

CYCLICAL AND TECHNOLOGICAL UNEMPLOYMENT IN GERMANY'S RUHR COAL INDUSTRY, 1918-1935

by

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Historians as well as contemporary observers have agreed that crushing unemployment was one of the most severe problems that Germany's Weimar Republic confronted. Not only did Germany suffer deeply from unemployment as Europe crumbled into the Great Depression of the early 1930s. Germany also experienced persistently high unemployment rates even in the later 1920s when its economy appeared to enjoy a much delayed phase of recovery and expansion after World War I. Average unemployment remained at a stubborn 10% of the labor force even for the "golden" years from 1924 to 1929.¹ But the unemployment in the Weimar years was not just a national economic problem, as serious as that might have been. Scholars have analyzed catastrophic political consequences emanating from the economic dislocation and unemployment of Weimar's later years. In an important study, Detlev Peukert has propounded an interpretive history of the Weimar Republic that singles out economic disaster as the crucial social crisis precipitating political catastrophe. Weimar, in his view, previewed the classic contradictions of economic and political modernity.² Analysts of urban conflict and political radicalization, particularly Eve Rosenhaft, also closely link political disintegration in the early 1930s to ruinous unemployment.³ Clearly Germany's persistent joblessness was critical to the social and political crisis of the latter part of the troubled Republic.⁴ In addition, unemployment hit some sectors much harder than others. In 1930, approximately 80% of Germany's jobless belonged to the blue collar sectors of industrial production, mining, and manufacturing.⁵ In the depth of the Depression in 1932, the largest masses of the out-of-work were found in Germany's traditional industrial regions: the Ruhr's Rhineland and Westphalian provinces, Berlin, and the state of Saxony.⁶ The industrial origins of severe unemployment have thus drawn significant attention. Debate has persisted about the causes of unemployment, especially in these traditional industrial sectors.

the measures of economic efficiency and productivity that were collectively known as the industrial rationalization movement for high unemployment in these years. Such condemnations escalated vehemently as Germany fell into the labor market sinkhole of the Great Depression. Based loosely on the techniques of the American production engineer, Frederick W. Taylor, and the American industrialist, Henry Ford, industrial rationalization in Weimar Germany sought to increase productivity and cut production costs through greater technological and organizational efficiency - at the level of corporate mergers as well as on the shopfloor and in individual works.⁷ However, although some sectors did escalate technological processes, industrial rationalization in the 1920's often meant finding greater efficiency without massive investment in new plant and equipment.⁸

Critics and historians have argued since the 1920's about the extent to which rising and then disastrous unemployment resulted from the efficiency and downsizing measures of industrial rationalization, and to what extent it derived from the cyclical slowdowns of the German and world economies in the interwar era. The following paper attempts to distinguish these two forms of unemployment for one important sector of the German economy in this era, the Ruhr coal mining industry. Germany's Ruhr industrial region nestles in the western part of the country, and stretches eastward from the confluence of the Ruhr and the Rhine rivers. The old city of Dortmund defines the eastern end of the region, Essen, the home of Krupp armaments and manufacturing stands at its midpoint, and the Rhine river at Duisburg marks the western boundary of the area. Rich deposits of hard coal underpinned the rapid expansion of Germany's iron and steel industrial revolution in the 19th century, drawing hundreds of thousands of workers to the area in the space of a few decades. The Ruhr coal mining industry grew to be one of the most important sectors in the German economy.⁹ Unfortunately, coal miners were one of the groups hit hardest by high unemployment in Weimar, and the industry was one which underwent dramatic reorganization and rationalization.¹⁰ The sector thus provides an excellent opportunity to separate the components of cyclical or business cycle unemployment from unemployment caused by technological enhancement. The first

part of this paper devotes itself to this problem, and concludes that rationalization and technological innovations in the Ruhr coal mines contributed a significant proportion of the unemployment experienced in the industry. The second part of the paper summarizes the wider political and economic debates in Weimar Germany concerning the benefits and risks of a rationalization strategy for pushing the German economy to recovery following a disastrous lost war.

