

WEBINAR ON BENCHMARKING AND TEMPORAL DISAGGREGATION

**Overview of case studies of temporal disaggregation
and benchmarking developed within STACE**

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20 SEPTEMBER 2023

STACE working group on benchmarking and temporal
disaggregation

Outline

- Composition of the working group
- Work-plan and developed activity
- Discussion in first meetings
- List of proposed case studies for 2022
- Summary of two case studies by Italy:
 - Temporal disaggregation of value added in trade of vehicles in Italy
 - Indirect estimation of a monthly service turnover indicator in Italy

Composition of the group

- Laura Bisio (Istat),
- Lemasson Corentin (Bank of Belgium),
- Maria Novas Filgueira (Ine),
- Riccardo Gatto (Eurostat),
- Barbara Guardabascio (University of Perugia),
- Enrico Infante (Eurostat)
- Gabor Lovics (Hungarian Central Statistical Office),
- Maria Liviana Mattonetti (Istat),
- Gian Luigi Mazzi (Private expert),
- F. Moauro (Istat),
- Richard Penny (Statistics New Zealand),
- Luis Sanguiao Sande (Ine),
- Yingfu Xie (Staistics Sweden).

Work-plan and developed activity

- Activity started in December 2021
- First report August 2022
- Undertaken actions:
 - Definition of a short group,
 - Approval of the draft mandate,
 - Elaborating a draft work plan,
 - Lines for the activities of the group
- Two meetings and several presentations so far
- First list of case studies in 2022, mainly implemented
- Second list in 2023
- Several contributions presented at the OECD Workshop in September 2022

TDB case studies: first list of case studies for 2022 (1/2)

- Guidelines of Italian quarterly national accounts
Draft paper available
- Temporal disaggregation of value added in trade of vehicles for Italy
Presented at the Workshop on Time Series Methods for Official Statistics, Paris Sept.2022
- Temporal disaggregation of Service Producer Prices Index in Spain
Presented at the Workshop on Time Series Methods for Official Statistics, Paris Sept.2022
- Fernandez or Denton in Belgian National Accounts?
Draft paper available, presented at the internal online meeting of 17 June 2022
- Temporal disaggregation in case of non-regular earnings in the Hungarian Central Statistical Office
Presented at the Workshop on Time Series Methods for Official Statistics, Paris Sept.2022

TDB case studies: first list of case studies for 2022 (2/2)

- A new reference indicator for the estimation of hours worked in Italian quarterly national accounts: a comparative study of temporal disaggregation using the back-casted indicator
Presented at the Workshop on Time Series Methods for Official Statistics, Paris Sept.2022
- Variable selection for monthly disaggregation of service turnover index: an empirical application for Italy
Presented at the Workshop on Time Series Methods for Official Statistics, Paris Sept.2022
- Benchmarking in the Swedish monthly GDP-indicator
- Reconciliation of seasonally adjusted data in the Swedish National Accounts

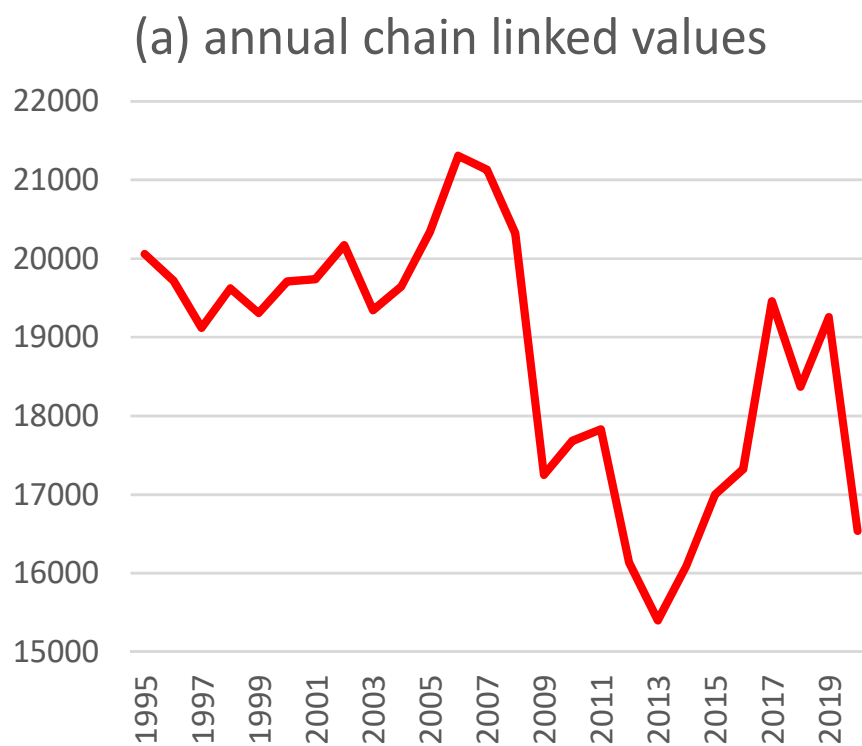
TDB case studies: second list of case studies for 2023, in progress

- Temporal disaggregation with many predictors: a case study making use of principal component analysis
- Temporal disaggregation with many predictors: a case study making use of a sparse approach
- Multivariate benchmarking of preliminary unbalanced quarterly supply and use tables: the Italian case
- Uncertainty of disaggregated estimates: standard errors for GDP components under a bottom-up aggregation strategy

