3. Matching

3.1 Import data

In [1]:
```
cd ..
```

```
/home/julian/PycharmProjects/corporate_disruptions
```

In [2]:
```
import parameters
import matplotlib.pyplot as plt
import pandas as pd
```

3.1.1 Import sample

In [3]:
```
import pandas as pd

sample = pd.read_feather("downloads/sample_2019-04-20.feather")
```

In [4]:
```
sample.head()
```

Out[4]:

	gvkey	name	SIC	NAICS	GICS_group	GICS_industry	GICS_sector	GICS_subindustry	execid	y
0	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
1	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
2	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
3	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
4	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	13283	200

In [5]:
```
len(sample)
```

Out[5]:
```
2676
```

In [6]:
```
sample['year'].value_counts()
```
Out[6]:
```
2006.0    237
2007.0    234
2013.0    231
2012.0    229
2008.0    224
2010.0    223
2011.0    222
2009.0    221
2016.0    210
2014.0    209
2015.0    206
2017.0    196
2018.0     32
Name: year, dtype: int64
```

3.1.2 Remove empty observations

Empty observations are those for which no personnel was identified by compustat in any year, and thus year has received a nan when merging compustat data on companies with compustat data on personnel. We will remove those for now.

In [7]:
```
sum(pd.isna(sample['execid']))
```
Out[7]:
```
2
```

In [8]:
```
sample[pd.isna(sample['execid'])]
```
Out[8]:

	gvkey	name	SIC	NAICS	GICS_group	GICS_industry	GICS_sector	GICS_subindustry	exe
875	007127	May Department Stores Co	5311	452111	2550	255030	25	25503010	N
1155	009563	Sears Roebuck & Co	5311	452111	2550	255030	25	25503010	N

In [9]:
```
len(sample)
```
Out[9]:
```
2676
```

In [10]:
```
sample = sample[~pd.isna(sample['execid'])]
```

In [11]:
```
len(sample)
```
Out[11]:
```
2674
```

3.1.2 Import recalls

In [12]:
```
recalls = pd.read_csv(parameters.recalls)
recalls.head(3)
```

Out[12]:

	country	date	description	hazard	importer	incidents	link	name	remedy
0	China	March 14, 2019	This recall involves Mobile Warming Performanc...	The lithium-ion battery can overheat, melt or ...	Tech Gear 5.7, Inc., of San Marcos, Calif.	Tech Gear 5.7 has received four reports of bat...	https://cpsc.gov/Recalls/2019/Tech-Gear-5-7-Re...	Mobile Warming Performance Heated Socks	Refund
1	China	March 12, 2019	The recall expansion involves lithium-ion batt...	The lithium-ion batteries can overheat, posing...	HP Inc., of Palo Alto, Calif.	HP has received eight new reports of battery p...	https://cpsc.gov/Recalls/2019/HP-Expands-Recal...	Lithium-ion batteries for HP commercial notebo...	Replace
2	Taiwan and China	March 14, 2019	This recall involves O'Brien Performer Pro Com...	The skis can detach from the binding during a ...	O'Brien Watersports Inc., of Snoqualmie, Wash.	O'Brien Watersports has received three reports...	https://cpsc.gov/Recalls/2019/OBrien-Waterspor...	Performer Pro Combo water skis	Refund

Make sure data is a date column.

In [13]:
```
recalls['date'] = pd.to_datetime(recalls['date'])
```

In [14]:
```
recalls.head(3)
```

Out[14]:

	country	date	description	hazard	importer	incidents	link	name	reme
0	China	2019-03-14	This recall involves Mobile Warming Performanc...	The lithium-ion battery can overheat, melt or ...	Tech Gear 5.7, Inc., of San Marcos, Calif.	Tech Gear 5.7 has received four reports of bat...	https://cpsc.gov/Recalls/2019/Tech-Gear-5-7-Re...	Mobile Warming Performance Heated Socks	Refu
1	China	2019-03-12	The recall expansion involves lithium-ion batt...	The lithium-ion batteries can overheat, posing...	HP Inc., of Palo Alto, Calif.	HP has received eight new reports of battery p...	https://cpsc.gov/Recalls/2019/HP-Expands-Recal...	Lithium-ion batteries for HP commercial notebo...	Repl
2	Taiwan and China	2019-03-14	This recall involves O'Brien Performer Pro Com...	The skis can detach from the binding during a ...	O'Brien Watersports Inc., of Snoqualmie, Wash.	O'Brien Watersports has received three reports...	https://cpsc.gov/Recalls/2019/OBrien-Waterspor...	Performer Pro Combo water skis	Refu

