



COYPU

Cognitive Economy Intelligence
Plattform für die Resilienz
wirtschaftlicher Ökosysteme

**Towards a Regional Public Dashboard for Crisis and
Resilience Management**

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Motivation

Regional Approach

- Economic analyses and forecasts including economic shocks are available at the national level, but specific analyses for the regional and local levels are often missing.
- It is important because regions are affected differently by shocks due to their specific industrial structures.

Challenges in Crisis and Resilience Management

- In the short term, supply chains can hardly be changed.
- In the medium and long term, supply chains can be modified (e.g., through diversification, reshoring, etc.). However, a complete decoupling from international value chains does not occur, primarily due to the economic welfare gains from international trade.

Goal

- Regional public dashboard for Saxony as blueprint, for crisis and resilience management, transferability to other regions.
- Quantify the effects of shocks along international value chains at regional and local levels in quasi-real-time.
 - especially changes in production, unemployment, value creation, tax revenues
- Support decision-makers from politics, economy, and administration in responding promptly to crises, containing the effects, and strengthening regional resilience.

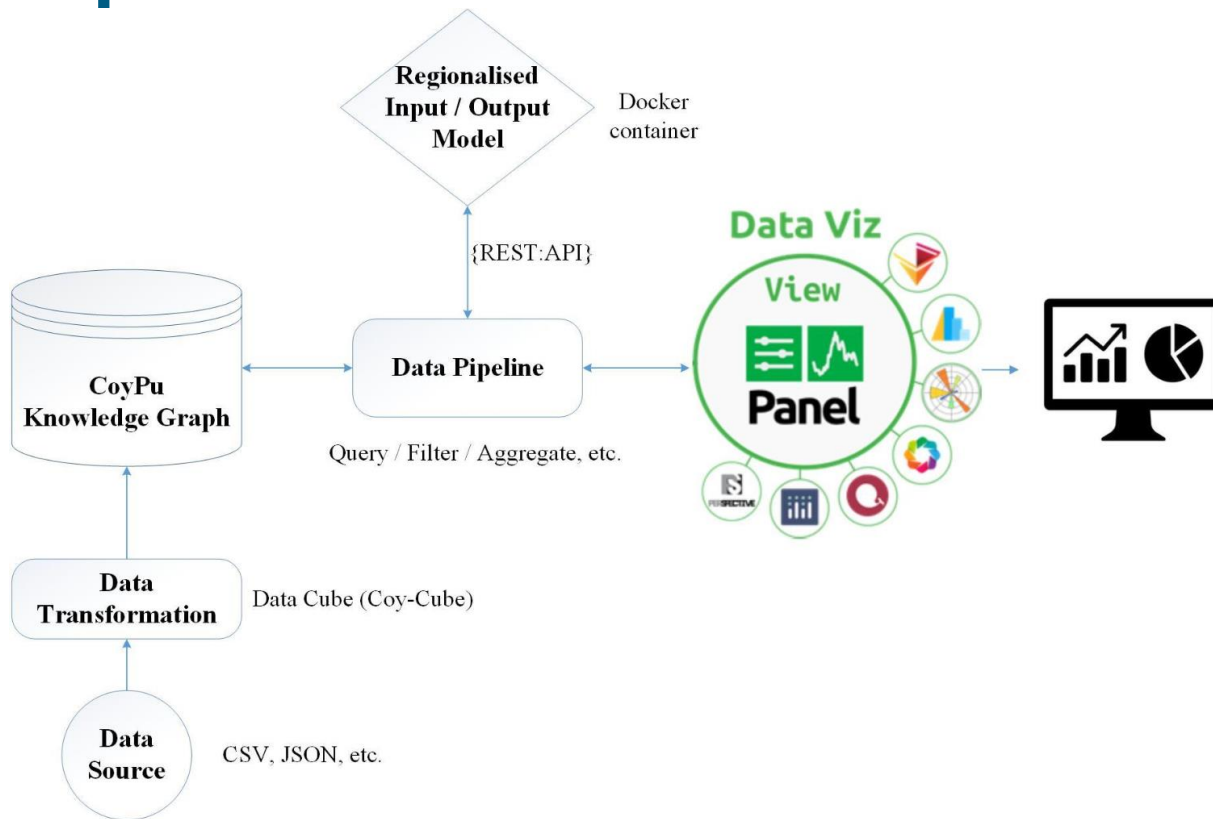
Data and Method

- Data from Federal Statistical Office of Germany (Foreign Trade, National Accounts, Crisis «Events» such as Disaster event , etc.)