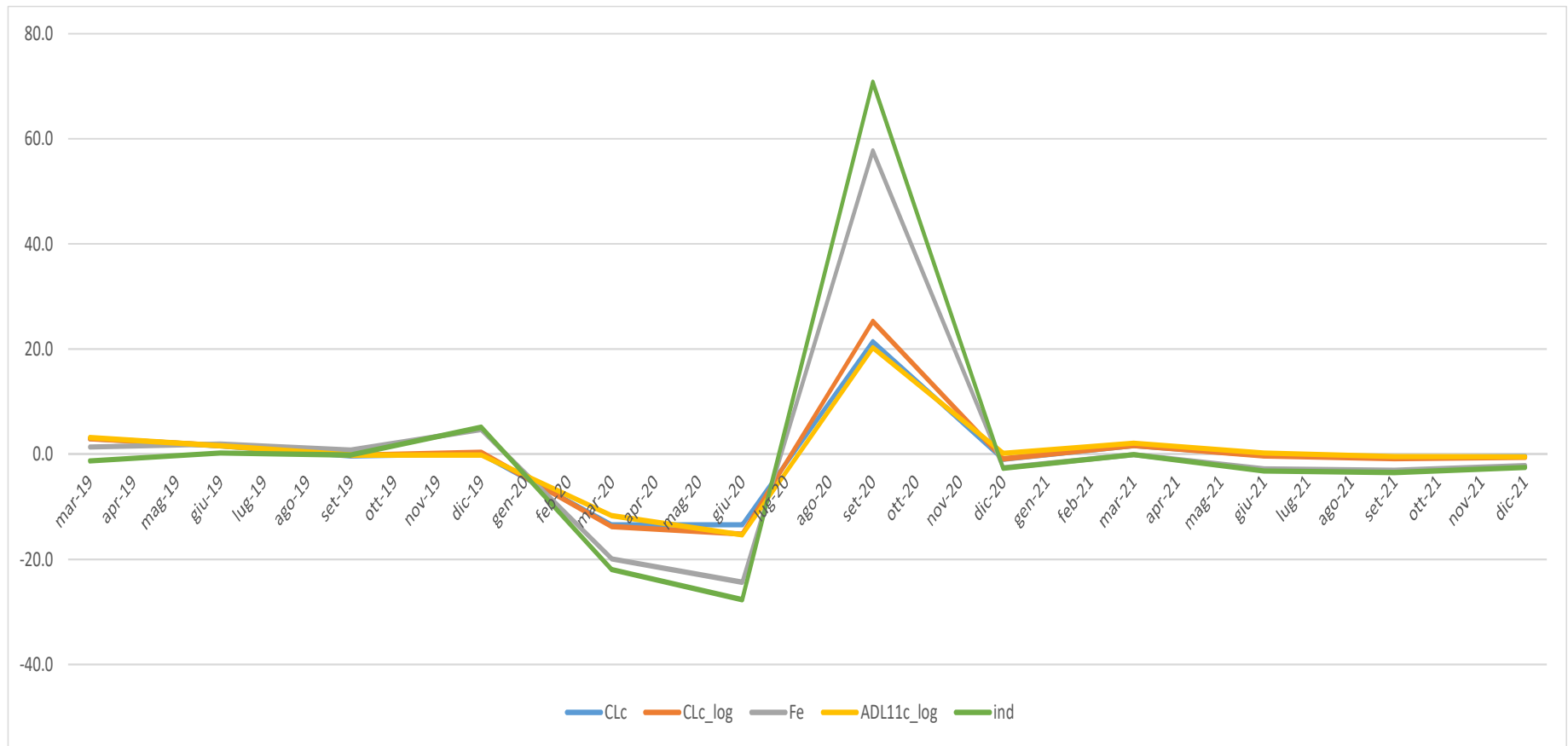
Case study 1: estimation of Italian value added of retail trade

- Quarterly disaggregation of the Italian annual value added of vehicle trade (G45 of NACE Rev.2) in millions of chain-linked euros over the years 1995-2020 and its extrapolation over the quarters of 2021.
- The exercise runs regularly within the procedures of Italian QNA
- it represents 1% of total value added.
- Related indicator → quarterly deflated turnover index 2015=100 in same sector over the quarters 1995q1-2021q4.
- The example provides main elements of model selection, identification and diagnosis among the ADL class of models adopted regularly for the compilation of Italian QNA.
- The case study mimics the specific situation occurring when the annual data of the current year (in this example 2021) is not yet available and when the relative quarters are extrapolated.

Case study 1: Annual benchmark and quarterly seasonal adjusted indicator



Case study 1: Growth rates of TD results and the related indicator over the quarters 2019q1-2021q4 for 4 alternative model specifications



