collaborative spaces exist including new 'cowork' offices, where start-ups and entrepreneurs can rent desks and work in a collaborative fashion. Examples include Cowork, Sinergia, and Espacio Serratosa, in different parts of the city.

Incubation

Regarding incubation, *Ingenio* has strong experience in Uruguay. Arising from a BID FOMIN project (which included *Laboratorio Tecnológico del Uruguay* (LATU) and ORT University as partners), *Ingenio* has incubated over 200 start-ups and had focused on ICT products and services in recent years. LATU wholly finances *Ingenio* although successful projects also remit some earnings in their first two years following successful graduation from the program. *Ingenio* provides firms in incubation with an office, basic infrastructure, and advice on several aspects of business activity. The incubator also hosts the 'Softlandings Uruguay' program, a program that supports and finances foreign entrepreneurs wishing to start a business in Uruguay.

All six universities provide incubation for start-ups arising from taught courses and research-based work. This includes physical spaces and 'virtual' rooms where entrepreneurs can receive advice and guidance. Probably the most successful has been the *Centro de Innovación y Emprendimientos* of University ORT. According to its own promotional material, the center has supported 80 percent of Uruguay start-ups.

4.2.1. Public Institutions Supporting ICT/ICTES and Incentives Framework

Although the IT industry grew organically in its earlier stages of development, several public institutions now focus on the IT industry. Uruguay XXI, Uruguay's export promotion agency, created the Global Services Program in 2012 with the support of the Inter-American Development Bank (IDB). One branch of the program focuses on the IT industry. The program includes the Smart Talent project, dedicated to linking demand

and supply in the labor market, and Finishing School programs, which enable fast acquisition of soft or technical skills for workers of a firm. An overview of the investment promotion and export incentives that are available to firms in the ICT/ICTES industry in Uruguay is provided in Box 8.

BOX 8. INVESTMENT PROMOTION AND EXPORT INCENTIVES IN URUGUAY

National and foreign investment promotion

Uruguay is very attractive compared with other countries that receive investments from the rest of the world, and for several years now, it has had an active policy to promote investments in the country.

Law 16/906 (1998) declared of national interest the promotion and protection of domestic and foreign investments. One of its main features is that foreign investors have the same incentives as local investors and there is no tax discrimination or restrictions for transferring profits abroad.

Decrees 455/007 and 002/012 updated the regulations. For investment projects in any sector of activity submitted and promoted by the Executive Branch, it is possible to compute as part of the tax payment (IRAE–Corporate Income Tax) between 20 percent and 100 percent of the invested amount, depending on the type of project and the score attained based on a matrix of indicators. The IRAE nationwide flat rate is 25 percent. Personal property included in fixed assets and civil works is exempt from the Net Wealth Tax, and the Value Added Tax is recovered from the purchase of materials and services for civil works. Moreover, the import of personal property included in fixed assets that is not competitive in the national industry is exempt from import taxes or duties.

Government incentives to exports

Reimbursement of VAT paid for the purchase of supplies

Firms generally recover VAT paid in purchases by discounting VAT invoiced in sales, paying the state just the difference. Because VAT is not invoiced in exports (of goods and services), the reimbursement of VAT included in the purchase of materials is authorized directly upon the company's request. The Tax Administration Office (DGI) issues credit certificates that firms may use to pay other taxes.

Decree No. 220/998 lists the transactions covered by the concept of services exports. Some examples are:

- International broadcasting of television material produced in the country
- Logistics support services to international cinema and TV production companies
- Consultancy services provided to people abroad
- Services rendered to people abroad in the design, development and implementation of specific logistics support
- Services rendered by international call centers provided that their main activity is destined for the external market and aimed at such
- Data processing
- Services provided for the design, development and implementation of digital contents
- Market and social research services
- Advertising services rendered by advertising agencies to customers overseas

Law on Free Trade Zones

Law No. 15,921 of December 17, 1987 regulates free zones in Uruguay. They can be operated on a private or state basis. The General Trade Office–Free Zone Area, Ministry of Economy and Finances administers, monitors and controls Free zones under private operation. This office is the main point of contact for all the regulations, permits, and controls regarding free zones in the country. As for state operated free zones, this is the area in charge of their management. Free zones can operate trade, industrial, or service activities. Moreover, companies in free zones can provide services to other countries and, in some cases, to Uruguay. The industrial activity may not only involve added value but also change in the nature of goods.

Businesses authorized to operate from free zones may be natural or legal persons under any company form. As for legal persons, there are no restrictions on their form but they need to have an exclusive purpose. There is no distinction between domestic or foreign investments, and the latter are not required to meet any special process or requirement. Foreign companies can set up branches. Up to 25% of their staff can be foreign.

Firms can keep goods in the free zones indefinitely and change their destination at any time.

Benefits granted to companies set up in free zones include:

- Exemption from Corporate Income Tax (IRAE), Wealth Tax (IP) and any other current or future domestic tax. The state is the guarantor of this exemption.
- Dividends distributed among shareholders domiciled abroad are also tax-exempt in our country.

- Foreign staff may be exempt from making social security contributions in Uruguay.
- Sales and purchases of goods and services to and from abroad are VAT exempt. Sales and provision of services within ZF are also VAT exempt.
- Non-resident entities are also IRAE exempt regarding activities developed with foreign goods declared in transit or kept within Free Zone, when they are not bound for the national customs territory. They are also IRAE exempt when sales bound for the national territory do not exceed 5% of the total disposals of goods in transit or kept within Free Zone.
- Goods traded by Free Zones with the rest of the world are exempt from customs duties.

In 2000, the government declared the production and trading of software and the provision of IT consultancy services exempt from certain taxes. However, in 2007, the administration revised the exemption to apply only to foreign sales. As of 2014, 86 percent of ICT firms felt that the tax system in Uruguay does not encourage investments (Universidad Católica del Uruguay 2015) (does not include ICTES).

The Agency for the Development of Electronic Government and the knowledge society (AGESIC) advises on ICT/ICTES-related affairs. The agency also promotes the use of ICT in the provision of public services, as well as dictating norms, standards and technical procedures in ICT matters on behalf of the date, including e-government. AGESIC also represents Uruguay in international organizations related to ICT. In recent years, due to investment but also due to a better promotion of results, Uruguay has ranked first in Latin America across several widely used indicators, including the ICT development index 2015 and the Netindex download speed test of OOKLA.

The Ministry of Industry, Energy, and Mining (MIEM), through the Directorate of Telecommunications and Industry also works on ICT sector policy. MIEM also coordinates the Information Technologies Sectoral Council.

The National Agency for Research and Innovation (ANII) is a public institution that promotes innovation and entrepreneurship in Uruguay and finances research and innovation projects. It sponsored the creation of six innovation centers. One of them, ICT4V, created in 2015, is devoted to promoting ICT-led innovation in health, agriculture, banking, and energy, among other sectors. ICT4V is an open partnership between private companies, universities, research centers, and public agencies.

The One Laptop per Child Project (*Plan Ceibal*) is an initiative promoted by the Uruguayan government in 2007. The program aims to "promote digital inclusion and reduce the digital gap... between Uruguay and other countries, as well as among Uruguayan

citizens, so as to enable a larger and better access to education and culture" (Uruguay Smart Services 2014). The program's main objective is to provide every child and every teacher in Uruguay's public elementary schools and junior high schools with free access to laptops to reduce the digital and knowledge gap of the country.

4.3. GLOBAL TRENDS SHAPING THE ICT/ICTES INDUSTRY AND STRATEGIC SEGMENTATION OF THE ICT/ICTES GLOBAL VALUE CHAIN

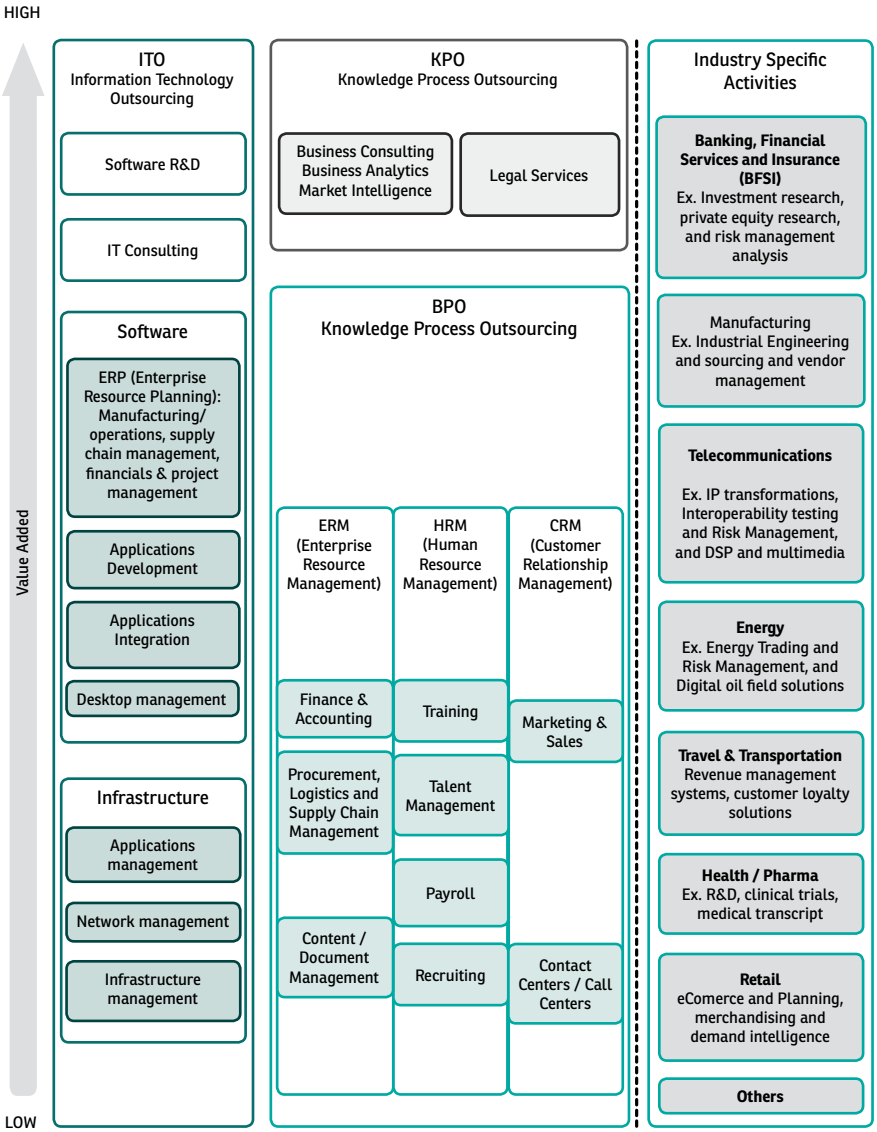
4.3.1. Trends Affecting Value Chain Structure in ICT/ICTES

This section broadly outlines industry dynamics and trends that affect value chain structure in ICT/ICTES. It focuses on trends related to global supply (including sources of comparative advantage in dominant countries and regions and firm-level response to changing demand), evolution in demand (including geographical evolution and adaptations in products and services), and changes in industry and firm-level structure (for example, localization, specialization, and integration among firms). This report follows the classification of the ICT/ICTES value chain and services developed by Fernandez-Stark, Bamber, and Gereffi (2011), presented in Figure 61. There are three broad types of general business services—ICT/ICTES services that can be provided across all industries: (1) information technology outsourcing (ITO), (2) business process outsourcing (BPO), and (3) knowledge process outsourcing (KPO). A second categorization refers to services that are industry specific, which must have industry-specific expertise and may have limited applicability in other industries. For general business services, all activities relate to supporting generic business functions, such as network management, application integration, payroll, call centers, accounting, and human resources (BPO). In addition, they include higher-value services, such as market intelligence, business analytics, and legal services (KPO). Within these services, ITO contains a full spectrum of low- middle- and high-value activities of the value chain. BPO activities are in the low and middle segments, while KPO activities are in the highest-value segment of the chain. Because human capital is the prominent determinant of value creation and growth in the ICT/ICTES industry, the level of value added brought by the various services provided by the industry strongly correlates with the skills and work experience of the workforce.

Overall, five trends and industry dynamics are shaping the structure and evolution of the ICT industry globally:

- Soaring global demand—estimated at US$755 billion with a strong 14 percent growth rate on emerging markets, as compared to 4.9 percent globally—makes entry in the industry particularly attractive.

FIGURE 61. **The ICT/ICTES Industry GVC and Type of Services**



Source: Fernandez-Stark, Bamber, and Gereffi (2011)

- Accelerating technological progress and rapid diffusion of innovation make the competitive landscape extremely dynamic and open to the continued reconfiguration of strategic segments in ICT.
- The constantly shifting technological frontier demands continuous investment in innovation and changes to business models, cost structures, and power relations within value chains.
- Global players and incumbent firms in ICT need to strike a fine balance between keeping up with the technological frontier and ensuring they do not outpace the absorption capabilities of their customer base, especially in the business to business (B2B) market segment.
- Innovation-by-acquisition of startups has emerged as the main innovation strategy for technology giants to minimize innovation risks and acquire the proprietary technology developed by nimble and emerging competitors.

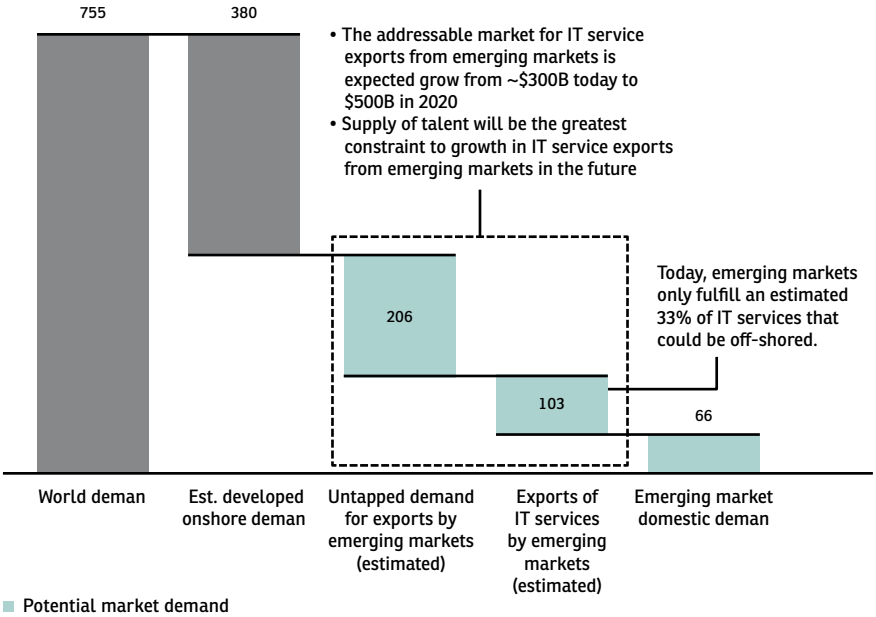
A deeper analysis of the global ICT/ICTES industry points to the emergence of market dynamics and firm-level behaviors that affect value chain structure. The following sections discuss these trends in more detail.

ICT/ICTES can rely on a large and growing market. The market for ICTES alone is estimated at US$755 billion with high emerging market growth (14 percent) compared to global growth (4.9 percent). Approximately US$170–200 billion is in emerging markets (Figure 62), with Brazil, India, China, and Russia accounting for half of it. Increased exports to developed markets (estimated at US$219 billion in 2015) and a growing domestic demand in emerging markets (up to US$112 billion in 2015) driven by business growth and increased sophistication of final users, propel growth.

With growth come jobs, which in ICT/ICTES industries are expected to (1) grow at 2-3 times the growth rate for other global non-farm jobs, (2) be highly skilled jobs (for example, software services accounts for 50 percent of ICT employment but 65 percent of ICT-related taxes), and (3) promote gender equality. (For example, women constitute 45 percent of the workforce for IT-BPO in India, and about 26 percent of female Indian IT-BPO workers are the primary wage earners in their households.)

A cursory overview of the regional dynamics of the ICT/ICTES industry in emerging markets (Figure 63) shows that Brazil leads Latin America in terms of new technology trends with a strong domestic ITO/BPO industry. Major firms in large cities have also invested in cloud computing capabilities. Similarly, Colombia has a growing ITO export sector, with Peru following suit. Russia and Ukraine play leading roles in Eastern Europe and Central Asia as well as globally, with a large domestic ITO/BPO market in Russia enabled by a deep ICT talent pool, and export-focused BPO and advanced ITO & KPO services in Ukraine supported as well by a sizable proficient workforce. India remains the ICT/ICTES powerhouse in South Asia, with its extensive highly skilled talent pool. Bangladesh follows. Its

FIGURE 62. **Global Market for the ICT/ICTES Industry (US$, billions)**



Source: Team elaborations based on IFC's IT/ICTES Strategy (2012).

public sector's openness to automation is driving momentum in developing e-services and e-government. Morocco and Tunisia witness the emergence of a government-supported BPO/ITO industry in the Middle East and North Africa, while the low ICT infrastructure development in Africa does not support the emerging technology trends.

A cursory overview of the key firms in Latin America shows that the presence of ICT/ICTES providers in Latin America and the Caribbean (LAC) reflects varied histories and distinct differentiators. *Global service providers* (such as IBM, HP, Accenture, and Capgemini) have enormous brand recognition with deep client relationships and the ability to deliver end-to-end solutions in complex environments. *Mid-size foreign providers* (such as Wipro, Tata, and Infosys) often have key niche specializations but have limited to moderate presence in the region to date. *Latin providers* (such as Stefanini, Tivit, and Sonda) have a smaller scale but local knowledge, client relationships, and domain expertise.

The emerging technological trends that drive the growth of ICT/ICTES include remote infrastructure management (RIM), big data analytics, cloud computing, and mobile appli-

FIGURE 63. **Regional ICT/ICTES Trends in Emerging Markets**

ECA
- Large domestic ITO/BPO market in **Russia** enabled by deep talent pool
- Skilled talent for export focused BPO and advanced ITO & KPO services in **Ukraine**, **Romania**
- Emerging ITO potential in **Belarus**

ASIA
- IT small-cap software services in **Indonesia**, **Vietnam**, **Bangladesh**
- Export focus on Japan, Europe, NA
- Emergence of mobile, e-government
- Large, competitive market in **China**
- Growth led by BPO (24%) in **India**

LAC
- Strong domestic ITO/BPO sector in **Brazil**, emerging Cloud capabilities
- Growing ITO export sector in **Colombia** with government backing
- Emerging small-cap ITO sector in **Peru**, with export potential

SSA
- Rising local ITO markets in **Kenya** and **Nigeria**, constrained by infrastructure
- Captive and export focused market in **South Africa**, with potential south-south expansion

MENA
- Government supported BPO/ITO to French Europe (**Morocco, Tunisia**)
- Emerging ITO software services in **Pakistan** with south-south and NA exports
- ITO sofware sector in **Turkey** with some BPO, mainly domestic

Source: Team elaborations based on IFC's IT/ICTES Strategy (2012).

cations. *RIM* involves managing infrastructure (such as desktop computers, data centers, networks, and security) using tools that allow personnel to be physically separate from the infrastructure. *Big Data* relates to the use of new technical architectures and analytics to enable insights on large data at a scale, distribution, diversity, or timeliness that unlock novel sources of value. *Cloud computing* is delivery of computing as a service (often "metered") as opposed to a product. Categories include Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). *Mobile applications* are software applications downloaded on mobile devices to increase productivity (e.g., email, calendar, and database) or simply for entertainment (e.g., games, music). The emergence of these technological trends enables ICT/ICTES firms to identify and serve new consumer preferences and corporate needs and create additional value and business models as summarized in Table 24.

