



# **Real-time VAT data: Applications for monetary policy and financial stability**

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# Outline

1. Overview of micro-data agenda and role for VAT (real-time networks)
2. Macro applications: spotting cyclical and structural trends
3. Finance applications: building more precise early warning indicators
4. Further applications

# Administrative micro-data in Chile is plentiful... but lonely

- Government agencies have built impressive data sets over the years:
  - Firms: balance sheets/income statements; loans (by bank); employment and wages (at the individual level); capital and other investments; purchases, sales, imports, exports
  - Households: demographics; family ties; education; health; employment; income; financial data; address; real estate ownership
- The problem: data loneliness
  - All these data are held by separate institutions with specific mandates (merging data for research purposes not one of them)
- Possible solutions: 2 big projects at the Central Bank of Chile
  - A server at the IRS for merging (eventually all?) data sources:
    - No quick solution: needs bilateral agreements with all institutions involved
    - What about anonymity?: remote access through “blind regressions”
  - **VAT data –real time firm network: today’s presentation**

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# VAT Data: what's in it?

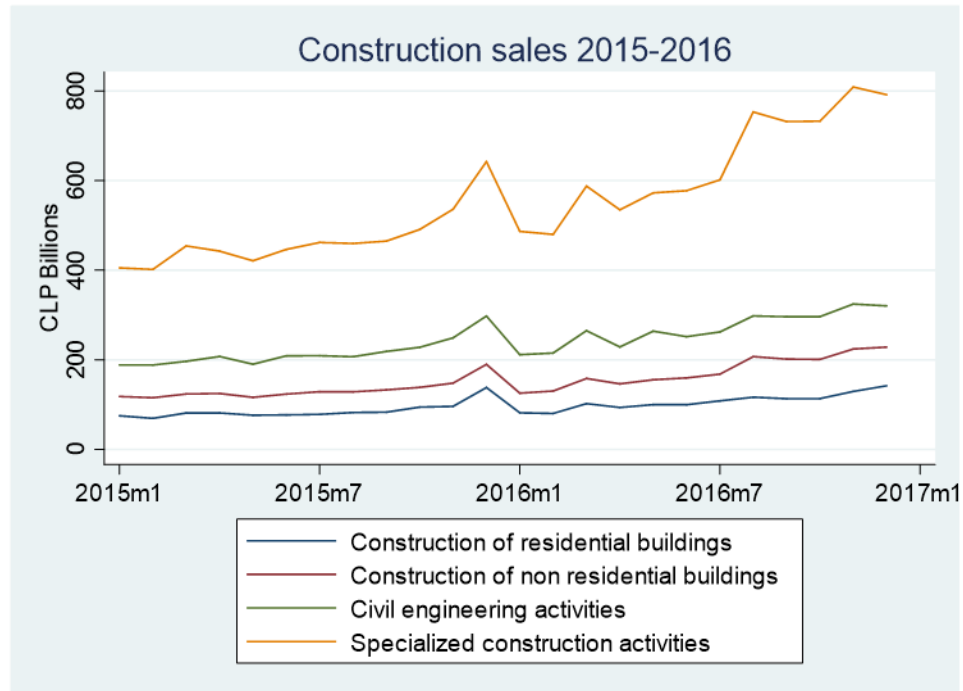
- Since early 2000, monthly forms summarizing net transactions between all pairs of firms (B2B)
  - From the original paper forms, IRS has digitalized data
- But, starting in 2018, all individual B2B between all firm pairs must be electronically informed in real time to IRS
- Individual invoice data includes:
  1. ID issuer and recipient
  2. Exit address and arrival address
  3. Issue date
  4. Transaction type (input ,K, real state)
  5. Net amount and VAT payed
  6. Discount
  7. Payment settlement date
  8. Product name
  9. Product price
  10. Product quantity

