

Tobias Alexander Jopp
Insurance, Fund Size, and Concentration

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Insurance, Fund Size, and Concentration

Prussian Miners' Knappschaften in the
Nineteenth- and Early Twentieth-Centuries and
Their Quest for Optimal Scale



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List of Abbreviations

AKP	Allgemeine <i>Knappschafts</i> -Pensionskasse
ASPD	Average sick pay per day
ATP	Average total pension
AW	Average annual wage
CR	Contribution rate
DP	Probability of dying
EAP	Economically active population
GDP	Gross domestic product
GLM	Generalized linear model
GNP	Gross national product
HHI	Hirschman-Herfindahl index
ICR	Invalids-to-contributors ratio
IP	Probability of becoming invalid
KV	<i>Knappschaft</i> fund (according to the German term <i>Knappschaftsverein</i>)
MC	Miscellaneous costs
MES	Minimum efficient size
MR	Miscellaneous revenues
N	Number of contributors
NNP	Net national product
OCR	Orphans-to-contributors ratio
OMP	Probability of out-migrating
OP	Operating costs
OSD	Overall sick days
P	Pensioners
PAYG	Pay-as-you-go
PCR	Pensioners-to-contributors ratio
RR	Replacement rate
RVO	Reich insurance regulation (according to the German term <i>Reichs-versicherungsordnung</i>)

SCR	Survivors-to-contributors ratio
SD	Standard deviation
SDCR	Sick days-to-contributors ratio
VAR	Variance
WCR	Widows-to-contributors ratio
YOR	Young contributors-to-old contributors ratio

Preface

This study is a revised and shortened version of my doctoral thesis, accepted by the Department of Economics and Social Sciences at *Universität Hohenheim* in March 2012. Written while I was working at the Chair of Economic and Social History, my study has to be considered as a part of the interdisciplinary research project entitled “Vergangenheit und Zukunft sozialer Sicherungssysteme am Beispiel der Bundesknappschaft und ihrer Nachfolger” funded by the Leibniz Association. I worked as a project assistant on the economic sub-project which was led by the *Rheinisch-Westfälisches Institut für Wirtschaftsforschung* (RWI) located in Essen in cooperation with *Universität Hohenheim* and Yale University. To my great delight, this study has been awarded the *Friedrich-Lütge-Preis* 2013 for outstanding dissertations in the fields of economic history by the *Gesellschaft für Sozial- und Wirtschaftsgeschichte* (GSWG). I would like to thank the GSWG very much for acknowledging my study in this way.

In fact, I am not the only one who contributed to the study – several persons did whose valuable professional and emotional support I highly appreciate, of course. To begin with, I would particularly like to acknowledge and express my gratitude for my doctoral supervisor, Prof. Dr. Jochen Streb, on the one hand, for enabling me to conduct research on the questions addressed according to my particular ideas and, on the other hand, for his dedicated mentoring at any time during the origination process. I am truly indebted to him as my academic teacher. Moreover I am very grateful to Prof. Timothy Guinnane, PhD, for discussing with me the subject matter on various occasions and giving me a lot of suggestions, which likewise were invaluable for preparing this study. Additionally, I owe special thanks to Prof. Dr. Christoph M. Schmidt and Prof. Dr. Manuel Frondel for their valuable support – funding inclusive – directly coming from the RWI. Besides, I would like to thank Prof. Dr. Jörg Schiller very much for acting as co-supervisor providing critical advice and important suggestions for revisions, too, and Prof. Dr. Gert Kollmer-von Oheimb-Loup for acting as chairman of the examining board.

In particular, I would also like to highlight the contribution that the amicable atmosphere among my appreciated colleagues provided for preparing my study. For human warmth and the willingness to discuss the subject matter at any time, I offer appreciation and many thanks to Nicole Waidlein, Stefanie Werner, and Harald Degner. Be-

sides, a handful of student assistants generously supported me by collecting and preparing data, namely Jana Schrödl, Meike Thumm, Patrick Baldes, Reiner Frommer, and Niklas Römig.

I am also deeply indebted to Prof. Dr. Carsten Burhop for setting the course to proceed with the project “doctorate” after I finished my studies by mentoring me as an external doctoral candidate. Moreover, I am very grateful to Prof. Dr. Mark Spoerer for having given me a considerable amount of freedom in fine-tuning my study and completing my doctorate after moving to *Universität Regensburg*. Finally, I would like to thank Prof. Dr. Reinhard Spree, who – as editor of the series *Beihefte des Jahrbuchs für Wirtschaftsgeschichte* – recommended incorporating my study, as well as the *Akademie Verlag* for publishing it.

Above all, I have to give my greatest thanks to my mother for her constant backing, encouragement and support for my project “doctorate” in all respects. To her and my grandparents Klara and Willibald I dedicate my study.

