The extent and composition of disaster relief after China's 1823 flood: New archival evidence

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Abstract: In 1823, large parts of China were drowned in one of the heaviest floods of the whole Qing dynasty (1644-1911), but detailed data on its impact and government responses have so far been scattered. Due to a recent reorganization of China's First Historical Archives, however, this paper is able to provide new evidence about the flood's impact as well as the extent and composition of central government disaster relief. This matters especially because many scholars believe that because of this flood, China entered into the "Daoguang Depression" providing the background for China's "lost century" in connection with interior and exterior security issues such as the First Opium War (1839-42), and the Taiping rebellion (1850-64). Our evidence thus may help to understand if these combined challenges exceeded state capacity when modernization would have required internal reform more than ever. We find that in the 17 provinces for which we have data at least 20 percent of all counties were flooded, half of them seriously. The combination of tax relief, water works and direct payments grew proportionally with the share of counties affected by the flood and totaled to about 26 million taels of silver, more than half of annual fiscal revenue of the Qing state.

Key words: Daoguang Depression, disaster relief, China, 19th century, state capacity

1. Introduction

No matter if from the perspective of meteorological, disaster or economic history, the year of 1823 (the third year of the Daoguang emperor's rule) was an all-important node. In this year, the Qing dynasty suffered a nationwide flood known as the "1823 flood," which led to enormous loss of lives, capital, and government resources. The Qing History Record (*Qing Shi Gao)* offers a flavour of how contemporary historians evaluated the relevance of this flood: "Since the Qing Dynasty had been established, the country entered into a peaceful and prosperous time as never before in the history […] However, this prosperity ended in 1823 because of the big flood." His words were quoted by Feng Guifen, a very famous scholar in the Late Qing. Feng said: "A lot of energy and strength were been spent in the flood of 1823. Merchants and farmers experienced great losses, and ordinary people changed from rich to poor gradually."[1] Feng's notion of the flood was later taken up by Zeng Guofan and Li Hongzhang, two powerful officials, and thus became very influential.

When it comes to the reasons for the flood, some scholars believe that it was caused by climate

[1] Feng Guifen, Please Reduce the Land Tax in Suozhou and Songjiang, in his book *Xian Zhi Tang Gao*, Volume IX, print in 1876.

change and the end of the 6th Little Ice Age while others argue the flood was a by-product of the eruption of the Tambora volcano in Indonesia in 1815. Concerning the consequences, some scholars argue that this flood was an important factor in to the "Daoguang Depression," a secular downturn in the first half of the 19th century.[2] While increasingly many scholars recognize the importance of the flood, there is a lack of quantitative research about the losses it actually inflicted on the Chinese society, economy and state. In this paper, we will therefore take up parts of this challenge and discuss the fiscal expenditures of the central government caused by the flood.

The main contribution consists in using hitherto unavailable archival resources, and in the fact that we base our research almost only on material that we collected ourselves. Thus, the paper will to a large extent describe the evidence from this endeavour, especially about the reports of the extent of the flooding in various provinces, and a discussion of the possibility to assess the death toll. Then we list the amounts spend by the government and their distribution across provinces decomposed by type of expenditure. Finally, we analyse the evidence in the light of recent debates. We find that the amount of relief was proportional to the flood intensity and thus find an element of objectivity in the structure of disaster relief that defies notions of other rationales, such as military strategic or political ones that would open up possibilities of strategic behaviour on lower levels of government. (We do however acknowledge the preliminary state of our findings.)

We also find that the total amount of spending in real terms per capita of the affected population was comparable to what Britain spent per capita during the Irish Famine. (Again we do not want to draw premature conclusions from this but simply put our findings in a context.)

As a share of government size, Chinese spending in 1823 was about 20 times higher than British spending or 60% versus 3%, respectively. Concerning the questions of state capability it should become clear that this flood overburdened the Chinese state with responsibility, and that this left few resources for other public goods such as defence or transport infrastructure in a time when other countries established or increased their paved road network at an astonishing speed.[3]

2. Description of archival sources

This article is based almost entirely on archival material, and relies on secondary literature only for some auxiliary comparisons. It contributes to the literature firstly by introducing, describing and explaining this new material, and secondly by putting it in the relevant context. This section gives an overview over the nature and extent of the used material.

The archival material can be divided into published and unpublished archives. The most important published material used includes research undertaken at the China Institute of Water Resources and Hydropower Research[4] as well as the "Edict Records of Jiaqing and Daoguang

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[2] There are several publications about this topic. There most important are: Wu Chengming,The Economy during the 18-19th century in China, in his book *China's modernization: the market and society*, Beijing: Sanlian Bookshop, 2001; Li Bozhong: "Daoguang Depressions" and 1823 Flood" , in the Journal of the Social Sciences, Vol 6, 2007; Cao Shuji, Mt. Tambora, Climatic Changes, and China's Decline in the Nineteenth Century"，Journal of World History, the 23rd in 2012.

[3] Uebele and Gallardo (2015).

[4] *Qingdai haihe luanhe honglao dang'an shiliao* 清代海河滦河洪涝档案史料. Comp. Shuili shuidian kexue yanjiuyan 水利水电科学研究院【China Institute of Water Resources and Hydropower Research】. Beijing: Zhonghua shuju, 1981.

Qingdai huaihe honglao dang'an shiliao 清代淮河洪涝档案史料. Comp. Shuili shuidian kexue yanjiuyan 水利水电科学研究院【China Institute of Water Resources and Hydropower Research】. Beijing: Zhonghua shuju,

Times" published by the First Historical Archives of China.[5]

These publications are very valuable for the understanding of the 1823 flood, since they contain reports of the provincial officials to the court in Beijing. Thus readily accessible, they have been widely used in the literature.[6] However, they contain only a small part of the total material. Moreover, they focus on the impact of flooding and other water engineering. In order to provide a more comprehensive picture of the 1823 flood, one needs to access unpublished material as well, which is stored in the First Historical Archives of China (Beijing) and mainly includes the "Palace Midrange Rescript Memorials,"[7] the "Extra Copies of the Grand Council Memorials,"[8] and the "Collection of Disaster Relief Materials."[9]

The published archives mentioned above are a selection from these, but represent no more than 10% of them. The unpublished archives thus offer much more detail and depth. In particular, in these reports, the provincial officials reported the number and level of the flooded counties in their respective province. They reported an assessment of the severity and characteristics of the flood, and they also needed to report what kind of measures they had taken and what they expected from the central government in terms of assistance.

In addition to the archival material we also accessed historical gazetteers reporting about counties, prefectures and provinces, and historical records such as published collections of the writings of individual officials, which can also be highly valuable.

Finally, we also made use of some official handbooks, mainly the "Rules and Explanations of the Qing Dynasty,"[10] and the "Veritable Records of the Qing Dynasty."[11]

Underlying this article therefore are excerpts from the archival records about the 1823 flood of more than 150,000 Chinese characters or about 150 A4-pages. Of course we can still not claim to have covered all available sources but we are confident that our collection includes most of the relevant written evidence available.

