Public and Private Investments in Innovation Capabilities for Risk Management and Export Growth: Structural Transformation within the Chilean Wine Industry

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I. INTRODUCTION

The process of industrial development, resource reallocation and productivity dynamics can be decomposed into three complementary types of “structural transformation”, namely: (1) cross-industry structural change, as inputs are reallocated across industrial activities; (2) within-industry structural change, as inputs are reallocated across enterprises within industries; and (3) within-firm structural change, as input reallocation and innovation alters the structure and efficiency of the firm. Eichengreen, Park and Shin (2013) speculate that countries often face “middle-income traps” when total factor productivity (TFP) gains from cross-industry structural change are largely exhausted and remaining TFP gains are available primarily via difficult-to-achieve within-enterprise structural change. In related work, Bollard, Klenow and Sharma (2013) decompose TFP dynamics in India into this three-way typology. They report that the large speed-up in the productivity of formal Indian manufacturing plants in the 1990s and early 2000s is mainly driven by within-plant productivity growth. Hsieh and Klenow (2013), based on employment and TFP growth over the life cycle of Indian and Mexican manufacturing plants relative to the US, point to the differences in within-plant TFP as being as important as the gains in TFP from resource reallocation across firms, accounting for about 25 percent of the gap in aggregate TFP between rich and poor countries.

This paper builds on the recent literature on “new sources of growth” by opening up for one industry the black box of conventional TFP estimated as a residual. It does so by instead directly measuring key knowledge-related elements of within-firm TFP in a developing country based on public and private investments in intangible assets that provide innovation capabilities, also referred to as Knowledge-Based Capital or “KBC” (OECD 2013, Hulten 2013, Dutz 2013a). Measurement of business spending on KBC is relatively recent, with the seminal work applying direct expenditure methods initially done for the U.S. economy (OECD 1998, Nakamura 2001, Corrado, Hulten and Sichel (“CHS”) 2005, 2009). In contrast to the conventional approach of treating spending on knowledge assets as intermediate expenditures and thereby assuming that all their benefits are reflected in the current year’s output of tangible goods and services, the KBC approach correctly capitalizes outlays that contribute to production and value beyond

1 PRMED, The World Bank; City University of New York – Graduate Center; and Professor, Universidad de Talca (1995-2012), respectively. The authors gratefully acknowledge support from World Bank’s DEC Research Support Budget for financing aspects of the underlying empirical work.
2 Born out of the insights of OECD’s Innovation Strategy (released in 2010), the OECD initiated a two-year project at the start of 2011 titled “New Sources of Growth: Knowledge-Based Capital”. It had two main aims: to provide evidence on the economic value of KBC as a new source of growth; and to improve understanding of current and emerging policy challenges. The project’s main analyses and policy findings are contained in OECD (2013).
the taxable year and treats them as longer-lived knowledge investments — using the same cost-based accounting that is used for physical capital. The KBC approach expands the conventional proximate sources of growth beyond human and physical capital to include knowledge investments in the resource reallocation/ innovation and risk management capabilities of the enterprise. Importantly, these investments go significantly beyond traditionally-measured R&D expenditures to include a range of co-investments required for enterprises to decide what to produce and how, to develop new ideas, to execute and translate these ideas into products, processes, organizational changes and markets, and to manage associated risks. The CHS classification divides KBC into three categories:

1. **digital assets** ("computerized information") - software and databases
2. **intellectual assets** ("innovative property") - R&D, creative assets, associated patent, trademark, copyright and other obtaining, licensing and enforcing costs, architectural, engineering and other designs, new products/systems in the financial industry, and mineral exploration and evaluation
3. **human-organizational assets** ("economic competencies") - market research, advertising and brand equity, firm-specific human capital, and business process/organizational improvements — as well as an additional-to-CHS sub-category likely most important for developing country industries behind the global technological frontier, namely spending on collaboration-related assets to diffuse, capture, adapt to local context and use existing but new-to-the-firm knowledge, such as outlays on networking and peer-to-peer learning from local clusters, subcontracting, foreign buyers and sellers, global value chains, consultants and study tours, and other forms of global knowledge.

The acceleration of globalization, technological progress, and increased trade and competition have resulted in rents from new ideas becoming more important for sustained firm-level competitiveness and aggregate growth across countries. In addition, as countries accumulate larger stocks of human capital, the production and use of different types of KBC are enabled and complemented. As knowledge inputs are becoming a bigger share of value added and all countries are seeking ways to take advantage of information communication and related technologies in their transition to more knowledge-intensive economies, investments in the full range of activities needed to commercialize new ideas and create competitive advantage are becoming more important over time. The increasing importance of KBC over time is shown by the steady increase in the KBC investment rate in the US as a share of expanded nonfarm business output, from 8 percent in 1977 to 14 percent in 2010, in contrast with a secular decline in the tangible investment rate (Corrado and Hulten 2010, Hulten 2013).

A recent international empirical literature has highlighted investment in intangible assets both as a distinct category of firm investment and as a major driver of growth. In the US, UK, Finland and Sweden, firms now invest more in intangible than physical capital. Estimates of KBC at the aggregate level across countries—to-date available for high-income OECD countries, Brazil, China and India—highlight that KBC is an important and dynamic element of aggregate economic growth, with a significant positive correlation between investments in “core” KBC (excluding software and architectural and engineering designs to control for the links with IT equipment investment and real estate bubbles) and PPP-adjusted output per capita (Hulten 2013). Applying this economy-wide methodology to Brazil, Dutz et al. (2012) estimate that during 2000-2008, annual business spending on intangibles averaged about 4 percent of GDP, showing that this investment is positively correlated with recent export growth and total factor productivity estimates across manufacturing industries. Hulten and Hao (2012) estimate China’s aggregate intangible expenditures at roughly 7.5 percent of GDP.
Measurement of investment in intangibles at the firm level is at an early stage for several reasons, though mainly because most firm surveys have not historically included distinct questions needed to quantify investment in intangibles. This shortcoming of existing methods is being gradually addressed, but so far only for high-income countries: Haltiwanger, Haskel and Robb (2009) discuss new survey data piloted in the UK (as reported in Awano et al. 2010a, b) and in the US (based on new questions on spending on intangible assets by young firms added in the longitudinal Kauffman Firm Survey). They conclude that R&D is but one measure of knowledge investment, with a range of additional questions being essential to fully capture knowledge spending, with complementary questions on depreciation rates of intangible assets yielding helpful insights.

The present study takes an initial step in measuring and quantifying the association between public and private investments in KBC and industry-level and firm-level sales outcomes. In this paper, we empirically examine the linkages between KBC investments and industry- and firm-level exports in the Chilean wine industry. The study tests two hypotheses: (i) that spending on KBC is a statistically significant and economically important correlate of growth as reflected in exports, both at industry and firm levels; and (ii) that spending on reputation & branding and on learning through global collaboration and network-building, namely on connecting firms to better existing knowledge flows, are both statistically significant and economically more important at the firm level than other types of KBC.

Why focus on the wine industry? Based on an international comparison between Italy and three New World wine producers, namely Argentina, Chile and South Africa, Giuliani et al. (2011) explain why the wine industry (rather than electronics, software, pharmaceuticals or telecommunications) is an ideal industry to investigate technological catch-up in emerging countries, and how R&D and innovation are indeed the main drivers of a traditional agro-food industry such as wine. They document how, as latecomers in the international market, New World producers have radically changed how wine is produced, sold and consumed. Their main argument is that innovation in product and process, spurred by consistent investments in innovation capabilities, has played a prominent role in the emergence of New World producers in the international market. Their empirical evidence shows that New World producers have improved the quality of their wines, investing in research in universities and laboratories, strengthening the link between university and industry, and importing external knowledge through experts. They show how a traditional agro-food industry can become highly competitive and catch up in the global market, thereby contributing significantly to the process of growth in these countries, when following a trajectory where investments in knowledge-intensive activities, R&D and innovation play a prominent role. However, their empirical evidence is based largely on a set of case studies of the main drivers of catch-up in Argentina, Chile and South Africa, namely universities and researchers, public institutions and firms. While there exist a number of empirical studies on the wine industry in Chile and in other countries (on Chile, see for instance Troncoso and Aguirre 2006, Kunc and Bas 2009, and Moreira, Troncoso and Bravo-Ureta 2011), there is no measurement of levels of investment in knowledge-based assets by firms or by the State, a shortcoming this study seeks to address.

The present study adopts two complementary methodologies. First, based on a unique dataset on public and private KBC investments compiled at the industry level, the paper categorizes into main types of KBC assets the individual project expenditures from Government of Chile databases covering all innovation support programs targeted at the wine industry from 1990 to 2012. It then explores statistical
aggregate industry-level time series correlations between bottled wine exports and expenditures on main types of KBC, lagged area planted, and a measure of global demand. Second, at the firm level, the paper reports on the findings of a novel field survey of wine enterprises conducted in Chile in the first half of 2013, based on a newly-designed “Survey of Investments in Knowledge-Based Capital”, adapted to a developing country context and to the wine industry, and pre-tested in the field in Chile. It then explores statistical correlations between export or domestic bottled wine sales and expenditures on main types of KBC and physical capital. In terms of methodology, the paper is most closely related to enterprise survey work undertaken by the Kauffman Foundation in the US as reported in Haltiwanger, Haskel and Robb (2009), and undertaken by Awano et al. (2010a, b) in the UK.

