Lessons from the Great Kanto Earthquake, 1923

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Outline

- Direct damage by the Great Kanto Earthquake
- Impact on the financial system and policies by the government and the Bank of Japan
- Impact on the spatial distribution of industries
- Lessons to the present

Human damage

					Persons, %
Area	Population before the earth quake	Death	Missing	Total	Percentage
Total	11,743,100	91,344	13,275	104,619	0.89
Tokyo	4,035,700	59,593	10,904	70,497	1.75
Tokyo City	2,265,300	58,104	10,556	68,660	3.03
Others	1,770,400	1,489	348	1,837	0.10
Kanagawa	1,379,000	29,614	2,245	31,859	2.31
Yokohama	446,600	21,384	1,951	23,335	5.23
Others	932,400	8,230	294	8,524	0.91
Chiba	1,347,200	1,373	47	1,420	0.11
Saitama	1,353,800	280	36	316	0.02
Shizuoka	1,626,300	450	42	492	0.03
Yamanashi	602,000	20	0	20	0.00
Ibaraki	1,399,100	14	1	15	0.00

Physical damage

				Number of buildings, %		
Area	Number of buildings before the earthquake	Completely burnt	Completely destroyed	Total	Percentage	
Total	2,284,200	381,090	83,819	464,909	20.4	
Tokyo	826,600	311,962	16,684	328,646	39.8	
Tokyo City	483,000	300,924	4,222	305,146	63.2	
Others	343,600	11,038	12,462	23,500	6.8	
Kanagawa	274,300	68,634	46,719	115,353	42.1	
Yokohama	98,900	62,608	9,800	72,408	73.2	
Others	175,400	6,026	36,919	42,945	24.5	
Chiba	262,600	478	12,894	13,372	5.1	
Saitama	244,900	0	4,562	4,562	1.9	
Shizuoka	289,100	16	2,241	2,257	0.8	
Yamanashi	117,000	0	562	562	0.5	
Ibaraki	269,700	0	157	157	0.1	