It would be very helpful to find a way to illuminate the relationship between industrial rationalization measures and unemployment in the Ruhr coal mines. The main difficulty is to separate the unemployment due to economic downturn, especially prominent in the Ruhr coal industry, from that created by productivity enhancing rationalization. It is easiest to consider unemployment created by all the forms of rationalization, which included both plant closings due to consolidations and productivity increases due to mechanization. Both processes “downsized” labor forces or enhanced individual productivity such that fewer workers were needed.¹¹ This paper, with its graphs and tables, seeks to analyze this problem for the Ruhr coal mines.

The analysis is based on calculations which take productivity per worker as their basis. If some “norm” for miner productivity could be identified, then, for any given level of coal production, a theoretical labor force may be calculated which would be needed to produce this amount of coal. This theoretical labor force may then be compared to the actual labor force. Where the actual labor force producing any given quantity of coal for a given year is less than the calculated, or theoretical, labor force, the productivity of the miners at this point was higher than that taken as “normal.” In the following, it is considered that all such gains in productivity in the 1920’s and early 1930’s - and therefore the reduced number of miners needed to produce that year’s coal - resulted from various forms of industrial rationalization. In the later 1920’s and early 1930’s, the difference between the level of the actual labor force and the higher level of the theoretical labor force (who would have been employed if not for productivity gains) would be the number of miners unemployed in a given year as a result of rationalization measures.

The key problem in this approach is to identify a level of productivity for Ruhr coal miners that can in some sense be considered

“normal.” Any such concept, of course, must be artificial, and any results based on it must be taken more as hypothetical than as historical reality. Nevertheless, such an approach at least allows a differentiation between unemployment (or non-employment) due to rationalization, and unemployment due to economic downturn. It is also possible to gain some perspective on the extraordinary swings in the Ruhr mining labor force that occurred in the Weimar years in comparison to the amounts of coal that the mines produced. Such an approach illuminates the pronounced turmoil in the labor market that the mining industry experienced in this period.

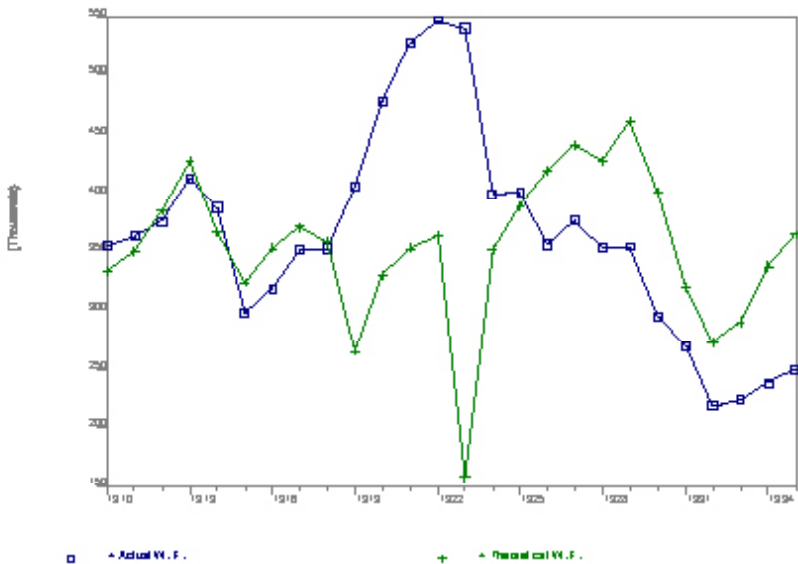
With these considerations in mind, the following calculations are based on the average productivity per Ruhr coal miner in the years from 1910 to 1915. Taking this average as “normal” has at least some grounds for justification. First, productivity in the Ruhr mines in the years before the first World War had reached a relatively stable plateau. Swings in productivity in these years often resulted from predictable responses to coal markets and the corresponding shifts in production organization in the mines. Except in strike years such as 1905 and 1912, external political turmoil played a secondary role in the profile of labor force productivity. Even the first year of the war may be seen as somewhat normal in that changes in production strategy corresponded to periods of high demand in the prewar era. Second, such productivity was based on a certain level of mechanization, which in some mines using Schüttelrutschen (mechanical, vibrating metal transport chutes) was already well advanced. Finally, these were the last years in which some form of “normal” operation of the mines occurred. During most of the war years and the 1920’s, productivity was influenced drastically by manpower shortages, worn out physical facilities ruined by the war effort, revolutionary turmoil, and rapid mechanization. While the concept of a “normal” productivity may be questionable, the period before the war offers a much better opportunity to identify such productivity than does any period during the war or after.

