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SPECIAL ISSUE

Turning Society into Graphs: Early 20th Century Statistical Undertakings in Shanxi Province

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While no census was ever successfully completed for all of China under the Republic, the poor province of Shanxi, ruled by warlord Yan Xishan, published new population statistics every year from 1919. The province's Statistical Office not only consistently collected various statistical data, it was also a pioneer with respect to graphical statistics. Why did Shanxi produce so many statistics? Who produced them, and for what purpose? How did they figure into the modernisation and state-building attempts by Yan Xishan? What can we learn about his concerns regarding the population from the collected statistical materials? How is statistical knowledge and information made visible in statistical diagrams, what meaning is created, and which arguments are made through visual semantics? To tackle these questions, we examine relevant actors and institutions, closely read Yan Xishan's preface to the earliest population statistics published in Shanxi, and finally look at the statistics and graphics published there between 1919 and 1931.

民國時期，儘管民國政府未完成全國人口普查，但閻錫山治下的山西省不僅持續收集統計資料，更以圖形統計的實踐領先全國。本研究通過分析原始資料、圖表及閻錫山親撰序言，探究其統計機制、實施主體及政治意圖。我們發現其圖表設計存在實驗性和不確定性，且凸顯出鮮明的政治邏輯——通過視覺化手段，將資料轉化為直觀的治理工具。統計圖以視覺秩序重構龐雜資訊，既服務于人口管控與國家能力建設，亦成為閻錫山推行地方現代化的話語載體。

Keywords: Statistics, Yan Xishan, Shanxi, Republican China, Statistical Graphs, Population

關鍵詞： 統計，閻錫山，山西，中華民國，統計圖，人口

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Introduction

By the 1930s, the lack of accurate countrywide population numbers had been a perennial problem since the waning years of the Qing dynasty. Chinese intellectuals and foreign observers alike questioned China's capacity to govern a state and its society without precise demographic and social statistics (Bréard 2018 and Zhu 1931, 5–8). Yet it was also recognised, that "obtaining precise population numbers was not just a problem of statistics *per se*, but first and foremost required political resources/strength and secondly a certain level of education."[1] In 1927, after the establishment of a National Government in Nanjing, government officials began to be trained according to the provisions of the Outline for the Establishment of the Republic of China (*Jianguo dagang* 建國大綱). This stipulated the census-taking of households and the measurement of land. Obtaining the total number of households in a certain place and period and studying the composition of these households should serve as a basis for the governance of the whole country. In 1928, the Ministry of the Interior promulgated the Rules for Statistical Reporting of Household Surveys (*Hukou diaocha tongji baogao guize* 戶口調查統計報告規則), which were ordered to be uniformly followed by all provinces throughout the country[2] and in October 1932 the Statistical Law (*Tongji fa* 統計法) was promulgated. Therein, it was determined that the household census would be centrally sponsored by the Office of the Comptroller of the National Government (*Guomin zhengfu zhuji chu* 國民政府主計處). However, even two decades later, these measures still "failed to achieve more than a patchwork of uneven data collection" (Lam 2011, 117); no census was ever successfully completed for all of China under the Republic.

Surprisingly, the poor province of Shanxi, ruled since 1911 by one of the infamous "warlords", seemed to do much better.[3] In 1931, Qiao Qiming 喬啟明, a native of Shanxi interested in questions of agricultural economics,[4] blamed Chinese cultural backwardness for

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[1] Chen 1933, 19: 要人口統計精確，不單是統計的問題，第一要政治有力量，第二要教育有程度。

[2] Results for the year 1928 were published by the Statistics Department of the Ministry of the Interior as the *Statistical Report on Household Surveys of Provinces and Municipalities in the Seventeenth Year of the Republic of China* (民國十七年各省市户口調查統計報告) in February 1931.

[3] See for example Qin 1926, 14: "If all provinces would equally be able to have statistics as accurate as Shanxi's, then I would certainly obtain a more sound basis to research the actual situation of the important issues of the whole country." (苟各省均能如山西之有正確統計，則吾人對於全國重要問題之時機狀況，必可多得切實之研究根據。)

[4] In 1931, Qiao was a 1924 B.S. graduate and Officer of Administration and Instruction at the Department of Agricultural Economics of the (private Christian) University of Nanking (see the *University of Nanking Bulletin* 8–1 from December 1931, p. 11), where he was "in charge of a population project under the China Land Utilization population study" (Chiao 1933a, 325). The study contained an important demographic aspect in collaboration with a statistician (Research application project from February 9, 1928, Yale University Archives RG011-200-3419, 18). In 1934, with a scholarship granted under the Famine Fund budget from Nanking University, he obtained a Master Thesis in

the continuing lack of reliable population numbers on a national level, but praised the quality of the exceptionally regular statistical production of his home province:

> 最近二年，有些省份，雖已各別的盡力做了些人口調查，可是其材料之是否真確，仍令人不能無疑。所以著者本平日的聞見以爲中國辦理人口調查較有成績者，仍不能不首推山西。
>
> 山西從民國元年，即從事本省的人口統計。民國八年，開始實行人事登記，聞至今未曾間斷。[…]
>
> 至於山西統計能進行順利的原因，約有三種：
>
> 一， 十數年來未受政局的大影響，
>
> 二， 村里制度比較嚴密而完善，
>
> 三， 主持統計者識見較遠。
>
> In the last two years there were some provinces which conducted population investigations through individual efforts, yet whether their material is reliable or not is still not without doubt. Therefore, the author, based on ordinary knowledge, believes that among those who in China conduct population investigations rather successfully, one cannot but put Shanxi in first place!
>
> Since the first year of the Republican era the province of Shanxi has been engaged in compiling its own population statistics. In 1919, they began to implement the registration of people, and I have heard that up to today, they have not interrupted it. [...]
>
> There are about three reasons why Shanxi can carry out statistics smoothly:
>
> 1. For more than ten years, the province has not been much impacted by the political situation.
> 2. The "village system" (*cunli zhidu* 村里制度)[5] is relatively strictly ordered and complete.
> 3. Those who are in charge of statistics have a fairly far-reaching knowledge.[6]

Sociology from Cornell University (Chiao 1933b). See also his earlier social survey work in Shanxi in Qiao 1932.

[5] On the village system see Gillin 1967, 53.

[6] Qiao 1931, 2. Even years after its dissolution, the work of the Shanxi Statistical Office was generally seen as exemplary, see Shanxi sheng zhengfu tongji zuzhi 1937. Taeuber 1973, 160 also refers to the "presumably model records of Shansi Province" which began in the period from 1912 to 1916, yet without indicating a reason or his source of information. Others had a more more critical view of Shanxi's statistics (and its governor). A population survey of a single district is even taken as representative of the main demographic problems the province was facing: an excess male population and a mortality rate exceeding the birth rate: "Because of more than ten years of peace, Shanxi has been praised as a model. De facto, Shanxi's governor has extorted money from the common people, the

The extraordinary efforts of the Shanxi Statistical Office were not confined to collecting numbers; it was also a pioneer with respect to graphical statistics. While before the late 1920s most provinces did not make use of complex diagrammatic designs (nor did the central Statistical Department 內務部總務廳統計科), charts on population statistics from Shanxi province for the years 1918 to 1926[7] show a bewildering variety of colourful layouts.[8] Yet, neither the statistical endeavours in general nor the particularly fascinating attempts at graphical representation have received much attention from scholars. Why did Shanxi produce so many statistics compared to other provinces? Who produced them, and for what purpose? How did they figure into the modernisation and state-building attempts by the ruling warlord Yan Xishan 閻錫山 (1883–1960)? What can we learn about his concerns regarding the population from the collected statistical materials? And what problems in quantifying and representing society can we discern from them? In order to tackle these questions, we will first present the relevant actors and institutions, then read closely Yan Xishan's preface to the first population statistics published in Shanxi, and finally look at the statistics and graphics published there between 1919 and 1931.

Statistical Actors and Institutions in Shanxi Province before 1928

When a constitutional government was supposed to save the crumbling Qing dynasty, population numbers were specifically needed to determine quotas of seats in a national assembly.

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population sits poverty-stricken, there are rifts within families. If one county is like this, the entire province can be known. I truly wish that you gentlemen inspect the tables: once you think thoroughly about it, you will feel deeply concerned." (十餘年來山西為安全，推山西為模範，其實山西當道多事聚斂，人民坐而困窮，以家庭為溝壑。一縣如此，全省可知。甚願閱表諸君子，一深思而軫念也) Liu 1930, 59.

[7] Statistics were published for Shanxi's population by the central *Neiwu bu tongji ke* 內務部統計科 for the years 1912 (published in 1917) and 1916 (published in 1918), before Shanxi Province's Statistical Office (*Shanxi shengzhang gongshu tongji chu* 山西省長公署統計處) compiled population statistics (among others) nine times for the years 1918 (published in 1919) to 1926 (published in 1931). For the year 1931 (published in 1934 as 山西省戶口統計) the work was again taken up centrally, following the forms that the government, i.e. the 民政廳, had issued in 1928.

[8] The fact that these publications fill the gap between the 1912 and 1928 national censuses might explain the relative independence/individuality with which these statistics were edited, coded, tabulated, and published. For the Nanjing decade (1928–1937), Paulès 2020 ascribes such statistical independence to the Warlord regimes: "La décennie de Nankin est caractérisée par la relative faiblesse du pouvoir central en dehors de la basse vallée du Yang Tsé, qui laisse de larges parties du territoire chinois aux mains de seigneurs de la guerre (*junfa* 軍閥) *de facto* quasi indépendants. Il est remarquable que sous la houlette de ces autocrates, que l'on a trop souvent dépeints comme des brutes uniquement assoiffées de pouvoir et de richesse, les zones situées hors de l'orbite du gouvernement central prennent elles aussi pleinement part au mouvement de production de statistiques."

The first ever Statistical Bureau (*Tongji ju* 統計局) in China was established in 1907.[9] In 1910, the Qing Government promulgated the Regulations on Household Surveys (*Qingcha hukou tiaoli* 清查戶口條例), which established a six-year household survey programme.[10] Population survey reports from the Xuantong era (1909–1911) were compiled and published in 1912, when the Republic of China was founded (see Lam 2011, 64ff.). The new Ministry of the Interior soon ordered a nationwide census to be held that year. It was in fact a continuation of the Xuantong period's census, with similar items to be counted, such as the number of households, the sex and age of individuals, marriage, occupation, and birth and death rates. Publication of the results of the 1912 census was much awaited but delayed. It began only in 1916, province by province, when, for example, statistics for Fengtian and Jilin were published. For Shanxi, it was in June 1917 that the Statistics Section of the Ministry of Internal Affairs published the 1912 data and again, a year later, data from 1916 (see Neiwu bu 1917 and Neiwu bu 1918). Later on, during the civil wars of the warlord era (1916–1928), the Beiyang government suspended its efforts to take care of statistics in the localities, and the nationwide population census was put on hold. As we already mentioned, no further national census was successfully conducted by the Republic of China.