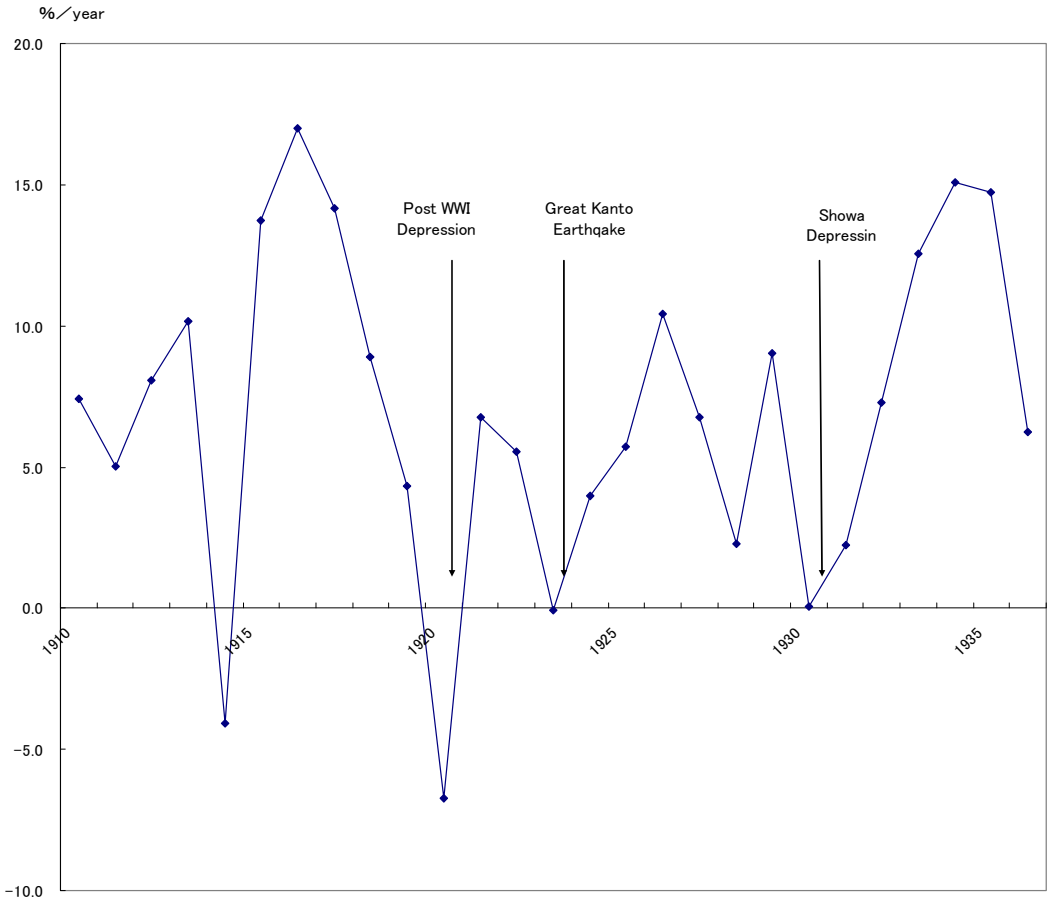
Variation of damage within Tokyo City

Ward	Number of buildings before	Completely burnt	Completely destroyed	Total	Percentage
Total	483,000	300,924	4,222	305,146	63.2
Kojimachi	11,590	6,484	337	6,821	58.9
Kanda	30,910	27,601	19	27,620	89.4
Nihonbashi	23,190	21,616	0	21,616	93.2
Kyobashi	31,880	29,290	0	29,290	91.9
Shiba	38,640	16,769	398	17,167	44.4
Azabu	19,320	185	721	906	4.7
Akasaka	11,590	1,863	323	2,186	18.9
Yotsuya	15,940	642	124	766	4.8
Ushigome	26,080	0	515	515	2.0
Koishikawa	32,360	1,201	462	1,663	5.1
Hongo	28,500	7,106	357	7,463	26.2
Shitaya	45,400	33,451	340	33,791	74.4
Aasakusa	63,760	59,192	133	59,325	93.0
Honjo	59,890	54,781	493	55,274	92.3
Fukagawa	43,950	40,743	0	40,743	92.7

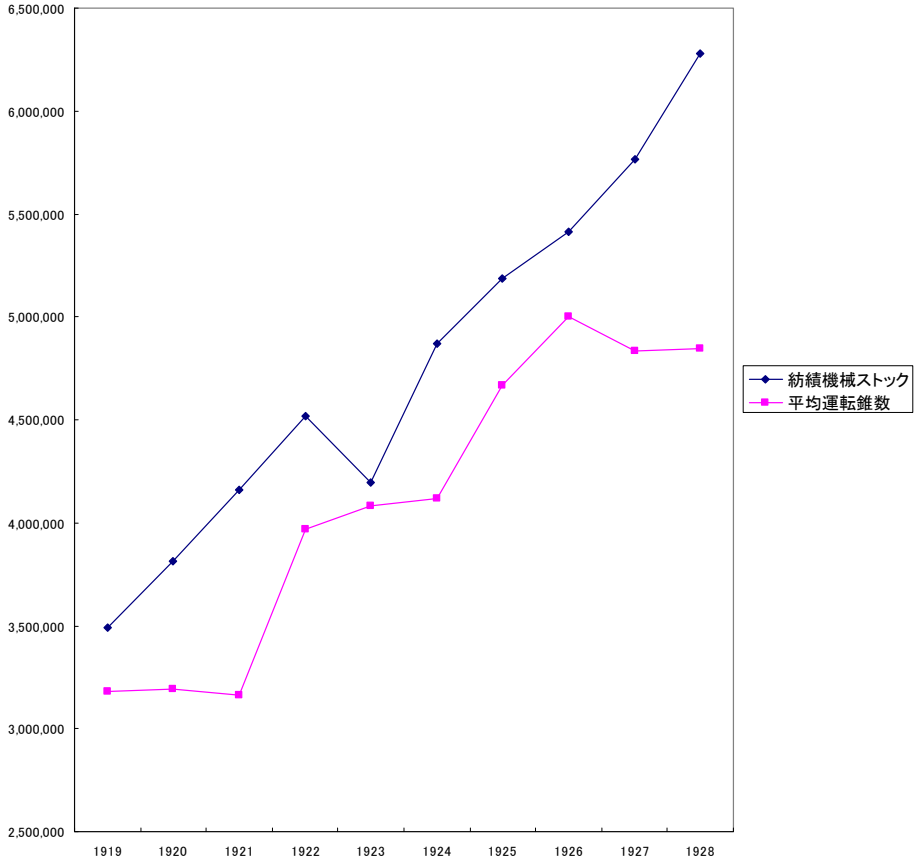
Comparing three great earthquakes in modern Japan