The following graphs and tables illustrate results of this approach first for the whole of the Ruhr mines, and then for one large mining firm, the Harpener Mining Company. Figures for the whole of the Ruhr are instructive, and provide good background, but are somewhat

problematic, since productivity gains for the whole region reflect the impact of the many small and inefficient mines that were closed in the 1920's. Figures for the Harpener mines illustrate more closely the gains that resulted from the more typical forms of mechanization and production reorganization carried out within mining firms in the Ruhr, although the Harpener mines undertook partial plant closings as well. Graph 1 shows results for the whole of the Ruhr coal region for the years 1916 to 1934.

GRAPH 1.

*Actual and Theoretical Labor Force in the Ruhr Mines, 1910-1935.*¹²



The graph shows that the actual labor force and the theoretical labor force in all of the Ruhr mines remained relatively close until the end of World War I, at which point they diverge significantly. The actual labor force grew rapidly in comparison to the amounts of coal produced during the inflation years from 1918 to 1924. This phenomenon had several causes. Primary was the much lower productivity after the war brought on by a decimated labor force, food shortages, and the waves of strikes and labor protest. Important also were factors such as the introduction of a shorter work shift underground and the compensatory production strategy of mine management in hiring as many workers as possible, many of them new and inexperienced.

This strategy had the effect of shifting the composition of the labor force toward larger proportions of support personnel and away from the categories of coal producing miners.

By 1924, following currency stabilization and the slump in world coal markets, the effects of efficiency, plant closings and mechanization began to take effect. By 1925 and 1926, the two curves cross, and the actual labor force becomes less than the theoretical one. Productivity gains from closing inefficient mines in the region and from mechanization increased labor productivity such that fewer miners were needed in the later 1920's and early 1930's to produce the same amounts of coal - again, based on an assumed "normal" labor productivity from the prewar years.

From the graph, one can visualize overall unemployment in the Ruhr coal industry for the middle and later 1920's and early 1930's. In December, 1922, the work force in the mines reached its post-war peak at 562,174. The "manpower strategy" of the Ruhr coal industry and the Reich governments in Berlin in the postwar years brought many new workers to the Ruhr specifically to work in the mines. While these years undoubtedly witnessed a much inflated labor force, in later years reductions in the labor force meant that some number of these workers were no longer employed in the mines. They were either unemployed or were forced to find work elsewhere in the Ruhr or the Reich. The difference, therefore, between this maximum labor force figure of December, 1922 and the actual labor force at any later date represents overall non-employment in the Ruhr coal mines during the later Weimar era (area of the graph *above the curve* for Actual Work Force).

It is possible now to distinguish between business cycle unemployment and rationalization unemployment. Had productivity remained at its "normal" level, even though coal demand may have slumped in the later Weimar era, the mines would have needed more miners than they actually employed. Productivity gains over the prewar era reduced even further the size of the Ruhr mining labor force. The difference between the actual labor force and the theoretical labor force (the area *between the two curves*) constitutes the number of miners who were no longer needed due to the improved productivity brought about by industrial rationalization measures.

Table 1 below summarizes these findings, and allows a calculation of the difference between business cycle unemployment and rationalization unemployment.

TABLE 1
Calculated Non-Employment Due to Business Cycle Downturn and Rationalization in Ruhr Mining, 1925-1935.¹³

