IMPORT AND EXPORT PRICE INDEXES WITH ALTERNATIVE DATA SOURCES

International Price Program
Sponsor: Dominic Smith (OPLC)

CIVIC DIGITAL FELLOWSHIP

Nitharsan Sivakanthan
Seattle University
MS in Data Science

IPP Alternative Data Project

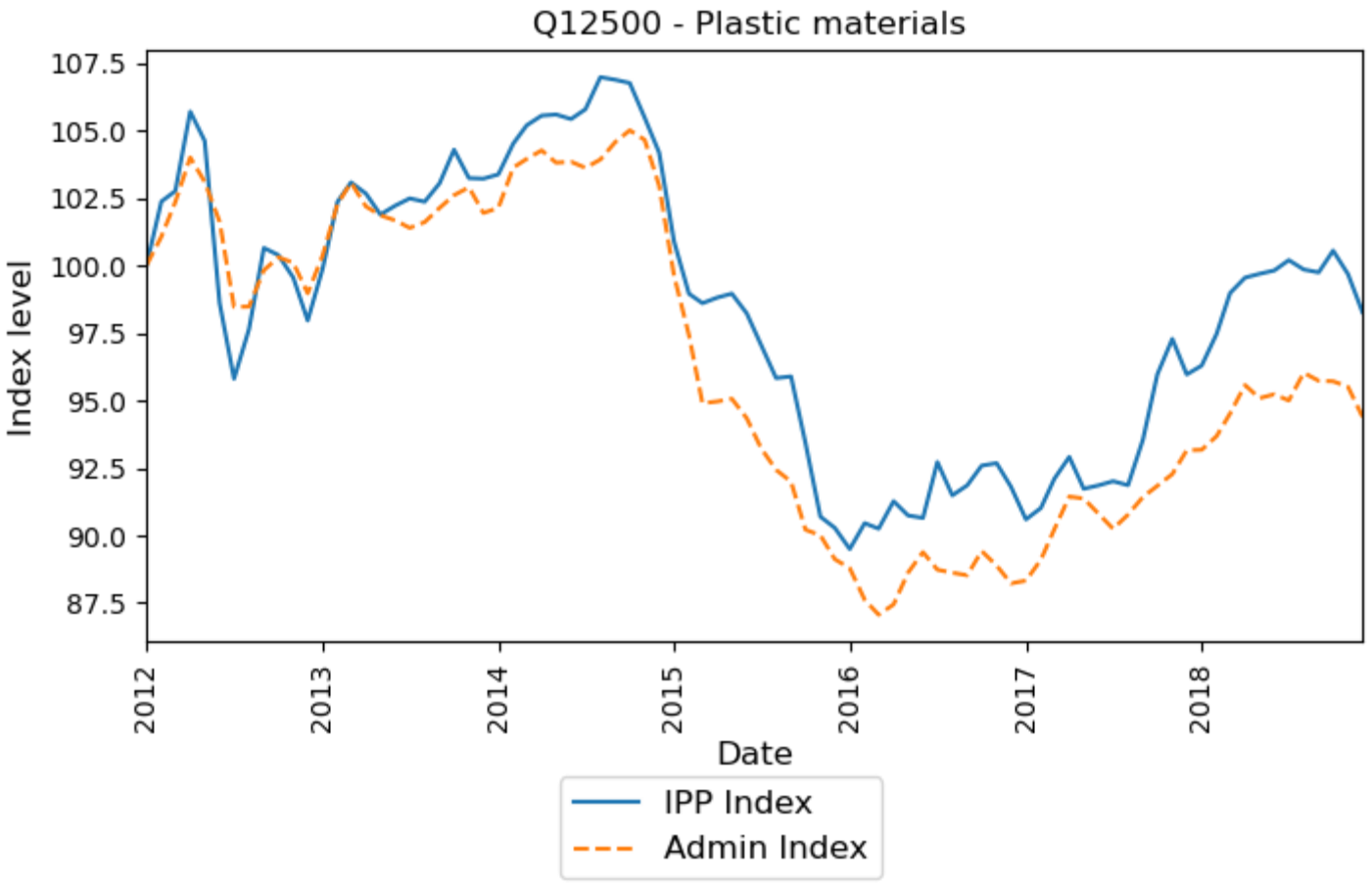
Goal: Replace the current International Price Program (IPP) indexes with alternative indexes where appropriate

- **IPP indexes**: Current import and export **price** indexes calculated using surveyed price data

- **Admin indexes**: Alternative import and export **unit value** indexes calculated using Customs administrative trade data

CIVIC DIGITAL FELLOWSHIP

IPP Alternative Data Project



- Admin indexes calculated for imports and exports for all 250+ BEA end-use product areas

- Compare indexes to evaluate admin indexes for each category

CIVIC DIGITAL FELLOWSHIP

Why would these two indexes differ?