	Year	Amount of damage (2010 price, 100 million yen)	GDP(GNP) in the preceeding year (2010 price, 100 million yen))	Ratio ti GDP(GNP) (
Great Kanto	1923	69,163	194,756	35.5
Hanshin	1995	82,206	4,182,677	2.0
East Japan	2011	169,000	4,791,760	3.5

Macro-economic impact of the Great Kanto Earthquake



Why the short-term macro impact was not so large ? : A case of the cotton industry



Direct impact on the financial system（Bank of Japan 1933）

- Destruction of collaterals
- Defaults by the damage on the borrowers
- Fall of financial asset prices

Policies on the financial system

- Moratorium（1923.9.7）
  - Due dates of the loans to the borrowers in the damaged areas were extended by 30 days
- Discount of bills by the Bank of Japan, backed by the guarantee of the government

  ←”In order to prevent financial instability by supplying liquidity, it was necessary for the BOJ to discount such bills that were not confirmed to be sound”
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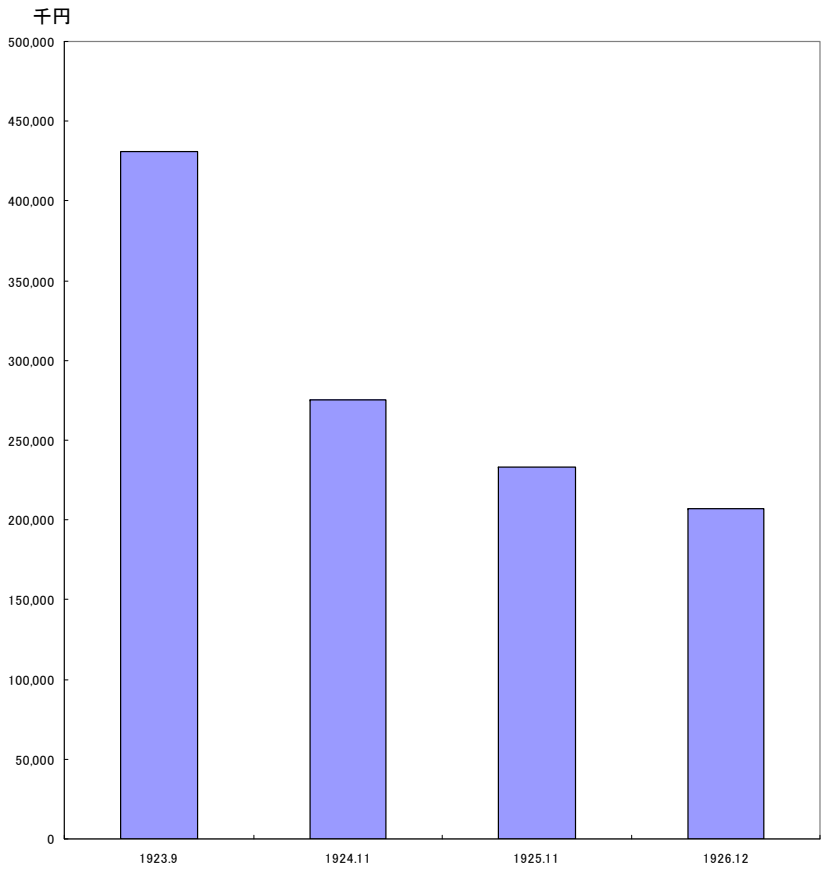
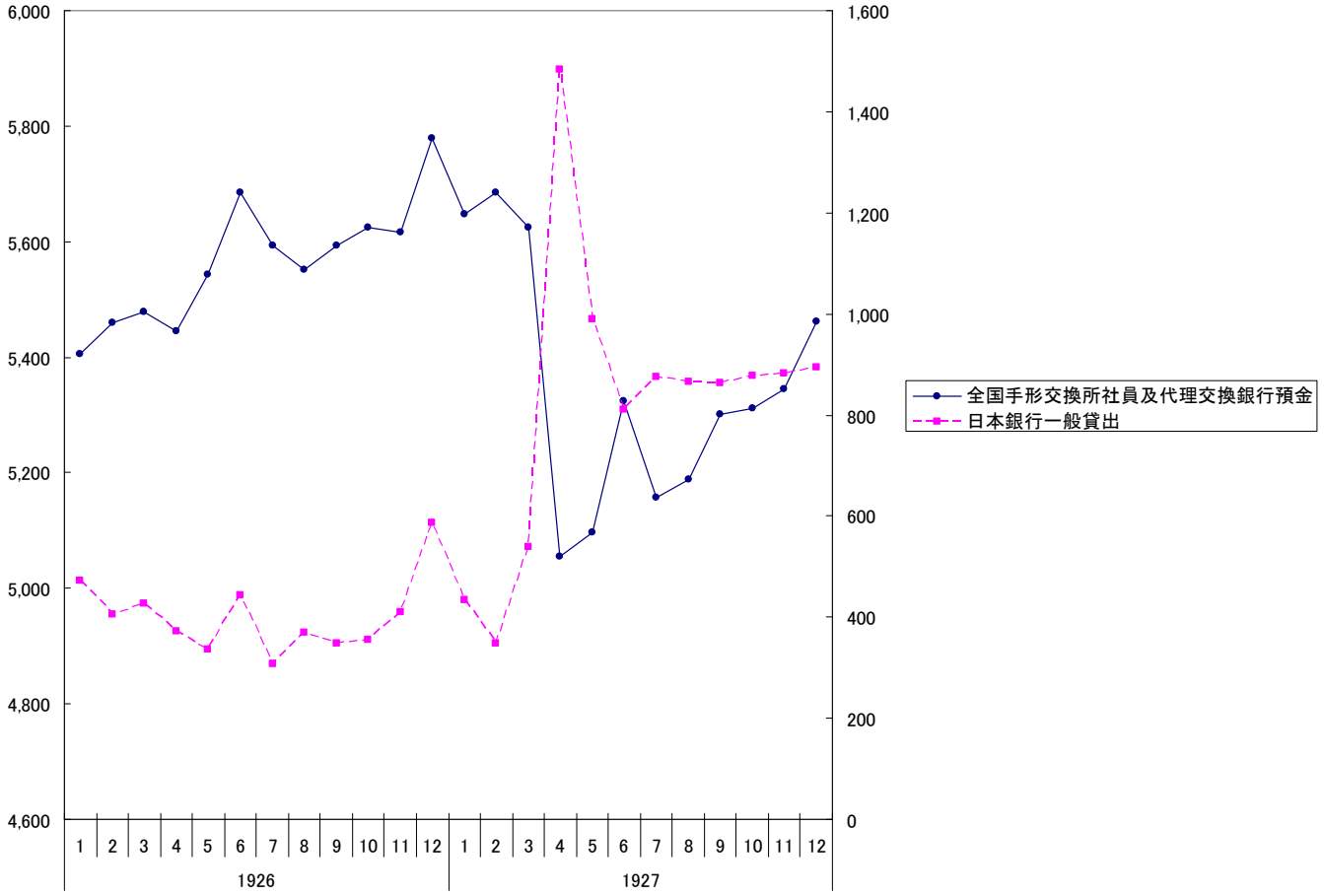
Major borrowers of the bills discounted by the BOJ under this scheme