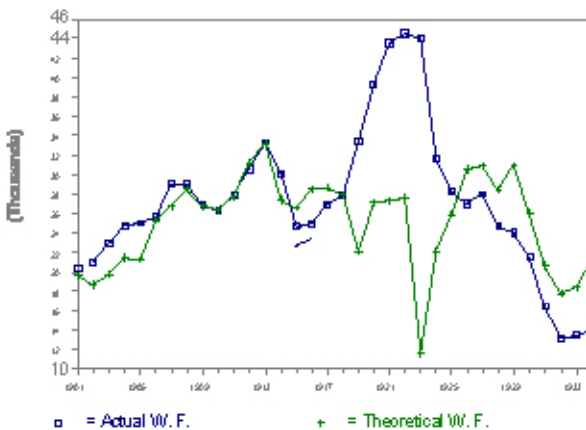
YEAR	I	II	III	IV	V
Unemploy- due Rational-	Actual Work Force	Theoretical Work Force	Theoretical minus Actual Work Force	Absolute Unemploy- ment	% ment to ization
1925	399621	387966	-11655	162553	
1926	355517	417802	62285	206657	30.14
1927	376020	439647	63627	186154	34.18
1928	352839	426865	74026	209335	35.36
1929	353417	460497	107080	208757	51.29
1930	294502	399329	104827	267672	39.16
1931	269566	319050	49484	292608	16.91
1932	218841	273023	54182	343333	15.78
1933	223426	289887	66461	338748	19.62
1934	238194	336785	98591	323980	30.43
1935	249052	363913	114861	313122	36.68

Column I in the above table lists the actual labor force for the Ruhr mines. Column II gives the theoretical, or calculated, labor force if productivity had remained at a prewar “norm.” Column III shows the difference between these two labor forces, and represents the additional number of miners who might have been employed in the years after 1925 if rationalization measures had not brought gains in productivity. This column represents workers who were eliminated due to all forms of rationalization. Column IV shows the overall size of the “unemployed” labor force compared to the manpower peak of December, 1922.¹⁴ Column V shows the rationalization unemployment as a percentage of overall unemployment.

Not unexpectedly, the table shows that in the relatively good years of the later 1920’s, a much higher percentage of the theoretical unemployment - or nonemployment - in the Ruhr mines was due to rationalization, as high as 51.29% in the good year of 1929. During the depression of the early 1930’s, the number of miners that the mines did not hire resulted mostly from business cycle downturn and much less from the effects of rationalization productivity gains.

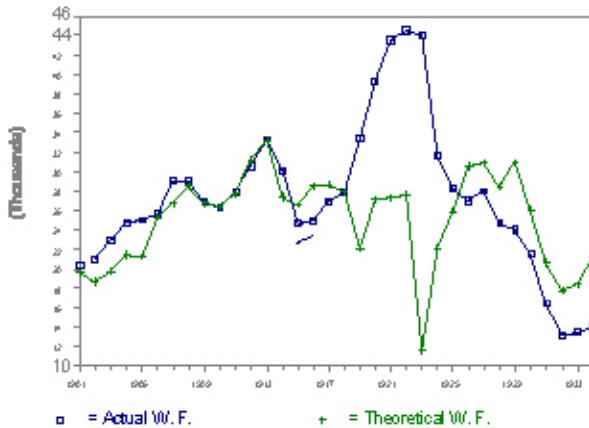
What did the pattern look like for the mines of a single large mining company? Graph 2 shows the same analysis for the Harpener Mining Company for the years 1901-1934.

GRAPH 2



GRAPH 2

*Actual and Theoretical Labor Force for the Harpener Mines, 1901-1934.*¹⁶



The mines of the Harpener firm present the same pattern as for the whole of the Ruhr. The graph reveals the inordinate expansion of the labor force during the postwar inflation years, and the increasing effects of efficiency and rationalization in the later 1920's. As in the previous graph for the whole of the Ruhr coal industry, the two curves for the Harpener mines cross between the years 1925 and 1926, showing the point at which fewer miners were working due to industrial rationalization in the later 1920's.

These results indicate that the rationalization and efficiency measures pursued by the Ruhr mines in the later 1920's led to the need to hire substantially fewer workers. Rationalization thus accounted for a significant component of unemployment in the Ruhr mines. What this means in effect is that, had it not been for rationalization, the Ruhr coal industry would have contributed less to the unemployment in the Ruhr than it did. The employment trend in the Ruhr coal industry, however, was clearly downward.

Labor force trends in the Ruhr mines were repeated in other industrial sectors across Germany throughout the 1920s and 1930s. During the recovery years of the middle 1920s, many advocated implementing industrial rationalization to spur needed upturn in business and industry after the disaster of World War I. Crucial debates

ensued about the potential impact on employment and labor force distribution which might result from such a strategy. The second part of this paper outlines some of the most important positions taken by various political and economic interests in the Weimar Republic. The concrete example of the Ruhr coal mines helps illustrate what potential outcomes were at stake in these debates.