# Linking demand and supply: broadening our tools to anticipate and understand the business cycle

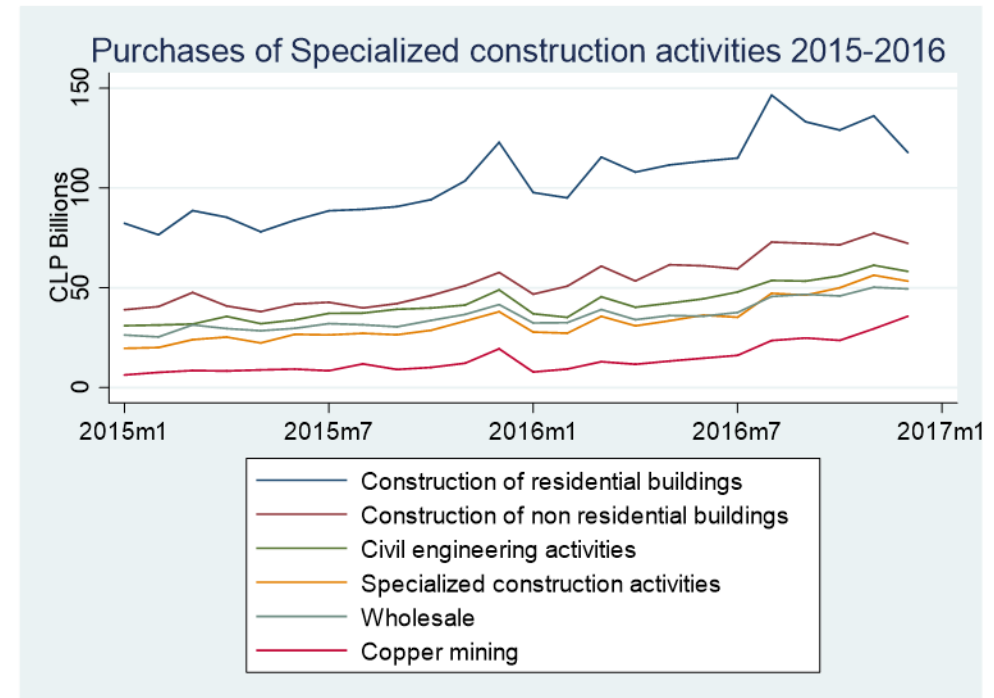
- Observing monthly value-added data on supply-side sectors gives an incomplete picture
  - If we see a pickup in “specialized construction activities”, what do we make of it?
    - Interpretation 1: construction/real estate firms are hiring demolition companies (specialized constr.) to start residential building projects
    - Interpretation 2: ...to start new non-residential buildings (corporate investment/new firms)
    - Interpretation 3: ...to dig for mining investment
  - Clearly, these have different implications for reading the stage of the cycle, and have different spillovers to other sectors of the economy
- Let’s illustrate this with an example: the mini construction boom of 2015-16
  - New tax code (2015) seek to eliminate VAT exemption for residential housing, starting in April 2017
  - This accelerated applications of building permits for new residential projects through 2015-2016
  - But how large was the effect on the construction sector? Hard to quantitatively separate in real time from alternative explanations

# Network data useful to understand drivers of investment: construction boom driven by residential buildings due to tax code changes

Construction sales by subcategory  
(2-digit ISIC)



Buyers of spec. construction activities  
(2-digit ISIC)

