

# Discrimination, Managers, and Firm Performance: Evidence from “Aryanizations” in Nazi Germany

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Kilian Huber

*University of Chicago*

Volker Lindenthal

*University of Munich*

Fabian Waldinger

*University of Munich*

Large-scale increases in discrimination can lead to dismissals of highly qualified managers. We investigate how expulsions of senior Jewish managers, due to rising discrimination in Nazi Germany, affected large corporations. Firms that lost Jewish managers experienced persistent reductions in stock prices, dividends, and returns on assets. Aggregate

We are particularly grateful to John List, three knowledgeable referees, Erik Hurst, Dirk Jenter, and Daniel Sturm, as well as Nicholas Bloom, Maristella Botticini, Kerwin Charles, Neale Mahoney, Alan Manning, Stephan Maurer, Filippo Mezzanotti, Stefan Nagel, Yona Rubinstein, Raffaella Sadun, Heather Sarsons, Claudia Steinwender, John Van Reenen, and many seminar audiences for helpful comments. We thank our research assistants Matthias Bing, Le Van Cao, Thomas Decker, Katharina Drechsler, Miguel Fajardo-Steinhauser, Felicitas Filsinger, Lukas Franz, David Full, Sebastian Hager, Hannes Halder, Robert Johannes, Kenan Jusufovic, Katharina Knuth, Tobias Nowacki, Franz Oertel, Constanze Vorrath, Saskia Wendt, and Stefan Wies for their outstanding work. We thank Dieter Ziegler, Martin Münzel, and Paul Windolf for generously sharing data on senior managers in Germany. Fabian Waldinger gratefully acknowledges start-up funding from the Innovation Policy working group at the National Bureau of Economic Research and funding from European Research Council Starting Grant no. 335573. Data are provided as supplementary material online.

Electronically published June 25, 2021

[*Journal of Political Economy*, 2021, vol. 129, no. 9]

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market value fell by roughly 1.8% of German GNP because of the expulsions. Managers who served as key connectors to other firms and managers who were highly educated were particularly important for firm performance. The findings imply that individual managers drive firm performance. Discrimination against qualified business leaders causes first-order economic losses.

Large-scale increases in discrimination can lead to dismissals of highly qualified business leaders and managers. Discriminatory expulsions of individuals holding important positions in the economy have occurred again and again, both historically and in modern times.<sup>1</sup> Recent political developments have renewed interest in the economic effects of this type of discrimination. For instance, the US travel ban on citizens of seven Muslim-majority countries has raised fears among large corporations that increasing discrimination will leave them unable to retain talent.<sup>2</sup>

Discriminatory dismissals are, of course, extremely hurtful to targeted individuals. But there is little evidence on whether such discrimination can cause large and persistent economic losses for firms and the economy as a whole, beyond hurting the welfare of the discriminated individuals.

In this paper, we analyze arguably the most horrendous episode of discrimination in human history, the treatment of Jews in Nazi Germany. We examine how the removal of senior managers of Jewish origin, caused by the rise of anti-Semitism in Nazi Germany, affected large German firms. After the Nazis gained power on January 30, 1933, discrimination against Jews quickly became commonplace in Germany. By 1938, individuals with Jewish ancestry had effectively been excluded from the economy.

Using newly collected data, we show that firms that had employed managers of Jewish origin were unable to replace them adequately. Stock prices, dividends, and returns on assets of these firms declined, relative to unaffected firms after 1933, and did not recover for at least 10 years, the end of our sample period. Stock prices fell only for firms that lost highly qualified managers with specific characteristics (university education and connections to other firms). A back-of-the-envelope calculation suggests that

<sup>1</sup> In Turkey, several thousand managers who follow the cleric Fethullah Gülen have been arrested or have fled overseas since 2016, fueling concerns of an economic collapse (*Economist* 2017b). In Uganda, Asians made up less than 1% of the population but owned 90% of businesses and paid 90% of tax revenue. In 1972, all Asians were expelled by Idi Amin (BBC 2016). Due to “race prejudice” during World War II, the United States interned Japanese-Americans (US CWRIC 1982). Many were highly educated and important managers in the food industry (Chin 2005). In Indonesia, ethnic Chinese have an “impressive business presence” but have faced repeated waves of discrimination; e.g., forced emigration in 1959 and riots in 1998 (Koning 2007). In France, the Huguenots were among the “wealthiest merchants and most successful industrialists” (Scoville 1953, 429). Following religious persecution, over 200,000 Huguenots left France for England, the Dutch Republic, and Prussia in 1685 (Hornung 2014).

<sup>2</sup> Concerned firms include Amazon (Wingfield and Wakabayashi 2017), Nike (Cox 2017), MasterCard (McGregor 2017), and Ben & Jerry’s (Solheim 2017).

expelling managers of Jewish origin reduced the aggregate market valuation of firms listed in Berlin by 1.8% of German GNP.<sup>3</sup> This sizable decrease shows that individual managers have large effects on firm performance and that a discriminatory ideology can lead to first-order economic losses.

Before the rise of the Nazis, managers of Jewish origin played a key role in the German economy. In fact, the “economic role of Jews in Germany [. . .] was greater than that in Western industrialized countries like England, France, or Holland. It also exceeded almost certainly their role in the development of the American economy” (Mosse 1987, 23). Managers of Jewish origin were assimilated into the German economic elite. They worked at all types of firms, including some of the largest German firms that were not associated with Judaism in any way (e.g., Allianz, BMW, Daimler-Benz, Siemens & Halske, and IG Farben). After the Nazis gained power, anti-Semitism surged across the whole economy and German firms began to dismiss managers of Jewish origin. Deutsche Bank, for example, forced CEO Oscar Wassermann and executive Theodor Frank to resign their positions by June 1, 1933 (James 2001, 25–26). The dismissals targeted a range of individuals, including Christians who had just one Jewish grandparent. Firms that happened to employ managers of Jewish origin lost a significant fraction of their senior managers as a result of anti-Semitic discrimination. Other firms did not have any managers of Jewish origin and, therefore, remained unscathed.

To carry out our analysis, we collect the names and characteristics of individuals holding around 30,000 senior management positions in 655 German firms listed on the Berlin Stock Exchange. We also digitize more than 240,000 daily stock prices from a historic publication series by the Berlin Stock Exchange, as well as data on dividends and returns on assets from historic volumes of *Handbuch der deutschen Aktiengesellschaften*. We consult various historical sources to identify which managers were of Jewish origin. While the fraction of Jews among the German population in the early 1930s was only 0.8%, our new data show that in 1932, 15.8% of senior management positions in listed firms were held by individuals of Jewish origin (whom, for simplicity, we refer to as “Jewish managers”). Jewish managers had exceptional characteristics compared with other managers in 1932. For example, Jewish managers were more experienced, educated, and connected (by holding positions in multiple firms). After the Nazis gained power, the share of Jewish managers plunged sharply in 1933 (by about a third) and dropped to practically zero by 1938.

<sup>3</sup> This number is likely to be a lower bound for the aggregate economic losses to the German economy, since Jews were also removed from lower-level positions, firms not listed in Berlin, and important positions in universities, law courts, hospitals, and cultural institutions. Of course, this number also does not do justice to the indescribable human suffering and loss of life that the Nazis inflicted on Jews and other targeted groups.

We present four main sets of results. First, we show that the expulsion of Jewish managers changed the characteristics of managers at firms that had employed a higher fraction of Jewish managers in 1932. The number of managers with firm-specific tenure, general managerial experience, university education, and connections to other firms fell significantly, relative to firms that had employed fewer Jewish managers in 1932. The effects persisted until at least 1938, the end of our sample period on manager characteristics.

Second, we show that the loss of Jewish managers reduced firms' stock prices. After the Nazis came to power, the stock price of the average firm that had employed Jewish managers in 1932 (where 22% of managers had been of Jewish origin) declined by 10.3 log points, relative to firms without Jewish managers in 1932. These declines persisted until the end of the stock price sample period in 1943, 10 years after the Nazis had gained power. The results are robust to controls for firms' connections to the Nazi Party (Ferguson and Voth 2008), size, age, and industry and to analyzing only firms that had employed at least one Jewish manager in 1932.

We proceed to investigate whether stock prices fell because firms lost managers with specific characteristics. The results indicate that stock prices declined only for firms that fulfilled at least one of two criteria: first, firms where the Jewish managers were responsible for a large share of university-educated managers, in particular, managers with graduate education; and second, firms where the Jewish managers were responsible for a large share of connections to other firms. Stock prices did not fall for firms where the Jewish managers were responsible for only a large share of experienced managers. This is an important finding. It implies that not all firms with a higher fraction of Jewish managers in 1932 experienced lower stock prices after 1933. Hence, it is unlikely that other shocks to firms with Jewish managers in 1932 explain the declines in stock prices. Rather, the findings strengthen the view that particular managerial characteristics are important for firm performance.

We explore managerial characteristics in more detail. We find that managers with graduate education in social sciences mattered in all industries, while managers with graduate STEM education mattered only in STEM-related industries. Managers with direct connections to other firms (both banks and nonbanks) were key for firm performance, while higher order, indirect connections mattered less. Moreover, we find that share prices declined not only if a firm lost its most senior managers, who were akin to modern CEOs, but also if it lost other senior managers. This suggests that managers beyond the CEO can have large effects on firm performance.<sup>4</sup>

<sup>4</sup> These findings differ from the theoretical prediction of Lucas (1978) but are similar to results of Bender et al. (2018).

To examine the robustness of the results, we explore whether the declines in stock prices were caused by the removal of Jewish managers or by the general increase in anti-Semitism after 1933. We find that the estimated effect of losing Jewish managers remains large and significant in a sample of firms favored by the Nazi government. This suggests that repression by the Nazi government does not explain the effect of losing Jewish managers. To further explore potential government repression, we identify firms that were perceived as “Jewish” and targeted by anti-Semitic measures.<sup>5</sup> We also identify firms that had large Jewish shareholders. The effect of losing Jewish managers remains unchanged when we control for effects on “Jewish firms” and firms with Jewish shareholders.<sup>6</sup> Furthermore, stock prices of firms perceived as Jewish fell only after 1935 and recovered by 1943, once all formerly Jewish firms had been taken over by non-Jews. The contrasting evolution of stock prices suggests that the effect of losing Jewish managers was not driven by forces that hit Jewish firms but by forces specifically associated with the loss of Jewish managers. In additional tests, we find that the effect of losing Jewish managers is stable when we control for losses of lower-ranked Jewish employees or anti-Semitic retail boycotts. Moreover, the effect was not driven by firms with greater exposure to various Nazi rearmament and infrastructure programs, firms with international activities, or firms hit by idiosyncratic demand shocks after 1933. Taken together, all these tests confirm that other correlated shocks cannot explain the underperformance of firms that lost Jewish managers.

In the third set of results, we estimate the aggregate cost of losing Jewish managers for firms listed in Berlin. A back-of-the-envelope calculation suggests that losing Jewish managers lowered the aggregate market valuation of firms listed in Berlin by 1.8% of German GNP. The calculation assumes that removing the Jewish managers had negligible spillover effects on firms that had not employed any Jewish managers in 1932. We test for such spillovers within regions and industries, and find statistically insignificant and negative spillover effects. The calculation indicates that highly qualified managers are of first-order importance to aggregate outcomes and that discriminatory dismissals can cause serious economic losses.

In the fourth set of results, we analyze the effects of losing Jewish managers on two additional measures of firm performance: dividends and returns on assets. We find that after 1933, dividends fell by approximately 7.5% for the average firm with Jewish managers in 1932 (which lost 22% of its managers). We also find that after 1933, the average firm that

<sup>5</sup> We use a range of historical sources to identify “Jewish firms.” These firms are distinct from firms with Jewish managers in 1932, since many German firms happened to employ managers of Jewish origin (e.g., BMW, Deutsche Reichsbahn, and IG Farben) without being perceived as Jewish.

<sup>6</sup> Recent papers by Ihlow and Jackwerth (2020) and Ritschl (2020) also discuss Jewish firms and shareholders. Their results confirm our findings (also see sec. IV.C.1).

had employed Jewish managers in 1932 experienced a decline in its return on assets by 4.1 percentage points. These results indicate that the loss of Jewish managers not only reduced market valuations but also led to real losses in firm efficiency and profitability.

This paper contributes to the literature by studying the effects of taste-based discrimination on firms. Becker (1957) predicted theoretically that discrimination can hurt firm profitability. We emphasize three aspects: firm-level effects of discrimination can be large and persistent, and depend on specific characteristics of the discriminated individuals. In the existing literature, a few papers use cross-sectional comparisons to analyze firm-level effects of discrimination.<sup>7</sup> In contrast, we propose a quasi-experimental methodology to estimate firm-level effects: we identify an economy-wide increase in taste-based discrimination and then use firm-level variation in exposure to this shock to estimate how rising discrimination affects firms.

A further difference relative to most existing work is that we focus on the effects of discrimination at the top, against highly qualified leaders. In contrast, the existing discrimination literature has largely analyzed how discrimination affects wages and hiring of women, Blacks, and underprivileged groups (for surveys, see Altonji and Blank 1999; Bertrand 2011; List and Rasul 2011; Bertrand and Duflo 2017).