1. Sample differences
   - Survey sample vs universe of transactions
2. Index formula differences
   - Laspeyres vs superlative

Admin indexes better

3. Pricing differences
   - Prices vs unit values

CIVIC DIGITAL FELLOWSHIP

Purpose

Explain differences in price indexes

A different perspective/method for creating ratings

Helps when more information is needed to determine final ratings

Potential to pinpoint promising product areas that can be researched to improve ratings

CIVIC DIGITAL FELLOWSHIP

Additions to last year's CIF Fellowship

Updated the data for Exports and performed further analysis

Same analysis performed on Imports

Adjustments made to group items by current key

CIVIC DIGITAL FELLOWSHIP

Task overview

Link import & export transactions in the IPP microdata and administrative trade data to assess how close unit values are to prices

- If prices are close → formula and sampling differences
- If prices aren't close → unit value bias

CIVIC DIGITAL FELLOWSHIP

Data sources

- IPP Microdata
  - Import & Export Prices
  - Items
  - Reporters

- Administrative trade data
  - Import & Export transactions
  - Employer identification numbers (EINS)
  - BEA end-use categories
  - Characteristics of the transaction (Country of origin, Port, etc.)

CIVIC DIGITAL FELLOWSHIP

Data sources

- IPP Microdata
  - Import & Export Prices
  - Items
  - Reporters

- Administrative trade data
  - Import & Export transactions
  - Employer identification numbers (EINS)
  - BEA end-use categories
  - Characteristics of the transaction (Country of origin, Port, etc.)

Clean Data:
Unit/Currency conversions, Outlier removal, Grouping items by best key

CIVIC DIGITAL FELLOWSHIP

Data sources

- IPP Microdata
  - Import & Export Prices
  - Items
  - Reporters
- Administrative trade data
  - Import & Export transactions
  - Employer identification numbers (EINS)
  - BEA end-use categories
  - Characteristics of the transaction (Country of origin, Port, etc.)