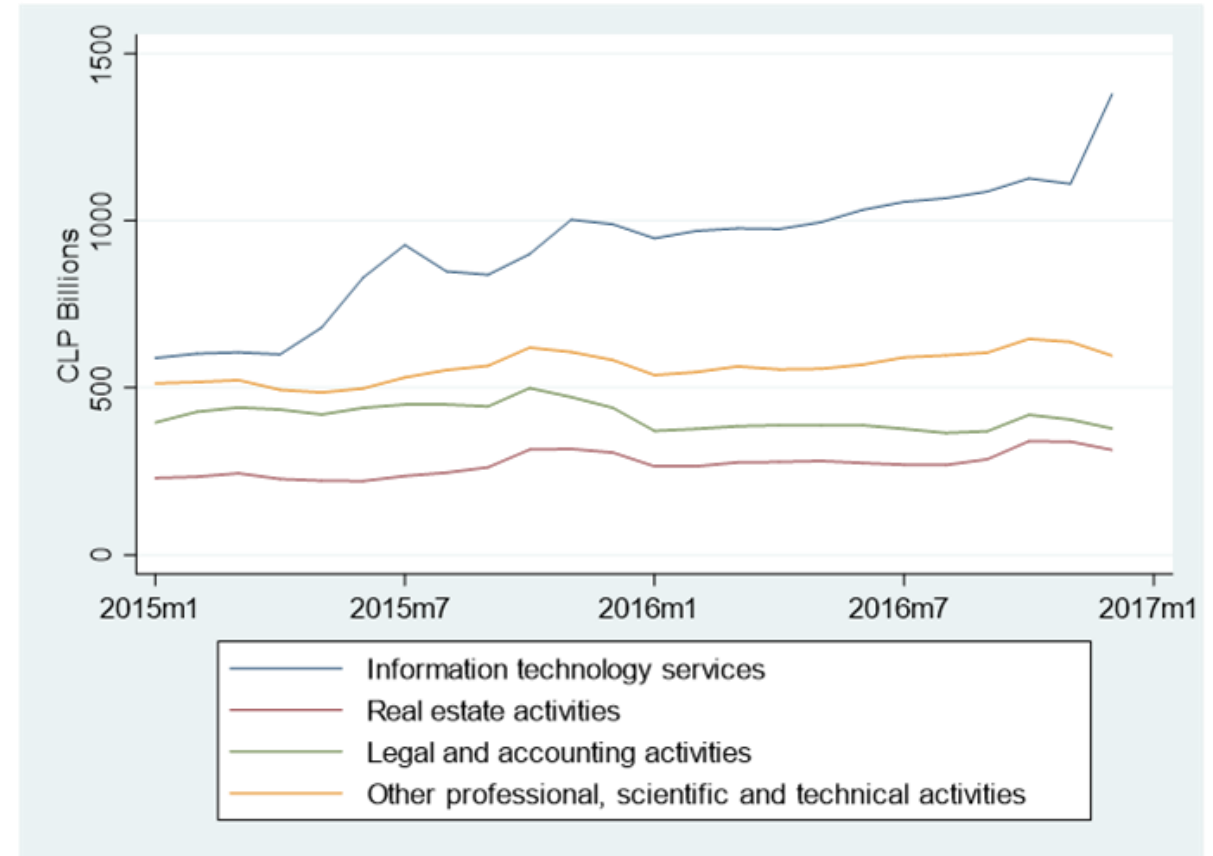


- Construction boom driven by tax changes: cannot be seen in sales of “Construction of res. Buildings” until buildings are sold
  - For tax exception, developers required to obtain building permits before Jan. 2016, but could build and generate actual sales after
- But, in real time, driver of boom can be seen in buyers of “specialized construction activities” (demolitions, excavations, etc.)
  - Main buyer of “specialized construction activities” → “Construction of res. Buildings”
- In contrast, boom is less driven by non residential buildings (corporate investment; new firms) or mining (which picked up in 2018)

# Network data also useful to spot structural trends: irruption of IT services into different sectors

- The Chilean economy had a mediocre couple of years in 2015-16
  - Negative investment rates on aggregate; weak employment growth
  - Business services closely linked to corporate investment, did poorly over the period
- Despite poor overall performance of the category, IT services expanded two-fold in the period
  - Apparently, the little investment there was become focused on enhancing administrative efficiency through IT development
- But, how generalized is this expansion across sectors?
  - Does it reflect changes in particular industries, such as emergence of e-commerce?
  - Or, does it reflect more general trends of cost consolidation across the economy –with dire consequences on inflation trends?

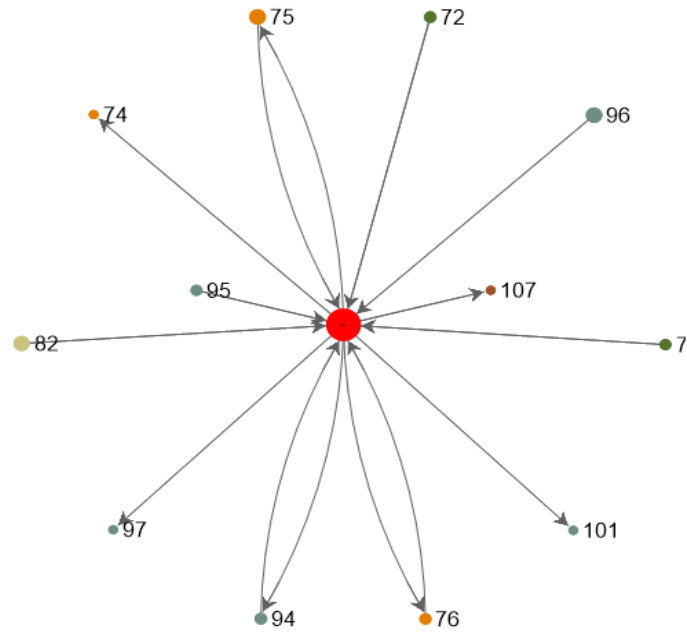
Business services sales by sub-category, 2015-2016  
(CLP Billions, real)