An innovation of our approach is that we use stock prices to measure the cost of discrimination for firms.<sup>8</sup> Stock prices are an attractive measure because they represent the present discounted value of future cash flows from holding stocks. Hence, changes in stock prices fully incorporate how market participants value the long-run costs of discrimination. Furthermore, by aggregating the firm-level estimates, we can approximate the aggregate cost of discrimination for all listed firms. The existing literature contains little evidence on how changes in discriminatory attitudes affect aggregate outcomes.<sup>9</sup>

Our paper also relates to the literature on the management of large firms. Influential studies by Bloom and Van Reenen (2007), Bloom, Sadun, and Van Reenen (2017), and Bender et al. (2018) argue that good management practices are akin to a more efficient production technology. Several

<sup>7</sup> English soccer clubs with more Black players achieve higher league positions, conditional on the wage bill (Szymanski 2000). Firms with more female employees earn higher profits and survive for longer (Hellerstein, Neumark, and Troske 2002; Kawaguchi 2007; Weber and Zulehner 2014). Evidence on CEO gender and firm performance is mixed (Farrell and Hersch 2005; Wolfers 2006; Adams and Ferreira 2009; Post and Byron 2015; Flabbi et al. 2019).

<sup>8</sup> A large literature has used wages to measure discrimination. Fewer papers use other market prices. For example, a pioneering paper by List (2004) uses trading prices of sports cards to analyze whether minorities face discrimination.

<sup>9</sup> Hsieh et al. (2019) use a structural Roy model to argue that declining discrimination against women and Blacks raised US aggregate productivity. Bell et al. (2019) argue that better allocation of talent could increase innovation.

papers study the effects of encouraging firms to adopt bundles of general management practices.<sup>10</sup> Bianchi and Giorcelli (2019) and Gosnell, List, and Metcalfe (2020) show which specific practices raise worker productivity at large firms. These studies suggest that firms can learn and adopt better management practices.

The results of our paper highlight a complementary channel: management quality also depends on the exceptional human capital of individual managers who are hard to replace. Our findings emphasize three aspects of managerial human capital: (1) losing senior managers had large and persistent effects; (2) losing a wide cadre of senior managers, and not just the CEO, affected firm performance; and (3) losing educated and connected managers mattered, while experienced managers were less important. In contrast, several studies have focused on short-run stock returns following CEO deaths, often finding small positive or small negative effects (Johnson et al. 1985; Worrell et al. 1986; Hayes and Schaefer 1999; Borokhovich et al. 2006; Nguyen and Nielsen 2010; Salas 2010; Fee, Hadlock, and Pierce 2013).<sup>11</sup> Unlike many older managers who die, the Jewish managers in our setting were often at the peak of their ability. Consistent with our results, Jenter, Matveyev, and Roth (2017) show that only deaths of young and short-tenured CEOs cause large value losses, while Kaplan, Klebanov, and Sorensen (2012) and Bandiera et al. (2017, 2020) document that firm performance is correlated with individual managers' ability and behavior.<sup>12</sup>

Finally, we show that the loss of the Jewish elite affected German firms and economic outcomes. Previous work has focused on universities (Waltinger 2010, 2012, 2016) and schools (Akbulut-Yuksel and Yuksel 2015). In Russia, the severity of the Holocaust was associated with long-run political and economic outcomes of cities and regions (Acemoglu, Hassan, and Robinson 2011; Grosfeld, Rodnyansky, and Zhuravskaya 2013).

<sup>10</sup> Some studies find that bundles of general management practices can raise firm performance (Bruhn, Karlan, and Schoar 2010, 2018; Bloom et al. 2013, 2020; Bruhn and Zia 2013; Drexler, Fischer, and Schoar 2014; Fryer 2017; Giorcelli 2019; Iacovone, Maloney, and McKenzie 2019). Other studies report limited effects (Cole, Sampson, and Zia 2011; Karlan and Valdivia 2011; Karlan, Knight, and Udry 2015; Brooks, Donovan, and Johnson 2018). This suggests the effects may vary by which specific practices are adopted and by firm type, firm size, and the available human capital in the firm.

<sup>11</sup> Bennedsen, Pérez-González, and Wolfenzon (2020) focus on temporary CEO absences and find transient effects on firm performance. Becker and Hvide (forthcoming) and Smith et al. (2019) focus on owner deaths and find persistent effects.

<sup>12</sup> Also related, Lazear, Shaw, and Stanton (2015) and Hofman and Tadelis (2018) highlight the impact of middle managers on worker productivity. Nygaard (2011), Ahern and Dittmar (2012), Matsa and Miller (2013), and Eckbo, Nygaard, and Thorburn (2016) analyze the effects of the Norwegian gender quota for managers on firm performance. More generally, Bertrand and Schoar (2003) find evidence that there are differences in "style" across managers, while Malmendier and Tate (2005) analyze the effects of overconfident managers. We also add to the literature on microfoundations in management strategy, which emphasizes that differences in individual human capital affect firms (Abell, Felin, and Foss 2008; Coff and Kryscynski 2011).

## I. Historical Context

### A. *Jews in the German Economy*

Following the partial emancipation of Jews after the Napoleonic Wars and full emancipation during German unification in 1871, Jews became increasingly influential in the German economy. They founded many important firms and became leading managers in some of the largest corporations. In 1908, 22% of the 747 richest Prussians were of Jewish origin (Mosse 1987, 6). In 1928, Jews paid more than 30% of Berlin's municipal taxes, despite accounting for only 5% of the population (Elon 2003, 259). Notwithstanding occasional episodes of anti-Semitism, German Jews were almost entirely assimilated, especially among the economic elite. Inter-religious marriages were common in the decades before 1933. Historians have argued that one could hardly differentiate a Jewish economic elite from a non-Jewish elite during the years of the Weimar Republic (e.g., Münzel 2006, 89).

### B. *The Rise of the Nazi Party*

The anti-Semitic National Socialist German Workers' Party, commonly referred to as the Nazi Party, received only 2.6% of votes in the May 1928 election to the German Reichstag. In the wake of the Great Depression, the party's vote share rose to 37.3% in the July 1932 election. In the following election in November 1932, the Nazi's vote share declined to 33.1%, and many political observers predicted a gradual decline of the Nazi movement (see, e.g., the article by Enderis [1933] published by the *New York Times* on January 1, 1933). Despite the declining vote share of his party, a political vacuum allowed Hitler to become chancellor on January 30, 1933. In the following months and years, the Nazi government started a host of measures targeting Jews that ultimately culminated in the Holocaust.

### C. *"Aryanizations" of Stock Market-Listed Firms*

The Nazi government did not pass any laws that explicitly forced private firms to dismiss Jewish employees before 1938. Nonetheless, many Jewish managers lost their positions as early as 1933, because of the rise of anti-Semitism.<sup>13</sup> As dismissals were not guided by formal rules, the "forced resignation of Jews from the boards of [. . .] enterprises [. . .] was a gradual

<sup>13</sup> The racist neologism "Aryanization" was coined during the 1930s. In the historical literature, the term is used as a synonym for the exclusion of Jews from the German economy (for a discussion of the term, see Bajohr 2002, 11). In particular, the term is used for two different types of discriminatory measures against Jews: first, the removal of Jews from senior management positions in large German firms (Münzel 2006), which is the focus of our paper; and second, the forced sale or liquidation of smaller "Jewish firms" (Bajohr 2002; Kreutzmüller 2017).

process effected with widely differing degrees of dignity and consideration” (Mosse 1987, 376). Many listed firms exploited laws and events that did not directly affect them to remove Jewish managers. For example, the law specifying the dismissal of Jewish civil servants of April 7, 1933, applied only to managers in firms that were majority-owned by the state (Münzel 2006, 126–8). Some privately owned firms nevertheless used the law as a pretext to dismiss Jewish managers.

In the following years, more and more Jewish managers were forced out of their firms. By 1938, virtually all Jewish managers had left their firms, sometimes because non-Jews saw the political situation as an opportunity to further their own careers by pushing Jews out or because Jewish managers migrated abroad to escape rising discrimination.<sup>14</sup> Following issuance of the Decree on the Elimination of the Jews from the German Economy on November 12, 1938, all joint stock firms were forced to dismiss remaining Jewish board members to avoid being liquidated (Benz 1988, 324).

The timing of the actual removal of the Jewish managers may have been endogenous to firm performance, as firms tend to dismiss managers when firms are performing poorly (Murphy and Zimmerman 1993; Denis and Denis 1995; Hayes and Schaefer 1999; Fee, Hadlock, and Pierce 2013; Bell, Pedemonte, and Van Reenen 2018; Jenter and Lewellen 2021). We therefore use variation in the fraction of Jewish managers in 1932 as the treatment variable in our analysis.

Our newly collected data on managers in all German firms that were listed in Berlin show how the loss of Jewish managers affected firms. We find that Jews were overrepresented among senior managers relative to their population share of 0.8%. Jews held 15%–16% of senior management positions in 1928 and 1932 (fig. 1). By the end of 1933, the fraction of Jewish managers had fallen by about one-third. By 1938, virtually no Jewish managers remained in firms that were listed in Berlin.

## II. Data

### A. *Data on Senior Managers of Listed Firms*

#### 1. Data on Managers

We construct a comprehensive new database that contains the names and characteristics of all senior managers of German firms listed on the Berlin Stock Exchange in 1932. We collect the data using a range

<sup>14</sup> Of the approximately 522,000 German Jews, around 304,000 managed to emigrate before the beginning of World War II (USHMM 2017). The main destinations of Jewish managers were the United States, the United Kingdom, Switzerland, the Netherlands, and France (Münzel 2006, 246). Most of the rest were brutally murdered in concentration camps. Victims included the former Commerzbank executives Albert Katzenellenbogen and Ludwig Berliner and the former Leonhard Tietz AG executive Franz Baumann. Very few survived the Holocaust in Germany.

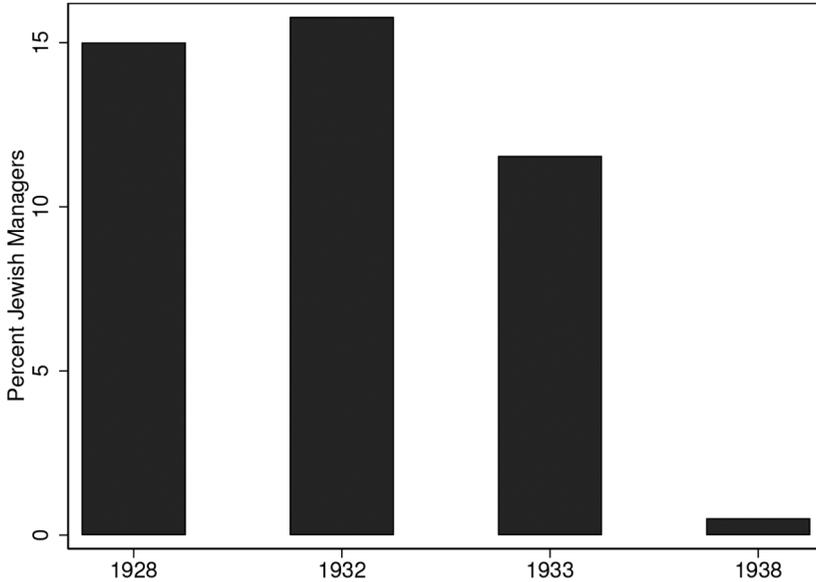


FIG. 1.—Percentage of Jewish managers over time. Bars indicate the percentage of senior management positions held by Jewish managers in the 655 firms that were listed on the Berlin Stock Exchange in 1932.

of historical sources. The 1932 edition of *Handbuch der deutschen Aktiengesellschaften* contains information on the most senior managers (executive and supervisory board members) of German joint stock firms. Each stock corporation in 1930s Germany was run by two boards: the supervisory board and the executive board. Until the late-nineteenth century, managers of the supervisory board had been the main decision makers in German firms. After a revision of commercial law in 1884, German executive board members became gradually more important (Münzel, 2006, 43).<sup>15</sup> The exact division of authority between supervisory board and executive board varied across firms in the 1930s. For instance, firm founders chaired the supervisory board in some firms, while in other firms, they chaired the executive board.

Our baseline measure of senior managers includes all members of both boards. We thereby ensure that we analyze the entire top management level. The average firm listed in our data employed 12 such senior managers. We extract information on top managers for all 655 firms that were listed in Berlin in 1932. The firms in our sample employed

<sup>15</sup> In many executive boards, there were two hierarchical levels: one was composed of one or a few most senior executives (who would perform functions akin to a modern CEO, together with the chairmen of the supervisory board) and the other regular managers (who were responsible for one specific line of business or region of operation).

TABLE 1  
SUMMARY STATISTICS ON MANAGERS IN 1932

	All Managers (1)	Jewish Managers (2)	Non-Jewish Managers (3)	Non-Jewish Managers in Firms with Jewish Managers (4)
No. of senior management positions	7,791	1,230	6,561	5,073
No. of senior managers	4,873	423	4,450	3,077
Manager characteristics (%):				
University education	36.18	45.15	35.33	38.22
Graduate education	24.24	35.93	23.12	24.63
<i>Kommerzienrat</i> title	4.72	8.75	4.34	4.91
Tenure since 1928	62.54	70.57	61.78	61.25
Experience since 1928	69.61	82.98	68.34	69.61
Average no. of board positions in other firms <sup>a</sup>	2.22	5.02	1.96	2.42

NOTE.—Data on managers are for the year 1932 and were collected from various historical sources (see sec. II for details).

<sup>a</sup> Equal to average number of firms connected to.

