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Measuring Small and Medium-Size Enterprises Contribution to Trade in Value Added: The case of Chile 2013-2016*

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Abstract
For many years, policymakers in Chile and elsewhere have been struggling to develop exporting-SMEs, aiming at broadening benefits of trade openness and globalization. Progress in this area, however, has been elusive due to the large entry costs to international trade networks. Still, involvement in international trade is not limited to being the direct exporter. Many firms may contribute and benefit from foreign trade as suppliers or contractors of other exporting firms. This can be measured as a firm´s contribution to Trade in Value Added using an Extended Supply and Use Table framework. Following recent empirical work led by the OECD, we show for Chile, using the 2013-2016 sample span, that (a) the total contribution of SMEs to exported value added is 33%, considerably larger than their share as final exporters (21%); (b) the indirect contribution of SMEs more than doubles the direct one; (c) most of the indirect contribution of SMEs to exported value added takes place through large exporting firms, and (d) even after considering the total SMEs contribution, such share is smaller than in most OECD countries and has remained relatively stagnant over time. Yet, since improving on the latter may happen through increasing the SMEs value contribution to other exporters as much as exporting themselves, policymakers should broaden the scope of public policies aimed at this end.

Resumen
En Chile como en muchos otros países del mundo, la capacidad de las empresas pequeñas y medianas (Pymes) para exportar bienes y servicios ha sido vista como indicativo de la posibilidad de ampliar los beneficios de una economía abierta y de la globalización. Esto ha motivado diversas políticas de apoyo y promoción hacia las Pymes exportadoras, cuyos avances han sido acotados, entre otras cosas, por los altos costos de entrada a las redes del comercio internacional. No obstante, el aporte de las empresas a las exportaciones no se agota en el rol de exportador directo. Muchas de ellas contribuyen y se ven beneficiadas del comercio internacional como proveedores de insumos o servicios a otras firmas que exportan directamente, aporte que puede ser identificado, medido y agregado. En efecto, el aporte de una firma al valor agregado exportado puede ser estimado usando un Cuadro de Oferta y Uso Extendido, dentro del marco de las cuentas nacionales. Usando trabajos recientes liderados por la OCDE, en este documento se mide la contribución al valor agregado exportado por tamaño de empresa para la economía chilena en el período 2013-2016. Los resultados de este ejercicio muestran que: (a) la contribución total de las Pymes al valor agregado exportado es 33%, considerablemente más alto que su coeficiente como exportadores directos (21%); (b) su contribución indirecta más que duplica el aporte directo (9 vs 4 billones de pesos); (c) la mayor parte de la contribución indirecta se canaliza a través de su rol como proveedores de insumos de grandes empresas, y (d) aún después de considerar el aporte total de las Pymes, este coeficiente es menor relativamente al exhibido por los países de la OCDE, manteniéndose estancado en el período analizado. Así, adoptar y aplicar este enfoque no sólo permitiría medir con mayor precisión el aporte de las Pymes a las exportaciones del país, sino que amplía la perspectiva para las políticas públicas que aspiren a elevarlo.

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1. Introduction

In previous years, Global Value Chains (GVCs) have emerged as a response to growing concerns about the fragmentation of production processes in a vertical trading chain across multiple countries. Driven by systematic changes in trade policies and production functions, Small and Medium Enterprises (SMEs) and large firms have progressively integrated GVCs not only by selling goods or services in foreign markets, but also as importers of intermediate inputs or, more important, as exporters suppliers in the value chain. This phenomenon caught the attention of several studies (Fetzer and Strassner, 2015; Suder et al., 2015; Giroud and Mirza, 2015; Fortainer et al., 2020) arguing the need of wider indicators to capture the trade dynamics and interrelationships between firms.

The concept of Trade in Value Added (TiVA) usually emerges to measure the fraction of exports which is net of imported inputs or Foreign Value Added (FVA) – this corresponds to Exported Value Added (XVA), a more precise measure of income from trade due to only the domestic component of total exports contributes to GDP (UNCTAD, 2013).[2]

Later, it became possible to measure XVA using Input-Output Tables (IOT) derived from Supply and Use Tables (SUTs). This tool allows computing the value added indirectly generated in the production of an exported good through the backward linkages in the economy. That is, value added of one firm, whose outputs are employed in a second, then a third, and eventually embodied in an exported good. Hence, SMEs and large firms would increase their indirect contribution in GVCs if both supply exporters in their productive chain.

Theoretically, IOT can reveal the inter-industry linkages by firm size. Adding them to the discussion of international trade allow to better assess their contribution to exports compared with the role they appear to play when output or gross exports are considered.

Previous works using turnovers from tax records to classify firm sizes in Chile showed that SMEs´ contribution reached 16 and 18% of total sales, on average, between 2004 and 2009 (Benavente, 2008; Pérez, 2010). Then, using employment stratification and some proxies of output from National Accounts, Correa and Echavarría (2013) estimated their contribution to GDP, reaching 46% during 2008-2011. Most recently, combining different tax records, Vivanco (2019) evaluated the heterogeneity

[2] Non-exported Value Added (NXVA) can also be split into the domestic component (after excluding FVA) that supplies the domestic market (consumption and investment). See Ffrench-Davis (2018) for a discussion on NXVA in Chile during 1960-2017. Estimations by firm size is covered in section 4.1.

at firm level in 2013, showing that the production function differs by size. In this respect, the export intensity (share of output) reached 5% and 29% for SMEs and large companies, respectively.

Beyond this, literature on TiVA measurements for the Chilean economy is scarce. Using benchmark compilations between 1986 and 2003, Henríquez and Venegas (2007) pioneered in showing an increasing pattern in the share of imported inputs (intermediates and capital) embodied in exports (around 7% of current GDP). More recently, Rébora and Vivanco (2016) found that i) foreign value added increased, on average, to 9% between 2008 and 2013; ii) domestic value added is heavily concentrated on services-producing industries (mainly business services and transport), illustrating an important role as suppliers of other industries.

Studies on exports at firm level have focused mostly in goods-producing industries such as Manufacturing or Mining (Crespi, 2006; García-Marin et al. 2017; García-Marin and Voigtlander, 2017).[3] This led to asses only the direct channel of the XVA, while ignoring the indirect contribution of firms in the service sector that usually explains the difference between XVA and gross exports.[4]

Yet, studies on TiVA have been limited by a crucial difficulty in breaking down the XVA considering the difference in the import intensity of production for the domestic market and abroad. Assessing this difference is essential for effective policymaking, since evidence shows that large exporters are typically more import intensive that SMEs exporters, which means that FVA is typically downward biased in studies that assume a homogenous structure.

The work on Extended Supply and Use Tables (ESUTs) led by the OECD tries to give methodological guidelines to compute TiVA indicators using official statistics, splitting the production functions in several dimensions (size, market orientation and ownership) based on detailed microdata. ESUTs, in this context, provide the accounting framework for GVCs, allowing to cover a wide range of policies related to the role and impact of SMEs, Multinationals (MNEs) and direct exporters, and the relationships between trade, investment and productivity.

[3] The lack of studies on services-producing industries is not solely for Chile. Some evidence is reported in Breinlich and Criscuolo (2009); Masayuki (2015) and Ariu et al. (2017).

[4] The contribution of the service sector to GDP is more relevant compared to goods-producing industries (Pagés, 2010) because of its size and the existence of several situations that boost their relative growth. The existence of policies that increases the cost of capital relative to labor; the trade liberalization has contracted the employment in goods-producing sectors; the deficiencies in business environment and taxes that increase the scale of production to be competitive, among others. For more information, see Neumeyer and Hopenhayn (2004), Revenga (1997) and Bartelsman et al. (2004).

Up until now, the use of tax records has permitted breaking down Supply and Use Tables (SUTs) to separate output into the contribution of intermediate inputs and value added, controlling by different dimensions. For instance, Tang et al. (2020) using an Extended Input-Output Table (EIOT) show that state-owned firms and SMEs in China exhibit a higher XVA to gross exports ratio, compared to the rest of the economy. The OECD and the statistical offices of the Nordic countries refined the detail of linked microdata in their annual GVC report, breaking firms down by size, ownership and trading status. Thus, by using ESUT as benchmarks, they eliminate the inconsistencies of tax records, while avoiding the homogeneity bias within industries. López-González (2017) applies a similar approach to develop results for several Asian countries by combining firm level data with the OECD-WTO inter-country IOT. Michel et al. (2018) find that exporting-oriented manufacturers in Belgium are more involved in GVCs as they have stronger backward linkages with other Belgian firms, mainly service suppliers. For the United States, Fetzer et al. (2018) show that the value added with respect to output is lower for foreign-owned firms compared to domestic companies, and that exports and imports are larger in foreign-owned firms.