The paper makes four contributions to the literature. First, in terms of linkages with risk management, we illustrate how specific KBC investments can be interpreted as investments that support firms’ four pillars of risk management, adapted and extended to include upside (innovation) risk from a framework suggested for downside risk management by Ehrlich and Becker (1972): the resilience of development outcomes can be improved both ex ante, before productivity or demand shocks are realized, by investing in knowledge, protection/enabling and insurance assets, and ex post by investing in coping/leveraging assets after the realization of the shock or after it becomes clear whether the innovation investments are succeeding or failing in the marketplace (Dutz 2013b). Second, at the industry level, the paper documents joint public-private investments across different types of KBC. Total public-private co-investments over the period were sizeable. The strong statistically significant positive correlation of industry-level R&D outlays with bottled wine export sales suggests that investments in KBC are more important for export competitiveness than our available industry-level proxy for investments in physical capital (area planted). The sizeable and long-term nature of public financing highlights the important role of government support to innovation, as outlined by Janeway (2012) and Mazzucato (2013). Third, the paper is, as far as the authors are aware, the first firm-level application of the KBC approach to measuring investment in a developing country. In terms of share of firms engaging in KBC investments by type, our results are in line with what Awano et al. (2010) found for the UK: namely, that the top three KBC categories are investments in reputation and branding, training and software. As in the UK, the average benefit lives for each asset category are greater than one year, strongly supporting the case for capitalizing the assets. We find statistically significant positive correlations between outlays on reputation & branding (in particular, on attendance at international wine fairs) and on collaborative learning from global knowledge (in particular, spending on foreign consultant services) and exports. Finally, in terms of measurement and policy guidance, the paper provides a survey design methodology for improving the success rate of policies and investments for other industries, by quantifying the role of different types of KBC in sales growth and suggesting what policies may matter for risk management and competitiveness.

Section II provides a brief background to the Chilean wine industry and presents summary statistics on our industry- and firm-level datasets. Section III then presents linkages between investments in KBC investments and risk management. It provides illustrative examples of how specific KBC investments can be re-interpreted according to firms’ four pillars of risk management, namely investments in knowledge, protection/enabling, insurance, and coping/leveraging assets. Section IV presents linkages between KBC investments and export (and domestic) sales, first based on industry-level results and then based on firm-level results. The final section concludes and discusses policy implications and opportunities for further research.
II.1. STRUCTURAL TRANSFORMATION IN THE CHILEAN WINE INDUSTRY

The Chilean wine industry has experienced impressive growth in recent decades. As highlighted in Figure 1a, growth in total wine production increased from 187 to 1,255 million liters between 1990 and 2012—at an average compound annual growth rate of 9.0 percent. During this same time, total area planted with wine grapes increased from 65.2 to 127.0 thousand hectares (3.1 average CAGR). By decomposing this growth rate into two periods, it is evident that the decade of the 1990s saw a faster compound annual growth rate in production of 13.1 percent (from a lower initial base) relative to the subsequent 2000-2012 period of 5.7 percent growth per annum. Total wine exports and the subset of total bottled wine exports, in turn, grew from 43 and 23 to 744 and 406 million liters over the same period, at a respective compound annual growth rates of 13.8 and 14.0 percent (with almost identical growth rates even when broken down into the two periods, at 19.9 and 20.9 percent per annum for total and bottled wines during the 1990s, and 8.9 and 8.5 percent per annum over the 2000-2012 period). The faster rates of growth of wine exports relative to wine production reflect a gradual shift in sales from domestic to export markets over time. Chile has climbed to be among the top five countries in terms of national shares of world wine export volume and value by the late 2000s (behind France, Italy, Spain and Australia, but ahead of the US, Germany, New Zealand, Argentina and South Africa, among others) (Andersen and Nelgen 2011).

Figure 1a: Evolution of export volumes, 1990 to 2012

The increase in export volumes between 1990 and 2012 is mirrored by equally spectacular increases in export values (in constant 2012 US dollars): from $116 million to $1.78 billion for total wine exports (or 13.2 percent per annum, 23 percent per annum over the 1990s and 5.6 percent per annum thereafter), and

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3 Area planted excludes the area with table grapes. Because capital investment is directly related to area planted, this variable can also be used as a proxy of investments in physical capital. The data were obtained from the Instituto Nacional de Estadísticas.

4 Bottled wine exports include tariff codes 22042110 (wines with Denomination of Origin) and 22041000 (sparkling wines), and exclude codes 22042190 (wine in tetrapack equal to or less than 2.0 litres) and 22042990 (other wine, mainly larger bulk containers). The series were obtained from ODEPA, Ministry of Agriculture’s Office of Agrarian Studies and Policies.
from $89 million to 1.35 billion for bottled wine exports (or 13.1 percent per annum, again 23 percent per annum over the 1990s and 5.5 percent per annum thereafter). Figure 1b shows the evolution of export unit values over time, with a significant price premium for bottled wine over all wine exports (taking into account that the higher-value bottled wine exports are also included in total exports). However, it is striking that bottled wine unit values have not increased further over time, suggestive of the continuing predominant niche of most Chilean wines as relatively low-cost “value for money” products, and indicative of potential additional gains in the future from further investments in market research, quality upgrading and branding. Figure 1b also shows, on the right-hand side axis, the evolution of the share of bottled wine exports in total exports by volume over time, with the share remaining relatively constant at approximately 55 percent, with a low of 39 percent in 1994 and a high of 61 percent in 2011 – highlighting that the mix of export volumes has not shifted significantly toward higher-value wines. As a signal of what is possible and the global brand image that Chile has attained, Concha y Toro has consistently been rated in the top 3 most valuable wine brands in the world from 2006 through 2013, according to an annual compilation of the top 100 spirits and wine brands (Intangible Business).

Figure 1b: Evolution of export unit values and bottled wine share of exports, 1990 to 2012

The evolution of the Chilean wine industry described above was accompanied by significant transformations and innovations, both in plantations and wineries as well as in the management of the firms. Thus, new technologies were introduced in the vineyards, in the way of new cultivars, vine training systems (besides the traditional double cordon) and pruning methods; similarly, wine cellars evolved from traditional winemaking methods (based on fermentation in oak casks) to modern oenological technology using stainless steel vats and equipment. All these transformations required investments not only in physical capital but also in worker and management training, adaptive R&D, software (including

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5 The share of bottled wine exports in constant 2012 US$ has also remained fairly constant over time, beginning the period at 77 percent in 1990 and ending at 76 percent in 2012, with a low of 67 percent in 1993 and a high of 82 percent in 2007.

6 These global rankings are based on objective measures such as market share, brand growth, price positioning, and number of markets with a significant brand presence, together with a range of subjective measures.
software to manage oenological processes, such as Kupay, developed by the Chilean firm, SONDA), new organizations (e.g. Wines of Chile A.G, with branches in the U.K and the U.S), trademarks recognized in Chile and abroad, and many other intangible investments.

II.2 INDUSTRY-LEVEL DATA

The extent of public sector funding support to KBC investments in the Chilean wine industry over the period 1990-2012 was large, sustained, multi-faceted, and growing over time. Table 1 shows the magnitude of this funding over the entire 1990-2012 period in millions of constant (2012) US dollars, by KBC type and program funding source, disaggregated into public funding and co-financing by private beneficiaries.  

Across the different types of KBC receiving public support, R&D projects received by far the largest total support, $79.3 million, and also benefited from the largest share of public support, $59.9 million or over 75 percent of the R&D total. The main public R&D funding source was CORFO, the Chilean Economic Development Agency, through its different support programs: INNOVA CHILE, a new agency formed in 2005, and merging the FONTEC program (the National Productivity and Technological Development Fund, created in 1991 to increase local industry competitiveness by supporting technological innovation) and the FDI program (the Innovation Development Fund). The other main funding sources were CONICYT, the Chilean National Research Council, through FONDEF (the Science and Technology Development Fund, created in 1991 to support public-private partnerships between public research organizations and private firms to work together on R&D projects) and FONDECYT (the National Fund for Scientific and Technological Development, created in 1981 to fund basic scientific and technological research), and the Ministry of Agriculture, through FIA (the Foundation for Agrarian Innovation to fund innovation in agricultural industries) and SAG (the Agriculture and Livestock Service, supporting agriculture development through improvements in the health and vigor of animals and plants).

Training projects received the next largest public support, $16.1 million or 77 percent of the total recorded public-private funding for training of $20.9 million. Public support for worker training and certification picked up significantly in the 2000s with the public subsidy offered through the Ministry of Labor and Social Security’s SENCE program (National Training and Employment Service), which provides a profit tax exemption to firms availing themselves of approved training, for wine firms provided largely through OTIC Chile Vinos, an “Intermediary Technical Training Organization” set up by the Vinos de Chile enterprise association. CORFO was another important public funder of training support projects, both directly and through INNOVA CHILE.