The Beiyang government set up a national Statistical Bureau (*Tongji ju* 統計局) in 1916. In 1917, after Yan Xishan had seized the governance of Shanxi Province, he immediately reorganised the government and founded a Statistical Office (*Tongji chu* 統計處) under the Department of Civil Affairs (*Zhengwu ting* 政務聽) (Shanxi sheng difang zhi bangongshi 2014, 35). Interested in a sound basis for governing Shanxi's population and all its related crises, Yan invested heavily in the production of numbers and graphs, in terms of human capital: "Two thirds of the bureaucrats he gathered around him in Taiyuan were less than forty years old, and virtually all had attended colleges or middle schools, generally in Shansi" (Gillin 1967, 173). The Statistical Office had a director, two section chiefs (*guzhang* 股長), four section staff, one first-rank secretary, and one second-rank secretary; every county seat also was supposed to appoint somebody responsible for statistical work (Shanxi sheng difang zhi bangongshi 2014, 36). They hired many additional staff, as can be seen from their own publications: 105 accountants and statistical officers (*zhujiyuan jian tongji zhuren* 主計員兼統計主任) were working throughout the province in 1919, thus soon after the founding of Shanxi's Statistical Bureau (see fig. 1).[11] They not only published their illustrated census, education, social, and climate statistics, but they also issued a large number of written directives

[9] See Bréard 2008, 5. Among the earliest published illustrated statistics were those on education. See Xuewu 1909.

[10] The original memorial by the Ministry of Civil Affairs 民政部 can be found in Tao 1909.

[11] In the counties, 79, 61, and 37 were hired in the years 1918 to 1920 and 2, 33, and 37 were dismissed from office, which leaves a total of 105. See Shanxi 1922, 11–12.

(from 1919 on) on how to collect data, fill out forms, and other census and survey-related matters.[12]

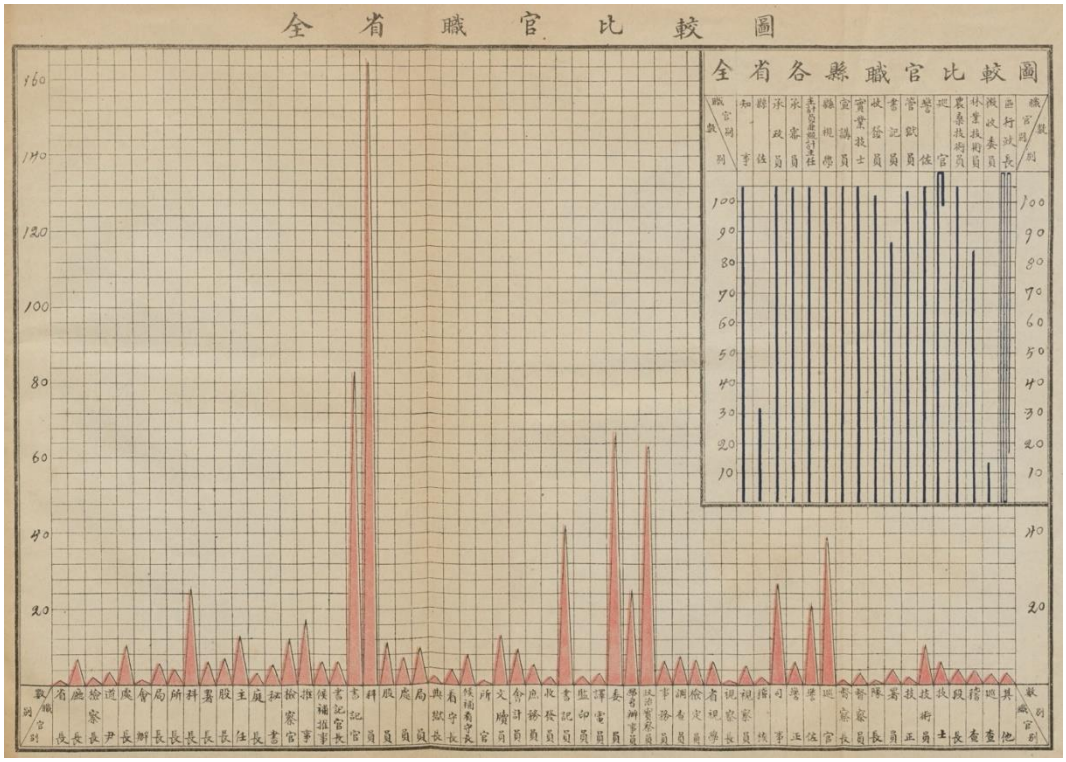

Fig. 1: Comparative diagram of government officials in the entire province (red triangles) and Comparative diagram of government officials in all districts of the entire province (blue bars, partly in serpentines) (全省[各縣]職官比較圖). Diagrams 1 and 2 in Shanxi sheng zhang gong shu tongjichu 山西省長公署統計處 1922.

The first director of the new Statistical Office was Gao Hong 高洪 (1880–1935), a native of Shanxi who, like Yan Xishan, had gone to study in Japan in 1904, namely at the Tokyo Railway College (*Dongjing tiedao xuetang* 東京鐵道學堂). After his return in 1909, he taught at various new academic institutions such as the Shanxi Railway College (*Shanxi tielu xuetang* 山西鐵路學堂), the Industrial School (*Shiye xuetang* 實業學堂), the Shanxi Business School (*Shanxi sheng shangye zhuanmen xuexiao* 山西省商業專門學校), and others. His subjects not only included "Accounting" and "General Introduction to Railways" but also "Statistics" (*tongji xue* 統計學) (Gao and Gao 2005, 29–31). In 1912, Gao Hong was elected vice-chairman of the first Shanxi Provincial Assembly. After he assumed the leadership of

[12] 1146 documents in 1918 and 1695 in 1920. See Shanxi 1922, 87–88.

the Statistical Office in 1917, he held this post until the bureau was dissolved in 1928 by the central authorities.

Statistical institutions had been plagued since the Qing dynasty by a lack of qualified personnel (Bréard 2018, 270–271), but Shanxi had invested early in statistical education and training. One important institution in this regard was the Shanxi Business School, founded in 1908 and operating until 1935, with a maximum of nineteen students graduating per year in specialised subjects.[13] It was one of only five public business schools in the Republic of China, and the only one left after 1926 (Gao 2020, 55). All the programmes taught there (including at the higher middle school level) included a course on statistics, which usually began in the third year and comprised two hours per week (Shanxi shengli shangye zhuanye xuexiao 1932, 121–123, 141–143). Some programmes also included more specialised courses on statistics: future accountants studied "statistical laws and regulations" (*tongji fagui* 統計法規), taxation students could choose "financial statistics", "economic statistics" (*caizheng tongji* 財政統計, *jingji tongji* 經濟統計), or "customs statistics" (*haiguan tongji* 海關統計) (ibid., 137). The major in statistics started with a compulsory class on "Population theory and population statistics" (*renkou lun ji renkou tongji* 人口論及人口統計), which lasted for a whole year with two hours each week (ibid., 253). In this class, students discussed "issues concerning population quantity, birth rate, quality of the population, migration, nutrition, cultural level, living standards, the future of world population, the relationship between population and the state and the international situation, the current status of the population in various countries and China, and population policy. It also summarized the population theories of Malthus and Marx" (講述人口之數量問題、生成問題、品質問題、移民問題、食料與人口問題、文化程度、生活程度、世界人口之將來、人口與國家及國際之關係、各國及吾國人口之現狀及人口之政策，並就馬爾薩斯與馬克思之人口論述其概要) (ibid., 253–254). Furthermore, the major included compulsory classes such as "Price index theory" (*wujia zhishu lun* 物價指數論), "Surveys of national strength" (*guoshi diaocha* 國勢調查), "Statistical systems of various countries" (*ge guo tongji zhidu* 各國統計制度), and non-compulsory courses such as "Economic statistics", "Customs statistics", "Political statistics" etc. The school's library included 65 books on statistics in Chinese and five in Japanese. Additionally, there were reference books such as *The General Theory of Statistics* (*Tongji tonglun* 统计通论, written by Yokoyama Masao, translated by Meng Sen), A. L. Bowley's *Elements of Statistics*, E. M. and W. P. Elderton's *Primer of Statistics*, M. T. Copeland's *Business Statistics*, etc. The importance of the transfer of foreign knowledge was not only reflected in the teaching and reference materials but also in the teaching staff's education: almost half of the

[13] The school changed its name several times. Upon its founding in 1908, it was called *Shanxi shangye xuetang* 山西商業學堂; in 1912, it was renamed *Shanxi gongli shangye zhuanmen xuexiao* 山西公立商業專門學校; in 1930 it was renamed *Shanxi shengli shangye zhuanye xuexiao* 山西省立商業專業學校.

214 teachers between 1908 and 1932 had studied abroad, most of them in Japan, eight in England, five in the United States, three in Germany, and one in France; two of the teachers were British and one American (ibid., 297–313). Many who worked at the Statistical Office also taught at the Shanxi Business School, including the already mentioned director Gao Hong.

The Warlord and his Numbers: Statistics in Service of the State

The political leadership in Shanxi demanded and sponsored the collection and publication of statistics on the province's population. But what were its reasons for doing so? How did they frame their statistical endeavours?[14] What problems, hopes, and political goals were associated with statistical practices? Answering these questions might shed new light on the state-building efforts of the Chinese warlord regimes in the early Republican era. Recent research has emphasised that the "men of guns", despite their negative image, "were not only military leaders, civil governors, and occasional subscribers to the prevailing ideas, but also important agents of the Chinese enlightenment" and that their rule might have been conducive to "intellectual, ideological, and cultural innovations" (Guo 2022, 8). At least one researcher has even pointed to statistical endeavours as a significant part of the warlords' state-building efforts; unfortunately, he did not provide much detail (Paulès 2022; also see Paulès 2020). In the following, we analyse the preface that Yan Xishan wrote for the first *Shanxi Population Statistics* from 1919, before taking a closer look at the statistics and their graphical representations produced in Shanxi during the 1920s and 1930s.