- Data are semantically linked and integrated into CoyPu knowledge graph.



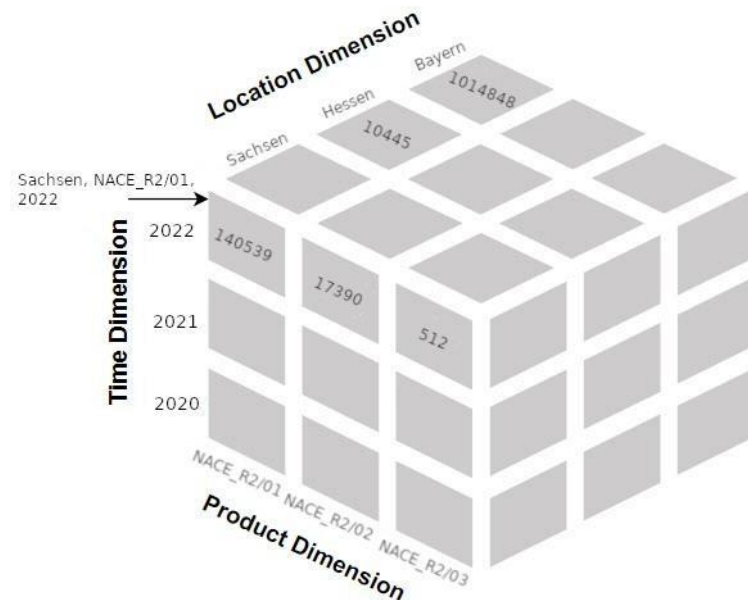
- Modelling of Supply Chain Shocks for Saxony:
 - Regionalized input-output model (interlinkages between industries)
 - Effects of (crisis) events on imports of intermediate goods to Saxony
 - Overall economic effects for Saxony (direct, indirect, induced)

Concept



Coy-Cube

- Customized data cube for the public dashboard
- Coy-Cube is used to represent the data from Destatis (Statistisches Bundesamt)
- Created the prefix "cq:" for the Coy-Cube and multiple properties



```
# -- Datastructure definition --
```

```
cq:dsd a qb:DataStructureDefinition ;-
```

```
..rdfs:label "Data Structure Definition for 51000-0034" ;-
```

```
..qb:component [ qb:dimension coy:hasYear , qb:order 1 ] ;-
```

```
..qb:component [ qb:dimension cq:state, qb:order 2 ] ;-
```

```
..qb:component [ qb:dimension cq:productGroup, qb:order 3 ] ;-
```

```
..qb:component [ qb:measure cq:value, qb:order 4 ] .-
```

```
-
```

```
# -- DimensionProperty definition --
```

```
cq:state a qb:DimensionProperty ;-
```

```
..rdfs:label "state" ;-
```

```
..rdfs:comment "state of Germany" .-
```

```
<https://data.coypu.org/genesis/51000-0034/observations/import/2022/14/GP19-01>
```

```
...a qb:Observation ;-
```

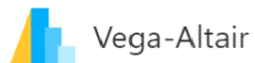
```
...cq:state <https://data.coypu.org/state/Sachsen> ;-
```

```
...cq:productGroup <https://data.coypu.org/classification/nace_r2/01> ;-
```

```
...cq:value "140539" ;-
```

```
...coy:hasYear 2022 .-
```