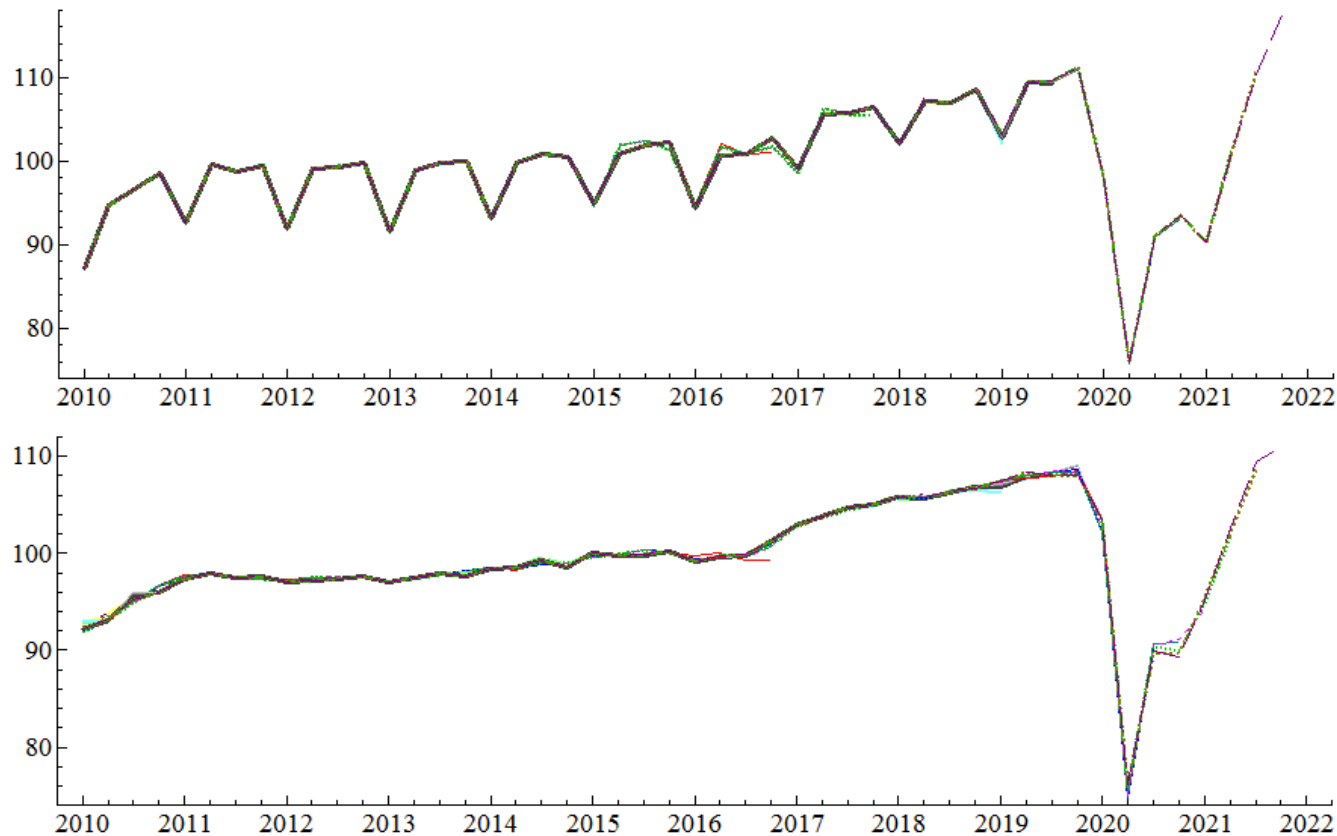
Case study 1: comparative view of model estimation statistics

	CLc	CLc_log	Fe	ADL11_log
Model coefficients				
Constant	778.3 (9.2)	-1574.4 (-4.2)	-	-1777.3 (-4.21)
β_0	16.4 (7.1)	2004.7 (8.2)	35.2 (16.8)	1592.2 (3.18)
β_1	-	-	-	-907.4 (-1.79)
ρ	0.710	0.681	-	0.678
Model diagnostics and other statistics				
R ²	.9768	.9787	.9591	.979
R ² -corrected	.9759	.9778	.9591	.978
F-test	1011.61	1102.88	585.8	543.13
Log-likelihood	-207.83	-205.72	-225.9	-205.29
AIC	10.41	10.33	10.90	10.38
BIC	10.51	10.42	10.95	10.52
Jarque-Bera	0.33	.36	.31	.14
Q Ljung-Box	2.88	2.77	4.44	3.90
H test	2.21	2.11	.69	.33
Correlations quarterly growth	.90 (.92)	.94 (.97)	.96 (.98)	.91 (.93)
Correlations annual growth	.76 (.86)	.81 (.89)	.81 (.91)	.77 (.85)
ME	1.60	1.54	.94	.79
MAE	4.47	4.11	4.77	3.71
RMSE	4.96	4.46	5.32	4.34

Case study 1: conclusive remarks

- From the table it emerges that all the 4 alternatives are a valid choice for the TD exercise,
- but the Fe specification provides higher correlations of TD estimates with the indicator, therefore ensuring that, especially for extrapolations, results are more in line with the evolution of the latter.
- By contrast, both MAE and RMSE are higher when compared to the 3 alternatives, meaning that the Fe extrapolations one year ahead do not fit well to the true annual benchmarks.
- In other words, in presence of an 'imperfect' indicator, Fe appears particularly well-chosen when we aim to have TD estimates close to the indicator,
- but at price of losing accuracy in terms of forecasts measured in terms of both MAE and RMSE

Case study 2: The dependent variable (target): Italian quarterly turnover index 2015=100 in transports



Case study 2: evaluation of two alternative criteria for the selection of indicators within temporal disaggregation in practice

