

# USE OF OUTPUT/INPUT MATRICES TO MEASURE SECTORAL DIGITALIZATION

Raul Katz, Director of Business Strategy Research

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# WHY IT IS NECESSARY TO MEASURE THE PROGRESS OF DIGITALIZATION FOR EACH SECTOR OF THE PRODUCTIVE SYSTEM?

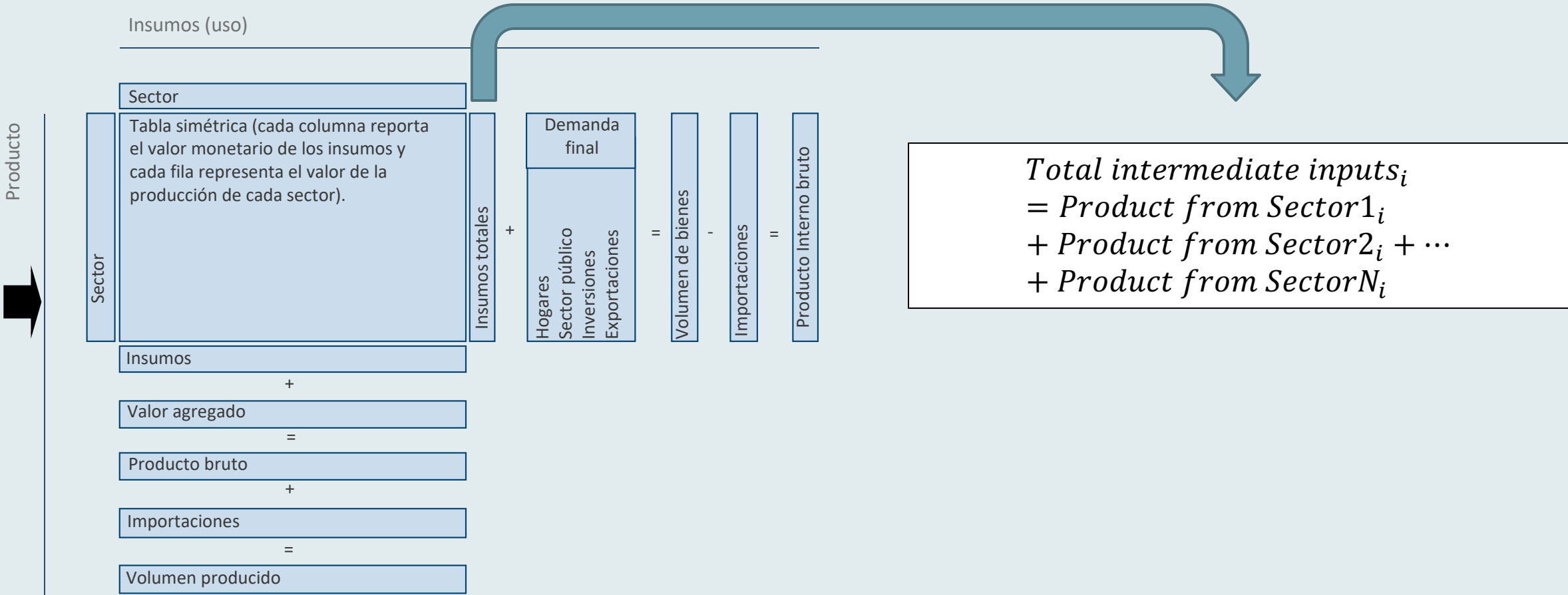
## Planning tool

- The development of national digital agendas pays little importance to the digitalization of production and focuses mainly on the digitalization of consumption.
- However, the spillover effects of digitalization on economic growth are fundamental.
- This requires delving into the definition of goals, objectives and plans for the digitalization of the production system.

## Sectoral digitalization is heterogeneous

- The digitalization of production varies by sector from: (i) its productive structure and informational intensity (ii) industrial organization, (iii) insertion in global production chains, (iv) the competitive intensity of the sector, and (v) degree of enlistment of firms and accumulation of intangible capital.
- Digitalization implies different spillovers in productivity.

