

Jewish Rescue during the Holocaust: The Role of Occupation, Demographic, Economic, and Institutional Conditions

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This paper examines cross-country differences in Jewish rescue during the Holocaust using data on individuals recognized by Yad Vashem as Righteous Among the Nations. The analysis covers 39 European countries and relates the number of recognized rescuers to four structural conditions: occupation status, prewar Jewish population, economic conditions, and prewar human rights and civil liberties. Unlike approaches that normalize rescue by Jews killed, the analysis uses the prewar Jewish population as an ex-ante measure of the population potentially exposed to persecution and in need of assistance. Log-linear OLS models with heteroskedasticity-consistent standard errors (HC3) and Poisson pseudo-maximum-likelihood (PPML) models are estimated. The results show a strong positive association between prewar Jewish population and the number of recognized rescuers, while countries that were not occupied have substantially fewer recognized rescuers conditional on demographic exposure. Evidence for economic conditions depends on whether aggregate GDP or GDP per capita is used. The demographic, occupation, and GDP-per-capita associations are robust to progressively restricting the sample by minimum prewar Jewish population and to excluding Germany, with the GDP-per-capita coefficient becoming, if anything, larger once Germany is excluded. The Human Rights Index (HRI) is positively associated with recognized rescue when Germany is included, but this association is not robust to Germany's exclusion, indicating that it reflects one influential observation rather than a stable relationship.

Keywords: Jewish rescue; Holocaust; Righteous Among the Nations; occupation; Jewish population; human rights; civil liberties; GDP; economic development; PPML

Introduction

Why did some countries produce many more rescuers of Jews during the Holocaust than others? This paper examines whether cross-country variation in the number of recognized rescuers can be systematically related to four structural conditions: (i) occupation status during the war, which shaped both the danger faced by Jews and the risks associated with providing assistance; (ii) the size of the prewar Jewish population, which determined the population potentially in need of assistance and the opportunities for contact between Jews and potential

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rescuers; (iii) economic conditions, which may have affected the resources available for refuge, transit, and relief; and (iv) prewar institutional and political conditions, which may have shaped the institutional and normative environment in which decisions to assist minorities were made.

The paper defines rescuers as individuals recognized by Yad Vashem as Righteous Among the Nations as of January 2024, with rescuers assigned to countries according to the country in which the rescue activity was recognized. This measure captures documented and officially recognized rescue rather than the complete underlying population of individuals who assisted Jews. The distinction is important because recognition depends on surviving documentation and on the criteria and procedures used by Yad Vashem. The empirical analysis therefore examines variation in *recognized rescue*, rather than claiming to measure the full incidence of rescue behavior.

The first structural condition is occupation. Occupation fundamentally altered the circumstances under which rescue could occur. In territories occupied by Nazi Germany or its Axis partners, Jews faced direct persecution, deportation, and extermination, while individuals who assisted them could face severe punishment. Rescue in such settings therefore often involved hiding Jews, providing false documents, arranging escape, or facilitating clandestine movement. In countries that were not occupied, rescue could take different forms, including providing refuge, transit, visas, documentation, financial assistance, or other forms of material support. Occupation status therefore affected both the demand for rescue and the risks and opportunities associated with supplying it. The empirical analysis captures this distinction with the NOTOCC indicator, which equals one for countries that were not occupied during the war.

The second condition is the size of the prewar Jewish population. Countries with larger Jewish populations had more people potentially requiring assistance and, correspondingly, more opportunities for interaction between Jews and potential rescuers. Population size may therefore generate a mechanical component of the cross-country variation in the number of recognized rescuers. We use the prewar Jewish population rather than the number of Jews killed because the former is an ex-ante measure of the population potentially at risk, whereas the latter is an ex-post outcome that is itself affected by occupation, persecution, escape, and rescue. Controlling for prewar Jewish population therefore allows the analysis to distinguish, at least partially, differences in the scale of the population at risk from differences in the number of recognized rescuers.

The third condition concerns economic circumstances. We distinguish between total GDP and GDP per capita because they capture different dimensions of economic conditions. Total GDP measures aggregate economic resources. It is a broad indicator of the material capacity available within a country for organizations, networks, transport, and relief activities. GDP per capita, by contrast, captures average economic development and is less directly determined by country size.¹ The

¹The concept of “country size” is multidimensional and may refer to economic size, measured by GDP; demographic size, measured by total population; or geographic size, measured by the area of the country. These dimensions are positively correlated with one another. In the present sample of 39 countries, the pairwise correlations are 0.338 between area and GDP ($p = 0.035$), 0.663 between area and population ($p < 0.001$), and 0.881 between GDP and population ($p < 0.001$).

two measures are therefore treated as alternative economic controls rather than included simultaneously. Their inclusion also allows the analysis to distinguish an aggregate country-size effect from an association between economic development and rescue.

The fourth condition is the prewar institutional environment, measured by human rights and civil liberties. We use the Human Rights Index reported by Our World in Data, based on the V-Dem Civil Liberties Index. The index ranges from 0 to 1 and incorporates dimensions relating to physical integrity rights, private civil liberties, and political civil liberties. The measure is used to capture broad institutional conditions prevailing before the war rather than wartime political developments.

There are several possible mechanisms through which prewar human rights and civil liberties could be associated with rescue. More extensive protection of individual liberties may be associated with stronger constraints on arbitrary state action, greater protection of freedom of movement and association, and a broader institutional environment in which private organizations and individuals can operate. Such conditions may facilitate forms of assistance that require organization, communication, mobility, or cooperation. They may also be associated with broader norms concerning the treatment of minorities. These mechanisms are plausible but are not separately identified in the present cross-country analysis. The Human Rights Index should therefore be interpreted as a broad institutional correlate rather than as a direct measure of altruism, tolerance, or individual willingness to rescue. These associations are further tested for robustness to alternative sample definitions and to the influence of individual observations, discussed in Section 11.

The empirical analysis uses a sample of 39 countries. Twenty-nine were either Axis countries or were occupied by an Axis power at some point during the Second World War, while the remaining ten were neutral countries or belligerents that were never fully occupied. Including the latter group is important because rescue was not confined to occupied territories. Non-occupied countries could provide refuge, transit, documentation, and other forms of assistance to Jews fleeing persecution elsewhere. Their inclusion therefore permits the analysis to examine whether the relationship between occupation, population size, economic conditions, human rights, and recognized rescue extends beyond territories directly subjected to occupation.

Including this introduction, the paper is organized into thirteen sections. Section 2 reviews the relevant literature and presents the conceptual framework of the study. Section 3 presents summary statistics for the variables used in the empirical analysis, followed by Section 4, which examines the correlations among these variables. Section 5 estimates the baseline regression model incorporating occupation and demographic conditions, while Section 6 extends the model to include economic conditions. Section 7 presents specification diagnostics, and Section 8 examines the robustness of the results using alternative estimation methods, including PPML. Section 9 adds the human rights variable to the baseline model, while Section 10 presents the regression results excluding Germany. Section 11 introduces sample restrictions as an additional robustness test. Section 12 discusses the limitations of the study, and Section 13 concludes.

Selected Literature Review and the Conceptual Framework

Research on the rescue of Jews during the Holocaust has developed along two broad traditions. One examines the political, military, economic, demographic, and institutional conditions that shaped the opportunities for rescue at the national or local level. The other focuses on individual and social-psychological characteristics of rescuers, including socialization, personality, moral development, and relationships between rescuers and rescued persons. Baron (1986) distinguishes these macro-level and psycho-social approaches and notes the limited integration of the two traditions in the earlier literature.

The present study belongs primarily to the first tradition. Its objective is not to explain why a particular individual became a rescuer, but rather to examine whether systematic differences across countries in the number of recognized rescuers are associated with observable demographic, economic, political, and wartime conditions. This approach does not imply that individual characteristics are unimportant. Rather, it asks whether the broader environment in which individual decisions were made helps explain why the recorded incidence of rescue differed substantially across countries.

Economic Theory of Holocaust-Era Behavior

An economic interpretation of Holocaust behavior is developed by Caruso (2016), who applies insights from economic theory and public choice to the role of identity, ideology, and incentives in the Holocaust. Caruso argues that individual behavior under Nazism cannot be understood solely in terms of material self-interest and incorporates identity-related and ideological considerations into the utility functions of individuals. In his framework, Nazi identity, propaganda, organizational structures, and material incentives interacted to encourage participation in persecution and genocide. This approach is relevant to the study of rescue because it highlights the broader economic principle that behavior during the Holocaust was shaped by both material and non-material incentives. While Caruso focuses primarily on the incentives and identity mechanisms underlying participation in persecution, the present study considers the complementary question of whether structural demographic, economic, institutional, and wartime conditions were associated with participation in rescue. The analysis therefore extends the economic perspective on Holocaust behavior from the incentives underlying perpetration toward the conditions associated with assistance to victims.

The most explicit economic theory of anti-minority hatred is provided by Glaeser (2005). In his model, hatred is treated as an equilibrium outcome of a market where political entrepreneurs supply false stories about an out-group and voters demand them to reduce the psychological costs of social interaction and redistribution. A politician's incentive to supply hatred is increasing when the minority is small enough that expropriating it is politically attractive, and when the cost of verifying the truth is high due to social segregation between groups. Conversely, the incentive declines when inter-group interaction is frequent, because voters can cheaply learn that the hateful story is false. This framework provides a direct theoretical justification for the structural conditions examined in this study. Prewar human rights

and civil liberties determine both the cost to political entrepreneurs of supplying hatred and the cost to ordinary citizens of acquiring accurate information. Occupation by Nazi Germany represents an extreme case where the state monopolizes hatred supply and raises the cost of truth-seeking to include severe punishment. Economic hardship, as in Doerr et al. (2022), increases the demand for scapegoating stories, while the size of the prewar Jewish population captures both the scale of potential expropriation and the potential for inter-group contact that Glaeser identifies as critical for debunking hatred.

An early economic interpretation of individual rescue is provided by Jones (1998) in his analysis of Oskar Schindler. Jones models Schindler's behavior as driven by both profit and amenity potential, where tangible resources such as capital and labor and intangible resources such as connections to the Armaments Inspectorate and the SS are used initially for opportunistic Aryanization and war contracts and later to protect workers. Regular interaction creates dependence and personal knowledge of workers, which transforms profit-seeking into a preference for their welfare, albeit constrained by the fact that assistance was punishable by death and had to be disguised as business concern. While the present study operates at the country rather than individual level and cannot measure such preference changes, Jones's account illustrates why aggregate economic capacity, the scale of prewar Jewish presence that creates opportunities for contact, and the legal-institutional environment that raises or lowers the cost of exercising amenity potential may be systematically associated with the number of recognized rescuers.

Ferguson and Voth (2008), using supervisory board memberships (*Aufsichtsrat*) of German joint-stock firms in 1932–33, show that firms with political connections to the Nationalsozialistische Deutsche Arbeiterpartei (NSDAP; National Socialist German Workers' Party), commonly known as the Nazi Party, experienced 7–8% abnormal stock returns between January and March 1933, while such connections had no value before Hitler's appointment as Chancellor. The market thus priced the material benefits of political collaboration almost immediately. Rescue, by contrast, offered no material gain, was punishable by death, and had to be disguised as business concern, in Jones's (1998) terms. This contrast highlights why aggregate economic capacity (GDP) alone cannot explain rescue and why the institutional environment that raises or lowers the cost of exercising *amenity potential*, as proxied by the Human Rights Index, may be systematically associated with recognized rescue.

