

Notebook

April 25, 2024

1 SB 125

1.1 Cycle 4, Spring FY2024

1.1.1 Freight Truck Economic Competitiveness

Created March 2024

Analysis and write-up completed by Noah Sanchez for Kelly McClendon for a request he received from CTC, Angel, and Hannah

Geodatabase provided by Affi N'Guessan contained data from the FAF5 <https://www.bts.gov/faf>

TCEP/SCCP Cycle 4 Project's included in the TCEP/SCCP Cycle 4 (<https://experience.arcgis.com/experience/1173a09d9f7a452ca7be858c39546678/>) were analyzed for freight movement to identify Freight Truck Economic Competitiveness.

Methodology ArcGIS was used to identify the segments in the FAF5 datasets that corresponded with Caltrans' Projects that were included in the TCEP/SCCP Cycle 4. Not all projects were included, only non-rail projects that had project lines that were within the limits of the various projects. Attribute tables that included the segments of the various projects were exported from ArcGIS Pro and imported into JupyterLab for this analysis. Each Project had the values in the column ['TOT_Tons_All_22'] averaged.

Deliverable This analysis is not a comprehensive economic analysis, but is being used to add to the conversation. The final deliverable is a CSV or Excel doc containing the Economic Competitive Analysis results and other general project information. The final deliverable was sent to Kelly McClendon and Affi N'Guessan via email on 3/21/2024.

Additional Research We discussed potential future analysis could be performed, including a more detailed breakdown of the freight being transported per segment in an effort to identify the average value of the freight in a given area.

```
/opt/conda/lib/python3.9/site-packages/google/auth/_default.py:78: UserWarning:
Your application has authenticated using end user credentials from Google Cloud
SDK without a quota project. You might receive a "quota exceeded" or "API not
enabled" error. See the following page for troubleshooting:
https://cloud.google.com/docs/authentication/adc-troubleshooting/user-creds.
warnings.warn(_CLOUD_SDK_CREDENTIALS_WARNING)
```

