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ESCUELA DE NEGOCIOS

The Import Contents in the Chilean Mining Exports

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Motivation

Globalization has increase international trade and the global value chains are everywhere. One interesting element of this process is the imported inputs content in the export.

If these imported inputs are not properly accounted for, net exports (and national output) will be mismeasured since the value of exports will in part incorporate the value of imported inputs.

In addition, the more the impact content the lower the impact of the Foreign Direct Investment.

Vertical Specialization

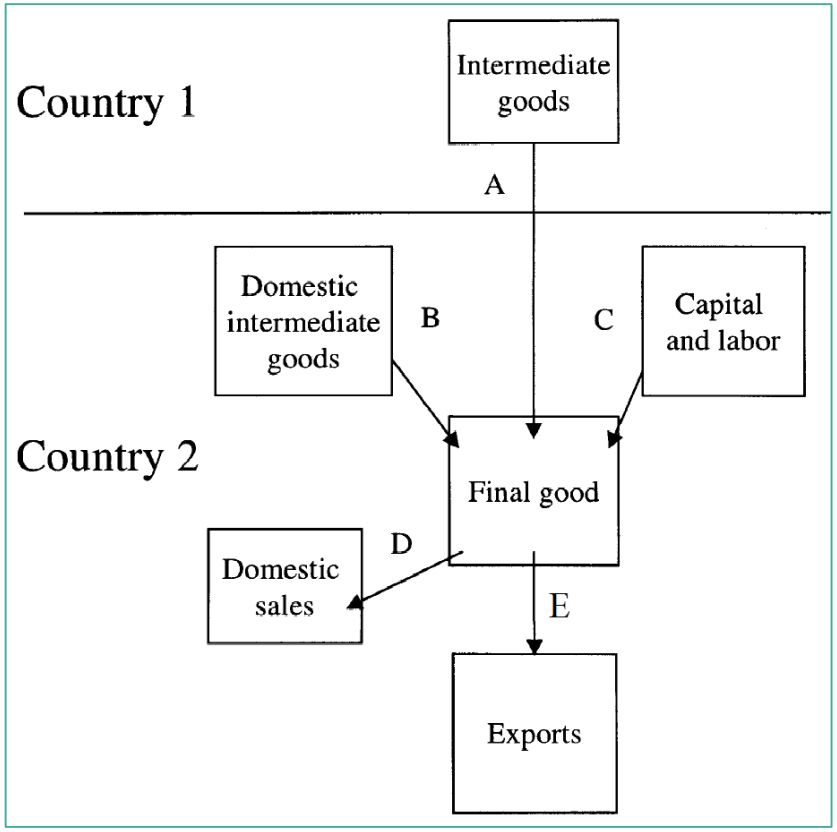
In the global value chains the country get connected with other countries in the world due to import of input or export of **good and services**.

The intensity of each process will be determined by the structure of the economy and its capacity to generate value added. This process is known as **vertical specialization** and it happens when the next three conditions are in place:

- A **good (commodity or product)** is produced by at least two stages.
- Two o more countries add value to the production of the **good**.
- At least one of the countries involved in the process imports inputs and part of the production is exported.

Vertical Specialization

Country 2, $VS_{2i} = (A/(D+E))*E = (E/(D+E))*A.$



Source: Adapted from Hummel et al (2001)

Vertical Specialization (VS)(Direct)

$$VS_{ki} = \left(\frac{Imported\ Intermediated}{Gross\ Output}\right) * Exports(E)$$

$$VS_{ki}^{I} = \mathbb{I} * A^{M} * E_i$$

Country k sector i

X is an $nx1$ vector of exports, Hummel et al (2001)

Vertical Specialization (Direct + Indirect)

$$VS_{ki}^{II} = \mathbb{I} * A^{M}\left(I - A^{N}\right)^{-1} * E_i$$

Country k sector i

X is an $nx1$ vector of exports, Hummel et al (2001)

VS share of total exports (Direct)

$$VS_I\ share\ of\ total\ exports = \frac{VS_k^I}{X_k} = \frac{\mathbb{I}A^M E_i}{X_k}$$

Where $\mathbb{I}$ is a $1xn$ vector of 1's, A^M is the nxn imported coefficient matrix, n is the number of sectors, and X_k is the sum of exports across the n sectors.

Elements a_{ij} of A^M denotes the imported inputs from sector i used to produce one unit of sector j's output (Hummel et al, 2001).