Even before the onset of the Depression, contemporaries hotly debated increasing industrial efficiency efforts and potential unemployment. Many already attributed a certain level of joblessness to rationalization processes by the later 1920s. Apologists for German industry and business admitted the inevitability of some level of unemployment due to downsizing and rationalization measures. But they argued that the positive, buoyant benefits of more efficient production would allow other sectors to absorb these redundant workers.

Unfortunately, these effects never materialized in Germany's economy before the Depression of the 1930s. As the likelihood of this scenario faded, German industrialists offered alternative justifications for rationalization, even in the face of rising unemployment. The main arguments included the urgent need to circumvent the allegedly destructive consequences of Weimar's mandatory system of state regulated labor relations. With state mandated wages and social benefits at impossibly high levels, industry had little choice but to implement rationalization measures in order to cut production costs wherever possible, whatever the impact might be on the labor force.¹⁷ Other industrial analysts blamed the pressure of reparation payments as well as the high cost of wages and social welfare costs for the urgency of rationalization.¹⁸

Liberal and leftist labor sociologists and trade unionists, while accepting that Germany needed greater production efficiency and lower costs to compete on changed world markets during the 1920s, still warned against these gains accumulating at the expense of the labor force. The labor-friendly publication of the Reich Labor Office, the *Reichsarbeitsblatt* (Reich Labor Newsletter) initiated a series of explanatory and analytical articles in 1926 on the issues of industrial rationalization and its potential impact on Germany's industrial work force. The series was inaugurated by the Catholic Christian Trade Unionist, Bruno Rauecker with a piece on "The Social Importance of

Rationalization.” This article was followed by at least four others on various aspects of rationalization, although Rauecker’s remained the most focused on the problem of unemployment.¹⁹ Likewise, Social Democrat and social policy expert in Weimar’s Reich Labor Ministry, Ludwig Preller, offered initial analyses of industrial rationalization in such trade union journals as the Socialist *Die Arbeit* and *Sozialistische Monatshefte* as early as 1926 and 1927. Having no hard evidence on the impact of rationalization measures at these relatively early dates, Preller still clearly raised the alarm about potential negative impacts on the work force, including rising unemployment.²⁰

By 1930 the editors of the Christian coal miners’ trade union newspaper, *Der Bergknappe*, endorsed the need for technological innovation and progress, but warned against burdening the work force with the costs of such progressive industrial necessities. “When it comes to technological innovation,” asserted the *Bergknappe* in a major article in 1930, “we affirm technology.” But, the article continued, “the exaggerated rationalization of recent years has caused major damage for numerous workers.” Rather, the Christian miners union demanded a “just distribution of technology’s loss and profit” between workers and management.²¹ In related articles in the same year, the newspaper took a harder line against industrialists and their rationalization measures, clearly linking unemployment to industrial rationalization. In the early throes of the Great Depression, the newspaper blamed industry’s “false rationalization” which stressed technological and organizational measures, but ignored the impact on unemployment, and the need to increase labor force income and consumer spending capacity. The paper also suggested motives of crass profit maximization as well as more benign efforts to ameliorate high taxes and wages.²²

A key question for contemporaries, both in economic and in political terms, was how long an unemployment crisis Germany could bear before a temporary and expected labor displacement from rationalization turned into long-term technological unemployment. Leftist economists such as Emil Lederer tried to give a definition to the concept of “technological unemployment.” As early as 1931 Lederer defined unemployment caused by technological or rationalization improvements that lasted for more than one year as going beyond mere

temporary displacement. Unemployment lasting beyond this limit, he argued, was genuine technological unemployment, and therefore a negative consequence of technological improvement.²³