At the same time, the emergence of these technological trends contributes to the constant redesign of the structure of the value chain of the firms that adopt them and plan to build their business models around them. In particular, to leverage the positive effects of all four technological trends, firms need to reassess their cost structures and invest in three critical inputs:

TABLE 24. **Emerging ICT/ICTES Technologies and Value Drivers for Business**

Emerging Technology Trends	Description	Value Added Drivers (for final business clients)
Big Data Analytics	Big data is the data, scale, distribution, diversity, and/ or timeliness of which require the use of new technical architectures and analytics to enable insights that unlock new sources of value	Greater data availability Enable experimentation to discover needs & improve performance Segment populations for marketing & product service/deliver Support decision making with automated algorithms Innovate new business models, products & services
Cloud Computing	Delivery of computing as a service (often "metered") as opposed to a product. Categories include Infrastructure (IaaS), Platform (PaaS), and Software as a Service (SaaS)	Multi-tenancy offers scale to SMEs and could lower cost Pay as you go pricing limits up-front investment required For providers: allows non-linear revenue to employee growth
Remote Infrastructure Management	Remote management of infrastructure such as desktop, Data Center, network & security utilizing tools that allow personnel to be physically separate from the infrastructure	Cost reduction in IT dept. 24x7 high talent support leading to better/faster problem resolution For providers: allows "asset-light" way of selling infrastructure services
Mobile Applications	Software applications downloaded on mobile devices to increase productivity (e.g., email, calendar, database) or simply for entertainment (e.g., games, music)	Increase of productivity Access to new customer groups and to new uses cases Combining multiple trends simultaneously (mobile, social, local) Constant access for users

Source: Team elaborations based on IFC's IT/ICTES Strategy (2012).

1. **The first critical input is ICT infrastructure.** All four technologies need highly-developed infrastructure and hardware, such as storage space for large amounts of data and powerful servers for real-time computing and increasing number of users/traffic. ICT firms can either in-source or outsource infrastructure requirements depending on the availability of reliable third-party providers and on the soundness of their balance sheet.
2. **The second critical input is a large and qualified workforce.** Skilled and innovative talent is critical to develop the technology, but also in terms of R&D to find creative technology uses, and profitable business models.

3. **The third critical input is access to finance structured around the needs of the emerging business models dictated by the new technologies.** For instance, an ICT firm will need working capital to pay for talent as well as infrastructure cloud services if the ICT firm outsources them. Alternatively, an ICT firm will require more tailored infrastructure financing instruments if it manages large ICT infrastructure in-house.

The technological trends presented above are non-exhaustive and exemplify the exponential technological change in the ICT/ICTES industry, at a rate that will likely continue to double every decade. Accelerating technological progress and rapid diffusion of innovation make the competitive landscape extremely dynamic and open to the continued reconfiguration of strategic segments in ICT/ICTES. The constantly shifting technological frontier demands continuous investment in innovation and changes to business models, cost structures, and power relations within value chains. At the same time, global firms and incumbents in ICT/ICTES need to strike a fine balance between keeping up with the technological frontier and ensuring they do not outpace the absorption capabilities of their customers, especially in the business to business (B2B) market segment. Innovation-by-acquisition of startups has emerged as the main innovation strategy for technology giants to minimize innovation risks and acquire the proprietary technology developed by nimble and emerging competitors.

The global demand and technological trends of the ICT/ICTES industry highlighted in the text above contribute to the emergence of recurring competitive strategies, business models, and market behaviors that we can broadly characterize as follows:

4.3.1.1. Winner-Takes-All (1)—Demand

"Winner-Takes-All Demand" markets are those in which top performers capture a disproportionate share of rewards, leaving competitors with little market share to contest. Recent trends in consumer applications and software suggest this market (a large part of the ICT/ICTES market) cannot sustain significant competition. Instead, the consumer technology industry has started to 'relay' market share. New entrants replace incumbents to acquire, quickly, a monopoly in a specialized new product or service. The new entrants are then replaced themselves by a new wave of entrants. New innovators repeatedly surpass and supersede predecessors only to themselves become monopolists, rather than continuously fighting for market share in the same space (as PepsiCo and Coca-Cola have done since the 1960s).

Products or services that improve with use amplify the winner-takes-all dynamic. For instance, Google provides faster and more relevant search results as more consumers use its search engine. (The company's search heuristics triangulate relevance

through quantity of searches, location, time of day, recent news, and information gleaned from its email, calendar, and other applications.) Concurrently, the faster and more relevant the search results become, the more likely consumers are to use Google. Network effects that drive up the value of the product or service as more users adopt it—that is, when the utility of the product or service itself improves with the quantity of people that use it—amplify winner-takes-all effects further. For example, an increase in the number of drivers providing transportation using the ride-sharing service Uber encourages an increase in the number of clients, which encourages an increase in the number of drivers. Similarly, as more people in an individual's network use social networking site Facebook, the more reason that individual has to use Facebook. Messaging application WhatsApp becomes more useful to an individual as others in their social network download and use the application.

The winner-takes-all demand market is inherently risky for value chain stakeholders. Strong network effects create natural monopolies that inevitably crowd out competition. They may be responsible for the decrease in the number of start-ups and declining dynamism among U.S. businesses (Smith 2016). For software and consumer applications, switching costs are very low, making ventures with high development capital expenditures riskier.

4.3.1.2. Winner-Takes-All (2)—Supply

"Winner-Takes-All Supply" markets are those in which top performers capture a disproportionate share of productive resources in a given location, leaving competitors with comparatively few resources to distribute among themselves. In ICT/ICTES, in which available talent is a significant driver of competitiveness, human capital is a scarce resource. Therefore, in any ICT/ICTES cluster there will be a critical balance between firm size, firm attractiveness, number of firms, and number of employees. Outside this equilibrium, the growth of a few firms may cannibalize the growth of other firms in the same cluster.

If the size of the talent pool increases proportionally to the needs of firms, then human capital is not 'scarce.' Enough workers are attracted to support cluster growth (number of firms) and firm growth (number of employees). However, when the number of workers cannot grow to match cluster growth or firm growth, cannibalization may occur. A firm in the cluster with an unlimited capacity to absorb good talent exacerbates the effect. Silicon Valley now approximates this scenario.

When human capital is scarce, the talent 'feed' becomes more important. This extra emphasis might increase the status and role of local training and academic institutions. Alternatively, firms might streamline their hiring mechanisms. As companies compete for the best workers, the bargaining power of workers rises, as does their remuneration.

4.3.1.3. Scalability of Products vs Scalability of Services

In ICT/ICTES, two of the most common business models involve (1) firms billing clients for time-bound *services* or (2) firms developing *products* (or suites of products), then selling them through traditional marketing and distribution channels.

ICT/ICTES *product* development costs have traditionally been high. Desktop programs were expected to perform across several (if not 'all') desktop devices, no matter the make or model, and consumers expected desktop software to interface with older programs built using old code protocols (e.g., MS Excel 2003) no matter the specification of their devices (e.g., screen size, processor speed, storage capacity or memory). As a result, desktop software development typically required high capital investment and large development teams.

Services have been notable for their 'pay as you grow' profile. Service providers (e.g., engineering services, software programming outsourcing) can hire more workers as their client base grows. This lowers the initial capital requirement and the barriers to entry. In theory, service providers can continuously scale their business to serve more clients for if they can hire staff to serve those clients. A typical 'services' business model may therefore rely on comparatively low fixed costs and very high variable costs.

However, the decreasing production costs and almost non-existent marginal costs for software development have blurred the barriers between ICT/ICTES products and services and increased the scalability of both business models. As attractive as the services business model might seem, ICT/ICTES product development has traditionally been a much more scalable business, mostly due to decreasing production costs and the fact that marginal costs (the costs of producing one more unit) are extremely low. With the rise of mobile applications and devices, software suites and software developer kits like Apple Developer Tools and Android SDK have further lowered the barriers to entry for software development by providing 'simple' and lightweight programming languages for programmers to use. Distribution and market-access was previously another cost driver in product development. Programmers and software developers traditionally relied on publishers to market and distribute their software using physical digital storage media (e.g., CDs and DVDs). This required a significant investment in branding, marketing, producing, and holding physical stock without knowing how successful the software (video game, office tool) would be. More recently, however, publishers have become able to distribute even complex media content using Internet-based digital distribution platforms (e.g., Steam, Amazon Digital Services, and GamersGate). Additionally, the increased availability of 'modular' app back-end features and functions (e.g., database provision, push notifications, and email software) has given even very small-scale developers the power to publish very sophisticated applications. Servers and bandwidth to distribute products typically have 'pay-as-you-grow' pricing models

and are also exponentially decreasing in cost (according to Gilder's Law and Less' law), further reducing marginal production and distribution costs.

In sum, low initial capital requirements, the introduction of "pay-as-you-grow" pricing mechanisms for the use of ICT infrastructure, and reliance on Internet-based marketing and distribution channels have converged into lowering entry barriers and enabling firms to continuously grow their operations as long as a skilled workforce is available. At the same time, a scalable business model is sustainable only until when a product/service gains significant market penetration on international markets. Once that threshold is passed, fixed investments in branding, customer service, and other key marketing and administrative functions come back into play. While the production and distribution costs of product development in ICT/ICTES (particularly as it relates to software) is decreasing, once a product crosses a certain threshold (in market penetration) the software's use must be supported by human-resource-heavy activities. Outside of software engineering, hardware engineering and design, product adoption growth must be supported by marketing functions, project management, customer services and support, administrative functions, finance, human resource management and recruitment teams, legal teams, operations teams, and a sales force.

4.3.1.4. Cybersecurity Risks to Cloud-Computing

Cybersecurity risks generally fall into one of two categories: those emanating from within the contracting parties to the outsourcing relationship and those from outside.

Outsider threats pertain to penetration of communications channels between the procuring company and the service provider. As firms outsource or offshore their business processes, they become more dependent on more vulnerable, publicly run communications networks. These general-purpose public communication networks may be more vulnerable to penetration by outsiders. They are typically beyond the control of either party and often not encrypted. Several incentives may motivate perpetrators, including industrial espionage, mischief, cyberterrorism, or activism.

Insider threats emanate from the increasing number of individuals and entities with legitimate access to a firm's data. By increasing the number of individuals and entities with legitimate access to its data, a firm increases the likelihood of its misuse, sabotage, or outright theft by malicious insiders. Malicious insiders have the potential to cause damage more cheaply and more quickly than outsiders. They have privileged access to facilities and information and may know how, when and where to attack and how best to disguise their activity.

Consequences of a cybersecurity breach may include the introduction of viruses and denial of service attacks as well the theft of proprietary or confidential information. These considerations are relevant both for business process outsourcing, where

the risks are primarily loss of privacy or fraud, and for knowledge process outsourcing, where they pertain more to loss of intellectual property. Security breaches are also likely to be of particular concern with regard to freelance employees (who may not have sufficient legal or organizational structures to give the contracting party comfort), which may constrain the type of work that firms can outsource to these types of contractors.

Cybersecurity measures typically include confidentiality and security agreements linked to outsourcing contracts, certification of background checks on potential vendor employees, the appointment of security and legal teams to train employees, and continuous internal and external auditing. Contracts may also prohibit service providers from indirect third-party outsourcing without explicit approval from the procurer. Other technical precautions for maintaining data security are common, including: keeping databases on servers in the procuring countries, to make it easier to isolate an abusive or derelict provider; allowing access to data on a one-record-at-a-time basis and only as needed; and ensuring that data is encrypted both at rest and in transit.

In offshoring and cloud computing, variations in the degree of legal protection and enforcement capacity compound the inherent complexity of a network business model. Countries attracting or already hosting offshore service providers have focused on their privacy laws, particularly (i) ensuring that local privacy laws apply equally to foreign citizens and entities whose data is stored in the local jurisdiction and (ii) creating a mechanism whereby local firms can recognize and make enforceable the laws of the procuring country.

4.3.1.5. Automation of Non-Routine, Complex, "Intelligent" Tasks

Automation is no longer confined to routine manufacturing tasks. It also applies to other routine cognitive tasks, particularly those in business process administrative support functions. Google's autonomous cars are one example of how manual tasks in transport and logistics may soon be automated. Estimates based on U.S. labor market job definitions suggest that as much as 47 percent of U.S. employment is highly susceptible to automation, meaning it may be lost in the next decade or two (Frey and Osborne 2013).

Advances in artificial intelligence, machine learning, and natural user interfaces (e.g., voice recognition) are making it possible to automate many knowledge tasks. This includes tasks that were previously impossible or impractical for machines to perform, even those that cannot be easily structured or codified (McKinsey Global Institute 2013). Two types of tasks appear relatively resistant to computerization: (1) those involving abstract, creative, or problem-solving cognitive skills and (2) those requiring flexible interpersonal communication or empathy. However, the boundary between what can and cannot be automated is shifting rapidly.

The key question for outsourcing and offshoring is whether a firm can deliver the task electronically over long distances with little or no degradation in quality (Blinder 2007). Occupations that can be outsourced are different from those that can be automated. There are activities that can be computerized but not outsourced (or at least not fully), and there are jobs that can be outsourced but not computerized—or at least not yet (for example, writing legal briefs) (Blinder 2007). A job cannot be outsourced if it must be performed at a specific work location and personally delivered. Neither characteristic correlates either with the education needed or with the wages paid.

The increasing reliability of ICT infrastructure in emerging economies entails that algorithmization is likely to influence the global ICT/ICTES industry significantly. In particular, jobs requiring routine cognitive tasks that are currently offshored are at increasing risk of automation. An example is voice recognition systems replacing call centers.

The clear implication is that growth of the global ICT/ICTES industry will likely to be higher in strategic segments supporting the automation process (e.g., software development) rather than in the delivery of low-cost non-specialized activities. More generally, the expansion of algorithmization indicates that concerns over the limitations of manufacturing as an engine for employment growth in developing countries may also apply to service industries.

4.3.1.6. Shared Economy: Diffused Value Creation, Concentrated Value Retention

The sharing economy (also known as collaborative consumption or the peer economy) describes peer-to-peer trade of goods and services through sharing, redistribution, or re-use of existing resources. Growth in online communities with shared interests and increased digital access within each community (through the proliferation of mobile technologies) have catalyzed the growth of this trade model.

Uber and Airbnb (valued at US$68.5 billion and US$30 billion respectively) are two successful firms leveraging the sharing economy in their respective business models and disrupting the urban transportation and hospitality industries. At its simplest, Uber's mobile application allows users to request personal transportation. Other users registered as drivers (whether they be licensed taxi drivers or not) can then respond to those requests through the application. Often, drivers use their personal (private use) vehicles. Similarly, Airbnb is a provider of hoteling services that enables users to rent out properties to other users. Like Uber, Airbnb hinges on an online application that makes identification and listing of properties relatively easy and crucially, the website encourages users to rent out their private homes (or rooms in their homes).

On the one hand, advocates of the sharing economy herald the lowering of barriers to entry and the diffusion of the process of value addition among the millions of users that

the concept creates. Both the hospitality and taxi industries have traditionally had high entry barriers due to high initial investment requirements (hotel industry) and heavily regulated entry and operation (permits and licenses). The hotel business has traditionally required real estate investment, the provision of food and beverage services, hospitality management (concierge, housekeeping), administration functions (e.g., billing, legal) as well as relevant licenses and permits. With Airbnb, users can provide accommodation services to customers if they have a room to rent and their identity can be verified (Airbnb 2016). Taxi services are traditionally highly regulated requiring a myriad of licenses and registrations purportedly to protect consumers from increasing and unpredictable fares, to ensure the quality and standard of vehicles, to reduce congestion and to reduce accidents. Uber driver requirements vary from country to country but in most U.S. states, drivers need only a car that meets the minimum requirements, a clean driver's license, in-state car registration and insurance and a social security number. They also must pass a background check (Uber 2016). Yet, Airbnb has become one of the largest accommodation service providers in the world without owning any real estate, and Uber has provided over 1 billion rides across 400 cities worldwide without owning any vehicles (Uber 2015).

On the other hand, critics of the sharing economy point out that while value creation diffuses among millions of users, the value chain actors commanding the proprietary online platform retain the largest share of the value added. For example, while in the recent past each major city had a number of taxi owners retaining value added *in situ*, Uber transfers most of the value added by its service to Silicon Valley. This wealth is not limited to simple 'profit' but also includes support activities (operations, legal, administration for example) related to the provision of taxi and transportation services. The drivers remain, but these are the lowest skilled workers in the value chain. However, local spillovers are not completely lost. In many cases, public authorities have sought to capitalize on the success of the sharing economy business models demanding tax and license fees from participants. Even so, as the sharing economy continues to thrive, the structure of the value chain is evolving with it.

4.3.1.7. Upgrading from Platform Enablers to Solution Providers (from ICT to ICTES)

ICT firms have traditionally provided platforms and services to enable other industries, such as finance or transport, to deliver their products and services more effectively and efficiently to their final customers. The power of ICT to reduce barriers to entry and enable the provision of products and services where it may have previously been impossible or impractical is well understood.

However, ICT companies are increasingly playing the role of solution provider to the final customer and vertically integrating value chain activities from other industries, such as banking or entertainment, into their core offerings. In doing so, they shift from

providing products and services that will *enable the delivery* of a solution, to *delivering that solution themselves.*

This trend toward the vertical integration of value chain activities is becoming increasingly common as ICT activities become more dominant and more critical (vis-à-vis other value chain activities) to the final delivery of the product or service.

BOX 9. NETFLIX AND PAYPAL – FROM IT PLATFORM ENABLERS TO GAME-CHANGERS IN THE HOME ENTERTAINMENT AND FINTECH INDUSTRIES

Netflix, having evolved from a mail order to DVD-by-mail service in 1998 to an on-demand digital streaming service by 2007, operated a very successful but vulnerable business model. The firm provided a digital platform through which subscribers could stream third-party content (television series and movies) which Netflix had themselves licensed at high cost. The vulnerability came from the fact that (1) Netflix depended highly on others for its core profit engine, (2) the business model was highly replicable, and (3) copycats and competitors not only threatened Netflix' market-share but also created upward pressure on licensing costs. Recognizing the relative value of the content distribution network (CDN), Netflix rolled out its own CDN in 2012, improving the quality of its technical offering, and at the same time started *producing* its own digital content rather than simply *enabling* subscribers to view third-party content.