3. The flood in 1823 and governmental response

3A. Extent of the flood

The territory of the Qing state was vast and enormously complex, so it was not uncommon that

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1988.

Qingdai changjiang liuyu xinan guojiheliu Honglao dang'an shiliao 清代长江流域西南国际河流洪涝档案史料. Comp. Shuili shuidian kexue yanjiuyan 水利水电科学研究院【China Institute of Water Resources and Hydropower Research】. Beijing: Zhonghua shuju, 1991.

Qingdai huanghe liuyu honglao dang'an shiliao 清代黄河流域洪涝档案史料. Comp. Shuili shuidian kexue yanjiuyan 水利水电科学研究院【China Institute of Water Resources and Hydropower Research】. Beijing: Zhonghua shuju, 1993.

[5] *Jianqing Daoguang Liangchao Shangyu Dang* 嘉庆道光两朝上谕档(Edict Records of Jiaqing and Daoguang Times), edited by the First Historical Archives of China (Beijing), Guilin: Guangxi Normal University Press, 2000.

[6] Li (2007) relies partially on them.

[7] Zhupi Zouzhe 宫中档朱批奏折(Palace Midrange Rescript Memorials).

[8] *Lufu Zouzhe* 军机处录副奏折(Extra Copies of Grand Council Memorials).

[9] *Qingdai Zaizhen shiliao huibian* 清代灾赈史料汇编(Collection of Disaster Relief Materials).

[10] *Daqing Huidian Shili* 大清会典事例(Rules Explanation of the Qing Dynasty). Shanghai: Shangwu Yinshuguan, 1908.

[11] *Qing Shilu* 清实录（Veritable records of the Qing Dynasty）Beijing:Zhonghua shuju,1986.

there would be serious disasters in the 18th and 19th centuries. However, the flood in 1823 was exceptionally intensive.

Shares of counties flooded

We can compare the intensity of the flood in the provinces by using our archival evidence about the number of counties flooded, and report them as a share of the respective total number of counties. According to this, the most seriously affected provinces were Zhili (89% of all counties affected), Jiangsu (84%), Anhui (66%) and Zhejiang (30%), while Shandong (13%), Henan (15%), Hubei (24%), Jiangxi (14%) had a somewhat better situation. Finally, provinces such as Hunan (7%), Yunnan (8%), Guizhou (1%), Sichuan (1%), Guangdong (7%), Shaanxi (3%) and Shanxi (1%), were still affected by the flood but rather marginally. After a thorough investigation of the archival material it appears that the outbreak of the flood was worst between June and August 1823[12], although in some provinces it rained even from April to August.

Zhili was the province flooded most heavily. There the flood was concentrated on mid-July and put 120 out of 135 counties under water. Initially, however, the year began with the fear of drought as no rain fell in spring and early summer. Thus, the Emperor and the Governor carried out a ceremony to pray for rain. At the beginning of July, it began to rain in Baoding prefecture and some other places. Then, during the middle of July, the sources say that "the rain, especially at night, was so heavy that in some low lands, all the seeds were destroyed."[13] At the same time, many riverbanks burst. The water level of Yongding River, the biggest river around Beijing, rose to dangerous levels, and the banks finally burst in July. The governor reported that the water was everywhere, and that this situation was extremely rare.[14] Among the 135 counties in Zhili, 81 counties in Zhili were reported being under water on August.[15] Since it was the province nearest to the capital, Zhili received the biggest attention by the Central Government but a week later, 21 counties were added to the list.[16] In the tenth month of the year, the flood continued and the total increased to 120, or 89% of all counties.

From the summer, the Yangtze Delta area was in disaster, especially in Jiangsu Province. In April, the rain was uninterrupted and a lot of rivers burst. Some land was covered with 1 or 2 meters water. In the whole May, more heavy rain fell and even continued to fall until to the middle of June. As if this had not been enough, from late Jun*e* to the middle of July rain fell almost continuously. Many riverbanks broke, and houses collapsed. According to one of the latest reports, after several months of continuous rain, 66 of the 79 counties in Jiangsu province were flooded, 47 of them seriously.[17] Zhejiang also experienced abnormally amounts of rain at that time. In March, when a great flood broke out, many houses were destroyed.[18] In July, in some areas it was still raining, such that, according to the statistics, 26 of 88 counties were flooded.[19] Except the drowned farmland, several salt mines in Jiangsu and Zhejiang had been put under water. Due to the extreme rainfalls, 16 salt mines in Jiangsu stopped to work.[20]

Anhui's flood began in May, later than in Jiangsu. A large number of counties were under

[12] Throughout the paper we converted all dates to the Western solar calendar. For example, April to June was May to July in the Chinese lunar calendar.
[13] China First Historical Archives (Beijing) : no. 04 -01-30-487- 19.
[14] China First Historical Archives (Beijing) : no. 04-01-01-647-17.
[15] China First Historical Archives (Beijing) :no. 04-01-01-0649-015.
[16] China First Historical Archives (Beijing) :no.04-01-01-0649-046.
[17] China First Historical Archives (Beijing) :no. 04-01-35-0057-049.
[18] China First Historical Archives (Beijing) :no. 04-01-01-0649-002.
[19] China First Historical Archives (Beijing) :no. 04-01-35-0057-047.
[20] China First Historical Archives (Beijing) :no. 04-05 01-35-0502-008.

water, and several rivers flowed over in Luzhou prefecture. Several people were reported dead in Nanling county due to the heavy rainfalls. From June to August, more heavy rainfalls occurred, and according to the provincial reports 45 counties were flooded in Anhui.[21] One year later, the Governor of Anhui reported to the Emperor: "The water in 1823 was very heavy not only because there was a lot of rain in Anhui, but also because of the big rains in Sichuan, Shaanxi, Hubei, Hu'nan and Jiangxi provinces at the same time, as Anhui is the main area for this water to the ocean. There are more than 1 million people seriously affected by the disaster."[22]

Shandong, Henan, Hubei, Jiangxi and Hunan were the provinces with only restricted destructions. Henan experienced rain from May to July, and 11 of 116 counties were flooded.[23] The situation in Shandong was similar to Henan. From April to June, Shandong suffered sustainable rainfalls, and 15 of its 116 counties were flooded.[24] At the same time, several rivers in these provinces flowed over, including the South Canal, the Wei River, the Zhang River and the Qin River. During that time, the Wei River burst 16 times, and the Qin River three times.[25]

In Hubei province, the flood happened mainly in April and June. It rained about five to ten times in early-, mid-, and late-April, respectively. Altogether, 17 of the 72 counties were under water.[26] Furthermore, along the Yangtze River in Jiangxi province 13 of the 92 counties were affected by the flood.[27]

Adding to these reports, more floods were reported to the Court in other areas of China. From April to June, flooding was experienced in ten of 124 counties in Yunnan, eight of 109 counties in Guangdong, and three of 97 counties in Shaanxi. More relevant reports came from Guizhou, Sichuan, Shanxi, Gansu, and Heilongjiang provinces.