Tobias A. Jopp
Regensburg, April 2013

1. Introduction

Anyone who is to some extent familiar with the German welfare state probably knows about the *Bundesknappschaft*, established in 1969, and its successor, the *Deutsche Rentenversicherung Knappschaft-Bahn-See*, established in 2005. While the former provided a package of social insurance benefits exclusively to miners – and, thus, was one of the few strictly sector-specific carriers of statutory health and pension insurance – the latter is now free to contract with everybody, not only with miners, railroaders, and shippers as its name implies.¹ Presumably less known are both of these social insurance institutions' direct organizational forerunners, to which they can be traced for their very origins in mediaeval times. This study examines one of these forerunners: the various *Knappschaftsvereine* (*Knappschaft* funds, or simply KVs² in the following) of the second half of the nineteenth and the early twentieth centuries.³ These mining-specific insurance funds, which had emerged from purely charitable associations of religious origin, existed throughout the various German mining areas. These funds insured their

¹ Actually, there is no natural translation of the terms *Bundesknappschaft* and *Deutsche Rentenversicherung-Knappschaft-Bahn-See*. As for non-German readers, however, we might call them “Federal *Knappschaft*” (for the term *Knappschaft* itself see the following footnote) and “German Mining-Railway-Sea Pension Fund.” Precisely, the *Deutsche Rentenversicherung Knappschaft-Bahn-See* is now the second pillar of the German statutory old-age insurance, besides the *Deutsche Rentenversicherung Bund* (“German Federal Pension Fund”). It was recently, in 2005, that the *Bundesknappschaft* merged with the *Bahnversicherungsanstalt* (social insurance for the railroad sector) and the *Seekasse* (health insurance for the shipping sector) into the new provider; see Bartels et al. (2009), pp. 195–208, and Klenk (2008), pp. 125–126.

² To clarify: *Knappschaften* is plural, and *Knappschaft* is singular. I use the abbreviation “KV” (singular) or “KVs” (plural) according to the German term *Knappschaftsverein(e)*. It is not possible – at least not to the best of my knowledge – to translate the term into an accurate English expression; “miners’ fund” would probably do it. The term itself relates to the mediaeval German term for miner, the *Knappe*. When I speak of “the *Knappschaft*,” I always refer to the *Knappschaft* institution – the basic idea *behind* the fund(s) and not a particular fund taken as an organization.

³ The timely gap between the KVs and the *Bundesknappschaft* is closed, on the one hand, by the *Reichsknappschaft*, which was established in 1923 and continued to operate until 1945, and, on the other hand, by the few self-standing *Bezirksknappschaften* (district *Knappschaft* funds), into which the *Reichsknappschaft* was split during the immediate post-war years; see Lauf (1994), pp. 201–204.

members against the major risks of life, including invalidity, sickness, survivorship, and old-age (i.e., longevity). Related insurance benefits – lifetime pensions and short-term payments such as daily sick pay, among others – were combined in a single package.⁴

The origin of the *Knappschaft* institution lies in the Middle Ages, when miners began to form mutual associations to collectively deal with contingencies like temporary or permanent incapacity to work and, thus, to earn one's living and to provide for one's household. As nineteenth- and early twentieth-century contemporaries of the KVs believed, the emerging collective action directed towards risk provision was due, essentially, to the unique character of the profession itself and to the highly developed sense of solidarity among miners, isolating mining from other economic activities.⁵ The German miners' funds, increasingly spreading over areas with resource deposits and characterized by the principle of charity, had then been under the patronage of the sovereign's administration during the absolutist-mercantilist era. Finally, KVs were converted from charitable or, respectively, state-run organizations into insurance funds thanks to the Prussian mining reform of 1851–1865, which significantly contributed to establishing a new liberal economic order regarding all kinds of mining activities.⁶ The seminal New *Knappschaft* Law of 1854 and, later, the Prussian General Mining Law of 1865 essentially shaped the miners' job-related social insurance system and re-established the KVs as publicly-licensed, but self-administered insurance providers. Membership in a fund would provide a miner with a conditional promise that he would receive a certain insurance benefit of pre-defined amount in the event of certified sickness or invalidity. Ensuring that this exchange took place was the KV's – or, more accurately, the KV's management's – responsibility. In return, a miner paid regular social insurance contributions to complete the transfer of insured risks to the KV. The KVs were still kind of mutual insurance organizations in that the various local memberships, together with mine owners, managed the funds, though within the limits of the states' regulations and without owning property rights in the funds.⁷

⁴ I prefer the term “invalidity” over the term “disability.” The terms may, however, be used interchangeably.

⁵ See, for example, von der Heyden-Rynsch (1881), p. 259, and Köhne (1915), p. 5.

⁶ See Fischer (1961a).

⁷ As emphasized, the underlying definition of what “insurance” might be is chosen to be fairly specific here. In a broader economic sense, the essence of “insurance” certainly is that it enables a risk-averse individual to exchange an uncertain and potentially high loss in the future for a small certain loss in the present; see, for example, Arrow (1996) on this. Whaples and Buffum (1991), for example, provide an overview of the different ways of provision against risks. Moreover, the coexistence of several different forms of provision against the risks of sickness or invalidity – through the state or through governmental agencies, individual care, collective mutual action, and the market – has been termed in the literature “the mixed economy of welfare.” Surely, such a mixed economy of welfare existed in Germany at the time, and the KVs were part of it; see, for example, Harris and Bridgen (2007), p. 1, and Pons Pons and Vilar Rodriguez (2011), p. 72.