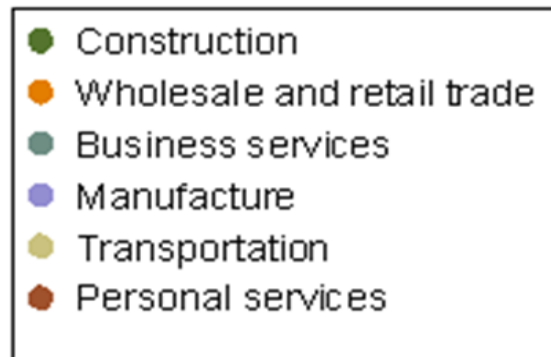
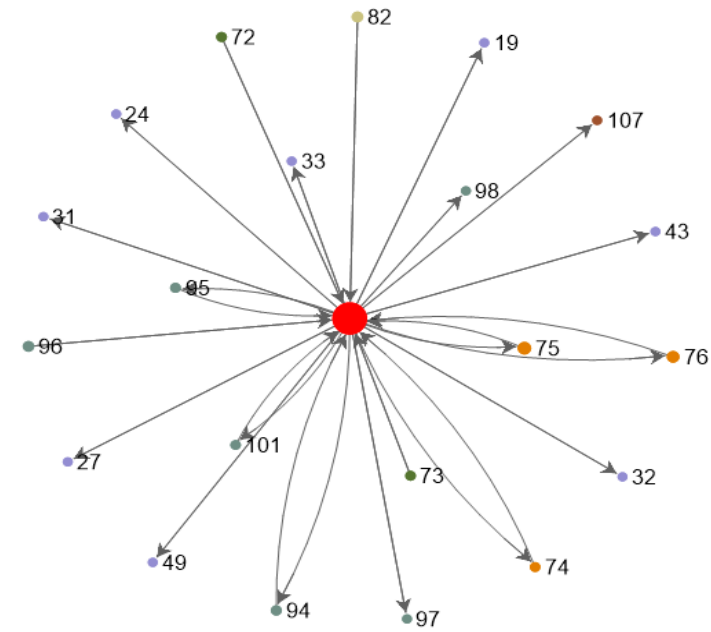