Fortainer and Miao (2018) propose a method to break down the IOT based on supply proportionality for several OECD countries. That is, using tax records on aggregate turnovers by size and industry to split the output for the industries/columns and products/rows. This allows keeping the IOT balance, while extending the Leontief matrix. Fortainer et al. (2020) expand this method by adding the ownership dimension to assess the impact of MNEs on GVCs.

These series of proposals also raise some challenges. The most relevant concern refers to inconsistencies between the IOT and SUT when the former is directly split. Aggregates from National Accounts are subject to the balancing of the SUT, whereas the IOT corresponds to a transformation of the former; therefore, to obtain an EIOT requires assumptions to break down the domestic supply and the national use (intermediate and final).

These concerns open relevant gaps to fill in the Chilean case. First, regarding the use of tax records to extend SUTs by industry-size across time. Second, refining the estimation of TiVA measures. Third, exploring a mechanism to improve the supply proportionality method by using electronic tax documents (ETD) that identify the commercial relationships between buyers and suppliers in the intermediate input market at firm-size level.

This paper measures the contribution of SMEs to TiVA based on the first ESUT for the Chilean economy between 2013 and 2016. This framework contains a characterization of the production

function for SMEs and large firms using official data from National accounts and tax records. In addition, this work provides guidelines to compute TiVA measures based on contribution by size, but also highlighting the exported value added driven by the interrelationships between firms.

Our results indicate that SMEs and large firms engage differently in GVCs in terms of their trade patterns, but also in the role as exporter suppliers. In fact, while SMEs are less frequently involved directly in international trade, their contribution to XVA is 12% larger than suggested by traditional statistics, as they supply other, often larger enterprises that subsequently export. This finding situates Chile above the average distribution of OECD countries controlling for GDP per capita (proxy of size of the economy) and number of large firms (proxy of linkages´ intensity). In addition, on average, around 60% of the XVA generated by SMEs is channeled to foreign markets via large enterprises.

This approach illustrates how SMEs, despite its lower export intensity, show relatively higher upstream production linkages compared to large firms. Possibly, their presence in the service sector and the higher probability of large companies to outsource processes in recent years would explain this pattern, allowing strong domestic supply chains.

The rest of this paper is organized as follows. Section 2 summarizes the data sources and the method to build an ESUT. Section 3 describes the main stylized facts from the databases. Section 4 presents both the results and the interpretations stemming from them. Lastly, section 5 provides concluding remarks.

2. Data and method

2.1. Data

This paper uses three different micro-datasets compiled by Chile´s tax administration, *Servicio de Impuestos Internos* (SII, for its acronym in Spanish) with a common identifier for firms. The first database contains income statements (Form 22) which details information across 2013-2016 at firm level on the value of total operating revenues, costs, wages and capital stock, among others.[5] The second database corresponds to wage statements (Form 1887) that provide the number of salaried employees for each firm. Then, following the OECD Structural Business Statistics, firms are classified in SMEs (1-249 employees) and large enterprises (more than 249 employees).[6] The third database contains the value added tax (VAT) statements that report gross exports and imported costs at firm level. In addition, an

[5] From 2017 onwards, Form 22 does not contain operating revenues, costs and wages. Hence, due to data availability, the sample span covers until 2016.

[6] When income (or value added tax) and wage statements were not matched, the owner was assumed to be the only employee.

industry classification – following the ISIC REV.4 - was added to the previous forms using the business register from National Accounts.

Official SUTs from the Central Bank of Chile are used for 2013-2016 at a disaggregation of 111 industries and 180 products. They separate domestic and imported products for intermediate inputs at basic prices, which is the relevant valuation for the transformation into the IOT.

In addition, we explore the electronic tax documents (ETD) from SII to provide some stylized facts at firm level and to compare the results assuming the supply proportionality method. This database contains purchases and sales between companies, which allow identifying the commercial relationships between buyers and suppliers.

2.2. Method

Measuring exported value added for SMEs requires introducing firm heterogeneity into the core components of the SUT. The basic structure of the domestic tables for 2016 - excluding imports - is showed in Figure 2A. For illustrative purposes, the products (contained in the rows) are grouped in goods, trade and services.

The SUT is the main tool for consistency and integration between products and industries statistics, both for goods and services. It systematizes the information on supply and demand (use) to balance National Accounts. Then, the equilibrium ensures the consistency of the three GDP approaches (production, expenditure and income).

Figure 2A: Supply and Use Table, 2016

(Billion Chilean pesos)

		Supply	Use			
			Consumption			
		Output	Intermediate	Final	GCF(*)	Exports
Products	Goods	122.8	46.1	19.1	19.6	38.0
	Trade	35.5	9.8	20.8	2.5	2.4
	Services	133.0	56.1	65.0	6.0	5.9
	Total	291.3	112.1	104.8	28.0	46.3

Source: Central Bank of Chile. (*) Gross capital formation includes the inventory change.

Formally, in a supply-use framework, the relation producers and consumers can be written as follows:

$$S = \sum_{k=\{int,f,gcf,x\}} U_k$$

Where S is a $m \times n$ matrix of the supply of m products and n industries. Elements of S denoted by s_{ij} represent the supply from industry i of one unit of the product j. Analogously, U_{int} is a $m \times n$ matrix of the intermediate consumption from industry i of one unit of the product j. For the rest of uses (investment and final consumption), U_k is a $m \times 1$ vector of final demand.

Disaggregating the SUT requires breaking down the columns, and subsequently the rows, by SMEs and large firms. Four core steps are involved in this transformation, described below.

i) Domestic supply

To disaggregate the SUTs columns/industries and rows/products, output by industry was split using the share of SMEs and large firms in overall output based on supply proportionality. Formally:

$$Y^d = \begin{bmatrix} y^d_{11,11} & 0 & \cdots & y^d_{n1,11} & 0 \\ 0 & y^d_{12,12} & \cdots & 0 & y^d_{n2,12} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ y^d_{11,m1} & 0 & \cdots & y^d_{n1,m1} & 0 \\ 0 & y^d_{12,m2} & \cdots & 0 & y^d_{n2,m2} \end{bmatrix}_{2m \times 2n}$$

Where the domestic output matrix Y^d of size $(2m \times 2n)$ is defined as containing $\tau = 1,2$ firm sizes (SMEs and large). Element $y^d_{i\tau,j\tau}$ is the domestic output from industry i and size τ of product j and size τ.[7]

Then, the domestic supply matrix S^d of size $(2m \times n)$ is obtained by adding each row of Y^d.

$$S^d = \begin{bmatrix} s^d_{1,11} & \cdots & s^d_{n,11} \\ s^d_{1,12} & \cdots & s^d_{n,12} \\ \vdots & \vdots & \vdots \\ s^d_{1,m1} & \cdots & s^d_{n,m1} \\ s^d_{1,m2} & \cdots & s^d_{n,m2} \end{bmatrix}_{2m \times n}$$

[7] 0s in the quadrant represents that supply from industry i and size τ can only fill values from the same size at product-level.

Where $s^d_{i,j\tau} = \sum_{j\tau}\sum_i y_i$ is the domestic supply from size τ and product j derived from industry i.

ii) Final demand

Using the VAT statement, the export vector is split using the export intensity (share of output) derived from industry by size. The residual (supply minus exports), consequently, is used to obtain the rest of final demand (consumption and investment) assuming supply proportionality (excluding exports). In short, we have:

$$U^d_{k\in\{f,gcf,x\}} = \begin{bmatrix} u^d_{11} \\ u^d_{12} \\ \vdots \\ u^d_{m1} \\ u^d_{m2} \end{bmatrix}_{2m\times 1}$$

iii) Imported intermediate demand

The vector of imported inputs is especially relevant for XVA. Its disaggregation is necessary to obtain the technical coefficient by size, which are multiplied by the Leontief matrix derived from the ESUT. This is done in a 2-steps procedure: i) direct imports are split using the VAT database by industry-size and ii) indirect imports via whosale intermediaries are obtained using the share of SMEs and large firms in overall purchases (excluding direct imports) from income statements.