Given their purpose and character, KVs might remind the reader of friendly societies and other related mutual funds, more intensively discussed in the economic-historical literature. KVs, however, were different in some important aspects. First, miners were obligated to join the local KV that was in charge of the area in which their workplace was situated – that is, membership was mandatory; this, in particular, meant that adverse selection as a basic insurance problem *did not* play a role for KVs unless, of course, it was a matter of choice of profession.⁸ Second, the benefit package that the KVs were obligated by law to provide was, at least, qualitatively more extensive in the sense that it combined daily sick pay, medical treatment and funeral benefits with lifetime invalidity and survivorship pensions. Third – and this fact provides the basis for the “connecting tissue” of this study – contemporary observers of the KVs seem to have focused on whether financial stability could be improved by exploiting economies of scale – all else being equal –, rather than, as contemporary observers of friendly societies in Britain and North America suggested, by improving the actual pricing techniques used at the time. The central research question of this study – which will be outlined below – is essentially motivated by the fact that there was this intense discussion among observers of the KVs – and that the importance of scale was at its centre.

Several scholars have, so far, emphasized the KVs’ importance as an early – presumably the earliest – *social insurance* scheme. The KVs had already been in operation for more than two decades when Bismarckian worker insurance came into existence in 1883 as their “counterpart” on the national level. According to Varnas (1947), Köhler and Zacher (1982), Tampke (1982) and Geyer (1985, 1992), for example, the great achievement of Bismarckian insurance was to make the advantages of insurance available to a larger circle of workers, selectively directed at first towards those in industry. It was, however, not the *Gesetz betreffend die Krankenversicherung der Arbeiter* (Health Insurance Law) of June 15, 1883 that formally invented and established social insurance – or the insurance business in general, for that matter.⁹ Instead, “insurance,” in the narrow sense of the word, already existed as an economic innovation and a technology to satisfy people’s and businesses’ needs for future financial security in the face of omnipresent uncertainty. As such, it emerged, at the latest, around the middle of the nineteenth century, in the private commercial (life insurance) sphere, as well as in the sphere of sector-specific social insurance (mining, railroad, and shipping).¹⁰ Initially the focus was on protection against sickness and incapacity to work, including the conse-

⁸ For the idea behind adverse selection, see Akerlof’s seminal 1970 paper on the “market for lemons.” Applications to economic history include, for example, Murray (2005) and Gottlieb (2007).

⁹ See Varnas (1947), p. 59, Köhler and Zacher (1982), p. 22, Tampke (1982), pp. 71–74, Geyer (1985), p. 96, and Geyer (1992), pp. 1 046–1 047.

¹⁰ See Borscheid and Drees (1988), pp. 3–49, for a short history of the insurance business in Germany, including social insurance. Furthermore, see Montz (2010) and Sulzer (2010) for the most recent studies about the occupational systems for the railroad and shipping sectors. Pearson (1997) provides an international perspective.

quences of work-related accidents; protection against the consequences of unexpected longevity, of survivorship and of unemployment appeared on the national agenda only in the early twentieth century.¹¹ Moreover, besides those scholars mentioned, Wagner-Braun (2002) brings particular attention to the KVs' historical and economic importance as the definitive pioneers of *compulsory* membership.¹² Finally, according to Hennock (2006) who wrote, among other things, on the emerging German and British welfare states in comparative perspective, entrepreneur Carl Ferdinand Stumm recommended several times, in the late 1870s, that politicians should seriously consider adopting the miners' insurance model for all employees in the industrial sector.¹³ Obviously, all countries that, to one extent or another, adopted the tradition of the Bismarckian welfare state have been influenced somewhat indirectly by the German miners' insurance model.

Against the historical background of the KVs' significance in the emergence of the German welfare state, researchers have made only limited efforts to understand this welfare institution in more detail and, thus, have neglected a crucial piece of German insurance history. This impression manifests all the more when we consider, in particular, approaches that would apply economics' methodology to filter out important insights into the KVs' historical development and its broader implications. This study helps fill that research gap by focusing on a particular issue that to explore demands some baseline (insurance) economics: the observable process of internal and, especially, external concentration among the KVs that began in the earlier 1870s and that culminated in the foundation of the *Reichsknappschaft* in 1923, which replaced the locally-organized and state-regulated funds with one national-level institution.

Before proceeding with the central research question that picks up this point, I like to address questions that may immediately have come to the reader's mind after these first introductory words: What precisely was the KVs' nature? Were those funds really carriers of a social insurance system – thus, may be appropriately called “social insurance funds” – or were they not, rather, kind of mutual insurance organization (*Gegenseitigkeitsversicherer*) in a private market? These questions touch on an important, yet – at this very early stage – not satisfactorily assessable, issue. Clearly, the nature of the KVs' insurance determines the theoretical and empirical concepts that do or do not matter in this particular context. Thus, one needs to know more about the KVs' nature before the way the analysis can be or should not, under all circumstances, be conducted can be properly specified. Unfortunately, I can answer these questions properly only

¹¹ This holds for Germany – or the German *Kaiserreich* – as well as for a set of states that had begun to implement social policies for the masses, shortly after Germany made the initial step in 1883. Lindert (1994) and Cutler and Johnson (2004) explain the emergence of the late nineteenth- and early twentieth-century welfare state(s) with reference to a set of theories and quantitative methods.