A powerful demonstration of how economic distress and cultural predispositions interact to produce radicalization and persecution is provided by Doerr et al. (2022). Studying Germany's 1931 banking crisis, they exploit precrisis cross-sectional variation in exposure to Danatbank, Germany's second largest bank, whose failure became synonymous with the crisis in the contemporary press. Using firm-bank connections for 5,610 joint-stock companies, they show that municipalities more exposed to Danatbank suffered sharper income declines and a significantly larger increase in NSDAP vote share between September 1930 and July 1932. Importantly, the effect was substantially larger in cities with a documented history of anti-Semitism, where Danat exposure added 6 percentage points to Nazi electoral gains compared to 2.9 percentage points on

average.² This synergy between financial distress and pre-existing cultural attitudes is central to the theoretical framework of the present paper. While Doerr et al. (2022) focus on the determinants of radical voting, their finding that the same interaction predicted more frequent attacks on synagogues during Kristallnacht in 1938, more anti-Semitic denunciations, and higher post-1933 deportation rates, provides a direct mechanism linking prewar institutional and cultural conditions to the risks and opportunities for rescue examined here.

Quantitative and Institutional Studies of Rescue

Hoffman (2011) provides an important benchmark for the quantitative analysis of rescue. Using country-level data for European countries together with individual-level evidence, Hoffman examines the relationship between economic conditions and rescue. His analysis reports a positive association between the log of the number rescuers per Jew killed and the log of GDP per capita. His interpretation emphasizes an income effect that may extend beyond the purely logistical ability to provide assistance. Hoffman's contribution is particularly important because it moves the study of rescue from predominantly qualitative and psychological analysis toward systematic cross-country econometric analysis.

Moore (2003) offers a complementary but distinct perspective, situated within the historical rather than the econometric tradition. Focusing primarily on the Netherlands, with comparisons to Belgium and France, Moore argues that rescue outcomes cannot be adequately explained by economic resources or individual psychology alone, but depended substantially on the institutional structure of German rule in each territory: whether occupation was civilian or military in character, the degree to which local police forces cooperated in deportation, and the comprehensiveness of prewar population-registration systems, which determined how dangerous and feasible it was for a Jew to go into hiding in the first place. Moore also stresses that collective rescue in any given locality typically depended on the presence of a small number of motivated organizers capable of mobilizing otherwise reluctant hosts, so that outwardly similar communities could produce starkly different levels of rescue activity. His analysis therefore points to political, institutional and administrative dimensions of rescue that is conceptually distinct from, though potentially correlated with, both economic conditions and the demographic scale of the population at risk. This dimension is difficult to capture directly with cross-country data, but it motivates the inclusion of a broader measure of the prewar institutional environment in the present analysis, discussed further below.

A related micro-level perspective is provided by Braun (2016, 2018, 2019). Using geocoded data for 93% of Dutch Jews, Braun (2016) shows that proximity to religious minority churches is robustly associated with Jewish evasion. Braun (2018) develops this into a general theory of the clandestine collective action dilemma: rescue requires both secrecy and mobilization, which are in tension.

²Hatred does not grow overnight. It takes time. Anti-Semitism in Germany had a very long history before the Nazis fanned the flames and took advantage of it. Voigtländer and Voth (2012) have argued that German Anti-Semitism goes back 600 years to the medieval period.

Expansion beyond trusted circles increases the risk of detection and internal ideological conflict. Minority communities are better able to solve this dilemma because members form isolated hubs of commitment with higher mutual assurance, more selective recruitment of organizers, and selective retention that prevents expansion outside the minority network. Analyzing 1,013 Dutch rescuers recognized by Yad Vashem and 2,883 religious communities from the 1930 Dutch census nested in 1,027 counties, he finds that 62% of rescuers belonged to a minority church compared to 26.6% of the general population, and that Catholic communities in Protestant municipalities and Protestant communities in Catholic municipalities were significantly more likely to produce rescue operations and less likely to suffer arrests once mobilized. This provides a community-level mechanism for the broader association between prewar civil liberties and recognized rescuers examined in the present paper: where prewar institutions permitted religious pluralism and autonomous organization, the organizational infrastructure for clandestine rescue was more readily available.

Individual-level studies of survival show that rescue and survival were selective rather than random, which provides a micro-foundation for the structural correlates examined at country level. Using linked registration and post-war lists for over 77,000 Jews in Amsterdam, Tammes (2017) finds a victimization rate of 74-75% and substantial socio-demographic differences in survival: Jews in the two highest social classes, intermarried Jews, immigrants - particularly German Jews and Polish Jews - and Jews who had abandoned Judaism had significantly higher survival chances, while married adults with children had lower chances than unmarried, divorced or widowed adults. These patterns are consistent with the argument that economic resources and non-Jewish social connections were critical for finding hiding places and exemptions, and that prior awareness of persecution among immigrants increased propensity to hide or flee. At the aggregate level, this supports the distinction made here between demographic scale (prewar Jewish population as exposure) and economic and political-institutional conditions that affect the capacity to provide refuge.

The institutional dimension of mass killing and rescue is placed in a broader growth framework by Easterly et al. (2006). They argue that social cohesion, proxied by low-income inequality and low ethnic fractionalization, endogenously determines institutional quality, which in turn determines both economic growth and the propensity for mass violence. Their database of mass killings, which includes the Holocaust as a central case, shows that more cohesive societies with better institutions experience fewer episodes of collective violence and therefore, it should be added, less need for rescuers. The present paper inverts this logic: if good institutions reduce the likelihood of mass killing, they should also increase the likelihood of assistance to victims once persecution begins. The Human Rights Index used here is therefore interpreted as Easterly et al.'s institutional quality channel - a broad measure of whether a society had the cohesion and civil liberties that make both organized persecutions more difficult and clandestine networks of rescue more feasible. This also explains the strong correlation between the Human Rights Index and GDP per capita ($r=0.6$) reported below in Table 3, since both are joint outcomes of underlying social cohesion.

Becker et al. (2022) provide a broader conceptual framework for persecution, pogroms and genocide that helps organize the structural conditions examined here. They distinguish between an early phase of persecution where emigration remains

feasible and a later phase where widespread hostilities and immigration restrictions make emigration much more constricted [Box A vs Box B in their framework]. Their discussion of cross-country variation in Jewish survival emphasizes the nature of Nazi control - whether the Nazis directly occupied the seat of government or ruled through collaborating governments under indirect control, as well as differences in state capacity and occupation regime (Becker et al., 2022, pp. 11-14). The Not Occupied (NOTOCC) indicator used in the present analysis captures a parsimonious version of this distinction at the country level, separating countries that were never fully occupied from those that were occupied or were Axis powers.

Within this framework, Becker et al. (2022) note that research on factors facilitating rescue has remained limited. They highlight evidence that rescuers' income and occupational position, minority status and sense of identification with another minority, and simply being asked to help (Varese & Yaish, 2000) predict rescue attempts, but argue that the role of culture and institutions has received too little attention among economic historians of the Holocaust (Becker et al., 2022, p. 14). The present paper operationalizes this institutional dimension at the country level through the prewar Human Rights Index, treated as a broad correlate of civil and political liberties rather than as a direct measure of altruism. Consistent with Becker et al.'s emphasis on selective intergenerational transmission of memory and on the imprint of persecution on institutions, the measure of recognized rescuers based on Yad Vashem is also interpreted here as documented and officially recognized rescue rather than the full underlying incidence of assistance. (Hoffman, 2011; Braun, 2016, 2019).

Contribution of the Present Study

Building on this literature, the present study differs from earlier quantitative work, and from Hoffman (2011) in particular, in several respects. First, the sample is expanded to 39 countries and includes countries that were not occupied and that could serve as places of refuge or transit. This is important because rescue did not occur exclusively within territories under Nazi occupation. Second, the analysis standardizes the scale of the Jewish population using the prewar Jewish population rather than the number of Jews killed. The latter is an ex-post outcome that is itself affected by persecution, escape, rescue, and occupation. Using the prewar population therefore provides a more clearly ex-ante measure of the population potentially exposed to persecution and in need of assistance.

Third, the analysis distinguishes between aggregate economic resources and economic development. Total GDP is used as an indicator of the scale of economic resources available within a country, whereas GDP per capita provides an alternative measure of average economic development that is less directly tied to country size. This distinction is important because total GDP is highly correlated with total population in the sample.

Fourth, the paper introduces prewar human rights and civil liberties as an additional political and institutional dimension. This extends the economic and demographic approach by asking whether differences in the political and institutional environment preceding the war are associated with cross-country differences in recognized rescue, in a manner broadly consistent with the

institutional emphasis found in Moore (2003), though operationalized here at the country rather than the local level. The analysis does not assume that the Human Rights Index directly measures altruism or tolerance. Instead, it tests whether a broad measure of prewar civil and political liberties is systematically related to the number of recognized rescuers after demographic, occupation, and economic conditions are taken into account.

Econometric Strategy

The econometric strategy also differs from a simple replication of earlier specifications. Hoffman employs weighted least squares and instrumental-variable methods in his analysis. The present study does not use the number of Jews killed as a weighting variable because doing so would reintroduce an ex-post mortality outcome into an analysis that deliberately uses the prewar Jewish population as the measure of the population at risk. The study also does not introduce an instrumental-variable strategy for GDP because a credible instrument must satisfy both relevance and exclusion restrictions in the present sample and historical setting. Rather than introduce an instrument whose validity would be difficult to establish, the analysis first estimates log-linear OLS models with HC3 heteroskedasticity-consistent standard errors and then estimates PPML models using the original count of recognized rescuers.

This approach also provides a useful test of whether the principal relationships are sensitive to functional form. OLS models the logarithm of recognized rescuers, whereas PPML models the conditional mean of the original non-negative count. PPML is attractive here principally because it estimates the conditional mean directly in levels. Let R_i denote the number of individuals in country i recognized by Yad Vashem as Righteous Among the Nations. The PPML specification models the conditional mean as

$$E(R_i|X_i)=\exp(X_i\beta)$$

where:

X_i = vector of explanatory variables for country i

β = vector of regression coefficients

$E(R_i|X_i)$ = expected (conditional mean) number of recognized rescuers, given the characteristics X_i

$\exp(\cdot)$ = exponential function

The key requirement for consistency is correct specification of the conditional mean, while robust/Huber-White standard errors accommodate variance misspecification.

The two approaches therefore impose different functional forms and provide complementary evidence. Consistency of the demographic and occupation coefficients across the two approaches would strengthen confidence that these relationships are not simply artifacts of the logarithmic transformation of the dependent variable. Differences between the OLS and PPML estimates, particularly for the economic and human-rights variables, are themselves informative about the sensitivity of the estimated associations to functional form.

Taken together, these four points mean the paper offers a partial bridge between the historical/institutional tradition represented by Moore and the econometric tradition represented by Hoffman — though it does so at a level of aggregation that cannot capture the local, organizer-dependent mechanisms Moore identifies as decisive within individual countries. The analysis consequently treats Jewish rescue not as the product of a single factor, but as a phenomenon potentially shaped by the interaction of wartime circumstances, demographic exposure, economic resources, and the political-institutional environment.