Then,

$$U^{imp}_{int} = \begin{bmatrix} u^{imp}_{11} & u^{imp}_{12,1} & \dots & u^{imp}_{n1,1} & u^{imp}_{n2,1} \end{bmatrix}_{1x2n}$$

Where $u^{imp}_{i\tau,j}$ is the imported intermediate demand from size τ and industry j of product j.

iv) Domestic intermediate demand

To disaggregate the column/industries, intermediate consumption is split using the share of SMEs and large firms in overall purchases (excluding direct imports) obtained from the income statement. Later, to disaggregate row/products, supply proportionality is used. Formally,

$$IC^d = \begin{bmatrix} ic^d_{11,11} & 0 & \dots & ic^d_{n1,11} & 0 \\ 0 & ic^d_{12,12} & \dots & 0 & ic^d_{n2,12} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ ic^d_{11,m1} & 0 & \dots & ic^d_{n1,m1} & 0 \\ 0 & ic^d_{12,m2} & \dots & 0 & ic^d_{n2,m2} \end{bmatrix}_{2m\times 2n}$$

Where the domestic intermediate consumption matrix IC^d of size $(2m \times 2n)$. Element $ic^d_{i\tau,j\tau}$ denotes the IC from industry i and size τ of product j and size τ. Then, the domestic intermediate demand U^d_{int} of size $(2m \times n)$ is obtained by adding each row of IC^d.

$$U^d_{int} = \begin{bmatrix} u^d_{1,11} & \dots & u^d_{n,11} \\ u^d_{1,12} & \dots & u^d_{n,12} \\ \vdots & \vdots & \vdots \\ u^d_{1,m1} & \dots & u^d_{n,m1} \\ u^d_{1,m2} & \dots & u^d_{n,m2} \end{bmatrix}_{2m \times n}$$

Where $u^d_{i,j\tau} = \sum_{j\tau} \sum_i u_i$ is the domestic intermediate demand from size τ and product j derived from industry i.

v) Extended Supply and Use Table

The resulting 2016 table on production accounts by industry-size is presented in Figure 2B, showing an enlarged matrix with the main components of the production function, that is, output, intermediate consumption (separated by domestic and imported inputs) and value added.

Regarding value added for 2016 (156 billion), SMEs contribution climbed to 46%, while large companies reached 54%. The highest difference between sizes was located within goods-producing industries. With respect to intermediate consumption, large firms showed a higher share (percentage of output) compared to SMEs – whereas domestic costs climbed to 40% and imported inputs reached 9%, SMEs depicted 37% and 7%, respectively. This difference was mostly driven by services industry.

Figure 2B
Production account by industries, 2016
(Billion Chilean pesos, current prices)

	Industries							
	Goods		Trade		Services		Total	
	SMEs	Large	SMEs	Large	SMEs	Large	SMEs	Large
Output	47.4	80.8	21.8	16.8	58.4	66.0	127.7	163.6
Int. Consumption	26.6	47.7	10.3	8.6	19.0	22.9	55.9	79.2
Domestic	20.9	38.3	9.2	7.9	17.1	18.7	47.1	64.9
Imported	5.8	9.3	1.1	0.7	1.9	4.2	8.8	14.3
Value added	20.8	33.1	11.6	8.2	39.4	43.0	71.8	84.4

Source: Author´s calculations based on SII and Central Bank of Chile.

Alternatively, Figure 2C exhibits the ESUT for the Chilean economy, featuring the intermediate and final use relationships that indicate how industries and sizes are interconnected. Focusing on the use side, intermediate consumption and gross capital formation (GCF) show similar shares by size, hence, there is a significant contribution of SMEs by providing goods and services for the domestic market. In the case of final consumption, SMEs contribution is lower, especially within services-producing industries.[8]

Large firms concentrate 79% of gross exports due to the high concentration within goods-producing industries, whereas SMEs achieve 21%. Nevertheless, the exported share of trade and services by SMEs is bigger compared to large firms, although far from compensating the former. This corresponds to the direct channel of GVCs.

[8] Possibly, the effect of public activities (categorized as large firms) downward bias the contribution of SMEs in the final consumption.

Figure 2C
Extended supply and use table, 2016
(Billion Chilean pesos, current prices)

			Supply	Use			
				Consumption			
			Output	Int.	Final	GCF	Exports
Products	Goods	SMEs	44.1	22.5	6.7	9.6	5.3
		Large	78.7	23.5	12.4	10.0	32.8
	Trade	SMEs	20.0	5.5	11.5	1.5	1.5
		Large	15.5	4.3	9.3	0.9	0.9
	Services	SMEs	63.6	32.9	24.2	3.5	3.1
		Large	69.5	23.3	40.8	2.5	2.9
	Total	SMEs	127.7	60.9	42.4	14.6	9.8
		Large	163.6	51.2	62.5	13.4	36.5
	% Total	SMEs	44	54	40	52	21
		Large	56	46	60	48	79

Source: Author´s calculations based on SII and Central Bank of Chile.

vi) Extended Input-Output Table

The Extended Input-Output Table constitutes a transformation of the ESUT (Figure 2C) by obtaining a diagonal production matrix along with the intermediate and final absorption matrices, referring to national products at basic prices, under certain assumptions of technology and activity.[9]

The relation between producers and consumers can be written as:

$$y_{ext} = A^{d}_{ext} \times y^{d}_{ext} + e_{ext} \quad (1)$$

Where y_{ext} is the $2n \times 1$ output vector of n industries and two sizes; A^{d}_{ext} is the $2n \times 2n$ technical coefficients matrix. Elements of A^{d}_{ext} are denoted by $a^{d}_{i\tau,l\tau}$ representing the ratio of domestic inputs from industry i and size τ that are required in the production of one unit of industry l and size τ. Lastly, e_{ext} is a $1 \times 2n$ vector of final demand. Then, solving for y_{ext} in equation (1) leads to:

[9] See Central Bank of Chile (2017) for detailed transformation of the IOT.

$$y_{ext} = (I - A^{d}_{ext})^{-1} \times e_{ext}.$$

(2)

Where $(I - A^{d}_{ext})^{-1}$ is the extended Leontief inverse matrix of size $2n \times 2n$. This represents the total requirements (direct and indirect) of domestic inputs by size to produce one unit of final demand.

Following Rébora and Vivanco (2016), to determine the exported value added in the final demand, we apply the following equation:

$$XVA_{ext} = VA_{ext} * (I - A^{d}_{ext})^{-1} \times e_{ext}.$$

(3)

Where VA_{ext} is a $1 \times 2n$ vector corresponds to the value added by size as a share of y_{ext}.

3. Stylized facts on exports and exporters by firm size[10]

3.1. Exporting firms: static and dynamic facts

Exports growth (at current prices) by firm size is featured in Figure 3A. The results show that, between 2009 and 2018, large firms mostly explained the overall dynamic, reaching 80% of the average annual growth rate. In addition, two results are highlighted: 1) SMEs and large firms grew, on average, 5.5% and 3.4%, respectively; and 2) growth volatility has been significant, however, large firms exceed the standard deviation of SMEs (9.7 and 7.7, respectively) in the sample span. Figure 3B shows the growth of the number of exporters across time. The annual average rate climbed to 4.1%, mostly explained by SMEs. Despite the latter, the creation of exporters has decreased continuously since 2014, reaching a 0,7% in 2018.

[10] This section shows different calculations using VAT and wage statements to classify firms as exporters and domestic firms by size. In addition, we use electronic tax documents to identify suppliers of other firms that produce for the domestic market, abroad, or both.

Figure 3A
Exports growth, 2009-18
(Current prices, contribution by size

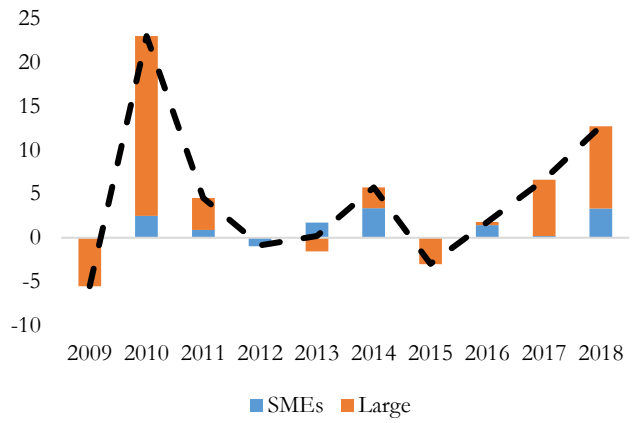
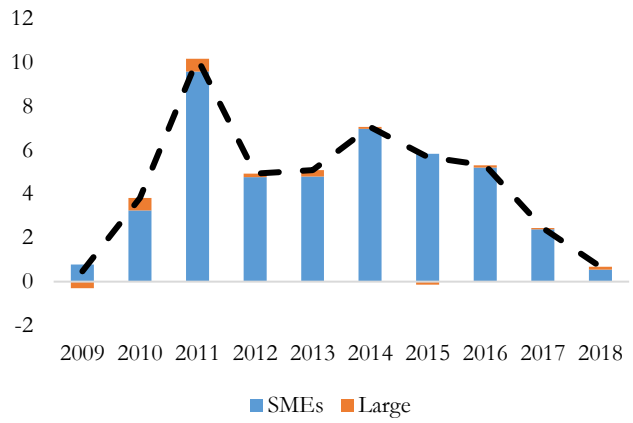