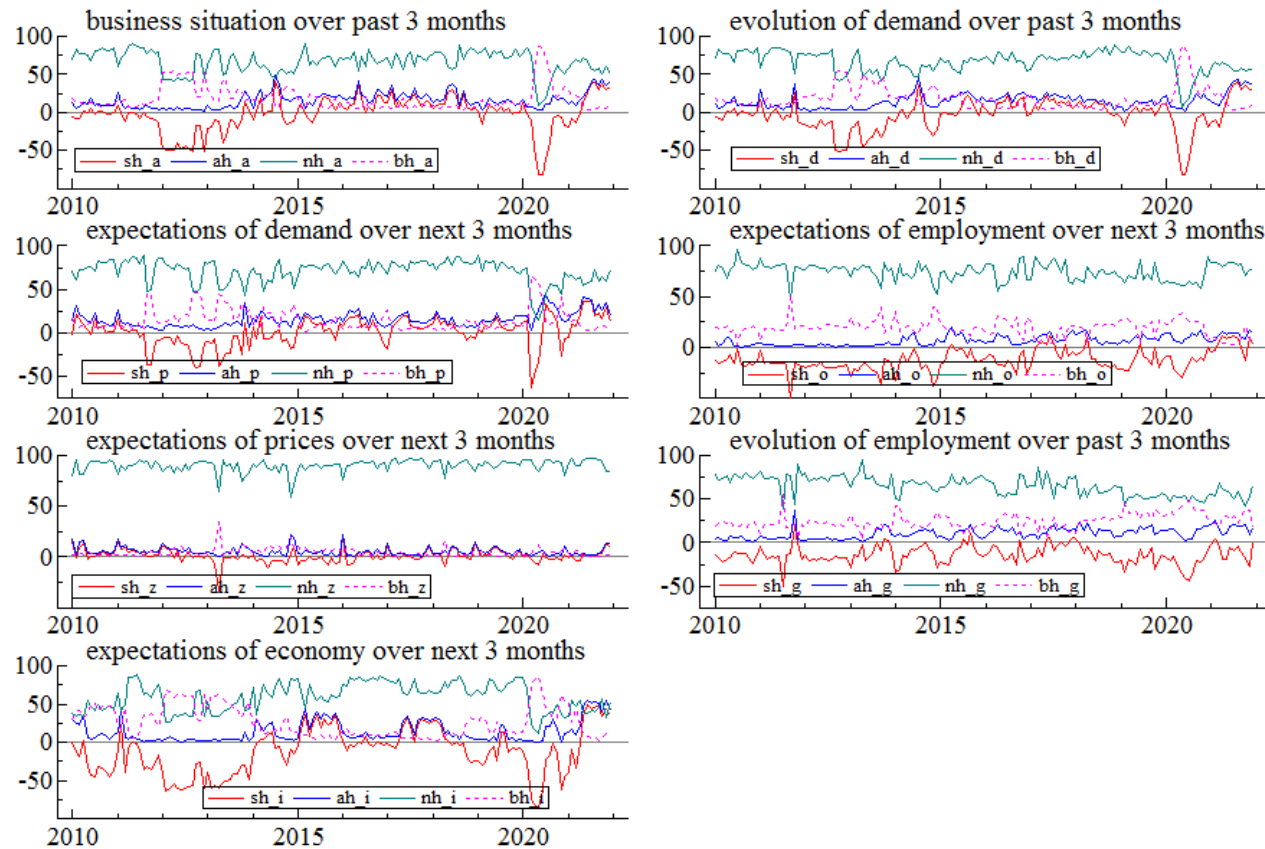
Aim: Both monthly disaggregation and forecasting of the quarterly service turnover in transports over the time span January 2010-Dicember 2021 affected by:

- the dramatic covid-19 crisis in 2020
- the resurgence of inflation at the end of 2021

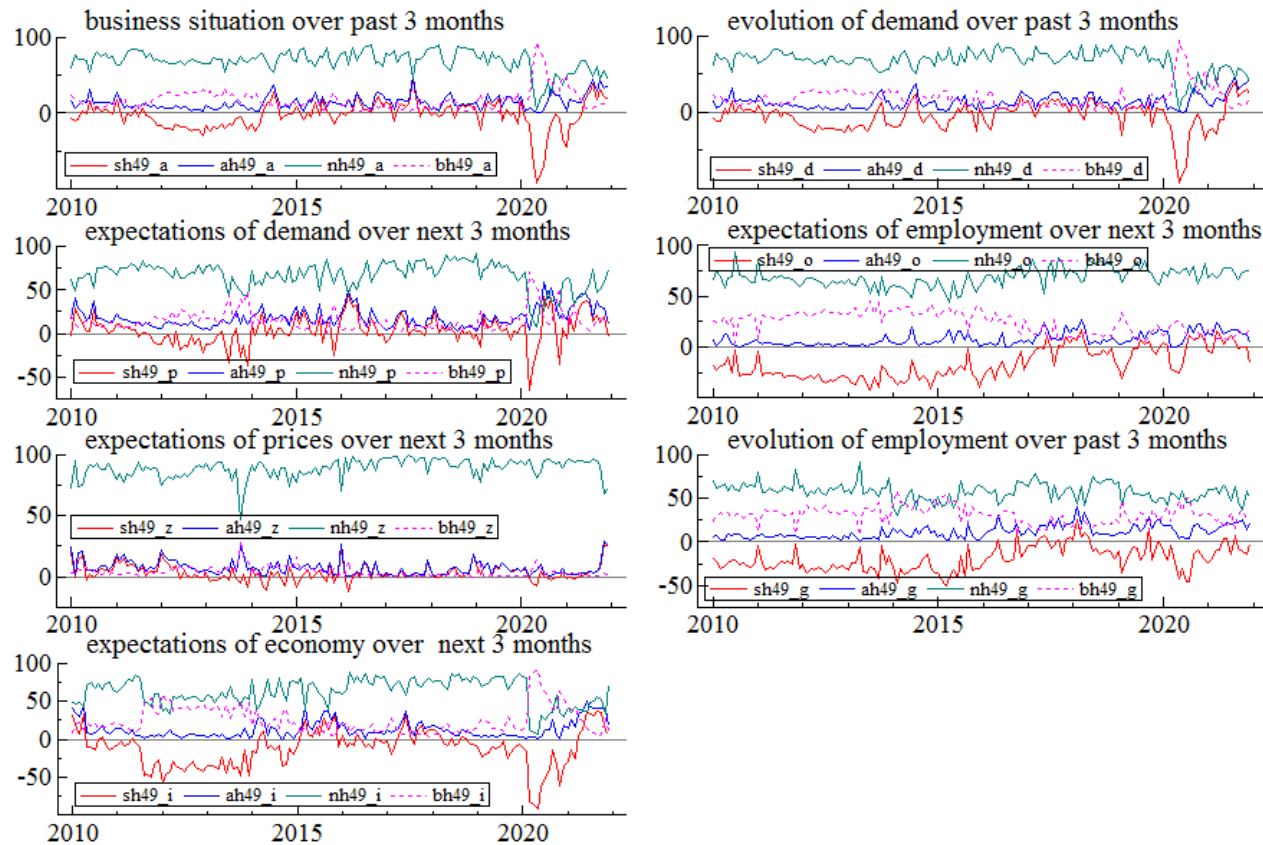
Data: 143 alternative indicators:

- 56 business survey series in transport including both the frequency of answers (positive, stable, negative) and their balance
- 18 series from assoaeroporti (commercial, passengers and cargo flights)
- 69 series of monthly turnover in industry split by both economic sector and reference market

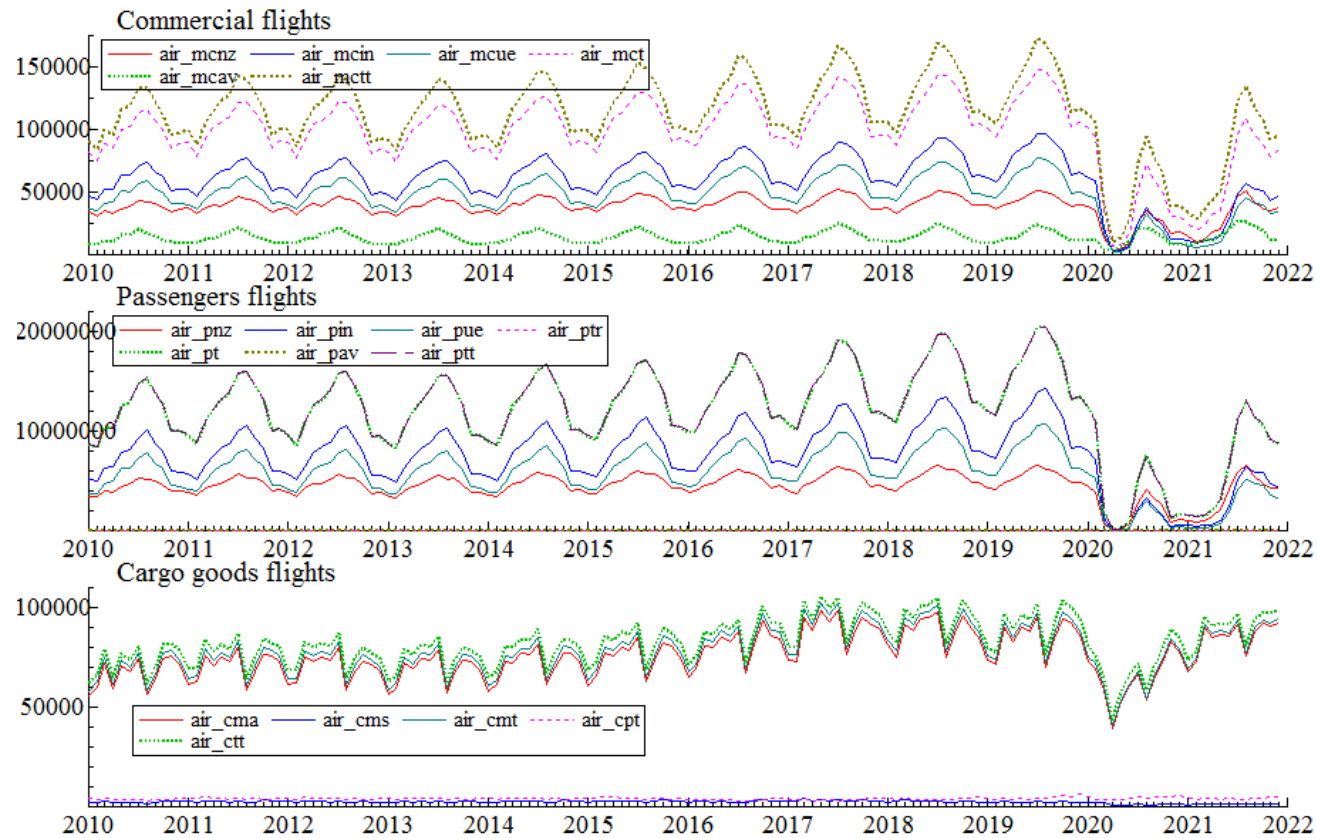
Case study 2: Predictors - Monthly Business Survey (BS) Section H



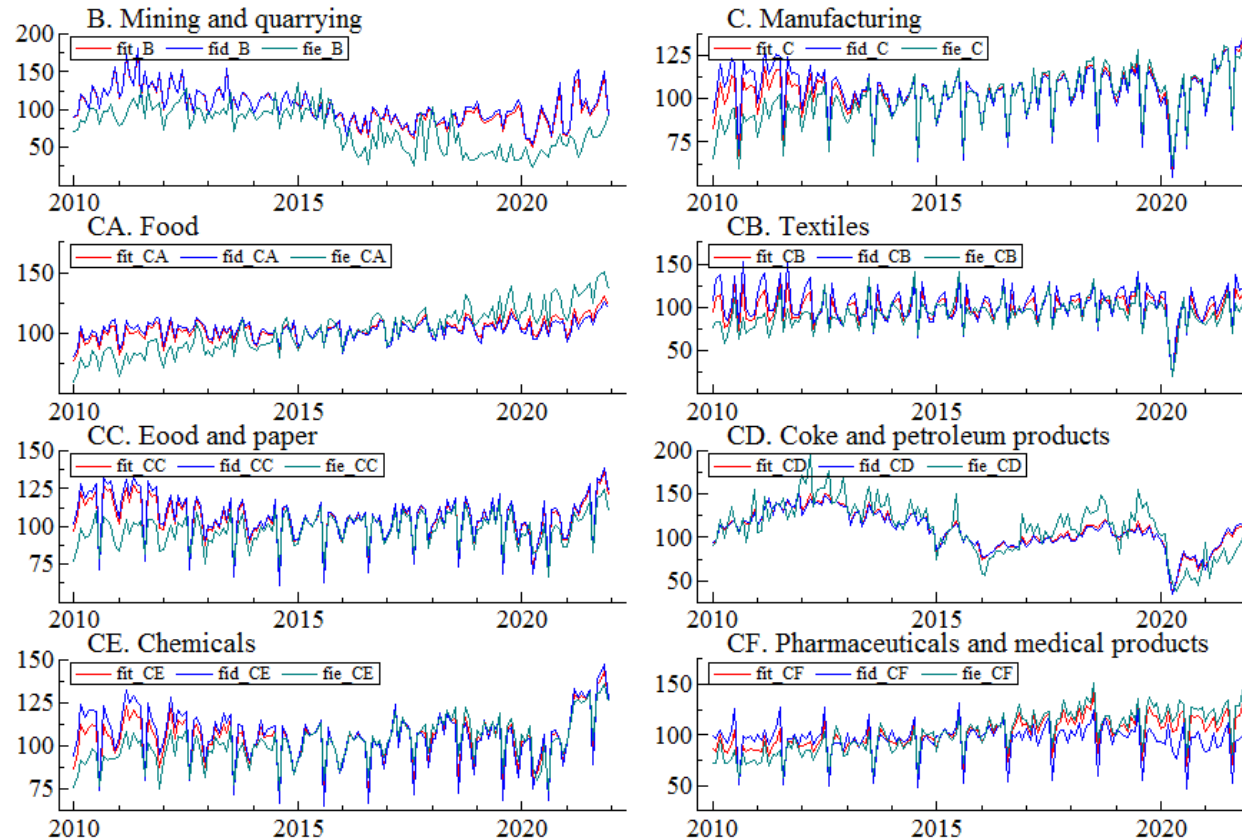
Case study 2: Predictors -: Monthly Business Survey (BS) Section H49