Yan Xishan begins his preface with two quotations highlighting the importance of statistics. The first is from Sugi Kōji 杉亨二 (1828–1917), a Japanese who introduced statistics from Prussia to Japan in the 1870s (Bréard 2008, 31): "Statistics is a decisive instrument for governing the state and pacifying the people" (統計者，治國安民之要具也) (Yan 1919, 1; all translations by the authors). Yan then comments: "That Japan could revoke its unequal treaties with other countries is due to its statisticians having compiled government tables and overviews of national strength. This is how one gets to see the real situation of civilisational progress" (日本之能與各國改正條約者，實賴統計家編纂政表及國勢要覽列陳。文明進步之實況有以致之) (ibid.). The second quote, attributed to Napoleon, says that "without statistics, there is no performance record; without a performance record, the state is not a state" (無統計則無政績，無政績則國為不國者哉) (ibid.). Clearly, Yan considers statistics in the general framework of a global competition between nation-states, which have to

[14] This is not a trivial question considering the opposition earlier population censuses ran into; see Lam 2011, 75ff.

modernise if they want to survive and prosper. "Civilisational progress" was already a key term in the Japanese modernisation efforts in the late nineteenth century, brought up by the highly influential thinker Fukuzawa Yukichi and later taken over by Liang Qichao (Nakajima 2020). Yan Xishan experienced Japan's progress firsthand when he studied there from 1904 to 1909, "awed and chagrined by the rapidity with which the Japanese were modernizing their country" (Gillin 1967, 10). The way he begins his preface demonstrates that statistics not only serve to measure a nation's "civilisational progress" but also to showcase it so the nation in question can be recognised as part of the modern world. It is noteworthy that the reference to foreign models is not coincidental. "Civilisational progress" is not an unknown entity but a measure given by the progress already produced in other locales, most notably Europe and Japan. A bit later in his preface, Yan writes, "Everything in the universe has a correct and unshakeable track, which is the guideline of evolution; if you follow this path seeking progress, there is no fear of failure midway" (宇宙間萬事萬物靡不有一正確不移之軌道，以為進化之導綫，循此道以求之，自無中途覆敗之虞) (Yan 1919, 1).

Yan not only refers to foreign models but also points to a Chinese origin of statistics, harking back to a style of argumentation already popular when Western technology was introduced during the Ming and Qing dynasties. He claims that an ancient cultural hero, Yu the Great, had already surveyed the land and registered the population, thus making him the founder of statistics in China.[15] Yu the Great was said to be from Shanxi, so he was a national and a local hero, which made him especially attractive for Yan Xishan's propaganda attempts in various contexts. Why, then, did China not develop modern statistics? Yan blames the "negligence" and ignorance of Yu the Great's successors. He knows, of course, that the dynasties ruling China throughout imperial times collected numbers on the population for administrative purposes. However, Yan thinks they were too careless in collecting the numbers and did nothing to gain deeper insights from the collected data. Thus, the old record-keeping could not fulfil the function Yan sees as the decisive feature of modern statistics: giving the state full visibility on its population. Yan knows he must break with past practices and introduce new statistical techniques because modernisation has brought a completely new set of challenges:

> 今者國家事情日趨複雜，風雲起伏莫可端倪，求廬山之真面悄恍迷離，探星海之淵源絕少跡象，圖治之難什百倍於曩昔，立一鵠焉以為庶政設施之助，斟酌而損益之，猶慮無完全，滿望達到樂觀之一日，況貿貿然僅憑個人理想上之判斷力，施諸此波譎雲詭之社會中，則非是是非非寸長尺短，南其轅而北，其轍將愈趨愈遠也，豈不悲哉。
>
> At present, the affairs of the state are becoming ever more complex. Storms are impossible to predict. In searching for the true face of Mount Lu, the view is blurred and confusing; exploring the origins of the sea of stars, there are hardly any signs to be

[15] From the late Qing, Yu the Great was constantly referred to as the first Chinese statistician; see Bréard 2008, 97.

> found. Governing well has become a hundred times more difficult than in the past. Establishing a target to help set up your policies and deliberating on their advantages and disadvantages means you want to think it all through and fully hope to reach a happy day [when your target is hit]. But if you hastily make decisions solely based on your personal judgement and thus put your policies into practice in this bewilderingly changeable society, then right will be wrong, wrong will be right, an inch will be long and a foot will be short, and south-pointing carriages will go north; the further you go this way, the farther you will end up from your destination. Isn't that tragic! (Yan 1919, 2f.)

The argument here, brought forward in highly metaphorical terms, implies two claims that are both related to *complexity*. Put simply, the first claim is that society has become more complex: it is "bewilderingly changeable", its "true face" is hard to see, and the sudden eruptions of social and political crises — the "storms" — seem impossible to predict. The usage of the relatively new term "society" indicates that Yan is very aware that not only has the old political order of the empire disappeared, but the social order is also experiencing profound change. Since its introduction in the early 20th century, the concept of "society" referred to a heterogeneous, troublesome, and constantly changing entity that no longer formed an organic unity of subjects and rulers but implied a sharp antithesis between society and the "state" (Vogelsang 2012). Although Shanxi was still mainly an agrarian society with little industrialisation, the presence of foreigners and foreign goods, the repeated student protests (Gillin 1967, 73f.), and Yan's aspirations to modernise the province's education, infrastructure, and economy had brought and would further bring hitherto unwitnessed social forces into play.

The second claim is that the tasks of the state have become more complex. The breakdown of the old social hierarchies and the new tasks of modern state-building meant that it was no longer enough to coopt only a part of the social elite into the state's service and mostly rely on the gentry for local issues, as had been the case in imperial times. Instead of merely using some outstanding men — late imperial statecraft thinkers usually spoke of "*yong ren*" (用人) — Yan deemed it necessary to secure the support of the whole population for his policies; he wanted a "government that makes use of the people" (*yong min zhengzhi* 用民政治).[16] It was a matter of both participation and control: Yan's government aimed at centralising the administration to gain a better grip on the population, and, at the same time, the population was supposed to contribute actively to the success of the government's policies. Yan established militias to fight banditry and a centrally trained police force; after an outbreak of the bubonic plague, he tried enforcing quarantine measures (Gillin 1967, 36). He also put in place various measures to send better-trained officials to administer districts and villages and to educate the largely illiterate population (ibid., 30ff., and 66ff. on educational policies). The

[16] About *yongmin zhengzhi*, explicitly mentioned in the foreword, see Gillin 1967, 41.

administrative division of his province was reorganised into the "village system" (*cunzhi* 村制), which Yan explicitly mentions in his foreword (Yan 1919, 3; also see Gillin 1967, 53). This policy was supposed to give the villagers a little more say in local affairs, to reduce the gentry's power, and to secure popular support for the central government. At the same time, it was aimed at improving central oversight. Furthermore, Yan attempted to revive and modernise Shanxi's economy, setting up a chamber of commerce, establishing the Taiyuan arsenal and further industries, increasing coal production, building roads, and improving agricultural productivity by introducing new technology and pushing the plantation of cash crops (Gillin 1967, 80ff.).

Most of Yan's government initiatives were hindered by inadequate planning and mismanagement, but there was also a more fundamental issue that Yan clearly articulates in his preface to the statistical compendium. It could be framed as a problem of *visibility*: the government lacked even the most basic data about the province's population ("the view is blurred and confusing"). Yan is aware that his policies might easily go astray without such an empirical basis and fail to show any effect ("south-pointing carriages will go north"). That is precisely where he brings statistics into play — in Yan's own words:

> 統計者，凡國家社會所生一切現象，網羅蒐集，纖細靡遺，鉤因果而證盈虛，綜名數而資比較。 其變通張弛之故，燦若列眉，成敗得失之原，瞭如指掌。
>
> Statistics catch and collect all phenomena occurring in state and society down to the finest detail without missing anything; it captures their causes and effects and demonstrates their waxing and waning; it summarises the numbers with measures and provides comparisons. [Thus,] the reasons for changes and constancies become evident, and the origins of successes and failures become clear. (Yan 1919, 1f.)

At first glance, and especially considering the statistical tables that follow, this seems like a gross overstatement of what statistics are able to do. Counting the population and the number of births, deaths, and marriages, as published in this 1919 compendium, hardly seems enough to reveal "causes and effects". However, Yan seems to have grasped the critical difference between the old administrative practices of record-keeping and modern statistics. As Xavier Paulès has put it: "Modern statistics indeed go well beyond the systematic compilation of numerous and precise figures. Raw data are analysed by ad hoc administrative structures and processed with sophisticated mathematical tools, in order to extract major national indices (inflation rate, GDP, foreign trade balance, unemployment rate, etc.). These indices guide public policy to a significant extent. Modern statistics change the way everyone understands certain social phenomena by formatting them in new ways, in particular by making them quantifiable and even (using diagrams and graphs, for example) *visualisable*" (Paulès 2020, 1328. Translation by the authors).

The increasing complexity of society and state demands new methods of seeing: even though the mathematical tools used in Shanxi were not yet very sophisticated, Yan has realised that collecting statistics on all kinds of social phenomena and combining them for analysis can indeed lead to seeing interrelations and social patterns that would stay hidden to a first-order observer of society.[17] Yan is not interested in the number of people, births, or deaths *per se*; he wants to understand what the trend is, that is if his population is growing or shrinking and at what rate. Therefore, he needs all those different numbers combined in a single analysis or, even better, a single graph that shows where things are heading. And he is not only interested in demographic trends; the wealth of data collected on many different aspects of the population shows that he clearly recognises the fundamental transformation in understanding society afforded by modern statistics. He fully embraced it as a way to uncover hidden social patterns and, thereby, to tame social complexity while building a modern state. In his own words: "Indeed, within this vast universe, the principles and fundamentals of innumerable matters can now be sought after following the charts[18], making it not difficult to uncover the most precious truths. What a significance it [statistics] has!" (即此茫茫宙合内，無量數事事物物之原理原則，從茲按圖而索，不難探得驪珠，其關係爲何如也).[19]

Furthermore, the new ways of observing society could also serve to solve the problem of *coordination*:

> 夫國於天地必有與立，與立者何？即國家政治上之一定軌道也。[...] 否則途徑紛歧毫厘千里，未有不望洋興嘆者矣).
>
> A state in the world must have a foundation to stand on. What is this foundation? That the governance of a state is set on a clear path. [...] Otherwise, the ways part in too many directions, and slight deviations result in wide divergences, leading everybody to despair. (Yan 1919, 1)

"A state in the world..." is an interesting formulation since it quotes a *Zuozhuan* passage that was also used in Qing statecraft thought but takes on a new meaning here.[20] As we have already pointed out, a modern state can no longer depend on a selected few for its governance but must instead engage the whole population. However, Yan repeatedly expresses concern

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[17] Cf. Stefan Christ's article "The Quantification of Chinese Society: Why Did Liang Qichao Ask for Statistics?" in this issue.

[18] It is somewhat unclear, what *tu* 圖 here refers to. It could be the statistical charts, which are also mentioned later in the foreword, or it might be a classical literary allusion to *an tu suo ji* 按圖索驥, "to look for a horse with the aid of a picture", as the anonymous reviewer has pointed out.

[19] Yan 1919, 2. We thank the anonymous reviewer for correcting some errors in our original translation of these passages.