VS share of total exports (Direct + Indirect)

$$VS_{II}\ share\ of\ total\ exports = \frac{VS_k^{II}}{X_k} = \frac{\mathbb{I}A^M\left(I - A^N\right)^{-1}E_i}{X_k}$$

Where $\mathbb{I}$ is a $1xn$ vector of 1's, A^M is the nxn imported coefficient matrix, n is the number of sectors, and X_k is the sum of exports across the n sectors.

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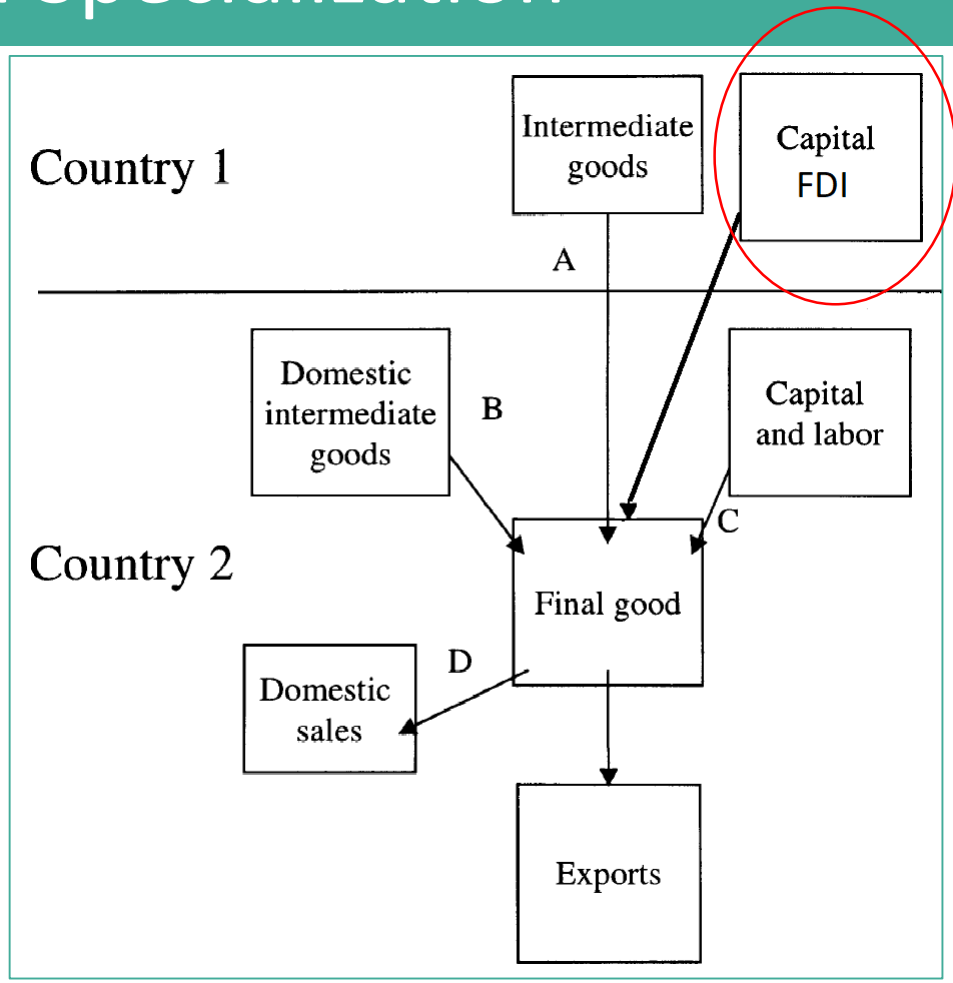
Vertical Specialization



Source: Adapted from Hummel et al (2001)

Imported capital input

- Alternatives:
  - **Depreciation** (economics): gradual decrease in the economic value of the capital stock of a firm, nation or other entity, either through physical depreciation, obsolescence or changes in the demand for the services of the capital in question.
  - **Payment to capital use**: the firms pay for each intermediate inputs their price and wages for using the services of labor. Therefore, payment to capital should be accounted by the profits that goes to the owners.

