

# Credit Losses from Declining Industries: Lessons for Climate-risk Modeling

Bill Nelson | September 15, 2021

The rise in banking agency interest in climate risks has owed in large part to a perceived risk that banks will make substantial losses on loans to firms that become unprofitable and ultimately insolvent because of climate-related developments.<sup>1</sup> While some businesses will no doubt prosper and others struggle in response to changes in the climate, changes in government climate policy and changes in climate-related technology over the next several decades, such a dynamic is nothing new. Business sectors are always waxing and waning in response to societal and technological change.

Economists that are seriously concerned that banks will incur a high level of loan losses because of such climate-related changes should be investigating past instances of similar change to gauge the risks. That's what economists do – analyze past events to inform their outlook for future events. This note dips a toe in those waters and comes away with comforting conclusions.

## ANALYSIS

We looked at the evolution of the top 50 firms in the Fortune 500 over the past 30 years, the time horizon that is generally being used for climate scenario analysis by the international regulatory community and has also been a period of extraordinary technological change. Thirty years ago, no bank could have foreseen the rise of the internet and the extraordinary advances in information technology.

The Fortune 500 consists of the largest 500 U.S. firms, measured by revenue. Appendix A provides the top 50 in 1991 and in 2021. As can be seen, the lists are strikingly different, and the impact of technological change and customer preference is readily seen. In particular, there is a shift from manufacturing to informational technology and services.

Table 1 summarizes the fate of the firms that were in the top 50 in 1991. In 2021, roughly one-quarter are still in the top 50, one-half are no longer in the top 50 but are still in the top 500, and one-quarter are gone. Of the 11 that are gone, nine were acquired or merged and are no longer headquartered in the United States, one still exists but is no longer in the top 500 and one failed.

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<sup>1</sup> The Federal Reserve's [2020 Supervision and Regulation report](#), for example, states:

Federal Reserve supervisors are responsible for ensuring that supervised institutions operate in a safe and sound manner and can continue to provide financial services to their customers in the face of all types of risks, including those related to climate change . . . For example, chronic flooding or wildfires may pose a risk to the value of the collateral that a bank has taken as security against its loans. Technological innovations in the production, storage, and transport of energy could decrease the value of assets dependent on older technologies, resulting in mark-to-market losses on bank's trading portfolios or reduced cash flow of certain borrowers. p. 26

1991 Top 50				
Still in Top 50	24%			
Still in Top 500 but not Top 50	54%			
Gone	22%			
...of which		Acquired	Below 500	Failed
		9	1	1

The firm that failed is Eastman Kodak, a victim of technological change. Kodak filed for Chapter 11 bankruptcy in January 2012 and emerged from bankruptcy in September 2013. Secured creditors and second lien holders were paid in full; unsecured creditors received just 4 cents on the dollar on their investments.<sup>2</sup> There were no banks among the unsecured creditors.<sup>3</sup> Thus, it appears that banks either secured their loans or stopped lending ahead of the bankruptcy filing.

Of course, what matters is not just what happened to the corporations that were large 30 years ago, but what has happened over *each* of the past 30 years. Nevertheless, analysis from a frozen-in-time perspective is relevant because, in certain cases, banking authorities are evaluating banks’ risks of loan losses over the next 30 years by assuming that the bank loan book will remain *unchanged* over the next 30 years. Under that assumption, banks will be lending to exactly the same sets of firms in exactly the same amounts in 30 years, in a “Groundhog Day” way, even if some of those firms fail. In fact, once a firm fails, it is likely to keep failing over and over again.

To be sure, banking regulators appear to be backing away from the static balance sheet approach and some have been explicit in their statements that it does not provide for useful analysis. For example, in the recently completed climate stress tests by the ACPR and the Banque de France, banks made assumptions about how their portfolio allocation across industries would evolve in reaction to changes in loss rates.

A comprehensive review of the disposition of the largest firms over each of the past 30 years is a task beyond our resources, but as a step in that direction, we did look at what happened over the past 25 years. The results are summarized in Table 2. Surprisingly, although the overall dynamic is essentially the same as the 30-year perspective, there were three new firms in the top 50 in 1996 relative to 1991 that were not in the top 50 this year because they failed – JCPenney, Sears and Kmart. While Kodak fell to digital photography, major retailers fell to the digitalization of shopping—buying through online retailers. Sears and Kmart merged in 2004 and the combined entity went into bankruptcy on Oct. 15, 2018; at present, the merged firm is continuing to slowly wind down. JCPenney went into bankruptcy on May 15, 2020. We have not been able to determine the losses to the creditors of the three retailers. Searching our recollection and the internet, however, we are unable to find reports of any bank failing or suffering a material financial loss to any of these companies. (If we have missed a loss, please let us know.)