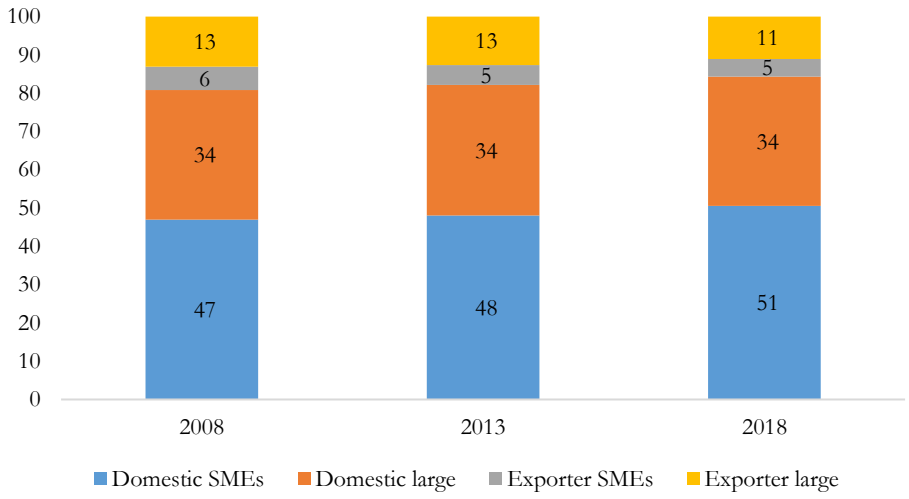
Figure 3B
Number of exporters´ growth, 2009-18
(Contribution by size)



Source: Author´s calculations based on SII databases.

Figure 3C breaks down the employment share by size and market orientation category (domestic and exporter firms) for three selected years (2008, 2013 and 2018). Overall, domestic SMEs contribute the most and increase their share across time, whereas large firms decrease their share, dropping from 47% to 45% in the last decade. Firms that supply the foreign market explain this result.

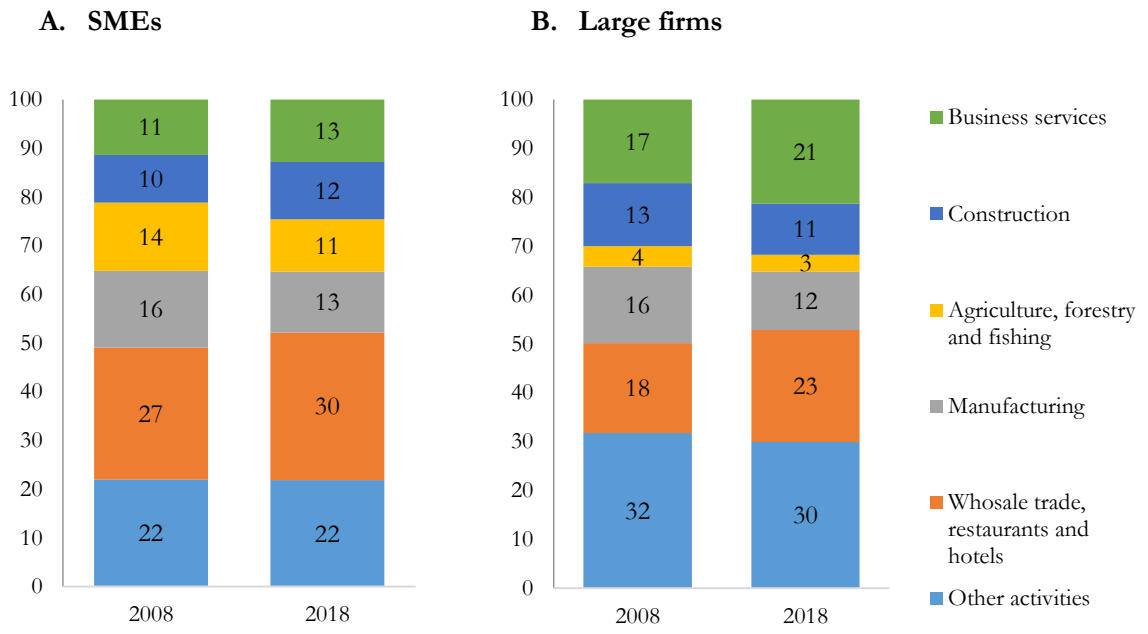
Figure 3C
Employment share by size-orientation, 2008-18
(Current prices, contribution by size)



Source: Author´s calculations based on SII databases.

The previous analysis is expanded by splitting employment by industry (see Figure 3D), where two findings emerge. First, the composition within sizes differs because SMEs are more concentrate in "Whosale trade, restaurants and hotels" while larger companies tend to concentrate in "Other activities" that include mainly services. Second, services-producing industries have increased relatively for both sizes vis-à-vis a reduction in "Manufacturing".

Figure 3D
Employment share by industry, 2008-18
(contribution by size)



Source: Author´s calculations based on SII databases.

Figures 3C and 3D illustrate certain regularities in exporting firms. To analyze their dynamic, however, Table 3A provides panel data to estimate the creation and destruction of exporter firms by size between 2008 and 2018.

For SMEs, the results show a low firm turnover in the exporting line: Of the 3.4% of the exporters in 2008, 1.2% ceased in 2013, while 1.3% added, thus completing 3.5% of the total. In 2018, only 1.7% permanently remained as exporters, while 1.4% did so in two occasions. Consequently, in at least one of the three measures, 2.6% of the SMEs appeared in this situation.

For large firms, the situation significantly changes. Of the 23.6% exported in 2008, 21.5% was exported continuously, 5.8% exported two of the three years and 9.2% remained the exporter condition only one year.

Table 3A

Creation and destruction of exporter firms: 2008-18

(Percentage of total)

2008	2013	2018		
		Exporter	**Non-Exporter**	**Total**
a) SMEs				
Exporter (2.2%)	Exporter (2.2%)	1.7	0.6	2.2
Exporter (1.2%)	Non-Exporter	0.2	1.1	1.2
Non-Exporter	Exporter (1.3%)	0.6	0.7	1.3
Non-Exporter	Non-Exporter	0.8	94.4	95.2
Total		**3.2**	**96.8**	**100.0**
b) Large				
Exporter (23.6%)	Exporter (23.6%)	21.5	2.0	23.6
Exporter (3.7%)	Non-Exporter	0.8	2.8	3.7
Non-Exporter	Exporter (5.7%)	3.0	2.6	5.7
Non-Exporter	Non-Exporter	3.8	63.3	67.1
Total		**29.2**	**70.8**	**100.0**

Source: Author´s calculations based on SII databases.

3.2. Evidence on SMEs suppliers

Based on the electronic tax documents, we present several facts regarding the distribution of firms by size and orientation. By not imposing the supply proportionality method but allowing for the granularity of microdata, this dataset incorporates heterogeneity to the domestic intermediate demand at product-size level, affecting the relationship between suppliers and buyers.

Number of suppliers and distribution by size: Table 3B shows that 61% of the companies are SMEs providing goods and services to other companies (534,320). In contrast, only 2,479 large firms are suppliers of other firms, but they employ 2,38 million workers, slightly less than the SMEs (2,45 million).

Table 3B

Employment and number of firms by size and orientation, 2018

(Quantity)

	Number of firms	Employment
1) Size		
a) SMEs	869,111	3,064,674
b) Large	2,663	2,491,570
Total	**871,774**	**5,556,244**
2) Type		
SMEs		
a) Suppliers	534,320	2,451,477
b) Others	334,791	613,197
Total	**869,111**	**3,064,674**
Large		
a) Suppliers	2,479	2,381,937
b) Others	184	109,632
Total	**2,663**	**2,491,570**

Source: Author´s calculations based on SII databases.

Notes: i) Suppliers include commercial intermediaries of goods and services; ii) Others correspond to the residual between overall companies by size and the number of suppliers identified.