VS2 share of total exports

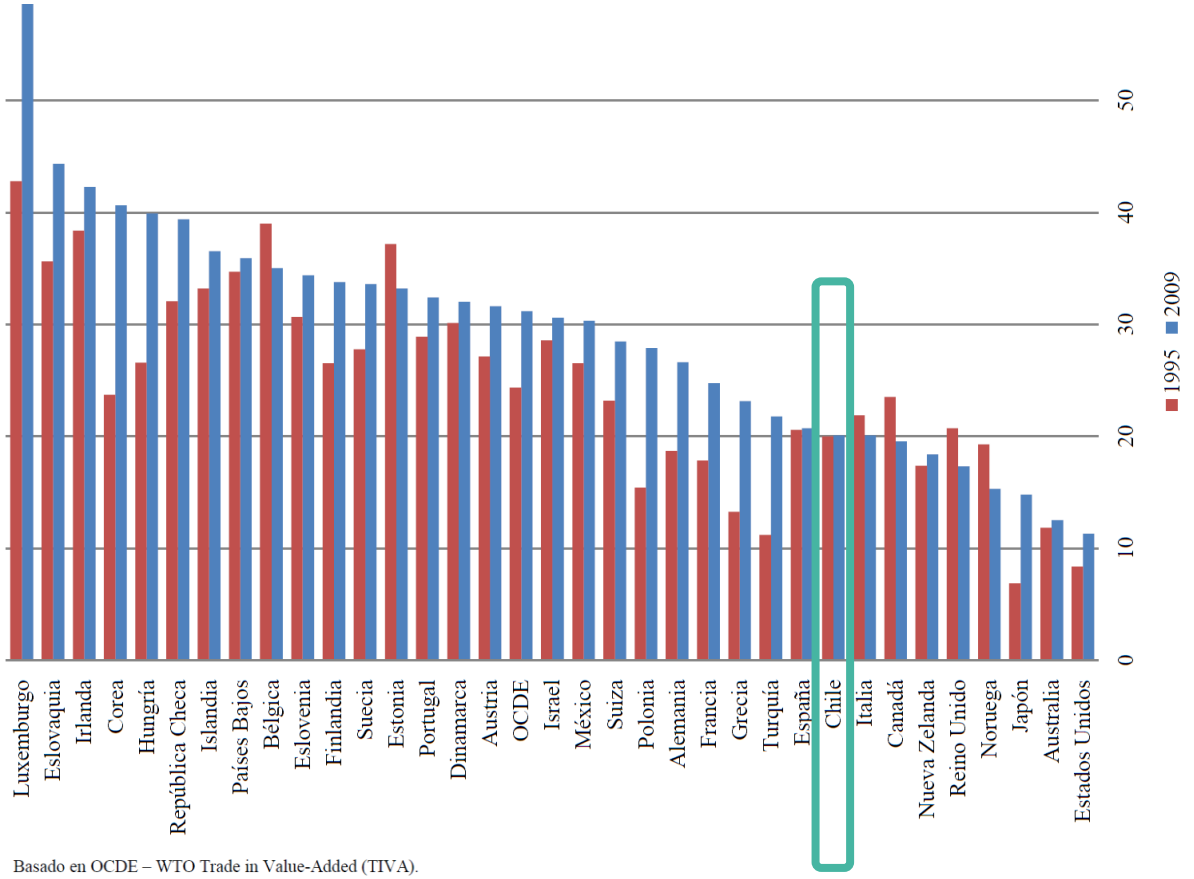
$$VS2_{ki} = \left(\frac{Profit\ of\ FDI\ +\ Imported\ Intermediated}{Gross\ Output}\right) * E$$

$$VS_I2\ share\ of\ total\ exports = \frac{VS_I2_k}{X_k}$$

$$VS_{II}2\ share\ of\ total\ exports = \frac{VS_{II}2_k}{X_k}$$

Fragmentation

The content of import in export is an indicator of fragmentation that arise because the global value chain.



Basado en OCDE – WTO Trade in Value-Added (TIVA).

Application to Mining Sector in Chile

Commodities-by-Industry Framework

Which is the proper matrix to estimate the value chain: commodity-by-commodity, industry-by-industry (IO tables) or use matrix?

- Commodity-by-commodity
- Are there difference? YES, the larger the secondary products the larger the differences.
- There is several published paper using industry-by-industry and use matrix and talking about products.

Commodities-by-Industry Framework

	Commodities	**Industries**	**Final Demand**	∑
Commodities		***U*** Use Matrix	***e*** by comm.	***q*** Gross Output
Industries	***V*** Make Matrix			***g*** Gross Output
Value Added		***va*** by industries		
∑	***q′***	***g′***		