[20] *Zuozhuan*, Zhao gong yuan nian: 一世無道，國未艾也，國於天地，有與立焉，不數世淫，弗能斃也。For an example from Qing statecraft thought, see Wei 1976, *juan* 1 and 7.

about people going in the wrong direction, on diverging paths, and getting ever further from the destination. He obviously thinks there must be clear goals and a clear way to reach these goals to let officials and the population at large know what to do. Now, the "clear path" is no longer provided by the *dao* of imperial times but broadly speaking by "civilisational progress" and "national strength". In contrast to the *dao*, these are translatable into measurable quantities: population and army size, industrial output, literacy rate, etc. So, statistics again is important because it not only provides a way to measure the status quo but also helps in setting targets and measuring progress towards these targets. As Yan Xishan presents it here, statistics is a vital tool for the state to set up policies and see them executed in a unified and effective way. It is thus unsurprising that Yan was impressed by the state-led modernisation and economic planning efforts in the Soviet Union and tried to implement his own "Ten-Year Plan" in the 1930s (Gillin 1967, 125ff.).

To sum up, in his preface, Yan Xishan presents statistics as a practice conducted by the state and for the state, which finds itself in competition with other states. The results of the statistical investigations and their visualisations were published to share information and secure popular support for the state: at the end of the preface, Yan again expresses his hope that the publication will help "to realise the policy of using the people". However, the statistics are not for the people to draw their own conclusions or for the population to recognise itself as "a people" (cf. Nikolow 2005). Although Yan emphasises using "careful thinking", collecting "adequate and realistic materials", and "striving for the truth" (Yan 1919, 3), he is not sponsoring a scientific undertaking. The statisticians he places in the newly founded Bureau of Statistics are not scientists researching the state as an object of knowledge; statistics serve the state in taking control over society as an object. It is there to enhance state capacity and bring order into a disorderly and complex society. What better way is there to order society not only in numerical tables but also in graphs, by arranging two sets of categories along the horizontal and vertical axis of a diagram, thereby allowing the co-ordination of data and eventually the deduction of logical correlations between a certain social category and its size?

Turning numbers into graphs

If we were to believe the author of a manual on historical statistics from 1934, China already had statistical graphs in the Warring States period, while in the West, it was not until 1782 (probably a reference to Crome 1782) that graphic methods were applied to "let the readers at a glance clearly understand the true situation or the relations of what is shown" (令閱者一見，即明瞭其所示事實的狀態或關係) (Wei 1934, 149). The manual's author even interprets the Han dynasty River Chart (*hetu* 河圖), the Diagram of the Supreme Ultimate (*taiji tu* 太極圖), or more generally, Zheng Qiao's Song dynasty theory of combined diagrams and lists (*tupuxue* 圖譜學) as a kind of statistical chart (ibid., 156–157). All of these certainly do

represent numbers in a relational way, a characteristic shared with statistical diagrams that relate, for example, population to the size of a country (see fig. 2) or to national income as in William Playfair's famous map from 1802 (Playfair 1802). The manual's diagrams certainly were also "essential epistemic instruments" (Sepkoski & Tamborini 2018) in Chinese intellectual history. Yet, they were not based on statistical data nor were they used to depict social realities, to make comparisons, to engineer society, or to expose the statistically illiterate to a more readable digest of legions of numbers.[21]

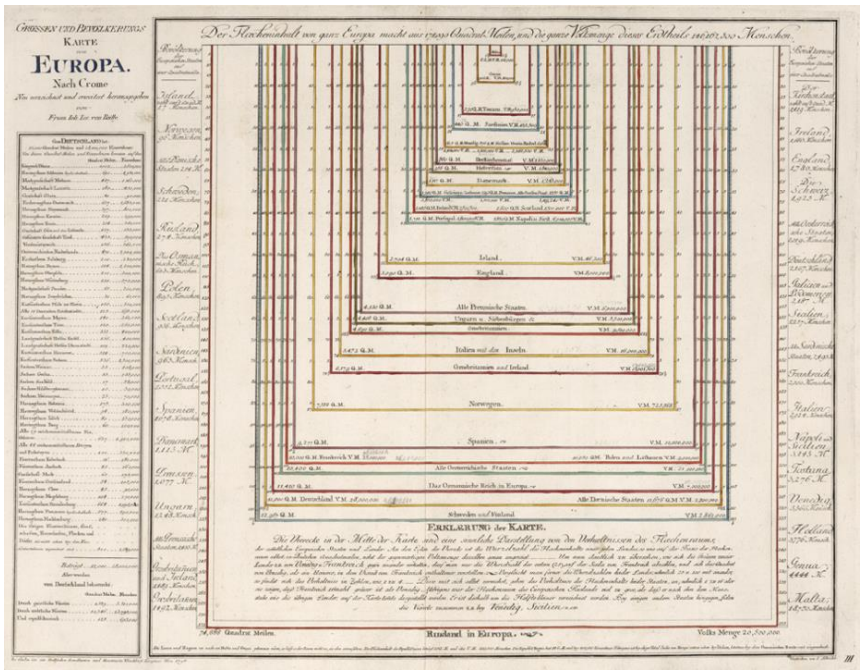

Fig. 2: "eine sinnliche Darstellung von Verhältnissen des Flächenraums" [A sensory representation of relations between surface areas] Reilly, Franz Johann Joseph von (1766–1820), Kininger, Vinzenz Georg, Schutz, Karl, and Albrecht, I. Groessen und Bevoelkerungs-Karte von Europa. Nach Crome. Neu verzeichnet und erweitert herausgegeben von von Franz Joh. Jos. von Reilly. Zu finden im von Reilly'schen Landkarten und Kunstwerke Verschleiss Komptoir. Wien, 1794. Gestochen von I. Albrecht (to accompany Crome's Grosser Deutscher Atlas).

As will be shown below, with respect to graphical statistics, the Shanxi province Statistical Office was a major actor – or rather, a major site of experimentation in the Republican era. As noted above, Shanxi's population statistics charts for 1918 to 1926 are remarkable for their visually appealing layouts. They are rarely accompanied by text, at best by a foreword; the images and tables do "speak" for themselves. Diagrams, thus, are not only representations

[21] Statistical charts were commonly exhibited at International, Health, and Colonial Exhibitions in the 19th century for a general public. See for example the list of statistical charts and tables from Japan at the 1884 London Health Exhibition, in Executive Council of the International Health Exhibition & Council of the Society of Arts, 1884, 677–679.

of social things, but they are things by themselves (Morgan 2020, 226 fn. 1). Yet, historians of Chinese science or statistics have devoted little or no attention to them.[22] The following will analyse how knowledge and information in statistical diagrams are made visible, what meaning is created and which arguments are made through visual semantics.

It would go beyond the scope of this article to discuss the transcultural nature of the Shanxi diagrams, for which models existed in statistical manuals from the Anglo-Saxon "Golden Age of Graphical Statistics" (Friendly 2008), i.e. the nineteenth century, but also from Japan.[23] Yan had studied in Japan, and, given that he refers to Sugi Kōji right at the beginning of the above-mentioned preface, which he wrote for the first locally compiled Shanxi population statistics in 1919, a certain Japanese influence cannot be ruled out. In Japan, colourfully illustrated atlases have been published since the late nineteenth century. In China, too, simple coloured pie and bar charts were included in statistical government publications from the late Qing onwards and in the early years of the Republican era, after the founding of the Central Statistical Bureau in 1907.[24] Yet, when one looks, for example, at the 1912 census results published by the Ministry of the Interior (*Neiwu bu* 內務部) in separate volumes for nearly all provinces, the number of illustrations is highly limited. For Shanxi alone, five diagrams squeezed on two pages precede a flood of tables spilt over 108 pages (Neiwu 1917).

While statistical manuals in the early Republican era all had chapters on statistical diagrams,[25] these were rather unsensational in layout. They were black and white, not particularly attractive to the eye, and they depicted only simple numerical facts.[26] In research articles, many of which discuss China's population problems, diagrams are rarely used[27] and specific manuals for teaching graphical statistics are rare.

Population statistics translated into diagrams functioned more than simply to represent data that resulted from a census or a survey. They were an ideal material for visually demonstrating the province as one yet composed of heterogeneous groups, and they show in an exemplary fashion a way of thinking in terms of a collective, away from the individual. In

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[22] Bray et al. 2011 do not address statistical knowledge representation, nor does Wang 2017.

[23] On the Japanese influence on statistical theories and practices, see Bréard 2008. See Kure 1911, plate between pages 94 and 95, as an example of kinds of graphs in Japanese statistical manuals.

[24] See, for example, Educational Statistics for the year 1907 or the First Statistical Tables for Commerce and Agriculture for 1912.

[25] Before 1932, it seems that no Chinese manuals specifically for quantitative graphics did exist (see Tai 1932). See also, slightly later, Zhu 1934, Tai 1935, and Chen 1936. Interestingly, Zhu 1934 was intended for primary school teaching.

[26] See for example Chapter 30 統計圖 in Meng 1909, the most widely circulated and reprinted statistical manual, which was an annotated translation from Japanese. On Meng Sen and his intellectual involvement with statistics, see Bréard 2018.

[27] For Shanxi in particular, see for example Qiao 1931; Qiao bases his statistical analysis solely on tables, as does Liu 1930. Liu 1929 has only one line diagram.

particular, pie charts were perfect illustrations of the functional differentiation of society: depending on the statistical categories which could be based on different functional systems, such as education, health, the economy, etc., the same pie — society as a whole — is cut into different pieces. By their sophisticated designs, statistical diagrams from Shanxi proved that the provincial government took quantification seriously as a tool for communication about the complexities of Shanxi's society.[28] Infants, primary school pupils, and secondary school students (see fig. 3), both female and male, were part of a whole; they had their share in the round of Shanxi's population. But social problems, such as illiteracy, were also addressed, and the illiterate were depicted, again, as a part — actually the majority — of the whole.

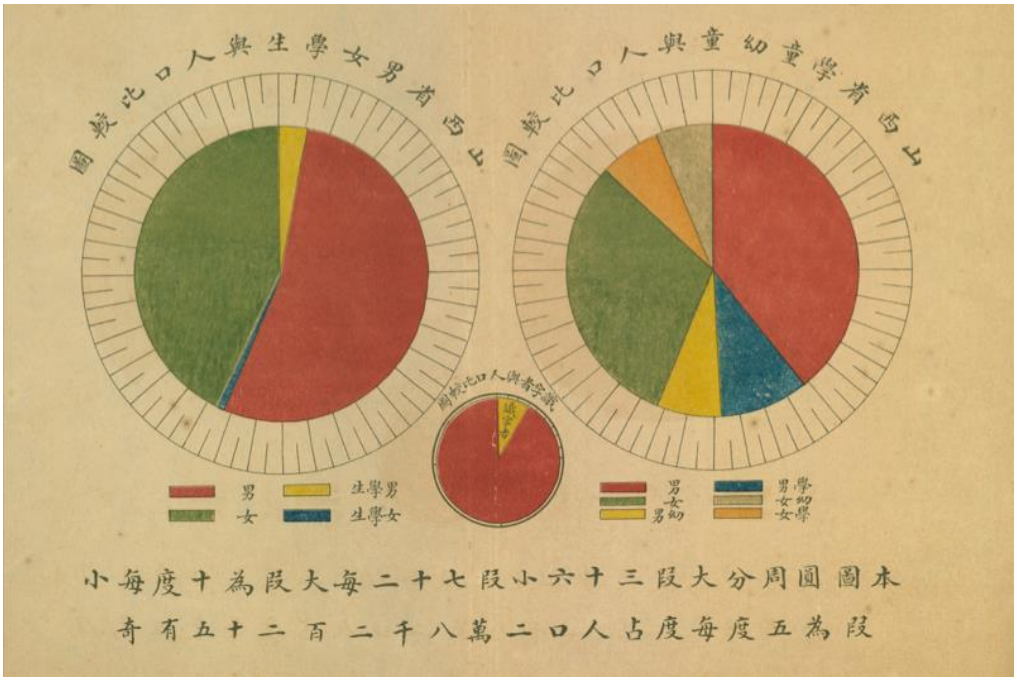

Fig. 3: The share of the illiterate population depicted in red in a cake diagram (small circle in the middle), in 山西省第一次人口統計圖表 (民国七年分=1918), 山西省長公署統計處編, 1919, plate 6.