Although public funds are supplied to the wine industry by several governmental programs, FIA ("Fondo de Innovación Agraria" of the Ministry of Agriculture) is charged with keeping a record of the research projects funded with public resources, to avoid duplications. FIA provided us with a complete list of the research projects carried out for the wine industry in the period 1990 through 2012, including the funds committed from public and private sources CORFO provided data on remaining public-private support to the different types of KBC.

CORFO, the Spanish acronym of the Corporacion de Fomento de la Produccion de Chile, is a government agency dedicated to promote entrepreneurship, innovation and economic growth since 1939. CORFO reorganized in 1991, transferring its loan portfolio to the private banking system, and refocused on reducing market failures impeding development, in particular through technology and innovation policy and project support.
Table 1: Total Public and Private Funding of KBC, 1990-2012 (in MM 2012 USD)

<table>
<thead>
<tr>
<th>KBC Type and Funding Source</th>
<th>Public Funding</th>
<th>Co-financing by beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R&amp;D</strong></td>
<td>59.87</td>
<td>19.45</td>
</tr>
<tr>
<td><em>INNOVA CHILE</em></td>
<td>21.77</td>
<td>12.18</td>
</tr>
<tr>
<td><em>FONDEF</em></td>
<td>16.31</td>
<td>-</td>
</tr>
<tr>
<td><em>FIA</em></td>
<td>5.87</td>
<td>-</td>
</tr>
<tr>
<td><em>FONTEC</em></td>
<td>5.62</td>
<td>4.66</td>
</tr>
<tr>
<td><em>FDI</em></td>
<td>4.16</td>
<td>2.61</td>
</tr>
<tr>
<td><em>FONDECYT</em></td>
<td>3.90</td>
<td>-</td>
</tr>
<tr>
<td><em>SAG</em></td>
<td>2.25</td>
<td>-</td>
</tr>
<tr>
<td><strong>Training</strong></td>
<td>16.06</td>
<td>4.82</td>
</tr>
<tr>
<td><em>SENCE/ Vinos de Chile - OTIC</em></td>
<td>9.42</td>
<td>-</td>
</tr>
<tr>
<td><em>CORFO</em></td>
<td>3.72</td>
<td>2.97</td>
</tr>
<tr>
<td><em>INNOVA CHILE</em></td>
<td>2.92</td>
<td>1.85</td>
</tr>
<tr>
<td><strong>Joint Marketing Support</strong></td>
<td>6.14</td>
<td>5.81</td>
</tr>
<tr>
<td><em>CORFO</em></td>
<td>5.38</td>
<td>4.61</td>
</tr>
<tr>
<td><em>INNOVA CHILE</em></td>
<td>0.77</td>
<td>1.19</td>
</tr>
<tr>
<td><strong>Global Collaboration</strong></td>
<td>4.57</td>
<td>1.91</td>
</tr>
<tr>
<td><em>CORFO</em></td>
<td>2.45</td>
<td>-</td>
</tr>
<tr>
<td><em>INNOVA CHILE</em></td>
<td>2.12</td>
<td>1.91</td>
</tr>
<tr>
<td><strong>Market Research</strong></td>
<td>0.21</td>
<td>0.14</td>
</tr>
<tr>
<td><em>CORFO/ INNOVA CHILE</em></td>
<td>0.21</td>
<td>0.14</td>
</tr>
<tr>
<td><strong>Business Process Improvement</strong></td>
<td>0.98</td>
<td>0.75</td>
</tr>
<tr>
<td><em>CORFO</em></td>
<td>0.73</td>
<td>0.46</td>
</tr>
<tr>
<td><em>INNOVA CHILE</em></td>
<td>0.25</td>
<td>0.29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>87.83</td>
<td>32.88</td>
</tr>
</tbody>
</table>

The other main types of KBC receiving public support were funded either directly by CORFO or through INNOVA CHILE. Joint marketing support projects benefited from over $6 million in public funding, with matching private sector funding of almost as much ($5.8 million). Over half of these support projects (74 of 133 projects) were listed as PROFOs or “Associative Promotion Projects”, a program created in 1992 managed by CORFO which promoted associations among groups of small and medium enterprises (SMEs), requiring the participation of at least 5 SMEs to improve technical, financial, managerial and marketing capabilities. In the wine industry, most PROFOs were directed at marketing challenges such as conquering new international markets. Rivas (2012) describes the case of SME wineries that initially produced and sold bulk wine to larger wine firms, and as a result of the program learned to work together to upgrade quality and jointly market own exports directly to global markets.
Global connectivity and knowledge network-building support projects were largely funded from public sources, with $4.6 million or over 70 percent of total public-private funding for these types of learning funded by CORFO. Approximately 60 percent of these projects were “misiones de captura tecnologica” or technology capture trips, for instance a structured study tour to France to learn about the latest technologies for the production of biodynamic wines, or a tour to Australia to learn “about the technologies used by one of our main global competitors”. Roughly 20 percent of the projects were “consultoria especializada” or foreign consultant services. And the remaining 20 percent were projects from a program involving the diagnosis of problems of a particular productive chain and the collaborative solution to such problems that typically included expert consultancies to help upgrade outdated technologies. Finally, market research projects were predominantly labeled “Programa de prospección e investigación de mercados”, and were typically supporting the national wine associations in their projects to better understand evolving foreign buyer wine tastes. Business process improvement projects were predominantly support to enterprises’ upgrading with respect to the ISO 9000, 14000 and HACCP (Hazard Analysis and Critical Control Points for food safety) series product process improvement methodologies.

Figure 2 shows the available data on programmatic funding to the Chilean wine industry by KBC type and source, now disaggregated on a year-by-year, project, and public-private funding basis. The numerals on the bars refer to the number of distinct projects that were active in a given year (a project may be firm-specific, as in BPI support, but typically benefit a group of firms, as in a PROFO project, or eventually most firms in the industry, as in a typical global connectivity or R&D support).

Support for R&D has been the most continuous on a year-by-year basis over the 1990-2012 period. It began with a single support project disbursing $8,000 in 1990 in constant 2012 US dollars, rose to disbursements of $200,000 over 4 projects by 1995, to $5.7 million over 23 projects in 2000, and to a high of $8.3 million over 35 projects in 2010. Public support for most other types of KBC investments began only later, with support for training beginning in 1996, for global collaboration in 1998, and with support for joint marketing, market research and business process improvement only beginning in 2005.
Figure 2: Funding amounts by KBC type and source, 1990-2012

Note: All figures in 2012 USD (MM). Series labels indicate number of distinct funded projects in the category and year.
II.3 FIRM-LEVEL DATA

Between January and April 2013, we collected firm-level information on investments in physical and intangible assets, export and domestic sales, estimated lifespan of intangible assets, and other firm characteristics of a stratified random sample of firms in the Chilean wine industry for the three latest available years (2009 through 2011). In particular, the questionnaire included novel, detailed questions on spending (both own-account or developed in-house and bought-in or purchased through external providers) on the six main types of intangible assets covered by Awano et al. (2010) (software, R&D, design, reputation & branding, training and business process improvements) plus collaboration-related economic competencies (collaborative learning through spending on both foreign consultant services and technology capture trips). The questionnaire is attached in the Appendix.

Table 2. Chilean wine industry: Universe and sample

<table>
<thead>
<tr>
<th>Size strata (ha)</th>
<th>Universe</th>
<th>Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>x≤100</td>
<td>120</td>
<td>50.8</td>
</tr>
<tr>
<td>100&lt;x≤500</td>
<td>83</td>
<td>35.2</td>
</tr>
<tr>
<td>500&lt;x≤2,000</td>
<td>29</td>
<td>12.3</td>
</tr>
<tr>
<td>x&gt;2,000</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>236</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The sample frame was drawn from a database of all registered wine-producing enterprises. Table 2 shows the total number of firms in the Chilean wine industry as of end-2011 and the respondent sample according to firm size (proxied by production hectares). As is evident, the stratum of smallest firms (100 hectares and less) is under-represented in the sample, while the largest firms were intentionally oversampled. Initially the identified, intended sample included 50 firms, weighted exactly as in the universe, but the survey period coincided with harvest time in the vineyards and many firm managers did not make themselves available to be surveyed. Thus, only 24 firms (or 48 percent of the original sample) responded to the questionnaire. In total, the firms sampled represent 53-54 percent and 56-60 percent of Chilean wine exports between 2009 and 2011, measured in value and physical (i.e. cases) terms, respectively.

Figure 3 shows the incidence of KBC spending by aggregated intangible asset type, broken down by size band (less than versus more than 500 hectares). Our results are similar for a developing country to what Awano et al. (2010) found for the UK across all industries, namely that the top three KBC asset types were training, software, and reputation & branding, and that R&D had the lowest incidence – with results

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9 The survey instrument used is available in the Appendix. It is a new survey instrument, adapted from the “Investment in Intangible Assets” survey sent to 2,004 UK firms by Awano et al. (2010), which in turn was modified from a template provided by the Central Bureau of Statistics in Israel. Two surveyors visited the sampled firms to apply the questionnaire.

10 These were typically structured study tours with local entrepreneurs going abroad.

11 There is no indication that the respondents represented a biased sample. Awano et al. (2010) report that 42 percent of firms to which their survey was sent provided KBC spending information.
holding for both large and small firms. Our results confirm that non-R&D intangible spending is much more widespread than outlays on R&D. Interestingly, our newly-tracked KBC category, spending on learning from global collaboration, is as common as software for smaller firms (71% of firms investing) and as important as design and business process improvements for larger firms (19% of firms investing).