More broadly, the literature reviewed above suggests that Jewish rescue cannot be understood through a single dimension. This study therefore organizes the empirical analysis around four structural conditions: occupation status, demographic exposure, economic conditions, and political-institutional conditions. The framework distinguishes the size of the population potentially requiring assistance from the institutional and material conditions under which assistance could be provided. It also separates aggregate economic capacity, measured by total GDP, from broader economic development, measured by GDP per capita. Human rights are treated as a political and institutional correlate rather than as a direct measure of altruism or tolerance. These considerations motivate the empirical specifications examined in the following sections.

The conceptual framework underlying the empirical analysis is summarized in Table 1. The number of individuals recognized as Righteous Among the Nations is expected to reflect several dimensions of the environment in which rescue could take place.

Table 1. *Conceptual Framework: Structural Conditions Associated with Jewish Rescuers*

Dimension	Empirical measure	Conceptual mechanism	Expected association with rescue
Occupation status	NOTOCC	Occupation altered the degree of persecution, surveillance, mobility, and risk faced by Jews and rescuers; non-occupied countries could also serve as refuge or transit locations.	Higher rescue outside occupied territories
Demographic exposure	Log Jewish population, prewar	A larger prewar Jewish population implies a larger population potentially requiring assistance and a greater scope for rescue activity.	Positive
Economic conditions	Log total GDP / Log GDP per capita, prewar	Greater aggregate resources or higher economic development may increase the material capacity available for hiding, transportation, documentation, and relief.	Positive
Political and institutional conditions	Human Rights Index, prewar	Greater protection of civil and political liberties may constrain arbitrary state action and facilitate freedom of association, movement, and private organizational activity relevant to assistance.	Positive

First, the size of the prewar Jewish population captures the scale of the population potentially requiring assistance and therefore provides a demographic measure of the potential demand for rescue.

Second, wartime occupation status captures an important constraint on the institutional and political environment in which rescue activities could occur.

Third, the Human Rights Index is used as a broad indicator of prewar institutional conditions that may be associated with the willingness or ability of individuals and social networks to protect members of a persecuted minority.

Finally, economic conditions are represented by total GDP and GDP per capita as alternative measures of the economic environment.

These variables therefore capture demographic exposure, wartime conditions, institutional conditions, and economic circumstances, respectively. The framework is associational rather than causal and provides the basis for the regression specifications examined below.

Summary Statistics

The data sources are listed in Appendix A. Table 2 reports summary statistics for the raw, untransformed data, which are provided in Appendix B. All variables exhibit pronounced right-skewness: rescuers (skewness = 2.91), prewar Jewish population (4.02), total prewar population (2.30), and total prewar GDP (2.63) are all far from symmetric, with means substantially exceeding medians in every case. For example, the mean number of rescuers (736) is nearly ten times the median (75).

Table 2. Summary Statistics

Variable	Obs.	Mean	Median	Std. Dev.	Min	Max	Skewness	Jarque-Bera (p)
Rescuers	39	736	75	1,648.1	1	7,318	2.91	150.4 (<0.001)
Jewish population (1938)	39	232,676	48,000	529,203	200	3,000,000	4.02	609.0 (<0.001)
Population (millions)	39	13.74	6.32	20.34	0.30	91.69	2.30	75.6 (<0.001)
GDP (\$bn)	39	71.82	24.34	128.35	0.86	566	2.63	108.1 (<0.001)
GDP per capita (\$)	39	4,566	3,619	2,657	1,476	10,860	0.84	4.93 (0.085)
NOTOCC	39	0.256	0	0.442	0	1	1.12	9.02 (0.011)
Human rights	39	0.4736	0.475	0.3154	0.014	0.932	-0.09	2.90 (0.234)

The number of recognized rescuers ranges from 1 to 7,318, with a mean of 736, a median of 75, and a standard deviation of 1,648. The large difference between the mean and median, together with a skewness of 2.91, indicates substantial right-skewness and considerable dispersion in the number of rescuers across countries.

The prewar Jewish population exhibits even greater dispersion, ranging from 200 to 3 million, with a mean of 232,676 and a median of 48,000. Its standard deviation of 529,203 and skewness of 4.02 indicate that a small number of countries had exceptionally large Jewish populations relative to the rest of the

sample. Total population likewise varies substantially, from 0.30 million to 91.69 million, with a mean of 13.74 million and a median of 6.32 million.

GDP ranges from \$0.86 billion to \$566 billion, with a mean of \$72 billion and a median of \$24 billion. The difference between the mean and median, together with a skewness of 2.63, indicates a highly asymmetric distribution in which a small number of countries account for a disproportionately large share of aggregate economic output. GDP per capita is considerably less skewed, with a skewness of 0.84, a mean of \$4,566, and a median of \$3,619, and ranges from \$1,476 to \$10,860.

Human rights protection varies widely and is approximately symmetric. The Human Rights Index ranges from 0.014 to 0.932 in our sample, with a mean of 0.474 and a median of 0.475 (SD = 0.315). Unlike the count variables, it exhibits virtually no skewness [-0.09] and the Jarque-Bera test does not reject normality ($p = 0.234$). This indicates that prewar liberal norms differed substantially across the 39 countries, from almost complete absence of civil liberties to near-full protection, with countries evenly distributed around the middle of the scale.

Finally, 10 of the 39 countries in the sample (25.6%) were not occupied, while the remaining 29 countries (74.4%) were occupied or were Axis countries. This variation in occupation status provides the basis for including the NOTOCC indicator in the empirical analysis.

Because the dependent variable and the principal continuous explanatory variables exhibit substantial right-skewness and differ by orders of magnitude, all continuous variables are log-transformed in the OLS analysis. This reduces the influence of extreme observations and allows coefficients to be interpreted as elasticities. Normality of regressors is not required for OLS; the transformation is motivated by skewness, scale, and the expected multiplicative relationship. Because the dependent variable is a non-negative count, we also estimate PPML models using the original, unlogged number of rescuers as the dependent variable.

Correlations Among the Variables

Table 3 reports the pairwise correlations among the variables used in the empirical analysis. The continuous scale variables are expressed in logarithmic form, while the Human Rights Index is retained on its original 0–1 scale because it is a bounded institutional measure. The NOTOCC indicator is also excluded from the correlation matrix because it is a binary variable rather than a continuous scale variable.

Among the principal demographic and economic variables, prewar Jewish population has the strongest bivariate association with the number of recognized rescuers ($r = 0.693$, $p < 0.001$), exceeding the correlations with total GDP ($r = 0.496$, $p < 0.001$) and total population ($r = 0.5$, $p < 0.001$). By contrast, GDP per capita is only weakly correlated with the number of rescuers, and the association is not statistically significant ($r = 0.185$, $p = 0.259$). This pattern provides initial bivariate evidence that the size of the prewar Jewish population is an important correlate of cross-country variation in the number of recognized rescuers.

Table 3. Correlation Matrix

	log(Rescuers)	log(GDP)	log(Jewish pop.)	log(GDP per capita)	log(Population)	Human Rights Index
log(Rescuers)	1.000					
log(GDP)	0.496***	1.000				
log(Jewish pop.)	0.693***	0.672***	1.000			
log(GDP per capita)	0.185	0.547***	0.193	1.000		
log(Population)	0.500***	0.936***	0.703***	0.216	1.000	
Human Rights Index	0.207	-0.071	-0.081	0.600***	-0.082	1.000

Notes: *** $p < 0.01$. $n = 39$.

The Human Rights Index has a relatively weak bivariate correlation with the number of recognized rescuers ($r = 0.207$, $p = 0.206$). Its correlations with prewar Jewish population ($r = -0.081$, $p = 0.623$) and total GDP ($r = -0.071$, $p = 0.666$) are also small and statistically insignificant. The Human Rights Index is, however, more strongly correlated with GDP per capita ($r = 0.6$, $p < 0.001$). This association indicates that the two variables contain a substantial amount of overlapping information concerning countries' broader socioeconomic and institutional conditions. Accordingly, the coefficients on the Human Rights Index and GDP per capita should be interpreted with some caution when both are included in the same specification.

The correlation matrix also reveals substantial collinearity among the scale-related economic and demographic variables. The correlation between total GDP and total population is particularly high ($r = 0.936$, $p < 0.001$), indicating that these variables contain very similar information about country size. Total GDP and total population are therefore not included simultaneously in the regression specifications that follow. GDP per capita, by contrast, has relatively low correlations with prewar Jewish population ($r = 0.193$, $p = 0.241$) and total population ($r = 0.216$, $p = 0.186$), and is consequently examined separately as an alternative measure of economic conditions.

The choice of prewar population as a measure of demographic exposure is consistent with demographic approaches to genocide that emphasize prewar projections rather than ex-post mortality. Kugler (2016) argues that the demographic visibility of genocide depends on a country's stage in the demographic transition and that total population change conflates direct casualties, disrupted births and forced migration. Defining recovery as a return to the prewar expected trajectory rather than simple postwar growth requires separating ex-ante population at risk from ex-post losses. The present analysis follows this logic by using the prewar Jewish population as an ex-ante measure of the population potentially exposed to persecution, rather than the number of Jews killed, which is itself a joint outcome of persecution, escape, migration and rescue.

These correlations are descriptive and do not establish causal relationships. They nevertheless provide useful information for the specification of the regression models. In particular, the strong association between total GDP and total population motivates their separate treatment, while the relatively strong correlation between GDP per capita and the Human Rights Index suggests that the independent contribution of these two variables should be interpreted cautiously. The subsequent regression analysis

examines whether the principal bivariate relationships persist after controlling for the other explanatory variables.

Demographic Conditions

Table 4 reports five specifications examining the relationship between the prewar Jewish population and the number of recognized rescuers. Column (1) regresses the log of recognized rescuers on the log of the prewar Jewish population alone, while column (2) adds a dummy variable for countries that were not occupied. The estimated elasticity of rescuers with respect to the Jewish population is positive and precisely estimated in both specifications, at 0.737 and 0.661, respectively. Thus, in column (2), a 1% larger prewar Jewish population is associated with approximately 0.66% more recognized rescuers, holding occupation status constant. This finding is consistent with the view that the size of the population at risk is an important determinant of the number of rescuers: a larger Jewish population created a larger potential population in need of assistance.

Adding the occupation dummy increases the adjusted R^2 from 0.466 to 0.593. The coefficient on NOTOCC is negative and statistically significant ($p = 0.003$). Its estimated coefficient of -2.182 implies that, conditional on the size of the prewar Jewish population, non-occupied countries had approximately 89% fewer recognized rescuers than occupied countries. This is calculated as $100[e^{-2.182}-1]$. The result indicates that occupation status is an important factor associated with cross-country differences in recognized rescue, over and above differences in the size of the Jewish population. Together, columns (1) and (2) indicate that both the size of the Jewish population and occupation status are important correlates of the number of recognized rescuers.

As a robustness check, column (3) restricts the sample to the 29 occupied countries and regresses $\log(\text{rescuers})$ on $\log(\text{prewar Jewish population})$ alone. The estimated elasticity, 0.732, is very close to the corresponding estimate in the full sample without controls (0.737) and comparable to the estimate obtained when occupation status is controlled for directly (0.661). This similarity indicates that the positive association between the size of the Jewish population and the number of recognized rescuers is not simply an artefact of pooling occupied and non-occupied countries.

Column (4) repeats the regression for the 10 non-occupied countries. The estimated elasticity is 0.387 and is not statistically distinguishable from zero ($p = 0.321$). The regression also has relatively little explanatory power, with an R^2 of 0.215 and an F-statistic p-value of 0.177. The contrast with the occupied-country subsample, where the estimated elasticity is 0.732 and highly significant, suggests that the population–rescuer relationship may differ according to occupation status. However, the non-occupied subsample contains only 10 countries, so the estimate is necessarily imprecise and should be interpreted cautiously.