3.2 Clean company names

In [15]:
```
sample.name.unique()
```

Out[15]:
```
array(['Best Buy Co Inc', 'Officemax Inc', 'Circuit City Stores Inc',
       'Target Corp', 'Dillards Inc  -Cl A', 'Dollar General Corp',
       'Family Dollar Stores', "Macy'S Inc", 'Gap Inc',
       'Genuine Parts Co', 'Home Depot Inc', 'Sears Holdings Corp',
       'L Brands Inc', "Lowe'S Companies Inc", 'Nordstrom Inc',
       'Penney (J C) Co', 'Autonation Inc', 'Ross Stores Inc',
       'Rs Legacy Corp', 'Toys R Us Inc', 'Foot Locker Inc',
       'Tjx Companies Inc', 'Big Lots Inc', 'Tiffany & Co',
       'Office Depot Inc', 'Signet Jewelers Ltd', 'Staples Inc',
       'Autozone Inc', "Kohl'S Corp", 'Bed Bath & Beyond Inc',
       "O'Reilly Automotive Inc", 'Petsmart Inc', 'Urban Outfitters Inc',
       'Tractor Supply Co', 'Dollar Tree Inc',
       'Abercrombie & Fitch  -Cl A', 'Carmax Inc', 'Gamestop Corp',
       'Advance Auto Parts Inc', 'Lkq Corp', 'Ulta Beauty Inc'],
      dtype=object)
```

In [16]:
```
sample['name_clean'] = sample['name']
```

3.2.1 Make everything lowercase.

In [17]:
```
sample['name_clean'] = sample['name_clean'].str.lower()
```

3.2.2 Remove special characters

In [18]:
```
sample['name_clean'] = sample['name_clean'].str.replace('[^\w\s]', '')
```

3.2.3 Remove resulting double spaces

In [19]:
```
sample['name_clean'] = sample['name_clean'].str.replace('  ', ' ')
```

3.2.4 Remove abbreviations like Inc, Co, etc.

We add a space to the end of the strings to be able to only remove full words. Otherwise, removing " co" would mess up occurances of "corp".

In [20]:
```
sample['name_clean'] = sample['name_clean'] + ' '
```

In [21]:
```
company_terms = [' co ', ' inc ', ' corp ', ' cl ', ' a ', ' ltd ', ' stores '

for term in company_terms:
    sample['name_clean'] = sample['name_clean'].str.replace(term, ' ')
```

Remove trailing whitespace.

In [22]:
```
sample['name_clean'] = sample['name_clean'].str.strip()
```

Inspect results.

In [23]:
```
sample.name_clean.unique()
```

Out[23]:
```
array(['best buy', 'officemax', 'circuit city', 'target', 'dillards',
       'dollar general', 'family dollar', 'macys', 'gap', 'genuine parts',
       'home depot', 'sears', 'l brands', 'lowes companies', 'nordstrom',
       'penney j c', 'autonation', 'ross', 'rs legacy', 'toys r us',
       'foot locker', 'tjx companies', 'big lots', 'tiffany',
       'office depot', 'signet jewelers', 'staples', 'autozone', 'kohls',
       'bed bath beyond', 'oreilly automotive', 'petsmart',
       'urban outfitters', 'tractor supply', 'dollar tree',
       'abercrombie fitch', 'carmax', 'gamestop', 'advance auto parts',
       'lkq', 'ulta beauty'], dtype=object)
```

The results look promising, but there might be some missmatches for gap. JCPenney might also need some alternative names (e.g., jcpenney), so we will remove those for now. Another entry to pay attention to is "staples" which might also yield missmatches.

3.2.5 Drop ambiguous

In [24]:
```
ambiguous = ['penney j c', 'gap']
```

In [25]:
```
ambiguous = sample['name_clean'].isin(ambiguous)

sample = sample[~ambiguous].reset_index(drop=True)
```

In [26]:
```
sample.head()
```

Out[26]:

	gvkey	name	SIC	NAICS	GICS_group	GICS_industry	GICS_sector	GICS_subindustry	execid	y
0	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
1	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
2	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
3	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
4	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	13283	200

3.3 Clean recall data

We look for matches in the retailer column.

3.3.1 Make everything lowercase

In [27]:
```
recalls['retailer'] = recalls['retailer'].str.lower()
```

3.3.2 Remove special characters

In [28]:
```
recalls['retailer'] = recalls['retailer'].str.replace('[^\w\s]', '')
```

3.3.3 Remove resulting double spaces

In [29]:
```
recalls['retailer'] = recalls['retailer'].str.replace('  ', ' ')
```

3.4 Check for complete cases

Some companies do not have executives registered in compustat in some years. We want to have all possible combinations in the dataset to match with the recalls. We create otherwise empty columns for those observations.

In [30]:
```
companies = sample['name_clean'].unique()
print(companies)
```
```
['best buy' 'officemax' 'circuit city' 'target' 'dillards'
 'dollar general' 'family dollar' 'macys' 'genuine parts' 'home depot'
 'sears' 'l brands' 'lowes companies' 'nordstrom' 'autonation' 'ross'
 'rs legacy' 'toys r us' 'foot locker' 'tjx companies' 'big lots'
 'tiffany' 'office depot' 'signet jewelers' 'staples' 'autozone' 'kohls'
 'bed bath beyond' 'oreilly automotive' 'petsmart' 'urban outfitters'
 'tractor supply' 'dollar tree' 'abercrombie fitch' 'carmax' 'gamestop'
 'advance auto parts' 'lkq' 'ulta beauty']
```