¹² See Wagner-Braun (2002), pp. 32–33.

¹³ See Hennock (2007), pp. 87–88.

after having introduced the institutional design KVs were embedded in. What I can do right now, however, is to stress my opinion about the KVs' nature: In my view, they can indeed be called the carriers of an early social insurance system, which distinguishes them in some way from what "mutual insurance organization" commonly means, at least in my perception. The remaining part of this introductory chapter might evoke a picture of KVs that is in contradiction to what is commonly seen in connotation with "social insurance." So, for example, I will provide some anecdotal evidence on the fact that KVs seem to have specified risk loadings as part of the contribution payment. This instrument of risk policy may rather be associated with commercial insurance, but not social insurance. Just one remark: KVs seem, indeed, to show up as hybrids. Yet, a basic characteristic that makes the mutual insurance organization "mutual" – policyholders own the organization such that they are at the same time the supplier of their insurance coverage – was definitely not fulfilled in the KVs' case.

1.1. Central research question and scope

Concentrating on the *Prussian* miners' KVs' experience over the formative period of the German welfare state, 1854 to 1923, the central research question is straightforward: Was there a minimum efficient or even optimal scale of operation, and, depending on the nature of economies of scale, was the proclaimed "cleaning of the market" by absorptions of KVs efficient in retrospect? The broader aim of this research is to evaluate the merger and liquidation wave among the Prussian *Knappschaften* beyond what historical research has hitherto done. Once we have examined what information on scale (dis)advantages is hidden in the data, we can relate this information to three important questions in this context: First, what does the evidence tell us about the efficiency of the insurance arrangement carried by KVs? Second, how does the evidence relate to the important discussion in the contemporary literature on the costs and benefits of *Knappschaft* insurance – a discussion centering on the claim that, ultimately, efficiency and survival of the miners' insurance was a function of KV size? Third, how does the evidence relate to the concentration process among KVs as it factually took place? Put differently, is there a picture emerging that is consistent with the traditional reading of the KVs' history, or does this fresh view on the KVs' struggle for optimality suggest a different reading? As to provide the reader with a prospect, in my opinion, evidence will suggest the latter.

This study's observation period covers the years during which the landscape of *Knappschaft* insurance was characterized, on the one hand, by the switch to insurance in the more narrow sense of the concept (see above) and, on the other hand, by many operating funds, or fragmentation. It has to be pointed out, though, that the "statistical observation period" – i.e., the period for which data are available – is 1861–1920. The

reason why to focus on the Prussian KVs primarily is fourfold: First, it was the Prussian state that initiated the influential reform of the mining law that subsequently spread across almost every German state; second, the Prussian KVs covered roughly 90 percent of German miners at the time; third, they were, statistically and with respect to contemporary secondary sources, the relatively best-documented funds; and, fourth, these KVs showed a clear consolidation process until 1923 that, nonetheless, leaves enough variation – basically in fund size – to perform serious, quantitative, mass data-based tests. Although Bavarian and Saxon *Knappschaft* insurance saw notable consolidation as well, variation with respect to size was smaller.

It seems helpful here to illustrate the stylized historical facts that this study takes as its starting point for research. Therefore, Figure 1.1 depicts the (statistical) beginning of KVs in 1861. Reported are the number of KVs, the number of working members (“contributors”), and the number of pensioners as consisting of invalids and survivors. All quantities are depicted by classes of KV size.¹⁴

Figure 1.1: The Prussian KVs’ starting position in 1861: Number of funds, of contributors, and of pensioners by size class



Sources: My own calculations based on Ministerium für Handel, Gewerbe und öffentliche Arbeiten (1861–1878).

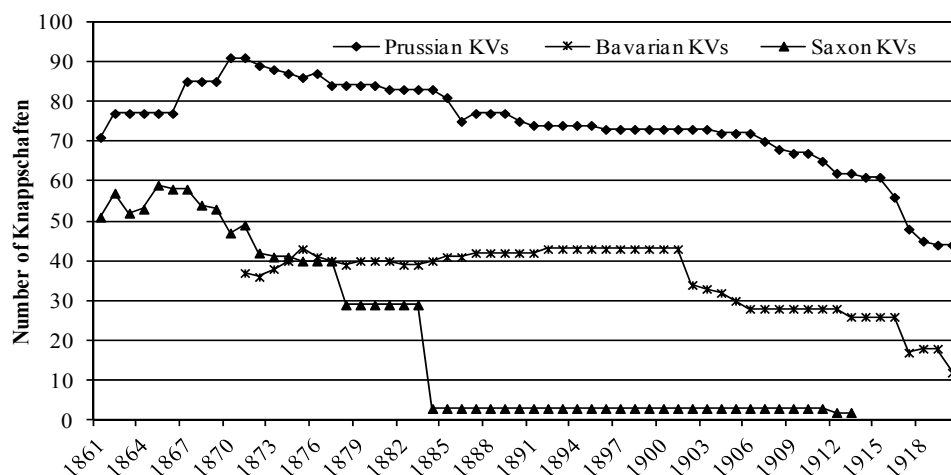
As of 1861, two stylized facts stand out: First, Prussian KVs initially covered around 119 000 working members and 21 000 pensioners. Second, KVs were distributed very unequally over size classes; most KVs were rather small, and the overwhelming number – namely 48 of 71 funds – operated below a size of 1 000 working miners. However,

¹⁴ KV size is measured in terms of contributors; see Chapter 3.

the largest five KVs alone accounted for about 55 percent of contributors (or 56 percent of overall members including inactive pensioners).