Column (5) provides a formal test of whether the relationship between Jewish population size and recognized rescuers differs by occupation status.³

³The historical literature on neutral countries shows that non-occupation did not imply open refuge. The Guttstadt, C., Lutz, T., Rother, B., & San Román, Y. [Eds.]. (2016) volume on neutral countries documents that Switzerland maintained a legally closed border after October 1939, criminalizing clandestine

The specification includes both NOTOCC and its interaction with $\log(\text{prewar Jewish population})$. The coefficient on $\log(\text{prewar Jewish population})$, 0.732, is the estimated elasticity for occupied countries, because NOTOCC equals zero for this group. The interaction coefficient, -0.346 , measures how much lower the elasticity is in non-occupied countries relative to occupied countries. Thus, the implied elasticity for non-occupied countries is $0.732 - 0.346 = 0.386$, which is virtually identical to the estimate of 0.387 obtained independently in column (4). The coefficient on NOTOCC, 1.2, represents the difference in the intercept between non-occupied and occupied countries when $\log$ Jewish population equals zero; because zero is far outside the economically relevant range of the logarithm of Jewish population in the sample, this coefficient should not be interpreted in isolation as the overall difference between the two groups.

Neither NOTOCC nor the interaction term is individually statistically significant ($p = 0.759$ and $p = 0.396$, respectively). This reflects the limited number of non-occupied observations and the resulting imprecision of the interaction specification. Nevertheless, a joint Wald test of the restrictions that both coefficients equal zero rejects the null at the 1% level ($F(2,35) = 7.20$, $p = 0.002$). The joint test therefore provides evidence that occupation status is relevant to the population–rescuer relationship, even though the individual coefficients cannot be estimated precisely enough to reject their respective null hypotheses separately.

The model-selection statistics also provide some support for the more parsimonious specification in column (2). Its Akaike information criterion ($AIC=3.91$) and Schwarz/Bayesian information criterion ($BIC=4.03$) are both lower than those of the interaction specification in column (5) ($AIC=3.91$; $BIC=4.08$). The identical AIC values indicate that the additional interaction terms do not improve the likelihood sufficiently to offset the complexity penalty imposed by the AIC, while the higher Schwarz criterion in column (5) provides somewhat stronger evidence against the more parameterized specification because the BIC imposes a larger penalty for additional parameters. The information criteria therefore do not provide a reason to prefer the interaction model over the simpler specification in column (2). It should be noted, however, that AIC and BIC are model-selection criteria rather than tests of statistical significance and should be considered alongside the theoretical rationale and coefficient estimates.

The overall F-statistics indicate that the regression models are jointly significant for the full sample and for the occupied-country subsample. In columns (1), (2), (3), and (5), the null hypothesis that all slope coefficients are jointly equal to zero is rejected at well below the 1% level. By contrast, the F-statistic for the non-occupied subsample in column (4) is not statistically significant ($p = 0.18$), consistent with the limited explanatory power of that specification. The corresponding HC3-robust Wald

crossing, and although about 28,000 Jewish refugees were tolerated, an estimated 16,000 requests for legal entry were refused, with border closure reaffirmed in August 1942 (Fivaz-Silbermann, 2016). Portugal limited entry to 30-day tourist transit with 15,000-17,000 transits mainly in 1940-41 before the French-Spanish border was sealed. Spain served mainly as a transit corridor for some 15,000 Jews between 1939-1944, while interning thousands deemed illegal and registering 6,000 Sephardic Jews in 1941. These accounts suggest that the large negative coefficient on NOTOCC captures differences in the technology of rescue - clandestine hiding under occupation versus restrictive transit and visa policies in neutral states - rather than a simple absence of need for assistance (Milgram, 2016; Calvet, 2016).

tests lead to the same broad conclusion: the full-sample and occupied-country specifications are jointly significant, whereas the non-occupied subsample is not.

Table 4. *Demographic Conditions of Rescue (Dependent variable: $\log(\text{rescuers})$)*

Specifications Regressors	(1)	(2)	(3) Occupied only	(4) Non-occupied only	(5) Interaction
Log (Jewish pop. prewar)	0.737*** (0.140)	0.661*** (0.135)	0.732*** (0.167)	0.387 (0.365)	0.732*** (0.167)
Not Occupied (NOTOCC)	—	−2.182*** (0.690)	—	—	1.2 (3.877)
$\log(\text{Jewish pop.}) \times$ NOTOCC	—	—	—	—	−0.346 (0.402)
Constant	−3.368** (1.533)	−2.024 (1.549)	−2.779 (1.907)	−1.579 (3.375)	−2.779 (1.907)
R ²	0.480	0.615	0.570	0.215	0.631
Adjusted R ²	0.466	0.593	0.555	0.117	0.600
F-statistic	34.12	28.72	35.86	2.19	19.98
Prob(F-statistic)	1.03E-06	3.50E-08	2.18E-06	0.18	1.01E-07
Akaike info criterion	4.16	3.91	3.84	4.12	3.91
Schwarz criterion	4.24	4.03	3.94	4.18	4.08
Hannan-Quinn criterion	4.19	3.95	3.87	4.05	3.97
Durbin-Watson stat	2.04	2.09	1.61	1.75	2.08
Overall Wald F-statistic	27.77	22.14	19.18	1.12	15.81
Prob(Overall Wald F-statistic)	6.11E-06	5.38E-07	0.00016	0.32	1.15E-06
Observations	39	39	29	10	39

Notes: HC3 heteroskedasticity-consistent standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Column (3) restricts the sample to the 29 occupied countries, while column (4) restricts the sample to the 10 non-occupied countries. Column (5) includes the interaction between $\log(\text{prewar Jewish population})$ and NOTOCC. The coefficient on $\log(\text{prewar Jewish population})$ in column (5) represents the slope for occupied countries; the coefficient on the interaction term represents the difference in slope between non-occupied and occupied countries. A joint Wald test of the restrictions NOTOCC = 0 and $\log(\text{Jewish population}) \times \text{NOTOCC} = 0$ yields $F(2,35) = 7.20$ ($p = 0.002$), rejecting the null that occupation status has no effect on either the intercept or the slope of the population–rescuer relationship. This joint test is distinct from the overall Wald F-statistic reported in the table. The small number of non-occupied countries ($n = 10$) limits the precision of the individual interaction estimates.

Taken together, the results suggest that the size of the prewar Jewish population is strongly associated with the number of recognized rescuers, while occupation status is associated with a substantial additional difference in the level of recognized rescue. The similarity between the occupied-country estimate in column (3) and the baseline estimate in column (1), together with the very similar implied non-occupied elasticity in columns (4) and (5), provides useful internal robustness. At the same time, the small number of non-occupied countries limits the precision with which differences in slopes can be estimated. For this reason, column (2), which allows occupation status to shift the level of recognized rescuers while imposing a common population elasticity, is retained as the preferred specification for the subsequent analysis.

Robustness to Economic Controls

Table 5 examines whether the relationship between demographic conditions, occupation status, and the number of recognized rescuers is robust to the inclusion of economic controls. The starting point is the preferred demographic specification reported in Table 4, column (2), which relates log recognized rescuers to log prewar Jewish population and the NOTOCC indicator.

Column (6) adds total prewar GDP to this specification. The coefficient on log GDP is positive and statistically significant (0.603, $p < 0.01$), while the coefficient on log Jewish population falls from 0.661 to 0.367. The coefficient on NOTOCC also becomes more negative, increasing in absolute value from -2.182 to -2.959 . The inclusion of GDP substantially increases the model's explanatory power, with the adjusted R^2 rising from 0.593 in the baseline specification to 0.646. However, the strong correlation between total GDP and total population ($r=0.936$; see Table 3) indicates that total GDP is capturing, to a substantial extent, differences in country scale. Because country size is itself closely related to the size of the Jewish population and the total population, the reduction of the Jewish-population coefficient should therefore not be interpreted straightforwardly as evidence that economic resources substitute for the association of the population at risk. Rather, the change is consistent with substantial overlap between the information contained in total GDP and the scale-related demographic variables.

Column (7) instead adds log GDP per capita, providing a measure of economic development that is less directly related to country size. The coefficient on GDP per capita is positive but statistically insignificant (0.514, $p = 0.450$). Its inclusion leaves the demographic coefficients largely unchanged: the estimated elasticity of recognized rescuers with respect to the Jewish population declines only modestly, from 0.661 to 0.634, and remains highly significant. The coefficient on NOTOCC also remains large and statistically significant, changing from -2.182 to -2.287 . The adjusted R^2 is essentially unchanged, increasing only from 0.593 to 0.595.

The contrasting effects of total GDP and GDP per capita are consistent with Easterly et al. (2006). Total GDP captures country size and therefore overlaps with total population and Jewish population, while GDP per capita captures the institutional/development component that Easterly et al. link to social cohesion. When both institutional quality (Human Rights Index) and development are included, the overlap in information is substantial, which is why their individual coefficients must be interpreted cautiously.

The stability of the demographic coefficients in column (7) is consistent with the relatively low pairwise correlations between GDP per capita and the demographic variables reported in Table 3 ($r=0.193$ with Jewish population and $r=0.216$ with total population). Taken together, these results indicate that GDP per capita does not provide additional statistically significant explanatory power for the cross-country variation in recognized rescuers once the size of the population at risk and occupation status are taken into account. This contrasts with the specification using total GDP, where the Jewish-population coefficient is substantially diminished after the economic control is introduced. Given the very high correlation between GDP and total population, the latter result is consistent

with total GDP partly capturing country-size associations rather than identifying an independent consequence of economic development.

The model-selection criteria provide a similar indication. Column (6), which includes total GDP, has an AIC of 3.79 and a Schwarz/Bayesian information criterion (BIC) of 3.96, compared with 3.92 and 4.10, respectively, for column (7). Thus, both criteria are lower for the total-GDP specification. However, these criteria should not be interpreted as establishing a causal or substantive superiority of total GDP. They measure in-sample model fit while penalizing model complexity; in this case, the improvement partly reflects the additional explanatory information contained in a variable that is highly correlated with country size. The economic interpretation of the coefficients therefore remains more important than the information criteria alone.

The overall F-statistics indicate that both specifications are jointly statistically significant. The conventional F-statistic is highly significant in both columns ($p < 0.001$), while the HC3-robust Wald tests likewise reject the null that the slope coefficients are jointly zero ($p < 0.001$ in both specifications). The robust results are particularly relevant given the use of HC3 heteroskedasticity-consistent standard errors.