	Amount (1,000 yen)
Suzuki	71,890
Kuhara	22,200
Kokusai Kisen	8,040
Hara	7,720
Takada	7,510
Murai	7,420
Nichiro Gyogyo	6,750
Oba	2,150
Nichibei Kiito	5,950
Yamamoto	4,630
Others	286,556
Total	430,816

Delayed collection of discounted bills



Showa Financial Crisis in 1927 and liquidity supply by the BOJ



Selective policy by the BOJ: Regression analysis

Dependent variable: Special loan by BOJ	係数		∂Pr/∂x
Asset	0.522	***	0.190
ROA	6.476	**	2.360
Loan-deposit ratio	-0.011		-0.004
Reserve ratio	-0.095		-0.035
Capital ratio	-0.684		-0.249
Urban	-0.346	*	-0.129
Relationship with BOJ (BOJ)	0.483		0.166
BOJ*ROA	40.327	*	14.700
BOJ*Loan-deposit ratio	0.176		0.064
BOJ*Reserve ratio	0.255		0.093
BOJ*Capital ratio	-5.818	*	-2.121
Log likelihood	-126.565		
Pseudo-R^2	0.330		
Obs.	288		
Positive obs.	193		

Summary on the financial issues

- Policies in the early stage
  - Giving priority to avoid “Type Ⅰ error”
    - Preventing failures of solvent banks and firms, taking the risk of rescuing insolvent banks and firms as well