In addition, Figure 1.2 illustrates the consolidation process among Prussian, as well as Bavarian and Saxon, KVs. The net reduction in the number of operating Prussian funds, which set in at the beginning of the 1870s and lasted until the formation of the *Reichsknappschaft*, resulted from a combination of mergers (absorptions may be a more accurate term) and liquidations, thus apparently a kind of selection process.¹⁵ At the same time, however, the number of working miners insured in Prussian, Bavarian and Saxon KVs climbed from about 119 000 (from 1861 onwards), 5 000 (from 1871 onwards) and 9 700 (from 1868 onwards), respectively, to more than one million in Prussian, 20 600 in Bavarian and 51 400 in Saxon KVs; counting insured pensioners, too, would, of course, push covered membership further up (around 1 340 000 or, respectively, 25 000 and 69 500 in 1920). Hence, against the background of a continuously growing aggregate membership, directly reflecting the mining sector's growth in terms of employment, more and more insureds were obviously distributed among fewer insurance carriers, and the average size among KVs climbed up.

Figure 1.2: The development of the number of Prussian, Bavarian and Saxon KVs



Sources: My own calculations based on Ministerium für Handel, Gewerbe und öffentliche Arbeiten (1861–1878), Ministerium für öffentliche Arbeiten (1879–1889), Ministerium für Handel und Gewerbe (1890–1922), and Oberbergamt München (1873–1921), and Königliches Finanzministerium Sachsen (1870–1872) and (1873–1921).

¹⁵ According to Kling (2006), who addresses the first merger wave among German firms before the First World War, we might speak in this context of the first social insurance fund merger wave in German history.

The one issue that motivates this study, besides the concentration phenomenon that we do not yet fully understand, is the historical debate in the literature among contemporary observers of the KVs, who discussed the funds' operations primarily in the context of some perceived major "design flaws." In this respect, the contemporary literature mirrors the steady attempt to not only identify those flaws, but to also seek solutions or improvements to the implemented institutional order – above all, external concentration. To make a long story short: Too many KVs were perceived as too small to provide sustainable insurance. In addition, complicating the whole story, the bundling of pension insurance and sickness insurance in one fund per location was perceived as inferior to separate provision in two self-standing funds. This, argument goes, prevented KVs from establishing the optimal-sized fund for each class of insurance – sizes that were proclaimed to be different for sickness and pension insurance. Contemporary critics *unanimously* supported the observable concentration process, which supposedly sorted out financially or actuarially unviable funds and, perhaps, led to the rescue of the funds that deserved to be rescued. Throughout the observation period, these critics even went beyond defending the observable process and demanded a still higher degree of concentration beyond what had been actually realized.

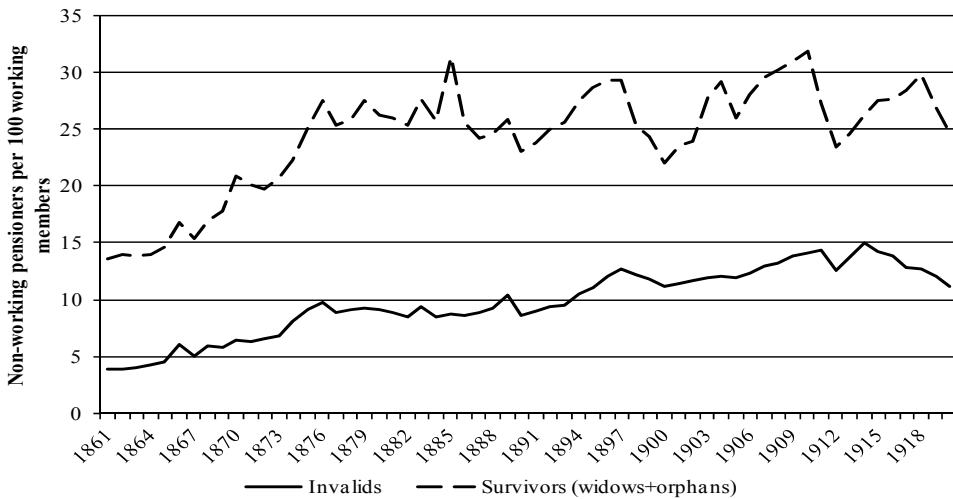
Although the KVs' quantitative account clearly reveals that the KVs' history at the time was, essentially, a history of concentration, the compiled statistical frameworks on them have – to my astonishment – not been used to date as an academic source to trace and evaluate the KVs' and, what is more, their observers' "quest for optimal scale."

There was actually one circumstance, also obvious from the statistics, that forced KVs into action and observers into thinking, and that, thus, initialized and motivated the search for the optimal institutional design of the entire insurance system: Economic dependency continually increased; put differently, the KVs' memberships aged. To illustrate this stylized fact, Figure 1.3 portrays the development of the number of economically dependent pensioners per 100 contributors, derived as annual cross-KV averages.