Figure 3: Share of firms engaging in KBC investment, by type and size

Figure 4 shows average expenditure on each asset type conditional on reporting positive spending, again broken down by size band, for 2011. There are large differences in the average expenditure by asset types and across size classes. In particular, large firms report spending significantly higher spending levels on average than smaller firms for the three most common asset types by incidence, namely reputation & branding, software and training. Spending is especially high for the largest firms on reputation & branding (an average of $771,000), driven by high levels of spending on creating and maintaining brands by the largest firms that are active and need to pay trademark licensing costs in a large number of foreign export markets. Spending is also significantly higher on training for the larger than for the smaller firms ($174,000 versus $15,000). Interestingly, reported average spending on R&D, business process improvements, and learning through global collaboration is higher for the smaller than for the larger firms. This may be due to a number of reasons, including a possible reluctance of the largest firms to reveal their actual spending in these categories as these may be perceived to be important sources of comparative advantage; as well, especially on R&D, the larger firms may participate mainly through collaborative public-private initiatives as reflected in the industry-level data, or larger firm respondents may systematically have a more restricted view of what is included under the R&D category.

Note that among the top three asset types, the results for the Chilean wine industry are distinct from those across all industries in the UK, with in Chile reputation & branding being the most common asset type (with all large firms, and 96% of smaller firms investing), followed by software (76% of large and 71% of smaller firms investing) and then training (67% of large and 78% of smaller firms investing); the incidence of R&D spending is 8% for small and 5% for large firms. In the UK training was the most common asset type (70% of large and 34% of smaller firms investing), followed by software (57% of large and 30% of smaller firms) and reputation & branding (38 and 22% respectively); the incidence of R&D spending was 8% for small and 19% for large firms. This result is no doubt affected by the importance of reputation and branding for the global wine industry.

In 2011, Concha y Toro purchased California’s Fetzer Winery for US$ 238 million, adding significantly to its brand portfolio. However, this is not an exceptional outlier, as the other largest firms also spend significantly more than the smaller firms in this asset category.
As well as the magnitude of KBC spending, the survey asked respondents to estimate the number of years that an investment in a particular KBC category would continue to yield benefits. Figure 5 shows the average estimated benefit lives for each asset type (excepting investments in global collaboration). Again, there are similarities between these results for the Chilean wine industry and results across UK industries: training is the asset type with the shortest reported asset life, namely 2.1 years in Chile and 2.7 years in the UK. While R&D was the asset type with the longest reported benefit life in the UK (4.6 years), it was in second place in Chile, with an average asset life of 5.3 years. Interestingly, the asset type with the longest reported asset life in the Chilean wine industry is reputation & branding, with an average benefit life of 9.9 years – a testament to the perceived staying power in the minds of consumers of well-established wine brands, as reported by investing entrepreneurs. Most importantly, as in the UK, the average life lengths across all assets types are comfortably greater than one year, strongly supporting the case for capitalizing KBC assets.

Note: Error bars represent 95% confidence intervals.
III. LINKAGES BETWEEN KBC INVESTMENTS AND RISK MANAGEMENT

In addition to being an important source of total investment and growth, different types of enterprise investments in KBC play a critical role as investments in enterprises’ pillars of risk management, providing enterprises with essential capabilities to anticipate, absorb and adapt to exogenous risks, and undertake endogenous risks in pursuit of larger expected profits with higher probabilities of success – empowering firms to learn and execute in their risky environments as enabled information platforms.\textsuperscript{14} The main types of traditionally-measured KBC investments can be relatively easily mapped into the four pillars of risk managed initially proposed by Ehrlich and Becker (1972), namely (see Figure 6):\textsuperscript{15}

- **investments in knowledge** of supply and demand trends and the likelihood of shocks, including changes in existing and emerging new global technologies and changes in consumer preferences – based on investments in R&D, and in global connectivity (including investments in knowledge diffusion networks and various search and match mechanisms to learn from and co-create with other local firms, global corporate partners, suppliers and buyers, universities and their extended communities, and the diaspora, and investments in local knowledge networks by informal enterprises)

- **investments in protection/enabling** to reduce the probability of losses and increase the probability of successful reallocation and innovation – based on investments in market research, branding and advertising to expand product varieties and market reach and thereby diversify location-specific product risks both on production and demand sides – as the optimal reallocation of resources under uncertainty may not be to invest all into a high-risk new technology, but to invest some resources in the existing technology and benefit from the option value of waiting until some additional uncertainties are resolved.\textsuperscript{16} D’Erasmo and Moscoso Boedo (2012) show that firm-level volatility is negatively correlated with such intangible expenditures: firms that incur higher intangible expenses are able to serve more markets and thereby diversify and reduce market-specific demand risk.\textsuperscript{17}

\textsuperscript{14} See Hulten (2013) on some policy implications of conceptualizing the firm as an information platform.

\textsuperscript{15} Sheffi (2005) surveys a wide range of largely intangible investments spanning the four pillars that firms have made to increase knowledge, self-protect, insure against and cope with low-probability high-impact disruptions, broken down into “reducing vulnerability” (early detection and security investments in databases and software to reduce the likelihood of intentional disruptions from industrial actions, sabotage or terrorism), “building resilience through redundancy” (investments in slack, non-used inventory, capacity and IT systems, and increased holdings of retained earnings) and “building resilience through flexibility” (investments in new business models to allow interchangeability of plants, parts and people, realign supplier relations in supply chains, and modify internal culture towards greater safety, quality, continuous communications, and conditioning for disruptions).

\textsuperscript{16} Bloom et al. (2007) show that higher uncertainty reduces the responsiveness of investment to demand shocks, with uncertainty increasing real option values and making firms more cautious when investing or disinvesting (firms only hire and invest when business conditions are sufficiently good, and only fire and disinvest when they are sufficiently bad; when uncertainty is higher, this region of inaction expands, as firms become more cautious in responding to business conditions). Investment is also shown to have a convex response to positive demand shocks, magnifying the response, and a concave response to negative demand shocks. Empirically, these ‘cautionary’ and ‘convexity’ effects of uncertainty are large and play an economically important role in shaping firm-level investment decisions, with a one-standard deviation increase in their measure of uncertainty (like that which occurred after September 11, 2001 and the 1973 oil crisis can halve the impact effect of demand shocks on enterprise investment. This implies that the responsiveness of firms to any given policy stimulus may be much weaker in periods of high uncertainty, suggesting that countries where firms face systematically higher uncertainty may require significantly higher levels of stimulus to achieve a comparable impact.

\textsuperscript{17} The authors find a significant negative relationship between firm-level idiosyncratic volatility and intangible expenses, based on US data from the Kauffman Firm Survey and Compustat both for a general measure of intangibles (selling, general and administrative expenses) and for advertising expenditures, and controlling for
investments in **insurance** to reduce the size of losses by transferring resources from good to bad times – based on including investments in private or public-private partnerships to pool and share risks such as an agreement with an OEM or with a large distribution chain that provides a resource cushion in temporary downturns and signals lower risk to investors, or investments by start-ups in patents to raise their salvage value if they go bust. Another example is the *ex ante* investment by formal firms in database rosters of specialized experts which can be tapped on-call when the need arises and by informal enterprises in local contacts, rather than *ex post* after the realization of a shock having to search and set up new contractual or non-contractual arrangements. According to Bartelsman (2012), it may be that firms operating in industries that are more prone to high idiosyncratic shocks invest more heavily in ICT (and associated KBC) to lower adjustment costs and smooth profit flows. Insurance-related investments also include efforts by enterprises, households and cities to obtain insurance from the government either directly (anti-dumping, temporary import tariff protection, flood insurance subsidies) or through investment in physical infrastructure.

- investments in **coping/leveraging** for *ex post* loss recovery or benefit enlargement if the investments in reallocation and innovation are successful in the marketplace, including investments in worker and management continuous learning, business process improvements, and software and databases to build up enterprise capabilities for more flexible adjustment, facilitating either scaling up or down, depending on the realization of the shock.

**Figure 6: Firms’ Four Pillars of Risk Management**

The main risks facing the Chilean vine-growing and wine-making industry over the past years were shifts in local inputs and in global demand and supply, exchange rate volatility, and natural disaster risks including viticultural pests and disease hazards, water and temperature variability, and earthquakes. Investments in different types of KBC and complementary physical capital by Chile’s wine-producing industry-time fixed effects and a time trend: their results imply that if the top quartile firm of the intangible expenses distribution in the Compustat sample (a firm with $84 million in intangible expenses) reduces expenditures to that of the median firm, its volatility would increase by roughly 23%. Their proxy for risk is the volatility of the portion of growth in sales which is not explained by either industry or economy-wide time effects, or firm characteristics associated with growth such as the firm’s age or size; all results are robust to a measure of idiosyncratic risk derived from TFP at the firm level.
enterprises may have played an important role in the decrease in monthly volatility of export volumes (and values) over the 1990-2012 period, as highlighted in Figure 7.