# THE PROPOSED METHODOLOGY IS BASED ON THE ANALYSIS OF INTERMEDIATE INPUTS REQUIRED BY EACH SECTOR OF THE MATRIX



# STEP ONE: THE AMOUNT OF INTERMEDIATE DIGITAL INPUTS IS CALCULATED AS A PERCENTAGE OF ALL INTERMEDIATE INPUTS (DIRECT EFFECTS)

Basic premise

- The higher the percentage of intermediate digital inputs purchased by a sector, the higher the direct digitalization of the sector.

Exception

- The percentage of intermediate digital inputs responds to the intrinsic characteristics of the sector.

$$\text{Level of sectoral digitalization}_i = \frac{\text{Product from sector } N-x_i + \dots + \text{Product from sector } N_i}{\text{Total Intermediate Inputs}_i}$$

## INTERMEDIATE DIGITAL INPUTS

Sector	Percentage assumed
Computers, electronic and optical equipment	100%
Postal and courier activities	100%
Audiovisual and broadcasting activities	100%
Telecommunications	100%
Information and information technology services	100%

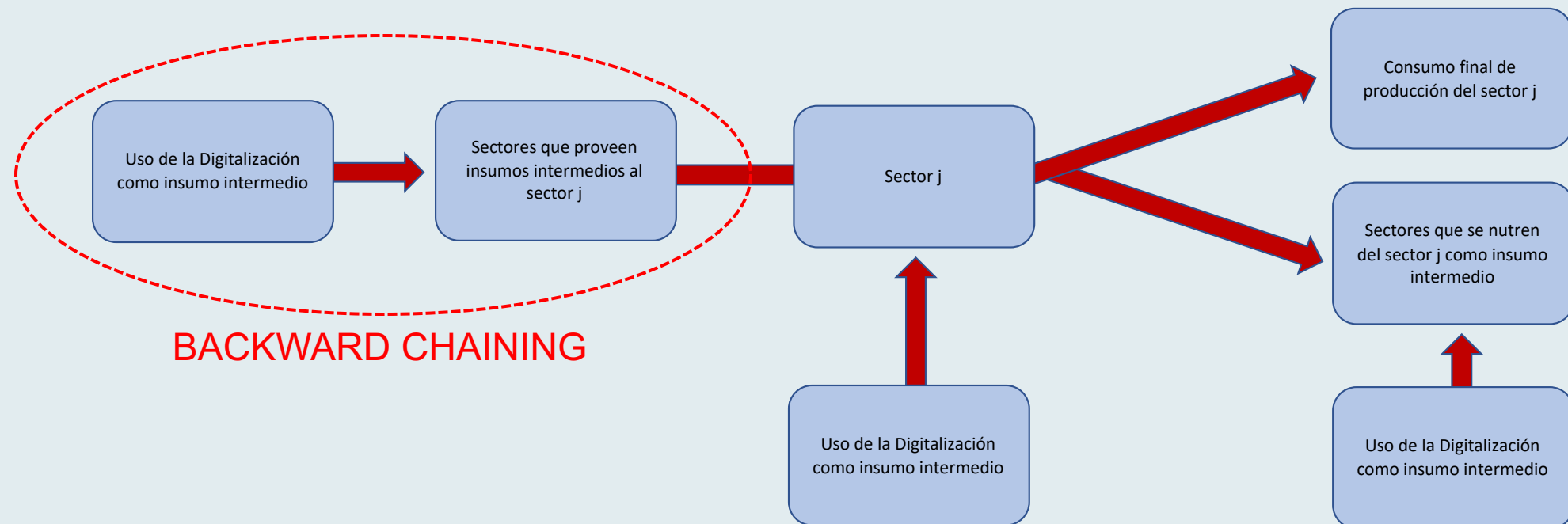
## SECOND STEP: THE AMOUNT OF DIGITAL INPUTS OF NON-DIGITAL INTERMEDIATE INPUTS IS CALCULATED (INDIRECT EFFECTS)

Basic premise

- Sectoral digitalization is not limited to a specific industrial sector but requires expanding the study to the production chains of which they are part.