Data Visualization & Dashboard Development



Panel

- Develop in your favorite environment, editor or jupyter-notebook
- Combine the Python visualization tools and plotting libraries such as Plotly, bokeh, etc.
- Develop quickly data tools, dashboards and complex apps
- Create interactive, high performing, streaming data applications that can run entirely in the browser
- Create performant, secure and production-ready web applications
- Panel is also part of HoloViz project

HoloViz-maintained libraries:



hvPlot



HoloViews



GeoViews



Datashader



Lumen



Param



Colorcet

Interactive Filters for Data

Exploration:

Foreign Trades:

Trade Direction

export
import

Trade Group

Crop and animal production, hunting and related activities
Electricity, gas, steam and air conditioning supply
Extraction of crude petroleum and natural gas
Fishing and aquaculture
Forestry and logging

Years: 2019 - 2021

Amount (in tons): 0.0 - 2.2m

Value (in Tsd. Euro): 0.0 - 2.9m

Disasters and Events:

Disaster type

Epidemic

List of Events

Show Events on Map!

Reset Filters!

Generate Report!

Overview Charts Map Disaster & Events Report Data

Introduction to CoyPu

In an increasingly networked corporate world, the company-specific variables that are relevant from the perspective of crisis management have very complex relationships and dynamic interactions with a wide range of external factors (e.g., location, customers, competition, suppliers, personnel market, legal and social framework). These external interactions in turn give rise to far-reaching internal (domino) effects and interdependencies across all areas of the company (operational, financial, strategic) (Fig. 1, right). Neither in-house expertise nor personal or local consultant knowledge is therefore sufficient to generate valid, economically usable insights or to derive concrete crisis-related entrepreneurial measures.

The CoyPu project addresses the complex economic challenges in crisis situations with an intelligent platform for the integration, structuring, networking, analysis and evaluation of heterogeneous data from economic value networks as well as the industry environment and social context. Based on cognitive modelling of data within a promoted system of networked knowledge graphs and flexibly configurable AI analysis tools, the CoyPu platform enables high-quality and up-to-the-minute insights into economic facts, trends, impact relationships and forecasts. The crisis-relevant questions that can be answered in this way can concern individual value networks or concrete value chains, focus on different regions, industries or company sizes, or be located at the overall economic level.

Thanks to its adaptability, the CoyPu platform can provide both low-threshold self-service offerings for broad use by SMEs and make complex analysis tools available for economic ecosystems for professional use by analysts and facilitators. Institutions of public administration, politics and associations, and research. Extensively networked and semantically integrated data from a variety of sources form the basis of a new information transparency for companies and markets, especially in the SME sector. By providing user-friendly offerings and enabling typical support roles for companies, SMEs can benefit from available AI functionalities even without access to technology specialists.

A federated approach on the level of data and methods as well as the inclusion of diverse legal issues across all development phases of the project is the basis of legally secure and data-sovereign applications in CoyPu.

Due to the intended broad utilization of the CoyPu solution, its intended orientation towards open standards (e.g. W3C) and reference architectures (e.g. IDS) as well as planned integration into large national initiatives (such as the GAIA-X-Cloud), sustainable positive effects for the stability and competitiveness of the German economy can be expected. By using the results provided by CoyPu, not only the decision-making ability and adaptability in economic crises themselves can be enormously improved in the future, but also the possibilities for risk assessment and resilience building in their run-up.





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Abstract

The paper presents ongoing work on a public dashboard that displays the trade relationships of a regional economy in Germany (Saxony) and uses semantic data integration techniques to connect it with localized information on global crisis events in supplying countries. Furthermore, it quantifies the impact of external supply shocks on (subregions of) the Saxon economy in quasi-real time and provides estimates of changes in macroeconomic determinants based on a regional input-output model. The dashboard will be a public resource to support decision makers from politics, business and administration in mitigating the effects of crises and improving regional resilience.

Keywords

Resilience Management, Crisis Management, Coypu Knowledge Graph, Regional Input Output Model



Further information

<https://coypu.org/>

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