<sup>2</sup> “Court Gives Kodak Approval to Leave Bankruptcy,” New York Times, August 20, 2013. <https://www.nytimes.com/2013/08/21/business/court-gives-kodak-approval-to-leave-bankruptcy.html>

<sup>3</sup> See Item 1.01 of Eastman Kodak Company’s form 8-K, September 3, 2013. <https://www.sec.gov/Archives/edgar/data/0000031235/000119312513361762/d595566d8k.htm>

Table 2				
1996 Top 50				
Still in Top 50	50%			
Still in Top 500 but not Top 50	32%			
Gone	18%			
...of which		Acquired	Below 500	Failed
		6	0	3

**IMPLICATIONS**

There has been extraordinarily rapid change in both technology and consumer preferences over the past 30 years, and that change is reflected in a high degree of turnover among the largest firms. Those firms that dwindled mostly just got smaller and in some cases they were acquired. Only in very few instances did a firm fail, and when it did, at least in the case of Kodak, banks made no losses. Most importantly for lessons for bank regulation, we know of no bank failing because of such losses, let alone a systemic event.

It seems reasonable to expect that the future will look like the past. As climate developments make some corporations unprofitable, those firms will likely dwindle rather than proceed in their current form and at their current size and suddenly fail. As they dwindle, their demand for bank loans will also shrink. Most of these firms won't fail at all, they will either adapt and operate at a smaller scale or be acquired by other firms.

A few will fail. For those who are skeptical that banks would be able to protect themselves from climate-related losses from those failures, or those noting that *somebody* is going to be left holding the bag, the important point is that the bag will get smaller as the firm's end approaches.

Moreover, insofar as banks continue to lend to those firms as failure approaches, they will take collateral, shorten tenors and strengthen covenants to protect their interests. In addition, investors with a higher risk tolerance than banks will step forward to risk loss in exchange for higher returns. Similarly, one process that is currently underway is that large corporations are shedding their carbon-intensive lines of business, selling them to investors that do not make use of bank loans and that are not making their investment choices based on social objectives.<sup>4</sup>

To be sure, the lessons from past declines in business sectors are not relevant for all of the risks associated with climate change. Changing climate may be associated with an increased probability of individual catastrophic events that could manifest over a matter of days or months rather than decades such as the events portrayed in the movie "The Day After Tomorrow." Consideration of how to prepare financial institutions for such events is not informed by looking at how business sectors were changed by the rise of railroads.

However, for the most part, the physical risks associated with climate change – and the ones that banking agencies seem concerned about – will evolve gradually in financial terms even if rapidly in geological terms. Such risks would include the gradual increase in the likelihood of severe weather events, the gradual rise in temperatures, the gradual rise in sea levels and gradual changes in regional climate conditions. Lessons from past incidences where a business sector became unprofitable and dwindled are relevant for considering the likely consequences of physical climate risks of this sort. A bank lending to a farmer to finance his seed now will not suffer a default on the

<sup>4</sup> See "A \$140bn asset sale: the investors cashing in on Big Oil's push to net zero," Financial Times, July 6, 2021.

same loan in 30 years if the land becomes unproductive – the farmer’s demand for credit will fall as the arability of the land declines.

The risks associated with climate change policies fall somewhere in between. A government could unexpectedly and rapidly establish policies that will crush an industry. But history suggests such policies would be foreseeable and implemented gradually. Moreover, as discussed in “[Green Lending: Is Regulatory Exuberance Irrational \(and a Little Dangerous\)?](#),” such risk exists for green firms as well as brown firms, not to mention tobacco firms; brewers, distillers and vineyards; defense contractors; and gun manufacturers. The challenge for those modeling the risks is to keep the analysis driven by data rather than by policy preferences.

## FUTURE RESEARCH

Our research into the fates of Kmart, Sears and JCPenney indicates that an examination of bank losses from the ongoing decline in face-to-face retail stores could be an excellent case study for informing judgments about the possible future disruptions from climate-related changes.<sup>5</sup> The double shocks of the rise of online shopping and the COVID-19 pandemic have driven many stores into bankruptcy. Banks have taken loan loss provisions in reaction, indicating that the banks expect to make losses on loans to retailers. The examination could size realized and expected bank losses relative to bank capital, investigate how bank exposures evolve relative to other lenders as industry troubles mount and document the steps banks take to protect themselves as the counterparties deteriorate.