Figure 7: Volatility in bottled wine export volumes

Figure 8 shows the association between investments in KBC relative to investments in tangible assets and changing export levels over the past two decades. In particular, it suggests that total measured investments in KBC, as the sum of expenditures on innovative property (investments in R&D), traditionally-measured economic competencies (outlays on market research, marketing, training and business process improvements) and global connectivity are more closely correlated with bottled wine exports than available proxies for investments in physical capital (area planted or number of wineries).

Figure 8: KBC and Chilean wine exports (2012 USD)
Examples of investments in KBC that support enterprise risk management include:

(i) **investments in knowledge.** An example of adjusting to the risks of losing market share when foreign competitors innovate is Miguel Torres’ (a Spanish-owned FDI firm) first introduction in Chile of temperature-controlled stainless steel vats instead of the traditional concrete fermenting vats that did not allow temperature control and retained residues adversely affecting taste and smell, widespread in use in high-income countries. This led Chilean-owned vineyards to introduce them – and required additional investments in technical support and local learning, as no one in Chile knew how to assemble them. To further lower the risk of falling behind the evolving technological frontier, CORFO and participating enterprises co-invested $5.1 million between 2005 and 2010 in 48 technology capture trips and in 15 foreign consultant service engagements by oenologists, viticulturalists and other global experts. And to lower the risk of volatile exports for smaller producers with less widespread distribution networks as well as to increase export levels, CORFO’s PROFO program and participating enterprises co-invested $11.5 million between 2005 and 2010 in a range of initiatives to learn how to best promote local wine regions, thereby developing a ready buyers’ market and strengthening customer loyalty, reducing the volatility of demand by making demand more price-inelastic.

(ii) **investments in protection/enabling.** Chile’s ideal geographical isolation (desert in the North, mountains to the East, Antarctic to the South, and Pacific to the West) has historically protected it from viticultural hazards such as the phylloxera louse. Chile’s government, through its Agriculture and Livestock Service (SAG), invested in rigorous zoosanitary border control, to protect this natural low-risk factor underpinning its agricultural competitiveness. An example of KBC to protect vine production against disaster risks such as pests and diseases as well as climate change-induced drought and temperature variability is the co-investment of $1.2 million between 2004 and 2012 by FONDEF. The co-investment resulted in a major study on adapting root stock and cultivar grafting to local conditions, generating the know-how to graft local vines on North American grapevine rootstocks and thereby providing resistance to parasites, ensuring local adaptation to changing water and temperature conditions, helping regulate the vigor of vine foliage to changing external conditions, and allowing lower-cost adaptation to other changing conditions such as soil salinity. Other protection against increasing drought as melt-water from the Andes diminishes was provided by investments in drip irrigation, which also enables more precise computer control of both watering and fertilizer, but required complementary investment in worker training.

(iii) **investments in insurance.** An example of insurance-related KBC is an investment in 2003 in a detailed census of all winemaking enterprises to document and benchmark their existing storage capacity, in order to stimulate investment in storage capacity as a shock absorber of volatile world market wine prices together with exchange rate risk – allowing smoothing of export supply to markets depending on varying earnings potential from year to year. Investment in additional storage capacity also serves as insurance against risk of loss of product from leaking vats as a result of unpredictable earthquakes, minimizing the marketing risks associated with foreign customers not being assured of continuous delivery of product and possibly switching to other countries’ product. Finally, an example of investing in KBC to insure against the risk of future continued appreciation of the exchange rate by lowering local costs is the co-investment of $725,000 between 2008 and 2011 by FIA and participating enterprises in R&D and an economic evaluation of sparkling wine based on a traditional low-value grape variety (Pais,
or Mission in California) – which dramatically lowered the cost of producing a good-quality sparkling export wine.

(iv) investments in coping/leveraging. An example of coping/leveraging-related KBC is the $15.3 million joint public-private investment in training between 2005 and 2010 to upgrade worker skills to increasingly sophisticated vineyard farming and winemaking techniques.

IV. LINKAGES BETWEEN KBC INVESTMENTS AND EXPORTS

IV.1 INDUSTRY-LEVEL RESULTS

Our hypothesis is that higher investments in KBC over time are associated with higher exports, controlling for investments in physical capital (proxied by evolving vine area planted) and external demand (proxied by evolving average GDP per capita of main wine purchasing countries). To motivate the regression analysis, Figure 9 presents a scatter plot of the logged values of wine exports and R&D spending across the entire Chilean wine industry for our period of study.

![Figure 9: Scatterplot of ln[R&D spending] and ln[Export Values] (1990-2012)](image)

Figure 9 highlights a strong time-series trend among both export values and R&D spending. Interestingly, a sharp reduction in R&D in 2011 & 2012 roughly coincides with almost no increase in exports between 2010-12. Since this shows a strong time-series component, we check whether one of our main control variables, area planted, is also correlated to exports in a similar way in Figure 10.
Area planted (in natural log) also has a strong time-series component; a concern is thus that the effect of R&D (or other KBC variables) may just capture correlations with other determinants of exports. Figure 11 compares this time trend in exports with other key explanatory variables, spending on worker training and spending on global connectivity.

**Figure 11: Scatterplot of ln(Worker Training)/ln(Connectivity Spending) and ln[Export Values] (1990-2012)**

A plot of residuals in Figure 12 of exports and R&D (after controlling for area planted) suggests that even once area planted is controlled for, there is a strong relationship between R&D and exports:
Thus even once controlling for important input factors that appear similarly correlated such as area planted, R&D spending appears to remain an important determinant of export values.

We now investigate the association between aggregate industry-level exports and joint public-private spending on KBC via multivariate OLS regression. Our estimation approach includes values of bottled wine exports, the public policy-supported aggregated KBC expenditure types (R&D, reputation & branding, training, and global connectivity) and two controls (area planted and a weighted average GDP per capita among the US, Canada, EU countries, and China [in constant 2005 USD]). All variables are in natural logs. We vary specification choices over aggregated versus more disaggregated KBC types, with separate regressions for increasing years for which we lag the area planted measure (as current-year planted area likely is only associated with exports in subsequent years, with a typical three-year or even four-year period before new vine seedlings become productive and generate bottled wine). We dummy out missing observations for the few cases in which our time series data do not extend to the beginning of our period of analysis. The results of these estimations are in Tables 3 and 4.
Table 3: Association of KBC with Industry-level Exports

<table>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
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<td>Area planted lag:</td>
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<td>0.161+++</td>
<td>0.133++</td>
<td>0.126++</td>
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<td>(0.048)</td>
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<td>(0.050)</td>
<td>(0.048)</td>
<td>(0.055)</td>
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<tr>
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<td>0.150</td>
<td>0.203</td>
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<td>(0.139)</td>
<td>(0.129)</td>
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<td>(0.140)</td>
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<td>-0.006</td>
<td>-0.000</td>
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<td>(0.036)</td>
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<td>(0.036)</td>
<td>(0.040)</td>
<td>(0.042)</td>
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<tr>
<td>Reputation &amp; Branding</td>
<td>-0.172</td>
<td>-0.153</td>
<td>-0.158</td>
<td>-0.112</td>
<td>-0.052</td>
<td>-0.041</td>
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<td>(0.116)</td>
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<td>(0.112)</td>
<td>(0.117)</td>
<td>(0.121)</td>
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<td>GDP Per Capita (weighted average)</td>
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<td>1.931</td>
<td>2.842</td>
<td>3.963+</td>
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<td>(1.848)</td>
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<td>R-sq</td>
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<td>0.994</td>
<td>0.994</td>
<td>0.993</td>
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Specifications have 23 observations and include an unreported constant term.
Standard errors in parentheses.

+ p<0.1,  ++ p<.05,  +++ p<.01

In Table 3, the only aggregate KBC type that is statistically significantly positively correlated with bottled wine exports over time is R&D spending (at the 1% level). For R&D, the coefficient is relatively stable across the different lag periods, suggesting that a 10 percent increase in R&D expenditures is correlated with a 1.5-1.6 percent increase in export values, and a 1.3-1.5 percent increase in volumes.
In Table 4 and our preferred specification, we disaggregate spending on KBC type for the only expenditure type which we had aggregated, namely reputation & branding. We here show results for one of the two sub-components, namely market research, as expenditures on market research and joint marketing support are highly correlated. Again, the coefficient for R&D is relatively stable across lag periods, suggesting that a 10 percent increase in R&D expenditures is correlated with a 1.2 percent increase in export values and a 1.1-1.3 percent increase in volumes. But including a more disaggregated KBC variable also allows the demand side control variable (our measure of GDP per capita of major export destinations) to play a highly significant role.
IV.2 FIRM-LEVEL RESULTS

Our hypothesis is that firms with average higher investments in KBC also have higher export and domestic sales, controlling for investments in physical capital. We investigate the association between firm-level exports or domestic sales and spending on KBC by multivariate OLS regression, taking advantage of the panel features of the data. We estimate these relationships using enterprise fixed effects, so that variation in the data comes from changes in within-firm investment and sales flows over three years. All variables are in natural logs, and we vary specification choices over the output measure (values of exports and domestic sales) and the extent of disaggregation of our KBC variables. We dummy out missing observations for the few cases in which enterprise respondents were not able to give either a positive or zero response. The results of these estimations are in Table 5.