In total, from February to July 1823, 348 counties, more than 20% of China's 1700 counties, were flooded.

Death toll

We also tried to assess other relevant socio-economic consequences of the flood using archival sources, such as a death toll estimate, because it would be easily comparable to other disasters in history. Li[28] summarizes the social impact of the flood using evidence from a compilation of gazetteers,[29] while most the evidence from the First Historical Archives was not available to her. According to this the qualitative assessments about the number of bodies was often "many" or similar. In our sources we found this as well. However, numbers such as "a death rate of more than 1000 per day" (in connection with a cholera epidemic) that was allegedly reached in Beijing in the summer of 1823 is not consistent with our archival evidence nor did we manage to reproduce this number from our sources.[30]

In particular, the references cited by Li consist of two county gazetteers (Luanxian and

[21] China First Historical Archives (Beijing) :no. 04-01-01-0643-027.
[22] *Qingdai changjiang liuyu xinan guojiheliu Honglao dang'an shiliao* 清代长江流域西南国际河流洪涝档案史料. Comp. Shuili shuidian kexue yanjiuyan 水利水电科学研究院【Research institute for water and electrical power】, pp.663-664, Beijing: Zhonghua shuju, 1991.
[23] China First Historical Archives (Beijing) :no.04-01-01-0643-026
[24] China First Historical Archives (Beijing) :no. 04-01-35-0057-052。
[25] China First Historical Archives (Beijing) :no. 04-01-01-0647-069.
[26] China First Historical Archives (Beijing) :no. 04-01-35-0057-054.
[27] China First Historical Archives (Beijing) :no.04-01-01-0643-014.
[28] Fighting Famine in North China, Stanford University Press, 2007, p. 264.
[29] HHLY. See Li p. 462 for the reference.
[30] In passing we note that evidence in 1823 may be accounted for in the year 1822 in HHLY. This would explain inconsitencies with the flood impact reports found in the First Historical Archives underlying this article.

Wangduo county)[31] telling that "a lot of people died" in 1822, and two gazetteers (Wen'an and Youngping prefecture) writing that "many people died."[32]

In the following we provide a detailed account of the quantitative (and to some extent also stylistic) evidence found in the provincial reports about the number of deaths. The sum of the precisely counted deaths is low but we conclude that precisely quantifying the number of bodies was not central to the official reports.

In the archives we could not find the number of deaths in Zhili. They only written evidence is that people "died" in Shuntian, Xuanhua and six other prefectures.[33] In the middle of June, the Yongding River broke, and the ships transporting Tribute Grain to Beijing were taken away by the flood such that many sailors died.[34] Except Wen'an and Youngping prefectures mentioned by Li,[35] there are also other gazetteers writing that "a lot of people were injured" in Jingxing, and "a lot of people died in the city" in Lulong county.[36]

In Jiangsu, we found a record that contained that after June due to the rain, "a lot of people and animals died" in Kunshan county.[37] Zhejiang province reported that in March, 15 people drowned, three in Jiande county and twelve in Chun'an county.[38] In May, ten people drowned in Fengshui and Zhuji counties.[39] So in total 25 people were counted dead in Zhejiang but of course many more fall into the unquantifiable category.

Regarding Anhui, there were reports that more than ten people died in Jixi county, as well as "some people" in Xuanchen county and Wuwei prefecture.[40] In a local gazetteer, it was recorded that "a lot of people drowned" in Caoxian, Hezhou prefecture and Tongchen county.[41]

Furthermore, six people drowned in Huangmei county of Hubei province in this year.[42] In Yunnan, six peopled drowned in Yongshan county in February, and two women died in Jianshui county in June,[43] so eight altogether in Yunnan. In Sichuan, there were also eight people who drowned in Fuzhou county,[44] as well as twelve people in April of Zhenghe county, Fujian province, according to the local gazetteer.[45]

Next, in Shaanxi, twelve peopled drowned in Zhouzhi county in June, and ten people drowned in Zhiyang county in the same month,[46] thus 22 in total in Shaanxi. In Ganshu, five soldiers drowned in Zhongwei county in May,[47] and three women drowned in Qinzhou.[48] In Guangdong

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[31] *Haihe liuyu lidai ziran zaihai shiliao* 海河流域历代自然灾害史料(Historical materials on natural disasters in the Hai River Basin)(Comp. Hebei sheng hanlau yubao keti zu. Beijing:Qixing chuban she, 1985), p. 682.
[32] Ibid. (p. 685).
[33] China First Historical Archives (Beijing) :no. 04-01-01-0649-015.
[34] China First Historical Archives (Beijing) :no. 04-01-01-0649-031.
[35] Fighting Famine in North China, Stanford University Press, 2007, p. 264.
[36] (Guangxu) Xuxiu Jingxing Xianzhi (*Continuation Jingxing County Gazetteer*) , Vol.3;(Guangxu) Yongping Fuzhi (*Yongping Prefecture Gazetteer*), vol.31.
[37] (Daoguang) Kunshan Xianzhi (*Kunshan County Gazetteer*), vol.39.
[38] China First Historical Archives (Beijing) :no. 04-01-01-0649-002.
[39] China First Historical Archives (Beijing) :no. 04-01-35-0057-047.
[40]China First Historical Archives (Beijing) :no.03-169-9853-44, 03-169-9854-17.
[41](Daoguang) Caoxian Zhi (*Caoxian Gazetteer*), vol.17; (Guangxu) Zhili Hezhou Zhi (*Hezhou Gazetteer*), vol.37;(Daoguang) Xuxiu Tongcheng Xianzhi (*Continuation Tongcheng County Gazetteer*),vol. 23.
[42]China First Historical Archives (Beijing) :no.03-169-9855-24.
[43]China First Historical Archives (Beijing) :no. 03-169-9853-20, 03-169-9853-46.
[44]*Qingdai changjiang liuyu xinan guojiheliu Honglao dang'an shiliao* 清代长江流域西南国际河流洪涝档案史料. Comp. Shuili shuidian kexue yanjiuyan 水利水电科学研究院【Research institute for water and electrical power】, pp.651, Beijing: Zhonghua shuju, 1991.
[45](Mingguo) Zhenghe Xianzhi (*Zhenghe County Gazetteer*), vol.3.
[46]China First Historical Archives (Beijing) :no.03-169-9854-14, 03-50-2843-18.
[47]China First Historical Archives (Beijing) :no. 03-169-9853-39.
[48]China First Historical Archives (Beijing) :no.03-169-9854-45.

province, 27 people drowned in the floods in Lianzhou, and in addition 15 people drowned in Yangshan county in *June*.[49]

In sum, the total number of people dying in the flood directly is only 141. This however does not mean that the death toll was really that low. It may be that the reports send to Beijing signalled the severity of the famine in qualitative terms only. As the next section will show the reactions that the reports triggered in Beijing were of a major scale both in comparison to earlier floods[50] and compared to other early modern states in Europe in similar crises.