Other analysts of the unemployment problem in the later 1920s saw the situation as more complex. Anthon Reithinger, writing in 1932, identified not only the impact of greater production efficiency and rationalization, but also saw the growth of Germany's working age population in comparison to the prewar years as crucial. Even accounting for losses during World War I, Reithinger calculated that there were some 5 million more work-age Germans in 1925 than in 1910. Moreover, between 1926 and 1931, the available work force increased again by approximately 1.4 million. This latter surge resulted from the birth cohorts of the war years which were now reaching working age. Reithinger contrasted this large potential labor force to significant labor saving productivity increases in key industrial sectors in the 1920s and early 1930s: he calculated 25% productivity gains in machine building and auto production; 18% in coal mining; 15% in the iron industry.²⁴ Clearly the demographic swell of new workers coming onto the job market coincided fatefully with both a cyclical and a structural or rationalization induced downturn in available employment, a perfect recipe for labor market disaster.²⁵

The Ruhr coal industry provides a clear example of these labor market strains in the face of increasing technological efficiency. The graph summarizing the sector's actual labor force illustrates these trends. In the immediate postwar years the Ruhr mines acted as a large labor sponge which soaked up many returning veterans and young men in the Ruhr who otherwise would have contributed to a severe demobilization unemployment. Yet the decline of the international coal market as well as the intense rationalization movement in Ruhr mining in the later 1920's stridently reversed this role of the Ruhr coal mines. Within the space of a few short years, not only were the mines no longer hiring, they were laying off miners in large numbers. From serving as a labor sponge, the mines quickly turned into a contributor to the large unemployed labor reserves of the Ruhr.

Many of these workers who were no longer working in the mines were fortunate enough to find work in other sectors of Ruhr heavy industry, though many remained unemployed. The severity of the situation only became apparent as the depression of the early 1930's

struck. Industrial rationalization was blamed widely throughout the Reich for the depth of Germany's recession. Recriminations about badly implemented rationalization came from all sides, many of which had previously endorsed the promising strategies of industrial efficiency.²⁶

Germany might have weathered the economic restructuring and high unemployment that industrial rationalization in part fostered had it not been for the depression of the early 1930's. The social and economic disadvantages which industrial rationalization brought with it, however, did not make their first appearance during the crisis. These problems were built into the German economy in the period of the middle and later 1920's.²⁷ In addition, the measures of efficiency and rationalization did not form an orderly, coordinated package of industrial and economic responses to the dilemmas of economic recovery and social modernization. Rather, diverse political and economic interest groups in Weimar endorsed rationalization in large part to further their own special interests and goals.²⁸ In the end, many of these groups got what they asked for. It was, unfortunately, often not what they wanted.

¹Dietmar Petzina, "The Causes and Extent of Unemployment in the Weimar Republic," in *Unemployment and the Great Depression in Weimar Germany* (New York, 1986), ed. Peter D. Stachura, 29-48, here p. 33. The myth of Weimar Germany's "Golden Twenties" has come under fire by recent scholars. See Harold James, *The German Slump. Politics and Economics, 1924-1936* (Oxford, 1986); and Thomas Childers, "Inflation, Stabilization, and Political Realignment in Germany, 1919-1928," *Die Deutsche Inflation, Eine Zwischenbilanz*, ed. Gerald D. Feldman, Carl-Ludwig Holtfrerich, Gerhard A. Ritter, Peter-Christian Witt (Berlin, 1982), 409-431.

²Detlev Peukert, *Die Weimarer Republik. Krisenjahre der klassischen Moderne* (Frankfurt, 1987). See also the critical reviews by Ben Lieberman, "Testing Peukert's Paradigm: The 'Crisis of Classical Modernity' in the 'New Frankfurt,' 1925-1930," *German Studies Review* 17:2 (1994): 287-303; and David F. Crew, "The Pathologies of Modernity. Detlev Peukert on Germany's Twentieth Century," *Social History* 17:2 (1992): 319-328. See also Harold James, "Economic Reasons for the Collapse of the Weimar Republic," in *Weimar: Why did German Democracy Fail?* (New York, 1990), ed. Ian Kershaw, 30-57.

³Eve Rosenhaft, "The Unemployed in the Neighbourhood: Social Dislocation and Political Mobilization in Germany 1929-33," in *The German Unemployed. Experiences and Consequences of Mass Unemployment from the Weimar Republic*

to the Third Reich (New York, 1987), ed. Richard J. Evans and Dick Geary, 194-227, especially 195-197.