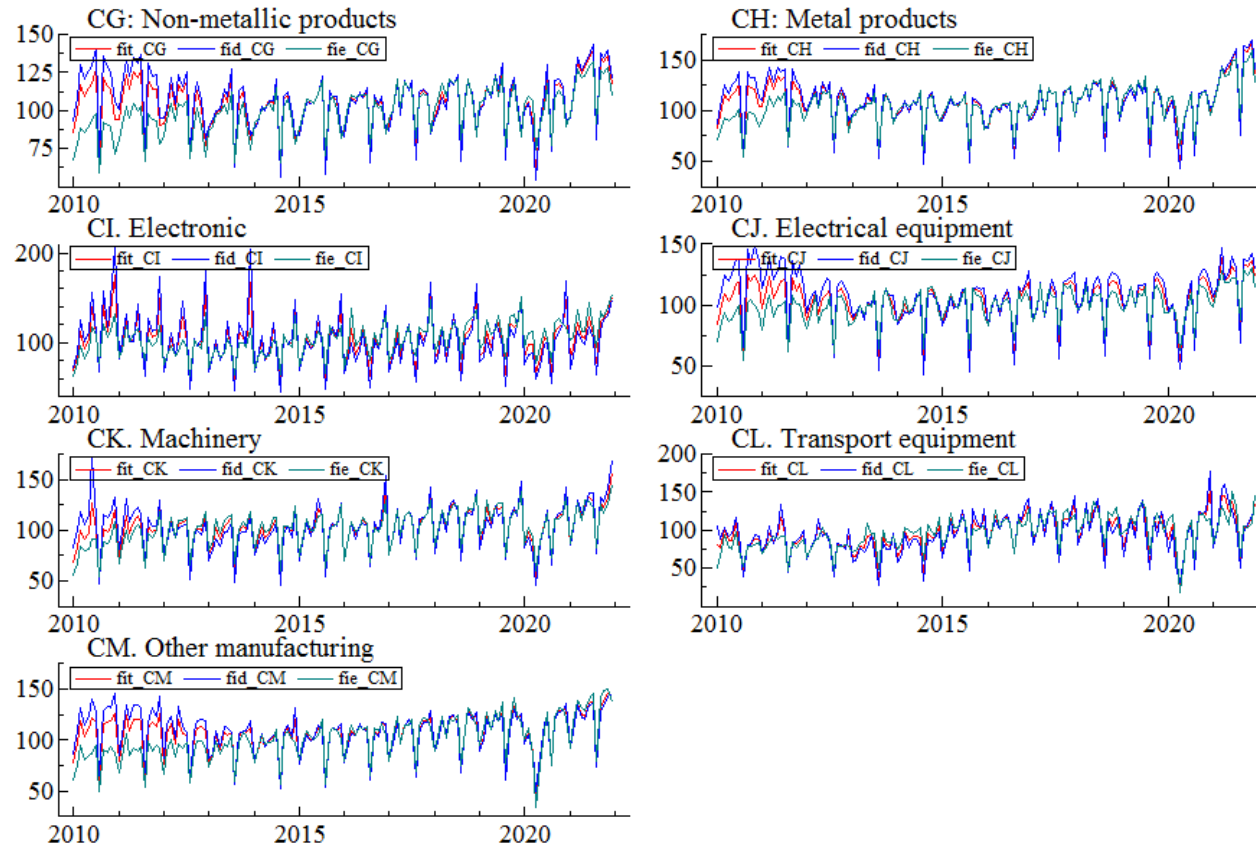
Case study 2: Predictors - Assoaeroporti (AA) monthly