PayPal's digital payments system facilitates money transfers between the bank accounts of its users and subscribers. As the company has evolved, PayPal has begun providing its users with loans, credit cards, and accounts in which they can deposit funds indefinitely. As of March 31 2016, PayPal held US$13 billion of customers' funds (PayPal 2016). Regulators do not consider PayPal a bank principally because it does not accept deposits—physically handle or hold funds placed into the PayPal service—as defined by U.S. law. Instead, PayPal deposits its customers' funds into FDIC-insured bank accounts at other institutions. Thus, PayPal is not subject to the regulatory scrutiny that would allow it to operate officially as bank. However, financial technology (fintech) is moving in this direction as technology further disrupts the banking and finance industry and reduces the barriers to entry. Once again, in this example, fintech firms are moving away from *enabling* the provision of banking services to *providing* those banking services themselves.

PayPal and Netflix have upgraded from providing IT-enabled service platforms to the home entertainment and finance industries to direct entry into the core value chain activities of both industries (Box 9). Netflix now directly produces video content, and PayPal now directly provides deposit accounts and banking services (PayPal).

This emerging trend is significant as a means by which firms and clusters of firms can gain control of the value chain and appropriate more value. Conversely, it may weaken other actors and activities in the value chain, weakening their bargaining power and their potential to create and retain value.

4.3.2. Strategic Segments in the Global ICT/ICTES Industry

Building on the analysis of the global trends and emerging business models for the ICT/ICTES industry, this section provides a non-exhaustive, high-level codification of those strategic segments that may be relevant for Uruguay. Figure 64 shows four strategic segments in the ICT/ICTES industry following the strategic segmentation analytical framework developed under the "Industry-Specific Global Value Chain Analytics" project of the World Bank (for a more detailed explanation of the approach please see Box 2);

1. Existing and emerging business segments (and associated value chains) that exist globally in the sectors of study were first identified. (see Section 4.3.1).
2. Porter's 'Five Forces'analytical tool was used to assess industry attractiveness by determining the profitability of the industry and identifying the actors within the industry with the most bargaining power (thereby determining which actors appropriate the bulk of the available profits).

Each strategic segment is defined by a matrix of specific needs, typology of final users, and mix of products and services. The combination of needs, final users, and mix of products/services defines the strategic segments that characterize the ICT/ICTES industry globally. At the same time, the competitive dynamics within each strategic segment of the ICT/ICTES industry are shaped by the relative strength of the 'five forces that shape competitive strategy', and require a specific "ideal" value chain configuration for firms and networks of firms to successfully compete and operate in that segment.

The overwhelming importance of skilled human capital for the ICT/ICTES industry implies that each segment is largely defined by the characteristics of the workforce, that is, the necessary human capital requirement (volume) and the degree to which provision of products or services in the segment require high-skilled workers. At the same time, the initial investment requirements to enter into a segment, and the degree of versatility with which firms can 'reorient' their product and service mix offering in

FIGURE 64. **Strategic Segments in the ICT/ICTES Industry (relevant to Uruguay's ICT/ICTES)**

1. Low-Cost	2. Abundant Skills	3. Powerhouse	4. Boutique
The provision of services that require a comparatively low level of specialisation and training. The reduced training requirement means that services and product offerings in this segment can usually be reoriented quickly to suit customer needs, trends and changing demand. Differentiation is difficult and firms compete on cost. Examples: Call centers, OCR conversion, data mining and search engine optimisation	The provision of services that require a high level of training and yet are widely available (almost commoditised) in the marketplace. Firms compete on volume and number of employees. Monochromatic workforce, makes it relatively difficult for firms to reorient themselves as demand and customer trends evolve. Examples: Software development and programming services for Microsoft's .NET Framework or SAP	Can support and sustain high-scale, high-volume adoption of B2B or B2C products (and remote or digital services). Cisco Systems Inc, eBay Inc, Netflix, Oracle Corporation and Apple Inc are leading examples of firms competing in the «Powerhouse» strategic segment. Competing in the «Powerhouse» strategic segment requires sustained high capital investment and a vast, highly-skilled worforce.	The provision of highly complex, bespoke products and services. High employee volumes are not essential, firms are smaller and are able to reorient their activities as the industry evolves. Products and services in this segment might include mobile application development, gaming software design services, digital animation and visual effects. Services radiology, dental imaging solutions or bioengineering laboratory services.

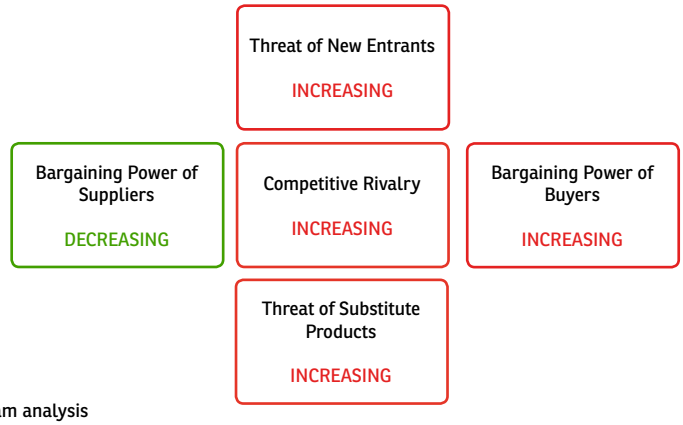
Source: Team's Elaboration

response to the rapid evolution of the industry, are also critical in defining the competitive dynamics within each strategic segment and identifying the ideal value chain structure to compete in it.

4.3.2.1. The Low-Cost Strategic Segment

The Low-Cost strategic segment typically includes the provision of ICTES with a relatively low specialized workforce that can quickly reorient product and services offerings to suit customer needs and changing demand. The Low-Cost segment (Figure 65) includes the provision of services that require a comparatively low level of specialization and training. The reduced training requirement means that services and product offerings in this segment can usually be reoriented quickly to suit customer needs, trends and changing demand. This strategic segment used to be dominated by the provision of customer services through call centers. As previously 'specialist' activities have become more commonplace or have been commoditized through technological advance, the

FIGURE 65. **Porter's Five Forces Analysis - "Low-Cost" Strategic Segment**



Source: Team analysis

strategic segment has expanded to include other outsourced business processes (e.g., on-/off-line data entry, document scanning, link building, OCR conversion, data mining and search engine optimization). As the offering is not highly specialized (and is therefore low-cost), firms achieve economies of scale through the volume (of services rendered) and turnaround time. Service providers that rely on human resources to perform activities will incur high variable costs, although activities in this segment are particularly conducive to automation through robotization, mechanization and automation.

Threat of New Entrants – *Increasing*
The threat of new entrants into this segment is high and increasing. Indian firms have dominated the low-cost outsourcing industry since the business model gained popularity in the early 1990s. Since then other low-cost sourcing hubs have merged including Malaysia, China, Philippines, Central and Eastern Europe and Brazil.

Bargaining Power of Suppliers – *Decreasing*
The most significant input in this segment is human capital. However, because workers require limited training, they have little power. Where service providers are providing voice services, suppliers may differentiate themselves through their language skills but this differentiation would usually occur at the country level rather than firm level.

Bargaining Power of Buyers – *Increasing*
Buyers in the "Low-Cost" strategic segment are rarely private individuals. Rather, they are business clients. The wide availability of BPO services means that the bargaining

power of these buyers is high vis-à-vis service providers and is increasing as more service providers enter the segment. The relatively low switching costs associated with the provision of services in the "Low-Cost" strategic segment also contributes to the increased bargaining power of buyers.

Competitive Rivalry—*Increasing*
As more firms enter the market, rivalry in the "Low-Cost" strategic segment continues to increase. Product/service differentiation is difficult. Firms principally compete on cost and turnaround time although culture, language, time zone (or flexibility of hours), technology infrastructure, IP protection and legal maturity. Geopolitical risk might also factor into investment location decision making.

Threat of Substitute Products—*Increasing*
As services in the "Low-Cost" strategic segment typically include routine, predictable, low-skilled tasks, they are at high risk of substitution from automation, mechanization and software algorithmization. In some cases technological advance may *replace* service provider's activities, (e.g., using software algorithms to do search engine optimization), and in other cases technological advance with *render certain services redundant* (e.g., improvements in optical character recognition reducing errors in document scanning thus reducing the need for 'human filters').

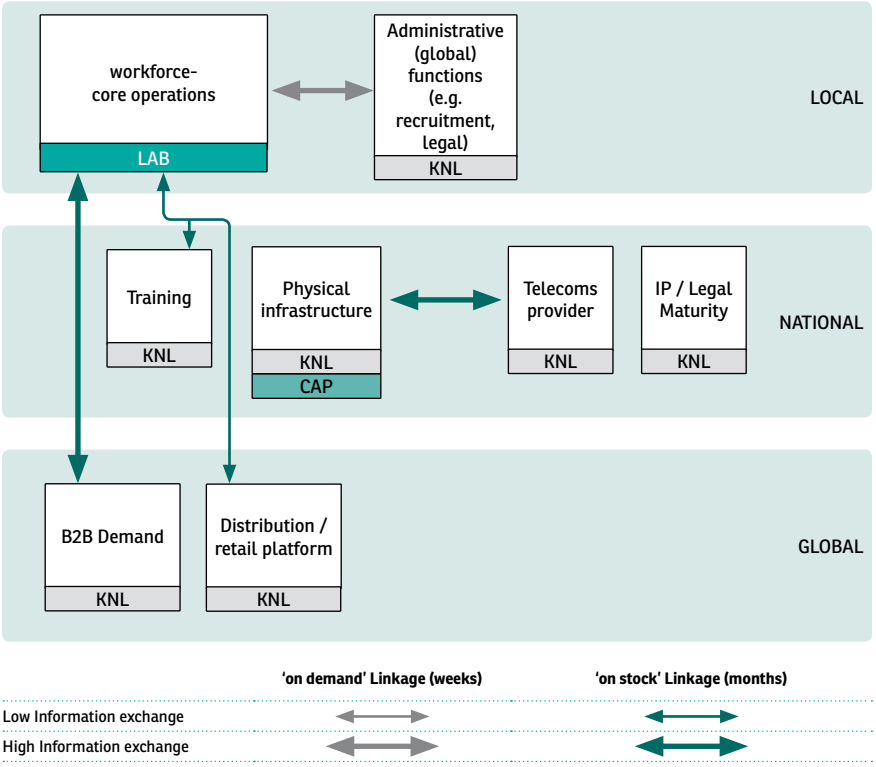
Optimal Value Chain Structure for Low-Cost Strategic Segment

The value chain for the "Low-Cost" Strategic Segment (Figure 66) is the least complex of the four profiled in this report. A large workforce is needed for example to provide BPO services, but the relative low level of specialization and skills required is due to the fact that activities are relatively labor-intensive, as opposed to knowledge or capital intensive. As service providers struggle to differentiate products, sales, marketing and brand positioning value chain activities are less important than in other strategic segments. At the same time, front office corporate functions are usually limited to administrative functions. Local business demand or consumer demand is also less important as actors in the "Low-Cost" strategic segment often serve foreign markets with high labor costs. As in all functions, however, strong infrastructure for communications, intellectual property protection, and data protection is important.

4.3.2.2. The Abundant Skills Strategic Segment

The Abundant Skills strategic segment (Figure 67) includes the provision of services that require high skills and specialized training, and yet are widely available (almost

FIGURE 66. **Minimum Requirement to Compete / Ideal Value Chain in Low-Cost Strategic Segment**

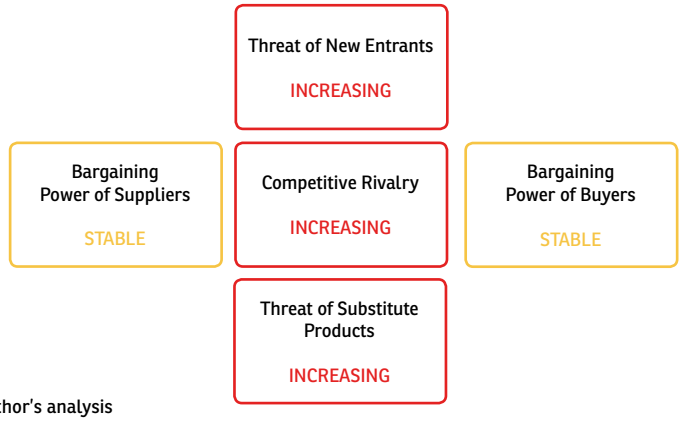


KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity;
CAP = Capital intensive activity; N-RES = Natural Resource
N.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).

Source: Author's own elaboration

commoditized) in the marketplace. Software development and programming services for Microsoft's .NET Framework are a prime example of offerings in this segment. As an illustration, the .NET framework encompasses a family of software platforms that primarily run on Microsoft Windows and are largely used to build applications created for Microsoft Windows. Largely due to the pre-eminence of the Windows Operating system (Windows' market share fell below 90 percent for the first time in several years in April 2016 (Net Market Share 2016)), there has traditionally been high demand for .NET software

FIGURE 67. **Porter's Five Forces Analysis – "Abundant Skills" Strategic Segment**



Source: Author's analysis

developers, and, a result, a disproportionately high number of .NET programmers and programming firms have emerged to support MS application use. Software engineering firms in this segment are typically engaged in customizing web and desktop applications created to suit specific business requirements, developing database and system architecture and testing and maintenance. ABAP programing services (ABAP is the programming language created for programming the SAP Application Server) and Java programming services (a core component of the Sun Microsystems' Java platform, now owned by Oracle) compete in a similar space, and represent two other examples of firms in this segment. Firms in this segment depend on the programming platforms of the tech-giants with which they affiliate. Software is rarely original. Service providers adapt, integrate, and maintain third-party software rather than producing proprietary software themselves. Furthermore, it is relatively difficult for firms to reorient themselves toward new demand trends given their highly specialized but homogeneous workforces. The ubiquity of their offerings requires that they compete on volume. Outside software engineering, the "Abundant Skills" strategic segment might also include professional services like finance and accounting, human resources management, legal services and marketing.

Threat of New Entrants – *Increasing*

The threat of entrants is high because the core skill associated with their offerings is abundant, and barriers to entry are low because buyers follow a 'pay as you grow' business model. Firms can hire human resource as and when needed thus reducing their fixed costs in the event they decide to enter the segment.

Bargaining Power of Suppliers—*Stable*
Suppliers in the "Abundant Skills" strategic segment are skilled but abundant, theoretically lowering the bargaining power of individual employees. However, high employee turnover rates characterize the sector (Ranganathan and Kuruvilla 2008) because the abundance of employees is balanced by an abundance of firms. Firms compete with one another to hire the best employees just as employees compete with one another for jobs at the best firms.

Bargaining Power of Buyers—*Stable*
As with the "Low-Cost" strategic segment, buyers in the "Abundant Skills" strategic segment are rarely private consumers. Rather, they are businesses. The wide availability of service providers means that the bargaining power of these firms is high. However, the many buyers in the space means that service providers have some freedom to negotiate contractual terms (because the market is very large).

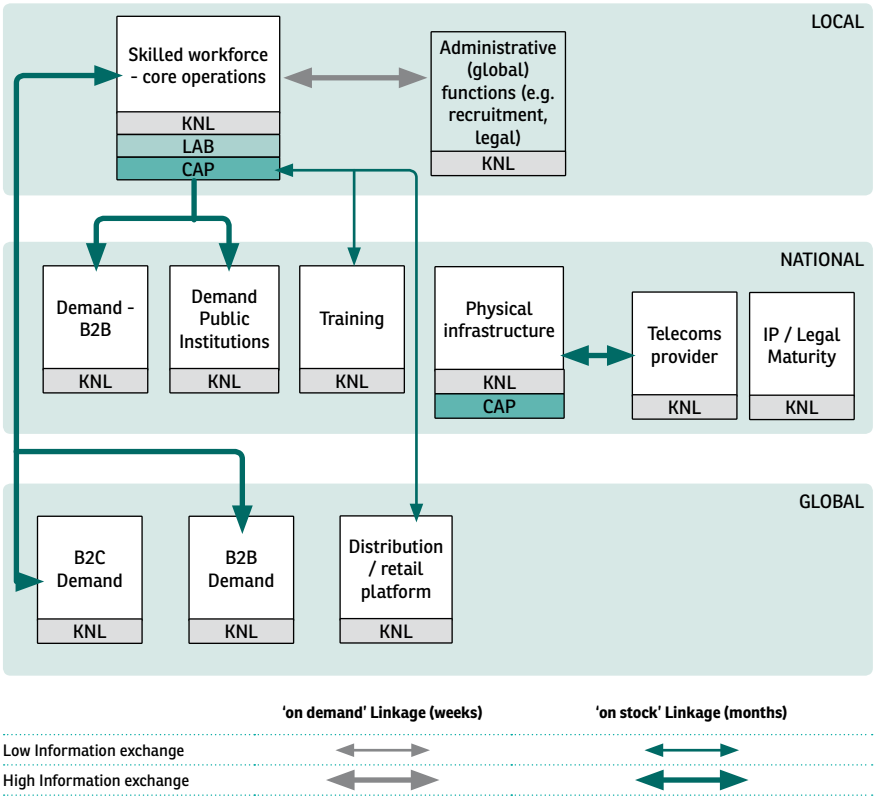
Competitive Rivalry—*Increasing*
Firms compete on their ability to perform and provide a wide range of general functions quickly and at low cost. Factors that affect competitiveness in the "Low-Cost" strategic segment (culture, language, flexibility, technology infrastructure, IP protection and legal maturity) also affect the "Abundant Skills" strategic segment, however service providers have slightly increased opportunity to differentiate themselves by type of in-house skill and number of employees.

Threat of Substitute Products—*Increasing*
The section on automation of non-routine, complex, "intelligent" tasks describes the emerging trends towards increased availability of software and mechanized solutions for non-routine, 'intelligent' tasks. As this trend continues, the threat of substitution of service providers by software and mechanized solutions increases. For example, as advancements in natural-language processing (computational linguistics) and in software engineering methodologies standardize and converge (e.g., Agile Methodology) it will become easier for naturally-written user requirements to be automatically compiled into executable code, directly threatening software firms in this segment. At the same time, it is likely that as technology takes over certain activities in the abundant skills segments, firms will either recalibrate their business model (relying more heavily on software as opposed to human resource), or they will shift their core business towards more complex activities.

Ideal Value Chain Structure for "Abundant Skills" Strategic Segment

The minimum value chain requirements to compete in the "Abundant Skills" strategic segment (Figure 68) are similar to the ones for the "Low Cost" strategic segment.

FIGURE 68. **Minimum Requirement to Compete / Optimal Value Chain in Abundant Strategic Segment**



KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity; CAP = Capital intensive activity; N-RES = Natural Resource
N.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).