Table 5. Economic Controls (Dependent variable: $\log(\text{rescuers})$)

Regressors	(6) + GDP	(7) + GDP per capita
Log (Jewish pop. prewar)	0.367** (0.155)	0.634*** (0.159)
NOTOCC	-2.959*** (0.806)	-2.287*** (0.756)
$\log(\text{GDP prewar in \$ bn})$	0.603** (0.224)	—
$\log(\text{GDP per capita prewar in \$})$	—	0.514 (0.673)
Constant	-0.651 (1.503)	-5.960 (5.194)
R ²	0.674	0.627
Adjusted R ²	0.646	0.595
F-statistic	24.15	19.63
Prob(F-statistic)	1.20E-08	1.23E-07
Akaike info criterion	3.79	3.92
Schwarz criterion	3.96	4.10
Hannan-Quinn criterion	3.85	3.99
Durbin-Watson statistic	1.97	2.03
Overall Wald F-statistic	1.43E+01	14.41
Prob(Overall Wald F-statistic)	2.99E-06	2.83E-06
Observations	39	39

Notes: HC3 heteroskedasticity-consistent standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Total GDP and total population are not included simultaneously because of their high pairwise correlation ($r = 0.936$; see Table 2). GDP per capita is examined separately as a measure of economic development that is less strongly correlated with the demographic regressors ($r = 0.193$ with Jewish population and $r = 0.216$ with total population). Column (2) of Table 4 provides the baseline demographic specification to which the economic controls are added.

Overall, the robustness analysis distinguishes between two different measures of economic conditions. Total GDP is statistically significant and improves model fit, but its inclusion substantially changes the estimated association of Jewish population size, consistent with the strong relationship between aggregate economic size and demographic scale. GDP per capita, by contrast, has a statistically insignificant coefficient and leaves the estimated association of Jewish population size and occupation status remarkably stable. Under the log-linear OLS specification, GDP per capita does not have a statistically significant independent association with recognized rescuers. Under PPML (shown below), however, GDP per capita is positive and statistically significant, with an estimated elasticity of 1.6.

As an additional robustness check, all specifications were also estimated using conventional OLS standard errors rather than HC3 heteroskedasticity-consistent standard errors (not reported). The estimated coefficients are identical, as expected, and the statistical significance and substantive conclusions are unchanged. In particular, the positive association between prewar Jewish population and recognized rescuers, the negative association between non-occupation and recognized rescuer counts, and the results concerning the economic controls remain qualitatively unchanged. The main tables therefore report HC3 standard errors, while the conventional OLS results are omitted for brevity.

Specification Diagnostics

Diagnostic tests were conducted for the principal OLS specifications. For the preferred demographic specification reported in Table 4, column (2), the Jarque–Bera test does not reject the null hypothesis of normally distributed residuals ($JB=0.929$, $p=0.630$). The residuals exhibit negligible skewness (-0.067) and a kurtosis of 2.255. The Breusch–Pagan–Godfrey test likewise does not reject the null hypothesis of homoskedasticity ($F(2,36) = 1.273$, $p = 0.292$; $LM \chi^2(2) = 2.576$, $p = 0.276$). The Ramsey RESET test does not reject the null hypothesis of no functional-form misspecification at the 5% level ($F(1,35) = 3.232$, $p = 0.081$), although its p-value provides some marginal evidence of possible functional-form misspecification at the 10% level.

The corresponding diagnostics for the economic specification in Table 5, column (7), yield a similar pattern for residual normality and heteroskedasticity. The Jarque–Bera test does not reject normality ($JB = 0.554$, $p = 0.758$), while the Breusch–Pagan–Godfrey test provides no evidence of heteroskedasticity ($F(3,35) = 1.997$, $p = 0.132$; $LM \chi^2(3) = 5.701$, $p = 0.127$). The Ramsey RESET test, however, rejects the null hypothesis of no functional-form misspecification at the 5% level ($F(1,34) = 6.148$, $p = 0.018$). The corresponding likelihood-ratio test also rejects the null ($LR = 6.482$, $p = 0.011$). Thus, although the residuals do not exhibit evidence of non-normality or heteroskedasticity, the diagnostic results raise some concern about the functional form of the fully specified log-linear OLS model.

These results provide additional motivation for the PPML analysis reported below. By modeling the original number of recognized rescuers directly as a count outcome and employing a different conditional-mean specification, PPML provides an important robustness check against the possibility that the estimated

relationships are sensitive to the functional form imposed by the log-linear OLS model. However, OLS and PPML should not be presented as simply two equally plausible alternative estimators. The RESET evidence gives a specific reason to place greater emphasis on PPML for the count outcome.

Robustness to Alternative Estimation: PPML

The baseline regressions are estimated using log-linear OLS, with the logarithm of the number of recognized rescuers as the dependent variable. As an additional robustness check, the models are re-estimated using Poisson pseudo-maximum likelihood (PPML), retaining the original, unlogged number of recognized rescuers as the dependent variable. PPML is well suited to a non-negative dependent variable and provides an alternative conditional-mean specification that does not require taking the logarithm of the dependent variable. Although the sample contains no zero-valued observations, PPML is useful here not because it accommodates zeros, but because it estimates the conditional mean of the original outcome without imposing a logarithmic transformation. All PPML estimates use Huber–White robust covariance estimates.

Table 6 reports three PPML specifications. Column (8) contains the demographic and occupation variables only; column (9) adds GDP per capita; and column (10) instead adds total GDP. The results provide strong support for the two principal relationships identified in the OLS analysis. The coefficient on log prewar Jewish population is positive and statistically significant in all three specifications, while the coefficient on NOTOCC is negative and highly statistically significant throughout. Although the magnitude of the coefficients varies across specifications, their signs and statistical significance remain stable.

In column (8), the coefficient on log prewar Jewish population is 0.591 ($p < 0.01$), implying that a 1% increase in the prewar Jewish population is associated with approximately a 0.59% increase in the expected number of recognized rescuers, conditional on occupation status. The coefficient on NOTOCC is -2.787 ($p < 0.01$). In the PPML log-mean specification, this corresponds to an estimated difference of approximately 93.8% lower expected recognized rescuers in non-occupied countries, conditional on prewar Jewish population.

The economic variables yield more interesting results. In column (9), GDP per capita enters positively and statistically significantly, with a coefficient of 1.587 ($p = 0.021$). The coefficient can be interpreted as an elasticity: conditional on Jewish population and occupation status, a 1% increase in GDP per capita is associated with an estimated 1.59% increase in the expected number of recognized rescuers. This estimate is noteworthy in relation to Hoffman (2011), who reports income elasticities ranging from 1.39 to 2.41 across alternative estimation methods and model specifications. The estimate obtained here, 1.59, lies within this reported range and is similar in magnitude to Hoffman's estimates. Because the underlying samples, variables, and specifications are not necessarily identical, the comparison should be interpreted as a comparison of magnitudes rather than as evidence that the two studies estimate the same parameter.

The PPML result also provides an important qualification to the OLS findings. In Table 5, GDP per capita is statistically insignificant in the log-linear OLS specification, with a coefficient of 0.514 ($p = 0.450$). Under PPML, however, the coefficient is 1.59 and statistically significant at the 5% level. Thus, the evidence concerning the independent association between economic development and recognized rescue is sensitive to the functional form used to model the count outcome. Rather than indicating that GDP per capita has no relationship with recognized rescue, the combined results suggest that its estimated association is considerably stronger under the PPML specification.

When total GDP is used instead of GDP per capita in column (10), its coefficient is 0.39 and is marginally significant at the 10% level ($p = 0.056$). The estimated coefficient implies that a 1% increase in total GDP is associated with approximately a 0.39% increase in the expected number of recognized rescuers, conditional on Jewish population and occupation status. The weaker result relative to GDP per capita is consistent with the conceptual distinction between economic development and aggregate economic scale. Total GDP combines economic resources with country size, whereas GDP per capita measures economic resources per person.

As an additional robustness check, the models were also estimated with dummy variables for broad European regions, including Northern, Central, and Southern Europe. The regional dummy variables were statistically insignificant, suggesting that the main results are not attributable to systematic differences across these broad European regions. The inclusion of the regional controls did not materially alter the coefficients or statistical significance of the principal explanatory variables.

Table 6. Poisson Pseudo-maximum Likelihood (PPML) Estimations
(dependent variable: number of rescuers)

Specifications Regressors	(8) Demographic	(9) + GDP per capita	(10) + Total GDP
log(Jewish population)	0.591*** (0.102)	0.729*** (0.134)	0.443*** (0.142)
NOTOCC	-2.787*** (0.409)	-3.159*** (0.815)	-3.300*** (0.560)
log(GDP per capita)	—	1.587** (0.685)	—
log(Total GDP)	—	—	0.389† (0.204)
Constant	-0.163 (1.459)	-15.284** (6.628)	-7.940† (4.320)
Observations	39	39	39
Estimation	PPML	PPML	PPML
Covariance	Huber-White	Huber-White	Huber-White

Notes: The dependent variable is the original, unlogged number of recognized rescuers. Huber-White robust standard errors are reported in parentheses. The coefficients on log Jewish population, log GDP per capita, and log total GDP are elasticities. For the binary variable NOTOCC, the percentage difference in expected rescuer counts is calculated as $100[e^{\beta} - 1]$. † $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Taken together, the PPML estimates reinforce the central demographic and occupation findings of the OLS analysis while providing a more nuanced picture of the role of economic conditions. The positive association between prewar Jewish population and recognized rescuers and the large negative association with non-occupation remain highly robust to modeling the original count of rescuers rather than its logarithm. By contrast, the estimated role of economic conditions depends on both the measure of economic resources and the functional form: GDP per capita is statistically insignificant in the OLS specification but positive and statistically significant under PPML, while total GDP is positive and only marginally significant under PPML. The PPML results therefore suggest that economic development may have an economically meaningful association with recognized rescue, although the strength of this relationship is sensitive to the empirical specification.

Human Rights and Jewish Rescuers

The analysis so far has focused primarily on occupation status, demographic characteristics and economic conditions that existed prewar. A further consideration is whether the political and institutional environment prevailing before the Holocaust was also associated with the extent of Jewish rescue. To examine this possibility, this section introduces a Human Rights Index (HR) obtained from Our World in Data. The index ranges from 0 to 1, with higher values indicating greater protection of civil and political liberties. Because the index is introduced as a measure of the institutional environment rather than as a direct measure of individual behavior, its coefficient should be interpreted as an association between prewar institutional conditions and the number of recognized rescuers. Table 7 reports three OLS specifications and three corresponding PPML specifications.

Model-Fit and Specification Statistics

For completeness, Table 7 reports the principal model-fit and specification statistics for both the OLS and PPML estimations. For the OLS specifications, these include the R^2 , adjusted R^2 , conventional F-statistic, HC3-robust Wald test, Akaike information criterion (AIC), Schwarz/Bayesian information criterion (BIC), Hannan–Quinn criterion (HQ), and Durbin–Watson statistic. For the PPML specifications, the table reports the corresponding fit measures together with the log likelihood, restricted log likelihood, likelihood-ratio (LR) statistic, AIC, BIC, and HQ.

Because OLS and PPML are estimated using different objective functions and likelihood frameworks, their information criteria and fit measures should not be compared directly across estimation methods. Within the PPML models, however, the information criteria can be used to compare specifications estimated on the same sample and with the same dependent variable. Similarly, the (R^2) and adjusted (R^2) reported for PPML should be regarded as model-specific fit measures rather than as directly comparable to the corresponding OLS statistics. The LR statistics reported for the PPML models are likelihood-based measures of the contribution of the

included regressors to the fitted model; inference on individual PPML coefficients is based on the reported Huber–White robust standard errors.

The information criteria are therefore used primarily as descriptive measures of within-framework model fit rather than as evidence of causal or substantive superiority. The coefficient estimates, their robust statistical inference, and the stability of the principal relationships across alternative specifications provide the more important basis for assessing the robustness of the empirical findings.