That statistical graphics were not simply there to visualise numerical data but instrumentalised to make visible certain social phenomena is underlined by the fact that the shown quantities do not correspond exactly to the numbers in the published tables. What matters in the figure below (Fig. 4) is the stark and continuous difference between a smaller female and a larger male population. That there was a drop of more than 10% in the total population

[28] Cf. for example the rather unspectacular presentation of occupational data for the years 1912 to 1924 in Liu 1929.

between 1917 and 1918 is not accurately depicted. Not even the absolute numbers are correctly represented, but any viewer of this bar chart would notice the striking (and numerically correct) excess of males over females of about one third when comparing the green with the brown lines. The reasons were both cultural and medical: the lower regard for the value of women in society, the pernicious habit of foot-binding and the casualties at childbirth (Hao 1934, 15), all three of which were part of Yan Xishan's concerns in modernising Shanxi's society.

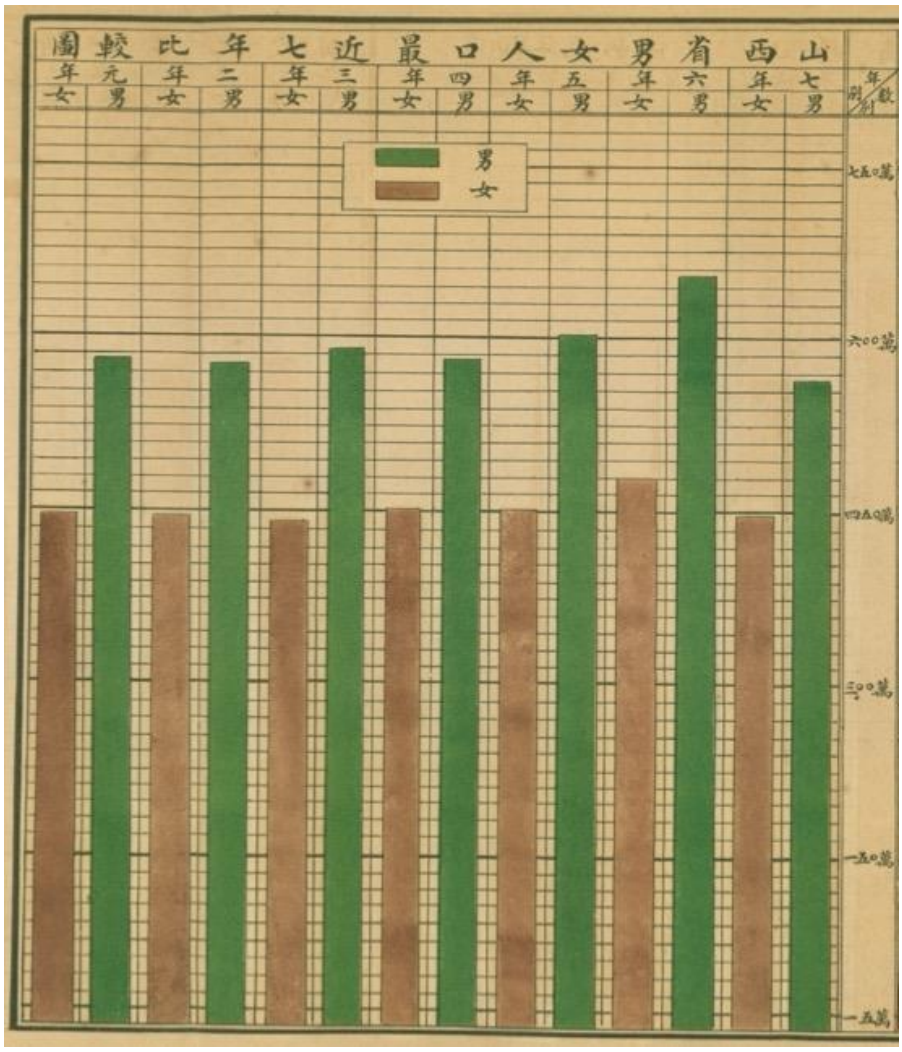

Fig. 4: Male (in green) and female (in brown) population of Shanxi for the years 1912 to 1918 (from left to right), in 山西省第一次人口統計圖表 (民国七年分=1918), 山西省長公署統計處編, 1919, plate 3.

1917 內務統計 山西人口之部	1919 山西省第一次人口統計圖表	1921 山西省第二次人口統計圖表	1922 山西省第三次人口統計圖表	1927 山西省第七次人口統計圖表
1. 山西現住人口年齡比較圖 2. 山西人口平均每百人所有已婚及未婚比較圖 3. 山西人口出產每百人中生死比較圖 4. 山西現住人口死亡類別比較圖 5. 山西現住人口患入種傳染病死亡比較圖	1. 山西省各縣每方里住戶疏密比較圖 2. 山西省各縣每方里人口比較圖 3. 山西省總人口最近七年比較圖 4. 山西省男女人口最近七年比較圖 5. 山西省各縣民商戶比較圖 6. 山西省現住人口比較圖 7. 山西省學童幼童與人口比較圖 8. 山西省學童幼童與人口比較圖 9. 山西省男女學生與人口比較圖 10. 識字者與人口比較圖	**第一編 靜態** 1. 各縣現住戶口比較圖 2. 各縣每方里住戶疏密比較圖 3. 各縣每方里人口比較圖 4. 全省戶口最近八年比較圖 5. 全省現住人口年齡比較圖 6. 全省現住人口已婚及未婚比較圖 7. 全省現住人口職業比較圖 8. 全省寄居外國人職業比較圖 9. 全省寄居外國人國籍比較圖 **第二編 動態** 1. 各縣婚姻比較圖 2. 全省婚姻季別比較圖 3. 全省婚姻月別比較圖 4. 全省婚姻年齡比較圖 5. 各縣出生死亡比較圖 6. 全省出生月別比較圖 7. 全省死亡月別比較圖 8. 全省死亡年齡比較圖 9. 全省死亡人數與年齡比較圖 10. 全省死亡原因比較圖 11. 全省移住戶數月別比較圖 12. 全省來住籍貫及往住地點比較圖 **第三編 省會人口靜態** 1. 省會現住人口數目比較圖 2. 省會現住人口百分比例圖 3. 省會現住人口年齡比較圖 4. 省會現住人口職業比較圖 5. 省會現住人口已未婚嫁比較圖 6. 省會現住人口廢疾比較圖 7. 省會現住人口籍貫比較圖 8. 省會現住人口宗教比較圖 9. 省會寄居外人國籍比較圖	**第一編 靜態** 1. 各屬現住戶口比較圖 2. 各屬每方里住戶疏密比較圖 3. 各屬每方里人口比較圖 4. 全省戶口歷年比較圖 5. 全省現住人口年齡比較圖 6. 全省現住人口職業比較圖 7. 全省現住人口已婚及未婚比較圖 8. 全省寄居外國人國籍比較圖 9. 全省寄居外國人職業比較圖 **第二編 動態** 1. 各屬婚姻比較圖 2. 全省婚姻季別及月別比較圖 3. 全省婚姻年齡比較圖 4. 全省出生月別比較圖 5. 全省死亡月別比較圖 6. 全省死亡年齡比較圖 7. 全省死亡人數與年齡比較圖 8. 全省死亡原因比較圖 9. 各屬出生死亡比較圖 10. 全省移住戶數月別比較圖 11. 全省來住籍貫比較圖 12. 全省往住地點比較圖	**第一編 靜態** 1. 全省現住人口比較圖 2. 各縣平均每方里住戶比較圖 3. 各縣平均每方里現住人口比較圖 4. 全省戶口歷年比較圖 5. 全省現住人口年齡比較圖 6. 全省現住人口職業比較圖 7. 全省寄居外國人國籍及職業比較圖 **第二編 動態** 1. 全省婚姻類別與年齡比較圖 2. 全省出生者父母年齡比較圖 3. 全省出生歷年比較圖 4. 全省死亡年齡比較圖 5. 全省死亡原因比較圖 6. 全省每年千人中出生與死亡數歷年比較圖 7. 全省遷徙原因及地點比較圖 8. 全省失踪者親屬及年齡比較圖
4 pages				
1934 山西省政府秘書處編 中華民國二十年份山西省户口統計				
1. 山西各縣戶數比較圖 2. 山西各縣人口比較圖 3. 山西全省戶數歷年比較圖 4. 山西全省人口歷年比較圖 5. 山西各縣戶數密度比較圖 6. 山西各縣人口密度比較圖 7. 山西全省男女人口數百分比較圖 8. 山西全省外國人寄居國籍比較圖				
8 pages	6 pages	23 pages	21 pages	15 pages

Table 1: Diagrams in different editions of Shanxi population statistics as listed in their tables of contents