Source: Author's own elaboration

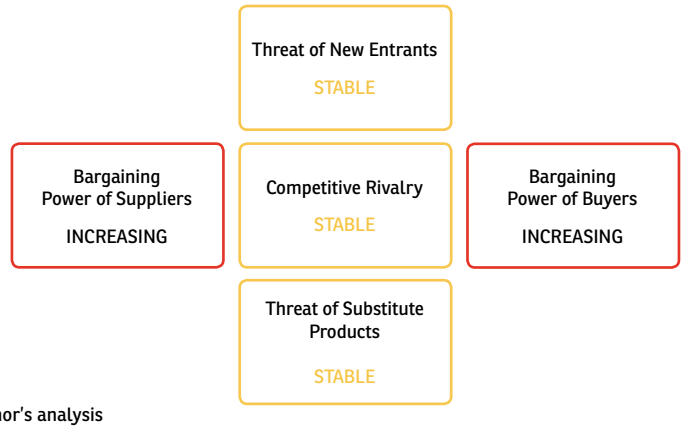
However, the abundant skills strategic segment requires a value chain with a larger pool of skilled workforce, a higher degree of knowledge-intensity of the activities and functions performed, and higher capital intensity of core operations, when compared to the low-costs segment. Depending on the product or service, the ideal value chain is characterized by a highly specialized but homogeneous workforce. As in the case of the "Low-Cost"

strategic segment, marketing, sales and brand positioning value chain activities are less mission-critical. At the same time, the presence of a relatively sophisticated local demand is important to drive the industry forward, especially in its early development. In particular, public institutions often play a vital role in creating demand for local products and services. Unlike firms in the low-cost strategic segment, firms and other actors in the "Abundant Skills" strategic segment interact directly with final consumers (though less so than in the "Powerhouse" and/or "Boutique" strategic segments). Foreign demand plays a stronger role than domestic demand for the segment to develop.

4.3.2.3. The Powerhouse Strategic Segment

The Powerhouse strategic segment (Figure 69) includes ICT/ICTES firms that can support and sustain large-scale innovation and high-volume introduction of new products and remote or digital services. Characteristically, powerhouse firms build software products that require minimal initial software development investments and limited human capital. At the same time, firms can grow easily because the marginal cost of producing an extra unit of a successful software product is negligible. However, once a product becomes successful on a global scale, marketing, branding, distribution, and customer services activities require significant investments in human resources. Products tend to be highly specialized and customized to the needs of a specific industry. High specialization and versatility on different platforms and ICT fields are

FIGURE 69. **Porter's Five Forces Analysis - "Powerhouse" Strategic Segment**



Source: Author's analysis

two key characteristics of the workforce in the "Powerhouse" strategic segment. Firms competing in the "Powerhouse" strategic segment are typically very large, with a large workforce, a wide global footprint, and sustained high capital costs and investment (in product and service development and adaptation, sales, marketing, legal protection, etc.). Global software applications and digital service providers such as Cisco Systems Inc., eBay Inc., Netflix, Amazon.com Inc., Oracle Corporation, Microsoft Corporation, Apple Inc. and Alphabet Inc. (Google) are leading examples of firms competing in the "Powerhouse" strategic segment. Competing in the "Powerhouse" strategic segment requires sustained high capital investment and a vast, highly skilled workforce.

Threat of New Entrants – *Stable*
Firms competing in the "Powerhouse" strategic segment are typically very large, with a large workforce, wide global footprint and sustained high capital costs and investment (in product and service development and adaptation, sales, marketing, legal protection etc.). The strategic segment is difficult to enter, and most firms enter through success in other strategic segments (notably the "Boutique" segment and to a lesser degree the "Abundant Skills" strategic segment). New entrants will need strong strategies to compete with well recognized and mature brands.

Bargaining Power of Suppliers – *Increasing*
The workforce in the "Powerhouse" strategic segment is extremely highly skilled whether they be involved in product/service-specific activities (e.g., software design) or 'support' functions, such as brand positioning and marketing. This increased their bargaining power and increases their earning potential. Other key inputs in this segment, which provide a good bargaining powers to their suppliers, include mobile communication services and sector-specific hardware.

Bargaining Power of Buyers – *Increasing*
Buyers in this segment are both final consumers and business clients. The rapid evolution of the industry, emerging technologies that disrupt the industry, and relatively low switching costs mean that buyers (particularly consumers) have freedom of choice and a wide range of options. Firms in the "Powerhouse" strategic segment must work harder and harder to retain customers and continuously refine their offering to attract buyers.

Competitive Rivalry – *Stable*
Firm rivalry within the segment is strong and competitors able to distinctly differentiate their products. Both competitive dynamics and product lifecycles facilitate monopolistic behavior and the emergence of one or two global players for each of the 'vertical' industries served by the segment.

Threat of Substitute Products - *Stable*
The threat of substitute products is stable. Competition remains rife within the segment, but the complexity of products and services in the segment means that of the four segments identified and described here, the "Powerhouse" strategic segment is the least susceptible to substitution.

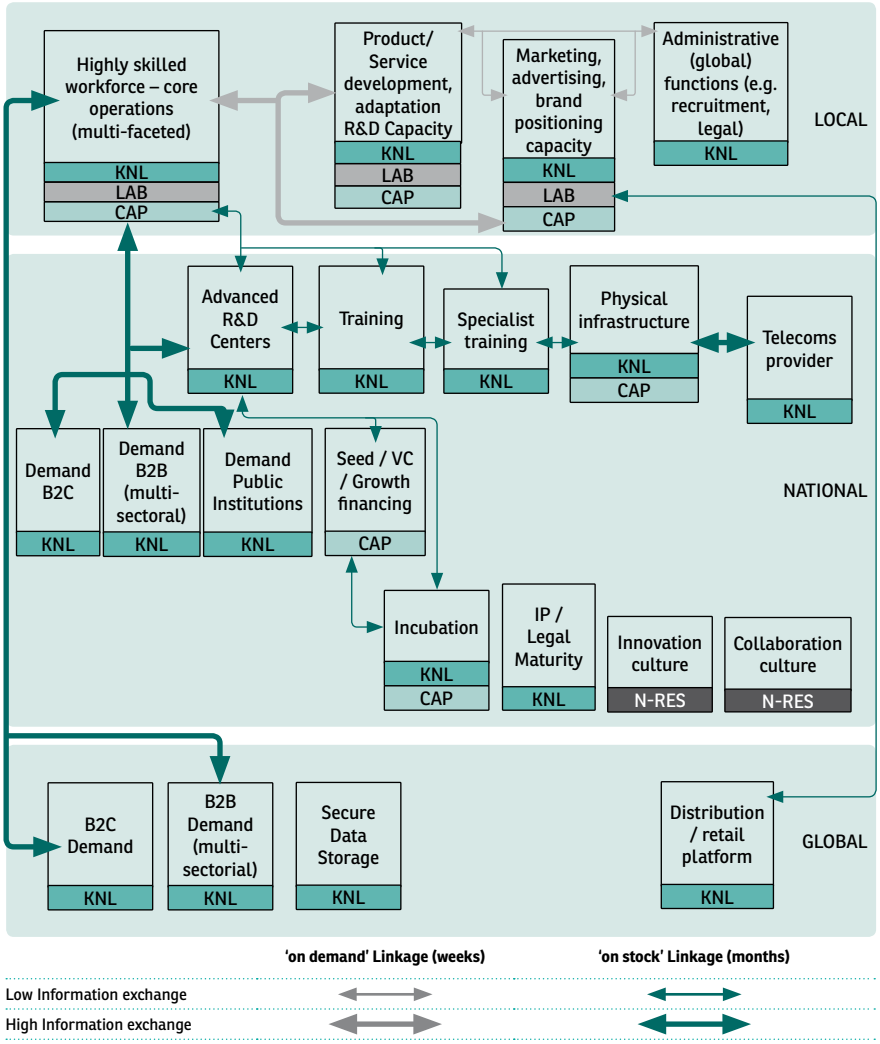
Optimal Value Chain Structure for "Powerhouse" Strategic Segment

The "Powerhouse" strategic segment has the most complex value chain structure of the four strategic segments profiled in this report (Figure 70). A large workforce that is multi-skilled and versatile supports the performance of the ideal value chain in this segment. "Front office" functions are as important to product or service delivery as core operations. Products are highly differentiated and require high information exchange between 'core operation' and 'marketing and brand positioning' activities. The rate of evolution of the segment also increases the emphasis on a firm/cluster/region's capacity to innovate, adapt and develop established products or services and to incorporate new technologies in their product and service offerings. International firms with large global footprints compete alongside start-ups, and the existence of a localized innovation ecosystem among the private sector, training institutions, and advanced research and development centers is a critical element of the ideal value chain. Incubation and early growth financing institutions to support entrepreneurship usually complement the local innovation ecosystem. In terms of demand, the fast evolving needs of the market at both a national and global level must be well understood by the local private sector, and therefore a pervasive culture of innovation and receptivity to sociocultural changes outside the ICT/ICTES industry strictly defined is a critical asset for local clusters competing in this segment.

4.3.2.4. The "Boutique" Strategic Segment

The Boutique strategic segment (Figure 71) entails the provision of highly complex, customized ICT/ICTES products and services by small dynamic firms with a highly specialized workforce. Firms in the segment follow nimble and adaptive business models, and are able to reorient their activities as the industry evolves. Products and services might include mobile application development, gaming software design services, digital animation, and visual effects. Services may also include highly specialized knowledge process outsourcing industry-specific services, such as radiology, dental imaging, or bioengineering laboratory services. As successful players in the "Boutique" grow, they usually reposition themselves either into the "Abundant Skills" or "Powerhouse" strategic segments.

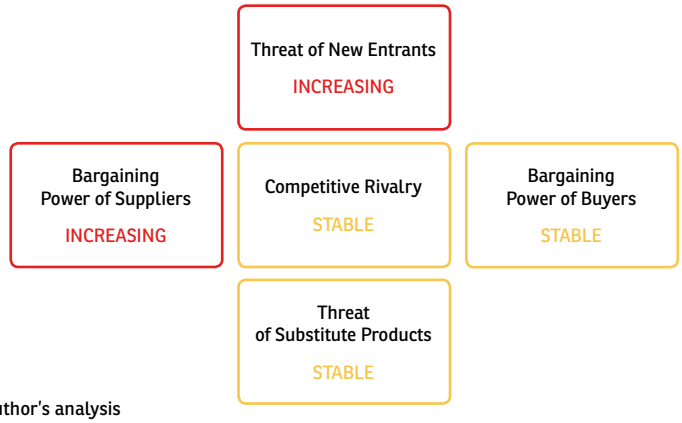
FIGURE 70. **Minimum Requirement to Compete / Ideal Value Chain in Powerhouse Segment**



KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity; CAP = Capital intensive activity; N-RES = Natural FF>Resource N.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).

Source: Author's own elaboration

FIGURE 71. **Porter's Five Forces Analysis—"Boutique" Segment**



Source: Author's analysis

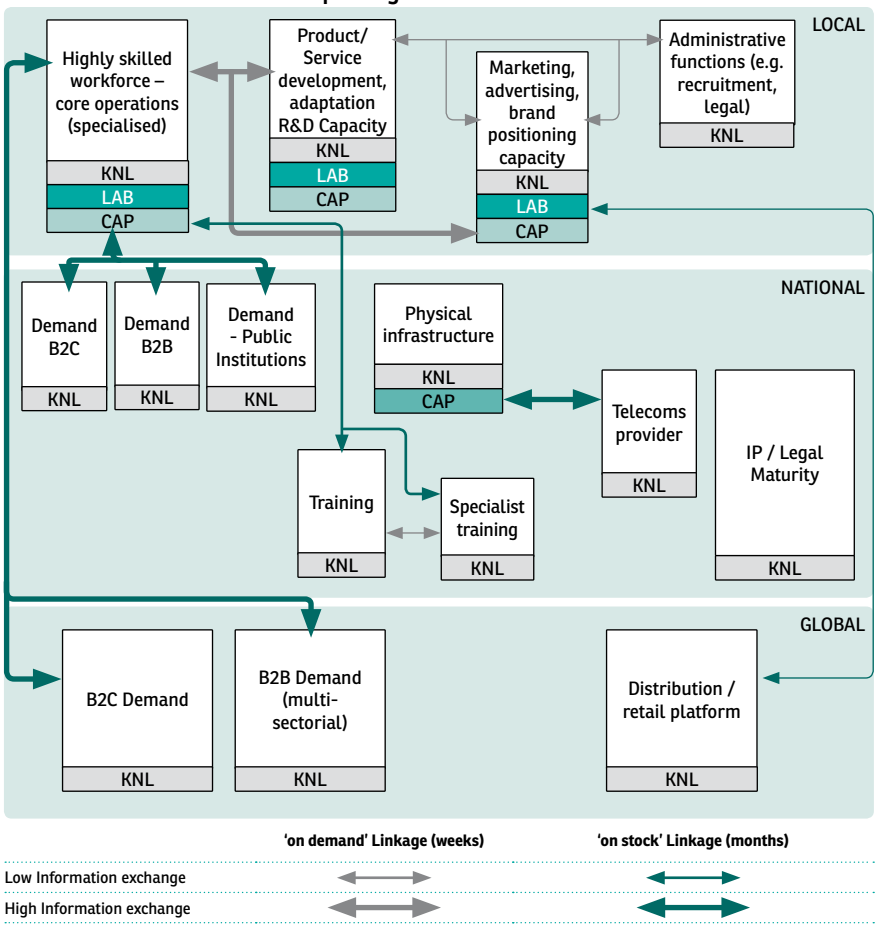
Threat of New Entrants – *Increasing*
Barriers to entry are relatively high and derive from the high skills and specialization required to participate. In some cases, access to the industry-specific technology, equipment, and certification (e.g., specialist laboratory equipment or clean rooms for bioengineering) is also a key barrier to entry.

Bargaining Power of Suppliers – *Increasing*
Similar to the "Powerhouse" strategic segment, the workforce in the "Boutique" strategic segment is highly specialized and varied. The high degree of specialization of the workforce makes them the single most important critical success factor and enables them to retain a good share of value added.

Bargaining Power of Buyers – *Stable*
Similarly to the case of the "Powerhouse" strategic segment, the specialized nature of the products and services provided gives firms in this segment a marginally stronger bargaining power than in other segment. However, consumers and business customers will still be able to dictate agreement terms.

Competitive Rivalry – *Stable*
Competitive rivalry within the segment is not based on price but on the ability to deliver top quality customized products and services to the specific industry niches to which firms cater.

FIGURE 72. **Minimum Requirement to Compete / Ideal Value Chain in Boutique Segment**



KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity;
CAP = Capital intensive activity; N-RES = Natural Resource
N.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).
Source: Author's own elaboration

Threat of Substitute Products - *Stable*

Algorithmizaton and automation of non-routine 'intelligent' tasks poses a threat also in this segment, but it is less relevant than for other ICT segments given the high sophistication of the products and services provided.

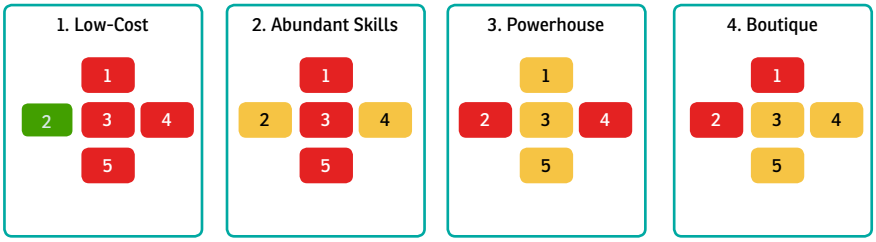
Ideal Value Chain Structure for Boutique Segment

The Boutique strategic segment has an optimal value chain structure (Figure 72) similar to that of the "Powerhouse" strategic segment. Lower scale of operation and smaller minimum efficient investment requirements are the main distinguishing factors between the two ideal GVCs, with the "Boutique" strategic segment often serving as the launchpad for successful start-ups to enter the "Powerhouse" segment. The emphasis on supporting activities on incubation, seed financing and entrepreneurship is greatly reduced because firms focus on specialized customer niches rather than on mass-markets, reducing the risks associated with large volumes. National consumer demand is also less relevant, with a focus on business to business clients.

4.4. COMPARATIVE ANALYSIS OF THE ICT/ICTES STRATEGIC SEGMENTS

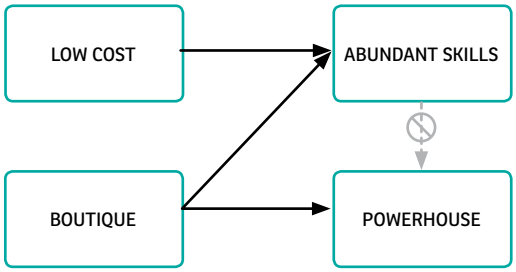
The dynamism of the ICT/ICTES industry can be explained also in terms of the continuous and rapid evolution of the five forces in each of the four strategic segments identified. The differences depicted in Figure 73 appear to be minor, but the corresponding structure of the value chain is very different as illustrated above. A comparative overview of all the four strategic segments analyzed suggests that the "Powerhouse" and 'Boutique" strategic segments might be the most 'attractive' as profitability is high (compared with the "Abundant Skills" segment and the "Low-Cost" segment) and more value is retained by the firms themselves (as opposed to buyers and suppliers). The five forces analysis seem to support the view that the "Powerhouse" strategic segment is more profitable than the "Boutique" strategic segment, as margins are high and they are obtained on a global scale in large mass markets. On the contrary, the "Low-Cost" strategic segment

FIGURE 73. **Comparative Analysis of Porter's Five Forces for the Four ICT/ICTES Strategic Segments**



Source: Author's Elaboration

FIGURE 74. **Upgrading Trajectories across the Four ICT/ICTES Strategic Segments**



Source: Author's depiction and Analysis

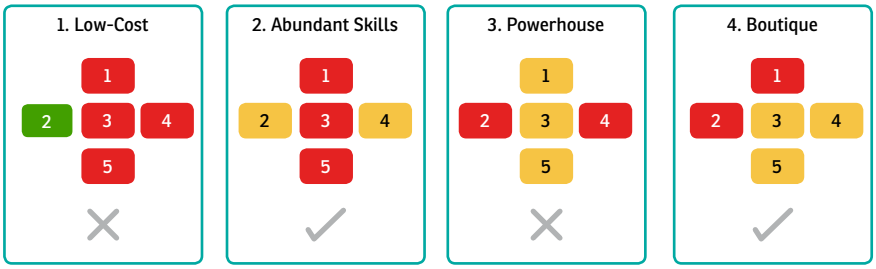
results as the most unattractive segment given that profitability is the lowest of all four segments and margins are captured to a larger extent by buyers and clients. Finally, the "Abundant Skills" strategic segment presents low margins, while on the positive side firms in the segment retain most of the margins created in the segment.