Suppliers´ distribution by market orientation of the user: A firm may produce for the domestic market, abroad, or both. Table 3C shows that SMEs mostly provide to domestic firms (55%), followed by firms with a domestic/foreign orientation (45%). In the case of large companies, the joint domestic/foreign orientation tends to dominate. The distribution of employment mimics the pattern for large companies, nevertheless, in the case of SMEs; joint-oriented companies show the biggest share.

Table 3C

SMEs suppliers: Employment and number of firms by use, 2018

(Quantity)

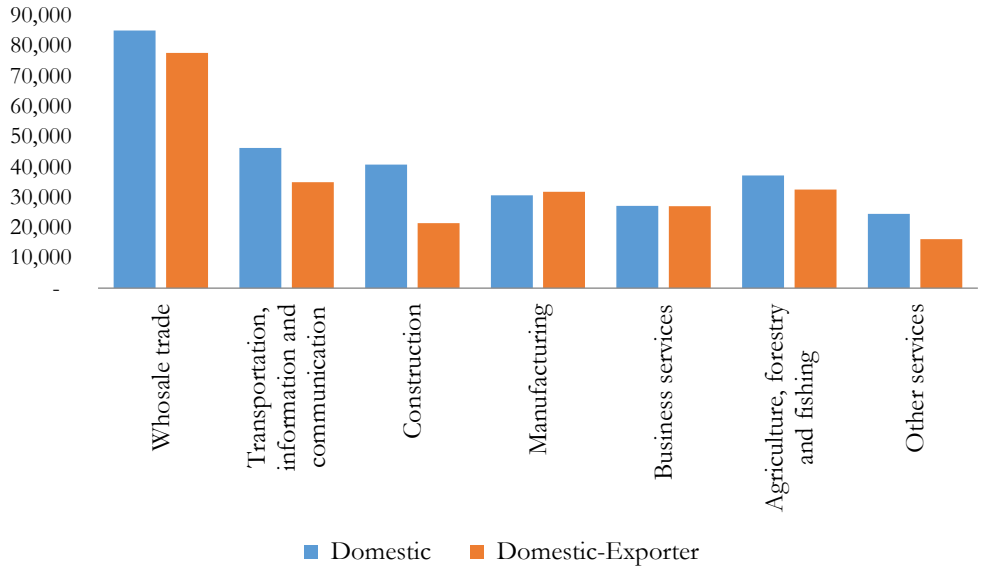
Size	Use	Number of firms	Employment
SMEs	Domestic	291,625	728,353
	Exporter	1,170	1,743
	Domestic-Exporter	241,525	1,721,380
	Total	**534,320**	**2,451,477**
Large	Domestic	380	373,772
	Domestic-Exporter	2,099	2,008,165
	Total	**2,479**	**2,381,937**

Source: Author´s calculations based on SII databases.

Suppliers´ distribution by industry of the user: Using the previous disaggregation on SMEs, Figure 3E shows that SMEs suppliers are concentrated in "Whosale trade", "Transportation, information and communications", "Construction" and "Manufacturing", respectively. The number of SMEs in "Whosale trade" is partially explained by the difficulty in separating the commercial intermediaries from the intermediate consumption of the rest of industries.[11] "Construction", on the other hand, could be upward biased by the inclusion of capital goods in the transactions between firms.

Figure 3E

SMEs suppliers: distribution of firms by use and industry



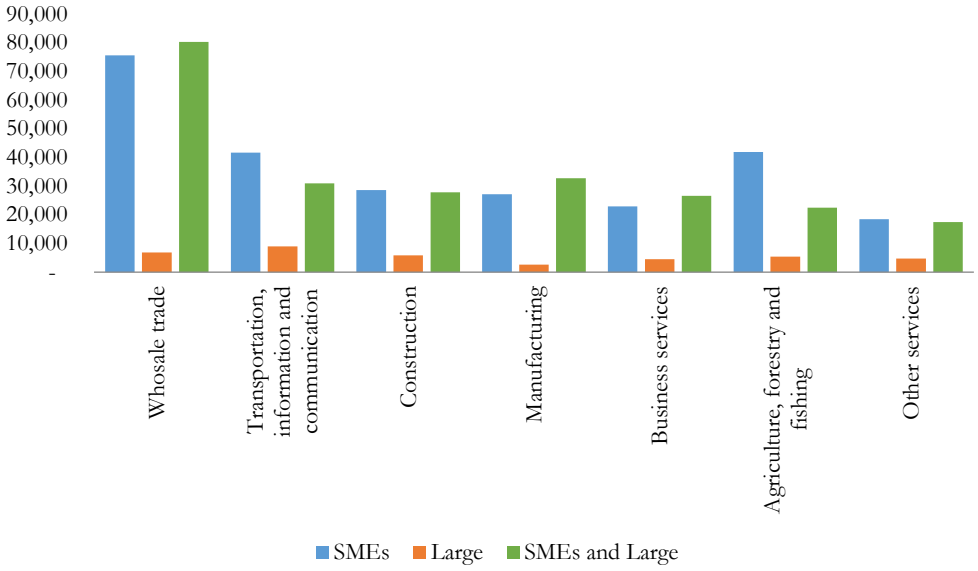
Source: Author´s calculations based on SII databases.

Suppliers´ distribution by size of the user and industry: The importance of SMEs that supply both sizes is observed in all industries (see Figure 3F), keeping the distribution of domestic users from Figure 3E. However, the pattern for the rest of sizes (purely SMEs or large firms) is more homogenous between activities with respect to domestic-exporters distribution.

[11] The output of commercial intermediaries corresponds, essentially, to trade margins, which are not considered in the intermediate demand of the EIOT.

Figure 3F

SMEs suppliers: distribution of firms by size-user and industry



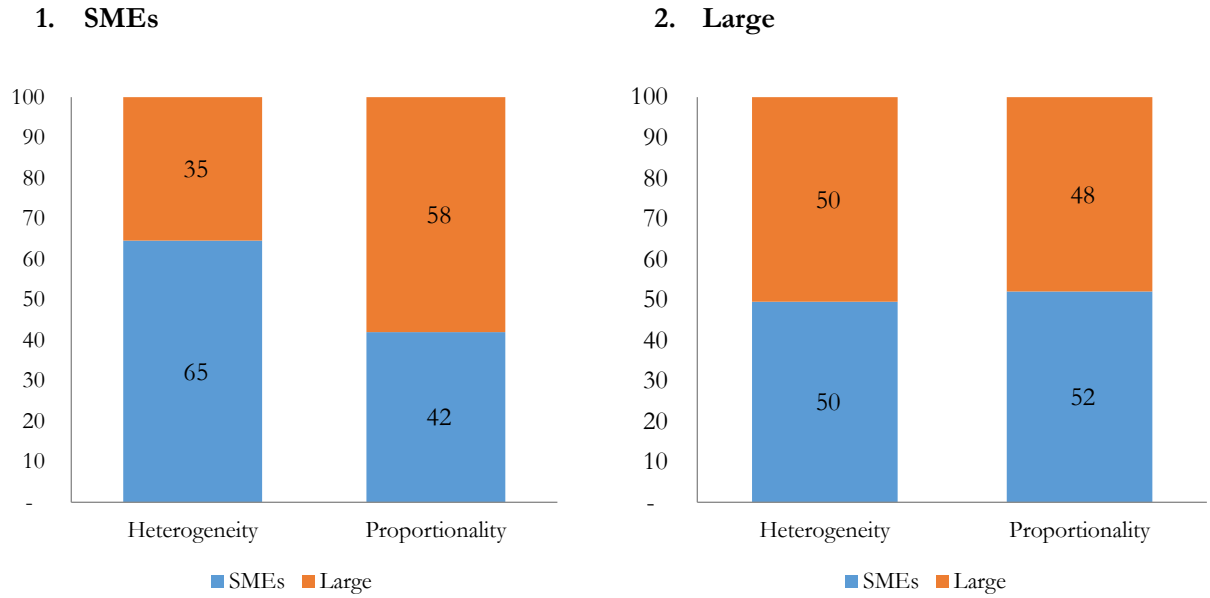
Source: Author´s calculations based on SII databases.

Supply proportionality vis-à-vis heterogeneity assumption: Figure 3G breaks down the intermediate demand by the supplier size, comparing the results of the supply proportionality method and the interrelationships captured in electronic tax documents. Our findings show that SMEs tend to operate more as suppliers of other SMEs assuming heterogeneity at supplier-buyer level, whereas the share remains similar for large firms. Based on this aggregate figure, the results based on proportionality would underestimate the role of SMEs in the value chain, which is directly correlated to their contribution to the exported value added.