4,873 senior managers holding a total of 7,791 positions in 1932 (table 1).<sup>16</sup> We collect similar data for the years 1928, 1933, and 1938 from the respective volumes of *Handbuch der deutschen Aktiengesellschaften*, as detailed in appendix B.1 (apps. A–D are available online).

## 2. Identifying Jewish Managers

*Handbuch der deutschen Aktiengesellschaften* does not report information on the Jewish origin of managers. We identify Jewish managers using multiple sources (Röder and Strauss 1980; Münzel 2006; Köhler 2008; Windolf 2011) and the online database World Biographical Information System (WBIS). We hand check all managers who do not appear in these sources by conducting an internet search to find information on their ancestry. Further details on the data collection are in appendix B.1.

For many of the early measures against Jews, the Nazi government considered an individual to be “Jewish” if at least one grandparent had been a practicing Jew.<sup>17</sup> We classify managers as Jewish based on this definition.

<sup>16</sup> Some managers held multiple positions because they could hold both executive and supervisory board positions in the same firm or executive positions and/or supervisory positions in multiple firms.

<sup>17</sup> This rule was, e.g., applied in the so-called “Law for the Restoration of the Professional Civil Service,” which was passed on April 7, 1933. The law was used to dismiss all Jewish civil servants from their position. While private firms were not forced to dismiss Jewish managers until 1938, many stock companies started to dismiss senior managers with reference to this law and to the same definition of “Jewishness” as early as 1933 (Münzel 2006, 126). This approach follows the definition of the historical literature on Jews in the Germany economy (see, e.g., the discussions in Mosse 1987 and Münzel 2006, 80–92).

The definition comprises practicing Jews, such as banker Max Warburg, who was active in the Jewish community of Hamburg, as well as individuals with Jewish ancestors who had converted to Christianity, such as IG Farben manager Carl von Weinberg. All of these managers were forced out of their firms because of their Jewish ancestry. Our data show that 423 of 4,873 managers (around 9%) were individuals of Jewish origin in 1932. They held 1,230 out of 7,791 manager positions (around 16%; table 1). The share of positions held by Jewish managers is consistent with data on a smaller set of firms presented by Windolf (2011).

### 3. Characteristics of Managers

We extract information on the characteristics of managers for the years 1928, 1932, 1933, and 1938 from the respective volumes of *Handbuch der deutschen Aktiengesellschaften*, as detailed in appendix B.1.2. Overall, we collect data on 29,834 manager positions for these 4 years. Table 1 summarizes the manager characteristics for 1932, the year before the Nazis came to power.

While about 1% of the relevant age cohorts were studying at a university at the turn of the century (Windolf 1990), 36% of managers were educated at a university. This figure was even higher for Jewish managers, 45% of whom had a university education. Jewish managers were also more likely to hold a graduate degree (36% vs. 24%).<sup>18</sup> Jewish managers were also more likely to hold the honorary title of *Kommerzienrat* (8.8% vs. 4.3%). This title was granted by the German Emperor to individuals who made outstanding contributions to society.<sup>19</sup> These numbers suggest that Jewish managers had higher general human capital than other managers.

Jewish managers had longer tenure, measured by whether they had already held a manager position at the same firm in 1928 (70.6% vs. 61.8%). Similarly, they had more general managerial experience, measured by whether they had already held a manager position at any of the sample firms in 1928 (83.0% vs. 68.3%).

Jewish managers were also better connected to other firms. We use data on whether managers held board positions at other firms in 1932 to measure connections. For this measure, we do not only consider the 655 firms listed in Berlin but also all 4,378 stock companies with nominal capital

<sup>18</sup> The fraction of senior managers with a graduate degree is higher in Germany than in other countries. At present, 45% of board members of the largest German companies have a doctorate degree (Schmid, Altfeld, and Dauth 2017).

<sup>19</sup> The title is roughly comparable to the honors system of the United Kingdom. A rigorous selection process based on wealth, income, public service, charitable activities, and standing among peers ensured that only the most successful businessmen were awarded the coveted title (for more information, see Mosse 1987, 3). In 1919, the German Reich officially discontinued the awards, but most individuals who had been awarded the title continued to list it in official documents.

above 500,000 Reichsmark (RM) in 1932 (for details, see app. B.1). We essentially document the complete manager network among large and medium-sized German firms. On average, managers held 2.2 board positions in other stock companies, but Jewish managers held more than 5 such positions.

The differences between Jewish and non-Jewish managers were not driven by the types of firms that they worked for. Compared with their non-Jewish colleagues in the same firms, Jewish managers held more academic and honorary titles and had longer tenure, greater experience, and more connections to other firms (see table 1, col. 4). Overall, the statistics suggests that Jewish managers were exceptional along a number of dimensions.<sup>20</sup>

### B. Data on Stock Prices and Dividends

We manually digitize stock prices from historical listings (*Monats-Kursblatt Berliner Börse*) of the Berlin Stock Exchange (see app. B.2.1 for details).<sup>21</sup> We record more than 240,000 daily stock prices for all German firms listed in Berlin in 1932, for the months January and July of the years 1929 through 1943.<sup>22</sup>

Some stocks, especially those of smaller firms, were not traded every day. We therefore average stock prices in a plus/minus 10-day window around January 10 and July 10 of each year.<sup>23</sup> Between 1929 and 1943, the stocks of some firms were consolidated. For example, Dresdner Bank stocks were consolidated on August 4, 1932, at an old-stock : new-stock ratio of 10 : 3. As a result, the reported stock price increased by 333%. We account for these consolidations by dividing all stock prices by the consolidation ratio (3.333, in our example) after each consolidation. Between 1929 and 1943, some firms issued new stocks and offered existing shareholders a subscription right to prevent stock dilution. We also adjust

<sup>20</sup> Two factors may explain the exceptional characteristics of Jewish managers. First, discrimination against Jews may have been prevalent even before 1933, and thus Jews would have had to be exceptional to be hired as managers. Second, a large literature has highlighted the extraordinary human capital of German Jews and, in particular, the entrepreneurial culture that flourished in the German Jewish community (e.g., Botticini and Eckstein 2007, 2012; Becker and Pascali 2019; D'Acunto, Prokopczuk, and Weber 2019; Koudijs and Voth 2020). The entrepreneurial spirit exhibited by many Jews contributed to the lasting success of Jews in manager-run businesses (Ziegler 2000).

<sup>21</sup> The Berlin Stock Exchange was the largest stock exchange in 1930s Germany and one of the largest in the world. It generated about 66% of financial transaction tax revenue in Germany (Gömmel and Pohl 1992, 179). The evidence in Ferguson and Voth (2008) suggests that stock prices adjusted quickly and in predictable ways to the release of new information.

<sup>22</sup> The German banking crisis led to the closure of the Berlin Stock Exchange between September 1931 and April 12, 1932. For 1932, we therefore use stock prices for April and October. The results are robust to dropping all observations for 1932 (table A.1, cols. 1 and 2).

<sup>23</sup> The results are robust to averaging stock prices in a plus-minus 3-day or plus-minus 5-day window around January 10 and July 10 or to averaging stock prices for all of January and July (table A.1, cols. 3–8).

stock prices for mechanical drops after the deduction of subscription rights by multiplying subsequent stock prices by the corresponding adjustment factor, following standard practice (Ronge 2002, 58; for details, see app. B.2.1). The adjustments hardly affect the results.

We also collect data on dividends from the listings of the Berlin Stock Exchange and from *Handbuch der deutschen Aktiengesellschaften* 1935 and 1941 (for details, see app. B.2.2).

### C. Data on Returns on Assets

We record data on firms' returns on assets from the 1932 and 1941 editions of *Handbuch der deutschen Aktiengesellschaften*. The return on assets is defined as profits before interest payments and taxes divided by total assets. The data are for the years 1931, 1936, and 1940. Many firms do not report the financial figures that are required to calculate the return on assets. As a result, the data allow us to calculate the return on assets for 289 firms (for details, see app. B.2.4).

### D. Data on Control Variables

We collect data on various firm-level control variables measured in 1932. We obtain connections to the Nazi Party from Ferguson and Voth (2008). The measure indicates whether any of the firms' managers made financial contributions or provided political support to Hitler, Göring, or the Nazi Party. We also collect data on nominal capital, industry classifications, and firm age from *Handbuch der deutschen Aktiengesellschaften* 1932. Finally, we collect data on the period during which the balance sheet is reported from *Monats-Kursblatt Berliner Börse*.

### E. Summary Statistics on Firms

We present statistics for all firms (table 2, col. 1), firms without Jewish managers (col. 2), and firms with at least one Jewish manager (cols. 3–7). The average firm employed roughly 12 senior managers in 1932 (col. 1). The average firm with at least one Jewish manager employed about three Jewish managers in 1932, corresponding to a 22% fraction of Jewish managers (col. 3).<sup>24</sup>

To assess preexisting differences across firms, we first compare firms without Jewish managers (col. 2) with firms with at least one Jewish manager (col. 3). Both types of firms were of similar age and reported their financial statements at similar times. Since Jewish managers were exceptionally qualified, the average firm with Jewish managers had more qualified managers, as measured by managers with tenure in the firm, general

<sup>24</sup> We report summary statistics by the importance of Jews for various firm-level managerial characteristics in table A.2.

TABLE 2  
SUMMARY STATISTICS ON FIRMS IN 1932

	AT LEAST ONE JEWISH MANAGER						
	ALL FIRMS (1)	NO JEWISH MANAGERS (2)	All (3)	Fraction Jewish Managers		Fraction Jewish Managers Without Conglomerates	
				≤Median (4)	>Median (5)	≤Median (6)	>Median (7)
No. of firms	655	247	408	215	193	213	193
No. of senior managers	11.89	8.64	13.86	13.56	14.20	13.24	14.20
No. of Jewish senior managers	1.88	.00	3.01	1.61	4.58	1.58	4.58
Fraction of Jewish senior managers	.14	.00	.22	.12	.33	.12	.33
Managers with tenure since 1928	7.54	5.43	8.82	8.40	9.29	8.14	9.29
Managers with experi- ence since 1928	9.21	6.37	10.92	10.41	11.50	10.14	11.50
Managers with univer- sity education	4.94	3.11	6.06	5.71	6.44	5.47	6.44
Managers with graduate education	3.22	1.97	3.97	3.80	4.17	3.57	4.17
Connections to large and medium-sized German firms	51.04	24.26	67.25	57.93	77.64	57.43	77.64
Nazi connection	.17	.09	.21	.22	.20	.22	.20
Nominal capital (RM millions)	36.36	4.72	55.52	91.67	15.24	17.46	15.24
Firm age (years)	42.06	42.89	41.55	40.95	42.23	41.25	42.23
Balance sheet reported in January	.68	.66	.69	.70	.68	.70	.68

NOTE.—Data on managers, their characteristics, and control variables are for the year 1932 and were collected from various historical sources (see sec. II for details).

experience, and university education. The average firm also had more connections to other firms through their senior managers. Perhaps surprisingly, the average firm with Jewish managers was more connected to the Nazi Party, presumably because firms with highly qualified managers were more connected to politicians in general. Furthermore, the average firm with at least one Jewish manager was larger, both measured by the number of senior managers and by the nominal capital of the firm. There are two reasons for this. First, the probability of employing a Jewish manager increases mechanically with the number of managers. Second, the exceptional characteristics of Jewish managers allowed them to manage larger firms.<sup>25</sup>

<sup>25</sup> The large difference in average nominal capital was predominately driven by two conglomerate firms: the national railroads Reichsbahn and the chemical producer IG Farben. Conglomerates were large firms composed of formerly independent companies that operated under one management in 1932. Without these two firms, the average nominal capital of firms with at least one Jewish manager was 16.4 million RM.

Throughout our analysis, we account for differences between firms with and without Jewish managers using several approaches. First, all regressions include a full set of firm fixed effects that control for permanent differences across firms. Hence, our identification strategy does not require that firms were similar in 1932. We assume only that firms with a higher fraction of Jewish managers would have evolved in parallel to other firms had the Jewish managers not been dismissed. We present evidence in support of this assumption below. Moreover, we control for potential shocks to firms with different characteristics by using a wide range of control variables interacted with time fixed effects.

To further strengthen our identification strategy, we construct subsamples where firm characteristics are similar. We consistently find that the effects of interest do not vary in these subsamples. For instance, we estimate results in a sample of firms that all had at least one Jewish manager. Conditional on having at least one Jewish manager, firms with a higher fraction of Jewish managers were similar to firms with a lower fraction of Jewish managers (table 2, cols. 4–5). The firms look particularly similar along all observable characteristics if we exclude the two conglomerate firms (Reichsbahn and IG Farben) that had a positive but low fraction of Jewish managers (cols. 6–7).

### III. The Effect on the Characteristics of Firms' Senior Management

This section presents the first set of main results. We analyze how the removal of Jewish managers affected the overall characteristics of firms' senior management. For this analysis, we use data on manager characteristics for the years 1928, 1932, 1933, and 1938. By 1938, essentially no Jewish managers remained in their firms.

Our empirical strategy compares changes in manager characteristics in firms that had employed Jewish managers in 1932 and lost them after the Nazi government took power in January 1933 with changes in firms that had not employed Jewish managers. We estimate

$$\log(\text{Characteristic}_{it}) = \sum_{\tau=1928}^{1938} \beta_{\tau} \text{Fraction Jewish Managers}(1932)_i \times \mathbf{1}[t(i) = \tau] + \text{FirmFE}_i + \text{YearFE}_t + \varepsilon_{it}. \quad (1)$$

The outcome variable is the log of a certain manager characteristic in firm  $i$  in year  $t$ , such as the log of the number of managers with a university education in firm  $i$  in year  $t$ .<sup>26</sup>

<sup>26</sup> A small number of firms report zeros on some of the outcome variables, so we cannot include them in specifications using the log outcome variable. Table A.3 reports robustness checks using the inverse hyperbolic sine transformation, which is an approximation to the log transformation that permits using zero values. The results are almost identical. Figure A.1 plots results including additional control variables.