The value chain structures described in Figure 66, Figure 68, Figure 70, and Figure 72 can shed some light on the degree to which participation in one strategic segment might lead to participation in higher value added strategic segments. Figure 74 illustrates this 'natural' development path. Firms participating in the "Low-cost" strategic segment may naturally transition to the (higher value-added) "Abundant Skills" strategic segment through upskilling and technological investment. Similarly, the "Boutique" segment value chain is a microcosm of the "Powerhouse" strategic segment using fewer resources and focusing on specialist clients rather than mass solutions. Transitioning from the "Boutique" segment to the "Powerhouse" strategic segment would usually require focus on workforce expansion, training and catalytic funding (see Section 5.2). However, significant intervention would be needed to shift firms and clusters successfully participating in the "Abundant Skills" strategic segment to the "Powerhouse" strategic segment.

4.5. DEEP DIVE ON THE ICT/ICTES STRATEGIC SEGMENTS RELEVANT FOR URUGUAY

This section presents the results of a summary benchmarking analysis of the existing value chains in Uruguay vis-à-vis the ideal GVC structures necessary to compete in each of the four ICT/ICTES strategic segments: "Low-Cost," "Abundant Skills," "Powerhouse," and "Boutique" (Figure 75).

FIGURE 75. **Uruguay's participation in ICT/ICES Strategic Segments**



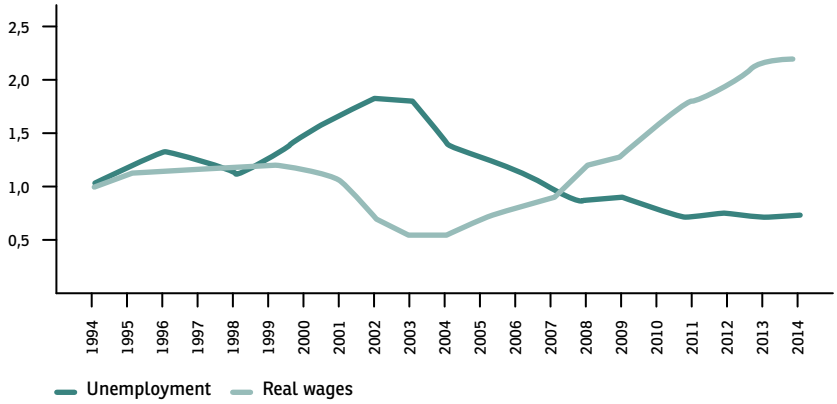
Source: Author's Elaboration

Figure 77, Figure 78, Figure 79, and Figure 80 compare the minimum requirements to compete in each segment with Uruguay's specific context (including factor conditions, demand conditions, firm structure, demand conditions and institutional context). Activities are identified as being optimally represented in Uruguay (highlighted in green), sub-optimally represented (highlighted in yellow) or not present in the country (highlighted in white). Figure 77 and Figure 78 illustrate that Uruguay meets almost all minimum requirements to compete globally in the "Low-Cost" strategic segment and in the "Abundant Skills" strategic segment. At the same time, the benchmarking analysis shows that in the Boutique segment (Figure 79) and especially in the "Powerhouse" strategic segment (Figure 80), some of the value chain activities are sub-optimal or arguably not present when compared to the ideal value chain needed to compete in these segments.

Two value chain activities and inputs are crucial for all four strategic segments of the ICT/ICTES industry, and they are a skilled workforce supported by higher education institutions and ICT infrastructure. The benchmarking analysis shows that Uruguay has strong higher education institutions and training programs that have the capacity to prepare skilled workers and satisfy ICT/ICTES development for the "Low-Cost", "Abundant Skills" and the "Boutique" strategic segments. In the "Abundant Skills," strategic segment, the activity has been identified as 'optimal' in recognition of the quality of education.

However, the relatively small size of the skilled workforce remains an issue. With an average of only 4,200 graduates a year in business segments related to ICT/ICTES (Uruguay XXI 2015), the quantity of graduates is unlikely to be able to support competitiveness in the "Abundant Skills" strategic segment. Furthermore, the relative high cost of labor compounds the challenges generated by the small size of the skilled workforce in Uruguay. Relatively high wages can be attributed to several factors. The overall increase in wages has coincided with a decrease in unemployment (Figure 76). The associated

FIGURE 76. **Uruguay - Unemployment and Real Wages 1994–2014**



Index Base 1994 = 1

Source: INE (2015) Bafico and Michelin (2015)

increase in the scarcity of human resources led naturally to an increase in the cost of the resources. The added ease with which ICT specialists can work for overseas clients (particularly as freelancers) also means that Uruguayan firms must pay a premium to retain their best employees. As a result, nearly 90% of Uruguayan ICT firms consider labor costs in the country 'high' or 'very high' (Universidad Católica del Uruguay 2015).

Connectivity, communications infrastructure and a strong and reliable provision of Internet services and mobile communications are essential to all four segments. Uruguay excels in this area and it ranked 49th overall in the 2015 ICT Development Index (IDI), the highest of any country in Latin and Central America (Table 25). It also ranked 46th in the world (1st in LAC) for IDI-use, 46th (1st in LAC) for skills, 50th (1st in LAC) for access, 29th for fixed broadband (1st in LAC), although Uruguay is the only country in LAC where caps are applied on monthly subscriptions. Uruguay also has the least expensive mobile-broadband prices for several broadband services (UNITU 2015).

The benchmarking analysis of the existing Uruguayan value chains against the ideal GVC for the "Low Cost" segment (Figure 77) shows that Uruguay meets all the minimum requirements to compete globally in the segment. Specifically, Uruguay has sufficient skills and quality of the workforce, ICT infrastructure, protection of intellectual property, availability of specialized training institutions, and exposure to the latest technological trends and international demand. However, the small pool of skilled workforce available and relatively high salaries, vis-à-vis global competitors with a large workforce such as

TABLE 25. **Regional IDI Ranking 2015**

Regional IDI Rank	Country	IDI	Global IDI Rank
1	Uruguay	6.70	49
2	Argentina	6.40	52
3	Costa Rica	6.20	57
4	Brazil	6.03	61
5	Venezuela	5.48	72

Source: UNITU (2015)

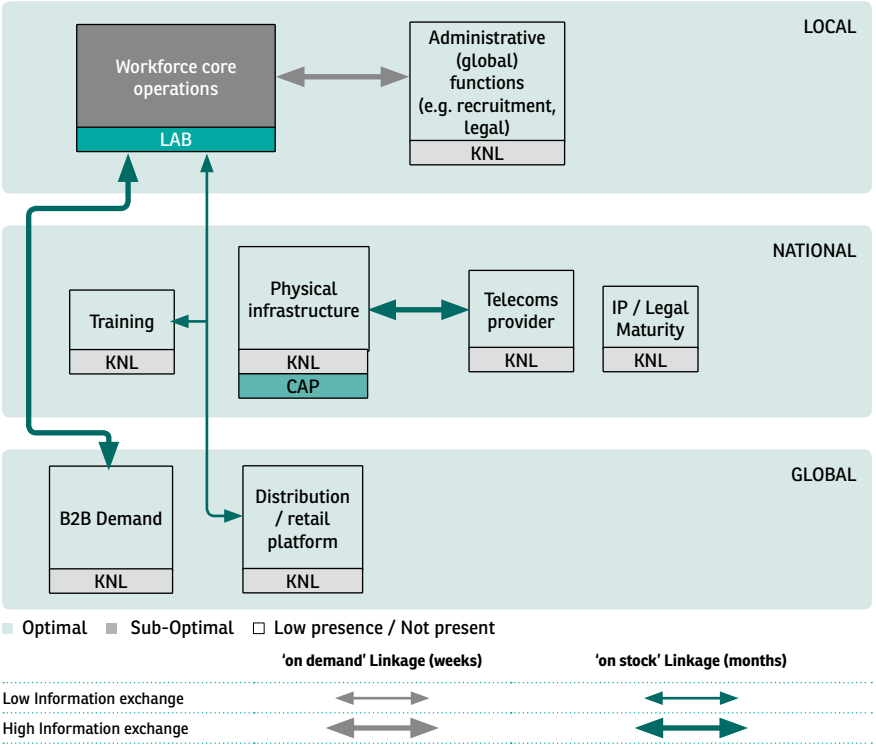
India or Russia, makes the scale Uruguayan value chain suboptimal for the labor-intensive and volume-based competitive strategy needed to succeed in this segment.

Similarly, the analysis of the Uruguayan value chains compared to the ideal GVC for the "Abundant Skills" strategic segment (Figure 78) shows that Uruguay has an adequate minimum scale for almost all activities of the value chain. The exceptions are a sizable pool of skilled workers and sophisticated domestic demand by both final consumers and public institutions. In fact, while ICT services and ICTES are typically global and do not hinge on domestic sales, a sophisticated local demand, often driven by public institutions, can usually help raise the standards of the local industry and stimulate the international competitiveness of local players, especially during the early stages of development of the domestic industry.

The benchmarking analysis of the value chains related to the "Powerhouse" strategic segment (Figure 79) shows that Uruguay has suboptimal scale in the value chain activities related to size of the skilled workforce, product and service development and adaptation, marketing, and branding. At the same time, while presence of specialized research and higher education institutions on ICT/ICTES is well established, the limited availability of specialist training programs for ICT/ICTES professionals constitutes a serious constraint to the ability to sustain competition in the most innovative strategic segment of ICT/ICTES. Similarly, an underdeveloped early stage financing institutional landscape does not seem to provide the adequate support to the entrepreneurial dynamism associated with the ideal GVC in the "Powerhouse" strategic segment.

The lack of critical mass in each of these areas of specialization is the reason why the three activities have been deemed to be "sub-optimal" for the delivery of products and services in the "Powerhouse" strategic segment. This too is the reason that training has been deemed sub-optimal and specialist training 'not present'. The quality of training available in Uruguay is well established, but Uruguay must improve the variety and availa-

FIGURE 77. **Benchmarking Uruguay with the Ideal Value Chain for the "Low-Cost" Strategic Segment**

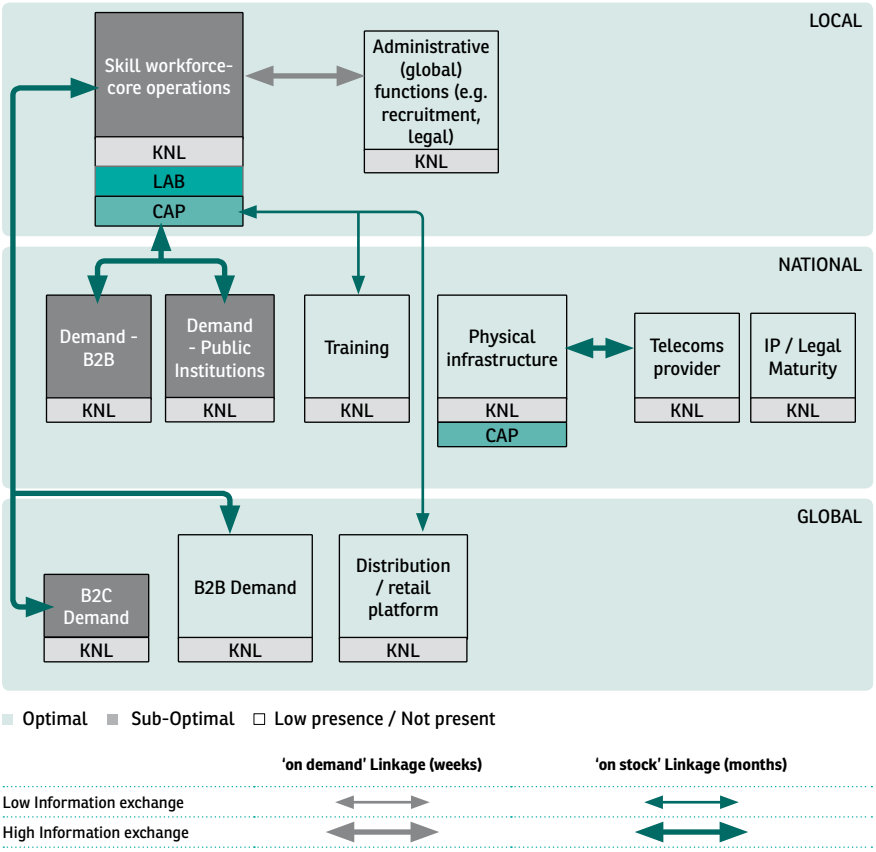


KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity; CAP = Capital intensive activity; N-RES = Natural Resource
N.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).

Source: Author's own elaboration

bility of specialist training to become competitive in the "Powerhouse" strategic segment. Additionally, investment in research, development and innovation is low in Uruguay. Uruguay spent only 0.2 percent of its GDP on research and development in 2012 (Table 26). By comparison, Brazil (with the highest R&D expenditure in LAC) spent 1.2 percent of its GDP on research and development in the same year and Israel (with the highest R&D expenditure globally in 2012) spent 4.2 percent of its GDP on R&D in 2012. Research and

FIGURE 78. **Benchmarking Uruguay with the Ideal Value Chain for the "Abundant Skills" Strategic Segment**



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Source: Author's own elaboration

development and crucially the potential for commercialization of R&D to fuel innovation in the private sector is essential to development of the segment. Yet, as of 2014, 79% of Uruguayan ICT/ICTES firms indicated that regulation, bureaucracy and administrative concerns are disincentives to investment (Universidad Católica del Uruguay 2015).

TABLE 26. **Research and development expenditure (percent of GDP)**

Country	2010	2011	2012
Israel	3.96	4.10	4.25
United States	2.74	2.77	2.81
Estonia	1.58	2.34	2.16
Brazil	1.20	1.10	1.20
Argentina	0.49	0.52	0.58
Uruguay	0.40	0.42	0.23

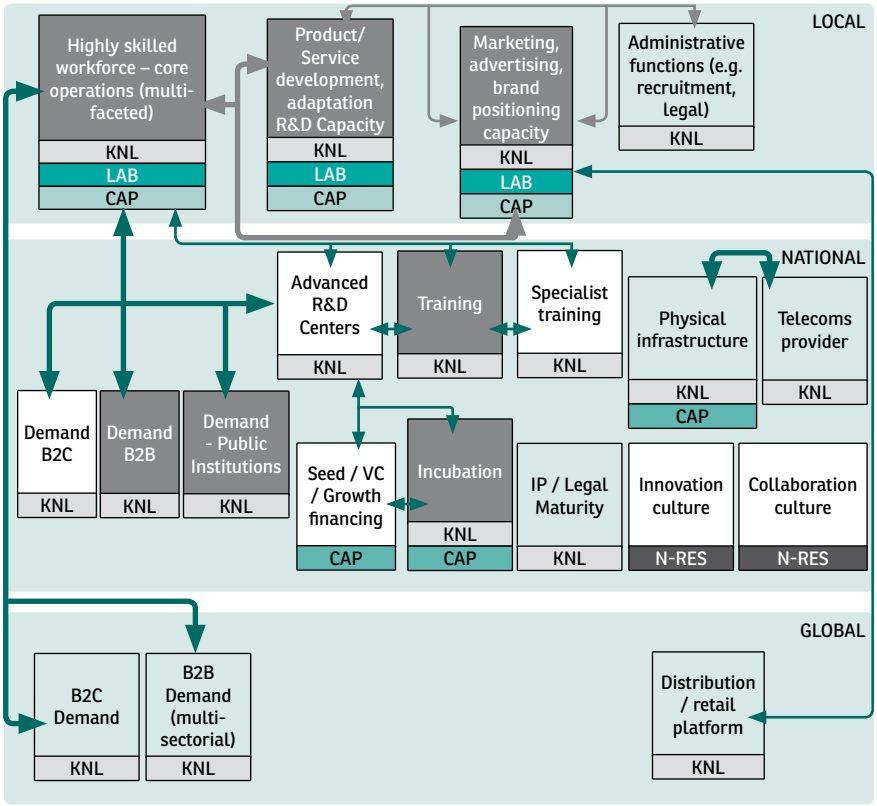
Source: *(World Bank 2016)*

In terms of early stage financing in support of ICT/ICTES, Uruguay shows a sub-optimal scale of activities and institutional support of the value chain. Although there have been significant gains in recent years, Uruguay does not have the advanced research facilities (private or public) necessary to compete in "Powerhouse" strategic segment. Additionally, while there are several incubation programs in Uruguay, they are relatively small in scale and are largely publicly funded. The "Powerhouse" strategic segment requires not only publicly funded incubation programs but also private support for idea generation and growth. A lack of high-risk financing in Urguay has also been identified as "not present" in Uruguay and remains a significant constraint to Uruguay's growth in the segment.

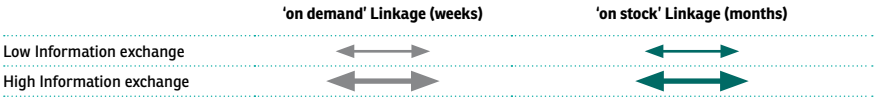
Furthermore, limited and low sophistication of local demand also constitutes a constraint on developing the Powerhouse segment in Uruguay. This shortcoming is not simply due to the limited volume of local demand, but also to the intensity and quality of interactions between buyers and providers of ICT/ICTES products and services. In fact, regular touchpoints and interaction between *innovation drivers* (firms identifying solutions) and *market creators* (users demanding solutions) is very important for innovation and entrepreneurship in the industry. Equally important is the sphere of influence of those market creators. In ICT/ICTES, network effects mean that new solutions can be adopted quickly. The far-reaching influence of American culture through television, movies, and social media platforms means that, by responding to the needs of their immediate market, firms in Silicon Valley can quickly find global markets for their solutions. This demand amplification will likely be less effective in Uruguay due to its smallness in the global landscape.

Finally, the benchmarking analysis of the existing Uruguayan value chains against the ideal GVC for the "Boutique" segment (Figure 80) shows that the structure of the ideal value chains for both the "Boutique" and "Powerhouse" segments are similar.