Figure 3G

Composition of the intermediate demand by size

(Percentage of total)



Source: Author´s calculations based on Central Bank of Chile and SII databases.

3.3. Foreign oriented premia for exporters and exporters suppliers

Literature on firm´s heterogeneity generally seeks to recognize the differences between domestic-oriented and exporter firms (Helpman et al., 2004; Maggioni et al., 2011; Bernard et al., 2009; Fetzer and Strassner, 2015). The evidence exhibits upper values of output, wages per worker and productivity for exporters, suggesting the existence of a better performance for their presence in foreign markets.[12]

A non-frequent comparison corresponds to estimate previous values for exporter suppliers. Studies commonly use firm size as a relevant control to recognize the differences in technology (Piacentini and Fortainer, 2015). In "Manufacturing", for example, export shares and labour productivity are higher within large firms compared to SMEs, with small companies displaying export values close to zero and large firms exhibiting higher export shares and productivity. The evidence on productivity, however, is inconclusive, depending on the measure being used (Correa and Echavarría, 2013) and how the employment level defines the type of firm. [13]

[12] This is caused, mostly, by a self-selection into foreign markets instead of some form of learning by exporting. The existence of a sunk entry cost, in this respect, have been widely documented jointly with scarce evidence of productivity improvements due to exporting/importing (Tybout, 1997; Bernard et al., 2009; Melitz, 2003; Licandro and Impullitti, 2010). Despite the latter, recently some works have documented the existence of evidence between exporting and technology upgrading (Lileeva and Trefler, 2010; García and Voigtlander, 2018).

[13] Recent works have mostly used OECD recommendations based on employment over the amount of sales. See Correa and Echavarría (2013) for a comparison in the SMEs' contribution to Chilean GDP in both scenarios.

Table 3D summarizes the premia for exporters and exporter suppliers for the Chilean case. We define premia as the average percentage difference between both categories by size and the residual group[14] for several characteristics, controlling for firm size and industry fixed effects (2-digit ISIC).

The dependent variables are value added, wages and capital stock per worker. In addition, employment and labour productivity are included to test the usual variables on productivity, all in logs. Hence, the coefficients are percentages. The explanatory variable is a dummy variable indicating whether the firm is involved only in exporting/suppling solely or not.[15]

SMEs exporters show higher returns compared to purely domestic SMEs in each variable, and this difference is greater with respect to large firms. This may explain for the existence of too many small and unproductive firms in the domestic market (Duarte and Restuccia, 2010) that reduces total productivity and drive out firms with higher value added.

For exporter suppliers, despite the premia is lower compared to purely exporters, the coefficients remained positive and significant for each variable. Moreover, the gap between sizes remains unchanged (SMEs exhibit higher coefficients compared lo large firms). These findings are particularly relevant when XVA is carried out since SMEs suppliers play an important role in the value chain, even when only a small fraction of these firms is directly involved in exporting.

Table 3D
Foreign oriented premia by firm size
(Regression coefficients and standard errors between brackets)

	Exporters		*Exporter suppliers*	
	SMEs	Large	SMEs	Large
Log value added per worker	0.77***	0.65***	0.37***	0.18***
	(0.01)	(0.04)	(0.02)	(0.34)
Log wages per worker	0.64***	0,40***	0.21***	0.20***
	(0.01)	(0.03)	(0.05)	(0.07)
Log labor productivity	0.87***	0.87***	0.45***	0.29***
	(0.01)	(0.05)	(0.01)	(0.19)
Log capital per worker	1.23***	1.15***	0.25***	0.56***
	(0.02)	(0.10)	(0.03)	(0.19)
Log employment	1.16***	0.27***	0.68***	0.48***
	(0.01)	(0.04)	(0.01)	(0.13)

Source: Author´s calculations based on SII databases.
Notes: All results are from bivariate OLS regressions that include robust standard errors (between brackets). *** is significant at the 99% level of confidence.

[14] Each group corresponds to a dummy variable in the database; therefore, the residual group is the reference when OLS coefficients are estimated.
[15] The average percentage difference is measured in logs. To capture the difference in levels for value added per worker within SMEs, for example, the exponent function is used as follows: $(exp(0.77) - 1) - 1 = 15.97\%$.

4. Results and discussion

This section provides a disaggregation of domestic value added between exported and non-exported for the Chilean economy according to the EIOT previously described.[16] The results, compared to the international experience, can be summarized as follows: for non-exported value added, the contribution of SMEs is higher through the direct channel, while the XVA increases when the indirect channel is added. For large firms, on the other hand, the evidence states a lower interrelationship compared to SMEs, mostly driven by the contribution of the direct channel to the XVA. Nevertheless, this depends on the Leontief matrix coefficients captured in the EIOT, i.e. the intensity of the backward linkages between-within SMEs and large firms by industry.

4.1. Aggregate value added by size-channel

EIOT decomposes the value added by size, separating the origin of that value. That is, the exported and non-exported value added by the direct contribution of SMEs and large firms, and their indirect contribution through the value chain.

Figure 4A summarizes EIOT results, differentiating between non-exported value added (consumption and investment) and XVA by size. For SMEs, the results show that the greatest contribution within domestic market is directly realized (60%), followed by the value driven by large companies (23%) and other SMEs (17%), respectively. Alternatively, the disaggregation of exported value added shows a significant contribution of SMEs in the value chain of large exporters (57%) – illustrating a greater backward linkage in GVCs – followed by the direct value (30%) and the interrelation with other SMEs (13%). Overall, 55% of the value added is directly created (39.2 billion), 29% is driven through large companies (20.7 billion), and the residual via other SMEs (11.8 billion).

With respect to large companies, non-exported and exported value added show a similar share in direct terms (around 73%). The difference between components is explained by the indirect contribution within SMEs and other large firms. In fact, whereas the interrelation in the domestic market is higher (depicting a similar share between sizes), the role of large firms as suppliers for exporter SMEs reached the lowest ratio (5%) of the economy.

[16] We use valued added instead of GDP since indirect taxes and imported tariff are not contained in the EIOT.

Figure 4A
Value added from by size-channel
(Billion Chilean pesos, current prices)

Source: Author´s calculations based on Extended Supply and Use Table.

4.2. Exported value added by size and channel

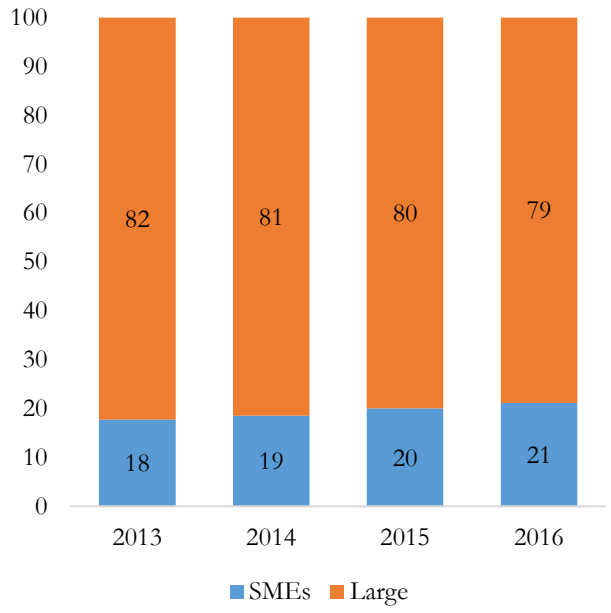
Figure 4A briefly outlined the exported value added driven by SMEs, however, this section expands forgoing analysis by adding a 4-year comparison (2013-2016) – allowing a simple trend analysis – along with showing the role of SMEs, and how these firms are engaged in GVCs.

As mentioned, SMEs are generally less directly involved in international trade. This can be explained by several factors including economies of scale (which may be exacerbated by more limited access to financing), but also by the existence of fixed costs to exporting.