Tables	Valuation	
Gross Domestic Product. Measured by product approach		
Gross Domestic Product. Measured by income approach		
Gross Domestic Product. Measured by expenditure approach		
Total Supply table	User price	
Total Use Matrix	User price	U
Total Final Demand for Commodities	User price	e
Value Added by Industries		va
Domestic Supply table	User price	
Domestic Use Matrix	User price	U_N
Domestic Final Demand for Commodities	User price	e_N
Imported Supply table	User price	
Imported Use Matrix	User price	U_M
Imported Final Demand for Commodities	User price	e_M
Total Supply table	Producer Price	
Total Use Matrix	Producer Price	U
Total Final Demand for Commodities	Producer Price	e
Domestic Supply table	Producer Price	
Domestic Use Matrix	Producer Price	U_N
Domestic Final Demand for Commodities	Producer Price	e_N
Imported Supply table	Producer Price	
Imported Use Matrix	Producer Price	U_M
Imported Final Demand for Commodities	Producer Price	e_M
Total Supply table	Basic Price	
Total Use Matrix	Basic Price	U
Total Final Demand for Commodities	Basic Price	e
Domestic Supply table	Basic Price	
Domestic Use Matrix	Basic Price	U_N
Domestic Final Demand for Commodities	Basic Price	e_N
Imported Supply table	Basic Price	
Imported Use Matrix	Basic Price	U_M
Imported Final Demand for Commodities	Basic Price	e_M
Make Matrix	Basic Price	V
Total Investment Matrix	User price	
Domestic Investment Matrix	User price	
Imported Investment Matrix	User price	

User Price

Producer Price

Basic Price

http://si3.bcentral.cl/estadisticas/Principal1/Excel/CCNN/cdr/excel.html

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Imported Use Matrix	Basic Price	U_M
Imported Final Demand for Commodities	Basic Price	e_M
Make Matrix	Basic Price	V
Total Investment Matrix	User price	
Domestic Investment Matrix	User price	
Imported Investment Matrix	User price	

Use Matrix - ***U***
Make Matrix - ***V***
Value Added - ***va***
Final Demand - ***e***

Tables	Valuation	
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Imported Supply table	Basic Price	
Imported Use Matrix	Basic Price	U_M
Imported Final Demand for Commodities	Basic Price	e_M
Make Matrix	Basic Price	V
Total Investment Matrix	User price	
Domestic Investment Matrix	User price	
Imported Investment Matrix	User price	

Total Matrices
Domestic Matrices
Imported Matrices

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Make Matrix and Distribution Matrix

- Make Matrix (versus diagonal matrix)
  - Primary production
  - Secondary production

- Distribution Matrix

$$D = V * \hat{q}^{-1}$$

where the hat means diagonal matrix.

Use Matrix and Use Coefficients

- Use Matrix -> input demands for producing:
  - Primary production
  - Secondary production

- Use Coefficient Matrix

$$B = U * \hat{g}^{-1}$$

where the hat means diagonal matrix.

The Leontief Inverse

Assuming that the secondary commodities in each sector is produced using the industry technology. The Leontief inverse:

- For commodity-by-commodity matrix: $(I - BD)^{-1}$
- For industry-by-industry matrix: $(I - DB)^{-1}$

Vertical Specialization (Direct + Indirect)