In columns 1 and 2, we estimate the association of KBC with export and domestic sales, aggregated according to seven types of KBC spending, namely software, R&D, design, reputation & branding, training, business process improvements, and global collaboration. None of the seven KBC types have a statistically significant relationship with either export or domestic sales.

In columns 3 and 4, we estimate a second (and preferred) specification in which we disaggregate spending on KBC types according to available and conceptually distinct components. In particular, reputation & branding is disaggregated into spending on branding (brand creation and protection, including quality certification, brand naming, trademark registration and license fees per country), spending on local advertising (including ad outlays in local newspapers and specialized magazines, radio/TV and Internet/social networking), and spending on international wine fairs (including participation in international wine shows in the US, UK, China, Germany, Japan, Russia and Brazil). And spending on learning through global collaboration is disaggregated into outlays on foreign consultant services (with global expertise coming in-country) and technology capture trips (structured study tours with local entrepreneurs going abroad). With this additional variation in the data, spending on international wine fairs and on foreign consultant services are both statistically significantly positively correlated with export sales (with the former at the 1% level), while spending on local advertising is statistically significantly positively correlated with domestic sales. Interestingly, spending on international wine fairs has a negative correlation with domestic sales, though this is only at the 10% level of significance; in principle, enterprises that spend more on global brand promotion could be doing so in response to a product mix shift from local to foreign sales, or the spending on global brand promotion itself could be resulting in an increase in export demand over time with a diversion in production from domestic to export sales. One additional statistically significant variable is spending on design, which is statistically significantly positively associated with local sales while negative associated with exports (though only at the 10% level of significance). In principle, this could reflect design expenditures (outlays on label, bottle shape design and other elements that provide a distinct image beyond the "brand") being more sensitive to local than global tastes, though to understand any possible negative association with export sales would require more detailed follow-on questions. Finally, it is interesting that the sizeable spending by firms on branding does not have a statistically significant association with either export or domestic sales in these data. However, this could in principle reflect the much longer asset life of brands as reflected in firm responses; with an average asset life of ten years, it is conceivable that spending in
prior years would be influencing 2009-2011 sales, and that current spending would be contributing to asset values and sales over the coming years.\textsuperscript{18}

\textbf{Table 5: Association of KBC with Firm-level Export/ Domestic Sales}

<table>
<thead>
<tr>
<th></th>
<th>Export</th>
<th>Domestic</th>
<th>Export</th>
<th>Domestic</th>
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<td>Physical Capital Investment</td>
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<td>0.097</td>
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<td></td>
<td>(0.137)</td>
<td>(0.211)</td>
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<td>Software</td>
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<td>(0.040)</td>
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<td>R&amp;D</td>
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<td></td>
<td>(0.264)</td>
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<td>Business Process Improvement</td>
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<td>(0.153)</td>
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<td></td>
<td>(0.354)</td>
<td>(0.566)</td>
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<td>International Wine Fairs</td>
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<td>-0.329+</td>
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</tr>
<tr>
<td></td>
<td>(0.086)</td>
<td>(0.138)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology Capture Trips</td>
<td>0.016</td>
<td>-0.179</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.094)</td>
<td>(0.150)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R-squared

| 0.077 | 0.069 | 0.377 | 0.325 |

Specifications have 72 observations and include an unreported constant term.

Standard errors in parentheses.

+ $p<0.1$, ++ $p<0.05$, +++ $p<0.01$

\textsuperscript{18} In an unreported alternative specification, we disaggregate total spending on training into outlays on management versus worker upgrading. While neither of these expenditures is statistically significantly associated with either export or domestic sales, all the other statistically significant results are preserved in this specification.
A key conclusion of the enterprise-level analysis is the importance of carefully disaggregating intangible asset expenditures into specific components that are likely to have an association either with export or domestic sales, and that an exploration at too high a level of aggregation may reveal more noise than clear associations.

V. CONCLUSIONS

This study has examined the extent to which transformational entrepreneurial firms in a developing country invest in particular types of KBC, and the association of KBC investments with key outcome variables. The study has assembled novel data at the industry and firm levels to test two hypotheses: (i) that spending on KBC is a statistically significant and economically important correlate of growth as reflected in exports, both at industry and firm levels; and (ii) that spending on reputation & branding and on learning through global collaboration that connects firms to better existing knowledge are both statistically significant and economically more important at the firm level than other types of KBC. Our findings support these hypotheses.

The paper began by documenting the extent of within-firm structural change in the Chilean wine industry as reflected in the evolution of export volumes and values over time. We also documented the extent of public and private investments in innovation capabilities through seven key types of KBC assets, namely software, R&D, design, reputation & branding (outlays on market research, branding, local advertising and international wine fairs; joint marketing support), training (outlays on worker and manager skills upgrading), business process improvement, and learning through global collaboration (primarily outlays on foreign consultant services and technology capture trips). We found that the extent of public sector funding support to KBC investments in the Chilean wine industry over the period 1990-2012 was large, sustained, multi-faceted, and growing over time. Based on firm-level responses, we found that the average life lengths across all assets types are comfortably greater than one year, strongly supporting the case for capitalizing KBC assets. We also documented linkages between investments in KBC and enterprise risk management. We provided suggestive evidence that there may be an important association between investments in knowledge, protection/enabling, insurance and coping/leveraging assets in the Chilean wine industry and the decrease in the monthly volatility of export volumes (and values) over the 1990-2012 period.

We explored empirically the association between investments in different types of KBC and export growth at both industry and firm levels. At the industry level, our findings from our preferred specification suggest that a 10 percent increase in R&D expenditures is correlated with a 1.2 percent increase in export values and a similar increase in volumes, with a significant role played by our demand side control variable (GDP per capita of major export destinations). At the firm level, our findings from our preferred specification are that spending on international wine fairs (a component of reputation & branding) and on foreign consultant services (a component of global collaboration outlays) are both statistically significantly positively correlated with export sales.

The study raises a number of issues for further study. It suggests that more carefully measuring KBC investments across a more detailed breakdown of types of assets and across more firms would be beneficial. In particular, the relatively large magnitude and statistical significance of R&D investments at
the industry level, mainly public but also importantly private outlays, but the small magnitude and lack of statistical significance at the firm level suggest that a more disaggregated and more carefully posed set of questions on research expenditures and particular on development outlays may be required to better capture different types of R&D expenditures at the firm level. As well, we found that aggregated outlays, namely summed-up outlays across different sub-types of investments in reputation & branding and global collaboration are not statistically significant, while more disaggregated outlays allow the relative impact on domestic versus export sales to be disentangled suggests. This finding suggests that a more finely posed set of questions across types of KBC would be important in better understanding the various drivers of within-firm productivity.

Even though this study focused on the Chilean wine industry, the methodologies developed to document public-private investments in KBC at the industry level and to capture firm-level investments in KBC are more broadly applicable. In particular, a modified version of this firm-level questionnaire should in principle be relevant for a better understanding of the within-firm productivity drivers of other agriculture, manufacturing and service industries – and perhaps in particular of commodity-based industries where there may not be a sufficient appreciation of the value for competitiveness of investing in KBC across value chains, such as agro-food processing industries including key agricultural crops, meat and milk products, and forestry and mining output processing industries. It is hoped that this study may provide inspiration for future work seeking to better understand the association between KBC and industry- and firm-level productivity. And finally, it is hoped that this study may assist in the design of more effective policies to stimulate productivity in a way that helps build shared prosperity for the bottom 40 percent of each country’s population – by spurring further studies to better understand the linkages between support policies and investments in particular types of KBC that help generate more jobs for the less well-off together with increased earnings over time in those jobs.
REFERENCES


Mazzucato, Mariana (2013). The Entrepreneurial State: Debunking Public vs Private Myths in Risk and Innovation, UK: Anthem Press.


Appendix: Survey of Investments in Knowledge-Based Capital

Purpose of this survey

ODEPA and the World Bank, with the sponsorship of Vinos de Chile, are seeking to develop a more complete view of the wine industry’s spending on knowledge-intensive intangible or “soft” assets that have no physical embodiment and that contribute to the firm’s productivity and profits over the longer term, namely spending on improvements in skills, better software, improved reputation and branding, R&D, better design, business process improvements, and other investments that connect your firm to better existing global product knowledge. We are interested in measuring all spending on such knowledge-based assets whenever today’s resources are invested in order to increase profits in the future, irrespective of your existing accounting practices (even if many of these expenditures are not currently measured or treated by you or by other firms in your country as capital investments). Your help is very much appreciated in collecting these data on knowledge building. Summary results of this survey will be made available to you. It is hoped that they will both help you directly (to benchmark yourself against other firms in the industry) and help to develop improved support policies for your industry. This is your opportunity to contribute.

Coverage and Reporting period

This survey exclusively covers firms that produce bottled wine for the domestic and/or export markets. Please report figures for calendar (January through December) years 2009, 2010 and 2011 wherever relevant and available; otherwise, please indicate time period coverage.