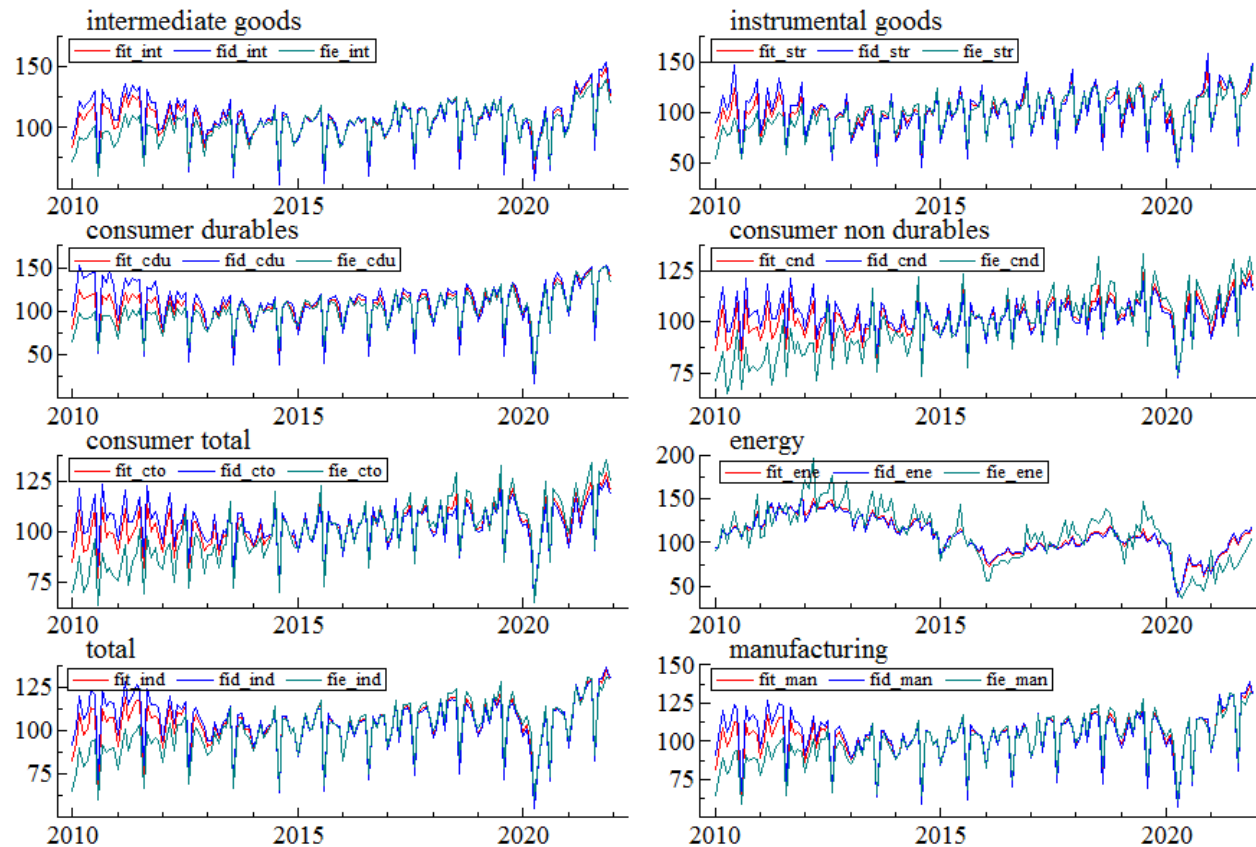
Case study 2: Predictors - Monthly Industrial Turnover (IT) - Section B,C and from CA to CF



Case study 2: Predictors - Monthly Industrial Turnover (IT) - Section from CG to CM



Case study 2: Predictors - Monthly Industrial Turnover (IT) Main industrial groups



Case study 2: the empirical application

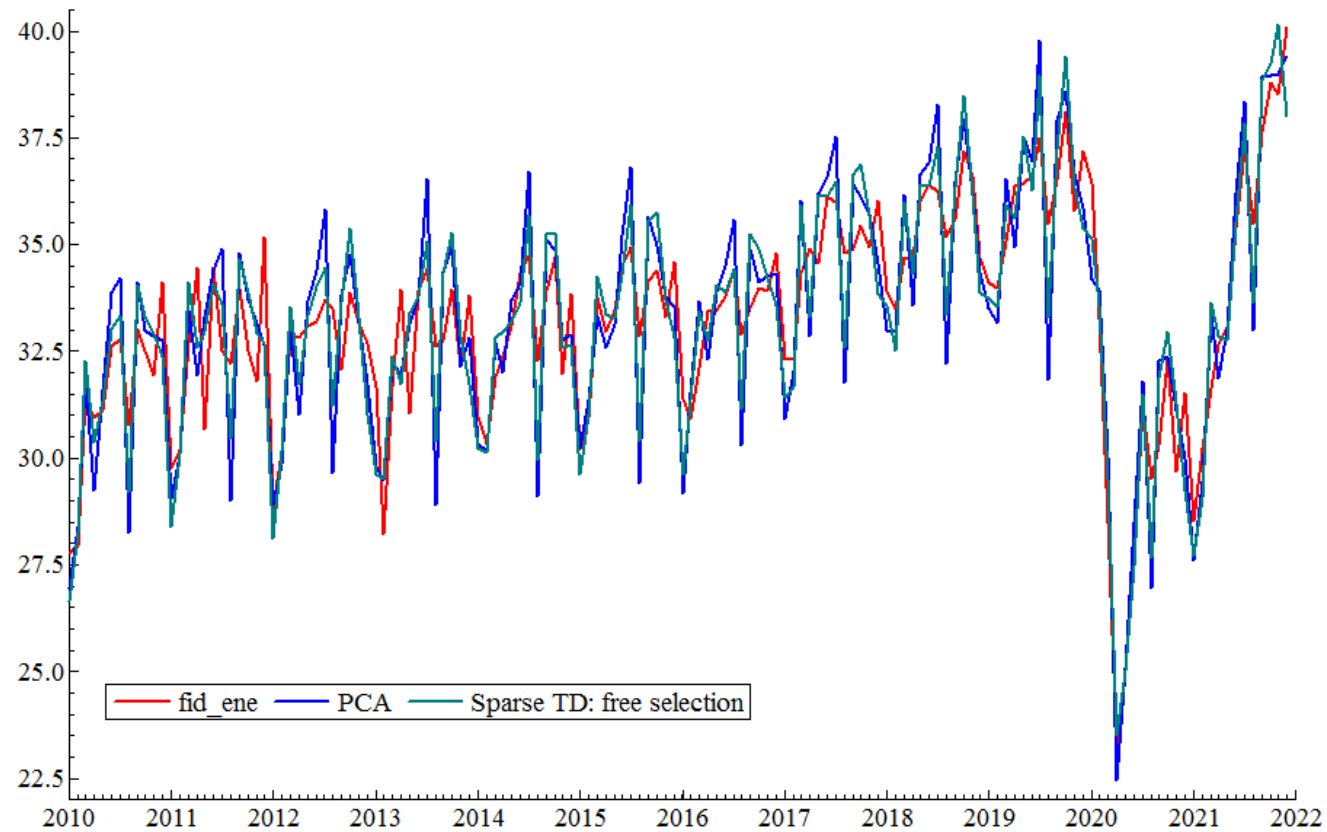
- Temporal disaggregation over the monthly sample 2010:1 - 2021:12
- Real time context at 30 days from the end of the quarter($T+30$, term under which all alternative indicators are assumed available
- First selection method \rightarrow principal component analysis (PCA)
- Second \rightarrow Sparse temporal disaggregation adapted LASSO