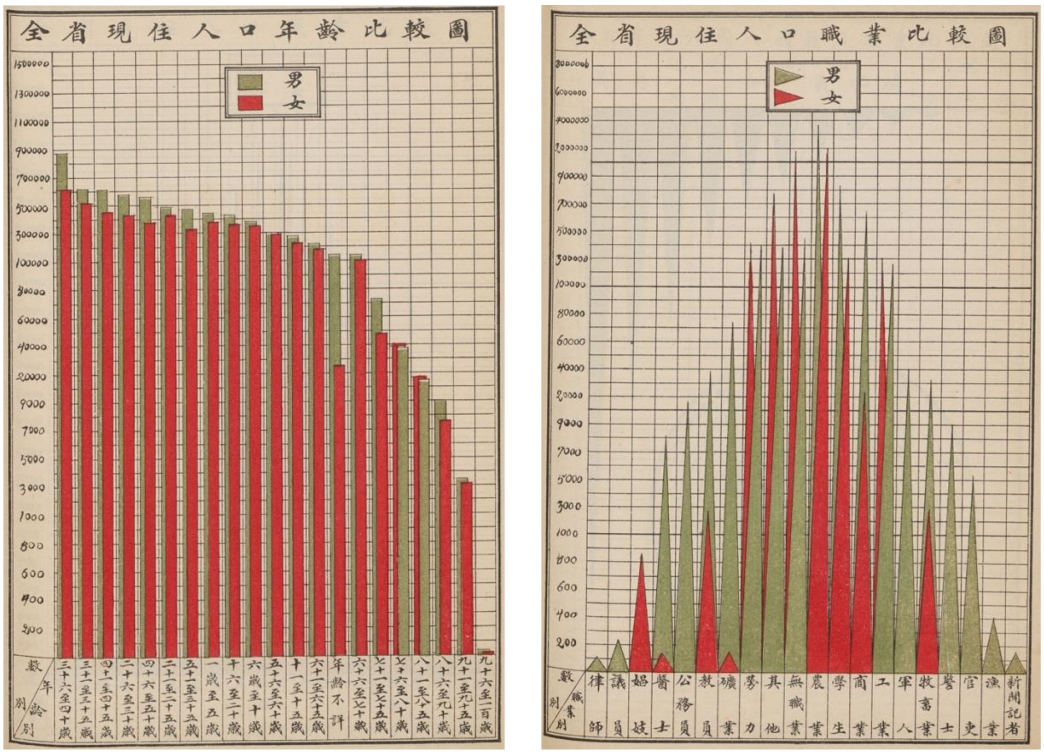

Fig. 5: Age "pyramid" (left) and Occupational categories (right) (Jinsui 1927)

What is striking when one looks at the first to the ninth editions of population statistical charts and tables published by Shanxi's Statistical Department is, first of all, a new structure that appears with the second instalment from 1921. It introduces the population as an entity subject to temporal change. Therein, all demographic material is divided into two categories, the static and the dynamic aspects of population, and separate diagrams and tables are provided in a third part for the static aspects of the provincial capital.[29] This division was not entirely new: already in Meng Sen's 1908 translation of Yokoyama Masao's *Tōkei tsuron* 統計通論, we find precisely, in chapter 4 on population statistics, a division into population states (*renkou zhi jingtai* 人口之靜態) and population flows (*renkou zhi dongtai* 人口之動態). This goes back to the German social statistical school of Georg von Mayr, who was highly influential in Japan.[30] Distinguishing between static and dynamic aspects of the population remains the overall classification from the 1921 edition of Shanxi population statistics onwards, but

[29] This third part is unique to the second edition and left out in all subsequent instalments.

[30] Mayr 1897. Mayr was in close contact with Hanabusa Naosaburo 花房直三郎 (1857–1921) and had a Japanese student, Takano Iwasaburo 高野岩三郎 (1871–1949), both of whom were important figures in population studies and statistics more generally in Japan. See Ōshima 1968, Takano & Suzuki 1968, and Mayr 1917.

1) the graphical layout of the same statistics is unstable, and 2) the content of the visually showcased numbers changes and becomes more specific from the 1st to the 7th edition.[31]

As for the first observation, it reveals the experimental character of the graphical production of statistics in Shanxi. By playing with the range of possibilities for laying out population numbers and related "social facts", the statisticians and workers in the offices often chose designs which were not intuitive for conveying numerical realities. For example, they organised certain data in a symmetric way. The numbers of persons belonging to different professional categories become harder to compare mutually when arranged in a bell-shaped curve rather than in ascending or descending order (fig. 5 to the right), yet in this way, the biggest category is moved to the central and most prominent position.[32] Here, the farmers are followed by those without profession to their left and students to their right. Thus, we find in the spotlight precisely those social groups which deserved particular attention or represented a particular social burden: the farmers because they supplied food for the people, students for they were responsible for building a modern future by learning, and the primarily female part of the unemployed population which was unproductive. What we see is the political gaze on society, not the mathematician's gaze on numbers, and by pushing our interpretation even further, what we see is the desire to order society in a symmetric fashion, to see it in a balanced and organised fashion instead of a chaotic, unordered social reality.

The same symmetrisation can be seen in a diagram of migration patterns within and without Shanxi province (fig. 6), where women migrating to and out of Shanxi for marriage represent the biggest group, followed by men moving in and out of the province to earn their livelihood. Arranging population numbers according to age group in a descending or ascending order is also not the most intuitive design. The 1927 edition of Shanxi population numbers shows a graph with the biggest group from 36 to 40 years of age to the very left down to the smallest group of those above 96 (fig. 5 to the left). Yet again, this is not simply an aesthetic choice for organising quantitative material. Such a layout focuses on the largest biological categories of Shanxi's population in terms of age and, thus, the group of highest political priority to act upon.

The second observation is that more specific topics of social concern and population dynamics were included over time from the 1st to the 9th edition. For example, we find new topics such as:

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[31] The 7th and 9th editions have the same content for the graphs and tables; only one minor change can be seen in the 8th edition. There, marriage statistics additionally show monthly figures, and age at marriage (*hunyin nianling* 婚姻年齡) and type of marriage (*hunyin leibie* 婚姻類別) are two separate charts instead of being shown on the same page one within the other.

[32] Precedents for this layout can be seen in Meng 1909, 149.

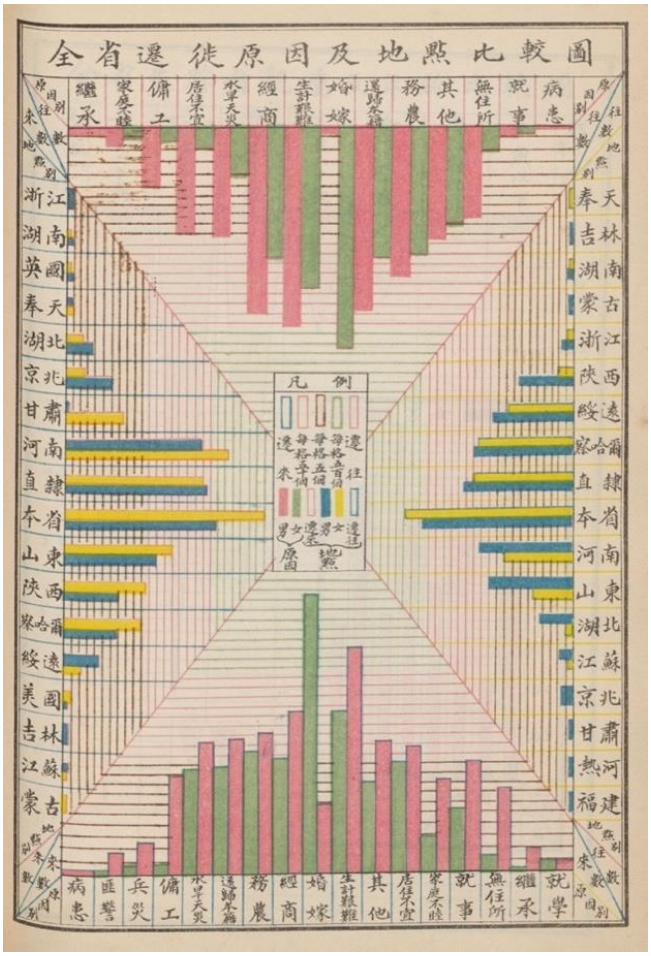

Fig. 6: Comparative diagram on reasons for and places of migration for the entire province (全省遷徙原因及地點比較圖) (Jinsui 1927).

- Profession and nationality of foreign residents (added in the 2nd ed. from 1921),
- age at marriage (added in the 2nd ed. from 1921),
- age of parents at childbirth (added in the 7th ed. from 1927),
- causes of death (added in the 2nd ed. from 1921),
- the number of missing persons (added in the 7th ed. from 1927),
- the reasons for intra- and interprovincial migration (added in the 7th ed. from 1927).

The second and third items were significant for explaining the growth rate of Shanxi's population. Qiao Qiming, in his analysis of Shanxi's population problems, credited its important scale to the "early marriage early childbirth pattern in Shanxi" (*Shanxi zaohun zaochan* 山西早婚早產) which he called "a common social disease" (*shehui tongbing* 社會通病) (Qiao

1931, 16). With Yan Xishan's attention paid to hygiene and medicine in Shanxi,[33] the causes of death were equally part of the "population problems" that Qiao listed. The least frequent known cause of death — giving up opium consumption (*jiechu yapian* 戒除鴉片) — was depicted centre stage in the 1927 population statistics (see fig. 7). But there is more to that: the low number of casualties is not only at the centre but also visually increased by adopting a logarithmic scale for the abscissa[34] — instead of a linear scale with serpentine-shaped bars for large values as seen in many other graphs (cf. fig. 1). The main reason for death — weakness due to age — thereby becomes a minor affair at the right margin of the graph and attracts less of the observer's attention.

Such a choice of visual layout confirms our hypothesis about the primacy of political statements over purely numerical information in statistical graphs. These were not simply condensed representations of large sets of numbers but allowed the visual support and justification of political goals. The finger was laid on the wounds and the weaknesses of society, not on the successes of policies nor the "strength of the state" (Nikolow 2001). Fig. 8 also shows nicely the burden of opium smokers in Shanxi's legal and penitentiary system: the sheer size of the amount of law cases resulting in punishments for opium consumption (followed by cases of gambling) rests as the solid basis of a tower that one — just like Yan Xishan — would like to dismantle.[35]

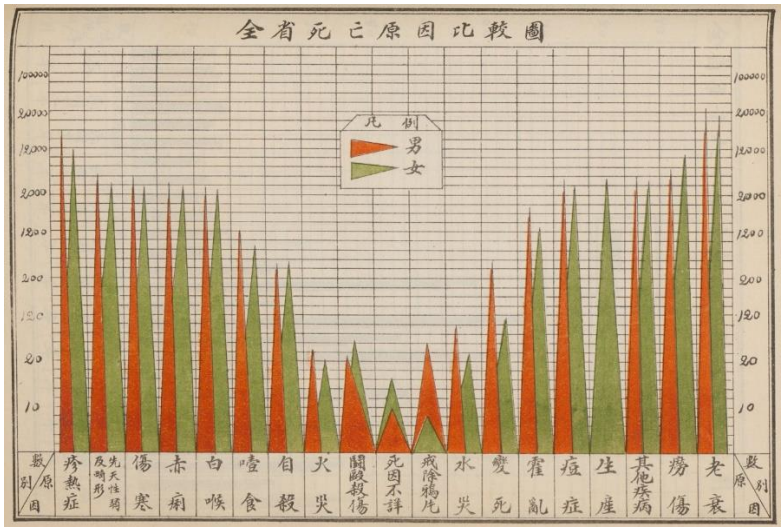

Fig. 7: Comparative diagram on reasons for death in the entire province (全省死亡原因比較圖), women in green, men in red (Jinsui 1927)

[33] On Yan Xishan's (failed) efforts to improve public health and his reliance on foreign missionaries, see Gillin 1967, 36–37.