Grain prices

The third way to assess the severity of the flood is to look at the shortage of food. In the absence of quantities of harvests a reliable measure is usually the reaction of market prices. This information is not systematically contained in the archival records we mainly used for this paper but there is data about this in the literature.[51] Table 1 provides some evidence about this for four provinces: Anhui, Shandong, Zhejiang and Jiangsu.

Table 1: Price behavior during and after 1823 flood

Percentage increase of grain prices from 1822 to 1823

	Province Averages		Prefecture with largest increase			
	Rice	**Wheat**	**Rice**		**Wheat**	
Shandong						
Cal. Year Avg.	-0,01	0,02	0,02	Linqing	0,12	Dongchang
August Prices	-0,01	0,04	0,05	Jining	0,15	Wuding
Anhui						
Cal. Year Avg.	0,12	0,12	0,34	Taiping	0,36	Taiping
August Prices	0,15	0,11	0,30	Taiping	0,26	Chizhou
Jiangsu						
Cal. Year Avg.	0,15	0,02	0,18	Tong	0,20	Zhenjiang
August Prices	0,14	0,03	0,28	Tong	0,22	Zhenjiang
Zhejiang						
Cal. Year Avg.	0,04	0,02	0,19	Yanzhou	0,08	Quzhou
August Prices	-0,01	0,03	0,21	Yanzhou	0,11	Quzhou

As we only aim at providing some idea about the extent of the flood it is sufficient to show that indeed in some of the provinces of our data set we can indeed observe large reactions of prices for food staples which corresponds with severe shortage of food.[52]

[49] China First Historical Archives (Beijing) :no.03-169-9854-47.
[50] It was never happened such scale flood in the Qing Dynasty before.
[51] We would like to thank Bas van Leeuwen to provide us with the data underlying Van Leeuwen et al (2012).
[52] More systematic analyses about the relation between flood intensity and price reactions must be left to further research.

The data set consists of 52 monthly price series for rice and wheat each from 1736-1911 of which we only present the change of prices between 1822 and 1823. In each province there are about a dozen of series at prefecture level. This allows for some insights into the large regional variation within and between provinces. We calculated percentage increases for both provincial averages and the prefecture with the largest respective price increase for rice and wheat each. We also present the change for solar calendar year averages and between August 1823 and 1822 (solar calendar). Thus for each province there are eight percentage price changes.

The province hit hardest by the flood for which prices are available is Jiangsu province. It is also the one which shows on average the largest price reactions with 15% increase for rice. However, wheat prices reacted only to a very limited extent. In Tong and Zhenjiang prefectures we even observe about 20% price increases.

The next hardest province was Anhui with 66% affected counties, whose grain markets reacted in a similar manner as those in Jiangsu. Some prefectures even had price increases of more than 30%.

Zhejiiang, of which 30% counties were flooded had on average almost no price reactions, but some prefectures were hit harder than others with about 20% prince increases. This holds also for Shandong but to a more limited extent.

While these reactions seem to reflect the intensity of the flood in a systematic way, they are not extreme compared to other regions or other periods. For example, the "year without a summer" 1816 after the eruption of the Tambora volcano in Indonesia in 1815 was followed by price increases in Europe between 50 and 100%.[53]

Moreover, we observe similar price changes (no more than 30%) in connection with another flood in 1833. We may thus conclude that the flood caused food scarcity, however not in an extreme way. If that was a result of a somewhat restricted impact on harvests or an outcome of successful governmental disaster management (or both) must remain open at this particular point.

3B. Fiscal responses

We divide the fiscal expenses of the central government in Beijing caused by the 1823 flood in two parts: direct ones and indirect ones. Direct expenses refer to payments by the government to subsidize food, clothes, and shelter to the people, including payments for water infrastructure works. Indirect expenses refer to the part of tax that the government did not want or was not able to collect, including tax exemptions and decreases of the tax base due to the disaster.

Private relief activities are not the focus of this paper. This however does not mean they might not have been substantial. To the contrary, there is evidence that their extent must have been large. Chinese landlords and the wealthy in general were to the best of our knowledge aware of the Confucianist ethics to help the poor. In addition, their generosity would be rewarded by the Central government with honorary titles or official positions. Also, local officials would sometimes donate private money to support people affected by a disaster. For example, the wealthy of Jiangsu province donated large amounts of grain during in year of 1823 ranging from 20,000 to 100,000 dan in different counties.[54] At the same time, officials also donated money as a private initiative, and officials at different levels of government of Yangzhou prefecture in Jiangsu

[53] Stothers (1984). Based on wheat prices observed in Austria, Belgium, France, Germany, and Sweden. See Uebele (2011) fort he data references.

[54] One dan of rice equals 50 kg approximately.

province donated 16,000 taels of silver from their private salaries for the flood-affected population in this year.[55] As can be seen below this compared with 1.86 million taels of direct government support and was thus a substantial addition.

Direct payments by the central government

The biggest part of direct expenditures were relief payments. In the period of the Daoguang Emperor (1821-1850), the process of relief distribution worked generally in the following way: The provincial officials should report the disaster within 40 days. If emergency assistance was needed, the officers of provinces should support the people in advance using local resources, such as building temporary shacks, and distributing food and clothes to the homeless as well as contributing money for funerals.[56] After the central government received the disaster reports, they would send officials for closer investigation and checking on the measures undertaken already.

The capital itself was in dire need of relief in 1823. In June, an officer reported that it had been raining in Beijing and its surrounding areas since May, which had already caused "the price of food and other daily necessities to rise quickly." He suggested the government to set up measures to reduce food prices,[57] to which the Daoguang Emperor agreed. Because the areas surrounding the capital were heavily flooded, "the number of poor people was twice the number of the previous years," and the measures to control prices continued until the following year. Altogether, more than 62,600 dans of rice and 7100 taels of silver were distributed.[58]

Zhili province was the area hit hardest in this flood. Being close to the capital, it also received more attention with regards to relief (see Figure 2 and the discussion in the next section). When the disaster began, the local official supported the population in disaster by using money and food according to the traditional system.[59] Since city of Tianjin, a major city in Zhili was massively flooded, the local government firstly distributed 1,200 dans of rice.[60] The counties of Wuqing and Baodi were also affected seriously, and received 73,573 taels of silver.[61] In June, 21 of the 135 counties were affected by the flood, so they collectively received relief payments of 1.8 million taels of silver. Because of the lack of rice reserves, 400,000 dans of rice taken from tribute grain were delivered to Zhili,[62] in addition to a number of other miscellaneous measures.[63] In total, more than 1,685,700 taels of silver and more than 550,000 dans of rice were used to relieve the province of Zhili from the immediate flood consequences.