Results check

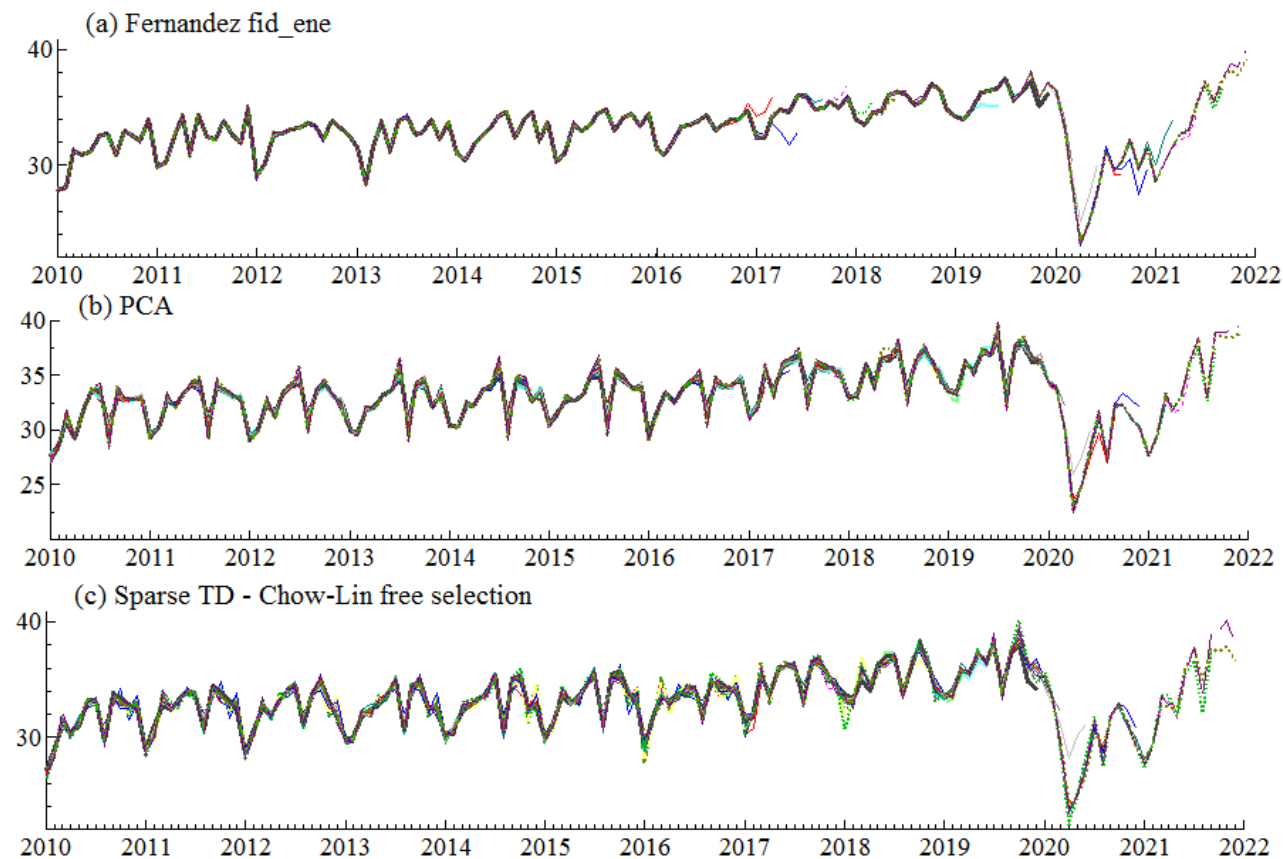
In the exercise several aspects of estimation are considered:

- selection stability in an expanding window that moves recursively from the quarterly sample period 2010:Q1-2016:Q4 to 2010:Q1-2021:Q4
- reliability of estimates in terms of their monthly pattern
- stable monthly estimates
- forecasting performance.

Case study 2: Comparison of disaggregated estimates



Case study 2: Vintages of monthly estimates using fid_ene as indicator (a), PCA factors (b) and the Sparse TD approach (c)



Case study 2: conclusions and practical implications

- The Sparse TD approach is user friendly
- It appears particularly effective for forecasting
- In absence of a real proxy, distributing over time data available at low frequency of observation is particularly challenging:
 - The choice of a single indicator provides stability of estimates, however it is risky since the real high frequency pattern is uncertain.
 - In contrast, both PCA and Sparse TD take the advantage to operate with a larger set of indicators
- It emerges a large variability both in terms of number of series included in the main set and on the choice of them.
- As a reflex, high volatility in monthly estimates release after release
- A practical solution is to select the main series to be adopted periodically (every one or more years) and fixing both the series and model parameters until the next review.