[34] Logarithmic scales allow to depict small quantities relatively bigger and large quantities relatively smaller.

[35] See Gillin 1967, 38–40 on Yan Xishan's changing approach to eradicating opium smoking.

Conclusion

The collection of statistical data in Shanxi was relatively systematic and consistent during the first half of the Republican era, yet, when turned into graphs, formats and layouts constantly changed. The high degree of experimentation and uncertainty regarding graphical representation can only partly be explained by the fact that statistical production was not an outcome of long-time deliberation within an established "scientific community" in Shanxi, but the product of a state bureaucracy operating on the provincial level under very challenging circumstances with personnel who had received only some formal training.

Behind the apparent graphical variety, we found that visual statistics all manifested a political primacy in communicating about Shanxi's society and its governance. They clearly depicted which aspects were of central concern to Shanxi's governor and, at the same time, the *raisons d'être* of his statistical endeavours. What statistical tables could not perform, statistical graphs could at first glance: ordering social and demographic categories. Ordering them symmetrically was also an expression of control and rule over the population, with the ultimate goal of enhancing state capacity and producing social progress in Shanxi.

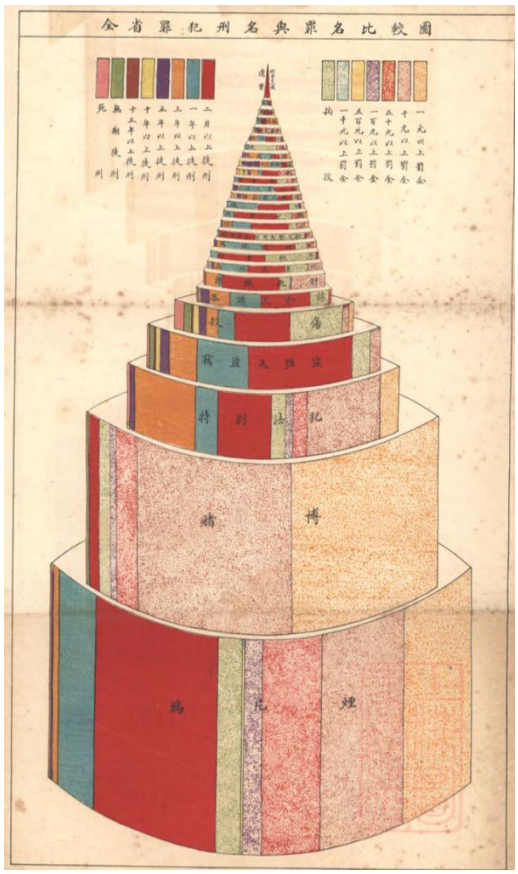

Fig. 8: Punishments shown according to monetary fines and length of imprisonment/death penalty 山西省第四次社會統計 民國十年份 (山西省長公署統計處 編纂 1924)

Bibliography

Bernoulli, Christoph. 1841. Handbuch der Populationistik oder der Völker- und Menschenkunde nach statistischen Ergebnissen. Ulm: Verlag der Stettin'schen Buchhandlung.

Bray, Francesca, Vera Dorofeeva-Lichtmann, and Georges Métailié (eds.). 2011. *Graphics and Text in the Production of Technical Knowledge in China. The Warp and the Weft.* Leiden: Brill.

Bréard, Andrea. 2018. "Meng Sen and Shen Linyi: Two Actors, two Careers in the History of Modern Statistics in China." In *Human Mobility and the Circulation of Scientific and Technical Knowledge in Late Imperial China,* edited by Catherine Jami, 267–293. Paris: Collège de France, Institut des Hautes Études Chinoises.

Bréard, Andrea. 2008. Reform, Bureaucratic Expansion and Production of Numbers: Statistics in Early 20th Century China, Habilitationsschrift, Technische Universität Berlin.

Chen Fangzhi 陳方之. 1933. "Woguo renkou tongji shuzi zhi shangque" 我國人口統計數字之商榷 (A discussion of China's population statistics figures). In *Renkou wenti* 人口問題 (The Population Problem), edited by Wang Yunwu 王雲五 and Li Shengwu 李聖五, 19–52. Shanghai: Shangwu yinshuguan 商務印書館.

Chen Shanlin 陳善林. 1936. *Tongji zhitu xue* 統計製圖學 (A Manual on Statistical Graphics). Shanghai: Shangwu yinshuguan 商務印書館 (大學叢書).

Chiao, Chi-ming. 1933a. "A Study of the Chinese Population." *The Milbank Memorial Fund Quarterly Bulletin* 11.4: 325–341. Continued in January and April 1934 in three more parts.

Chiao, Chi-ming. 1933b. Rural Population and Vital Statistics for Selected Areas of China, l929–l931. MS Sociology, Cornell University.

Crome, August Friedrich Wilhelm. 1782. *Europens Produkte: zum Gebrauch der neuen Produkten-Karte von Europa.* Dessau: Bey dem Verfasser und in der Buchhandlung der Gelehrten zu Dessau und Leipzig.

Educational Statistics for the year 1907 (學部總務司編, 第一次教育統計圖表光緒三十三年分) https://catalog.digitalarchives.tw/item/00/12/80/bf.html.

Executive Council of the International Health Exhibition & Council of the Society of Arts (eds.). 1884. *Health Exhibition Literature.* Volume XVII. *Special Catalogue of the Education Division...* London: William Clowes and Sons.

First Statistical Tables for Commerce and Agriculture for 1912 中華民國元年第一次農商統計表, edited by the Statistical Department of the General Office of the Ministry of Agriculture and Commerce 農商部總務廳統計科編 (Reprint: Shanghai: Zhonghua shuju 中華書局 1993).

Friendly, Michael. 2008. "The Golden Age of Statistical Graphics." *Statistical Science* 23: 502–535.

Galton, Francis. January 15, 1880. "Visualised Numerals." *Nature*, 252–256. [Extended Version in the *Journal of the Anthropological Institute*, August 1880, 85–102.]

Gao Ruijiao 高瑞皎. 2020. *Shanxi jindai de shangye jiaoyu yanjiu* 山西近代的商业教育研究(1902–1937) (A Study of Commercial Education in Modern Shanxi). Master thesis, Shanxi University (Shanxi daxue 山西大学).

Gao Yinghui 高迎晖 and Gao Jiong 高炯. 2005. "Minguo shiqi Shanxi shoujie sheng yihui fuyizhang Gao Hong" 民国时期山西首届省议会副议长高洪 (Gao Hong, Vice-President of the First Provincial Council of Shanxi during the Republican Era). *Wen shi yuekan* 文史月刊 10: 29–31.

Guo, Vivienne Xiangwei. 2022. Negotiating a Chinese Federation – The Exchange of Ideas and Political Collaborations between China's Men of Guns and Men of Letters, 1919–1923. Leiden: Brill.

Gillin, Donald G. 1960. "Portrait of a Warlord: Yen Hsi-shan in Shansi Province, 1911–1930." *The Journal of Asian Studies* 19.3: 289–306.

Gillin, Donald G. 1967. *Warlord. Yen Hsi-Shan in Shansi Province, 1911–1949*. Princeton, NJ: Princeton University Press.

Hanabusa Naosaburō 花房直三郎. 1900. *Jinkō tōkeino hōhō gijutsu* 人口統計ノ方法及技術 (Demographic Methods and Techniques). Tokyo: Kobayashi Matashichi 小林又七.

Hao Baoying 郝寶英. 1934. "Shanxi renkou zong diaocha" 山西人口總調查 (General survey of Shanxi's population). *Xin Nongcun* 新農村 13/14: 258–272.

Jinsui zongsiling bu tongji chu 晋綏總司令部 統計处 (ed.). 1927. *Shanxi sheng di qi ci renkou tongji* Minguo shisan nian fen 山西省第七次人口統計 民國十三年分.

Jinsui shehui jingji diaocha tongji she 晋綏社會經濟調查統計社 (ed.). 1935. *Jinsui shehui jingji diaocha tongji she niankan* 晋綏社會經濟調查統計社年刊 (Annual of the Association for the Promotion of Statistical Investigation of the Economics and Societies of Shansi and Suiyuan).

Kure Ayatoshi 呉文聡. ([1]1901) [4]1911. *Junsei tōkeigaku* 純正統計学 (Pure Statistics). Tokyo: Maruzen 丸善.

Lam, Tong. 2011. A Passion for Facts: Social Surveys and the Construction of the Chinese Nation-State, 1900–1949. Berkeley: University of California Press.

Liu Furuo 劉孚若. 1930. "Shanxi Yishi xian renkou zhi diaocha" 山西猗氏縣人口之調查 (A population survey of Yishi county in Shanxi). *Tongji yuebao* 統計月報 2.4: 59–62.

Liu Jie 劉杰. 1929. "Shanxi renkou zhiye de fenxi" 山西人口職業的分析 (An analysis of occupations of Shanxi's population). *Laozi heyi* 勞資合一 1.1: 1–4.

Mayr, Georg von. 1897. *Statistik und Gesellschaftslehre*. Vol. 2: *Bevölkerungsstatistik*. Freiburg im Breisgau, Leipzig, Tübingen: Mohr (Paul Siebeck).

Mayr, Georg von. 1917. Statistik und Gesellschaftslehre. Vol. 3: Sozialstatistik. Tübingen: Mohr.

Meng Sen 孟森. 1909. *Gaiding zengbu tongji tonglun* 改訂增補統計通論 (A General Discussion of Statistics, revised and enlarged) (3rd ed.). Shanghai: Shangwu yinshuguan 商務印書館. Original: Yokoyama, Masao 横山雅男. 1906. *Tōkei tsuron* 統計通論 (A General Discussion of Statistics) (8th ed.). Tokyo: Senshūgakkō 專修學校.

Morgan, Mary S. 2020. "Inducing Visibility and Visual Deduction." *East Asian Science, Technology and Society: An International Journal* 14: 225–252. DOI https://doi.org/10.1215/18752160-8538247.

Nakajima, Takahiro. 2020. "The Progress of Civilization and Confucianism in Modern East Asia: Fukuzawa Yukichi and Different Forms of Enlightenment." In *Chinese Visions of Progress, 1895 to 1949*, edited by Thomas Fröhlich and Axel Schneider, 75–102. Leiden: Brill.

Neiwu bu tongji ke 內務部統計科 (ed.). 1917. *Neiwu tongji. Minguo yuannian fen. Shanxi renkou zhi bu* 內務統計 民國元年分 山西人口之部 (Ministry of the Interior Statistics for the year 1912, Shanxi Population Section). Wenyi Publisher (Ministry of Interior Gazette supplement) 文益印刷局 (內務公報附刊).

Neiwu bu tongji ke 內務部統計科 (ed.). 1918. *Minguo wu nian fen. Neiwu Tongji. Shanxi renkou zhi bu* 民國五年分 內務統計 山西人口之部 (Ministry of the Interior Statistics for the year 1916, Shanxi Population Section). Wenyi Publisher 文益印刷局.