## CONCLUSION

Analysis of financial risk arising from climate change is fraught with uncertainty over the path of climate, climate policy, and related technology as well as the implications of those developments for economic activity (see [Anderson and Covas \(2021\)](#)). In many cases, that uncertainty arises because the developments are novel. It is perhaps understandable, therefore, that the analysis is largely based on assumptions and scenarios intended to be plausible but not grounded in empirical investigation. The exposure of banks to losses due to the steady decline of old firms and rise of new ones is not novel, however. It is, in fact, normal and eminently investigable. We encourage those attempting to model climate-related bank losses to investigate and then to base their models on historical experience rather than on assumptions to the extent possible.

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<sup>5</sup> See, for example, “[Sears Showcases Banks' \\$350 Billion Risk From Trembling Retailers](#),” The Street, June 6, 2017 and “[US banks disclose retail exposure as distress mounts in the space](#),” S&P Global Market Intelligence, July 27, 2020.

## APPENDIX A

### Top 50 U.S. corporations by revenue (Fortune).

Table A1			
Rank	1991	1996	2021
1	General Motors	General Motors Corporation	Walmart
2	Exxon Mobil	Ford Motor Company	Amazon
3	Ford Motor	Exxon Corporation	Apple
4	Intl. Business Machines	Wal-Mart Stores, Inc.	CVS Health
5	Mobil	AT&T Corp.	UnitedHealth Group
6	General Electric	International Business Machines Corporation	Berkshire Hathaway
7	Altria Group	General Electric Company	McKesson
8	Texaco	Mobil Corporation	AmerisourceBergen
9	DuPont	Chrysler Corporation	Alphabet
10	ChevronTexaco	Philip Morris Companies	Exxon Mobil
11	Chrysler	Prudential Insurance Company of America	AT&T
12	Amoco	State Farm Group	Costco Wholesale
13	Boeing	E.I. Du Pont de Nemours and Company, Inc.	Cigna
14	Shell Oil	Texaco, Inc.	Cardinal Health
15	Procter & Gamble	Sears, Roebuck & Company	Microsoft
16	Occidental Petroleum	Kmart Corporation	Walgreens Boots Alliance
17	United Technologies	The Procter & Gamble Company	Kroger
18	Dow Chemical	Chevron Corporation	Home Depot
19	Marathon Oil	Citicorp	JPMorgan Chase
20	Eastman Kodak	Hewlett-Packard Company	Verizon Communications
21	Atlantic Richfield	PepsiCo, Inc.	Ford Motor
22	Xerox	Metropolitan Life Insurance Co.	General Motors
23	PepsiCo	Amoco Corporation	Anthem
24	McDonnell Douglas	Motorola, Inc.	Centene
25	ConAgra Foods	American International Grouping.	Fannie Mae
26	Tenneco Automotive	ConAgra, Inc.	Comcast
27	ConocoPhillips	The Kroger Company	Chevron
28	Nabisco Group Holdings	Dayton Hudson Corporation	Dell Technologies
29	Hewlett-Packard	Lockheed Martin Corporation	Bank of America
30	Digital Equipment	United Technologies Corporation	Target
31	3M	The Allstate Corporation	Lowe's
32	International Paper	Federal National Mortgage Association	Marathon Petroleum
33	CBS	Merrill Lynch & Company, Inc.	Citigroup
34	Georgia-Pacific	J.C. Penney Company, Inc.	Facebook
35	Rockwell Automation	United Parcel Service of America, Inc.	UPS

Table A1			
Rank	1991	1996	2021
36	Honeywell Intl.	The Dow Chemical Company	Johnson & Johnson
37	Sunoco	BankAmerica Corporation	Wells Fargo
38	Sara Lee	GTE Corporation	General Electric
39	Caterpillar	International Paper Company	State Farm Insurance
40	Goodyear Tire & Rubber	The Boeing Company	Intel
41	Johnson & Johnson	Xerox Corporation	Humana
42	Motorola	Cigna Corporation	IBM
43	Alcoa	Johnson & Johnson	Procter & Gamble
44	Anheuser-Busch	Loews Corporation	PepsiCo
45	Unocal	American Stores Company	FedEx
46	Bristol-Myers Squibb	Price/Costco, Inc.	MetLife
47	Coca-Cola	USX Corporation	Freddie Mac
48	General Dynamics	The Coca-Cola Company	Phillips 66
49	Unisys	BellSouth Corporation	Lockheed Martin
50	Lockheed Martin	Sara Lee Corporation	Walt Disney

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