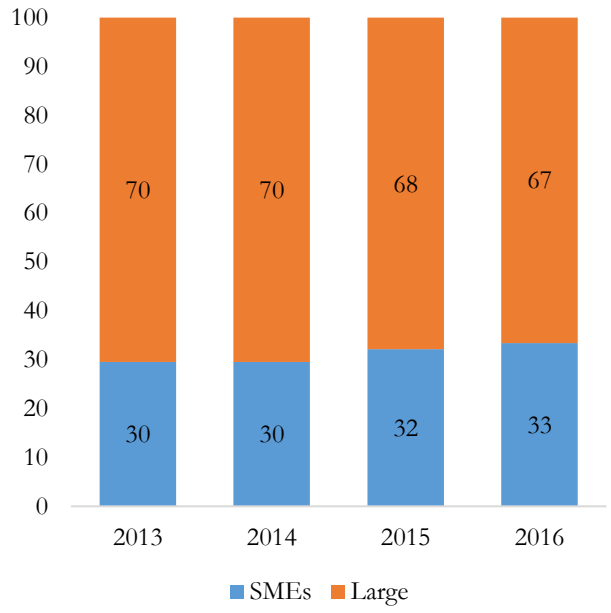
Figure 4B shows that the contribution of SMEs to exports is much larger than suggested by traditional statistics using the ESUT. On average, they reached 19% of gross exports across 2013-2016, rising to 31% of exported value added. This indicates that although SMEs have difficulties to directly access to foreign markets, they present a significant role as suppliers to other firms, often larger enterprises that subsequently export.

Figure 4B
Gross exports and exported DVA by size
(Share of total, current prices)

1. Gross exports



2. Exported value added



Source: Author´s calculations based on Extended Supply and Use Table.

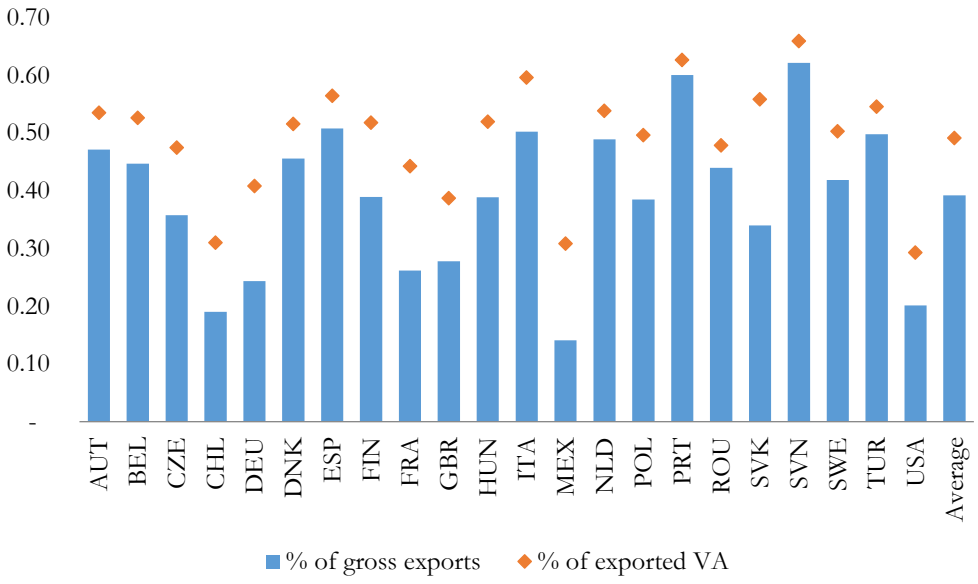
To compare this feature in relative terms, Figure 4C shows the difference between SMEs' contribution to gross exports vis-a-vis XVA for a sample of OECD countries. The results show that, on average, their contribution increases by 10% when the backward linkages are included (39% vs 49%). Chile, in this respect, is located slightly above the average distribution, reaching a 12% gap. Yet, there is no significant changes in the overall ranking, situating Chile (31%) at the bottom of the group above the United States (29%) and Mexico (30.8%).

An alternative analysis is to compare the additional contribution against GDP per capita - the standard measure of welfare – in order to assess some pattern based on the economic development across countries. According to Figure 4D.1, the indirect role of SMEs is particularly important in larger economies (over US$40,000 GDP per capita) such as Germany, Finland and the UK, where the contribution of SMEs in gross terms exceed 10%. However, there is a second group of richer economies integrated by the USA, the Netherlands, Denmark, Australia, among others, which are below the average gap of the sample.

With respect to the countries below US$40,000 GDP per capita, the evidence is still inconclusive. Whilst economies such as Turkey, Portugal, Romania and Slovenia show lower SMEs contribution – indicating a positive correlation between GDP and X-XVA gap – there are similar nations (measured by GDP) like Chile, Mexico and Poland that are located above the average distribution.

Besides GDP per capita, other hypothesis states that higher backward linkages are explained by the existence of many large enterprises with low market power. Figure 4D.2 indicates a slightly positive correlation between both variables, therefore, smaller economies with fewer (very) large firms, such as Portugal, Slovenia and the Netherlands show that the role of SMEs in X-XVA gap is smaller. On the contrary, economies like Germany, UK and France (over 4,000 large companies) exhibit a significant contribution from SMEs to the XVA.[17] Chile, in this scenario, despite is located nearly above the median distribution of firms (2,209), the indirect contribution of SMEs to XVA appears to be significant compared to economies that even double its number.

Figure 4C
SMEs: share of gross exports and DVA
(Percentage)



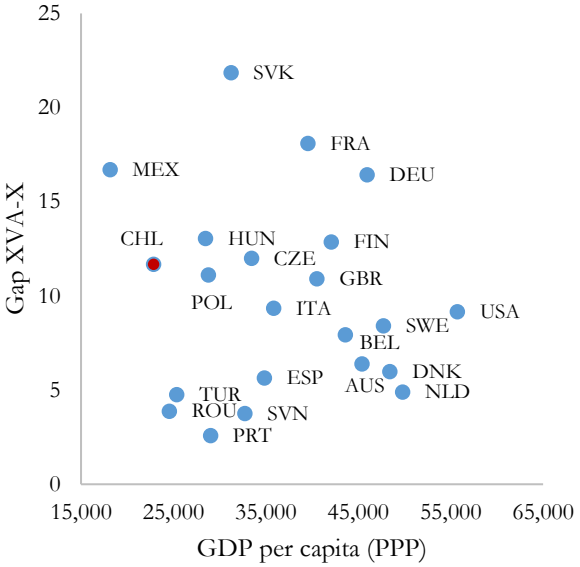
Source: Data for OCDE countries is from Fortainer et al. (2018).
Notes: Australia (AUT), Belgium (BEL), Czech Republic (CZE), Chile (CHL), Germany (DEU), Denmark (DNK), Spain (ESP), Finland (FIN), France (FRA), United Kingdom (GBR), Hungary (HUN), Italy (ITA), Mexico (MEX), Netherlands (NLD), Poland (POL), Portugal (PRT), Romania (ROU), Slovak Republic (SVK), Slovenia (SVN), Sweden (SWE), Turkey (TUR) and United States (USA).

[17] The USA was excluded from Figure 4D.2 because it is an outlier in the sample – It exhibits around 26,000 large companies in 2017.

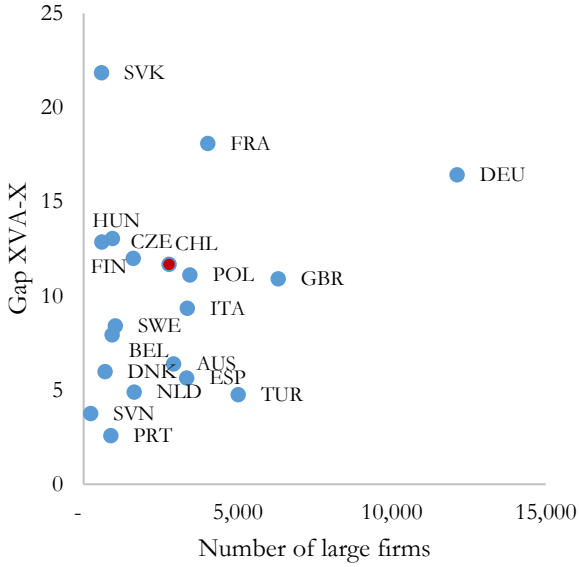
Figure 4D

Comparison across countries

1. GDP per capita (PPP) and Gap XVA-X



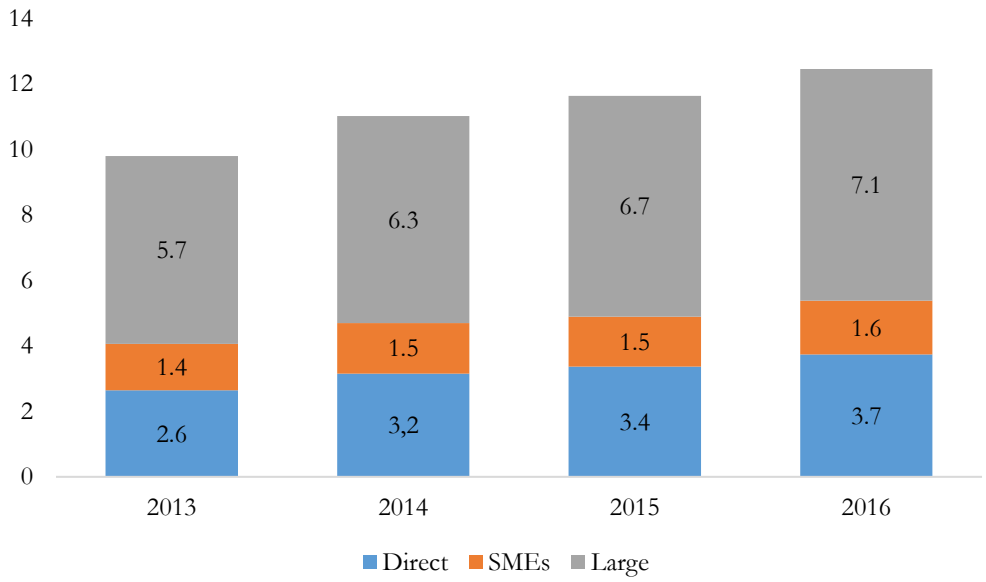
2. Number of large firms and Gap XVA-X



Source: Data from World Bank and OECD for GDP per capita and number of large firms, respectively. For Chile, data is from Extended Supply and Use Table.