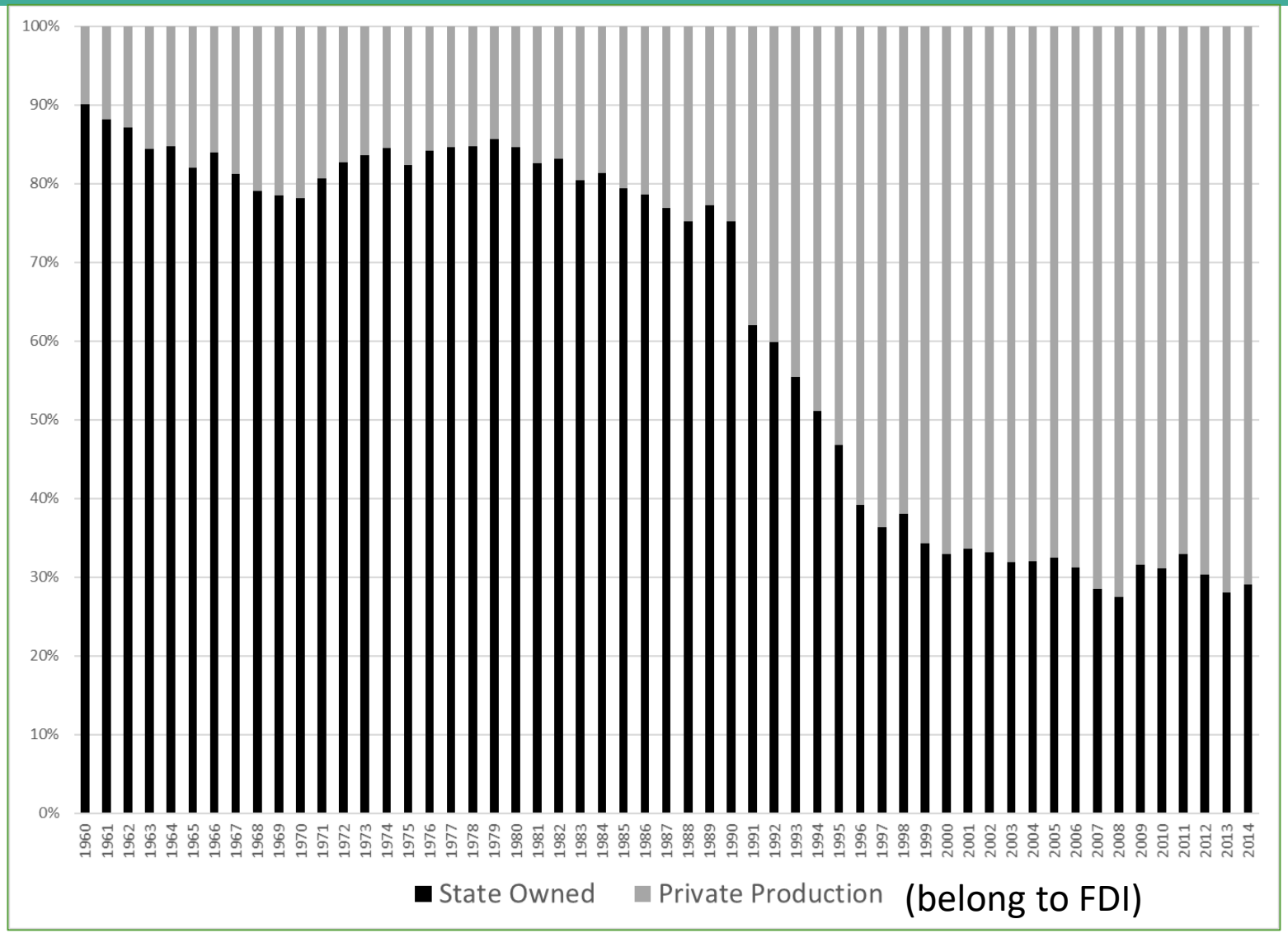
$$VS_{ki}^{II} = \mathbb{I} * A^{M}(I - BD)^{-1} * E_i$$

Country k sector i

X is an $nx1$ vector of exports, Hummel et al (2001)