The OLS Model

The OLS models use the logarithm of the number of recognized rescuers as the dependent variable and are estimated with HC3 heteroskedasticity-consistent standard errors. The first specification adds the Human Rights Index to the preferred demographic model from Table 4, column (2). The second additionally controls for total prewar GDP, while the third instead controls for GDP per capita.

In the first OLS specification, the coefficient on the Human Rights Index, entered as $(10 \times \text{HR})$, is positive but statistically insignificant (0.039, $p = 0.675$). The coefficients on the two principal variables remain highly informative: the elasticity of recognized rescuers with respect to the prewar Jewish population is 0.667 ($p < 0.001$), while the coefficient on NOTOCC is -2.158 ($p < 0.01$). Thus, the inclusion of the human-rights measure has very little effect on the estimated demographic and occupation relationships.

The second OLS specification adds total prewar GDP. The coefficient on the Human Rights Index becomes slightly negative (-0.017) and remains statistically insignificant ($p = 0.854$). The coefficient on log Jewish population falls to 0.357 ($p < 0.05$), while the coefficient on NOTOCC becomes more negative, at -2.988 ($p < 0.01$). Total GDP is positive and statistically significant (0.617, $p < 0.05$). The third OLS specification replaces total GDP with GDP per capita. The coefficient on the Human Rights Index remains statistically insignificant (-0.031 , $p = 0.802$), while the coefficient on log Jewish population is 0.624 ($p < 0.01$) and that on NOTOCC is -2.327 ($p < 0.01$). GDP per capita is positive but statistically insignificant (0.621, $p = 0.493$).

Taken together, the OLS estimates do not provide statistically significant evidence of an independent association between the Human Rights Index and the number of recognized rescuers. Importantly, however, this conclusion is specific to the log-linear OLS functional form. The PPML estimates reported below provide an alternative way of modeling the non-negative count outcome without taking the logarithm of the dependent variable.

The PPML Estimation with Human Rights

The baseline regressions are estimated using log-linear OLS, with the logarithm of the number of recognized rescuers as the dependent variable. As an additional robustness check, the models are re-estimated using Poisson pseudo-maximum likelihood (PPML), retaining the original, unlogged number of recognized rescuers as the dependent variable. PPML is appropriate for a non-negative count outcome and provides an alternative conditional-mean specification that does not require taking the

logarithm of the dependent variable. All PPML estimates use Huber–White robust covariance estimates.

This alternative estimation strategy is particularly relevant in light of the diagnostic tests for the OLS specifications as reported in section seven. Table 7 reports three PPML specifications corresponding to the OLS models. Column (4) includes the Human Rights Index together with log Jewish population and NOTOCC. Column (5) adds total GDP, while column (6) instead adds GDP per capita.

The PPML results differ in an important respect from the OLS estimates. In the baseline PPML specification, the coefficient on (10*HR) is positive and statistically significant at the 5 percent level (0.233, $p = 0.010$). Because the variable is scaled as (10*HR), a 0.10 increase in the original Human Rights Index corresponds to a coefficient change of 0.233. The implied percentage change in expected recognized rescuers is therefore

$$100[e^{0.233}-1] \approx 26.2\%.$$

Thus, within this PPML specification, a 0.10 higher value of the Human Rights Index is associated with approximately 26.2 percent more expected recognized rescuers, conditional on the other variables in the model. The coefficient on log Jewish population is 0.620 ($p < 0.001$), while the coefficient on NOTOCC is -2.734 ($p < 0.001$). The principal demographic and occupation relationships therefore remain highly stable after the introduction of the institutional variable.

The specification including total GDP produces similar results. The coefficient on the Human Rights Index, is 0.211 and statistically significant ($p = 0.002$). A 0.10 increase in the index corresponds to an expected percentage difference of

$$100[e^{0.211}-1] \approx 23.5\%.$$

The coefficient on log Jewish population is 0.487 ($p < 0.001$), while NOTOCC has a coefficient of -3.410 ($p < 0.001$). Total GDP is positive, although its statistical significance is more sensitive to the specification.

The final PPML specification replaces total GDP with GDP per capita. The coefficient on 10×HR is 0.164 and statistically significant ($p = 0.017$). A 0.10 increase in the Human Rights Index is therefore associated with approximately

$$100[e^{0.164}-1] \approx 17.9\%.$$

more expected recognized rescuers, conditional on the other variables. The coefficient on log Jewish population is 0.789 ($p < 0.001$), NOTOCC is -3.346 ($p < 0.001$), and GDP per capita is positive and statistically significant (1.480, $p = 0.002$).

The difference between the OLS and PPML estimates for the Human Rights Index is noteworthy. The coefficient is statistically insignificant in all three OLS specifications but positive and statistically significant in all three PPML specifications. This should not be interpreted as evidence that one estimation method necessarily provides the “correct” result. Rather, it indicates that the estimated relationship between institutional conditions and recognized rescuers

is sensitive to the functional form used for the dependent variable. The PPML results suggest a positive conditional association between prewar human-rights conditions and the expected number of recognized rescuers, whereas the log-linear OLS models do not detect such an association.

The PPML estimates also provide an important robustness check for the two principal relationships identified earlier in the analysis. The coefficient on log prewar Jewish population remains positive and highly statistically significant in every PPML specification. Similarly, the coefficient on NOTOCC remains negative and highly statistically significant throughout. Their estimated magnitudes vary across specifications, but the signs and statistical significance are remarkably stable. The evidence concerning the economic variables is less uniform. In particular, GDP per capita is statistically insignificant in the corresponding OLS specification but statistically significant in the PPML specifications, indicating that the evidence for an independent role of average economic development is also sensitive to functional form.

Correlation and Interpretation of the Human Rights Measure

The pairwise correlations provide some additional context for these findings. The Human Rights Index has very weak correlations with prewar Jewish population ($r = -0.081$), total GDP ($r = -0.071$), and NOTOCC ($r = -0.062$), none of which is statistically significant. Its strongest correlation among the principal explanatory variables is with GDP per capita ($r = 0.600$, $p < 0.001$). This relatively strong association indicates that the Human Rights Index and GDP per capita contain a substantial amount of overlapping information concerning cross-country institutional and socioeconomic conditions. Consequently, the coefficients of these variables should be interpreted with particular caution when they are included in the same specification. The pairwise correlations themselves, however, do not establish either causality or the absence of omitted-variable bias.

The overall pattern of results suggests that institutional conditions may be relevant to cross-country differences in recognized Jewish rescuers, but the strength of this relationship depends on the estimation framework. The OLS estimates provide no statistically significant association between the Human Rights Index and recognized rescuers, whereas the PPML estimates consistently identify a positive and statistically significant association. At the same time, the PPML results reinforce the robustness of the two central relationships established earlier in the paper: countries with larger prewar Jewish populations tend to have more recognized rescuers, while countries that were not occupied during the war tend to have substantially fewer recognized rescuers conditional on the size of the Jewish population.

These findings should nevertheless be interpreted as cross-country associations rather than causal estimates. In particular, the Human Rights Index is a broad political and institutional measure and cannot by itself identify the specific mechanisms through which prewar civil liberties might have affected individual decisions to assist Jews during the Holocaust. Moreover, recognition by Yad Vashem is necessarily an imperfect measure of the underlying population of rescuers. The PPML results therefore provide evidence of an association that is

consistent with an institutional dimension of Jewish rescue, rather than a causal estimate of the effect of human rights on rescue behavior.

The difference between the OLS and PPML results for the Human Rights Index is potentially consistent with the nonlinearities discussed by Glaeser (2005). Glaeser's model allows the relationship between social conditions and hatred to be nonlinear, with the costs of opposing hatred increasing once hatred becomes sufficiently widespread. The present analysis does not directly test such a threshold mechanism. Nevertheless, the difference between the log-linear OLS and PPML estimates suggests that the association between institutional conditions and recognized rescue may not be adequately summarized by a simple proportional relationship. This interpretation is also broadly consistent with the historical evidence on the institutional and network conditions emphasized by Moore (2003) and Braun (2016).

The positive association between the prewar Human Rights Index and recognized rescuers found in the PPML specifications can be interpreted in light of Doerr et al. (2022). They argue that the Nazi narrative sold more easily where a history of anti-Semitism coincided with real suffering induced by financial distress. In their framework, anti-finance rhetoric and anti-Semitic messages overlapped, and the banking crisis was presented as evidence of the failings of the Weimar "system". The Human Rights Index used here captures precisely the opposite institutional environment: stronger constraints on arbitrary state action, protection of freedom of association and movement, and a broader normative environment for minority protection. If financial distress facilitated persecution where civil liberties were weak, as Doerr et al. (2022) document, it is plausible that stronger prewar civil liberties facilitated forms of assistance that require organization, clandestine networks, and mobility. This is consistent with Moore (2003) and Braun (2016), who emphasize administrative structures and minority-group networks, and provides a theoretical rationale for why the institutional association may be more readily detected in the PPML specification.

The positive PPML coefficient on the Human Rights Index is also consistent with Braun's (2018) minority advantage argument. The Human Rights Index captures the extent to which prewar states protected private civil liberties and freedom of association, i.e., the conditions under which minority communities could maintain dense, autonomous networks. Under occupation, those same networks could be repurposed for secret protection, while in more repressive prewar regimes such networks had already been weakened or co-opted. The country-level Human Rights association reported here should therefore be interpreted not as direct evidence of tolerance, but as a proxy for the availability of the kind of minority-based organizational infrastructure that Braun shows was critical for overcoming the clandestine collective action problem at the local level.

Table 7. *Human Rights and Jewish Rescue*

Regressors / Statistics	(1) OLS	OLS + GDP (2)	OLS + GDPpc (3)	PPML (4)	PPML + GDP (5)	PPML + GDPpc (6)
Log Jewish population	0.667*** (0.144)	0.357** (0.172)	0.624*** (0.183)	0.620*** (0.069)	0.487*** (0.065)	0.789*** (0.080)
NOTOCC	-2.158*** (0.705)	-2.988*** (0.816)	-2.327*** (0.767)	-2.734*** (0.775)	-3.410*** (0.843)	-3.346*** (0.975)
10*HR	0.039 (0.093)	-0.017 (0.094)	-0.031 (0.121)	0.233** (0.091)	0.211*** (0.067)	0.164** (0.069)
Log total GDP	—	0.617** (0.238)	—	—	0.445*** (0.110)	—
Log GDP per capita	—	—	0.621 (0.896)	—	—	1.480*** (0.483)
Constant	-2.277 (1.826)	-0.506 (1.819)	-6.586 (6.131)	-1.780** (0.867)	-11.040*** (2.459)	-16.038*** (4.805)
R ² / Pseudo-R ²	0.617	0.675	0.628	0.680	0.766	0.845
Adjusted R ² / Adjusted Pseudo-R ²	0.584	0.636	0.584	0.653	0.739	0.827
F-statistic	18.80	17.62	14.35	—	—	—
Prob(F-statistic)	<0.001	<0.001	<0.001	—	—	—
Robust Wald F-statistic	16.12	12.00	14.96	—	—	—
Prob(Wald F-statistic)	<0.001	<0.001	<0.001	—	—	—
Akaike information criterion	3.952	3.840	3.974	548.292	405.016	359.672
Schwarz information criterion	4.122	4.053	4.187	548.463	405.229	359.885
Hannan–Quinn criterion	4.013	3.917	4.050	548.354	405.093	359.749
Durbin–Watson statistic	2.108	1.969	2.009	—	—	—
Observations	39	39	39	39	39	39

Notes: OLS specifications report HC3 heteroskedasticity-consistent standard errors in parentheses. PPML specifications use the original, unlogged number of recognized rescuers as the dependent variable and Huber–White robust covariance estimates. The HR variable is measured on a 0–1 scale and is multiplied by 10; its coefficient therefore corresponds to a 0.10 increase in the original index. The reported PPML R² and adjusted R² are the statistics produced by EVIEWS and should not be interpreted as directly comparable to the OLS R² measures. Information criteria are comparable only across models estimated within the same likelihood framework and with the same dependent variable; OLS and PPML information criteria should therefore not be compared directly. Durbin–Watson and conventional F-statistics are reported only for the OLS specifications.