The relief methods in Jiangsu were similar. In June, 23 counties were flooded and the situation became very serious. The Jiangsu governor initially sent food that could support people for one month, and 200,000 taels of silver were distributed to the poor.[64] Afterwards when food prices rose, the government collected silver to buy rice from neighbouring provinces.[65] According to reports from the Jiangsu governor, North Jiangsu needed one million taels of silver, and South

[55] China First Historical Archives (Beijing) :no.04-01-01-0643-029.
[56] In general, there would be five taels of silver for the soldiers and one tael for civilians.
[57] China First Historical Archives (Beijing) :no.09-9864-001.
[58] China First Historical Archives (Beijing) :no.03-9854-011.
[59] China First Historical Archives (Beijing) :no. 04-01-01-0649-015.
[60] China First Historical Archives (Beijing) :no.04-01-35-0057-050.
[61] China First Historical Archives (Beijing) :no.03-9855-047.
[62] China First Historical Archives (Beijing) :no.04-01-35-0243-028.
[63] China First Historical Archives (Beijing) :no.04-01-01-0645-009.
[64] China First Historical Archives (Beijing) :no.04-01-01-0649-017.
[65] China First Historical Archives (Beijing) :no.01-35-0057-049.

Jiangsu needed about 360,000.[66] As a whole, Jiangsu used 1,820,000 taels of silver and 277,187 dans of rice for relief activities.

There are only two records about relief in Zhejiang. The first one contains that 7,000 taels of silver were sent to Jiande and Chunan counties.[67] Another is that the local government sent 300,000 taels of silver to buy rice from the neighbouring provinces.[68] Since the salt mines of Jiangsu and Zhejiang suffered from the flood, they also received support from the government, however, the amount of silver being unknown.[69]

Different from Zhejiang, the records about Anhui are very detailed. In April, 8,000 taels of silver were sent to those in need.[70] In June, 1,300,000 taels of silver were used for relief.[71] In *August,* Anhui sent officials to buy 10,000 dans of rice collected in Sichuan, Hubei, Hunan and Jiangxi provinces.[72]

Hubei province also spent 138,846 taels of silver for the poor,[73] but there was only one record about the level of relief in Shangdong, which was 26,776 taels of silver to repair military barracks destroyed by the rain.[74] The situation of Hunan, Jiangxi and other provinces were in all likelihood similar but we could not find the respective reports.

As a total, direct relief payments recorded in the archives were 5,383,300 taels of silver and 954,287 dans of rice. However, the flood must also have affected other areas in China. We thus assume that in addition substantial payments were made in unknown areas and therefore revise the total figure upwards. The actual amount of direct payments was in all likelihood close to 8,000,000 taels of silver, and total rice shipments probably about 1,500,000 dans.

Apart from silver payments and food shipments, river engineering was the third part of direct fiscal expenditure by the central government. From the archival records we can see that the provincial government of Zhili spent 201,972 taels of silver to repair the Yongding River between *May* and *August*.[75] Zhili also spent 219,062 taels of silver on the northern Grand Canal[76] summing up to 421,034 taels.

Next, Henan province spent 196,400 taels of silver to strengthen the dams of the Qin River,[77] while Shandong province spent 36,514 taels of silver on flood control measures at the Wei River.[78] Since the Yellow River crossing Henan and Shandong provinces brought serious flooding from May to July, 1,327,266 taels of silver were spent to repair dike breaches.[79] Accounting for the respective provincial contribution between Henan and Shandong provinces, we can divide this number in two parts, such that when including their own expenses, we arrive at 860,033 taels paid in Henan and 700,347 taels paid in Shandong, respectively.

The rivers in Jiangsu province were hit by the flood at the beginning of April continuing into

[66] China First Historical Archives (Beijing) :no.04-01-01-0643-030.
[67] China First Historical Archives (Beijing) :no. 04-01-01-0649-002.
[68] China First Historical Archives (Beijing) :no. 04-01-02-0082-007.
[69] China First Historical Archives (Beijing) :no. 04-01-01-0643-040.
[70] China First Historical Archives (Beijing) :no. 04-01-01-0649-004.
[71] China First Historical Archives (Beijing) :no.04-01-01-0643-019.
[72] China First Historical Archives (Beijing) :no.04-01-01-0643-015.
[73] China First Historical Archives (Beijing) :no. 04-01-01-0643-054.
[74] China First Historical Archives (Beijing) :no. 04-01-20-0010-018.
[75] China First Historical Archives (Beijing) :no.04-01-01-0647-056.
[76] China First Historical Archives (Beijing) :no. 04-01-01-0648-051.
[77] China First Historical Archives (Beijing) :no. 04-01-01-0647-039.
[78] China First Historical Archives (Beijing) :no.04-01-01-0648-056.
[79] China First Historical Archives (Beijing) :no.04-01-01-0648-024.

August, and 380,000 taels of silver were spent on reconstructing their banks.[80] The expenditures made in Zhejiang have not been recorded very neatly, unfortunately, except one record of 20,810 taels of silver for riverbank repairs.[81]

Finally, the total for Hubei, Jiangxi and some other places amounted to 2,528,693 taels of silver, while for Anhui, Yunnan, Guangxi, which also had known river projects, our records remain silent. Thus we guess that the total amount spent on river engineering would be about 3,500,000 taels of silver in 1823.

Summing up, direct payments we can trace back to archival records were 5,383,300 taels of silver and 954,287 dans of rice, plus 2,528,693 taels of silver for river repair works. However, we do not believe the archival records to be complete but probably missing about 30% of the total records as a rule of thumb. We therefore think that payments of 8 million taels in silver directly plus 3,5 million for rivers, and 1,5 million dans of rice would be more realistic.

Indirect expenditures: tax reductions

The second part of government expenditure consists of indirect expenditures or explicit reductions of the otherwise expected tax payments in normal times. There are four major types of payments or shipments arriving in the imperial coffers in normal times stemming from land tax, tribute grain, salt tax and customs duties. Since their normal annual amount was relatively stable, deviations in disaster years can be understood as indirect expenses dedicated to disaster relief.

First, land tax, was the main revenue source during the Daoguang reign at about 33 million taels of silver per year compared to total tax revenues of about 45 million taels, somewhat above 70%. Table 1 summarizes the expenditures paid by reductions of the land tax quota by province.