The average number of invalids (survivors) per 100 contributors per KV increased from about four (14) dependent pension recipients to 14 (more than 25) in 1913; this equals an overall growth by 357 percent regarding invalids and around 181 percent, at the least, regarding survivors. There is reason to conclude that KVs were under massive pressure from a continuously rising proportion of pensioners, precisely because they applied what is commonly known as pay-as-you-go (PAYG) financing (in contrast to funding; *Umlage* and *Kapitaldeckung*). This underlying circumstance was all the more relevant because KVs used to pay out pensions until death in the event of both invalidity of a miner and survivorship of a miner's wife. Thus, KVs effectively covered the risk of longevity and, therefore, implicitly provided old-age coverage.¹⁶

¹⁶ The KVs' collective solidarity – within their respective memberships, but also across memberships – "was going to be tested", so to say; see Pearson (2002) and Pearson (2003), p. 51. I refer here to the title of Pearson's paper on English mutual fire insurance.

Figure 1.3: Average number of invalids and survivors per 100 contributors (Prussia)



Sources: My own calculations based on Ministerium für Handel, Gewerbe und öffentliche Arbeiten (1861–1878), Ministerium für öffentliche Arbeiten (1879–1889), and Ministerium für Handel und Gewerbe (1890–1922).

This study should not be understood as arguing that the economic, social, and political conditions in the nineteenth- and early twentieth-century, in which the KVs were embedded, were the same as in today's industrialized economies with their advanced – or should we, at least, say matured – social security systems. Since the KVs were job-related, mining-specific factors probably were an important source of financial challenges (e.g., financial shocks due to massive accidents; exhaustion of resource deposits and, thus, structural decline of a mining area; and worsening geological conditions because of an increasing average depth). Nonetheless, by answering the central research question as it stands, this empirical study identifies parallels to modern economies in terms of the basic fundamental economic problem of creating a viable social insurance system that would provide efficient and lasting insurance coverage.¹⁷ The question of what might be the optimal scale at which to target insurance operations – whether or not that optimal scale could be realized or whether it existed at all – worried KVs and con-

¹⁷ That KVs still are a quite neglected piece of German insurance history becomes exemplarily clear when taking a look at Arps (1965), whose book *Auf sicheren Pfeilern – Deutsche Versicherungswirtschaft vor 1914* still seems to be the most comprehensive and, thus, standard historical account on the subject matter. He mentions the *Knappschaft* only four times – first and foremost in the context of Stumm's proposition of factory worker insurance along the lines of the KVs. This fact would not be that astonishing if he did not address Bismarckian social insurance either. But, indeed, there are separate chapters on *Reich* sickness, accident, and invalidity insurance.

temporary observers, including the regulator. Today, that same question tends to worry researchers, politicians, regulators, and lobbyists for various, perhaps conflicting, reasons.

1.2. The historical discussion about the appropriate fund size

A closer look at what I call the “historical discussion of the appropriate fund size,” a look that goes beyond the notes in the previous subchapter, is inevitable for the subject matter.¹⁸ The following concise overview discusses some anecdotal evidence; the overview is inevitably selective. However, I believe that the quotes presented are representative enough to provide an understanding of the discussion’s bottom line. What might strike the reader after few lines as problematic is the fact that the historical discussion lacks counter-arguments. In fact, it was quite one-sided. Contemporary observers did not conduct a true discussion in the sense of weighing advantages and disadvantages. Rather, they – whether researchers, *Knappschaft* officials, or some kind of members’ advocates – agreed with one other that their basic arguments about “design flaws” were correct. As a result, the contemporary literature does contain significant repetition and redundancy, not to mention a set of unproven assertions.

This overview begins with the “essence” of the contemporary observers’ complaints, namely the important design flaws or structural deficiencies identified by them. Note that, for the most part, design flaws were identified with reference to Prussian KVs’ experience, although they were of practical concern to the German *Knappschaft* institution as a whole. The essential flaws identified by observers were:

- (1) KVs were too many in number and reflected a highly unequal size distribution (“fragmentation” design flaw);
- (2) KVs were used to provide pension and sickness insurance “out of one hand,” which prevented them from creating efficient KV sizes in each insurance section (“different efficient size” or “compound insurance” design flaw);
- (3) If KVs engaged in mergers to partly overcome flaw (1), either voluntarily or under pressure from the industry regulator, their engagement was not sufficient to contribute to the stability of the whole insurance system (“insufficient merger activity” design flaw);

¹⁸ This subchapter contains sections of the articles “Old times, better times? German miners’ Knappschaften, Pay-as-you-go Pensions, and Implicit Rates of Return, 1854-1913” and “Insurance, size, and exposure to actuarial risk: Empirical evidence on nineteenth- and twentieth-century German Knappschaften;” see Jopp (2011b) and (2012a). Moreover, this section, as well as other parts of the study, includes a number of direct quotations. All translations from German are my own; see this study’s long version (Jopp 2012b) for the German originals.