In [31]:
```
years = sample['year'].unique()
print(years)
```
```
[2006. 2007. 2008. 2009. 2010. 2011. 2012. 2013. 2014. 2015. 2016. 2017.
 2018.]
```

In [32]:
```
rows_before = len(sample)
print(rows_before)
```
```
2525
```

In [33]:
```
import itertools as it

combinations = list(it.product(companies, years))
combinations[:5]
```
Out[33]:
```
[('best buy', 2006.0),
 ('best buy', 2007.0),
 ('best buy', 2008.0),
 ('best buy', 2009.0),
 ('best buy', 2010.0)]
```

In [34]:
```
missing_combination = [True not in
                        ((sample['name_clean'] == combination[0]) & (sample['ye
                        for combination in combinations]
sum(missing_combination)
```
Out[34]:
```
0
```

Fortunately, there are no missing cases. We don't have to add any dummy rows and can use the number of rows for each company-year set to see the number of managers/executives.

3.5 Find companies in recalls

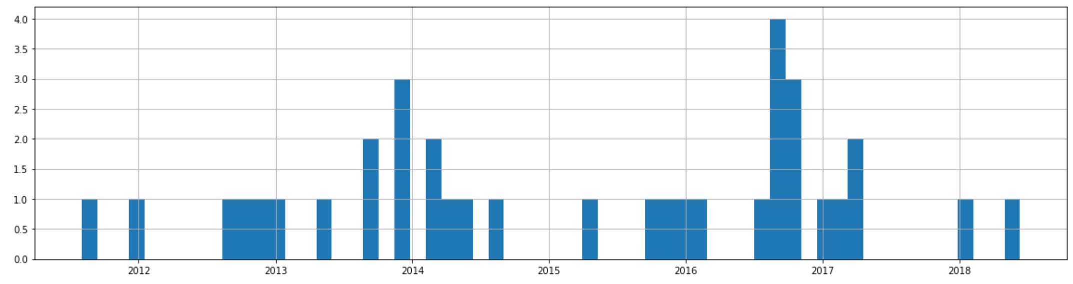
3.5.1 Run testrun

In [35]:
```
company = sample['name_clean'].unique()[0]
print(company)
```
```
best buy
```

In [36]:
```
test = recalls['retailer'].str.contains(company, na=False)
```

In [37]:
```
from pandas.plotting import register_matplotlib_converters
register_matplotlib_converters()
```

In [38]:
```
best_buy_hist = recalls[test].date.hist(figsize=(20,5), bins=60)
plt.show(best_buy_hist)
```



Seems to be working as expected. In the next step, we want to find all matches per company-year observation.

In [39]:
```
recalls['year'] = recalls['date'].dt.year
```

In [40]:
```
pd.value_counts(recalls[test]['year'])
```

Out[40]:
```
2016.0    9
2013.0    6
2012.0    5
2014.0    5
2015.0    4
2017.0    4
2018.0    2
2011.0    1
Name: year, dtype: int64
```

3.5.2 Find all matches

In [41]:
```
len(recalls)
```

Out[41]:
```
7235
```

In [42]:
```
recalls_matched = pd.DataFrame()
```

In [43]:
```
for company in sample['name_clean'].unique():
    matches = recalls['retailer'].str.contains(company, na=False)
    matches = pd.value_counts(recalls[matches]['year']).rename('recalls').to_f
    matches['name_clean'] = company
    recalls_matched = recalls_matched.append(matches)
```

In [44]:
```
recalls_matched.index.names = ['year']
```

In [45]:
```
recalls_matched
```

Out[45]:

	recalls	name_clean
year		
2016.0	9	best buy
2013.0	6	best buy
2012.0	5	best buy
2014.0	5	best buy
2015.0	4	best buy
2017.0	4	best buy
2018.0	2	best buy
2011.0	1	best buy

In [46]:
```
len(recalls_matched)
```

Out[46]:
```
134
```

3.6 Merge

In [47]:
```
len(sample)
```

Out[47]:
```
2525
```

In [48]:
```
recalls_matched = pd.merge(sample, recalls_matched, on=['name_clean', 'year'],
```

We accurately report that we have not found recalls where the value is NA.

In [49]:
```
recalls_matched['recalls'] = recalls_matched['recalls'].fillna(0)
```

In [50]:

```
recalls_matched.head()
```

Out[50]:

	gvkey	name	SIC	NAICS	GICS_group	GICS_industry	GICS_sector	GICS_subindustry	execid	y
0	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
1	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
2	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175	200
		Best								

In [51]:

```
len(recalls_matched)
```

Out[51]: 2525

In [52]:

```
recalls_matched
```

Out[52]:

	gvkey	name	SIC	NAICS	GICS_group	GICS_industry	GICS_sector	GICS_subindustry	execid
0	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175
1	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175
2	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175
3	002184	Best Buy Co Inc	5731	443142	2550	255040	25	25504020	06175

3.6 Save to feather

In [53]:

```
from datetime import date

recalls_matched.to_feather('{0}/recalls_matched {1}.feather'.format(
    parameters.preprocessed folder, str(date.today())))
```