Fraction Jewish Managers(1932), measures the fraction of Jewish managers in firm  $i$  in 1932. It is interacted with indicator variables for 1928, 1933, and 1938. The interaction with the indicator for 1932 is excluded from the regression so that the coefficients are estimated relative to 1932, the last year before the Nazis came to power. FirmFE $_i$  is a full set of firm fixed effects, and YearFE $_t$  is a full set of year effects (for 1928, 1933, and 1938). To account for potential correlation of shocks within firms across time, we cluster standard errors at the firm level.

We plot the yearly coefficients and corresponding 95% confidence intervals in figure 2. The first outcome is a measure for firm tenure, that is, the number of managers who had been working as managers in the same firm since 1928. From 1932 to 1933, firms with a higher fraction of Jewish managers in 1932 experienced a sharp decline in the number of managers with tenure since 1928, relative to firms without Jewish managers (fig. 2A). The drop continued until 1938, when virtually all Jewish managers had been

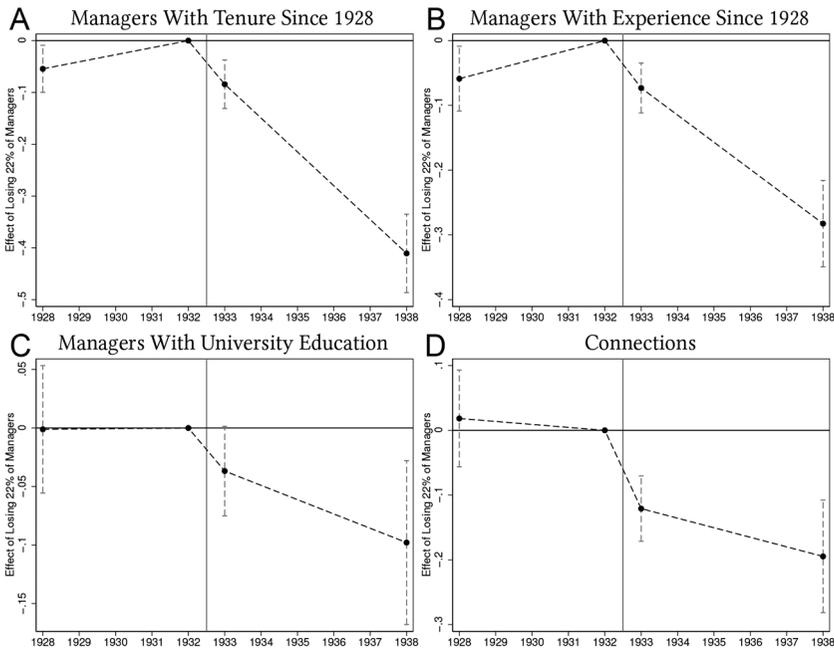


FIG. 2.—Effect on the characteristics of firms' senior management. The graphs plot yearly coefficients ( $\beta_t$ ) and 95% confidence intervals from equation (1). Each panel reports results for a different dependent variable, as indicated. The dependent variables are in natural logarithms. The main explanatory variables are the fraction of Jewish managers in 1932 interacted with a fixed effect for each year. The interaction with 1932, the last year before the Nazis gained power, is the excluded interaction. Coefficients and standard errors are scaled to reflect the effect on the average firm with Jewish managers in 1932. The average such firm lost 22% of its managers after 1932. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level.

dismissed. For both 1933 and 1938, the difference between firms that lost Jewish managers and other firms is statistically significant, relative to their 1932 values. This finding is not surprising, because once a manager with tenure is expelled, finding a replacement with the same length of tenure in the firm is impossible.

The second outcome is a measure for experience, that is, the number of managers who held a manager position in any of the sample firms in 1928. Firms could have compensated for the loss of an experienced Jew by hiring a manager who had experience running another firm. Firms with a higher fraction of Jewish managers in 1932 experienced a statistically significant decline in the number of experienced managers, relative to other firms (fig. 2*B*). This suggests that the firms did not replace the dismissed Jewish managers with other managers of similar experience.

We also find that firms with a higher fraction of Jewish managers in 1932 employed fewer managers with a university education after 1933 (fig. 2*C*). The difference is statistically significant in 1938. Hence, firms did not replace the highly educated Jewish managers with similarly educated non-Jews.

Finally, we analyze the effect of losing Jewish managers on the number of connections of a firm. For this analysis, we consider connections between firms through senior managers. Connections are measured contemporaneously (i.e., we measure the number of connections of a firm to other listed firms in Germany in that year). Connections to other firms dropped sharply and significantly in 1933. They remained low until 1938. This shows that firms with a higher fraction of Jewish managers in 1932 could not compensate for the loss of highly connected managers after 1933.

We test the robustness of the graphical analysis by estimating a differences-in-differences specification:

$$\begin{aligned} \log(\text{Characteristic}_{it}) = & \beta_1 \text{Fraction Jewish Managers}(1932)_i \times \text{Post}1933_t \\ & + \text{FirmFE}_i + \text{YearFE}_t + \beta_c \text{Controls}_{it} + \varepsilon_{it}, \end{aligned} \quad (2)$$

where  $\text{Post}1933_t$  is an indicator variable that is equal to one for all years after 1932 and zero otherwise.  $\text{Controls}_{it}$  is a vector of firm-level control variables, described in detail below. We measure all controls in 1932 and interact them with year fixed effects, to ensure the control variables cannot endogenously respond to the removal of the Jewish managers.

Table 3 presents the results for all manager characteristics, using one panel for each outcome variable. The specifications in column 1 control for firm and year fixed effects. The coefficients on the interaction of the fraction of Jewish managers in 1932 with a post-1933 indicator are negative and significant for all outcome variables, consistent with the graphical evidence. The average firm with Jewish managers in 1932 lost 22% of its managers after the Nazis came to power. The point estimate in column 1

TABLE 3  
EFFECT ON THE CHARACTERISTICS OF FIRMS' SENIOR MANAGEMENT

	(1)	(2)	(3)	(4)	(5)	(6)
A. log(No. of Managers with Tenure since 1928), Observations/Firms: 2,412/655						
Fraction of Jewish managers (1932) × Post 1933	-.847*** (.110)	-.842*** (.112)	-.837*** (.112)	-.837*** (.112)	-.836*** (.112)	-.824*** (.113)
R <sup>2</sup>	.748	.748	.749	.749	.749	.756
B. log(No. of Managers with Experience since 1928), Observations/Firms: 2,493/655						
Fraction of Jewish managers (1932) × Post 1933	-.601*** (.104)	-.617*** (.104)	-.615*** (.104)	-.613*** (.105)	-.609*** (.105)	-.616*** (.107)
R <sup>2</sup>	.658	.661	.662	.664	.664	.679
C. log(No. of Managers with University Education), Observations/Firms: 2,408/645						
Fraction of Jewish managers (1932) × Post 1933	-.292*** (.109)	-.278** (.108)	-.279** (.109)	-.277** (.109)	-.276** (.109)	-.238** (.109)
R <sup>2</sup>	.018	.022	.024	.030	.031	.054
D. log(No. of Connections), Observations/Firms: 2,510/655						
Fraction of Jewish managers (1932) × Post 1933	-.744*** (.142)	-.756*** (.143)	-.759*** (.143)	-.755*** (.144)	-.755*** (.144)	-.712*** (.145)
R <sup>2</sup>	.256	.258	.261	.263	.263	.283
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Nazi connection × time FE		Yes	Yes	Yes	Yes	Yes
Reporting period × time FE			Yes	Yes	Yes	Yes
Firm age × time FE				Yes	Yes	Yes
Nominal capital × time FE					Yes	Yes
Industry FE × time FE						Yes

NOTE.—Reported are point estimates ( $\beta_1$ ) from eq. (2) for different dependent variables, which are indicated in the panel headers. The main explanatory variable measures the fraction of Jewish managers in 1932 interacted with an indicator for the years after 1932. The control variables include an indicator for any connections to the Nazi Party, an indicator for whether the firm published its 1932 financial statement in January, firm age in 1932, firm nominal capital in 1932, and industry fixed effects. All controls are interacted with a full set of year fixed effects. The data include the years 1928, 1932, 1933, and 1938. Standard errors are clustered at the firm level. FE = fixed effects.

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

of panel A implies, for example, that the average firm with Jewish managers experienced a decline in the number of managers with tenure since 1928 of approximately 18 log points.

In the subsequent columns, we add several control variables: connections to the Nazi Party, whether a firm published its financial statements in January every year (coinciding with the Nazis coming to power in 1933), firm age, firm size, and industry. All controls are interacted with a full set of year fixed effects. The coefficient on the fraction of Jewish managers remains stable and significant in all columns. The results with an alternative treatment variable, a binary indicator for whether the firm had any Jewish managers in 1932, are quantitatively similar to the results using the fraction as treatment variable (table A.4; tables A.1–A.23 are available online). The decrease in manager characteristics was not primarily a result of a lower total number of managers (table A.5). This suggests that the affected firms hired other managers to replace the dismissed Jewish managers but that these managers had different characteristics.<sup>27</sup>

Taken together, the evidence shows that the removal of Jewish managers had a lasting impact on the characteristics of managers at firms that had employed Jewish managers in 1932. In 1938, these firms still had fewer managers with firm-specific tenure, general managerial experience, a university education, and fewer connections to other firms. The persistent decline in these manager characteristics up to 1938 is noteworthy, because firms had up to 5 years to replace the Jewish managers after 1933.

There are three possible interpretations of these results. First, managers may have all the bargaining power in wage negotiations with the firm or the managerial labor market may be perfectly competitive, with a negligible role for firm-specific human capital. In both cases, firms have to fully compensate managers for their marginal product, firm value is independent of managerial characteristics, and firms have no incentive to hire managers with similar characteristics. Under this extreme interpretation, the loss of Jewish managers would not have affected firm value.

Second, the manager characteristics we analyze may be beneficial to firm value. Tenure is likely associated with firm-specific human capital, while experience and university education are likely associated with general human capital. Connections could proxy for manager quality, since only reputable managers may be offered multiple board positions. In addition, managers with many connections could improve information flows to input providers and output customers. Firm-specific human capital generates rents for employers in standard models (Becker 1964). General human capital can benefit the employer if there are information frictions on managerial labor markets (Acemoglu and Pischke 1998;

<sup>27</sup> In general, there was a significant degree of turnover in managerial labor markets. For example, 37% of senior managers in 1932 were not employed in the same firm in 1928.

Dessein and Prat 2019). Despite the benefits, frictions on the labor market for managers may have left firms unable to adequately replace the Jewish managers. Under this second interpretation, the loss of the Jewish managers would have harmed firm value.

A third interpretation views the characteristics we analyze as detrimental to firm value. Highly educated and experienced managers may be more skilled at becoming entrenched and extracting rents from their employers (Shleifer and Vishny 1989). Managers with many connections may be busier (Fich and Shivdasani 2006) or hire less competent executives only because they are in their network (Kramarz and Thesmar 2013). This may weaken corporate governance. Even if the detrimental nature of these characteristics were known, firms may not choose to endogenously fire their managers, because firing signals to investors that the firm is performing poorly or because firing managers is costly. Under this third interpretation, firms had no incentive to hire managers with similar characteristics in place of the Jewish managers. The exogenous removal of the Jewish managers may have raised firm value.

The following section allows us to differentiate between the three interpretations. We analyze how firm stock market performance responded to the removal of the Jewish managers and whether the loss of specific manager characteristics was particularly beneficial or harmful to firm performance.

#### IV. The Effect on Stock Prices

##### A. The Average Effect on Stock Prices

We investigate the effect on stock prices with the following specification:

$$\log(\text{Stock Price}_{it}) = \sum_{\tau=1929.0}^{1943.5} \beta_{\tau} \text{Fraction Jewish Managers}(1932)_i \times \mathbf{1}[t(i) = \tau] + \text{FirmFE}_i + \text{TimeFE}_t + \beta_c \text{Controls}_{it} + \varepsilon_{it}. \quad (3)$$

The specification is similar to that in the previous section, but uses the log of the stock price as the outcome variable.<sup>28</sup> As explained in section II, we

<sup>28</sup> This section focuses on stock price changes, without incorporating dividends into the analysis. We find a negative effect of losing Jewish managers on dividends separately in sec. VI. In an additional robustness check, we adjust the stock prices for dividends, assuming that investors immediately reinvest the dividend into the stock (for details, see app. B.2.3). The adjustment means that the coefficients measure the effect of losing Jewish managers on the return of investing (on January 10, 1933) into the average firm with Jewish managers in 1932, relative to investing into a firm without Jewish managers in 1932. We use the adjusted stock prices to construct fig. A.2. The pattern over time is almost identical to that in fig. 3. The point estimate corresponding to table 4, col. 6, using the adjusted stock prices is  $-0.474$  (0.152). The more negative coefficient is consistent with the finding that firms that lost Jewish managers paid out lower dividends after 1933.

have two observations of the stock price for each firm  $i$  per year, around January 10 and July 10. The data cover the years 1929–43.<sup>29</sup> We exclude January 10, 1933, as the last observation before Hitler became Chancellor on January 30, 1933. We plot the estimated coefficients  $\beta_t$  and the 95% confidence intervals in figure 3. Figure 3A shows the coefficients of a specification with a full set of firm and time fixed effects. Figure 3B plots the coefficients of a specification that further controls for connections to the Nazi Party, reporting period, firm age, nominal capital, and industry fixed effects, all measured in 1932 and interacted with a full set of time fixed effects.<sup>30</sup>

The main identifying assumption is that the stock prices of firms with a higher fraction of Jewish managers in 1932 would have followed the same trend as the stock prices of firms without Jewish managers, if Jewish managers had not been expelled from their firms. Before January 1933, the coefficients on the fraction of Jewish managers are small and not significantly different from zero. This indicates that firms with a higher fraction of Jewish managers were not exposed to different shocks before 1933, in line with our identification assumption.