⁴Overall unemployment figures for the late 1920s and early 1930s are familiar enough. Unemployment as a percentage of the available labor force for the years 1928-1934: 1928: 6.3%; 1929: 8.3%; 1930: 14.0%; 1931: 21.9%; 1932: 29.9%; 1933: 25.9%; 1934: 13.5%. Unemployment figures for official trade union membership were even higher in these years. Based on statistics in *Statistisches Jahrbuch für das Deutsche Reich*, summarized in *Sozialgeschichtliches Arbeitsbuch III. Materialien zur Statistik des Deutschen Reiches 1914-1945* (München, 1978), ed. Dietmar Petzina, Werner Abels Hauser, Anselm Faust, 119-120.

⁵*Statistisches Jahrbuch für das Deutsche Reich*, Bd. 50 (1930), 301, cited in Thomas Childers, *The Nazi Voter. The Social Foundations of Fascism in Germany, 1919-1933* (Chapel Hill, 1983), 324-325, note 220.

⁶Petzina, "Extent and Causes of Unemployment," 34-35.

⁷Robert A. Brady, *The Industrial Rationalization Movement in Germany. A Study in Economic Planning* (Berkeley, 1933). Most recently, Mary Nolan, *Visions of Modernity. American Business and the Modernization of Germany* (Oxford, 1994).

⁸One scholar who diminishes the importance of technological innovation in the rationalization process is Jürgen Böning, "Technik und Rationalisierung in Deutschland zur Zeit der Weimarer Republik," in *Technik Geschichte* eds. Ulrich Troitsch and Gabriele Wohlauf (Frankfurt, 1980), 390-419; Harold James also questions the extent of new capital investment and new technologies in his *The German Slump. Politics and Economics, 1924-1936* (Oxford, 1986). By contrast some scholars stress the importance of technological change. See Dietmar Petzina, "Was There a Crisis before the Crisis? The State of the German Economy in the 1920's," in *Economic Crisis and Political Collapse. The Weimar Republic, 1924-1933* (New York, 1990), ed. Jürgen von Kreudener, 1-19, especially 16-19. Ruhr coal mining was one industry which did undergo significant technological transformation in the interwar era. See Uwe Burghardt, *Die Mechanisierung des Ruhrbergbaus 1890-1930* (München, 1995).

⁹On the development of the Ruhr industrial region, see Werner Abels Hauser, Franz-Josef Brueggemeier, and Wolfgang Koellmann, *Das Ruhrgebiet im Industriezeitalter: Geschichte und Entwicklung* (Dusseldorf, 1990). For the more specific history of the Ruhr coal industry see, Paul Osthold, *Die Geschichte des Zechenverbandes. Ein Beitrag zur deutschen Sozialgeschichte* (Berlin, 1934); August Heinrichsbauer, *Harpener Bergbau Aktien-Gesellschaft 1856-1936. Achtzig Jahre Ruhrkohlen-Bergbau* (Essen, 1936). More recent scholarship on Ruhr coal in the interwar era has focused on various aspects of the industry. See Burghardt, *Mechanisierung*; Karin Hartewig, *Das unberechenbare Jahrzehnt. Bergarbeiter und Ihre Familien im Ruhrgebiet 1914-1924* (München, 1993); Helmuth Trischler, *Steiger im Deutschen Bergbau. Zur Sozialgeschichte der technischen Angestellten 1815-1945* (München, 1988); John Gillingham, *Industry and Politics in the Third*

Reich. Ruhr Coal, Hitler, and Europe (New York, 1985); John Ronald Shearer, "The Politics of Industrial Efficiency in the Weimar Republic. Technological Innovation, Economic Efficiency, and their Social Consequences in the Ruhr Coal Mining Industry, 1918-1929," (Ph.D. Thesis, University of Pennsylvania, 1989).

¹⁰On the connection between rationalization and unemployment in the Ruhr mines and other sectors of the German economy, see Elisabeth Schalldach, *Rationalisierungsmassnahmen der Nachinflationszeit im Urteil der deutschen freien Gewerkschaften* (Jena, 1930); Georg Berger, "Arbeitslosigkeit im Deutschen Steinkohlenbergbau," in *Arbeitslosigkeit der Gegenwart Teil I. Deutsches Reich* ed. Manuel Saitzew (Munich, 1932): 1-31; Eva Cornelia Schöck, *Arbeitslosigkeit und Rationalisierung. Die Lage der Arbeiter und die Gewerkschaftspolitik der KPD 1920-1928* (Frankfurt, 1977).