- (4) Due to their choice of PAYG financing – or, alternatively, the absence of a strong regulator who would have prescribed full pre-funding of present and future liabilities – KVs were seen as incapable of keeping benefit promises to the ready-to-retire membership once made to them during their working years (“securing of benefits” or “PAYG” design flaw);
- (5) The different treatment of members with more rights and those with fewer rights that many KVs perpetuated was judged unjust and misleading (“unestablished miners” design flaw);
- (6) Since the bottom line of KV operations was that any working member who was willing to relocate to another KV’s area lost his accumulated entitlements, free spatial movement of labor was *de facto* restricted (“portability of entitlements” design flaw); and
- (7) The design of the KVs often offered members incentives to feign illness and to claim sickness benefits in excess of what was actuarially appropriate (“simulation” design flaw).

All of these complaints – which had already been voiced at the beginning of the KVs’ new insurance era after the Prussian General Mining Law of 1865 and were steadily revived thereafter – were finally legally addressed by the important 1906 reform of the basic regulations, but with a delay of four decades (see Chapter 2 for details). In the following, I concentrate on design flaws (1) to (3), but address also flaw (7).¹⁹

As one of the earliest observers, Julius Hiltrop argued in 1869 that many KVs were, on the one hand, too small to ensure actuarial stability of their pension insurance scheme and, on the other hand, too large to successfully control for moral hazard in their health insurance scheme:

“Of greatest importance for a KV’s usefulness and efficiency, however, is its size. The more members a KV has, [...], the more solid will it become in view of granting benefits and overcoming challenges. [...] The basic evil, rather, is the preposterous fusion of health and pension insurance; a KV’s size may be too large for it as provider of health insurance and too small for it as provider of pension insurance.”²⁰

¹⁹ Regarding point (4), which has, in the opinion of contemporaries, something to do with KV size as well, I refer the reader to the long version of this study, where I consider that point in more detail; see Jopp (2012b). Furthermore, due to the fact that many of the selected quotes contain implications on more than just one issue, it seems not appropriate to me to introduce separate subsections (indicated explicitly by four subheadings) and process the anecdotal evidence strictly separately. Besides, I am aware that the reader may wish at one point or another to have more institutional knowledge at hand to better classify the evidence. However, since I faced a “problem of sequence” in order to avoid too much repetitions, I decided to provide here only a minimum of institutional information. Since the only intention of this section is to convey an impression of what contemporaries thought were the bottom lines regarding the KVs’ problems, this lack of additional information may be acceptable. Hirsch (1875), for example, offers an early contemporary listing of the KVs’ deficiencies.

²⁰ Hiltrop (1869), pp. 223–225.

In his opinion, this was so because of the assessment that:

“Sickness and pensions funds are so much different regarding their underlying basic principles, such that a fusion of both [in one scheme] is inappropriate and would not serve the purpose.”²¹

Which factors or requirements that establish such differences had he in mind? Actually, this is difficult to say. What we can say, in my opinion, is that a major and long-standing claim made early in dealing with the KVs’ operations had been that small funds were actuarially unviable regarding pension finance because of their inappropriate size, and that the funds’ performance would considerably improve alongside a growing collective of insureds. The favored formula was simple: The larger the KV, the better – if pension provision was addressed; however, if sickness insurance was addressed, then the formula would have to be re-stated as: The smaller the KV, the better. This interpretation is in line with Hiltrop’s views, expressed a few years after the enactment of the basic regulations.

But Hiltrop was not alone in this view. Others, such as Albert Caron, Harry Karwehl, Heinrich Imbusch, and Ferdinand Bertrams, expressed similar thoughts.²² Caron (1882), for example, combined the implications of the “law of large numbers” – that the relative frequency of an event x would steadily approach its true, but hitherto unknown probability of occurrence the more observations (i.e., in this case: insureds) are available – with pricing considerations. He did so by considering the implicit degree of risk loading as an important component of a premium, in addition to the expected value of costs and the administrative overhead loading. He actually established a relationship between the degree of risk loading and a KV’s size, such that a smaller KV would require a higher risk loading:

“The first fundamental condition for a restructuring of Knappschaft insurance would be to form large Knappschaft areas to bring into effect the law of large numbers. We would best achieve this by merging all Prussian Knappschaften into one pension fund. [...] It has to be emphasized that the surcharge on top of the net payment of contribution to even out fluctuations has to be larger, the smaller the collective of insureds is.”²³

It should be noted here that Caron tackled an issue that is one of the cornerstones of insurance economics: adequate pricing of an insurance contract.²⁴

²¹ Hiltrop (1869), p. 223.

²² See Caron (1882), pp. 10–35, Karwehl (1907), pp. 61–71, Imbusch (1910), p. 61, and Bertrams (1912), p. 1413.

²³ Caron (1882), p. 20. As Caron had pointed out in a publication one year earlier, the risk surcharge was commonly considered part of “voluntary, market-based” insurance and was seen as a quantity that mattered; see Caron (1881), p. 15.