Implications

- It is necessary to broaden the analysis considering for each sector of activity  $i$ , the backward linkages (sectors that provide inputs to  $i$ ), and the impact of digitalization on each link in the chain.



## SECOND STEP: DETAIL OF THE CALCULATION OF INDIRECT EFFECTS

$$DIGIT\_DBL_i = \sum_{j=1}^{j=n} VAB\_DIGIT_j * w_{ji} \quad \forall i \neq j$$

- The impact by backward chaining ( $DIGIT\_DBL_i$ ) is calculated as the sum of digital inputs of intermediate inputs not considered in the direct analysis (e.g., logistics).
- $w_{ji}$  the weight of the supply of industry input  $j$  to industry  $i$  on the total production of  $j$ , weighted by the level of digital inputs in industry  $j$ .

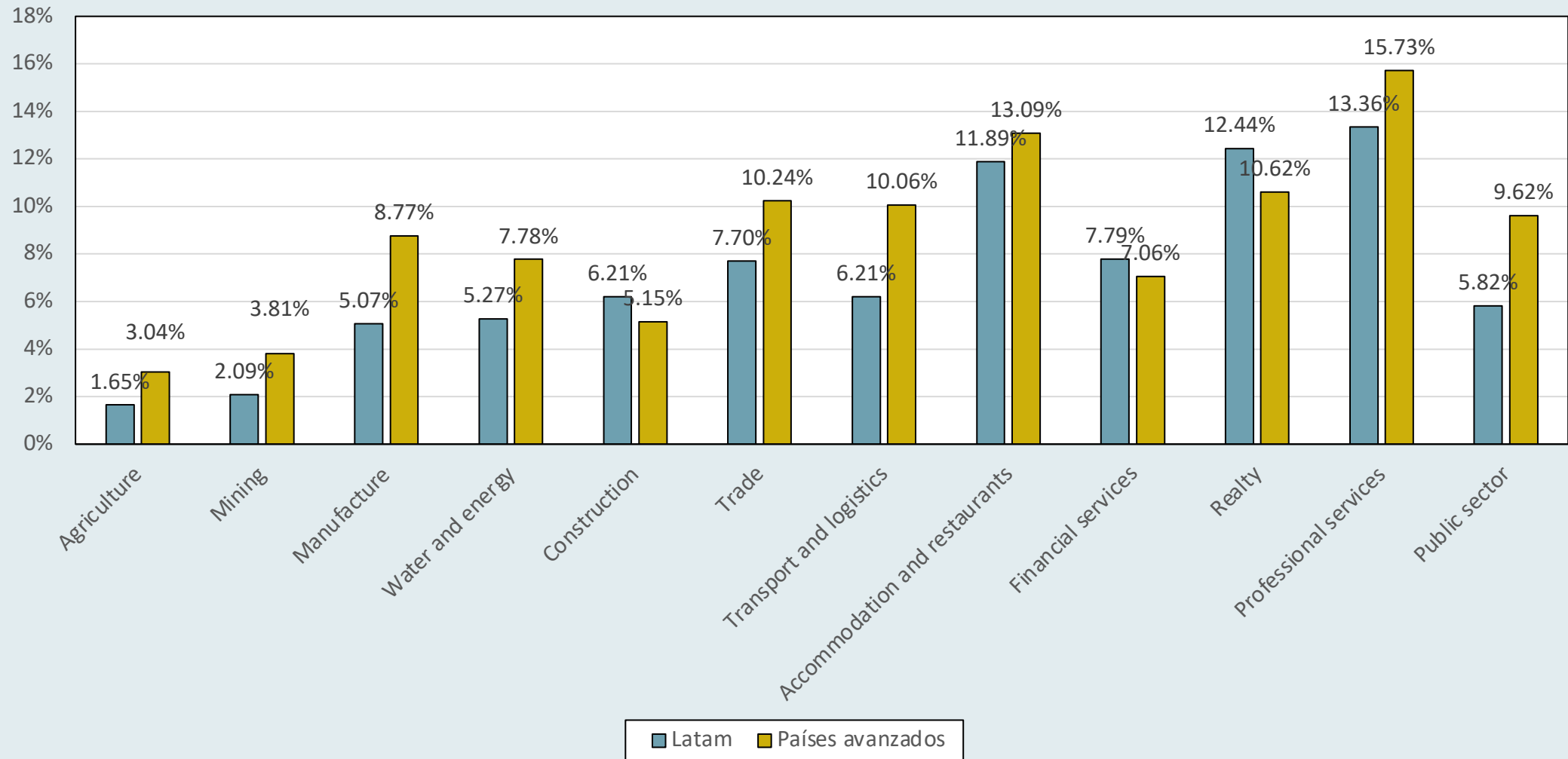
# RESULTS FOR THE CONSOLIDATION OF ARGENTINA, BRAZIL, CHILE, COLOMBIA, MEXICO AND PERU