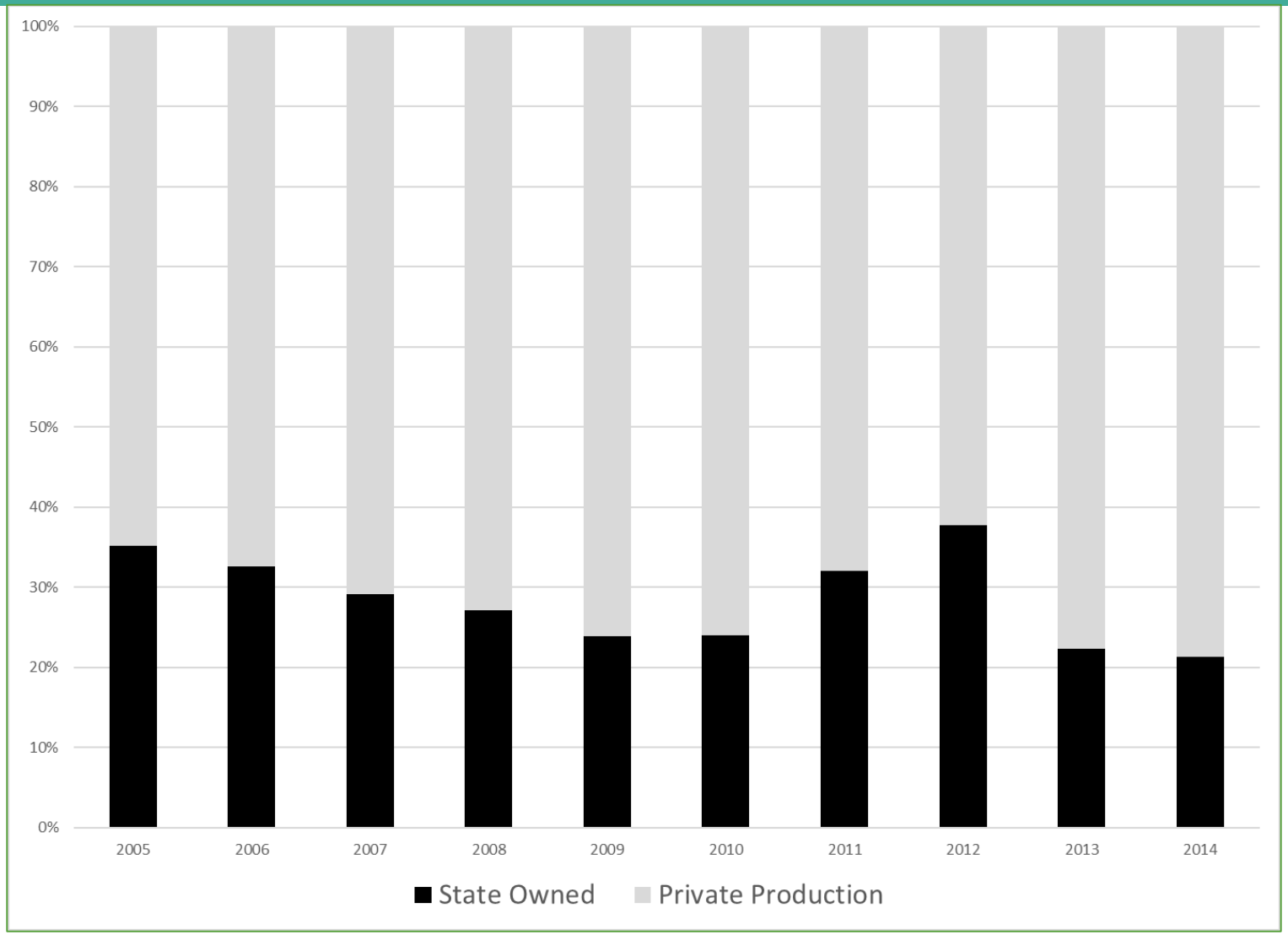
Chilean Mining Sector

Ownership share of Chilean Copper Production