*** p<0.01, ** p<0.05, * p<0.10.

Excluding Germany

As a further robustness check, we conduct a leave-one-country-out sensitivity analysis of the two full-framework PPML specifications. The analysis re-estimates each specification after excluding each country in turn. This approach is preferable to relying on classical Cook's distance because the latter is developed for linear regression models, whereas leave-one-country-out estimation can be applied directly to the PPML specifications used here. Across the countries examined, the principal coefficients are generally stable, although Germany is relatively influential, particularly for the Human Rights Index when GDP per capita is used as the economic control.

Germany's influence does not appear to be attributable simply to its size within the sample. Poland has both a substantially larger prewar Jewish population (3,000,000 versus 525,000) and a larger number of recognized rescuers (7,318 versus 666), while Russia has a larger total population. Rather, Germany occupies an unusual position in the joint distribution of economic and institutional conditions, combining comparatively high prewar GDP per capita with a relatively low prewar Human Rights Index. This combination is atypical given the positive correlation between these two variables in the sample ($r=0.600$); see Table 3). Germany also combines its relatively high GDP per capita with a comparatively low number of recognized rescuers.

The results excluding Germany are reported in Table 8. The coefficients on prewar Jewish population and NOTOCC remain positive and negative, respectively, and statistically significant at the 1 percent level in both specifications. Thus, the two principal demographic and wartime-status associations are not dependent on Germany. The economic variables are also positive and statistically significant in both specifications. When total GDP is used, its coefficient increases from 0.445 in the full sample to 0.597 after Germany is excluded. When GDP per capita is used, its coefficient increases from 1.480 to 2.487 and remains highly statistically significant. Thus, Germany affects the estimated magnitude of the economic association, particularly in the GDP-per-capita specification, but does not alter its positive sign or statistical significance.

The Human Rights Index produces a different pattern. In the specification using total GDP, its coefficient declines from 0.211 to 0.151 but remains statistically significant at the 1 percent level. In contrast, when GDP per capita is used, the coefficient falls from 0.164 in the full sample to 0.036 and becomes statistically insignificant after Germany is excluded. The evidence therefore indicates that the association between prewar human-rights conditions and recognized rescue is sensitive both to the measure of economic conditions and to the inclusion of Germany. This sensitivity is consistent with the substantial correlation between GDP per capita and the Human Rights Index identified earlier, although the leave-one-country-out results do not by themselves establish that collinearity is the sole cause of the change in the Human Rights coefficient.

Germany's atypical combination of relatively high prewar GDP per capita with low prewar human rights and a comparatively low number of recognized rescuers is consistent with Ferguson and Voth (2008), who show that firms with supervisory-board connections to the NSDAP earned 7-8% abnormal returns in January-March 1933, suggesting that in the German case economic resources were associated with returns to political collaboration rather than with capacity for rescue.

The difference between the two economic specifications is not unexpected, because total GDP and GDP per capita capture distinct dimensions of economic conditions. Total GDP reflects the aggregate scale of the national economy and therefore partly incorporates country size, whereas GDP per capita captures average economic conditions and is less directly related to population size. This distinction is particularly relevant in our sample: total GDP is very strongly correlated with population ($r=0.936$), whereas GDP per capita has only a weak correlation with population ($r=0.216$).

Table 8. *Excluding Germany (PPML, dependent variable: number of rescuers)*

Variables	PPML + GDP	PPML + GDP per capita
log(Jewish population)	0.446*** (0.055)	0.919*** (0.095)
NOTOCC	-3.665*** (0.765)	-3.763*** (0.980)
log(total GDP)	0.597*** (0.123)	—
log(GDP per capita)	—	2.487*** (0.538)
10 × HR	0.151*** (0.056)	0.036 (0.049)
Constant	-1.512** (0.749)	-25.388*** (5.408)
N	38	38
Pseudo-R ²	0.772	0.918
Adjusted Pseudo-R ²	0.744	0.908
AIC	367	270

Notes: Huber–White robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Both specifications exclude Germany ($n = 38$).

Consequently, total GDP may partly capture the scale of economic resources associated with larger countries, whereas GDP per capita captures variation in average economic conditions that is less directly attributable to country size. The substantially larger GDP-per-capita coefficient after Germany's exclusion should therefore not be interpreted simply as evidence of a stronger economic effect. Rather, the two coefficients refer to different economic measures and their magnitudes are not directly interchangeable.

The results for the Human Rights Index are more sensitive. The Human Rights coefficient remains statistically significant when total GDP is used but becomes statistically insignificant when GDP per capita is used after Germany is excluded. This pattern is consistent with the correlation between GDP per capita and the Human Rights Index, but the results should be interpreted as specification-sensitive rather than as establishing a causal explanation for the instability of the HR coefficient.

Robustness to Sample Restrictions

The preceding analysis identified positive associations between the number of recognized Jewish rescuers and three structural conditions: the size of the prewar Jewish population, economic conditions measured by Total GDP and GDP per capita, and, in specifications that include it, the Human Rights Index. Because the analysis is based on a relatively small cross-country sample of 39 European countries, it is important to examine whether these relationships are sensitive to the inclusion of countries with relatively small prewar Jewish populations or to individual observations that may exert disproportionate influence on the estimates. This section therefore examines the robustness of the principal results to alternative sample restrictions. The analysis is conducted using Poisson pseudo-maximum likelihood (PPML) with Huber–White robust covariance, which is the preferred specification for the count dependent variable.

Robustness to the size of the prewar Jewish population

The first robustness exercise progressively excludes countries with relatively small prewar Jewish populations. The thresholds are set at more than 500, 1,000, 2,000, 5,000, and 10,000 Jews. These restrictions should not be interpreted as alternative definitions of the population at risk. Rather, they provide a sensitivity test of whether the estimated associations are disproportionately affected by countries with very small Jewish populations.

Table 9 reports the PPML estimates without the Human Rights Index. The results are remarkably stable. The coefficient on the logarithm of prewar Jewish population ranges from 0.705 to 0.748 across the six specifications and remains statistically significant at the 1 percent level throughout. The coefficient on the non-occupation indicator is also highly stable, ranging from –3.159 to –3.299 and remaining statistically significant at the 1 percent level.

Table 9. *PPML-Huber–White Estimates under Alternative Prewar Jewish Population Restrictions*

Variable	Full sample	JEWPOP >500	JEWPOP >1,000	JEWPOP >2,000	JEWPOP >5,000	JEWPOP >10,000
Constant (p-value)	–15.284 (0.02)	–15.835 (0.019)	–15.957 (0.019)	–15.883 (0.020)	–15.738 (0.022)	–15.328 (0.024)
Log Jewish population	0.729 (<0.001)	0.745 (<0.001)	0.748 (<0.001)	0.737 (<0.001)	0.732 (<0.001)	0.705 (<0.001)
Non-occupation	–3.159 (<0.001)	–3.164 (<0.001)	–3.234 (<0.001)	–3.255 (<0.001)	–3.277 (0.000)	–3.299 (<0.001)
Log GDP per capita	1.587 (0.021)	1.627 (0.020)	1.636 (0.020)	1.645 (0.018)	1.636 (0.019)	1.630 (0.018)
Observations	39	37	36	32	29	26

Note: The dependent variable is the number of Yad Vashem-recognized rescuers. Estimates are obtained using Poisson pseudo-maximum likelihood (PPML) with Huber–White robust covariance. Exact p-values are reported in parentheses below the coefficient estimates.

Most importantly, the coefficient on GDP per capita changes very little as the sample is progressively restricted. It is 1.587 in the full sample of 39 countries and increases only modestly to 1.627, 1.636, and 1.645 as countries with fewer than 500, 1,000, and 2,000 prewar Jews are excluded. It then remains virtually unchanged at 1.636 and 1.630 in the samples restricted to countries with more than 5,000 and 10,000 prewar Jews, respectively. The coefficient therefore varies within a very narrow range of 0.058, while its Huber–White standard error remains close to 0.70. The GDP-per-capita coefficient is statistically significant at the 5 percent level in every specification, with p-values consistently close to 0.02, ranging from 0.018 to 0.021.

These results provide substantial evidence that the positive association between economic conditions and the number of recognized rescuers is not driven by countries with relatively small prewar Jewish populations. They also provide a useful contrast with the OLS-HC3 estimates reported earlier in the paper. In the OLS specification, the GDP-per-capita coefficient increases substantially as the sample is restricted, from 0.514 in the full sample to 1.606 in the sample with more than 10,000 prewar Jews, with statistical significance emerging only in the more restricted samples. The corresponding PPML estimates, by contrast, remain remarkably stable across the entire sequence of restrictions. This difference suggests that the estimated economic association is considerably more sensitive to sample composition under the log-linear OLS specification than under the count-data PPML specification.

Robustness of the institutional association

A second set of specifications examines whether the positive association between the Human Rights Index and the number of recognized rescuers remains after controlling simultaneously for prewar Jewish population, occupation status, and GDP per capita. The results are reported in Table 10.

For the sample containing countries with more than 500 prewar Jews, the coefficient on the Human Rights variable is positive and statistically significant (0.165, $p = .018$). The corresponding coefficient in the more restrictive sample containing countries with more than 10,000 prewar Jews is almost identical, at 0.168 ($p = .016$). Thus, within samples that retain Germany, the estimated Human Rights association is remarkably stable.

The inclusion of Human Rights also leaves the GDP-per-capita association positive and statistically significant. The GDP-per-capita coefficient is 1.538 in the >500 specification and 1.521 in the $>10,000$ specification, with $p = .002$ in both cases. Thus, controlling for the institutional variable does not eliminate the positive economic association. The coefficient on prewar Jewish population remains positive and highly significant, while the coefficient on non-occupation remains negative and highly significant.

The evidence therefore initially appears consistent with independent economic and institutional associations. However, the next robustness test shows that the HRI result requires more cautious interpretation.

Table 10. *PPML-Huber–White Estimates Including the Human Rights Index*

Variable	JEWPOP >500	JEWPOP >10,000
Constant	–16.782 (<0.001)	–16.098 (0.001)
Log Jewish population	0.807 (<0.001)	0.766 (<0.001)
Non-occupation	–3.366 (<0.001)	–3.506 (<0.001)
Log GDP per capita	1.538 (0.002)	1.521 (0.002)
10*HR	0.165 (0.018)	0.168 (0.016)
Observations	37	26
Adjusted R ²	.826	.810

Notes: The dependent variable is the number of Yad Vashem-recognized rescuers. Estimates are obtained using Poisson pseudo-maximum likelihood (PPML) with Huber–White robust covariance. Exact p-values are reported in parentheses below the coefficient estimates. HR is entered as $10 \times \text{HR}$; consequently, the reported coefficient refers to the scaled variable.