After January 1933, the trends diverged. The stock price of the average firm with a higher fraction of Jewish managers started to decline sharply, compared with the stock price of a firm without Jewish managers.<sup>31</sup> The estimated short-run effect of losing Jewish managers is close to the initial stock price responses to prominent manager exits in recent times. For example, after Apple CEO Steve Jobs took permanent medical leave in 2011, Apple stock fell by 6% (BBC 2011). When Fiat Chrysler CEO Sergio Marchionne stepped down due to surgery in 2018, Fiat Chrysler stock lost 5% (Reuters 2018).

<sup>29</sup> As we have two observations per year, the data contain 30 time periods. Time fixed effects refer to January 10 and July 10 of each year (i.e., there are two time fixed effects per year).

<sup>30</sup> The industry classifications are as follows: financial services; insurance; transport; mining/iron/steel; machinery/electronics; construction/stones/earth; textile/clothing; chemistry/paper/wood; food/drinks; and other (consisting mainly of retail/trade/energy provision). The results are robust to using finer industry classifications (table A.6).

<sup>31</sup> The stock price of the average firm with Jewish managers experienced a relative decline of 7.1 log points between January and July 1933 (fig. 3B). The sharp relative decline is consistent with the timing of events described in the historical literature. For example, Münzel (2006) documents that “from the very start” of the Nazi reign there was “radical pressure on elite managers of Jewish origin,” with “more than a third of Jewish executives losing their positions” by July 1933 (182). Similarly, our manager data show that the average firm lost 34% of the Jewish managers in 1933. The point estimate on the stock price in July 1933 amounts to 51% of the July 1938 point estimate. The difference between the fraction of managers lost and the drop in stock prices may be explained by the sharp decline in the number of connections in 1933, as documented in fig. 2. We show that losing connected managers led to larger effects in sec. IV.B below. In fig. A.3, we document that German stock prices were generally rising after 1933 but that they were rising less quickly in firms with a higher fraction of Jewish managers in 1933.

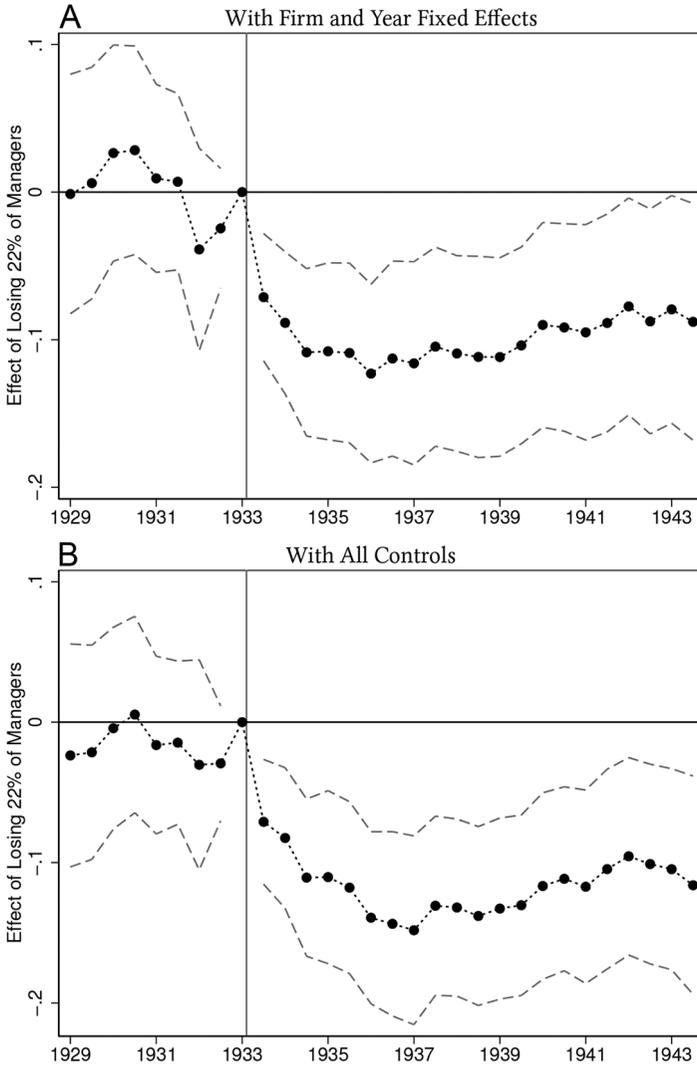


FIG. 3.—Effect on stock prices. The graphs plot coefficients ( $\beta_t$ ) and 95% confidence intervals from equation (3). The dependent variable is the natural logarithm of the stock price. Stock prices are averaged in a plus-minus 10-day window around January 10 and July 10 of each year. The main explanatory variables are the fraction of Jewish managers in 1932 interacted with a fixed effect for each time period. The interaction with January 1933, the last period before the Nazis gained power, is the excluded interaction. Coefficients and standard errors are scaled to reflect the effect on the average firm with Jewish managers in 1932. The average such firm lost 22% of its managers after 1932. Panel A controls for firm and time fixed effects. Panel B additionally controls for an indicator for any connections to the Nazi Party, an indicator for whether the firm published its 1932 financial statement in January, firm age in 1932, firm nominal capital in 1932, and industry fixed effects. All these additional controls are interacted with a full set of time fixed effects. Standard errors are clustered at the firm level.

The effects of losing Jewish managers persisted until the end of our stock sample period. The specification with the full set of controls suggests that in July 1943, 10 years after the Nazis had come to power, the stock price of an average firm that had employed Jewish managers in 1932 (which lost 22% of its managers) was still 11.6 log points below that of a comparable firm that had not employed any Jewish managers. The individual point estimate for July 1943 is significantly different from zero at the 1% level, as are all the point estimates from July 1933 onward. The results are similar with and without the controls, strengthening the view that firms with Jewish managers were not on fundamentally different trends from other firms, except for losing Jewish managers.

We also estimate results with a differences-in-differences specification:

$$\log(\text{Stock Price}_{it}) = \beta_1 \text{Fraction Jewish Managers}(1932)_i \times \text{Post}1933_t \\ + \text{FirmFE}_i + \text{TimeFE}_t + \beta_c \text{Controls}_{it} + \varepsilon_{it}. \quad (4)$$

The regressor of interest is the fraction of Jewish managers in 1932 interacted with an indicator for the months after January 1933. The point estimate in the specification with only firm and time fixed effects is significant at 1% (table 4, col. 1). The point estimate indicates that after the Nazis came to power, the stock price of the average firm that had employed Jewish managers (where 22% of managers were Jewish) was 10.3 log points

TABLE 4  
EFFECT ON STOCK PRICES

	(1)	(2)	(3)	(4)	(5)	(6)
Fraction of Jewish managers (1932) × Post 1933	-.469*** (.138)	-.459*** (.136)	-.458*** (.136)	-.479*** (.134)	-.479*** (.134)	-.464*** (.138)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Nazi connection × time FE		Yes	Yes	Yes	Yes	Yes
Reporting period × time FE			Yes	Yes	Yes	Yes
Firm age × time FE				Yes	Yes	Yes
Nominal capital × time FE					Yes	Yes
Industry FE × time FE						Yes
No. of observations	12,710	12,710	12,710	12,710	12,710	12,710
No. of firms	655	655	655	655	655	655
R <sup>2</sup>	.566	.569	.570	.580	.582	.622

NOTE.—The dependent variable is the natural logarithm of the stock price. Stock prices are averaged in a plus-minus 10-day window around January 10 and July 10 of each year. The main explanatory variable measures the fraction of Jewish managers in 1932 interacted with an indicator for the months after January 1933. The control variables include an indicator for any connections to the Nazi Party, an indicator for whether the firm published its 1932 financial statement in January, firm age in 1932, firm nominal capital in 1932, and industry fixed effects (FE). All controls are interacted with a full set of time fixed effects. The data include the months January and July for the years 1929–43. Standard errors are clustered at the firm level.

\*\*\*  $p < .01$ .

( $0.469 \times 0.22 \times 100 = 10.3$ ) lower after 1933, compared with the stock price of firms that had not employed any Jewish managers.

The addition of control variables hardly affects the coefficient. Each control is measured in 1932, before the rise of the Nazi government, and interacted with a full set of time fixed effects. Because the Nazi government may have favored some firms after 1933, we add an indicator for firms closely connected to the Nazi Party (col. 2). We control for whether a firm published its financial statements in January. The timing of financial reporting matters because the Nazis came to power on 30 January, 1933, and firms that published their statement after January may have experienced more stock price volatility (col. 3). We also control for firm age (col. 4) and firm size measured by nominal capital (col. 5), since the asset pricing literature has shown that the stocks of young (Pástor and Veronesi 2003) and small (Fama and French 1992) firms often perform differently. Finally, we control for industry fixed effects (col. 6). They account for potential shocks that may have hit specific industries. These checks offer further evidence that differential exposure to other shocks cannot explain the effect of losing Jewish managers. The results are quantitatively similar and significant using as treatment variable a binary indicator for whether the firm employed any Jewish managers in 1932 (table A.7).

By comparing the 1932 and 1933 editions of *Handbuch der deutschen Aktiengesellschaften*, we can identify which firms lost some of their Jewish managers already in 1933 and which firms lost Jewish managers only after 1933. We estimate how this differential timing affected stock prices. Firms that lost some of their Jewish managers in 1933 experienced relatively lower stock prices in 1933 (table A.8, first row of coefficients). In the following years, when these firms lost the remaining Jewish managers, their relative stock price declined somewhat further (second row of coefficients). Firms that lost all their Jewish managers after 1933 experienced no relative decline in stock prices in 1933 (third row of coefficients) but experienced lower stock prices after 1933 (fourth row of coefficients). This suggests that the sharp relative decline in stock prices in 1933 (seen in fig. 3) was entirely driven by firms that lost managers in 1933. Of course, this result should be interpreted with caution, since Jewish managers may have left their firms for endogenous reasons. For this reason, we use the fraction of Jewish managers in 1932 as the treatment variable in the baseline specifications. This measure is immune to the endogenous timing of manager separations.<sup>32</sup>

<sup>32</sup> Our data on the composition of firm management cover the years 1928, 1932, 1933, and 1938. We can therefore explore the exact timing of dismissals by investigating changes between 1932 and 1933 but not for the subsequent years until 1938. By 1938, virtually all Jewish managers had left their firms (fig. 1, last bar). While the results suggest that the stock market reacted sharply to the timing of dismissals for the first wave of dismissals, the later dismissals may have been more anticipated, and hence, the dismissal of all Jewish managers seems to have been priced in by 1937 (see fig. 3B).

The effects of losing Jewish managers on stock prices were persistent, just like the effects on the characteristics of firms' senior management found in the previous section. The stock price results support the view that firms had gained rents from employing the Jewish managers and, hence, that the managers' salaries did not reflect their marginal contribution to their firms' market value. Frictions in the labor market presumably left firms unable to replace managers with certain characteristics, and this persistently lowered their stock market valuation.

We carry out several robustness checks. The effects are stable and significant in a sample of firms that all employed at least one Jewish manager in 1932 (table A.9). In this sample, the observable characteristics of firms with a higher fraction of Jewish managers were similar to firms with a lower fraction of Jewish managers, especially if we additionally exclude the two conglomerate firms from the sample (see table 2, cols. 6–7). The results are also robust to controlling for firm size in various ways, to restricting the sample to regularly traded firms, to dropping observations in 1932 during the German banking crisis, and to limiting the sample to firms that were never delisted (see app. C for details).

*Heterogeneity: when do managers matter?*—In additional results, we show that managers are more important in competitive industries. We construct a firm-level measure of membership in cartels using data from *Handbuch der deutschen Aktiengesellschaften* (see app. B.4). In the sample of firms that do not belong to a cartel, the point estimates are larger than the main results and significant at the 1% level. In the sample of firms that are members of at least one cartel, the point estimates are smaller and not significant at conventional levels (table A.10).<sup>33</sup>

We also find that a wider cadre of senior managers affects firm performance, not just managers in chief positions. We define managers in chief positions to be the top hierarchical level of the executive board and the chairmen of the supervisory board (i.e., managers performing functions akin to those of a modern CEO). The remaining board members are regular managers. The point estimates for losing managers in both types of positions are statistically different from zero, of similar magnitude, and not statistically different from each other (table A.12). The results are consistent with those of Bender et al. (2018). Managerial human capital could matter because it may be hard to replace the unique leadership

<sup>33</sup> The loss of managers should disproportionately affect firms where managerial skill is an important input into the production process. We identify an industry's dependence on managers by calculating the share of middle- and upper-level managers in an industry out of all employees, using data from the 1933 census. The share ranges from 0.03% to 2.28%. The results suggest that industries where managers are more important were more affected by losing Jewish managers (table A.11).

ability of individual managers or because qualified managers cultivate organizational practices (Dessein and Prat 2019).