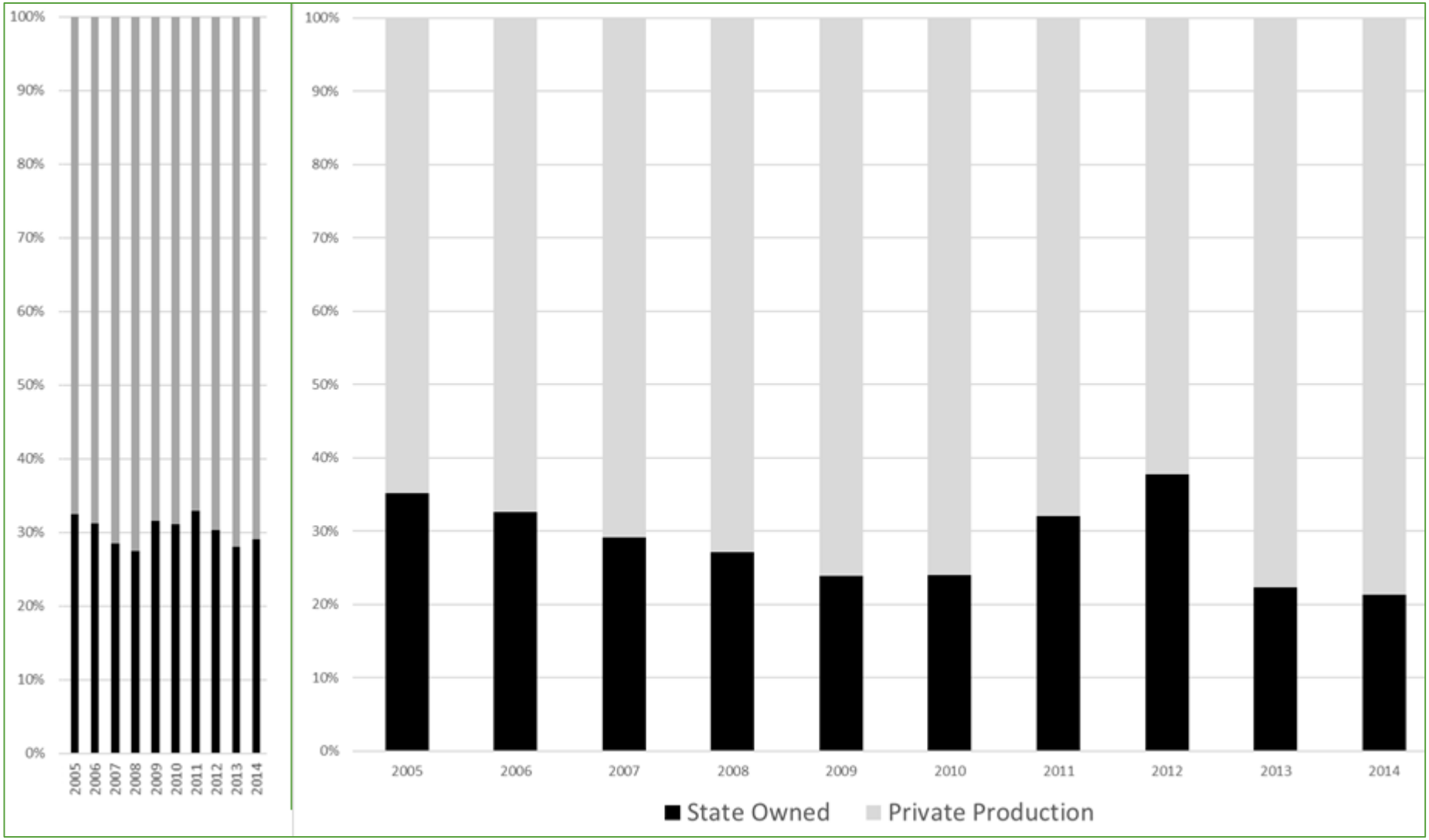


(belong to FDI)

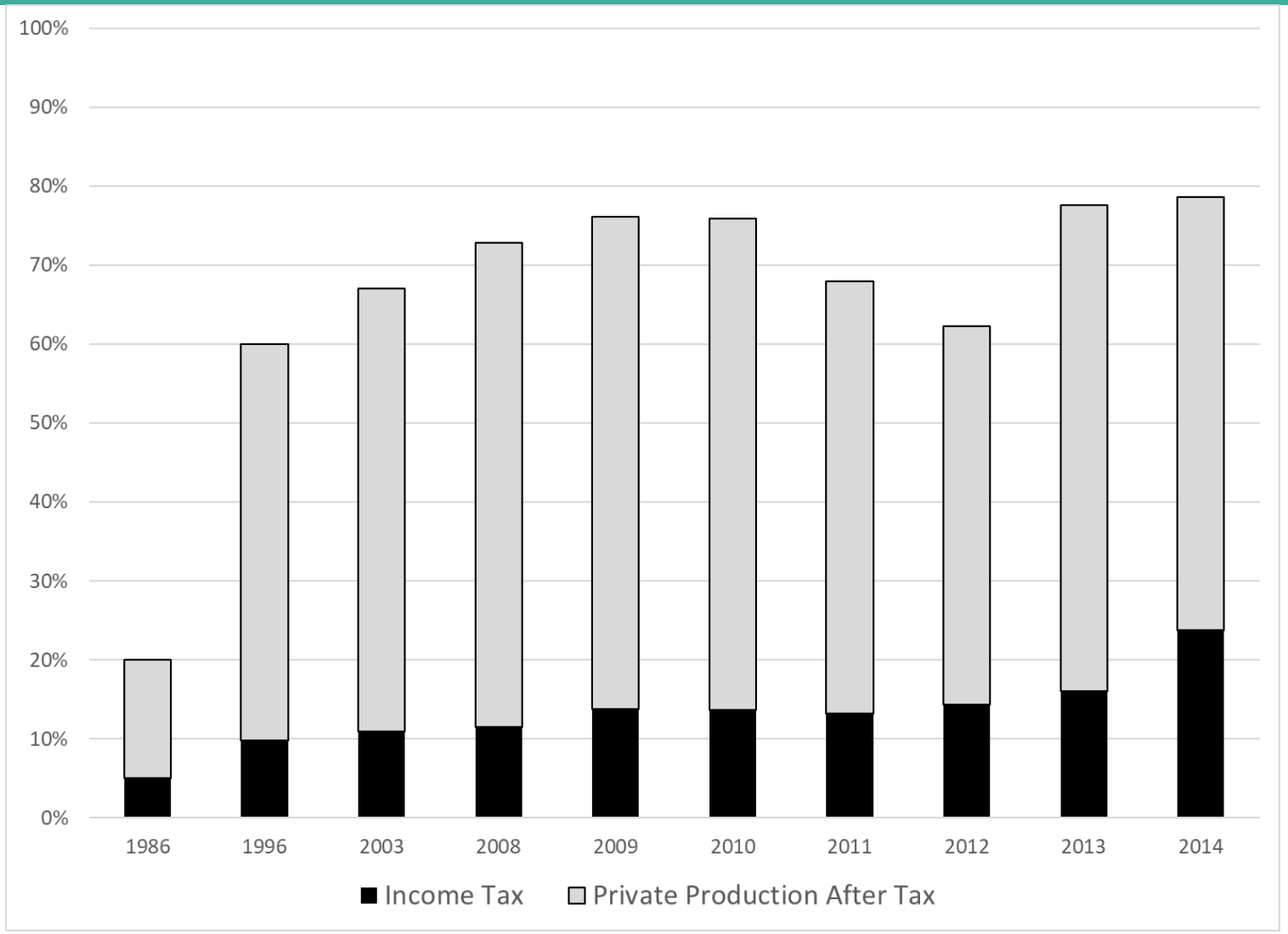
Ownership share of Chilean Copper Profits