Section A – Professional qualifications of the interviewee and Status of the firm

1.1 Name: Company:
   
   Position: 
   Professional degree: University:
   Graduation year:

1.2 Language skills:
Mother tongue: ______________________

Please mark one of the alternatives for each non-Spanish language:

<table>
<thead>
<tr>
<th>English</th>
<th>French</th>
<th>German</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No knowledge of language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rudimentary knowledge of written and spoken language. Limited vocabulary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average command of the language, written and spoken. Can follow instructions, prepare reports and communicate effectively</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluent. Communicates with no difficulty in the written and spoken language</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.1. Specify the **total production size** of your firm:
2009: area planted_______ (hectares); wine processing capacity_______ (mn litres)
2010: area planted_______ (hectares); wine processing capacity_______ (mn litres)
2011: area planted_______ (hectares); wine processing capacity_______ (mn litres)

2.2a Specify the **total domestic and export sales revenues** of your firm’s wine production:
2009: ______________(domestic sales, mn pesos); __________________(exports, thous. USD)
2010: ______________(domestic sales, mn pesos); __________________(exports, thous. USD)
2011: ______________(domestic sales; mn pesos); __________________(exports, thous USD)

2.2b Specify the breakdown of your TOTAL revenues from your wine sales (in rough %) according to the following categorization of **wine quality**:

<table>
<thead>
<tr>
<th>Quality (US$/case of 12 bottles)</th>
<th>National market (%)</th>
<th>Export market (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 – 99</td>
<td></td>
<td></td>
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<tr>
<td>60 – 79</td>
<td></td>
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<td>40 – 59</td>
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<tr>
<td>20 – 39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 20</td>
<td></td>
<td></td>
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</tbody>
</table>

2.3 Specify the percentage of your 2011 exports that your firm made through direct negotiations with the following intermediaries (to provide a sense of the extent of learning through your marketing channels, etc.):

2011 exports (%)

(a) Stores specializing in wines and liquors
(b) Supermarkets
(c) Wholesale firms
(d) Importers

2.4 Extent of firm’s **foreign ownership** (%):
2009: _________
2010: _________
2011: _________

2.5 Specify the **total foreign investment** of your firm in foreign wine production, if any:
2009: _______________________(thous. USD)
2010: _______________________(thous. USD)
2011: _______________________(thous USD)
2.6 Specify the total annual investment in physical (tangible) capital of the firm (including any investments in vineyard establishment/upgrading, equipment and tools, vehicles, irrigation and mechanical pruning/ harvesting, winery plant, machinery and buildings, but not land):

2009: __________________(thous USD)
2010: __________________(thous USD)
2011: __________________(thous USD)

2.7 Year of construction of firm’s first winery (bodega): _________

2.8 Geographic valley of location of firm’s main vineyard(s)/ most important grape purchases:

(i) ____________________________; (ii) ____________________________
(iii) ___________________________; (iv) _____________________________

Section B – Investments in intangible assets

3. In your firm’s Balance Sheet (current and recent years), please respond to the following questions if the concept of “intangible assets” appears in your financial accounts:

3.1 Indicate with an X the concepts included as “intangible assets”:

   Patents and brands   
   Software and information systems 
   Water rights 
   Other (please specify) 

3.2 Please include, based on your firm’s financial accounts, the values of intangible assets over the years 2009-2011.

<table>
<thead>
<tr>
<th>Year</th>
<th>Patents and brands ($, 000s)</th>
<th>Software and info systems ($, 000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td></td>
<td></td>
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<tr>
<td>2010</td>
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<td>2011</td>
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</tbody>
</table>
Section C – Enterprise-funded Training and Staff Development

4. During the past three years, did your firm fund any training of your employees? This refers to training of managers, staff and field labourers, whether purchased from external organizations (with training provided on-site or elsewhere), or in-house spending by the firm’s own personnel. Examples include training in IT systems, new production equipment, ISO or EUREPGAP accreditation, etc.
Yes → Go to question 5
No → Go to question 9

5. Refer first to the purchased, externally-provided training provided by other organizations received by your managers, and your vineyard (field) and winery workers.
5.1 Specify the external training programs offered to your workers.

5.2 Indicate the total cost of this training by external suppliers, and the percentage that can be attributed to Government subsidies (e.g. Sence), for those cases where subsidies apply (so that we can calculate the actual expenditures incurred by your firm for the training). Include tuition payments by the firm for job-related education at universities and other schools.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cost ($’000)</th>
<th>Subsidy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td></td>
<td></td>
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<td>2010</td>
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<tr>
<td>2011</td>
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</tbody>
</table>

5.3 Specify the external training programs offered to your managerial staff and office clerks.

5.4 Indicate the total cost of this training by external suppliers, and the percentage that can be attributed Government subsidies (e.g. Sence), for those cases where subsidies apply.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cost ($’000)</th>
<th>Subsidy (%)</th>
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<tbody>
<tr>
<td>2009</td>
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<td>2010</td>
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<tr>
<td>2011</td>
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</tbody>
</table>
6a. What, if any, was the firm’s in-house spending on staff training carried out by its own staff, for both vineyard and winery workers, and managerial staff and clerks?

Indicate the total cost of this training by the firm’s own personnel, and the percentage that can be attributed Government subsidies (e.g. Sence), for those cases where subsidies apply. Include staff costs for the development and delivery of training, any travel and subsistence payments, wage costs for the time employees participate in both externally-provided and in-house developed training, books/magazines and newsletters, and associated costs such as providing facilities, overheads and materials but not capital costs.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cost ($’000)</th>
<th>Subsidy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td></td>
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<td>2010</td>
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<tr>
<td>2011</td>
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</tr>
</tbody>
</table>

6b. On average, how many TOTAL days training (both externally purchased and in-house provided) did your personnel receive during the period 2009-2011?

- Vineyard and winery workers: 2009 _____
  2010 _____
  2011 _____

- Managerial staff and clerks: 2009 _____
  2010 _____
  2011 _____

7. On average what is your estimate of the time in years that your firm will benefit from investments in a given year in training?

- Years: _______

Section D – Software

8. During the past three years, did your firm purchase or develop any software? This refers to the purchase of external software and in-house software development. Include operating systems, commercial general purpose applications (e.g. Office, Softland, Defontana ERP) and customized software systems, databases, the design of new types of software, etc. Exclude software development conducted as part of R&D, which should be included in Section E.

Yes → Go to question 9
No → Go to question 12

9. What was your firm’s expenditure on purchased, externally-provided software by other organizations? Include off-the-shelf software, software licenses and license renewals, for generic as well as customized software. Exclude software embedded in other items of current or capital expenditure, such as software pre-installed on IT hardware.
9.1 Specify the software purchased by your firm in the years:
- 2009: _________________________________________________
- 2010: _________________________________________________
- 2011: _________________________________________________

9.2 Estimate the total cost of these purchases:
- 2009: __________________ (MM$)
- 2010: __________________ (MM$)
- 2011: __________________ (MM$)

10. What was your firm’s expenditure on software developed in-house by your own staff? Include: (i) Staff costs of all staff involved; (ii) Associated costs, including office facilities, overheads and materials but not capital costs. Estimates based on proportions of staff time are acceptable.
- 2009: __________________ (MM$)
- 2010: __________________ (MM$)
- 2011: __________________ (MM$)

11. On average what is your estimate of the time in years that your firm will benefit from investments in a given year in software?
- Years: _____

Section E – Reputation and Branding

12. During the past three years, did your firm spend on any external or internal work intended to enhance the firm’s reputation or the value of its existing or new brands (sales and marketing expenditures, including quality and standard certification)? This refers to spending related to international trade fairs, product launches, promotion campaigns, the development of promotional materials, etc. We would appreciate obtaining the separated costs for firm-specific advertising, and your contribution to collective/public advertising/branding of Chilean wine (e.g. your region, organic/ecological, high-quality wines, generic “Chilean wine”). Exclude expenditures on graphic/physical design, which should be included in Section F.
Yes → Go to question 13
No → Go to question 16

13. List and estimate the purchased, external costs of the different activities provided by other organizations to enhance the reputation or brand value of your wines. Include all external costs paid for by your firm for support service providers and trade fair providers, advertising and marketing campaign providers, media organizations, suppliers of market research and marketing databases, etc, in Chile and abroad, for: (i) wine fairs and shows; (ii) media advertising and marketing campaigns, (iii) branding.

13.1.1 Wine fairs and shows:
- 2009: _________________________________________________
- 2010: _________________________________________________
- 2011: _________________________________________________
13.1.2 Estimate the total external cost of these activities to your firm. If there are subsidies from Prochile or other Governmental institutions, estimate the value of these contributions.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost for my firm ($’000)</th>
<th>Subsidy ($’000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td></td>
<td></td>
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<td>2010</td>
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<td></td>
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<tr>
<td>2011</td>
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</tr>
</tbody>
</table>

13.2.1 Media advertising campaigns: Indicate the media where you have advertised your wines (TV, radio, specialized magazines, websites, other) in the years indicated below:
- 2009: _________________________________________________
- 2010: _________________________________________________
- 2011: _________________________________________________

13.2.2 Estimate the total external cost of these activities for your firm. If there are subsidies from Prochile or other Governmental institutions, estimate the value of these contributions.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost for my firm ($’000)</th>
<th>Subsidy ($’000)</th>
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<tbody>
<tr>
<td>2009</td>
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<tr>
<td>2011</td>
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</tbody>
</table>

13.3.1 Branding: List below the different brands your firm owns.
- List of Brands: _____________________________________________________
- Brands created within the period 2009-2011: __________________________

13.3.2 Estimate of the external cost of creating all new brands over the past three years, if any: Include here the fees charged by the advertising agencies, the cost of registering a trademark in the Departamento de Patentes y Marcas, the cost of certifying specific quality attributes (e.g. specific denomination, quality control, organic, etc.) and all other related external expenditures.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost for my firm ($’000)</th>
<th>Subsidy ($’000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td></td>
<td></td>
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<tr>
<td>2010</td>
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<tr>
<td>2011</td>
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</tbody>
</table>
14. What were your firm’s total in-house expenditures on reputation and branding by your own staff? Include: (i) Staff costs of all staff involved, e.g. any sales and marketing personnel and product managers, or the proportional cost of staff spent on reputation and branding activities, including staff time attending wine fairs, working on media campaigns, and helping develop brands; (ii) Associated costs, including office facilities, overheads and materials but not capital costs. Estimates based on proportions of staff time are acceptable.