FIGURE 79. **Benchmarking Uruguay with the Ideal Value Chain for the "Powerhouse" Strategic Segment**



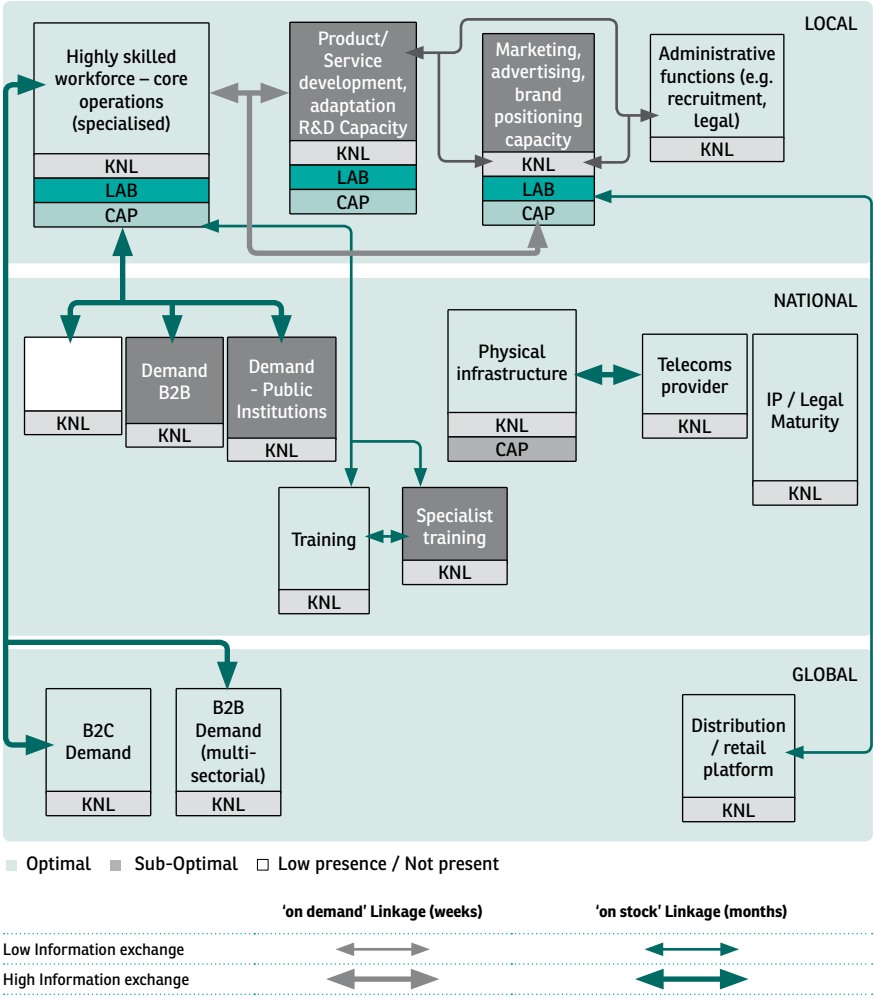
Optimal ■ Sub-Optimal □ Low presence / Not present



KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity; CAP = Capital intensive activity; N-RES = Natural ResourceN.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).

Source: Author's own elaboration

FIGURE 80. **Benchmarking Uruguay with the Ideal Value Chain for the "Boutique" Strategic Segment**



KEY: KNL = Knowledge intensive activity; LAB = Labor intensive activity; CAP = Capital intensive activity; N-RES = Natural Resource N.B. Box size indicates scale of activity and significance to value chain structure (qualitative judgement).

Source: Author's own elaboration

Lower scale of operation and smaller minimum efficient investment requirements are the main distinguishing factors between the two ideal GVCs, with the "Boutique" strategic segment often serving as the launchpad for successful start-ups to enter the "Powerhouse" segment. Also in the case of the "Boutique" segment, the actual value chain in Uruguay presents suboptimal scale activities in terms of the size of the skilled workforce, product and service development, and adaptation, marketing and branding. Similarly, the absence of a sophisticated domestic demand, both private and public, and the only nascent early stage financing innovation ecosystem, remain as two important constraints to the growth of the "Boutique" segment. At the same time, the overall lower entry requirements and smaller scale of operations needed to compete successfully in the "Boutique" segment enable Uruguayan ICT/ICTES firms to hold a better positioning, and stronger potential, in this segment vis-à-vis the "Powerhouse" one.

In summary, the structure of the ideal value chains for both the "Boutique" and "Powerhouse" segments are similar. Lower scale of operation and smaller minimum efficient investment requirements are the main distinguishing factors between the two ideal GVCs, with the "Boutique" strategic segment often serving as the launchpad for successful start-ups to enter the "Powerhouse" segment. Also in the case of the "Boutique" segment, the actual value chain in Uruguay presents suboptimal scale activities in terms of the size of the skilled workforce, product and service development, and adaptation, marketing and branding. Similarly, the absence of a sophisticated domestic demand, both private and public, and the only nascent early stage financing innovation ecosystem, remain as two important constraints to the growth of the "Boutique" segment. At the same time, **the overall lower entry requirements and smaller scale of operations needed to compete successfully in the "Boutique" segment enable Uruguayan ICT/ICTES firms to hold a better positioning, and stronger potential, in this segment vis-à-vis the "Powerhouse" one.**

Overall, the strategic repositioning options available to the Uruguayan ICT/ICTES industry point to the relevance and viability of the "Boutique" strategic segment and to the long-term potential of the "Powerhouse" strategic segment. A set of policy recommendations for each repositioning option are presented in Section 5).

5. Strategic Repositioning Options and Recommendations

Uruguay's path towards greater integration in global (and regional) value chains will require a multipronged strategy that targets increased sophistication of Uruguay's productive structure and diversification into specialized, high-value, modern service-exports that are not constrained by lack of economies of scale or distance. Identifying and addressing economy-wide and industry-specific policies that could enable the implementation of a global integration strategy remains a critical policy priority. The recommendations of this report aim to contribute to this agenda, and include a policy mix of industry-specific policy options for the dairy and ICT/ICTES industries. We summarize them here and organize into the following categories: (1) Recommendations on the Strategic Repositioning Options for the Dairy Industry in Uruguay, (2) Recommendations on the Strategic Repositioning Options for the ICT/ICTES industry in Uruguay, and (3) Recommendations on How to Improve Data Collection and Statistical Tools on GVCs in Uruguay.

5.1. RECOMMENDATIONS FOR THE DAIRY GLOBAL VALUE CHAIN

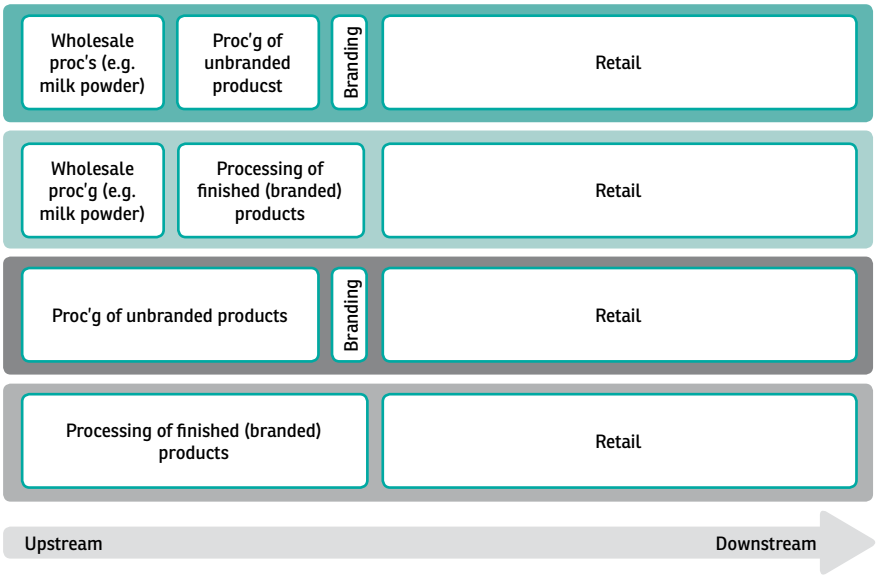
5.1.1. Recommendations for the Tradable Stockable Global Strategic Segment of the Dairy GVC

The analysis of the TSG segments points to two strategic repositioning options: (1) a "downstream" option focused on repositioning Uruguay's dairy processors to gain entry to and price premia in end markets, and (2) an "upstream" option focused on repositioning Uruguay's dairy producers to compete in the global organic dairy market.

5.1.1.1. The downstream option: processing Uruguayan dairy for premium end markets

The first strategic repositioning option focuses on direct investments in the downstream phases of the dairy value chain to gain a foothold and price premium in end markets. Dairy *processors* (as opposed to producers) that can achieve the necessary scale to compete in the TSG segment have the opportunity vertically integrate additional

FIGURE 81. **Post-production Value-Addition—Global Dairy Commodities TSG Segment**



Source: Project team interviews and research
Note: Image is not to scale and is representative only.

downstream activities. Conaprole and Uruguay's smaller processors typically engage in bulk processing of wholesale dairy products and less commonly, production of un-branded dairy products (Figure 81).[18] As Figure 28 shows, the "upstreamness" of Uruguay's dairy exports has increased slightly since 1998, indicating that Uruguayan dairy exporters in the TSG segment have not been able to enter the downstream phases of the value chain and retain a higher share of the value added by interacting closely with final consumers over the last 19 years.

The massive investments required in marketing, branding, reconstitution plants, final processing facilities, distribution and retail in end markets make this a long-term

18 Bulk and wholesale items are sold to other secondary dairy producers to make finished dairy products (e.g., yoghurts, reconstituted milk, ice-cream mixes) or sold to other food manufactures to produce confectionary products, beverages, baked goods, nutritional supplements and other foods that use dairy products as ingredients. There may be an opportunity for Uruguayan dairy processors to appropriate more value from the value chain by producing more finished goods.

strategy, subject to the FDI and acquisition strategies for Uruguay of global players with an existing foothold in international end markets. Box 10 illustrates how key global players in the TSG segment have established a foothold on international end markets, and what are the competitive dynamics and investment requirements needed to pursue a downstream repositioning strategy in TSG premium end markets.

BOX 10. HOW HAVE GLOBAL DAIRY PLAYERS IN THE TSG STRATEGIC SEGMENT PURSUED A DOWNSTREAM REPOSITIONING STRATEGY?

Product branding and diversification are highly visible in Dairy TSG strategic segments. The wide range of global brands and labels give the impression that there are many dairy processors in the market. In reality, many of these brands are owned by only a handful of large corporations. For example, the largest dairy producer in the USA, Dean Foods, owns more than 40 brands (Murray, 2015). Similarly, 80 percent of Danone's dairy product portfolio in the Commonwealth of Independent States (CIS) in 2014 were so-called 'local' brands (Danone, 2014). Therefore, competitiveness in TSG segments also requires branding and marketing prowess in destination markets rather than in the country of production.

However, market penetration is not the only hurdle for global dairy processor; once a local presence has been established, reaching the consumer at point of sale requires firms to be able to negotiate supply contracts with retailers. Over the last 30 years, supermarkets in both developed and developing economies around the world have acquired an increasing share of grocery markets (Emongor and Kirsten 2009) (Starmer n.d.). Consequently, the bargaining power of retailers vis-a-vis dairy processors and other suppliers is **increasing.** Figure 82 **shows** the combined share of top three grocery retailers 2008–2013 in eight emerging markets. As can be seen, the combined share of the top three grocery retailers is rising in all eight (geographically and economically disperse) cases.

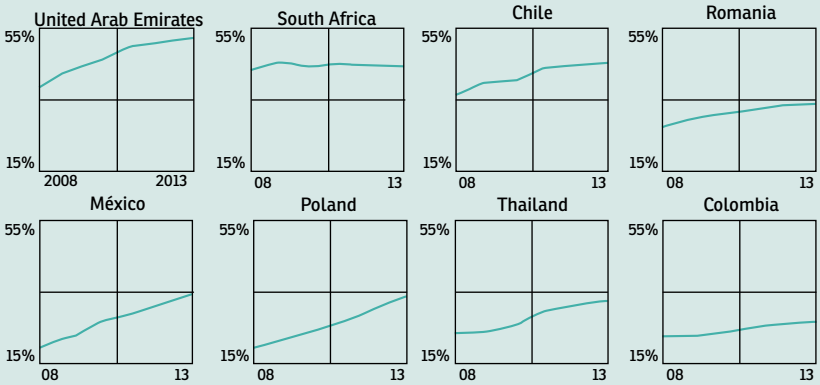
Given that in many cases dairy processors may have only limited access to end consumers except through supermarkets like Carrefour, Tesco, Nakumatt and Walmart, their dominant presence means that supermarkets may be increasingly able define supply terms including sources, quantity, quality, delivery schedules, packaging, returns policy, and above all, price and payment conditions (Consumers International 2012). As an example, supermarkets often give discounts to suppliers that can provide goods in high volume, indirectly discriminating against smaller suppliers. This is part of the reason that the dairy processing industry (in

TSG segments) is characterized by extremely large multinational corporations with a wide range of diversified products not always limited to dairy.

To illustrate, Nestle (Switzerland), Danone and Lactalis (France), New Zealand (Fonterra), Dairy Farmers of America (USA) and FrieslandCampina (Netherlands) dominate the industry with turnovers of US$27.8 billion, US$19.5 billion, US$19.5 billion, US$18.5 billion, US$17.9 billion and US$14.8 billion respectively. However every dairy processor featured on Rabobank's list of "Global Dairy Top 20[1]" had a turnover of over US$5 billion in 2014 (Rabobank 2016). Indeed, more than third of USA's top 100 dairy processors have annual revenues of more than $1 billion (Carper 2015).

The global footprint of leading dairy processors is equally significant; Nestle has 447 factories in 86 countries, directly employing approximately 333,000 people (Nestle 2016). Fonterra collects 20 billion litres of milk every year from 100 countries around the world relying on a workforce of 16,000 people (Fonterra 2016). This global expansion is a relatively recent phenomenon. In 1996, French processor Danone had only 5 percent of its operations in Asia Pacific, Latin America, Middle East, and Africa. In 2014, the same region represented 38 percent of its operations. Today, Danone employs 100,000 people and operates in over 140 countries around the world, 60 percent of which are outside Europe (Danone 2016).

FIGURE 82. **Combined share of top three grocery retailers 2008–2013 (percent company shares by global brand owner)**



Source: (Euromonitor 2014)

1 Ranked by turnover based on dairy sales in 2014

FIGURE 83. **Market Penetration, Organic Dairy as a Percentage of Total Dairy**

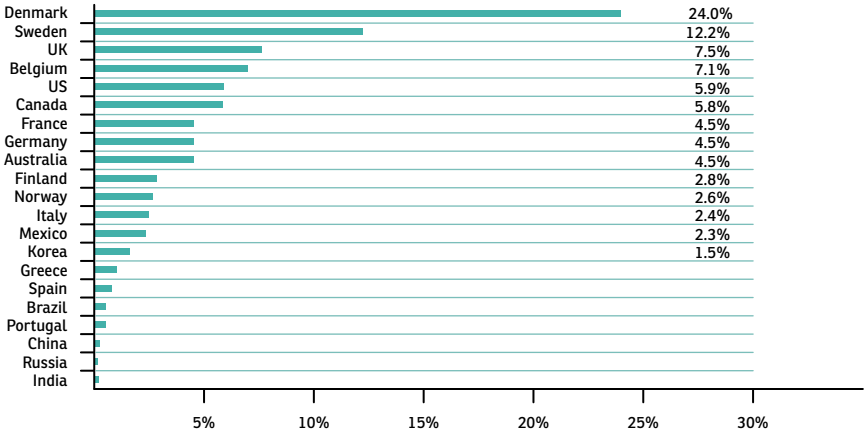
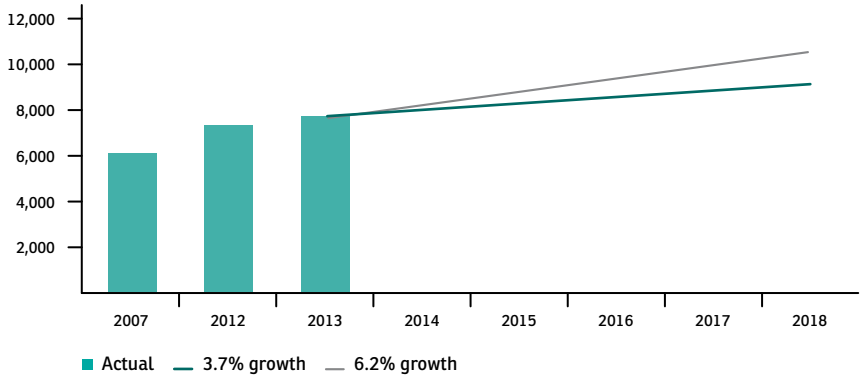


FIGURE 84. **Global Organic Dairy Market Value Projections, 2013–2018 (US$, millions)**



Source: OMSCO – Organic Milk Market Report 2015.

The upstream option: targeting the global market for organic milk powder

The second option is more incremental. It focuses on repositioning the existing TSG value chain in Uruguay toward the international organic dairy powder market to fetch the almost fivefold price premium that it provides. The global organic dairy market is valued at US$7.7 billion, 11 percent of the total global organic food and drink market,

with a 3.7 percent CAGR from 2007 to 2013 rising to a 6.2 percent growth rate for the post global financial crisis period (OMSCo 2015). With Europe and North America representing 90 percent of the global organic dairy market, the low market penetration in emerging economies such as China, Russia, and India (Figure 83) is a medium-term growth opportunity with a 6.2 percent forecasted annual growth (Figure 84) in spite of the stagnant or dropping prices for regular milk.

If the global dairy commodity market continues to grow as forecasted (US DEC 2016) (Rabobank 2016), TSG segments may be an accessible route for producers to insert themselves into GVCs. Although the dairy industry in Uruguay lacks the organic brand recognition of final dairy products on international markets to reap the full price premium associated with these products in end markets, the continued growth of the global market for organic dairy products also presents clear product differentiation opportunities in the TSG segments in which Uruguay operates. As an illustration, milk powder constitutes approximately 52 percent of Uruguayan dairy exports and traded on international markets for US$2,043 per ton in 2016. By comparison, organic milk powder fetches a price premium of US$9,863 per ton on international markets, an almost fivefold increase in markup attributable to the ability to differentiate an otherwise commoditized product in the TSG strategic segment.

Cooperatives and other collaborative production schemes mean that small-scale producers can participate even given the high economies of scale in production of commodity products (Shah 2012, Hogeland 1998). This insertion can lead to upgrading in the sophistication and quality of production. Although domestic consumer demand might coalesce around lower-quality, lower-cost products, regional and global markets demand goods that appeal to a wider range of consumers. Thus, global industries tend to emphasize quality and uniformity through use of product standards, which are often internationally harmonized and recognized (United Nations ESCAP 2015). However, as suppliers-only to milk processors, producers are extremely vulnerable to global market volatility and must compete with imported products.

This strategic repositioning option focuses on upgrading the upstream phases of the value chain in primary production to differentiate the product and to obtain internationally-recognized organic certification and leverage the existing domestic portion of the TSG value chain to enter a contiguous higher-value market. Entering the organic milk powder market requires upgrading processes in the upstream phases of the value chain with a focus on dairy farming and livestock practices. The average conversion time from a regular to organic dairy farm is three years.

The switch to organic dairy farming is usually accompanied by a coordinated package of public policies and industry-level initiatives to (1) harmonize national legislation and regulation on food safety, minimum residues fertilizers and feed regulation, animal health, and traceability with international standards (Box 11), (2) facilitate compliance

BOX 11. USDA REGULATIONS ON ORGANIC LABELLING

To be sold in the United States as "organic," all agricultural products, including domestic and imported livestock products, must comply with National Organic Program regulations. The United States Department of Agriculture (USDA) regulates the production and labelling of "organic" livestock and livestock products under the Organic Foods Production Act of 1990 and the National Organic Program (NOP), Section 7 of the Code of Federal Regulations (CFR), Part 205, which is also known as the "NOP Final Rule" (USDA, 2000).