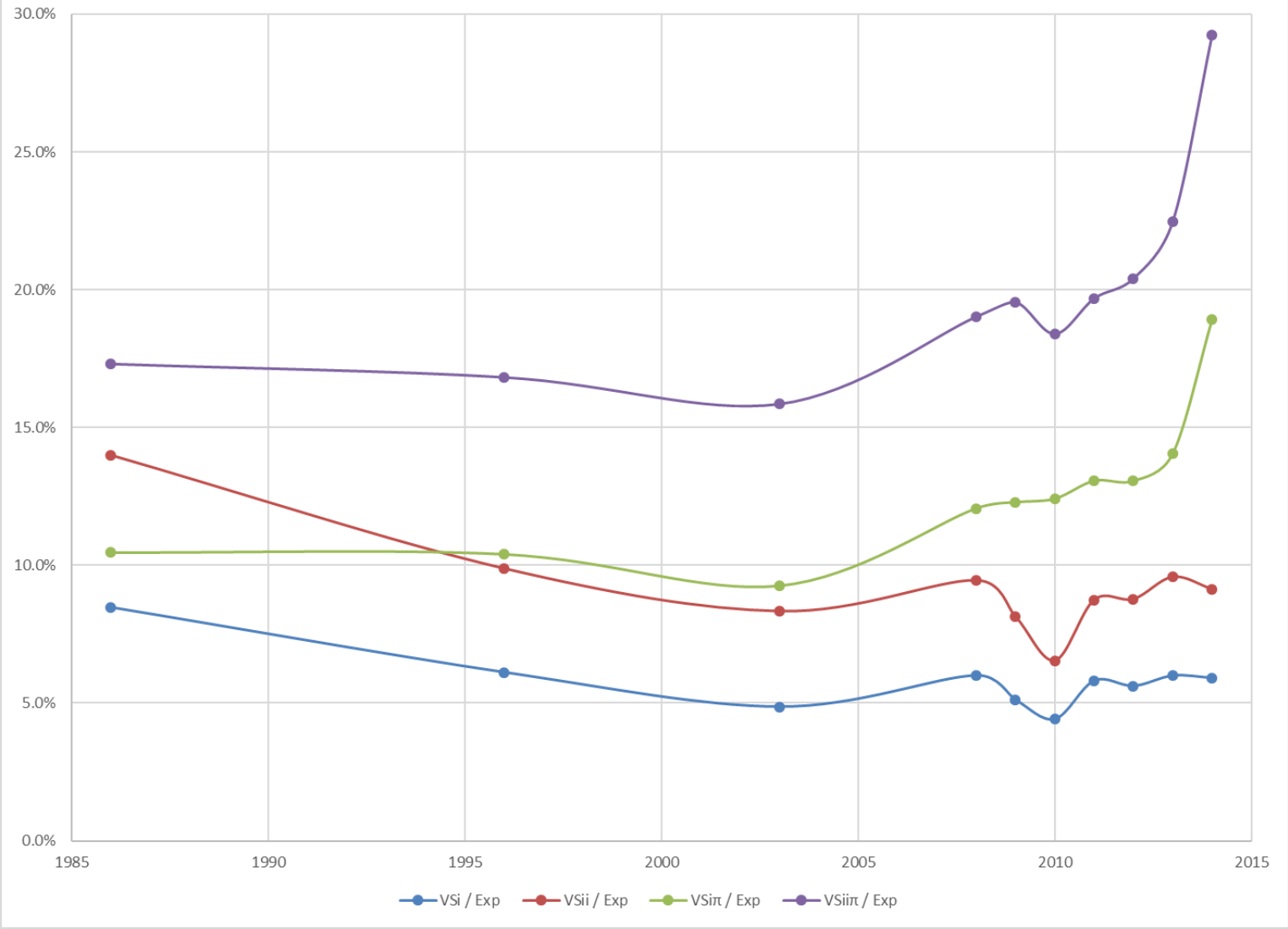
Production and Profits for same years



Profit and Income Tax



Chilean Vertical Specialization



Conclusions and Challenges

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