- Policy change in the 1926-27
  - Being careful to avoide “Type Ⅱ error”
    - Rescuing only solvent banks and firms under the financial crisis

Long-term change in the spatial distribution of factory workers in Tokyo

		Number of factory workers			Percentage		
		1922	1923	1936	1922	1923	1936
Tokyo Prefecture		183,521	119,012	376,718	100.00	100.00	100.00
Tokyo City	Kojimachi	2,335	1,671	4,008	1.27	1.40	1.06
	Kanda	5,984	1,435	7,676	**3.26**	**1.21**	**2.04**
	Nihonbashi	2,075	552	3,105	1.13	0.46	0.82
	Kyobashi	13,914	2,154	12,810	**7.58**	**1.81**	**3.40**
	Shiba	15,684	6,456	23,955	8.55	5.42	6.36
	Azabu	2,567	2,486	4,019	1.40	2.09	1.07
	Akasaka	421	568	844	0.23	0.48	0.22
	Yutsuya	675	834	934	0.37	0.70	0.25
	Ushigome	2,838	3,216	4,668	1.55	2.70	1.24
	Koishikawa	6,300	6,835	6,641	3.43	5.74	1.76
	Hongo	2,388	1,611	3,397	1.30	1.35	0.90
	Shitaya	3,227	1,827	6,564	1.76	1.54	1.74
	Asakusa	3,471	866	9,486	1.89	0.73	2.52
	Honjo	23,206	7,613	31,582	**12.64**	**6.40**	**8.38**
	Fykagawa	13,525	2,176	12,670	**7.37**	**1.83**	**3.36**
Counties	Ebara	15,284	15,205	83,059	8.33	12.78	22.05
	Toyotama	6,121	4,985	18,219	3.34	4.19	4.84
	Kitatoshima	25,205	24,085	59,885	13.73	20.24	15.90
	Minamiadachi	1,693	1,610	10,778	0.92	1.35	2.86
	Minamikatsushika	36,608	32,827	72,418	19.95	27.58	19.22

Testing the recovering power of spatial distribution (1)

Dependent variable : Growth rate of worker share (1923-36)						
	(1)		(2)		(3)	
Growth rate of worker share 1922-23	-0.670	***	-0.880	***	-0.927	***
Growth rate of worker share 1915-22			-0.280		-0.135	
Density of worker share 1922			-0.290		-0.341	*
Ratio of industrial zone					0.480	
Const.	-0.067		0.157		0.113	
Obs	20		20		20	
R^2	0.528		0.625		0.659	

Testing the recovering power of spatial distribution (2)

Dependent variable : Growth rate of worker share (1923-36)						
	(1)		(2)		(3)	
Growth rate of worker share 1922-23 Textil	-0.766	***	-0.846	***	-0.864	***
Growth rate of worker share 1922-23 Mach	-0.189		-0.261		-0.302	
Growth rate of worker share 1922-23 Chem	-0.578	***	-0.618	***	-0.638	***
Growth rate of worker share 1922-23 Food	-0.729	***	-0.841	***	-0.876	***
Growth rate of worker share 1922-23 Other	-0.924	***	-1.064	***	-1.117	***
Growth rate of worker share 1915-22			-0.099		-1.003	
Density of worker share 1922			-0.196	*	-0.291	***
Ratio of industrial zone					0.870	***
Const.	-0.059		0.143		0.077	
Obs	97		97		97	
R2	0.409		0.444		0.498	

Summary on the spatial distribution of industries

- Impact of the earthquake on the spatial distribution of workers
  - Concerning the industry total, the impact was not persistent
    - Seemingly persistent shock in the descriptive statistics reflect the long-term general tendency that industries moved from the congested downtown to suburban areas
  - Difference in the persistence across industries
    - Concerning the machinery and metal industry, the earthquake gave a persistent impact on the spatial distribution
    - Role of close networks between plants

Lessons to the present

- We may not be so pessimistic on the long-term negative impact on the macro-economy
  - The impact of the Great Kanto Earthquake, which gave a 10 times larger damage relative to GDP, was overcome
  - In general, the impact on the spatial distribution on industries was not persistent

- Policy implications
  - Financial policies
    - Need to consider the timing of policy change
      - From overall rescue to selective rescue
  - Industrial policy
    - Need to focus on selective industries as a part of the strategic policies for the growth of the whole Japanese economy