Dairy animals must be fed and managed organically for at least one year prior to the production of organic milk. Slaughter animals must be managed organically from the last third of gestation, or from the second day after hatching for poultry. Feed must be 100 percent organic. All livestock must have access to the outdoors, and ruminants must have access to pasture during the growing season. Organic livestock producers must establish preventative livestock health management practices. Medical treatment cannot be withheld from sick animals to maintain the animals' organic status. The use of growth hormones, antibiotics, genetic engineering, and cloning is prohibited, as is the feeding of slaughter by-products. All organic livestock production and processing operations must be certified by USDA-accredited certification agencies. Detailed records of all feeds, medications, and transactions must be maintained. Organic integrity must be protected by preventing organic livestock and livestock products from contacting prohibited substances or being commingled with non-organic products

Source: Reproduced from Riddle (2012)

with mandatory and voluntary international product standards through the introduction of organic accreditation and certification schemes, and (3) establish organic farmer support schemes (such as the EU Organic Farmer Support Schemes) to provide incentives for conversion to or maintenance of the organic status of dairy farms.

Uruguay is well positioned to consolidate the policy and regulatory framework and public-private institutional infrastructure to enable the conversion to organic dairy production by building on the food safety and traceability systems that it has already in place for the livestock and meat industries. With 500 organic farms and 759,000 hectares of organic land (5.1 percent of arable land) for the meat, wine, honey, citrus, and dairy industries, Uruguay can leverage the expertise and regulatory framework

and public-private institutional infrastructure, such as the National Institute for Meat for the beef industry, to support the adoption of organic production and processing practices and minimize the costs of converting to organic dairy production. Many European countries—such as Denmark, the UK, and France, which have the highest market penetration for organic dairy products (24 percent of dairy market in Denmark)—are good models of how a package of sector-specific regulatory reforms and adoption of international product standards, along with organic sourcing polices for public procurement (France), and organic farm conversion and maintenance schemes can facilitate entry into the higher value organic dairy market.

In Uruguay in particular, the implementation of this repositioning strategy would require adopting the following coordinated package of public policies and industry-level initiatives:

1. **Harmonize national[19] legislation and regulations with international standards[20]** on pasture management, seed certification, food safety, maximum residues fertilizers, pesticides, and livestock feed regulation, livestock health care practices, and traceability;
2. **Conduct an industry level audit on organic dairy farm practices in Uruguay** to assess implementation gaps and investment needs to launch or recalibrate temporary support schemes for conversion to organic;

19 The Codex Alimentarius and IFOAM guidelines are minimum standards for organic agriculture, intended to guide governments and private certification bodies in standard setting. As such, they can be considered "standards for standards." Governments can use these texts to develop national organic agriculture programs, which are often more detailed because they respond to specific country needs. Most national standards (e.g., EU countries, Japan, Argentina, India, Tunisia, USA), are specified in legally binding regulations (www.ifoam.bio).

20 The FAO/WHO Codex Alimentarius Commission (the inter-governmental body that sets standards for all foods) has produced international guidelines for the production, processing, labeling and marketing of organically produced foods to guide producers and protect consumers against deception and fraud. All member states of the Codex Alimentarius Commission have agreed on these guidelines. The private sector's equivalent to the Codex Alimentarius guidelines is the International Basic Standards for Organic Production and Processing, created by IFOAM. Codex Alimentarius and IFOAM guidelines include accepted management principles for the production of plants, livestock, bees and their products (IFOAM makes provisions also for fibers, aquaculture and non-wood forest products); for handling, storage, processing, packaging and transportation of products, and a list of substances permitted in the production and processing of organic foods. These guidelines are regularly reviewed, particularly the criteria for permitted substances and the process by which inspection is carried out and certification held (www.ifoam.bio).

3. **Introduce organic accreditation[21] and certification[22] schemes** for service providers and farms to facilitate compliance with mandatory and voluntary[23] international product standards; and
4. **Establish temporary non-distortive organic farmer support schemes** to provide incentives for conversion to, or maintenance of, the organic status of dairy farms, based on the results of the industry audit on organic dairy practices and implementation gaps under point (2).

5.1.2. Recommendations for the Perishable Premium Local Strategic Segment of the Dairy GVC

Strategic Repositioning through a Collective Upgrading and Formalization Strategy for Artisanal Cheese Producers. The analysis of the PPL segment points toward the strategic repositioning option of pursuing a collective upgrading and formalization

21 Accreditation is a procedure by which an authoritative body evaluates and gives formal recognition that a certification program is in accordance with the standards of the authoritative body. For organic agriculture, certification bodies can apply the voluntary international standards and/or the national mandatory standards and be accredited by the related "authority". The International Organic Accreditation Service (IOAS) accredits certification bodies according to IFOAM Accreditation Program criteria by delivering the "IFOAM Accredited" logo. IOAS is an independent NGO that ensures global equivalency of certification programs and attempts to harmonize standards, taking into consideration local differences. Membership in IFOAM by certifying bodies does not constitute IOAS accreditation. Governments or national accreditation bodies accredit certification bodies operating in their country, if their country has organic agriculture legislation. Both private and public bodies adhere to the International Organization for Standardization basic standards for accreditation of certifiers (ISO 65) in addition to their specific requirements (www.ifoam.bio).

22 Certified organic products are those which have been produced, stored, processed, handled and marketed in accordance with precise technical specifications (standards) and certified as "organic" by a certification body. Once a certification body has verified conformity with organic standards, the product can be labeled as such. This label will differ depending on the certification body, but can be taken as an assurance that the essential elements constituting an "organic" product have been met from the farm to the market. An organic label applies to the production process, ensuring that the product has been produced and processed in an ecologically sound manner. The organic label is therefore not a product quality claim (www.ifoam.bio).

23 In some countries (e.g., Germany), individual certification bodies may produce their own standards, which can be more stringent than the regulation in force, usually in response to specific consumer demands. Although these are not legally enforceable, private certifiers may be more restrictive than is required by law (www.ifoam.bio).

strategy for artisanal cheese producers (Box 12) geographically clustered in the regions of Colonia and San Jose. The objectives of this strategic repositioning option would be to:

- Increase the share of value added captured by artisanal cheese producers on the domestic market in Uruguay, as artisanal cheeses are currently sold in bulk at local markets (ferias) or through small distributors under their private labels for a limited price premium.
- Consolidate sustainable formal jobs in rural areas, which risk being displaced by global integration trends. In fact, 23 percent (800) of the 3,600 registered milk producers in Uruguay are artisanal cheese producers. Another 47 percent (1700) produce less than 1400 liters of milk per day (INALE 2015) and only supply milk to processing plants. These groups would benefit from a collective upgrading initiative in the PPL as they constitute the weakest actors in the PPL value chain and might benefit from increasing their bargaining power in the chain.

BOX 12. THE POTENTIAL FOR PPL: HOW WISCONSIN CREATED THE WISCONSIN CHEESE BRAND

In 1994, the Wisconsin Specialty Cheese Institute was formed to promote specialty cheese in Wisconsin, a Midwestern state of 5.7million people. In the same year the Wisconsin Center for Dairy Research, the Wisconsin Milk Marketing Board and UW-Extension (an outreach arm of the University of Wisconsin that uses university resources and research to meet the specific needs and interests of Wisconsin residents and communities) established the Wisconsin Master Cheesemaker Program as an advanced education program for experienced cheesemakers. In the first ten years specialty cheese[1] production more than doubled.

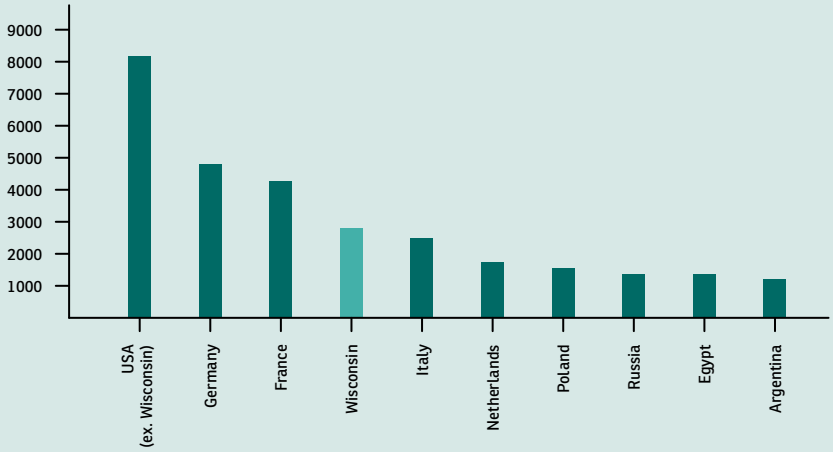
Recognizing that there was further potential, in 2005, the Dairy Business Innovation Center was created. Its original mission was to strengthen the image of the specialty cheese industry in Wisconsin by better distinguish itself from the commodity cheese industry, emphasizing Wisconsin's deep-rooted cheese-mak-

1 Greenberg (2005) defines Specialty Cheese as "*cheese produced in limited volume, with distinctive characteristics that result in high quality products, create added value and command a premium price from consumers*"

ing heritage, developing more branded cheeses and emphasize the unique artisan characteristics of Wisconsin specialty cheeses. The Dairy Business Innovation Center also offered business development assistance to farmers and cheese processors for value-added dairy product development, business planning and market development. By 2012, The Dairy Business Innovation Center had been instrumental in the construction of 43 new dairy plants, 72 expanded dairy plants, and the creation of more than 50 new cheese varieties.[2]

By 2013, Wisconsin's specialty cheese production exceeded 640 million pounds (90 percent is sold beyond state borders), accounting for 22 percent of Wisconsin's total cheese production and 46 percent of total U.S. specialty cheese production. As shown in Figure 85, Wisconsin is also the fourth largest cheese-producing region in the world.[3]

FIGURE 85. **Wisconsin vs Top Cheese-Producing Nations (2013)**



2 Carpenter (2012) Cheese Underground, Available from : http://cheeseunderground.blogspot.com/2012/09/the-end-of-dairy-business-innovation.html Date Accessed: 4th March 2017

3 America's Dairyland (2015) 2015 Dairy Data. Available From: http://www.americasdairyland.com/economicimpact/statistics/dairystatistics

- Foster business formalization among informal cheese producers through the provision of shared services to improve regulatory, tax, and product standard compliance for the micro and small entrepreneurs willing to participate in a collective upgrading program.
- Prepare the groundwork both in terms of regulation, product standards, and investment, to enter the Perishable Global Premium (PGP) strategic segment in the medium term.

Policy and Private Sector Initiatives enabling the Strategic Repositioning

The objectives of focusing on the artisanal cheese segment are valid on grounds of improving sustaining rural livelihoods, promoting regulatory compliance and business formalization, and building the foundations for entry into international markets in the PGP segment in the medium term. Nevertheless, the growth expectations for the short term need to be mitigated in consideration of the fact that (1) the small size of the domestic market in Uruguay limits the growth prospects of any local strategic segment such as the PPL, and (2) the domestic dairy market shows signs of saturation. Nonetheless, significant efficiency gains and firm-level upgrading can be achieved by focusing on the following package of regulatory and policy initiatives:

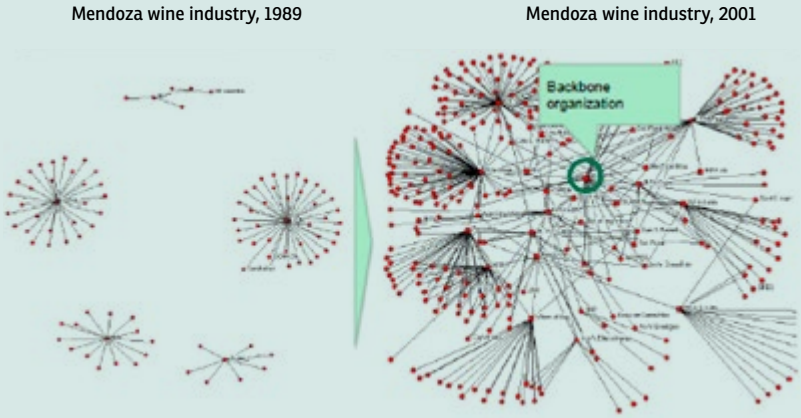
- **Develop voluntary yet enforceable product standards** for cheeses to obtain artisanal geographical certification of origin such as "Colonia cheese", with compliance monitored and sanctioned by local industry associations or cooperatives;
- **Strengthen food safety, sanitary, and phytosanitary control mechanisms**, both by consolidating public veterinary and sanitary service provision at the local level, and by supporting the introduction of good agricultural practices and food safety management practices through capacity building and advisory services by local industry associations and cooperatives;
- **Enable investment in a distribution network, with a cold chain as necessary**, to be owned and operated by an industry association or cooperative of artisanal cheese producers, to increase the bargaining power and value added retained by producers vis-à-vis small retailers and supermarket chains;
- **Invest in developing a nationally recognizable brand for Uruguayan artisanal cheese** to reap the benefits from the regulatory changes and investments proposed under recommendations (1), (2), and (3). Using the brand and the related extension and distribution services must be conditional on producers' compliance with the food safety and product standards established under recommendations (1) and (2). The combined package of firm-level self-interest, public pressure toward regulatory compliance, and self-governance mechanisms by collective organizations can lead to a virtuous process of formalization and upgrading as with buffalo mozzarella producers in Southern Italy and fruit exporters in Northeast Brazil (Box 13).

BOX 13. WINE, BUFFALO MOZZARELLA, AND FRUIT: FORMALIZATION AND UPGRADING THROUGH COOPERATION IN ARGENTINA, SOUTHERN ITALY AND THE NORTHEAST OF BRAZIL

In a classic case, in Argentina in the 1990s two neighboring provinces took different approaches to rescuing their wine industries. One implemented one-off tax breaks that attracted a short surge in private investment that soon fell away. The other built a network of institutions with participatory governance, generated a stream of innovations for a decade, and steadily grew to take 2% percent of the global market. In the Argentinean case above, the province of Mendoza built a network of such consultative and participatory institutions, with new institutions spinning out of old ones to perform new tasks and old ones being rejuvenated or reformed. These were all connected in a dense web of cross-governance, so that by the end of the decade an industry loosely connected at the beginning had forged deep networks of learning (Figure 86).

Mendoza has in common with Petrolina-Juaziero in Northeast Brazil and Campania in Southern Italy the process through which trust was built among the implementation networks of firms. Although the initial challenges facing fruit

FIGURE 86. **Building trust among firms through cooperation networks: Mendoza before and after**



exporters in Petrolina-Juazeiro and mozzarella manufacturers in Campania were different, their underlying problems were the same: failure to cooperate would undermine the competitiveness, perhaps even the viability of the local industry. As a result, the producers came together in defense of their own self-interest. And in both cases, the initiative was taken by a small group of large producers, precisely those who had most to lose should the situation not be corrected*. Yet, in both cases, these producers' associations quickly became more encompassing and hence representative organizations. As a result of government pressure, both the Consorzio and Valexport opened its doors to all local producers involved in the same sectors. Essentially government agencies entered into an exchange with these producers' associations. In return for the provision of a public or quasi-public good -- granting the DOC (certification of origin) to the buffalo mozzarella cheese producers in Southern Italy and providing extensive financial and technical support to the fruit fly eradication program in Petrolina-Juazeiro -- the government insisted that these associations open their doors and become truly representative bodies. Finally, both cases illustrate the importance of self-governance mechanisms in supporting and maintaining the cooperative efforts of the local producers. Careful monitoring efforts by Valexport was essential to the success of the fruit fly eradication program. Without these efforts as well as the association's provision of collective services to all members, pest control in the PJ region would not have been possible. Periodic testing and sanctioning of members were also essential to the ability of the Consorzio to reduce the adulterating practices among its members. Had these practices continued, the distinctiveness and hence source of competitiveness of the entire industry would have surely eroded. In short, all three elements—self-interest, government policy, and self-governance institutions were essential to the construction of trust among producers in Campania and Petrolina-Juazeiro.

* In Campania, four large producers involved in both buffalo herding (milk production) and cheese manufacturing together founded the Consorzio to defend themselves from the dual threat of large, outside firms entering the local industry and of local firms adulterating the product. In Petrolina-Juazeiro, again four of the largest growers together established Valexport to avoid past mistakes that led to the decimation of the local melon industry.

Source: Adapted from (Criscuolo, 2012 mimeo; Jordan, 2012, Locke, 2004)

5.2. RECOMMENDATIONS FOR THE ICT/ICTES GVC

The analysis of the ICT/ICTES industry highlights the viability of the "Boutique" strategic segment and potential of the "Powerhouse" strategic segment for Uruguay. It points to two strategic consolidation and repositioning options:

5.2.1. Recommendations for the "Boutique" ICT/ ICTES Strategic Segment

Uruguay's ICT/ICTES firms are strongest in the "Boutique" strategic segment. Opportunities to strengthen the value chain do exist, particularly in generating and maintaining specialized human resources and increasing demand for services. **The first recommendation is to consolidate Uruguay's software industry position in the "Boutique" strategic segment by increasing its foothold in main export markets,** namely the U.S. and Latin America, in terms of direct marketing channels, B2B client management services, and geographical co-location and co-production. To increase the demand for Uruguay's ICT services, it is essential to Increase Uruguay's foothold in major export markets (the U.S. and Latin America) in terms of direct marketing channels, B2B client management services, and geographical co-location and co-production. In order to achieve this objective, the analysis of the "Boutique" segment points to the following areas of focus and recommendations for policymakers:

1. **Recalibrate the focus of export promotion programs for ICT/ICTES from micro and small enterprises to dynamic start-ups, and mid-sized firms with reasonable prospects of successful internationalization.** The initial entry into a new export market by a Uruguayan software company in the "Boutique" segment requires a minimum investment of US$ 300,000, a business development effort of one-year minimum, and a minimal annual turnover of US$ 4 million. Unfortunately, there seem to be a mismatch between these minimum entry requirements that can be met mostly by medium-sized companies and the focus of the government supported programs of export promotion which are geared towards small enterprises unable to meet the minimum market entry requirements and contribute to low rates of export survival.
2. **Reduce barriers to trade for Uruguayan ICT/ICTES exporters through a clear strategy of integration into the global marketplace, including negotiating market access on a bilateral basis as well as double taxation agreements.** Firms in the "Boutique" segment of the ICT/ICTES industry in Uruguay have shown a significant export dynamism in spite of lack of bilateral or multilateral free trade agreements for the service sector. However, this situation is beginning to erode the cost competitiveness of Uruguayan software services exporters as they are subject to differential tax rates (for example

10% in Paraguay, or 25% in Peru). The retreat of Uruguay from the multilateral trade agreement of the Trade Agreement in Services (TISA) constitutes a setback in the process of enhancing the export competitiveness of Uruguayan service exporters.

3. **Engage pre-emptively on tailored STEM education policies and programs to address the projected skills shortage for the ICT/ICTES industry in Uruguay expected to constraint the growth of the Boutique segment.** Human capital is the key asset to the sustainability of a knowledge intensive ICT/ICTES industry, and Uruguay has performed well over the past decades in supplying a sizable pool of skilled workers that have constituted the entrepreneurial backbone of the Boutique segment. However, the strong demand growth for skilled workers by the software and global business services industries (estimated at 500 technical graduates per year by CUTI) has already outpaced the supply of technical graduates (300 per year) by the Uruguayan educational system. A well-concerted secondary and tertiary education policy to address the projected skill shortage will be vital for the sustainability of the whole industry, including the transition to the "Powerhouse" strategic segment (see below).