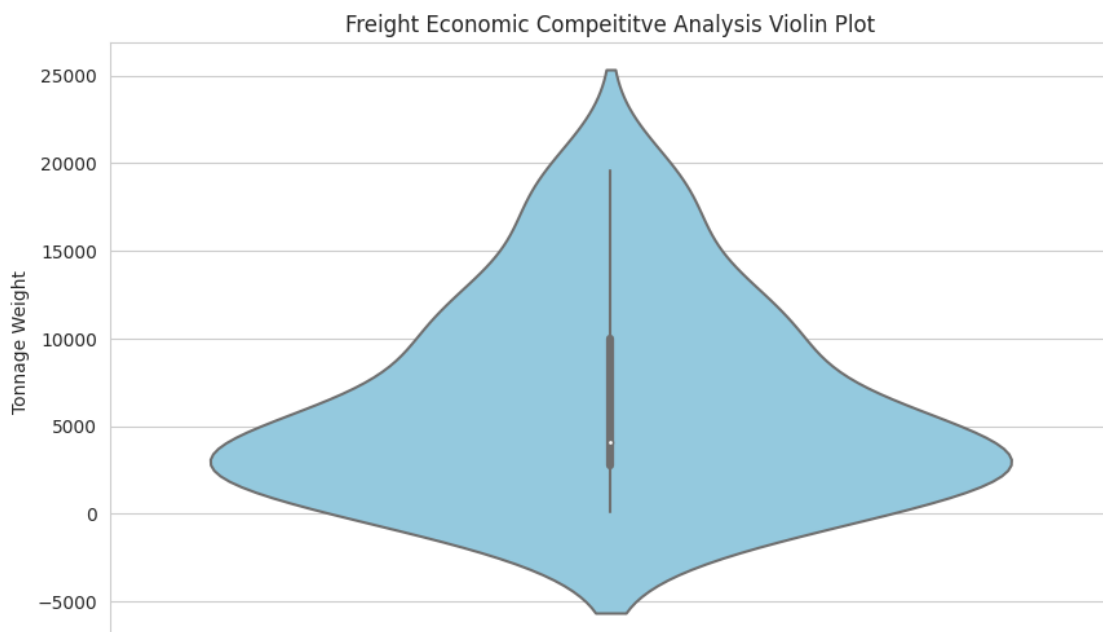
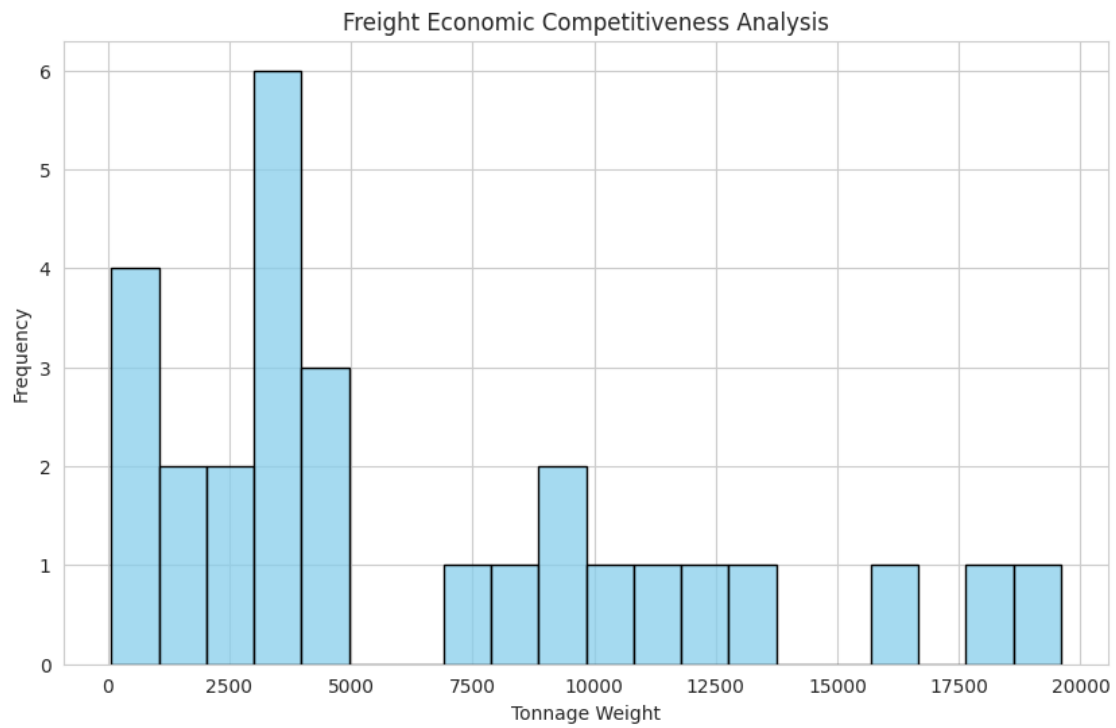
Freight Economic Competitiveness Analysis Results