*B. The Effect of Managers with Certain Characteristics on Stock Prices*

To investigate whether the loss of specific managerial characteristics was responsible for the decline in stock prices, we estimate

$$\begin{aligned} & \log(\text{Stock Price}_{it}) \\ &= \beta_1 \times \mathbf{1}[0 < \text{Importance of Jews for Managerial Characteristic}(1932) < 0.20]_i \times \text{Post1933}_i \\ & \quad + \beta_2 \times \mathbf{1}[0.20 \leq \text{Importance of Jews for Managerial Characteristic}(1932) < 0.80]_i \times \text{Post1933}_i \\ & \quad + \beta_3 \times \mathbf{1}[0.80 \leq \text{Importance of Jews for Managerial Characteristic}(1932)]_i \times \text{Post1933}_i \\ & \quad + \text{FirmFE}_i + \text{TimeFE}_t + \beta_c \text{Controls}_{it} + \varepsilon_{it}. \end{aligned}$$

As before, the outcome variable is the log stock price. The three main explanatory variables are indicators for whether Jewish managers were responsible for (1) less than 20%, (2) 20%–80%, or (3) more than 80% of a given characteristic of firm managers (e.g., connections to other firms or number of educated managers). All characteristics are measured in 1932. The three indicator variables are interacted with an indicator for the months after January 1933. If a firm did not have any Jewish managers in 1932, the three indicator variables are zero. Hence, the coefficients on the three indicator variables are estimated relative to firms that did not employ any Jewish managers in 1932.<sup>34</sup>

We start by analyzing managers that were important in connecting their firm to other firms. To identify connections, we use data on whether managers held board positions in other firms in 1932.<sup>35</sup> We define a measure that captures the importance of connections formed by Jewish managers, relative to connections formed by other managers. If firm  $i$  had connections to  $N_i$  other firms and  $\text{Share Jewish Connectors}_{ij}$  was the share of connections between firms  $i$  and  $j$  formed by Jewish managers, we define

$$\begin{aligned} & \text{Importance of Jews for Managerial Connections}(1932)_i \\ &= \frac{\sum_j \text{Share Jewish Connectors}(1932)_{ij}}{N_i}. \end{aligned}$$

<sup>34</sup> We do not use observed changes in managerial characteristics as regressors, since observed changes are endogenous to firm performance.

<sup>35</sup> We measure connections to 4,378 German stock corporations. These corporations were listed in Berlin and/or had nominal capital of at least 500,000 RM. Seven firms listed in Berlin had nominal capital below 500,000 RM. The majority of German stock corporations were not listed on any stock market and rarely traded.

This measure is the share of firm  $i$ 's connections that were formed by Jewish managers, averaged over all firms that were connected to firm  $i$ .<sup>36</sup> The measure is based on the theoretical networks literature (Jackson 2010). It captures the influence of Jewish managers on the degree centrality of the firm.

After 1933, stock prices declined by 3.4 log points (not significant) for firms where Jewish managers made up less than 20% of the firm's connections in 1932, relative to firms without Jewish managers (table 5, col. 1). Stock prices declined by 17.9 log points (significant at 1%) in firms where the Jewish managers were responsible for 20% to less than 80% of the firm's connections and by 25 log points (significant at 5%) in firms where the Jewish managers were responsible for more than 80% of the firm's connections, relative to firms without Jewish managers in 1932. The results suggest that firms that lost a large share of their connections suffered larger declines in stock prices. In line with other work, these findings imply that social capital matters for firm outcomes and that it is hard to replace well-connected managers (Glaeser, Laibson, and Sacerdote 2002; Cai and Szeidl 2018; Haselmann, Schoenherr, and Vig 2018).<sup>37</sup>

Next, we study the effect of managers with a university education. After 1933, stock prices declined by 5.2 log points (not significant) in firms that had Jewish managers in 1932 but where Jewish managers were not responsible for more than 20% of the firm's managers with a university education (table 5, col. 3). Stock prices declined by 21.4 log points (significant at 1%) among firms where the Jewish managers made up 20% to less than 80% of the firm's managers with a university education and by 62.3 log points (significant at 1%) among firms where the Jewish managers made up more than 80% of the firm's managers with a university education. The results indicate that firms that had a large share of Jewish managers among their highly educated managers suffered larger declines in stock prices. The results on managerial connections and education are robust to the inclusion of additional control variables (table 5, cols. 2 and 4).

<sup>36</sup> To be clear, consider the simple example in fig. A.4. Firm A had four managers. Managers 1 and 2 were Jewish. Manager 1 was connected to firm B; managers 2 and 3 to firm C; and manager 4 to firm D. Hence, the firm had three connections overall, i.e.,  $N_i = 3$ . Jewish managers were responsible for the full link to firm B, 0.5 of the link to firm C, and 0 of the link to firm D. Hence, for firm A

$$\text{Importance of Jews for Managerial Connections}(1932)_A = \frac{\overbrace{1}^{\text{Firm B}} + \overbrace{0.5}^{\text{Firm C}} + \overbrace{0}^{\text{Firm D}}}{3} = 0.5.$$

Firm A would fall in the middle category where Jewish managers were responsible for  $\geq 20\%$  but  $< 80\%$  of the firm's connections.

<sup>37</sup> The indicator variables could simply proxy for firms that had a high fraction of Jewish managers in 1932. To rule out this concern, we estimate specifications that include the fraction of Jewish managers in 1932 among the regressors, in addition to the three indicator variables. The coefficient on the fraction is statistically insignificant and positive, while the coefficients on the indicator variables remain at the same significance levels and of similar magnitude to the results presented in this section.

TABLE 5  
IMPORTANCE OF MANAGERIAL CHARACTERISTICS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I[0 < importance of Jews for managerial characteristics (1932) < .20] × Post 1933	-.034 (.058)	-.003 (.059)	-.052 (.047)	-.037 (.046)	-.111** (.055)	-.093* (.050)	.022 (.066)	.077 (.065)
I[.20 ≤ importance of Jews for managerial connections (1932) < .80] × Post 1933	-.179*** (.048)	-.164*** (.046)					-.120** (.059)	-.115** (.057)
I[.80 ≤ importance of Jews for managerial connections (1932)] × Post 1933	-.250** (.103)	-.295*** (.098)					-.170 (.110)	-.215** (.107)
I[.20 ≤ importance of Jews for managerial education (1932) < .80] × Post 1933			-.214*** (.053)	-.199*** (.051)			-.153** (.067)	-.142** (.063)
I[.80 ≤ importance of Jews for managerial education (1932)] × Post 1933			-.623*** (.208)	-.733*** (.209)			-.555*** (.209)	-.655*** (.216)
I[.20 ≤ importance of Jews for managerial experience (1932) < .80] × Post 1933					-.170*** (.048)	-.163*** (.047)	.065 (.077)	.068 (.067)
I[.80 ≤ importance of Jews for managerial experience (1932)] × Post 1933					-.385*** (.077)	-.110 (.170)	-.117 (.114)	.142 (.188)
Firm FE	Yes							
Time FE	Yes							
All controls		Yes		Yes	Yes	Yes	Yes	Yes
No. of observations	12,710	12,710	12,710	12,710	12,710	12,710	12,710	12,710
No. of firms	655	655	655	655	655	655	655	655
R <sup>2</sup>	.568	.625	.572	.629	.566	.622	.574	.631

NOTE.—The dependent variable is the natural logarithm of the stock price. Stock prices are averaged in a plus-minus 10-day window around January 10 and July 10 of each year. The main explanatory variables are indicators for whether Jewish managers were responsible for (1) less than 20%, (2) 20% to less than 80%, and (3) more than 80% of the indicated managerial characteristic. In cols. 7 and 8, the lowest category is an indicator for losing less than 20% in all categories, in order to avoid a problem of perfect multicollinearity. For firms without Jewish managers in 1932, all of the reported indicator variables in all columns are zero. The main explanatory variables are all interacted with an indicator for the months after January 1933. The control variables are identical to table 4. The data include the months January and July for the years 1929–43. Standard errors are clustered at the firm level. FE = fixed effects.

\*  $p < .10$ .

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

Last, we study the effect of managers with experience since 1928. The specification without controls suggests there is a larger effect for firms that had a larger share of Jewish managers among their experienced managers (table 5, col. 5). However, the inclusion of the control variables renders similar the coefficients for different shares of experienced managers (table 5, col. 6). For example, the point estimate on firms where more than 80% of experienced managers were Jewish is statistically insignificant and of similar magnitude to the point estimate on firms where less than 20% of experienced managers were Jewish. This suggests that experienced managers were less important for firm performance.<sup>38</sup>

To compare the effect of different manager characteristics more conclusively, we also estimate specifications that simultaneously include the indicator variables for all three characteristics. These specifications estimate the effect of one characteristic, while keeping constant the other characteristics. Therefore, the results account for potential correlations between different characteristics. For example, managers with many connections may also have been more educated. The estimates are of similar magnitude compared with the previous specifications (table 5, cols. 7–8). The coefficients on connections and education are statistically significant with and without controls. The coefficients on larger shares of experienced managers are statistically insignificant with and without controls. This implies that the earlier results did not rely on spurious correlations between the different managerial characteristics.<sup>39</sup>

Overall, the results suggest that managers who connect to other firms and managers with university education significantly contribute to firm value. The findings are consistent with the view that connections and education are positively correlated with managerial human capital. There is no evidence that experienced managers affect market value, as long as managerial experience is not correlated with connections and the education level of managers. This finding could indicate that the positive effects of experience on firm-specific human capital are outweighed by the negative effects of experience through rent seeking and entrenchment.

The coefficients on firms where Jewish managers were responsible for less than 20% of all three managerial characteristics are positive, close to zero, and statistically insignificant (table 5, cols. 7 and 8). Hence, losing Jewish managers per se had no significant effect on stock prices. This is a key

<sup>38</sup> In unreported specifications, we separately examine tenure in the same firm and experience in other firms. We find little evidence that firm-specific tenure or experience in another firm affected stock prices.

<sup>39</sup> In unreported results, we vary the definition of the explanatory variables that indicate greater managerial characteristics. For example, we use 25% and 75% as the cutoffs, or 50%. In all these specifications, the point estimates on a large share of connections and university education are negative, while the point estimates on any share of experienced managers are small and mostly positive.

finding, which validates our identification strategy. It indicates that firms with Jewish managers in 1932 and firms without Jewish managers in 1932 remained on parallel trends after 1933, unless Jewish managers were responsible for a large share of the firm's connections or educated managers.

### 1. The Importance of Managerial Connections

The data allow us to investigate the role of managerial connections in more detail. Our main measure of connections, degree centrality, may potentially miss interesting aspects of the German firm network. We therefore analyze other network measures (Katz centrality, eigenvector centrality), which capture higher-order links between firms (Katz 1953; Bonacich 1987; see app. D for details). The results indicate that changes in direct connections that were caused by the removal of Jewish managers had large effects on stock prices. In contrast, changes in higher-order connections were less important (table A.13).<sup>40</sup>

Moreover, we find that connections to both banks and nonbanks affected firm performance (table A.14). The results are consistent with the view that losing managers with direct relationships to banks harms access to finance but that relationships to nonfinancial firms are of similar importance.

### 2. The Importance of Managerial Education

We also inspect different types of university education in more detail. Stock prices declined only if firms had employed a higher share of Jewish managers with a graduate degree but not if the managers had only a basic university degree. This suggests that upper-tail managerial human capital is particularly important for firm performance (table 6, cols. 1 and 2).

Stock prices in all types of industries declined if firms had employed a higher share of Jewish managers with a graduate degree in social sciences (e.g., law, economics, business, and history; for details on the field of study of managers, see app. B.1.2). This suggests that knowledge related to commercial transactions and human interactions is an important part of managerial skill, independent of firm type. In contrast, we find that losing managers with graduate degrees in STEM subjects (e.g., engineering and chemistry) mainly affected firm performance in STEM-related industries, such as pharmaceuticals or machinery production, but not in non-STEM industries, such as banking and insurance (table 6, cols. 3 and 4).

<sup>40</sup> Information flows along upstream or downstream production chains may be easier when managers have direct connections, consistent with evidence found by Cai and Szeidl (2018). In contrast, indirect information flows through multiple nodes of the firm network seem less important. Such indirect information pass-through may have some importance in networks of small microfinance firms (Banerjee et al. 2013) but may be less relevant for large, listed corporations.