Neiwu bu zongwu ting tongji ke 內務部總務廳統計科 (ed.). 1922. *Neiwu tongji tudi yu renkou (Zhonghua minguo shiyi nian du)* 內務統計 土地與人口 中華民國十一年度 (Ministry of the Interior Statistics for the year 1922: Land and Population).

Nikolow, Sybilla. 2005. "Statistische Bilder der Bevölkerung in den grossen Hygieneausstellungen als Wissensobjekte." In *Das Konstrukt Bevölkerung vor, im und nach dem „Dritten Reich"*, edited by Rainer Mackensen and Jürgen Reulecke, 476–488. Wiesbaden: Verlag für Sozialwissenschaften.

Nikolow, Sybilla. 2001. "A. W. F. Crome's Measurements of the 'Strength of the State': Statistical Representations in Central Europe around 1800." In *The Age of Economic Measurement*, edited by Judy L. Klein and Mary S. Morgan. Special issue, *History of Political Economy* 33 (annual supplement), 23–55. Originally published 1999 in German: " 'Die Versinnlichung von Staatskräften': statistische Karten um 1800." *Traverse: Zeitschrift für Geschichte* 6–3: 63–82. http://doi.org/10.5169/seals-17727.

Ōshima Kiyoshi 大島清. 1968. *Takano Iwasaburo den* 高野岩三郎伝 (Biography of Takano Iwasaburo). Tokyo: Iwanami Shoten 岩波書店.

Paulès, Xavier. 2022. "Warlords at Work: Four Crucial Realms and Four Dynamics of State Building in Republican China, 1916–1937." *Twentieth-Century China*, 47.1: 40–49.

Paulès, Xavier. 2020. "Le petit âge d'or statistique de la décennie de Nankin (1928–1937)." In *Encyclopédie des historiographies: Afriques, Amériques, Asies. Volume 1: sources et genres historiques*, edited by Kouamé, Nathalie, Éric P. Meyer, and Anne Viguier, 1328–1334. Paris: Presses de l'Inalco. https://doi.org/10.4000/books.pressesinalco.27790.

Playfair, William. 1802. Carte statistique représentant l'étendue, la population et les revenus des principales nations de l'Europe, aprés la division de la Pologne et le traité de Luneville. Paris: Chez Batilliot; Chez Genets.

Qiao Qiming 喬啟明. 1931. "Shanxi renkou wenti de fenxi yanjiu (fu biao)" 山西人口問題的分析研究(附表) (Analytic Research (with tables) on Population Problems in Shanxi). *Shehui xuekan* 社會學刊 2.2: 1–24.

Qiao Qiming 喬啟明. 1932. "Shanxi Qingyuan xian yibai sishisan nongjia renkou diaocha zhi yanjiu" 山西清源縣一百四十三農家人口調查之研究 (Analysis of a Survey of 143 peasant families in Qingyuan County, Shanxi Province). In *Zhongguo renkou wenti* 中國人口問題 (Population Problems in China), edited by Zhongguo shehui xueshe 中國社會學社 (Chinese Sociology Association). Shanghai: Shijie shuju 世界書局.

Qin Hancai 秦翰才. 1926. "Du Shanxi ren zhi zhiye tongji" 讀山西人之職業統計 (Reading Occupation Statistics of Shanxi People). *Jiangsu jiaoyu gongbao* 江苏教育公报 (年终增刊): 13–14.

Sepkoski, David, and Marco Tamborini. 2018. " 'An Image of Science': Cameralism, Statistics, and the Visual Language of Natural History in the Nineteenth Century." *Historical Studies in the Natural Sciences* 48.1: 56–109. https://doi.org/10.1525/hsns.2018.48.1.56.

Shanxi sheng difang zhi bangongshi 山西省地方志辦公室 (ed.). 2014. *Minguo Shanxi zhengquan zuzhi jigou* 民國山西政權組織機構 (Organisational Structure of the Shanxi Government during the Republic). Taiyuan: Shanxi renmin chubanshe 山西人民出版社.

Shanxi shengli shangye zhuanke xuexiao 山西省立商業專科學校 (ed.). 1932?. *Minguo ershiyi niandu Shanxi shengli shangye zhuanke xuexiao yilan* 民國二十一年度-山西省立商業專科學校一覽 (An Overview of Shanxi Provincial Business Colleges for the Year 1932).

Shanxi shengzhang gongshu tongji chu 山西省長公署統計處 (ed.). 1922. *Shanxi sheng di yi ci zhengzhi tongji. Zongwu zhi bu* 山西省第一次政治統計 總務之部 (First Statistics on Government from Shanxi Province. General Administration Section). [Taiyuan]: Shanxi sheng zhang gong shu tongjichu 山西省長公署統計處.

Shanxi shengzhang gongshu tongji chu 山西省長公署統計處 (ed.). 1924. *Shanxi sheng di si ci shehui tongji. Minguo shiyi nian fen* 山西省第四次社會統計 民國十一年份 (Fourth Social Statistics from Shanxi Province for the Year 1922). [Taiyuan]: Shanxi sheng zhang gong shu tongjichu 山西省長公署統計處.

Shanxi sheng zhengfu mishu chu 山西省政府秘書處 (ed.). 1934. *Shanxi sheng hukou tongji. Zhonghua minguo ershi nian fen* 山西省戶口統計 中華民國二十年份 (Household Statistics from Shanxi Province for the Year 1931).

"Shanxi sheng zhengfu tongji zuzhi zhi yange yu xianzhuang" 山西省政府統計組織之沿革與現狀 (History and Current Status of the Statistical Organisation of the Shanxi Provincial Government). 1937. *Tongji yuebao* 統計月報 29: 75–76.

Sugi Kōji 杉亨二 et al. 1902. 杉先生講演集 (Collected Lectures by Mister Sugi Koji), Yokoyama Masao 横山雅男 ed. 国立国会図書館デジタルコレクション (National Diet Library Digital Collection), https://dl.ndl.go.jp/pid/898298 (consulted September 9, 2024).

Taeuber, Irene B. 1973. "The Data and The Dynamics of The Chinese Populations." *Population Index* 39.2: 137–170.

Tai Shuangqiu 邰爽秋. 1932. *Jiaoyu tushifa* 教育圖示法 (Teaching Drawing Techniques). Jiaoyu yinshu hezuo she 教育印書合作社.

Tai Shuangqiu 邰爽秋. 1935. *Shiyong jiaoyu tubiao huizhi fa* 實用教育圖表繪製法 (Applied Teaching of Drawing Techniques). Shanghai: Jiaoyu bianyi guan 教育編譯館.

Takano Iwasaburo 高野岩三郎 and Suzuki Koichiro 鈴木鴻一郎 (eds.). 1961. *Kappa no he: ikoshu* かっぱの屁 : 遺稿集. Tokyo: Hosei daigaku shuppankyoku 法政大学出版局.

Tang Lina 唐丽娜, Pan Yue 潘月, and Shen Yanfang 申艳芳. 2023. "Wo guo xiandai renkou pucha de xianqu yu chuxing—Dai Shiguang yu Chenggong renkou pucha shiyan" 我国现代人口普查的先驱与雏形——戴世光与呈贡人口普查试验 (The Pioneer and Prototype of Modern Census in China—Dai Shiguang and Census Trial in Chenggong). *Shehuixue pinglun* 社会学评论 (*Sociological Review of China*) 11.2: 70–90.

Tang Lina 唐丽娜 and Yang Jiaqi 杨镓萁. 2021. "Qingmo minguo shiqi tongjixue de chuanru yu fazhan—jiyu dui tong shiqi 204 ben tongji xueshu tushu de yanjiu" 清末民国时期统计学的传入与发展—基于对同时期 204 本统计学术图书的研究 (The Introduction and Development of Statistics in the Late Qing Dynasty and the Republic of China Period-Based on the study of 204 Statistical Academic Books of the Same Period). *Tongji yanjiu* 统计研究 (Statistical Research) 38.3: 150–160.

Tao Baolin 陶保霖 (ed.). 1909. *Diaocha hukou zhangcheng shiyi* 調查戶口章程釋義 (An Explanation of the Principles of Household Surveys). Shanghai: Commercial Press 商務印書館.

Thompson, Malcolm. 2013. *The Birth of the Chinese Population : A Study in the History of Governmental Logics*. PhD thesis, University of British Columbia, 2013. https://doi.org/10.14288/1.0073963.

Tufte, Edward R. 1990. *Envisioning Information.* Cheshire, Connecticut: Graphics Press.

Tufte, Edward R. 1997. Visual Explanations. Images and Quantities, Evidence and Narrative. Cheshire, Connecticut: Graphics Press.

Tufte, Edward R. 2001. The Visual Display of Quantitative Information. Second Edition. Cheshire, Connecticut: Graphics Press.

Vogelsang, Kai. 2012. "Chinese 'Society': History of a Troublesome Concept." *Oriens Extremus* 51: 155–192.

Von Oertzen, Christine. 2016. "Datafication and Spatial Visualization in Nineteenth-Century Census Statistics." *Historical Studies in the Natural Sciences* 48.5: 568–580. https://doi.org/10.1525/hsns.2018.48.5.568.

Wang Defa 王德发. 2017. *Zhonghua minguo tongjishi* 中华民国统计史 1912–1949 (A History of Statistics in the Republic of China, 1912 – 1949). Shanghai: Shanghai Caijing Daxue 上海财经大学.

Wei Juxian 衛聚賢. 1934. *Lishi tongjixue* 歷史統計學 (Historical Statistics). Shanghai: Shangwu yinshuguan 商務印書館.

Wei Yuan 魏源. 1976. "Mogu" 默觚 (Quiet Notes). In *Wei Yuan ji* 魏源集 (Collected Writings of Wei Yuan). Beijing: Zhonghua shuju 中華書局.

Xuewu gongsuo 學務公所 (ed.). 1909. *Zhejiang jiaoyu tongji tubiao* 浙江教育統計圖表 (Statistical graphs and tables on education in Zhejiang province).

Yan Xishan 閻錫山. 1919. "Xuyan" 序言 (Preface). In *Shanxi sheng di yi ci renkou tongji tubiao* 山西省第一次人口統計圖表, edited by Shanxi sheng zhanggong shu tongji chu 山西省長公署統計処, 1–4.

Zhu Zuoting 朱佐廷 (ed.). 1934. *Tongji tubiao bianzhi* 統計圖表編製 (The layout of statistical diagrams and tables). Liming shuju 黎明書局.

Zhu Zuhui 朱祖晦. 1931. *Zhongguo renkou tongji zhi guoqu ji qi muqian jiuji zhi tujing* 中國人口統計之過去及其目前救急之途徑 (The past of Chinese population statistics and the current path to meet an urgent need). Nanjing: Lifa yuan tongji chu 立法院統計處.