Table 2: Land tax of the flooded area in 1823 (in tael of silver)

	I	II	III = I - II	III / I
	Quota – tax target	Reduced target	Tax relief	Relief ratio
Zhili	2,556,866	966,439	1,590,427	62%
Jiangsu	3,625,814	2,058,011	1,567,803	43%
Zhejiang	2,249,330	1,995,784	253,546	11%
Shandong	3,589,694	2,305,385	1,284,309	36%
Henan	4,354,543	2,734,017	1,620,526	37%
Anhui	1,807,563	1,143,020	664,543	37%
Hubei	1,144,208	1,015,025	129,183	11%
Jiangxi	2,423,720	2,249,330	174,390	7%
Hunan	912,643	886,040	26,603	3%
Yunnan	210,073	209,382	691	0%
Guangdong	1,148,284	1,091,740	56,544	5%
Shaanxi	1,333,169	1,332,535	634	0%
Ganshu	283,555	267,585	15,969	6%
Sichuan	768,536	768,536	0	0%

[80] China First Historical Archives (Beijing) :no.04-01-01-0646-006.
[81] China First Historical Archives (Beijing) :no.04-01-01-0648-033

Guizhou	121,667	76455	45,532	37%
Guangxi	336,951	308,746	28,205	8%
Fujian	1,234,192	1,034,460	199,732	16%
Total	**28,100,808**	**20,442,490**	**7,658,637**	**27%**

Sources: *Chao Dang* (Copies of the Archives), stored in the Library of Economic Institute, Chinese Academy of Social and Sciences.

From Table 2, we can see that 7,658,637 taels of silver were exempt from the normal land tax target or about 27% on average. Zhili received the highest exemption with 62%, followed by Jiangsu with 43%. Anhui, Henan, Guizhou and Shandong received 36-37%, while the others received much less in relative terms. As we will show in the next section these ratios reflect the degree of flood intensity of the provinces relatively well.

Second, tribute grain was at the time regarded as the most important form of tribute payment and could usually not be exempt from the annual quota of about four million dans of grain. However, since the situation in this year was so serious, the government had to deviate from its usual plan. According to our records it received only 3,082,740 dans of grain, which means a reduction of a quarter.[82]

The third item, the salt tax, was as important for fiscal revenues as tribute grain. When the flood hit the country, Changlu in Zhili province received an exemption of 97,391 taels of silver on the salt tax.[83] Yunnan was given an exemption of 23,222, and Zhejiang of 2,384,000[84] totalling to 2,504,613 taels of silver. Unfortunately however, we were not able to find the exemption records of the Liang Huai Salt area, the one most affected by the flood, which provided almost half of the salt tax in usual times. Thus, we guess that the total tax reduction is unlikely to have been been lower than four million taels of silver.

Finally, the flood also adversely affected custom duties. According to our records, this amounted to indirect expenditures of about 400,000 taels of silver.[85]

3C. Structure and composition of disaster relief

What were the main determinants of disaster relief? How did the central government's bureaucracy decide about how to distribute the scarce resources between provinces? According to Carol Shiue in one of the later contributions to this debate,[86] there was an inverse relationship between the level of centrally monitored grain storage in normal times and the size of disaster relief in disaster times. This is explained with moral hazard on the side of the provincial officials who would tend to embezzle funds earmarked for storing grain if they could expect short run

[82] The files copy in Chinese Academy of Social Economic Research collage, Transport category, volume XIV, in the Library of Economic Institute, Chinese Academy of Social and Science.

[83] Jiaqing and Daoguang Period Edict Records, Vol 28, p.331, Guilin: Guangxi Normal University Press, 2000.

[84] China First Historical Archives (Beijing) : 04-01-35-0502-011。

[85] Ni Yuping's research: Qing Chao Jia Dao Guan Shui Yan Jiu,清朝嘉道关税研究(Research On the Customs Duties in the Jiaqing and Daoguang Times of the Qing Dynasty), 北京师范大学出版社(Beijing:Beijing Normal University Press), 2010.

[86] Shiue, Carol (2004): Local Granaries and Central Government Disaster Relief: Moral Hazard and Intergovernmental Finance in Eighteenth- and Nineteenth-Century China , The Journal of Economic History, Vol. 64, No. 1 (Mar., 2004), pp. 100-124.

assistance in case of disaster by the central government.

Since the present paper is only on 1823, and Carol Shiue's analysis covers the period 1740-1820 we do not provide an actual test for her hypotheses. Moreover, our new material is on disaster relief only, so we do not have new evidence on targeted or realized grain storage in the provinces, so this needs to be left for further research. However, we would like to take her findings as a background for our research, and ask the question if the structure of disaster relief in 1823 would be consistent with a moral hazard story or not. We do this by trying to find some rationale in the distribution of relief, which would merely depend on the actual disaster intensity and not on time invariant provincial characteristics such as distance to the capital, or presence of a military garrison. Specifically, let us consider her finding that "[…] the geographical pattern of disaster-relief funding from the center was skewed and not likely to have been determined by the random occurrence of disasters."[87] We argue in 1823, the distribution of disaster relief-funding actually depended on the flood intensity reported by the officials, and only slightly on other determinants.

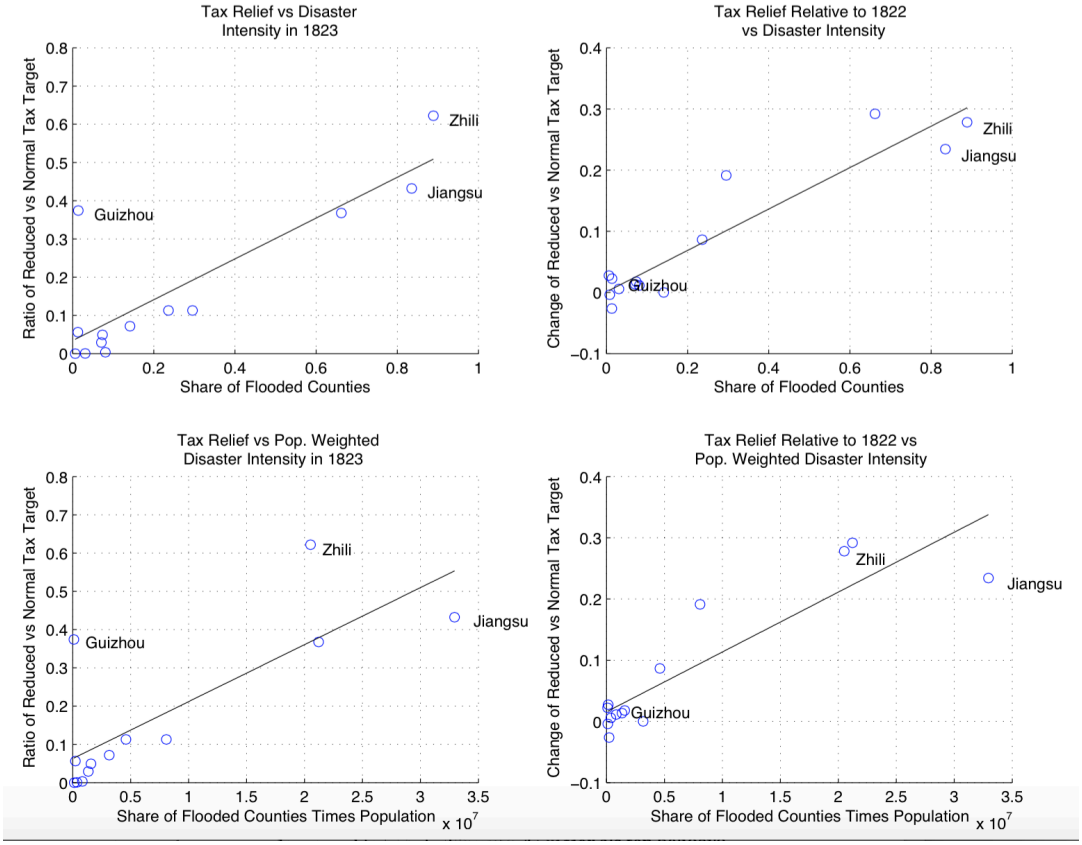
The data we collected for this are the number of counties affected by the flood, the population in 1820,[88] the composition of disaster relief by type of assistance and province as well as the respective tax targets of the previous year 1822. The latter was used to calculate not only absolute tax relief as a percentage of the current year's target, but also the change of the tax relief as a percentage to the year before, as in some provinces there was a more permanent tax relief independent of annual flood reports.