TABLE 6  
GRADUATE VERSUS BASIC UNIVERSITY EDUCATION AND STEM  
VERSUS SOCIAL SCIENCE GRADUATE EDUCATION

	Full Sample (1)	Full Sample (2)	Firms in STEM Industries (3)	Firms in Non-STEM Industries (4)
I[0 < importance of Jews for managerial characteristics (1932) < .20] × Post 1933	.005 (.046)	.009 (.047)	.032 (.083)	.029 (.063)
I[.20 ≤ importance of Jews for managers with basic university education (1932) < .80] × Post 1933	−.053 (.071)	−.051 (.072)	−.034 (.151)	−.034 (.069)
I[.80 ≤ importance of Jews for managers with basic university education (1932)] × Post 1933	.062 (.122)	.053 (.122)	.083 (.113)	−.007 (.199)
I[.20 ≤ importance of Jews for managers with graduate education (1932) < .80] × Post 1933	−.190*** (.052)			
I[.80 ≤ importance of Jews for managers with graduate education (1932)] × Post 1933	−.350*** (.114)			
I[.20 ≤ importance of Jews for STEM graduate education (1932) < .80] × Post 1933		−.004 (.076)	−.057 (.089)	.037 (.107)
I[.80 ≤ importance of Jews for STEM graduate education (1932)] × Post 1933		−.051 (.102)	−.239* (.141)	.110 (.116)
I[.20 ≤ importance of Jews for social science graduate education (1932) < .80] × Post 1933		−.154*** (.057)	−.166* (.097)	−.131** (.062)
I[.80 ≤ importance of Jews for social science graduate education (1932)] × Post 1933		−.261*** (.078)	−.278* (.149)	−.189* (.111)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
All controls	Yes	Yes	Yes	Yes
No. of observations	12,710	12,710	5,198	7,512
No. of firms	655	655	264	391
R <sup>2</sup>	.627	.626	.693	.638

NOTE.—The dependent variable is the natural logarithm of the stock price. Stock prices are averaged in a plus-minus 10-day window around January 10 and July 10 of each year. The main explanatory variables are indicators for whether Jewish managers were responsible for (1) less than 20% of all managerial characteristics analyzed in the given column, (2) 20% to less than 80% of the indicated managerial characteristic, and (3) more than 80% of the indicated managerial characteristic. For firms without Jewish managers in 1932, all of the reported indicator variables in all columns are zero. The main explanatory variables are all interacted with an indicator for the months after January 1933. In cols. 2–4, we additionally control for indicators representing the share of Jewish managers with a graduate degree for which we cannot assign a field of study. Further control variables are identical to table 4. In cols. 1 and 2, the sample contains all firms listed in Berlin. In col. 3, the sample contains firms in STEM industries, e.g., pharmaceuticals or machinery production. In col. 4, the sample contains firms in non-STEM industries, e.g., banking or insurance. The data include the months January and July for the years 1929–43. Standard errors are clustered at the firm level. FE = fixed effects.

\*  $p < .10$ .

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

### C. *Alternative Explanations for the Effect on Stock Prices*

The results in the previous subsections indicate that the removal of connected and educated Jewish managers led to declines in firms' stock prices. In this section, we explore whether firms with Jewish managers suffered from other shocks after 1933 that were correlated with the fraction of Jewish managers in 1932. We consider two types of shocks: those resulting from other discriminatory measures against Jews and those arising from other shocks to the demand for the products of some firms.

#### 1. Other Discrimination against Jews

*Effect in a sample of firms favored by the Nazi government.*—Other discriminatory measures against Jews in Nazi Germany may have disproportionately affected firms with a higher fraction of Jewish managers. In a first test, we restrict the sample to firms that were favored by the Nazi regime. It is likely that these firms were not exposed to repressive measures but rather experienced political support after 1933. We identify firms favored by the Nazi government based on three criteria. First, we include firms with managers who made financial contributions or provided political support to Hitler, Göring, or the Nazi Party before 1933 (e.g., the insurance company Allianz or the car manufacturer Daimler-Benz). This measure was developed by Ferguson and Voth (2008). Second, we include firms that were granted forced labor workers by the Nazi government (e.g., IG Farben). The measure is based on the "Catalogue of Camps and Prisons in Germany and German-Occupied Territories 1939–1945." Third, we exclude firms that the German public or the Nazi government perceived as "Jewish" (see below for the definition of "Jewish" firms). Overall, this sample includes 171 firms that were favored by the Nazis. Despite the fact that this sample of firms is much smaller than the full sample, the effect of losing Jewish managers remains significant at the 5% level in the specification with all controls (table 7). Hence, losing Jewish managers affected stock prices even among a sample of firms that were not negatively exposed to government repression.

*Discrimination against firms perceived as "Jewish."*—In a second test, we analyze firms that were associated with Judaism more generally. Such firms may have suffered after the Nazis came to power, for example, because of anti-Semitic measures by the government or because they suffered from consumer boycotts. We identify firms that contemporaries explicitly named as "Jewish firms," using a range of historical sources about Jews in Germany (Bruer 1927; Landsberg 1927a, 1927b; Priester 1927; Mosse 1987).<sup>41</sup> Many

<sup>41</sup> As the historical sources cover only certain industries, we augment the definition of "Jewish firms" with the definition of "Jewish firms" established by Mosse (1987), the standard reference on Jews in the German economy. All results hold if we focus on the definition that relies only on the contemporary sources.

TABLE 7  
EFFECT AMONG FIRMS FAVORED BY THE NAZIS

	(1)	(2)
Fraction of Jewish managers (1932) × Post 1933	-.576* (.333)	-.704** (.313)
Firm FE	Yes	Yes
Time FE	Yes	Yes
All controls		Yes
No. of observations	3,834	3,834
No. of firms	171	171
$R^2$	.563	.663

NOTE.—The dependent variable is the natural logarithm of the stock price. Stock prices are averaged in a plus-minus 10-day window around January 10 and July 10 of each year. The main explanatory variable measures the fraction of Jewish managers in 1932 interacted with an indicator for the months after January 1933. The sample contains firms with connections to the Nazi Party and firms that received forced labor workers from the Nazi government, excluding firms historically perceived as Jewish. The control variables are identical to table 4. The data include the months January and July for the years 1929–43. Standard errors are clustered at the firm level. FE = fixed effects.

\*  $p < .10$ .

\*\*  $p < .05$ .

of these “Jewish firms” had a Jewish founder, such as Leonhard Tietz, the department store founded by the Jewish merchant of the same name, or Allgemeine Electricitätsgesellschaft, one of the world’s largest electrical companies, founded by the Jewish industrialist Emil Rathenau.<sup>42</sup>

We separately analyze the evolution of the stock prices of Jewish firms (table 8). We find negative but insignificant coefficients for Jewish firms after 1933 (cols. 1–2). The pattern becomes clearer when we separately consider the period after 1935. The stock prices of Jewish firms hardly changed in 1933 and 1934 but declined significantly after 1935 (cols. 3–4). These findings are consistent with historical accounts: During the early years of Nazi rule, large Jewish firms were not harmed by the government because the Nazis wanted to boost employment and did not target firms that were vital for the economic recovery (James 2001, 38). After passing the Nuremberg racial laws in 1935, however, the Nazi government explicitly began to target large firms perceived to be Jewish (Barkai 1990, 83; Strauss 1999, XVII; James 2001, 38).

Importantly, controlling for Jewish firms does not affect the post-1933 coefficient on the fraction of Jewish managers in 1932 (table 8, cols. 5–6). These results indicate that Jewish firms indeed suffered in Nazi Germany but that the effect on Jewish firms was orthogonal to the effect of losing Jewish managers.

<sup>42</sup> The average fraction of managers with Jewish origin was higher in Jewish firms compared with other firms (24% vs. 13%), but there was significant variation in both groups. The 1st to 99th percentile range of the fraction of Jewish managers was 0% to 62% for Jewish firms and 0% to 57% for other firms.

TABLE 8  
JEWISH MANAGERS VERSUS FIRMS PERCEIVED AS JEWISH

	(1)	(2)	(3)	(4)	(5)	(6)
Jewish firm	-.127	-.137	-.021	-.041	.029	.007
× Post 1933	(.096)	(.084)	(.097)	(.090)	(.099)	(.092)
Jewish firm			-.140**	-.128**	-.142**	-.131**
× Post 1935			(.057)	(.059)	(.058)	(.060)
Fraction of Jewish managers (1932) × Post 1933					-.446***	-.441***
					(.138)	(.138)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
All controls		Yes		Yes		Yes
No. of observations	12,710	12,710	12,710	12,710	12,710	12,710
No. of firms	655	655	655	655	655	655
R <sup>2</sup>	.563	.619	.563	.620	.567	.623

NOTE.—The dependent variable is the natural logarithm of the stock price. Stock prices are averaged in a plus-minus 10-day window around January 10 and July 10 of each year. The first main explanatory variable is an indicator for firms historically perceived as Jewish interacted with an indicator for the months after January 1933. The second main explanatory variable is an indicator for firms historically perceived as Jewish interacted with an indicator for the months after January 1935. The third main explanatory variable measures the fraction of Jewish managers in 1932 interacted with an indicator for the months after January 1933. The control variables are identical to table 4. The data include the months January and July for the years 1929–43. Standard errors are clustered at the firm level. FE = fixed effects.

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

To further explore the development of Jewish firms over time, we run a specification akin to equation (3) and additionally include an indicator for Jewish firms, interacted with a full set of time fixed effects. Stock prices of Jewish firms remained constant until January 1935, then started to decline, reached their lowest point in 1939, and fully recovered by 1943 (fig. A.6; figs. A.1–A.7, B.1–B.4 are available online). The recovery of stock prices of Jewish firms suggests that discriminatory measures against these firms had only temporary effects, which lasted until they were taken over by non-Jews and were no longer associated with Judaism. In contrast, the stock prices of firms that lost Jewish managers remained persistently low, even after all Jewish managers had left their firms by 1938.

Taken together, these findings imply that the effect of losing Jewish managers cannot be explained by other shocks that hit Jewish firms. This is hardly surprising. Many firms happened to employ managers of Jewish origin (e.g., BMW, Deutsche Reichsbahn, or IG Farben), but they were not perceived to be Jewish in any way by the Nazis or the public and were hence unlikely to face direct repression or shocks to demand.

*Discrimination against lower-ranked Jewish employees.*—In a third test, we explore whether the discrimination against Jewish managers was correlated with discrimination against lower-ranked Jewish employees. There

are no consistent data on the number of lower-ranked Jewish employees for firms listed in Berlin. We therefore collect data on the share of Jews among lower-ranked employees from historical statistics published by the German Statistical Agency (*Statistisches Reichsamt*; for details, see app. B.5). These data are based on the 1933 census and report the fraction of Jews by sector (manufacturing or services) and region or large city (e.g., Berlin, Hamburg, Breslau, Königsberg). Whenever we are able to use the city-level information, we do so (for about 33% of the sample). Otherwise, we use regional information.

The data allow us to estimate the effect of losing Jewish managers for firms in region-sector cells with very low fractions of lower-ranked Jewish employees (table A.15). We analyze firms in region-sector cells with the lowest quartile of Jewish blue-collar workers (cols. 1–2), the lowest quartile of lower-ranked Jewish white-collar workers (cols. 3–4), and the lowest quartiles of both measures of lower-ranked Jewish employees (cols. 5–6).<sup>43</sup> In the sample using both measures, the percentage of Jews is only 0.22% among blue-collar workers and 0.02% among lower-ranked white-collar workers (fig. A.7). In contrast, the fraction of Jewish managers remains at 10.7% (vs. 13.8% in the full sample). In all specifications, the effect of the fraction of Jewish managers remains of similar magnitude and significant. These results suggest that the underperformance of firms that lost Jewish managers was not predominantly driven by a reduction in the supply of lower-ranked Jewish employees.

*Discrimination against Jewish shareholders.*—In a fourth test, we explore the role of Jewish shareholders. There is no complete register of shareholders for this time period, but *Handbuch der deutschen Aktiengesellschaften* 1932 lists large shareholders for the firms in our sample. For example, the industrial property developer Königstadt AG lists two large shareholders: Bank für Brau and the Jewish private bank Gebrüder Arnhold. We identify all Jewish individuals or firms (e.g., Jewish private banks) that were large shareholders in any of the sample firms.<sup>44</sup>

The results are robust in a sample of firms without large Jewish shareholders in 1932 (table A.16). This implies that fire sales of large blocks of stocks by Jewish shareholders do not affect the estimated effect of losing Jewish managers. This finding is consistent with the historical literature, which suggests that Jewish private banks and other Jewish shareholders

<sup>43</sup> Lower-ranked white-collar workers do not contain the senior managers that are the focus of our analysis because high-level white-collar workers are separately listed in the census data.

<sup>44</sup> We classify firms as having a large Jewish shareholder if an individual shareholder was of Jewish origin (as defined in sec. II.A), if an institutional shareholder was perceived as a Jewish firm (as defined in sec. IV.C.1), or if the institutional shareholder was a Jewish private bank (as listed in Köhler 2008).

were not able to sell their stocks but that their stock portfolios were mostly seized and redistributed as a whole.<sup>45</sup>

*Discrimination by retail customers.*—In a fifth test, we consider potential discrimination by retail customers that may have been correlated with the fraction of Jewish managers. Anti-Semitic customer boycotts disproportionately hit retail firms. In a sample of nonretail firms, the results are similar to the baseline results (table 9, cols. 1–2). This suggests that customer discrimination cannot explain why firms with Jewish managers experienced declines in stock prices.

## 2. Correlated Demand Shocks (Not Directly Related to Discrimination)

*Rearmament and infrastructure spending.*—Next, we explore whether demand shocks that were not directly caused by discrimination against Jews disproportionately affected firms with a higher fraction of Jewish managers. Soon after gaining power, the Nazi government started massive rearmament and infrastructure programs. Armament spending increased from about 0.8 billion RM in 1932 to 30 billion RM in 1939 (Carroll 1968). Infrastructure spending focused on war-related construction: strategic roads (the famous autobahn), airfields, and waterways (Tooze 2008, 45). To test whether armament and construction spending drives the effects, we exclude all firms that the Reichswehr had identified as important for rearmament (table 9, cols. 3–4); firms in the war-related industries iron and steel production, machine tools, and chemicals (table 9, cols. 5–6); and construction firms (table 9, cols. 7–8).<sup>46</sup> Despite dropping large shares of the sample, the coefficients remain similar to the baseline effect.