An additional feature is to assess the channel where SMEs create XVA (see Figure 4E). Our findings show that large companies drive the highest value (reaching, on average, 57% in the sample span) followed by the direct contribution (29%) and through other SMEs (14%). This ratifies a significant contribution of SMEs in GVCs explained by the backward linkages with large firms. With respect to the results across 2013-16, two findings highlighted: 1) the average annual growth of XVA is positive for each channel, and 2) despite the indirect contribution is larger, the direct channel exhibits the higher growth rate in relative terms.

Figure 4E
SMEs: XVA by export channel
(Billion Chilean pesos, current prices)



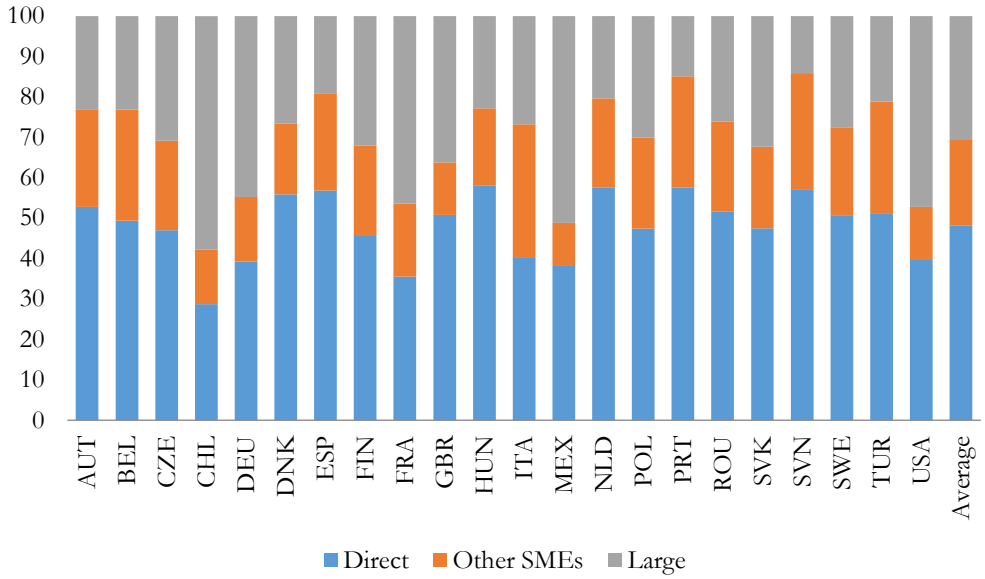
Source: Author´s calculations based on Extended Supply and Use Table.

The comparison with OECD countries on SMEs contribution by channel is showed in Figure 4F. The direct participation reached, on average, 48% for the overall sample, followed by the large exporters' channel (30%) and the rest of SMEs (22%). Chile, in this context, reached the largest contribution via large companies (57%), followed by Mexico (51%), the United States (47%) and France (46%) at the upper level of the distribution.

Figure 4F

OECD: SMEs exported VA by channel

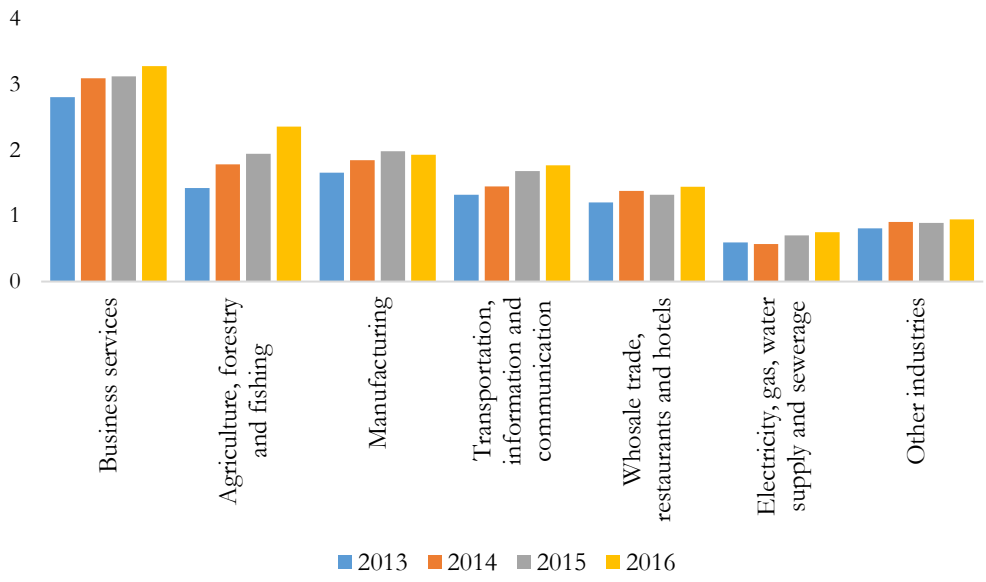
(Share of total)



Source: Data for OCDE countries is from Fortainer et al. (2018). For Chile, shares correspond to the average between 2013 and 2016 from Extended Supply and Use Table.

Finally, Figure 4G exhibits the disaggregation of XVA by industry and year to illustrate the key industries for SMEs' contribution, and their evolution across time. Our findings illustrate that exported value added is the highest within "Business services", achieving 27% of the total value. By relevance terms, "Agriculture, forestry and fishing" (16.6%), "Manufacturing" (16.5%) and "Transportation, information and communication" (13.8%) also highlight by their relevance in the suppling chain.

Figure 4G
XVA from SMEs by industry
(Billion Chilean pesos, current prices)



Source: Author´s calculations based on Extended Supply and Use Table.

5. Concluding remarks

The challenge of fostering the internalization of SMEs is still latent. Traditional figures for the Chilean economy show that the share of gross exports by SMEs represents around 20%. Yet, they fail to recognize the indirect contribution of SMEs as suppliers in the value chain. That is, the value added indirectly generated in the production of an exported good through the backward linkages in the economy.

Based on National Accounts data along with several tax records at firm level, this paper is the first attempt to break down the SUT by firm size. This latter extends the Leontief matrix to estimate the direct and indirect contribution from SMEs to exported value added.

Our results show that SMEs contribution to XVA is 12% larger than suggested by gross exports, as they mostly supply exporter firms. In fact, their indirect contribution more than doubles the direct one. This finding situates Chile above the average distribution of OECD countries. In addition, most of the indirect contribution (57%) takes place through large exporting firms, showing larger upstream production linkages compared to advanced economies. Nevertheless, it also evidences that SMEs are still less directly involved in international trade and has remained relatively stagnant over time, reflecting

shortcomings in exporting. Progress in this area requires a wider scope of public policies that strengthen the direct channel, aiming at increasing the benefits of GVCs.

There is plenty future research related to this method. First, a further disaggregation of the intermediate demand within industries and size using electronic tax documents. A preliminary view of this data shows that SMEs may operate even more as suppliers of other firms, therefore, their contribution to XVA could be higher assuming heterogeneity in the linkages between firms and sizes. Second, the deflation of the ESUT figures is still a challenge in the international context. By controlling the price effect (exchange rate and relative prices of imports and exports) would allow to identify what is the effective contribution of XVA by firm size in GDP growth. Finally, exploring the impact of allocating imports from trade forms part of the research agenda that takes this work forward.

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