Our analysis is done in four steps and presented in scatter plots with a fitted OLS trend (Figure 1). First, in the upper left panel, the absolute disaster relief (as a share of the target) is plotted against the disaster intensity (share of counties affected). Second, absolute disaster relief is replaced by the change of the reduced target as a percentage of 1822's reduced target. On the x-axis we plot again disaster intensity. Third, on the lower left panel, we have again absolute disaster relief but now plotted against disaster intensity weighted by population size in order to identify provinces that received disproportionally much or little assistance given their population size hinting at other rationales that would probably favour a moral hazard explanation. Finally, we plot the relative relief ratio (the change of tax relief relative to 1822's tax relieve) against population weighted disaster relief on the lower right panel (Figure 1). Note that here we only provide one type of indirect assistance, exemptions from land tax, and do not take into account the other types of direct and indirect relief since for the point we would like to make this turns out to make no difference. These results can be obtained from us, though.

[87] Ibid p. 101.

[88] Cao Shuij 曹树基. Zhongguo Renkou Shi 中国人口史. Vol.5. Qing Shiqi 清时期. Shanghai: Fudan Daxue Chubanshe, 2001.

Figure 1



The first and most important observation is that relief was apparently allotted proportionally to the intensity of disaster. This holds for absolute relief as well as for the increase of the tax reduction to the previous year, and for population weighted as well as for simple disaster intensity. We however highlight three provinces in all three graphs that stick out from the others and help to clarify the likely mechanisms behind disaster relief further.

In the upper left panel Guizhou clearly is an outlier. It receives 37% relief from its normal tax target although only one of 74 counties was flooded. Controlling for population (lower left panel) does not change the picture as Guizhou was not exceptionally populous with 7.5 million citizens in 1820. The reason why Guizhou was relieved of so much tax is maybe that it always received 1/3 to 1/2 land tax relief during the Daoguan reign (1821-1850).[89] This becomes evident when looking at the declines of tax targets relative to 1822. According to this relative measure Guizhou is not favoured anymore, because the target was already reduced in the year before. Its tax reduction is therefore not related to flood intensity.

A similar case is Zhili, the province closes to Beijing, which however becomes only apparent when controlling for its population size (lower left panel). Since it was affected more by the flood than all other provinces with 89% counties under water its top absolute tax reduction of 62% is roughly in proportion with the other provinces (upper left panel). When considering its population

[89] Land tax tables of Guizhou province in Daoguang times 道光朝贵州地丁征收表, in *Chaodang* (Copy of the Archives), stored in the library of the Institute of Economics, the Chinese Academy of Social Sciences(Beijing). Sources for wheat prices:
Institute of Economics, Chinese Academy of Social Science (2009), Grain Price Table Between 1821 and 1912, 23 Volumes, Guangxi Normal University Press. (中国社会科学院经济研究所，清代道光至宣统间粮价表，广西师范大学出版社 2009 年 1 月 January, 2009)

size, however, it becomes clear that it should have received much less when compared for example with Jiangsu or Anhui (the latter lying almost perfectly on the trend line). This shows that Zhili did indeed receive a permanently higher tax reduction because it was politically and strategically more important than the other provinces.

In the disaster of 1823, however, there was no bonus for Zhili. When looking how much its tax target was reduced on top of the reduction it had already received in 1822, it lay clearly in line with the other provinces (upper right panel). When taking into account its population, however, some of the story reappears as it received proportionally more than the others, however, considerably less than suggested by the absolute tax reduction.

Finally, Jiangsu received in total too little however the levels of assistance are plotted against flood intensity. Especially when considering its relatively large population (lower panels) it becomes clear that the central government bureaucracy supported it less then other provinces given the number of counties affected by the flood.

As a conclusion to this section we do not see evidence in 1823 that would be consistent with moral hazard at the provincial level in terms of risking too much when managing grain storage in expectation of the respective tax relief. Disaster relief depended apparently on the relative number of counties in need in this particular year and not on political or strategic considerations. Having said that, we are aware that this is a far from convincing analysis. For example, since the number of counties in disaster depends on the reports of the governors, the moral hazard argument might easily be reintroduced. Also, our analysis is merely a case study, while Shiue relies on 80 years of evidence.

On the other hand, her data does not take into account the actual amount of relief but rather the number of instances of relief during the whole period, while we produced exact numbers from archival resources. The next steps should therefore aim at repeating this exercise with independent meteorological data about flood intensity.

3D. Comparative size of disaster relief

This final section tries to tentatively evaluate China's central government spending of disaster relief in an international context. We are well aware of the dangers of this approach, all the more as it is only a preliminary execution of this endeavour, yet we think it is valuable as it leads into the right direction and already puts the debate in the literature into perspective.

First, what is best guess on total disaster relief spending after having taken into account the evidence as described so far? Next, does this confirm or refute similar estimates in the literature? And finally, how does this compare to disaster spending in other cases in history, just to put into perspective?

During the Daoguang period, the Qing government had a fiscal income of 45 million taels of silver. If we apply a rice price of one dan to one tael of silver, we can add payments in kind to monetary payments and find that the relief was about 9,500,000 taels of silver, and river engineering fees about 3,500,000 taels. Thus direct expenditures were 13 million, about 29% of total tax revenues. Indirect expenditure included 7,658,637 taels of silver of land tax exemptions, 1 million of tribute grain, four million of salt tax exemptions, and 400,000 taels of custom duties. This amounts roughly to another 13 million taels of silver. As a total, central government expenditures would be about 26 million taels of silver or about 58% of 1823's total fiscal revenue.