# IT services indeed increased connections with other industries fairly quickly (based on 2-digit ISIC)

Jan 2015



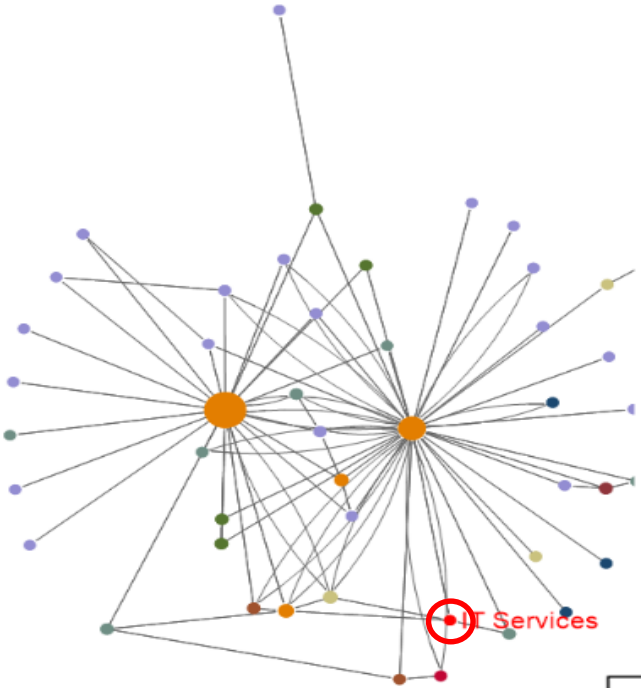
Dec 2016



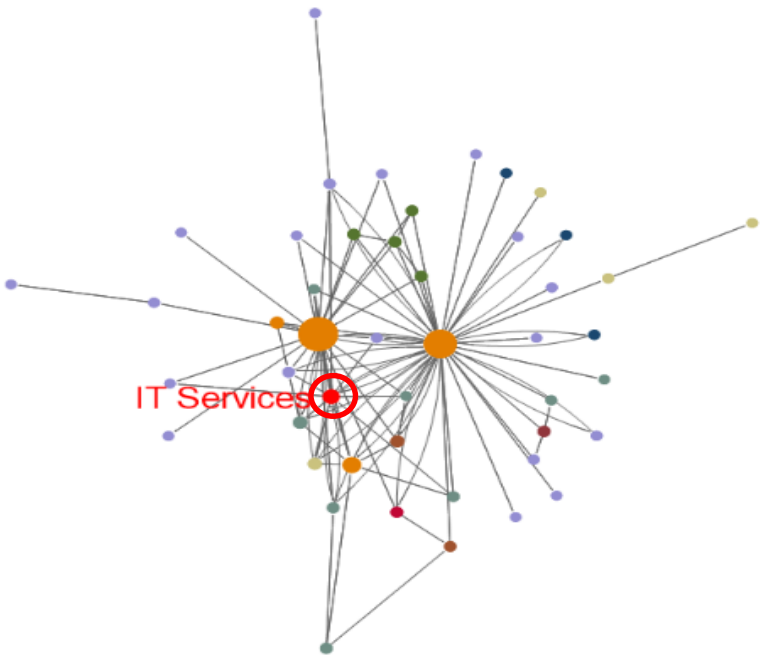
- In 2015.1, IT sold to 4 industries, bought from 4, and had bilateral flows with 3.
- In 2016.12, IT had increase its client industries to 11, and bilateral flows to 6.

# Indeed, IT services quickly moved closer to the center of the economic network

Jan 2015



Dec 2016



Research questions:

- Did IT adopters substitute technology for labor?
- Did they manage to increase productivity/lower costs? Increase market share?
- What is the overall effect on market competition in different sectors?
- What are the consequences for medium-term inflationary pressures?

→ all these can be answered with current data at the CBC (work in progress)

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# Using real-time network data to spot financial vulnerabilities

- Financial regulators need to assess systemic risk at different financial institutions –and react accordingly
  - However, predicting systemic events is notably difficult in real time
- How can network data be used to this effect? Here's a thought
  - Step 1: for each bank, identify individual firms and/or households in their loan portfolios
  - Step 2: for each individual (firm or household) in portfolio, assess underlying economic risks
    - Firms: studying their networks, assess probability of economic distress (say, depending on recent sales performance, or performance of their clients/suppliers), include financing structure (loans, commercial credit) in the evaluation
    - Households: since employer can be identified in real-time, economic distress probability of firms translates into household distress assessment (i.e., unemployment likelihood)
  - Step 3: update calculations regularly
    - Arbitrarily short lag for firms exposure (VAT forms generated daily)
    - About 2-month lag for household exposure

# **We are not there yet... but getting close**

- VAT data already available: gives daily sales and networks of all firms in the economy
- Credit data also available... but not yet merged with VAT data
  - Depends on reaching agreements with new financial regulator (under new Banking law)

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# Further applications: price and quantities

- New VAT data is generated at the individual invoice level
  - Contains individual description of goods/services transacted, unit price, and quantities
- This leads to many applications, for both economic research and applied monetary policy analysis
  - **Predicting inflation from micro data:**
    - Forecasting inflation from aggregate data is becoming increasingly harder
    - Micro data on B2B transactions (together with firm-level wages) can be used to quantify firm and industry-level markups and cost pressures
  - **Constructing physical productivity measures:**
    - Standard data sets usually observe sales, but not P and Q separately. This additional info allows estimating TFP --as opposed to TFPR, which confounds unobservable market power with actual productivity dynamics
    - This distinction is key for assessing the drivers of persistent “measured productivity” differentials across firms

## Further applications: spatial economics

- Standard data sets are unreliable indicators of physical firm's (plants) location
  - Businesses tend to give address of headquarters, not where actual economic activity takes place
- In contrast, VAT forms tend to be more reliable, as transport of goods need to be supported by address documentation (point of origin and delivery address)
- This opens many opportunities:
  - May alleviate current difficulties in measuring regional GDP (at least in Chile)
  - Can be used to compute transport costs, and eventually as input for urban planning through spatial taxes/subsidies



# Summing up

- Availability of new (and old!) administrative data sets is redrawing the sort of information we use for both economic research, as well as applied monetary and financial policy
  - → Central Banks (and governments) need to get their act together to exploit its potential!
- **Key difficulty is not technological, but institutional**
  - Institutions are zealous of their own data –but resistance to share it diminishes its value significantly
- At the CBC, we have invested significant resources in an effort to break the stalemate
  - Not easy: many govt. institutions do not perceive clear benefit from data sharing
  - Challenge for economists: persuade them benefits far outweigh the costs