- 2009: ________________ (MM$)
- 2010: ________________ (MM$)
- 2011: ________________ (MM$)

15. On average what is your estimate of the time in years that your firm will benefit from investments in a given year intended to enhance the reputation and branding of your wines?

- Years: _______

Section F – Research and Development (R&D)

16. During the past three years, did your firm fund any external or internal R&D work to create and apply new knowledge? This refers to original investigation or experimentation to acquire new knowledge, or adapt and apply existing knowledge to new contexts (e.g. different soil or climate conditions), or the design of new mixes of wines or yeasts or new strains of grapes (e.g. new fermentation or enzyme technology, technologies controlling grape vine growth rates, adaptation and calibration of weather and irrigation systems to local conditions, soil conservation techniques, etc.).

Yes → Go to question 17.1
No → Go to question 20

17.1 List external, purchased R&D projects undertaken by other organizations, either local or international universities, public research organizations, or other entities (technology transfer organizations, research consortia, consultants, etc.). Include bought-in R&D services.

- 2009: ____________________________________________
- 2010: ____________________________________________
- 2011: ____________________________________________

17.2 Estimate your firm’s spending on all such projects, if any, and other external R&D costs including licenses and related fees paid for any intellectual property or other forms of R&D-driven technology transfer:

- 2009: ________________ (MM$)
- 2010: ________________ (MM$)
- 2011: ________________ (MM$)

18. What was your firm’s expenditure on R&D conducted in-house by your own staff? Include: (i) Staff costs of all staff involved; (ii) Associated costs, including use of laboratory facilities, overheads and materials but not capital costs. Estimates based on proportions of staff time are acceptable.
18.1 List the projects developed during 2009 through 2011, either funded entirely by your firm or co-funded by Governmental institutions (e.g. Fondef, Fondecyt, Innova, FIA).

- 2009: ________________________________
- 2010: ________________________________
- 2011: ________________________________

18.2 Estimate your firm’s spending on all such projects, if any:

- 2009: ______________ (MM$)
- 2010: ______________ (MM$)
- 2011: ______________ (MM$)

19. On average what is your estimate of the time in years that your firm will benefit from investments in a given year in R&D?

- Years: ______

Section F – Design

20. During the past three years, did your firm fund any external or internal design work? This refers to design work including (i) label design; (ii) bottle design; (iii) any other graphic product aimed at providing a distinct image to your wines. Exclude design of new mixes of wines or yeasts (part of R&D) and design of software (part of software).

Yes → Go to question 21
No → Go to question 24

21. What was your firm’s spending on purchased, externally-provided design services by other organizations? Include costs of bought-in design services. Exclude costs of design embedded in other items of current or capital expenditures.

- 2009: ______________ (MM$)
- 2010: ______________ (MM$)
- 2011: ______________ (MM$)

22. What was your firm’s spending on design work developed in-house by your own staff? Include: (i) Staff costs of all staff involved, e.g. graphic designers, product designers, etc.; (ii) Associated costs, including office facilities, overheads and materials but not capital costs. Estimates based on proportions of staff time are acceptable.

- 2009: ______________ (MM$)
- 2010: ______________ (MM$)
- 2011: ______________ (MM$)

23. On average what is your estimate of the time in years that your firm will benefit from investments in a given year in design?

- Years: ______
Section H – Business Process Improvement

24. During the past three years, did your firm fund any external or internal work on business process (or organizational) improvement? This refers to work on improving the efficiency and effectiveness of the business, including business strategy development and implementation, improved inventory systems, changes in the organizational layers of the firm and greater worker empowerment, etc. Exclude software spending included in Section C.
Yes → Go to question 25
No → Go to question 28

25. What was your firm’s spending on purchased, externally-provided business process improvement services undertaken by other organizations? Include costs of bought-in management consulting services.
   - 2009: _______________(MM$)
   - 2010: _______________(MM$)
   - 2011: _______________(MM$)

26. What was your firm’s spending on business process improvement work developed in-house by your own staff? Include: (i) Staff costs including those who do this as part of their everyday jobs, e.g. managers working to improve general business processes; (ii) Associated costs, including office facilities and overheads for staff but not capital costs. Estimates based on proportions of staff time are acceptable.
   - 2009: _______________(MM$)
   - 2010: _______________(MM$)
   - 2011: _______________(MM$)

27. On average what is your estimate of the time in years that your firm will benefit from investments in a given year in business process improvement?
   - Years: _______

Section I – Connecting and Collaboration with global product knowledge

28. During the past three years, did your firm fund any other (non-training, non-reputation and branding, non-R&D, non-business process) investments to learn about and apply better global practices and other relevant existing knowledge? This refers to spending on external viticulture and oenology consultants, on university and public research organization experts, on laboratory and testing service contracts for certification, on global value chains and corporate partners, on wholesale/retail distributors and other marketing channel providers, and other individuals and organizations that facilitate learning and transfer of existing technologies, as well as in-house spending by the firm’s own personnel to learn from global knowledge, such as travel for the purpose of learning about better existing practices. “Global” knowledge explicitly includes better existing local, regional, national and international knowledge. Exclude tuition payments by the firm for job-related education at universities and other schools, which should be included in Section B.
Yes → Go to question 29
No → Go to question 31
29. What was your firm’s spending on purchased, externally-provided global knowledge services undertaken by other organizations?

29.1 List here the viticulture and oenology consultants (not management consultants, but including university researchers that serve as bridges to global knowledge) or other external expert individuals or organizations your firm hired to connect you to existing global knowledge about your products (related to vineyards and wineries) and their specialties:

- 2009:
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________

- 2010:
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________

- 2011:
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________
  Expert: _________________________ Specialty: _________________

29.2 Estimate the total cost of all such external expert-related activities for your firm. If you participated of the FAT (“Fondo de Asistencia Técnica”) program of Corfo, estimate the value of their contribution.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost for my firm ($’000)</th>
<th>Subsidy ($’000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
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<tr>
<td>2011</td>
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</tbody>
</table>

30. What was your firm’s spending on connecting to and learning about global knowledge conducted in-house by your own staff?

30.1 Has your firm made use of technological capture missions and conference participation in the period 2009-2011?
Yes → Go to question 30.2
No → Go to question 30.4
30.2 List the firms/conferences and countries visited:

- **2009:**
  - Firm/Conf: ____________________  
    Country: _________________
  - Firm/Conf: ____________________  
    Country: _________________
  - Firm/Conf: ____________________  
    Country: _________________
- **2010:**
  - Firm/Conf: ____________________  
    Country: _________________
  - Firm/Conf: ____________________  
    Country: _________________
  - Firm/Conf: ____________________  
    Country: _________________
- **2011:**
  - Firm/Conf: ____________________  
    Country: _________________
  - Firm/Conf: ____________________  
    Country: _________________
  - Firm/Conf: ____________________  
    Country: _________________

30.3 Estimate the total cost of these investments for your firm. If you participated in the “Viajes de captura tecnológica” program of Corfo, estimate the value of their contribution.

<table>
<thead>
<tr>
<th></th>
<th>Cost for my firm ($’000)</th>
<th>Subsidy from CORFO ($’000)</th>
</tr>
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<tbody>
<tr>
<td>2009</td>
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<td>2010</td>
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<td>2011</td>
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</tbody>
</table>

30.4 Does your firm belong to a wine-related trade association (e.g. Vinos de Chile, Corporación Chilena del Vino, etc)?

Yes → Go to question 30.5

No → Go to question 30.7

30.5 List the associations you are a member of:

- ________________________________
- ________________________________
- ________________________________

30.6 Estimate the total annual cost to your firm that belonging to the associations named above imply to your firm. If you are part of a Profo, estimate the amount of the annual subsidy.

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<th>Cost for my firm ($’000)</th>
<th>Subsidy ($’000)</th>
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<td>2009</td>
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<tr>
<td>2011</td>
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</tbody>
</table>
30.7 Estimate any other spending by your firm on connecting to and learning about global knowledge conducted in-house, including any additional network-building investments by your own staff, including any investments associated with learning from your own foreign investments in vineyards and/or wineries, if any?

- 2009: ______________ (MM$)
- 2010: ______________ (MM$)
- 2011: ______________ (MM$)

We thank you for completing our questionnaire.