5.2.2. Recommendations for the "Powerhouse" ICT/ICTES Strategic Segment

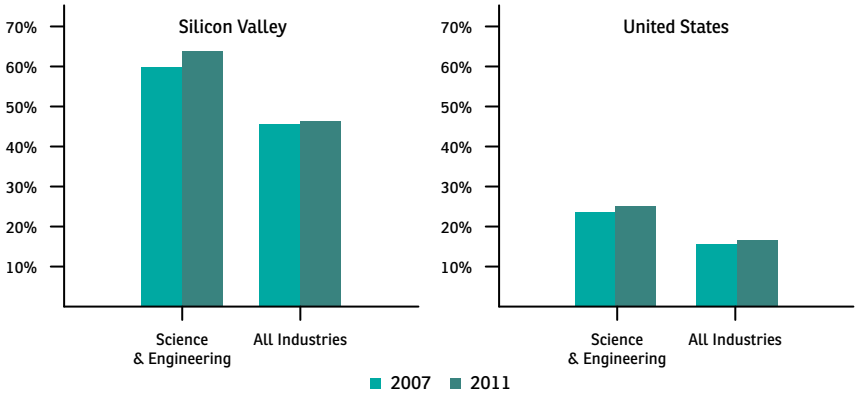
The second one is a medium to long-term strategy, and focuses on establishing the enabling conditions for a strategic repositioning of the ICT/ICTES industry to the "Powerhouse" strategic segment. Scale and rapid business model scalability, sound intellectual property rights legal framework and protection, state-of-the-art ICT infrastructure, access to a sizable and diverse technological talent pool, and availability of catalytic financing for knowledge intensive entrepreneurship represent the key enabling factors for the emergence of significant market players capable of competing in the "Powerhouse" segment. While the 'smallness' of Uruguay remains an overarching constraining factor, the following policy recommendations can contribute to overcome the challenges associated with being a small country with a small domestic market and possibly enter on equal terms the global powerhouse strategic segment:

A. **ICT/ICTES Skills: Increase the critical mass of skilled workforce through a coordinated package of policy changes on attracting returnees and foreign talent, secondary and tertiary education, on-the-job specialization and continuous training, and aftercare for ICT/ICTES FDI.** Access to a wide pool of ICT/ICTES talent and a skilled workforce is the single most critical factor for a knowledge intensive industry such as ICT/ICTES, especially to consolidate a competitive position in the Boutique segment and enter the Powerhouse strategic segment. Uruguay has done very well in cultivating a highly skilled talent pool over the past decades, however,

as it approaches the natural limits to further growth of the critical mass of ICT/ICTES talent due to the smallness of the country, the following policies might help overcome this challenge:

1. **Promote increased diversity in STEM education and improve the rate of participation of women and lower income Uruguayans.** Only 30 percent of the workforce in ICT in Uruguay are women, which tend to fill administrative and support positions in 80 percent of the cases (CUTI, 2015) (does not include ICTES). There is similar inequality across different socio-economic classes—while 70.3 percent of students from top income brackets complete secondary education, only 7.6 percent of students from lower income brackets achieve the same (UNICEF 2013). This leads to low university enrollment and graduation rates. A more proactive diversity policy in STEM education would help increase graduation rates and mobilize significant untapped talent pools for ICT/ICTES.
2. **Enable proactive global recruitment policies to attract and retain returnees and foreign talent in ICT/ICTES** (Figure 87). Any changes to STEM education policies will bear fruit in the medium to the long term. The Government of Uruguay could therefore consider partnering with the ICT/ICTES industry to enable proactive global recruitment policies by firms to build the human resources to grow the sector quickly.

FIGURE 87. **Percentage of Employed Population in the U.S. and Silicon Valley with a BA or Higher that is Foreign-Born**



Source: U.S. Census Bureau, American Community Survey PUMS (Collaborative Economics 2016) (Wang 2014)

Uruguay ranks 109th on the WEF indicator on the availability of scientists and engineers, 98th on the capacity to attract talent, and 70th on the capacity to retain talent (WEF, 2016);

3. **Enhance skills policies and curricula, jointly with the ICT/ICTES industry, for continuous learning and on-the-job specialized-skills training programs.** Continuous learning and high-specialization are two critical success factors for firms and their employees both in the Boutique and Powerhouse strategic segments, as competition is based on the ability to rapidly master the knowledge and capabilities to operate in the emerging programming platforms, which will shape the competitive landscape for the following 3 to 7 years. This requires continuous and significant investment in the workforce as it takes between one and two years of training for an already experiences system engineer to switch to an emerging software platform. The design and co-funding of demand-driven, flexible, and on-the-job learning curricula between the public sector and industry associations is an effective policy option to be considered. Box 14 illustrates how the State of Michigan in the U.S.

BOX 14. ICT/ICTES SKILLS POLICIES. A PUBLIC-PRIVATE MULTIPRONGED STRATEGY IN MICHIGAN AND BRAZIL

An instructive case is "Shifting Code," a mentoring program started in Southeast Michigan in 2012 to address the shortage of qualified IT professionals for the local market. The program seeks to develop the pipeline of IT talent in the region by asking IT firms to collectively decide upon specific skills that they would like to see developed in the local workforce. These wishes are then imparted upon local community colleges, which create customized programs aimed at meeting employer needs. Shifting Code costs students a nominal fee of $100. The true cost of this program is absorbed by the community colleges and the state of Michigan; it costs the state $1,700 per student and the community college $1,300 in technology, services and teachers. The companies provide mentorship, instruction, internships and potential hiring opportunities. Thus, employers outsource some of their training and reserve the right to hire or not to hire graduates. Programs such as this could ensure greater alignment between curricula and employer needs.

A second potential solution is to fund internal training programs. Companies usually complain that poaching reduces their willingness to invest in new hires. As a means of offsetting the cost and risk of running these programs, governments can subsidize training of new hires for up to six months. Through these programs, each

registered ICT/ICTES firm would have an annual quota of funded traineeships, giving firms a greater incentive to invest in workforce training

Finally, many emerging markets have successfully developed programs that send their top students overseas for tertiary studies, with the caveat that they return once they are finished. Brazil's "Science Without Borders" set out to grant 100,000 fellowships to undergraduates, graduate students and postdoctoral fellows for up to three years. The purpose of the program has been to send Brazilian students abroad to study STEM in leading institutions around the world. The private sector is involved with this program as well, as 25% of the funding comes from companies in Brazil. 85,000 students have already been put through the program and the last batch of 15,000 students has been selected. Students must return to Brazil upon completion of their studies.

Source: Adapted from (Sturgeon and Zylberberg, 2015)

and many emerging economies, such as Brazil, have adopted a multipronged joint public-private strategy to tackle this issue.

4. **Focus on tailored FDI aftercare policies to facilitate the relocation of knowledge-intensive function by MNCs as a mechanism to increase the pool of ICT/ICTES skills in Uruguay.** Uruguay has been able to ride the wave of global business services offshoring, attract key players in the industry such as TATA Consulting, IBM, Globant, Mercado Libre and others for a total FDI investment of US$ 156 million. While a good share of these FDI investments have moved to Uruguay to service the "Low-cost" and "Abundant Skills" strategic segments of the ICT/ICTES industry, the business linkages and knowledge transfer flows forged over the time have contributed to create a domestic

BOX 15. BECOMING AN ICT/ICTES "POWERHOUSE": THE CASE OF IRELAND

Ireland, a country of 4.5million people, is the second largest exporter of computer and IT services in the world. ICTES Exports (BoP) have risen from US$31 billion in 2005 to US$88 billion in 2015 (183 percent growth). OECD countries grew from

US$509 billion to US$1,073 in the same period (111 percent growth). Dublin plays host to Google (employing over 2,500 staff) as well as Facebook, Amazon, Yahoo, Twitter, Hubspot, Dropbox, and LinkedIn. Global software applications and digital services stalwarts such as Intel, HP, IBM, and Microsoft are also well established. Dublin has also been able to attract smaller and more nimble gaming firms such as Big Fish, EA, Havok, DemonWare, PopCap, Zynga, Riot Games, and Jolt . Although there has been some concentration of activity and growth in Dublin, other smaller cities and regions of Ireland have also benefitted. As an example, in 2015, Uber set up a Centre of Excellence in Limerick (a city of 95,000 people) which is also home to Thomson Reuters, QAD, Intel, Arista, Dell, and several other tech companies. In the west of the country Galway has over 190 tech companies, including multinationals such as Avaya, IBM, Oracle, EA, Cisco, SAP and Apple (who is investing US$850 million in a new data center). As is indicative of the Powerhouse segment, Ireland has also been able to foster its own indigenous industry and companies like Ex Ordo and Altocloud make a significant contribution to the Galway ICT ecosystem .

The growth of ICT/ICTES in Ireland is largely due to sustained FDI-attraction and export promotion policies. Even in 2005, of the 17 EU countries plus the U.S. and Norway for which OECD provides data, Ireland, at just over 20 percent recorded the highest share of services-sector employment in foreign-owned firms . Barry (2013) attributes Ireland's ability to attract FDI during this period to EU membership, Western European governance standards; strong English-speaking workforce; a low corporation tax rate; the efforts of the Industrial Development Agency, and an educational system that complemented and worked in partnership with Ireland's FDI-oriented development strategy.

The Industrial Development Agency (IDA) whose role is to attract foreign industry together with Enterprise Ireland (EI) a sister agency tasked with export promotion has had a particular impact on the growth of the ICT/ICTES sector in Ireland. Initially using "traditional" FDI attraction strategies (for example identifying large companies in target sectors and persuading them to locate in Ireland), the agencies shifted its focus towards 'capability' support in areas such as human resource development, R&D, marketing and market development as EU restrictions on state aids to industry tightened . Barry (2013) also notes that the IDAs bureaucratic and administrative capacity to inform policy directly has increased their influence and ability to translate market changes into effective real FDI.

ICT/ICTES entrepreneurial pool and could be leveraged to facilitate the relocation of knowledge-intensive functions through a tailored FDI aftercare policy. Box 15 illustrates how Ireland successfully implemented a similar strategy.

B. **Consolidate Uruguay's regional leadership in ICT infrastructure by adopting a pro-competitive policy and enabling entry to private investment.** Uruguay is an ICT/ICTES leader in the region according to a variety of measures. The number of households with computers has grown rapidly since 2004 and today surpasses that of peers such as Mexico, Brazil, Argentina, Chile and Colombia and is on a par with Italy. Similarly in terms of mobile telephony, the number of telephones per 100 persons surpasses that in regional peers (with the exception of Argentina which has a similar figure) as well as a number of OECD countries such as the US, Spain and Germany. Uruguay also leads regional peers in the index of ICT/ICTES development. Data services stand out globally for their high speed and low price. However, Uruguay is one of the very few Latin American countries where the local fixed-line market is neither privatized nor liberalized. ANTEL, the state-owned incumbent, has a monopoly in the provision of local telephony and fixed broadband services. Other segments of the telecom market have been opened to competition, including international long-distance telephony, mobile telephony, and fixed-wireless broadband. Uruguay is also one of the few countries in the world where broadband access via cable modem does not exist (Table 27).

This is in line with Uruguay's position that allows SOEs already holding a legal monopoly in at least one market to extend its dominance to other related markets. For instance, ANTEL has extended its legal monopoly over fixed lines with a de facto

TABLE 27. **Degree of government participation in ICT infrastructure**

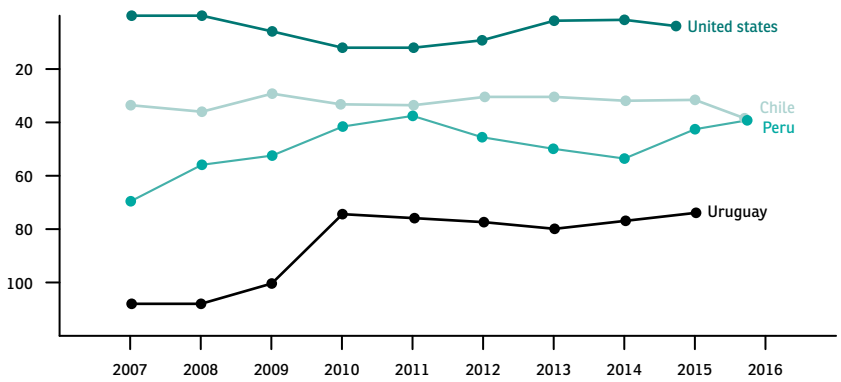
National, state or provincial governments hold equity stakes in the largest firm in the sector	Yes	No	Gov't share in the largest firm in the sector	Number of companies operating in the market	Market share of the largest company in the sector
Telecom					
Fixed-line network	X		100%	1	100%
Fixed-line services	X		100%	1	100%
Mobile services	X		100%	3	50%
Internet services	X		100%	3	Over 90%

Source: World Bank, 2015.

monopoly over optic fiber network for data transmission while private operators have neither received licenses to use their own network nor access to ANTEL's network (World Bank, 2015). Progressively allowing entry to private investment into ICT infrastructure would enable to sustain the significant and continuous investments that are needed to sustain entry and leadership in the Powerhouse strategic segment.

C. **Increase access to catalytic financing and early-stage investing to foster the ICT/ICTES entrepreneurship ecosystem.** Limited access to finance for knowledge intensive start-ups is a common constraint for the ICT/ICTES industry across several countries due to the intrinsically intangible nature of the industry. Uruguay is no exception and in a recent survey of the ICT/ICTES industry in Uruguay conducted by the Instituto de Competitividad – UCU (2015), lack of access to finance ranked as the top 3rd constraint to the competitiveness of the industry, after the cost and availability of skilled workers. In spite of significant progress made over the last decade in early stage financing, Uruguay still lags behind in terms of venture capital availability as it ranks 71th in the relative WEF indicator for 2016 (Figure 88).
A public expenditure review and rationalization of the programs supporting innovation and entrepreneurship under the newly established Sistema Nacional de Transformacion Productiva y Competitividad would contribute to keeping the policy focus on bridging this critical financing gap both for the Boutique and Powerhouse strategic segments of the ICT/ICTES industry.

FIGURE 88. **Uruguay Ranked 71th in terms of Venture Capital Availability in 2016 according to the World Economic Forum**



Source: WEF, 2016

D. **Leverage Algorithmization trends to overcome the shortage of a large pool of ICT/ICTES talent.** By developing global specialization in algorithmization, mechanization and robotization of tasks, Uruguay's ICT/ICTES industry could not only develop competitive advantage in a niche that is growing in significance, but also actively contribute to reducing the reliance of the global industry on human capital (i.e. changing the value structure in such a way as to displace established market leaders, networks and alliances). This kind of 'disruption' is not unprecedented and does not always emerge from established "Powerhouse" strongholds, and Box 16 illustrates the case of the 'Voice over IP' (VoIP) in Estonia.

BOX 16. E-ESTONIA. HOW VOICE OVER IP (VOIP) ENABLED ESTONIA TO BECOME A NICHE ICT/ICTES GLOBAL PLAYER

Since the inception of Estonia's Information Policy in 1994, the small country of 1.3million people has continued to drive its digital strategy forward by using an e-Government as a platform for development and advancement. With the highest digitization index in the EU[1], Estonia provides (access to) a large proportion of its services online including Education, Financial Services, Healthcare, Public Safety, Policing and Utilities. In particular, Estonia's launch of its ID-card system, Mobile ID and i-Voting systems have increased the demand for cyber-fraud protection in the region and have so doing spurred high growth in this particular industry. As a result, Estonia now enjoys particular comparative advantage in cyber security centers (and management), security software development, defense software and systems integration, mobile security and wireless security. This is reflected in the fact that NATO's and Skype's security teams are located in Estonia. Much of this growth can be attributed to Estonia's ICT/ICTES labor pool: Estonia has a proportionally high level of young workers, which has allowed more niche-oriented specialisms, such as gaming, to emerge. Estonia also has a higher than average degree/post graduate education level, which will bode well for future co-operative ventures, perhaps encompassing Engineering and strong foreign language abilities.

Estonia's most notable export has been Skype. Developed in Tallinn, the nation's capital, Skype Technologies' Skype platform has commoditized the cost of

1 EU eGovernment Report 2016, Available from: https://ec.europa.eu/digital-single-market/en/news/eu-egovernment-report-2016-shows-online-public-services-improved-unevenly

international calls to near zero and in so doing virtually eliminated this previously lucrative revenue stream for telecommunications companies (the Technical Advisory Council estimates that only 6 percent of Americans will use the PSTN by 2018 (Technology Advisory Council 2011). Before 'Voice over IP'(VoIP), communication was largely possible through Public Switched Telephone Networks ("landlines") whose value chain structure of the industry relied heavily on maintenance of physical infrastructure (particularly the switches themselves which place huge demands on heating, ventilation and air conditioning and consume a huge amount of power). With the increasing popularity of VoIP services, the value chain of many/most strategic segments in the telecommunications industry has completely changed over the last ten years. A complete switch to all IP networks will mean significant changes in maintenance, power consumption, and real estate on which have has previously hinged the value structure of the strategic segments in the industry. In the meantime, Tallinn has capitalized on its early work in the field having more than 50 companies (e-Estonia 2016) specializing in the area of mobile solutions and telecommunications alone and is well positioned to support the expansion of IP networks globally.

Firms in Uruguay's ICT/ICTES sector may have an opportunity to similarly hone a niche that will at the same time disrupt the value chain structure itself toward a more accessible actuality.

5.3. RECOMMENDATIONS FOR DATA COLLECTION AND STATISTICAL TOOLS ON GVCS

High-quality data is crucial for evidence-based policymaking. While data available in Uruguay is of high quality, two improvements could make it better suited for the analysis of participation in international production networks. These are:

1. **Matching firm-level survey data from the National Economic Activities Survey, compiled by the *Instituto Nacional de Estadísticas*, with customs transactions data (from customs registries).** Matching these datasets through a common identifier (for example, the unique registration number of the firm) would allow to, when looking at customs transactions, isolate firms that export and import and produce from firms that are only

international traders, aggregating production from small and medium firms. It would also allow for a more detailed analysis of drivers of a firm's position into a given value chain in terms of its upstreamness, or of quality upgrading. For example, richer data may help understand how financial constraints affect the ability of a firm to access imported inputs. Similarly, they could shed light on how capital intensity and productivity affect the likelihood to expand the range of production stages performed by a given firm.

2. **Collecting information on the nature of firms' linkages.** Currently, no data are available to trace the nature of firms' interactions (e.g., as suppliers or clients), which limits the possibility of better understanding, for example, transmission of shocks through GVCs, or drivers of productivity or knowledge spillovers. In some countries (e.g., Belgium), tax registries, in particular from VAT declarations, has been made available to researchers to better understand these issues.

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