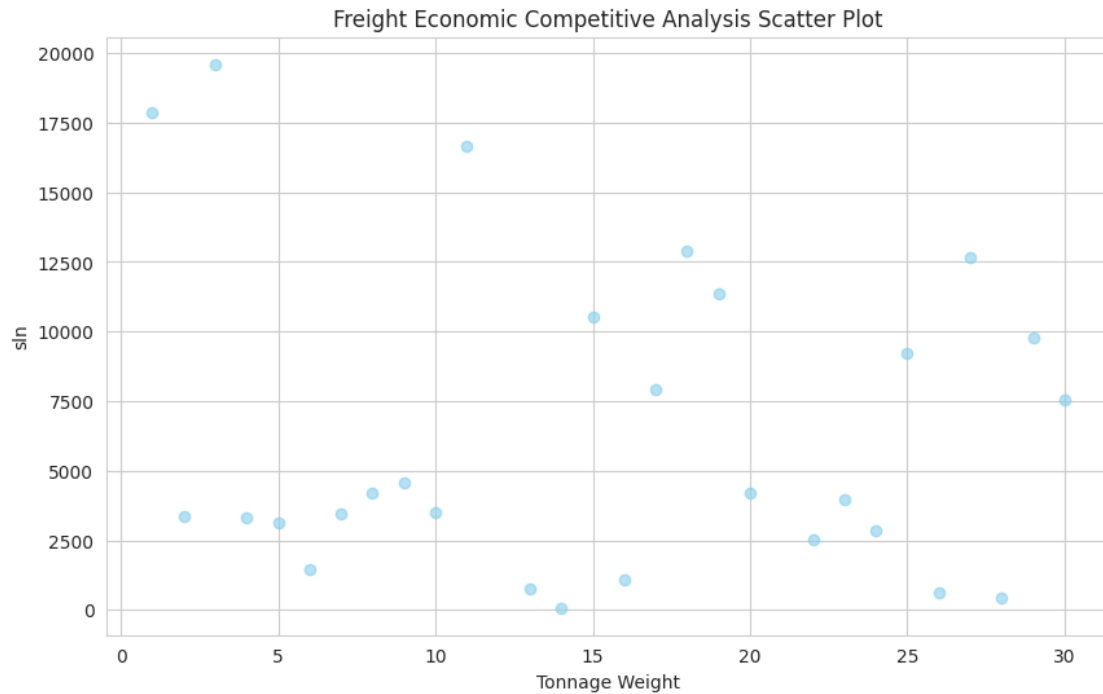
```

[ ]:      sln  freight_ec
0    03      NaN
1    04    17860.50
2    05     3370.16
3    07    19599.28
4    10     3323.42
5    11     3119.47
6    12     1467.86
7    15     3473.47
8    18     4199.73
9    19     4555.10
10   22     3479.98
11   23    16643.05
12   25      NaN
13   27      771.96
14   29       72.21
15   30    10533.22
16   32     1085.17
17   37     7913.15
18   39    12896.31
19   40    11352.45
20   42     4181.13
21   43      NaN
22   44     2524.16
23   45     3950.36
24   47     2863.96
25   50     9210.17
26   53      618.38
27   54    12667.98
28   61      443.47
29   62     9753.58
30   63     7552.66

```

1.1.2 Data Visualizations





Exports

Notebook successfully converted to PDF:
freight_truck_ec_analysis_hidden_code.pdf

Notebook successfully converted to PDF: freight_truck_ec_analysis.pdf

```
-----
OSError                                Traceback (most recent call last)
Cell In[28], line 2
      1 # Create a CSV from the data
----> 2 freight_ec_data.to_csv(f"{GCS_PATH}/outputs/freight_ec_data.csv", index=False)
      4 # Print the success statement after the CSV has been exported
      5 print(f"DataFrame exported to CSV successfully at freight_ec_data.csv")

File /opt/conda/lib/python3.9/site-packages/pandas/util/_decorators.py:211, in _deprecate_kwarg.<locals>._deprecate_kwarg.<locals>.wrapper(*args, **kwargs)
    209     else:
    210         kwargs[new_arg_name] = new_arg_value
--> 211 return func(*args, **kwargs)
```

```

File /opt/conda/lib/python3.9/site-packages/pandas/core/generic.py:3720, in
↳ NDataFrame.to_csv(self, path_or_buf, sep, na_rep, float_format, columns, header,
↳ index, index_label, mode, encoding, compression, quoting, quotechar,
↳ lineterminator, chunksize, date_format, doublequote, escapechar, decimal,
↳ errors, storage_options)
    3709 df = self if isinstance(self, ABCDataFrame) else self.to_frame()
    3711 formatter = DataFrameFormatter(
    3712     frame=df,
    3713     header=header,
    (...)
    3717     decimal=decimal,
    3718 )
-> 3720 return DataFrameRenderer(formatter).to_csv(
    3721     path_or_buf,
    3722     lineterminator=lineterminator,
    3723     sep=sep,
    3724     encoding=encoding,
    3725     errors=errors,
    3726     compression=compression,
    3727     quoting=quoting,
    3728     columns=columns,
    3729     index_label=index_label,
    3730     mode=mode,
    3731     chunksize=chunksize,
    3732     quotechar=quotechar,
    3733     date_format=date_format,
    3734     doublequote=doublequote,
    3735     escapechar=escapechar,
    3736     storage_options=storage_options,
    3737 )