¹¹Industrial analysts in the 1920's and 1930's distinguished "negative" and "positive" forms of rationalization. The former referred to the closing of inefficient or unprofitable facilities, including those that could not produce the grades of coking coal in demand. The latter term identified the results of more efficient work planning and organization, the increased use of machinery and pneumatic or electric tools underground, and the consolidation and enhancement of transportation systems. See Burghardt, *Mechanisierung*, 288-310.

¹²Source, Graph 1: Based on labor force and productivity statistics for the Oberbergamtsbezirk Dortmund in *Jahrbuch für den Ruhrkohlenbezirk 1935*, 475.

¹³Source, Table 1: Statistics in *Jahrbuch für den Ruhrkohlenbezirk 1935*, 475.

¹⁴These figures do not correspond to any official statistics on unemployed miners from the 1920's, since they are compared to the artificial standard of the December, 1922 manpower peak. Weimar unemployment statistics only listed those who registered as unemployed miners seeking work.

¹⁵Source, Graph 2: A. Heinrichsbauer, *Harpener Bergbau-Aktien-Gesellschaft* (Essen, 1936), Appendix Table 11, "Harpener Gefolgschaft seit Gründung der Gesellschaft," [no pagination].

¹⁶Source, Graph 2: A. Heinrichsbauer, *Harpener Bergbau-Aktien-Gesellschaft* (Essen, 1936), Appendix Table 11, "Harpener Gefolgschaft seit Gründung der Gesellschaft," [no pagination].

¹⁷For these arguments in the Ruhr coal industry, see Rudolf Tschirbs, *Tarifpolitik im Ruhrbergbau 1918-1933* (Berlin, 1986), 339-356.

¹⁸See Heinrich Niebuhr, "Die Arbeitslosigkeit in der deutschen Eisen schaffenden Industrie," in Manuel Saitzew ed. *Die Arbeitslosigkeit der Gegenwart*, Zweiter Teil, Deutsches Reich I (München/ Leipzig, 1932): 33-79. Niebuhr was "Syndikus" of the German Association of Iron and Steel Industrialists (Verein Deutscher Eisen- und Stahl-Industrieller).

¹⁹Bruno Rauecker, "Die soziale Bedeutung der Rationalisierung," *Das Reichsarbeitsblatt* (Nichtamtlicher Teil) 16 (1926): 267-272.

²⁰Ludwig Preller, "Fliessarbeit und Arbeiterschutz," *Die Arbeit* 4 (1927): 65-75; and idem, "Fliessarbeit und Planwirtschaft," *Sozialistische Monatshefte* 64 (1927): 200-203. After exile from the Nazi regime, Preller published his classic study of Weimar social policy in 1949: *Sozialpolitik in der Weimarer Republik* (Düsseldorf, 1949/ 1978).

²¹"Rationalisierung als Ursache der Arbeitslosigkeit," *Der Bergknappe* 35, Nr. 21 (24 May, 1930): 6-7.

²²"Arbeitslosigkeit und Rationalisierung," *Der Bergknappe* 35 (1930), Nr. 41, Oct. 11, p. 1; and "Warum haben die Unternehmer rationalisiert?" *Der Bergknappe* 35 (1930), Nr. 41, Oct. 11, pp. 1-2.

²³Emil Lederer, *Technischer Fortschritt und Arbeitslosigkeit* (Tübingen, 1931), 51-60.

²⁴Anton Reithinger, *Stand und Ursachen der Arbeitslosigkeit in Deutschland*, Vierteljahrshefte zur Konjunkturforschung, Sonderheft 29 (Berlin, 1932), 15-16.

²⁵On the unusual character of Weimar Germany's economic slump, which extended beyond merely a cyclical downturn, see James, "Economic Reasons for the Collapse of the Weimar Republic."

²⁶"Arbeitslosigkeit und Rationalisierung," *Der Bergknappe*, Nr. 41, 11 October 1930, 1.

²⁷This is the main argument of Harold James' important study, *The German Slump. Politics and Economics, 1924-1936* (Oxford, 1986).

²⁸See Nolan, *Visions of Modernity*.