## LATIN AMERICA: SECTORAL DIGITALIZATION

Ranking	Sector	Direct Effect	Indirect Effect	Total Effect
1	Professional Services	9.24%	4.12%	13.36%
2	Realty	7.12%	5.33%	12.44%
3	Accommodation and restaurants	4.71%	7.18%	11.89%
4	Financial services	3.83%	3.95%	7.79%
5	Trade	5.08%	2.62%	7.70%
6	Transport and logistics	3.28%	2.93%	6.21%
7	Construction	2.76%	3.45%	6.21%
8	Public Administration, Defense, Health, and Education	2.75%	3.07%	5.82%
9	Electricity and water	1.92%	3.35%	5.27%
10	Manufacturing	2.41%	2.66%	5.07%
11	Mining	0.44%	1.65%	2.09%
12	Agriculture	0.30%	1.35%	1.65%

# ANALYSIS COMPARED TO WEIGHTED AVERAGE OF THE UNITED STATES, GERMANY, THE UNITED KINGDOM, JAPAN, FRANCE, AUSTRALIA AND SOUTH KOREA

## PERCENTAGE OF TOTAL INTERMEDIATE DIGITAL INPUTS LATIN AMERICA VS. ADVANCED COUNTRIES





## USEFULNESS OF SECTORAL DIGITALIZATION ANALYSIS BASED ON OUTPUT INPUT MATRICES

- Analysis of input/output matrices in Latin America confirms the initial hypothesis that **the most intensive sectors of information processing as a factor of production (professional services, real estate, trade and financial services) naturally tend to acquire a higher share of intermediate digital inputs.**
- **Agriculture, mining, and manufacturing, three priority sectors in terms of contribution to Latin American gross product, have a lower level of direct digitalization.**
- In contrast, direct sectoral digitalization analysis for the weighted average of advanced nations offers similar positioning for professional services (the first), trade (the third), and mining and agriculture (the latter). However, manufacturing, transport and logistics have a higher level of digitalization in advanced nations than in Latin America. In other words, **while sectoral digitalization varies consistently based on structural considerations, advanced nations have a higher level of direct digitalization in sectors key to competitiveness.**
- Application of the methodology:
  - Confirmation of qualitative evidence (industry surveys, case studies).
  - Ability to identify counterintuitive results that need to be investigated in greater depth.
  - Compare sectors of an economy by identifying differences in the formulation of goals and plans in an agenda of digitalization of production.



## TELECOM ADVISORY SERVICES, LLC

For further information please contact:

Raul Katz, [raul.katz@teleadvs.com](mailto:raul.katz@teleadvs.com), +1 (845) 868-1653

Telecom Advisory Services LLC  
139 West 82<sup>nd</sup> Street, Suite 6D  
New York, New York 12581 USA