When comparing this with some instances in the literature, some inconsistencies appear. For example, in Li's book on famines in North China, she writes, "in one year alone, 1766, the state spent 34.5 million taels on relief in various parts of the empire, or approximately 12 percent of its total expenditures for the year."[90] This implies that in 1766, the spending was one third higher than in 1823, and the size of the government more than six times as large. When tracing back the material this statement is based on one arrives at an article by Li Xiangjun[91]. It states: "The government spent the biggest amount of money on disaster relief during the Qianlong reign. The expenditure in 1766 were 34.51 million taels of silver. If we take this year as a standard, and the annual disaster relief money (4,241,300 taels) as a total, that would be approximately 12 percent of its total expenditures for this year." Thus, the disaster spending was approximately 4.2 million taels, not 34.5 million, and the size of the government 34.5 million taels, not 288 million.

Table 3 is thus based on our finding of total spending during 1823 of 26 million taels of silver and a figure for Britain's spending on the Irish famine for five years, seven million pounds contributed by Peter Gray (see tables notes for references). Of course one need not to forget that Britain's dealing with Irish famine has been criticized for being much too low and one of the worst examples of the consequences of Malthusian thinking. On the other hand, China's approach to disaster spending is rather an example of benevolent government behaviour towards its population. However, maybe exactly because of that the comparison might be enlightening.

[90] Lilian Li: p. 248.

[91] Li Xiangjun:"Qingdai jiuzai de zhidu jianshe yu shehui xiaoguo"清代救灾的制度建设与社会效果（The establishment of the famine relief system of the Qing period and its social effects），page 79, in Lishi yanjiu 历史研究, 1995, no. 5(Oct, 15):71-87.

Table 3: Disaster spending of Britain (1845-49, annual average) and China (1823).

			I	II	III	IV	V	VI
			GNP	Gov. Revenue	Gov. Share	Diasaster Spending per year	Percent of GNP	Percent of Gov. Rev.
Local currencies								
China	1823	mn taels of silver	4000	45	0,011	26	0,0065	0,58
Britain	1845-49	pound sterling	579	55,1	0,095	1,4	0,0024	0,03
Grams of silver								
China		g Ag	149200	1678,5		969,8		
Britain		g Ag	60574	6116,1		146,5		
Population (million)								
China	400	g Ag / capita	373	4		2,42		
Britain	24	g Ag / capita	2524	255		6,10		
Affected Population (million)								
China	80	g Ag / capita	1865	21		12,12		
Britain	8	g Ag / capita	7572	765		18,31		
Grain/capita								
China		kg / capita	2500	28		16,25		
Britain		kg / capita	5963	602		14,42		

Notes:

I: Vries (2012), p. 16 for China, for Britain Hills, Ryland and Dimsdale (2010):
The UK recession in context - what do three centuries of data tell us), Quarterly Bulletin (4)

II: Own calculations for China, for Britain Vries (2012), p. 39

IV: Own calc. for China, for Britain, 7 mn pounds over five years from Gray,P.: The Irish Famine, NY 1995.

Population: Cao (2001), and Statistics on World Population, GDP and Per Capita GDP, 1-2008 AD
http://www.ggdc.net/maddison/Historical_Statistics/horizontal-file_02-2010.xls

Affected Population: 20% from own calculations for China, population of Ireland from Maddison file.

Silver to grain	1 tael = 1 dan			
	1 dan = ca. 50 kg	in grams of silver per kg	0.75	in China
Shilling to silver	5,23			
Pound to silver	104,62			
Price of wheat per imp. quarter, avg. 1845-49	55,05	in grams of silver per kg	1.27	Britain

We start with figures in local currencies and then work our way through to more comparable units. What we can see directly in these lines is the comparison of government shares and disaster spending as shares of GNP and government revenues. First, we note that the British government was about ten times as big as the Chinese as a share of GNP. Second, China spend almost three

times as much on the 1823 disaster than Britain did one average in the years 1845-49. However, one must take in to account that Britain accordingly did this five years in a row while China did it only once. Nevertheless it is revealing that in 1823, China spend almost 60% of its government revenue on relief, while Britain spend merely 3% of its government spending. Again, when leaving out the size of the government and only comparing it with GNP, China still spend 2-3 times more than Britain.

Of course these numbers should be expressed on per capita basis to compare how much was left for each single person. For this, we expressed national income in grams of silver. When taking rough population figures of 400 million and 24 million, respectively, one becomes aware of the large gap in economic potential: The average Briton had about seven times more income than the average Chinese. This also changes the picture on British spending: Per capita, three times more grams of silver were spent on disaster relief than in China.

However, the population actually affected was in both cases smaller. As a comparison we took 20% of the population in China according to the share of counties affected, and the population of Ireland, about eight million before the famine. This again changes the perspective, as now the per capita spending gap is reduced to about 50% that Britain spent more in silver on the affected population.

Finally, accounting very roughly for the differing prices of grain we can express the figures in kilogram of wheat per affected person. This surprisingly closes the gap between absolute per capita spending between Britain and China.

Yet again, we are not going to draw too strong conclusions from this, as this finding is only tentative and preliminary. It however hints at how relevant it might become to get better and accurate figures for the issues in question.

4. Conclusions

This paper provides an accurate description and preliminary analysis of Qing government spending during the 1823 flood broken down by province and type of spending. We describe the extent of the crisis as taken from the archives, the amount of spending in the provinces and as a total, and analyse the relation between distribution of resources and crisis intensity. Finally, we make a rough comparison with Britain's total spending during the Irish Famine.

We find that about 20% of China's counties were severely affected by the flood from the governors' reports to the court. The number of deaths turns out not to be quantifiable as each precise figure is usually accompanied by a remark that implies much higher figures but without any quantification. Finally, food prices rose during the flood by 20% to 30% in some prefectures.

Second, we are able to relate the distribution between provinces with the share of counties affected in a proportional way, especially when controlling for the size of population and the permanent tax reductions some provinces enjoyed already before the flood. This does not square well with the moral hazard argument of governors expecting disproportional relief payments and behaving opportunistically.

Finally, when comparing the total spending we find that as a share of government revenue the amount was enormous, about 20 times higher than in Britain during the Irish Famine, but per capita of population affected expressed in silver it was less than what the British paid. In real terms both per capita spending figures even turn out to be quite similar. Given our today's notion of Britain being overly Malthusian and the Chinese state rather paternalistic this may be an

interesting conclusion and certainly deserves closer investigation.

However, we should not forget that the figures presented here on the 1823 flood are only about the expenditures occurring at the government. When it comes to population loss, houses and property damaged, and harvest failures; the total economic loss would of course fair much higher than the fiscal loss only. This would be the necessary perspective in order to understand why the 1823 flood has left such a deep impression on contemporaries and the later generations.

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