²⁴ Emery and Emery (1999) and Broten (2010) recently estimated the implicit degree of risk loading for U.S. fraternal lodges and English friendly societies and concluded that both types of voluntary organizations charged quite risk-adequate premiums. The obvious implication of Caron’s consideration is, again, in line with standard insurance theory saying that the reduction in the variance of

Beyond that, Caron made the case for merging KVs into larger entities as the inevitable prerequisite to reforming the unstable organizational structure of KVs, something that the reform of the *Knappschaft* law had failed to address two decades earlier. He actually seems to have been a kind of “structural optimist” since he continued to think of one empire-wide institution that should be formed to the advantage of the entire sector and all insured workers:

“If one merged, in contrast, all the state’s funds into one organization, this would best guarantee the survivability of the whole institution. For it can be concluded that mining in the whole country would not at some time persistently decline below its current state.”²⁵

Harry Karwehl more explicitly underlined the design flaw that was identified in the high fragmentation as the “cancerous ulcer” of *Knappschaft* insurance.²⁶ He tried as well to make clear why one did well to consider small KVs inappropriate to deal with the challenges of insuring miners:

“A small *Knappschaft* fund is much too sensitive to particular events occurring for the mine or the few mines belonging to it. Such events may be: firedamp, coal-dust explosion, pit fires, man-shaft accidents, epidemics, but also the depletion of the resource deposit or other technical or economic obstacles to operating a mine. Of these events, massive accidents drive claims costs up extraordinarily and might also result, at the same time, in decreasing payments of contributions.”²⁷

This quote might remind the reader of what can be called in insurance theory and practice the “accumulation risk” to which an insurer might be exposed; it basically means that the claim of insurant *y* is not independent of the occurrence of a claim by insurant *x*.²⁸

Based on this assessment, the natural consequence for Karwehl, as for his previous speakers, was to advocate a necessary selection process during which unviable, small KVs were to be merged into larger KVs:

“Further concentration is imperative, for, in addition to some individual disadvantages arising for comrades from fragmentation, the small and smallest funds cannot, from the start, fulfill the social tasks that a KV is basically intended to fulfill.”²⁹

average costs is the necessary precondition for an insurer to lower the risk surcharge. In a competitive environment, an insurer would very probably do so, and the premium would develop toward an actuarially fair one, which is roughly equal to expected individual costs; see Emery and Emery (1999), p. 81, and Broten (2010), pp. 35–40.

²⁵ Caron (1882), p. 21.

²⁶ Karwehl (1907), p. 71. Precisely, he stated: “The German *Knappschaft* institution obviously suffers from cancer: It is the fragmentation into various small funds.”

²⁷ Karwehl (1907), p. 72.

²⁸ The corresponding German term to “accumulation risk” is “Kumulrisiko.”

²⁹ Karwehl (1907), p. 72. Heinrich Imbusch, to bring this famous workers’ representative into play, points out the same problems that Hiltrop, Caron, and Karwehl wrote about. With respect to the high fragmentation among KVs, he stated: “One of the basic evils regarding *Knappschaft* insurance is its high degree of fragmentation. Instead of forming large pools of insurants, it was often

Karwehl further makes the case for separating the KVs' pension insurance section from their sickness insurance section, thus substantiating design flaw (2) (as Hiltrop, for example, had already done in 1869 – without proper explanation, however):

“All these facts force KVs to separate sickness insurance from pensions. A mere accounting separation would not be enough; rather, an organizational separation is imperative. This is because sickness funds require small collectives of insureds such that members can monitor each other, which is more effective and cheaper than administrative control by physicians; this would help to identify causes of excess expenditures. [...]. Pension funds, in contrast, require large collectives of insureds with many members such that the law of large numbers comes into effect, [...]. [...] So, only for a large stock of insureds can regularities be identified regarding the process of becoming invalid or dying [...].”³⁰

In this respect, Imbusch claimed that the rate of mergers was not sufficient, not the least because mine owners might have refused to participate in them in order to maintain autonomy and to retain control of their workforce:

“The belated amalgamation of smaller funds and the formation of larger area-related funds was usually difficult because the state of assets often diverged, and KVs could not agree on how to compensate each other; besides, employers wanted to have small funds per mine to better discipline their workforce.”³¹

Another contemporary, Peter Simons, earlier suggested, in 1890, that larger KV areas, achievable by mergers, would result in a de-coupling of local, or even regional, economic growth or decline and a KV's financial state. This is because growing areas, where deposits were still rich, could cross-subsidize stagnating areas, where deposits were close to economic or technical exhaustion.³² An industry regulator would very probably like this argument since it implies greater stability of the entire insurance system. However, in a prospering mining area, employers as well as miners would very probably not have liked to see their prosperity being redistributed to stagnating areas. So why should have employers decided to absorb a stagnating KV if not for solidarity or pressure by the regulator?

Ferdinand Bertrams's (1912) assessment points in a similar direction:

“Where there were larger KVs, one could better compensate for recessions or diminishing numbers of members. However, if the few mines (or the single mine) that were linked to a small KV experienced demand crises or membership shrinkage, they were on the verge of ceasing operations. Such insurance institutions must have their feet planted on solid ground and be willing to make immense sacrifices to withstand the storms of bad times. Such sacrifices – increases in contributions without commensurate increases in benefits – were not always easy to sell to the memberships.”³³

the case that KVs came into existence for very small areas, if not for single mines;” Imbusch (1910), p. 61.

³⁰ Karwehl (1907), pp. 61–62.

³¹ Imbusch (1910), p. 61.

³² See Peter Simons (1890), p. 11.

³³ Bertrams (1912), p. 1 413.