```

```

File /opt/conda/lib/python3.9/site-packages/pandas/util/_decorators.py:211, in
↳ deprecate_kwarg.<locals>._deprecate_kwarg.<locals>.wrapper(*args, **kwargs)
    209     else:
    210         kwargs[new_arg_name] = new_arg_value
--> 211 return func(*args, **kwargs)

```

```

File /opt/conda/lib/python3.9/site-packages/pandas/io/formats/format.py:1189, in
↳ DataFrameRenderer.to_csv(self, path_or_buf, encoding, sep, columns,
↳ index_label, mode, compression, quoting, quotechar, lineterminator, chunksize,
↳ date_format, doublequote, escapechar, errors, storage_options)
    1168     created_buffer = False
    1170 csv_formatter = CSVFormatter(
    1171     path_or_buf=path_or_buf,
    1172     lineterminator=lineterminator,
    (...)
    1187     formatter=self.fmt,
    1188 )
-> 1189 csv_formatter.save()

```

```

1191 if created_buffer:
1192     assert isinstance(path_or_buf, StringIO)

File /opt/conda/lib/python3.9/site-packages/pandas/io/formats/csvs.py:261, in
↳ CSVFormatter.save(self)
    241 with get_handle(
    242     self.filepath_or_buffer,
    243     self.mode,
    (...)
    249
    250     # Note: self.encoding is irrelevant here
    251     self.writer = csvlib.writer(
    252         handles.handle,
    253         lineterminator=self.lineterminator,
    (...)
    258         quotechar=self.quotechar,
    259     )
--> 261     self._save()

File /opt/conda/lib/python3.9/site-packages/pandas/io/common.py:133, in
↳ IOHandles.__exit__(self, *args)
    132 def __exit__(self, *args: Any) -> None:
--> 133     self.close()

File /opt/conda/lib/python3.9/site-packages/pandas/io/common.py:125, in
↳ IOHandles.close(self)
    123     self.created_handles.remove(self.handle)
    124 for handle in self.created_handles:
--> 125     handle.close()
    126 self.created_handles = []
    127 self.is_wrapped = False

File /opt/conda/lib/python3.9/site-packages/fsspec/spec.py:1876, in
↳ AbstractBufferedFile.close(self)
    1874 else:
    1875     if not self.forced:
-> 1876         self.flush(force=True)
    1878     if self.fs is not None:
    1879         self.fs.invalidate_cache(self.path)

File /opt/conda/lib/python3.9/site-packages/fsspec/spec.py:1742, in
↳ AbstractBufferedFile.flush(self, force)
    1740 self.offset = 0
    1741 try:
-> 1742     self._initiate_upload()
    1743 except: # noqa: E722
    1744     self.closed = True

```

File /opt/conda/lib/python3.9/site-packages/gcsfs/core.py:1626, in GCSFile.

```
↪ _initiate_upload(self)
    1624 def _initiate_upload(self):
    1625     """Create multi-upload"""
-> 1626     self.location = sync(
    1627         self.gcsfs.loop,
    1628         initiate_upload,
    1629         self.gcsfs,
    1630         self.bucket,
    1631         self.key,
    1632         self.content_type,
    1633         self.metadata,
    1634         self.fixed_key_metadata,
    1635         timeout=self.timeout,
    1636     )
```