Merge on: month, country, reporter, HS code → 20-25% merge rate

CIVIC DIGITAL FELLOWSHIP

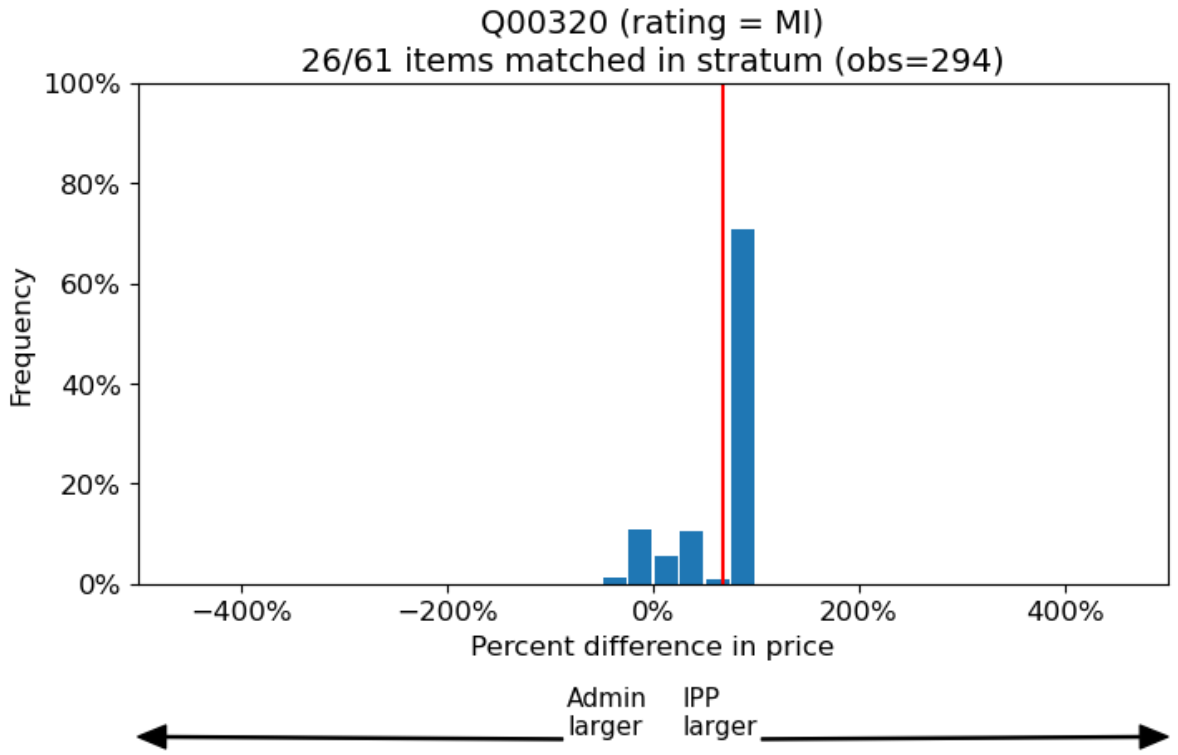
Percent difference in prices

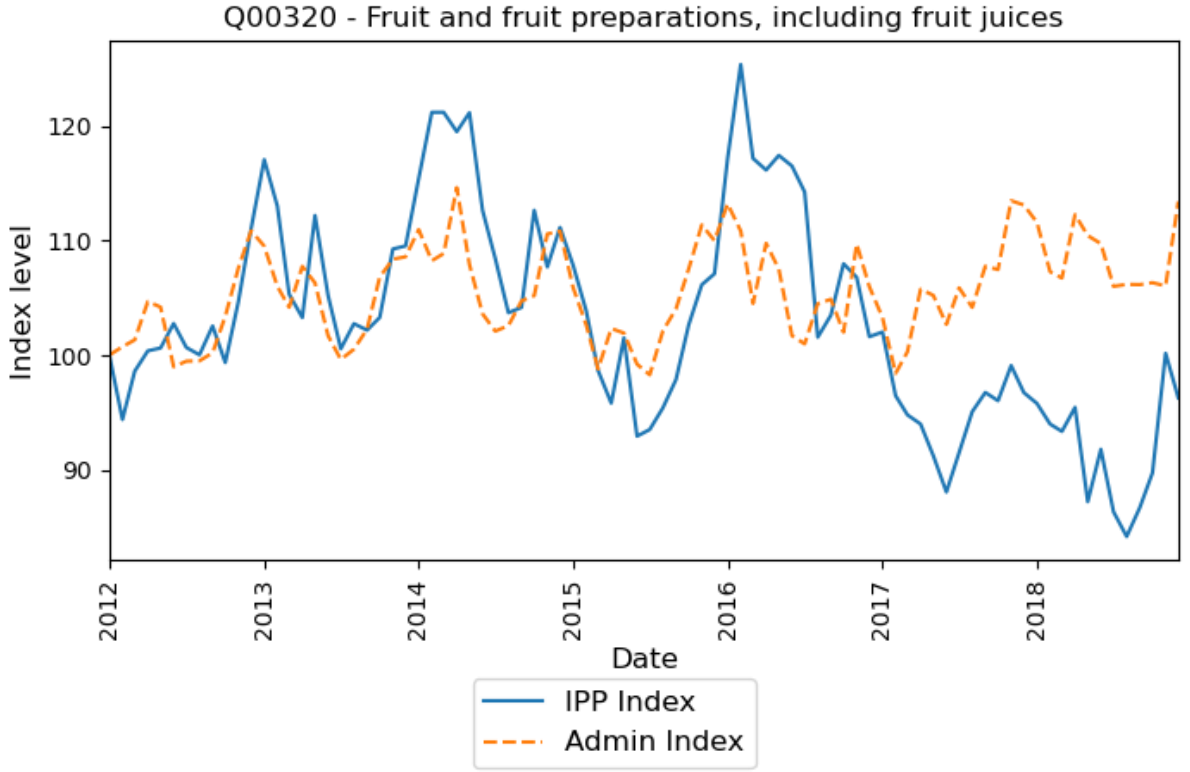
For each item in IPP data, percent difference between IPP price and mean price across all candidate matches in admin data

Distributions by product areas

Percent difference in price:

Differences likely due to unit value bias, index calculations, and sampling

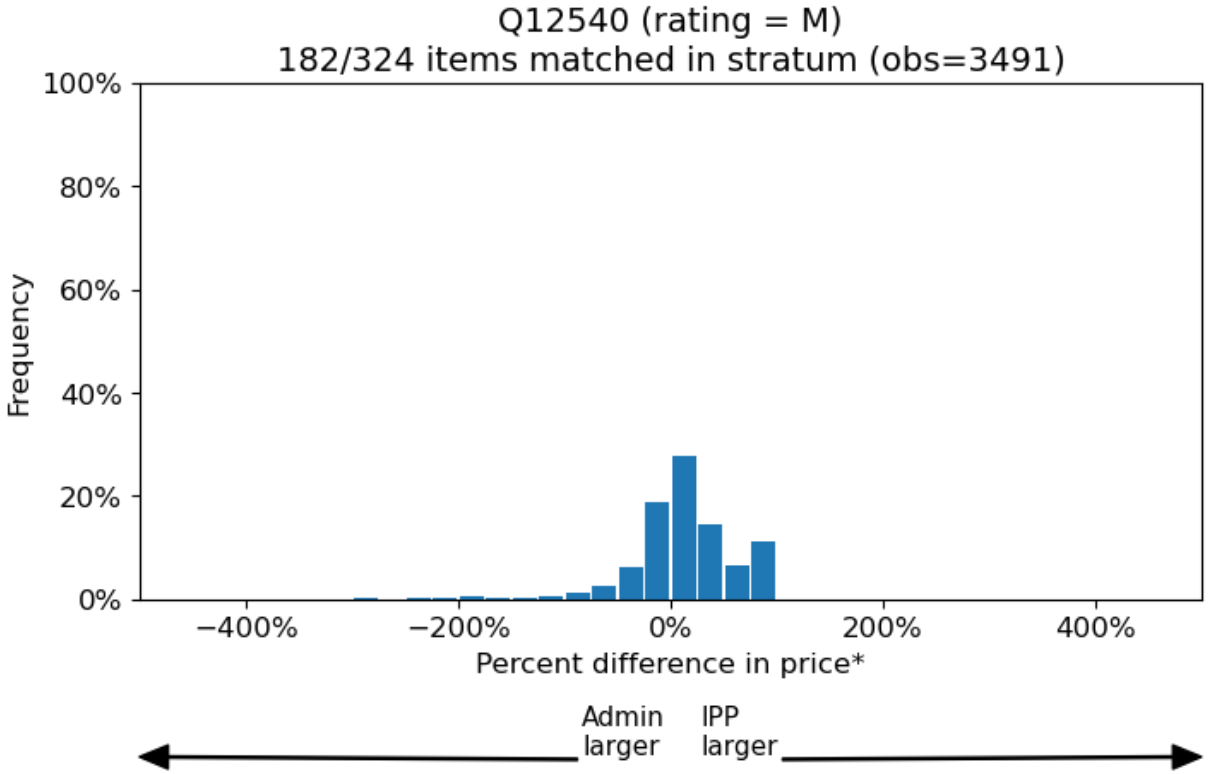


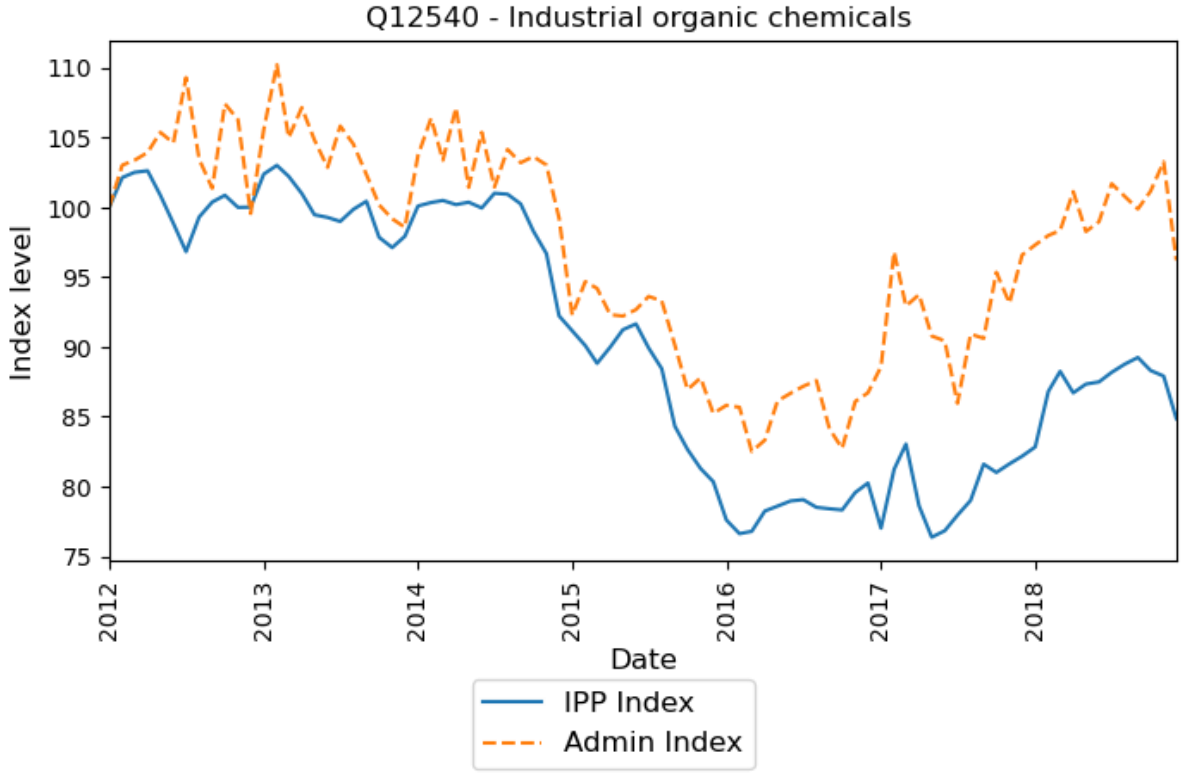


CIVIC DIGITAL FELLOWSHIP

Percent difference in price:

Differences likely due to unit value bias, index calculations, and sampling

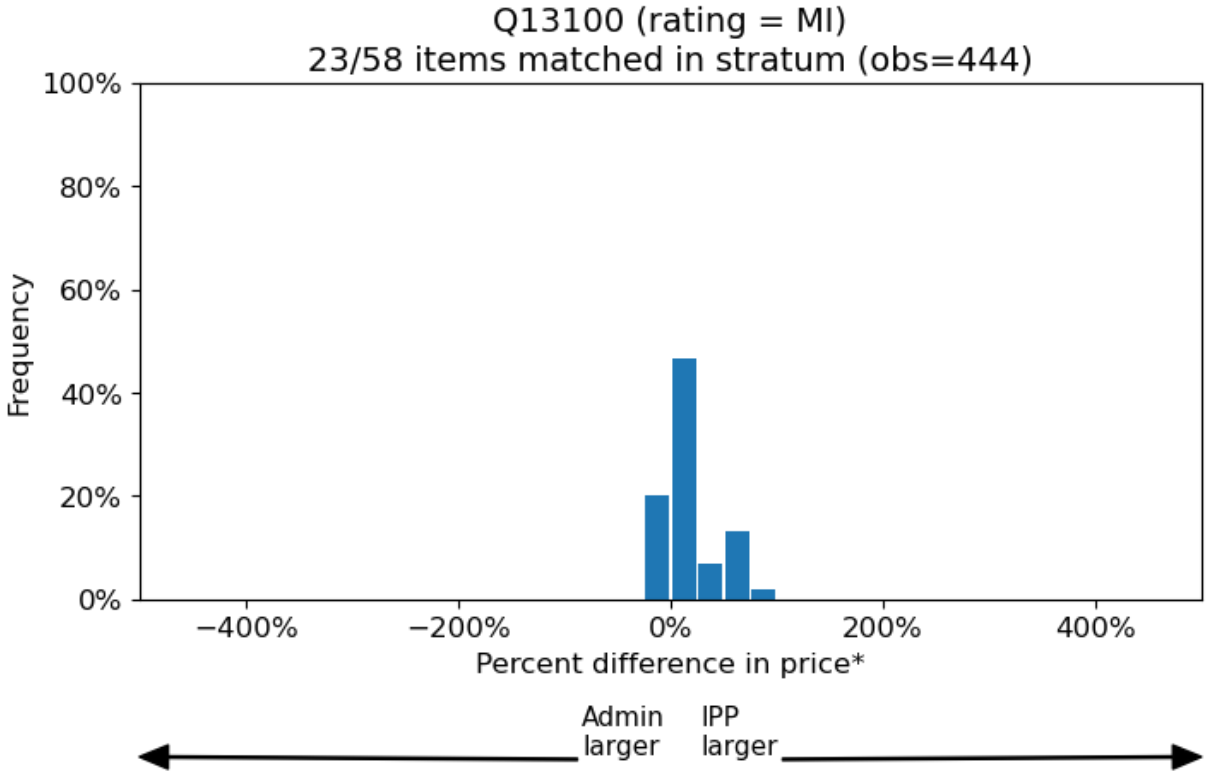


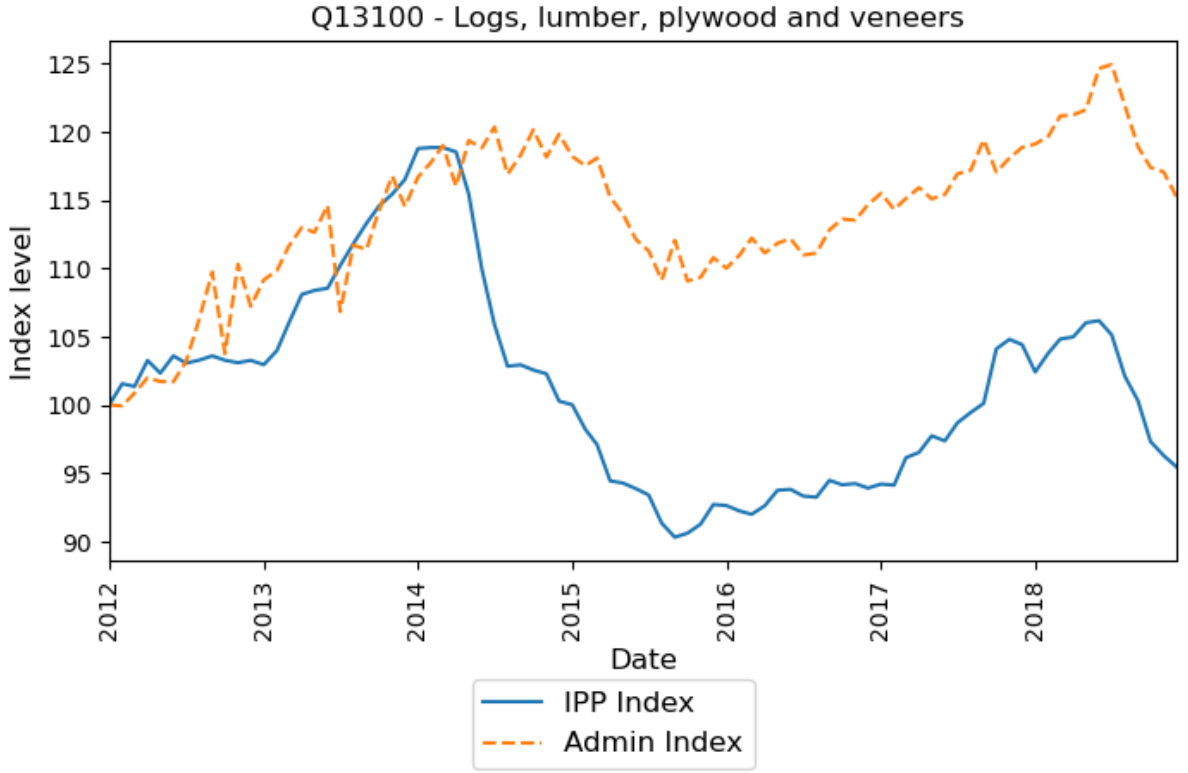


CIVIC DIGITAL FELLOWSHIP

Percent difference in price:

Differences likely due to unit value bias, index calculations, and sampling





CIVIC DIGITAL FELLOWSHIP

Further Investigations

For Exports, product areas that show potential for improvement

- 26/62 product areas rated low quality

Improvements to methods:

- More accurate currency conversions
- Optimize outlier removal trim
- Improve match rates

CIVIC DIGITAL FELLOWSHIP

Personal Takeaways

Applied technical skills to important problems

Python, R, SQL

Learned new skills both technical and professional

Linux, LaTeX, Visualizations, Best coding practices

Exposure to public sector at the federal level

CIVIC DIGITAL FELLOWSHIP