*Reduced demand by international customers.*—We consider whether lower demand from abroad may have disproportionately hit firms with a larger fraction of Jewish managers. International customers or trading partners may have been less willing to work with firms that had dismissed their Jewish managers. *Handbuch der deutschen Aktiengesellschaften* 1932 includes a

<sup>45</sup> Recently, Ihlow and Jackwerth (2020) adopt a similar approach to analyzing Jewish shareholders. They use shareholder data from the *Handbuch* and find no effect of Jewish shareholders on stock prices, just as we do. In contrast, Ihlow and Jackwerth (2020) use less detailed manager data and analyze only a small share of firms managed by individuals of Jewish origin. For instance, they do not observe any manager characteristics, which makes it difficult to study the effects of managerial human capital. Moreover, historians (Münzel 2006; Windolf 2011) and our data show that roughly 400 firms (60%) listed in Berlin had a Jewish manager, while Ihlow and Jackwerth (2020) identify only 91 such firms. Despite these differences, the results of Ihlow and Jackwerth (2020) are consistent with our conclusions. Specifically, both studies find that stock prices of firms with Jewish managers, but not with Jewish shareholders, fell after 1933 (table A.16).

<sup>46</sup> We exclude firms using a list of suppliers that the Reichswehr had identified as important for rearmament production (Hansen 1978). *Anlage Nr. 6* (p. 217) reports firms that prepared for the production of armament material in 1927/28. *Anlage Nr. 10* (p. 226) reports firms that were important providers of inputs for armaments production in 1931.

TABLE 9  
CORRELATED DEMAND SHOCKS

	NO RETAIL		NO ARMS PRODUCERS		NO IRON AND STEEL, MACHINES, CHEMICALS		NO CONSTRUCTION		NON-INTERNATIONAL FIRMS		NO FIRM-SPECIFIC DEMAND SHOCKS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fraction of Jewish managers (1932) × Post 1933	-.463*** (.140)	-.464*** (.140)	-.457*** (.138)	-.449*** (.138)	-.588*** (.170)	-.424*** (.187)	-.460*** (.145)	-.461*** (.144)	-.479*** (.162)	-.376*** (.165)	-.449*** (.155)	-.445*** (.156)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	12,546	12,546	12,070	12,070	7,588	7,588	12,004	12,004	7,657	7,657	10,065	10,065
No. of firms	647	647	626	626	386	386	620	620	419	419	544	544
R <sup>2</sup>	.563	.621	.561	.619	.532	.604	.558	.616	.564	.624	.572	.626

NOTE.—The dependent variable is the natural logarithm of the stock price. Stock prices are averaged in a plus-minus 10-day window around January 10 and July 10 of each year. The main explanatory variable measures the fraction of Jewish managers in 1932 interacted with an indicator for the months after January 1933. We drop from the sample: firms in the retail sector (cols. 1 and 2); firms that the Reichswehr had listed as important for armaments production, based on Hansen (1978) (cols. 3 and 4); firms producing iron and steel, machines, and chemicals (cols. 5 and 6); firms in the construction sector (cols. 7 and 8); firms that were internationally active (cols. 9 and 10); firms that were hit by firm-specific product demand shocks between 1933 and 1941 according to the 1941 edition of *Handbuch der Deutschen Aktiengesellschaften* (cols. 11 and 12). The control variables are identical to table 4. The data include the months January and July for the years 1929–43. Standard errors are clustered at the firm level. FE = fixed effects.

\*\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

written narrative about each firm. We code international firms as those firms that reported “imports,” “exports,” or “foreign activity” as part of their business activities. For example, the brewery Dortmundener Actien-Brauerei reported “beer export: to Holland, France, Belgium, and overseas” among its business activities. The coefficient on losing Jewish managers remains stable in a sample of firms without international business activities (table 9, cols. 9–10).

*Firm-specific demand shocks.*—Finally, we investigate whether firm-specific product demand shocks may have disproportionately hit firms with a higher fraction of Jewish managers. *Handbuch der deutschen Aktiengesellschaften 1941* provides narrative histories that describe each firm’s development between 1933 and 1941, including discussions of product demand. We carefully read the narrative of each firm and identify all positive or negative demand shocks. For example, the entry for the storage and transport company Königsberger Lagerhaus describes that a record agricultural yield in Eastern Germany increased demand for its services. In the opposite direction, harsh winters in certain parts of Germany reduced construction and, therefore, demand for the cement producer Breitenburger Portland-Cement. Other demand shocks were caused by public policy. For example, the local government made the river Donau between Ulm and Kelheim more easily navigable by ship, which benefited the shipping company Rhein-Main-Donau AG. The coefficient on losing Jewish managers remains stable and significant in a sample of firms without firm-specific demand shocks between 1933 and 1941 (table 9, cols. 11 and 12).

## V. The Effect on the Aggregate Market Valuation of Listed Firms

A back-of-the-envelope calculation allows us to estimate the aggregate decrease in market valuation of firms listed in Berlin due to the loss of Jewish managers. The calculation relies on the assumption that firms without Jewish managers were not affected by the removal of Jewish managers from other firms, that is, we assume no spillover effects. Positive spillovers may exist because firms without Jewish managers could have taken over market share from firms in their industry that lost Jewish managers. Negative spillovers may exist in the form of reduced productivity spillovers among firms in the same industry, lower regional aggregate demand, or because firms that had employed Jewish managers poached managers from unaffected firms.

We explore the plausibility of the assumption of no spillovers by testing for spillovers within industries and within regions. We estimate regressions based on versions of equation (4) and report the results in table A.17. The regressors of interest include the original regressor (the firm’s fraction of Jewish managers) and the average fraction of Jewish

managers in all other firms in the industry or the region, all interacted with an indicator for the months after January 1933. While the coefficients on the firm's fraction of Jewish managers are stable and statistically significant, the coefficients on the industry- and region-level fractions of Jewish managers are all insignificant and negative. There is no evidence that positive spillovers played an important role. If anything, the negative coefficients suggest that spillovers amplified the negative firm-level effects of removing the Jewish managers. Papers by Greenstone, Hornbeck, and Moretti (2010), Moretti (2010), Bloom, Schankerman, and Van Reenen (2013), and Huber (2018) similarly suggest that spillover effects tend to amplify the effects of firm-level shocks. Negative spillovers would imply that the following calculation underestimates the aggregate loss to the German economy.

The aggregate market capitalization of firms in the sample was approximately 20.1 billion RM, based on the market capitalization of firms from January 1933 or the closest available month before January 1933. The average fraction of Jewish managers for all firms in the sample was 0.14 in 1932 (table 2). The point estimate for the effect of the fraction of Jewish managers in 1932 on the average log stock prices after 1933 is  $-0.46$  (table 4, col. 6). This implies a decrease of 36.87% ( $= 100 \cdot [e^{-0.46} - 1]$ ) if a firm lost all its managers. Multiplying the percentage decrease with the average fraction of Jewish managers results in a 5.16% ( $= -36.87 \times 0.14$ ) decline in the stock price of the average firm. Multiplying this average decline with the total market capitalization in January 1933 gives an approximate loss of market valuation of 1.04 billion ( $= 0.0516 \times 20.1$ ) RM due to the stock price decrease. German GNP in 1933 was 58.4 billion RM (Räth 2009), so the stock price drop due to the removal of the Jewish managers reduced the market valuation of firms by 1.78% of the GNP. This number is likely an underestimate of the aggregate loss to the German economy due to aggregate anti-Semitic discrimination, since the expulsion of Jews affected the economy through more channels than just the loss of managers in firms listed on the Berlin Stock Exchange.

## VI. The Effect on Dividends and Returns on Assets

In this section, we assess how the loss of Jewish managers affected additional measures of firm performance. The first measure is the dividend paid to investors. Together with stock price changes, the dividend determines the return of a stock. The dividend also conveys information about firm profitability, since it is usually paid out of firm profits. We use annual data on dividends of all 655 firms in our sample for the years 1929–43 (for details, see sec. II.B). The dividend is reported as a percentage of the nominal stock value. We estimate specifications equivalent to equation (4), using

dividends as the dependent variable. As the dividend is reported at yearly intervals, we replace the time fixed effects with year fixed effects.

Firms that lost a higher fraction of Jewish managers lowered dividends after 1933, but the effect is imprecisely estimated in the specification without controls (table 10, col. 1). Adding the controls renders the effect significant at 5%. The point estimate indicates that the average firm with Jewish managers (which lost 22% of its managers) paid a dividend that was, on average, 0.34 percentage points lower from 1933 onward (table 10, col. 2). The average dividend paid by all firms in the sample was 4.6%, so the average firm with Jewish managers reduced its dividends by around 7.5% after 1933.

We also examine how the loss of Jewish managers affected firms' returns on assets, which is the ratio of profits before interest payments and taxes to total assets. The return on assets is a commonly used measure of the performance of firm managers, because it captures how efficiently the firm uses its available assets to generate profits (for details on the data, see sec. II.C). We estimate specifications equivalent to equation (4), using the return on assets measured in 1931, 1936, and 1940 as the dependent variable.

In the specification with firm and year fixed effects, the coefficient on the fraction of Jewish managers interacted with a post-1933 indicator is negative and significant at 5% (table 10, col. 3). In the specification with all controls, the coefficient remains significant at 5%. The point estimate implies that the return on assets of the average firm with Jewish managers was 4.1 percentage points lower after 1933 (table 10, col. 6). The results on dividends and returns on assets are robust in a sample of firms favored

TABLE 10  
EFFECT ON DIVIDENDS AND RETURNS ON ASSETS

	DIVIDENDS		RETURN ON ASSETS	
	(1)	(2)	(3)	(4)
Fraction of Jewish managers (1932) × Post 1933	-1.266 (.960)	-1.557** (.778)	-.235** (.105)	-.187** (.079)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
All controls		Yes		Yes
No. of observations	7,379	7,379	492	492
No. of firms	655	655	289	289
R <sup>2</sup>	.176	.240	.401	.560

NOTE.—The dependent variable in cols. 1 and 2 is the annual dividend payment, measured as a percentage of the nominal stock value. The data in cols. 1 and 2 include the years 1929–43. The dependent variable in cols. 3 and 4 is the return on assets, measured as the ratio of profits before interest payments and taxes to total assets. The data in cols. 3 and 4 include the years 1931, 1936, and 1940. The main explanatory variable measures the fraction of Jewish managers in 1932 interacted with an indicator for the months after January 1933. The control variables are identical to table 4. Standard errors are clustered at the firm level. FE = fixed effects.

\*\*  $p < .05$ .

by the Nazis (table A.18), to controls for discrimination against firms perceived as Jewish (table A.19), and to controls for various demand shocks (table A.20).

The evidence in this section indicates that the effect of losing Jewish managers went beyond stock prices. Firms became less profitable and less efficient after losing Jewish managers.

## VII. Conclusion

We study the effects of discrimination against Jewish managers on German firms. Our analysis relies on newly digitized data, based on a large number of historical sources. We assemble information on the characteristics of senior managers at all firms listed on the Berlin Stock Exchange in 1932, as well as stock prices, dividends, and returns on assets of these firms. We show that the removal of Jewish managers, caused by rising anti-Semitism after the Nazis came to power in 1933, negatively affected German firms, including some of the largest and most important corporations.

The findings of this paper suggest that individual managers are key to firm performance. We emphasize four aspects. First, firms were unable to adequately replace the characteristics of dismissed managers. As a result, affected firms had fewer managers who were important connectors to other firms, who had managerial experience, and who were university educated. Second, the market valuation, profitability, and efficiency of affected firms fell. A back-of-the-envelope calculation implies that removing the Jewish managers caused large reductions in the aggregate market valuation of German listed firms. Third, the effects persisted until at least 10 years after managers started leaving their firms. This indicates that it takes a significant amount of time for firms to recover from losing managers. Fourth, we highlight particular managerial characteristics that are hard to replace. Losing managers with connections and university education, especially with graduate degrees in social sciences, had large effects on firm performance. Losing experienced managers was less harmful.

The findings also demonstrate that taste-based discrimination can cause firms to underperform. We thereby provide evidence in favor of Becker's (1957) influential theory. The magnitude of the estimates may not automatically generalize to other instances of discrimination because we study a severe form of discrimination against exceptional business leaders (List 2020). However, we estimate causal effects of discrimination, based on quasi-experimental variation. The causal interpretation of the results combined with Becker's (1957) theory suggest that the underlying theoretical mechanisms may apply more generally.

Firm performance may also suffer, for instance, when less drastic instances of discrimination lead to a loss of talent. The US travel ban on citizens of seven Muslim-majority countries or the persecution of Turkish

businessmen who follow the cleric Fethullah Gülen are recent examples of rising discrimination that are likely to affect firms. Even the perception of not being welcome in a country may lead to an outflow of qualified individuals with similar consequences. A survey in the wake of the Brexit referendum suggests, for example, that 12% of continental Europeans who make between £100,001 (\$130,000) and £200,000 a year were planning to leave the United Kingdom in the coming years (*Economist* 2017a). The results in our paper indicate that such an exodus, and similar outflows of talented managers, could have large economic consequences.

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