File /opt/conda/lib/python3.9/site-packages/fsspec/asyn.py:106, in sync(loop, func, timeout, *args, **kwargs)

```
↪ func, timeout, *args, **kwargs)
    104     raise FSTimeoutError from return_result
    105 elif isinstance(return_result, BaseException):
--> 106     raise return_result
    107 else:
    108     return return_result
```

File /opt/conda/lib/python3.9/site-packages/fsspec/asyn.py:61, in _runner(event, coro, result, timeout)

```
↪ coro, result, timeout)
    59     coro = asyncio.wait_for(coro, timeout=timeout)
    60 try:
----> 61     result[0] = await coro
    62 except Exception as ex:
    63     result[0] = ex
```

File /opt/conda/lib/python3.9/site-packages/gcsfs/core.py:1744, in _initiate_upload(fs, bucket, key, content_type, metadata, fixed_key_metadata)

```
↪ initiate_upload(fs, bucket, key, content_type, metadata, fixed_key_metadata)
    1742     j["metadata"] = metadata
    1743     j.update(_convert_fixed_key_metadata(fixed_key_metadata))
-> 1744     headers, _ = await fs._call(
    1745         method="POST",
    1746         path=f"{fs._location}/upload/storage/v1/b/{quote(bucket)}/o",
    1747         uploadType="resumable",
    1748         json=j,
    1749         headers={"X-Upload-Content-Type": content_type},
    1750     )
    1751     loc = headers["Location"]
    1752     out = loc[0] if isinstance(loc, list) else loc # <- for CVR responses
```

File /opt/conda/lib/python3.9/site-packages/gcsfs/core.py:430, in GCSFileSystem._call(self, method, path, json_out, info_out, *args, **kwargs)

```
↪ _call(self, method, path, json_out, info_out, *args, **kwargs)
```

```

426 async def _call(
427     self, method, path, *args, json_out=False, info_out=False, **kwargs
428 ):
429     logger.debug(f"{method.upper()}: {path}, {args}, {kwargs}.
↳get('headers')}")
--> 430     status, headers, info, contents = await self._request(
431         method, path, *args, **kwargs
432     )
433     if json_out:
434         return json.loads(contents)

```

File /opt/conda/lib/python3.9/site-packages/decorator.py:221, in decorate.

```

↳<locals>.fun(*args, **kw)
219 if not kwsyntax:
220     args, kw = fix(args, kw, sig)
--> 221 return await caller(func, *(extras + args), **kw)

```

File /opt/conda/lib/python3.9/site-packages/gcsfs/retry.py:114, in

```

↳retry_request(func, retries, *args, **kwargs)
112     if retry > 0:
113         await asyncio.sleep(min(random.random() + 2 ** (retry - 1), 32)
--> 114     return await func(*args, **kwargs)
115 except (
116     HttpError,
117     requests.exceptions.RequestException,
118     (...)
119     aiohttp.client_exceptions.ClientError,
120 ) as e:
121     if (
122         isinstance(e, HttpError)
123         and e.code == 400
124         and "requester pays" in e.message
125     ):
126

```

File /opt/conda/lib/python3.9/site-packages/gcsfs/core.py:423, in GCSFileSystem

```

↳_request(self, method, path, headers, json, data, *args, **kwargs)
420 info = r.request_info # for debug only
421 contents = await r.read()
--> 423 validate_response(status, contents, path, args)
424 return status, headers, info, contents

```

File /opt/conda/lib/python3.9/site-packages/gcsfs/retry.py:95, in

```

↳validate_response(status, content, path, args)
92     msg = content
94 if status == 403:
--> 95     raise OSError(f"Forbidden: {path}\n{msg}")
96 elif status == 502:
97     raise requests.exceptions.ProxyError()

```



```
OSError: Forbidden: https://storage.googleapis.com/upload/storage/v1/b/
↳calitp-analytics-data/o
noah.sanchez@calitp.org does not have storage.objects.create access to the
↳Google Cloud Storage object. Permission 'storage.objects.create' denied on
↳resource (or it may not exist).
```

DataFrame exported to Parquet successfully at freight_ec_data.parquet.