Sensitivity to Germany

Because Germany is a historically distinctive observation in the European sample and may be influential in the relationship between institutional and economic conditions, a further sensitivity analysis excludes Germany. This test is particularly important for interpreting the Human Rights coefficient.

The results in Table 11 reveal a clear difference between the economic and institutional variables. In the full 39-country sample, the coefficient on GDP per capita is 1.480 and statistically significant at the 1 percent level, while the coefficient on Human Rights is 0.164 and statistically significant at the 5 percent level. After Germany is excluded, the GDP-per-capita coefficient increases to 2.487 and remains highly statistically significant ($p < .001$). Thus, the positive association between economic conditions and recognized rescuers does not depend on Germany. If anything, excluding Germany strengthens the estimated GDP-per-capita association.

The Human Rights result is different. Its coefficient falls from 0.164 in the full sample to only 0.036 after Germany is excluded, and the associated p-value increases from .017 to .462. The positive Human Rights association therefore does not survive this particular influence test.

The same pattern appears in the more restrictive sample with more than 10,000 prewar Jews. With Germany included, the Human Rights coefficient is 0.168 ($p = .016$), while excluding Germany reduces it to 0.032 ($p = .529$). In contrast, the GDP-per-capita coefficient rises from 1.521 to 2.623. The evidence therefore indicates that Germany is influential for the estimated HRI association but does not account for the positive GDP-per-capita association.

Table 11. *Sensitivity of PPML Estimates to the Exclusion of Germany*

Variable	Full sample	Germany excluded	>10,000 Jews	>10,000 Jews, Germany excluded
Constant	-16.038 (<0.001)	-25.388 (<0.001)	-16.098 (0.001)	-26.610 (<0.001)
Log Jewish population	0.789 (<0.001)	0.919 (<0.001)	0.766 (<0.001)	0.926 (<0.001)
Non-occupation	-3.346 (<0.001)	-3.763 (<0.001)	-3.506 (<0.001)	-3.968 (<0.001)
Log GDP per capita	1.480 (0.002)	2.487 (<0.001)	1.521 (0.002)	2.623 (<0.001)
10*HR	0.164 (0.017)	0.036 (0.462)	0.168 (0.016)	0.032 (0.529)
Observations	39	38	26	25
Adjusted R ²	.827	.908	.810	.899

Notes: The dependent variable is the number of Yad Vashem-recognized rescuers. All estimates are obtained using Poisson pseudo-maximum likelihood (PPML) with Huber–White robust covariance. Exact p-values are reported in parentheses below the coefficient estimates. HR is entered as $10 \times \text{HR}$; consequently, the reported coefficient refers to the scaled variable.

Overall Assessment of the Robustness Analysis

Taken together, the sample-restriction exercises produce a differentiated picture of the empirical findings. The association between the number of recognized rescuers and prewar Jewish population is highly stable across all PPML specifications. The negative association with non-occupation is likewise persistent across alternative samples. Most importantly, the positive association between GDP per capita and recognized rescuers is remarkably robust. Its coefficient remains close to 1.6 when countries with progressively larger minimum Jewish populations are excluded, remains statistically significant when Human Rights is introduced, and becomes even larger when Germany is excluded.

The evidence concerning Human Rights is more qualified. Human Rights is positively and significantly associated with the number of recognized rescuers in specifications that include Germany, and its coefficient is remarkably similar in the >500 and >10,000 samples. However, the association disappears when Germany is excluded. The Human Rights result should therefore be regarded as sensitive to an influential observation and interpreted more cautiously than the GDP-per-capita result.

An additional consideration is the correlation between Human Rights and GDP per capita. In the 26-country sample with more than 10,000 prewar Jews, their correlation is 0.559 and is statistically significant ($p = .003$). This indicates that the two variables capture partly overlapping cross-country variation. Nevertheless, the correlation does not by itself indicate severe multicollinearity; using the pairwise correlation, the corresponding variance-inflation factor is approximately 1.46. The sensitivity of Human Rights to Germany therefore appears more closely related to

the influence of that observation than to severe collinearity between the two explanatory variables.

Overall, the robustness analysis strengthens the interpretation of the PPML specification as the principal empirical framework of the study. The principal economic association survives alternative sample restrictions, the inclusion of the institutional control, and the exclusion of Germany. The institutional association measured by Human Rights is positive in the full sample but less robust to influential observations. These results reinforce the distinction between findings that are consistently supported across specifications and those that require a more cautious interpretation.

Limitations

This study has several limitations that should be considered when interpreting the results. First, the dependent variable is the number of individuals recognized by Yad Vashem as Righteous Among the Nations rather than the total number of people who assisted Jews during the Holocaust. Recognition depends on the availability of documentary evidence and on the criteria and procedures used by Yad Vashem. Consequently, the measure is likely to capture documented and recognized rescue rather than the full underlying incidence of rescue. This distinction is particularly important for cross-country comparisons because differences in surviving documentation, historical research, and recognition may contribute to differences in the observed number of rescuers.

Second, the analysis is conducted at the country level. This level of aggregation is appropriate for examining broad structural differences across European countries, but it cannot capture the local and interpersonal mechanisms emphasized by historical research. Rescue decisions were often shaped by local administrative institutions, relationships between rescuers and Jews, networks of family and community, geographic conditions, religious and social organizations, and the behavior of individual officials and collaborators. These factors may vary substantially within countries and cannot be adequately represented by national-level indicators. The estimated relationships should therefore be interpreted as cross-country associations rather than as explanations of individual decisions to rescue.

Third, the empirical design does not establish causal effects. The analysis relates recognized rescue to prewar demographic, economic, and institutional characteristics and to wartime occupation status, but the observational cross-country data cannot rule out omitted variables or establish the direction of causality. In particular, the Human Rights Index is a broad measure of political and civil liberties and should not be interpreted as a direct measure of altruism, tolerance, social attitudes toward Jews, or individual willingness to incur risks on behalf of others. Similarly, GDP and GDP per capita capture different dimensions of economic conditions but cannot by themselves identify the specific material mechanisms through which economic circumstances may have affected rescue.

Fourth, the choice of the prewar Jewish population as the principal demographic measure has both advantages and limitations. It provides an ex-ante measure of the population potentially exposed to persecution and avoids using wartime Jewish

mortality as a denominator that is partly determined by the subsequent course of persecution and rescue. At the same time, prewar population does not measure the number of Jews who actually required rescue in each country. The extent of Nazi control, deportation, emigration, evacuation, and variation in the timing and intensity of persecution differed considerably across countries. Thus, the coefficient on Jewish population should be understood as capturing the relationship between demographic scale and recognized rescue rather than a direct measure of the probability that an individual Jew was rescued.

Fifth, the available country-level data do not permit direct measurement of individual motivations, including ideology, identity, altruism, religious commitment, personal relationships, or perceptions of risk. As emphasized by Caruso (2016), such non-material components may be central to understanding individual behavior during the Holocaust.

Sixth, the country-level distinction between occupied and non-occupied countries is necessarily uneven. Cagé et al. (2023) show how local determinants of collaboration operated within occupied France. Exploiting the quasi-random rotation of regiments through Verdun in World War I, they find that home municipalities of regiments that served at Verdun under Pétain raised 7-9% more active Nazi collaborators per capita under Vichy, with effects extending to economic collaboration and to joining groups that hunted Jews and the Resistance. Their evidence that hierarchical networks of heroes can legitimize extreme political behaviors helps explain why occupation regimes produced substantial within-country variation in collaboration and resistance. The NOTOCC indicator used here therefore captures a broad wartime context rather than the local veteran, religious and civic networks emphasized by both Cagé et al. (2023) and Braun (2016), which cannot be measured in a 39-country sample.

Seventh, the relatively small sample of 39 countries limits statistical precision and the ability to estimate more elaborate specifications. This constraint is particularly relevant for the non-occupied subsample, which contains only 10 countries, and for specifications containing several correlated explanatory variables. The relatively strong correlation between GDP per capita and the Human Rights Index also makes it difficult to disentangle their independent associations with recognized rescue. The differences between the OLS and PPML estimates further indicate that some relationships are sensitive to functional form. The robustness exercises, including alternative economic measures and the exclusion of Germany, reduce—but cannot eliminate—these concerns. Section 11 addresses this concern directly: re-estimating the models across samples progressively restricted by minimum prewar Jewish population, and after excluding Germany, leaves the demographic, occupation, and GDP-per-capita associations essentially unchanged, while showing that the Human Rights Index association depends on the inclusion of Germany. These exercises reduce—but cannot eliminate—concerns about sample size and influential observations, particularly given the correlation between GDP per capita and the Human Rights Index ($r = 0.559$ in the restricted $>10,000$ -Jews subsample; $VIF \approx 1.46$).

Finally, the present cross-country associations should not be given a causal interpretation. Doerr et al. (2022) achieve identification by exploiting within-Germany variation in precrisis bank-firm linkages before 1921 to rule out self-selection. No such firm-level instrument exists at the 39-country level. Future research could follow their strategy by collecting city-level data on bank exposure and prewar

anti-Semitism to test whether the same localities that experienced greater radicalization and persecution also produced fewer recognized rescuers, conditional on Jewish population.

Taken together, these limitations imply that the results should be viewed as evidence concerning structural cross-country patterns in documented and recognized Jewish rescue, rather than as estimates of the causal effects of occupation, economic conditions, or human rights on individual rescue behavior. The findings therefore complement rather than replace the detailed historical and local-level evidence on the circumstances under which rescue occurred.

Conclusions

This paper examined cross-country differences in Jewish rescue during the Holocaust through a framework that combines four dimensions: occupation status, demographic exposure, economic conditions, and prewar political and institutional conditions. Using data for 39 European countries and the number of individuals recognized by Yad Vashem as Righteous Among the Nations, the analysis sought to determine whether these structural characteristics are systematically associated with the number of recognized rescuers.

Three findings are particularly consistent across the analysis. First, the size of the prewar Jewish population is strongly and positively associated with the number of recognized rescuers. The relationship remains positive and highly statistically significant across the principal OLS and PPML specifications. This result is consistent with the demographic scale of the population potentially requiring assistance being an important component of cross-country differences in the number of documented rescuers.

Second, occupation status is strongly associated with the number of recognized rescuers. Conditional on prewar Jewish population and other controls, countries that were not occupied have substantially fewer recognized rescuers than occupied countries. This finding should not be interpreted to mean that occupation itself generated rescue. Rather, occupation fundamentally altered the circumstances in which both persecution and assistance occurred, while non-occupied countries could perform different functions as places of refuge, transit, or external assistance. The result therefore highlights the importance of the wartime environment in which rescue took place.

Third, the evidence concerning economic and institutional conditions is more specification-sensitive. Aggregate GDP is positively associated with recognized rescue in the full-framework PPML specification, whereas GDP per capita produces a substantially larger positive coefficient. The difference reflects the distinct information contained in the two measures: total GDP captures the aggregate scale of national resources and is closely related to country size, while GDP per capita captures average economic development. The Human Rights Index is positive and statistically significant in the PPML specifications when estimated over the full sample, including the specification with aggregate GDP. Its association becomes statistically insignificant when GDP per capita is used after Germany is excluded. This sensitivity is consistent with the relatively strong correlation between human rights and GDP per capita and

cautions against interpreting either variable as an independently identified causal determinant of rescue.

The comparison between OLS and PPML is also informative. The demographic and occupation relationships are remarkably stable across the two estimation frameworks, whereas the estimated associations of economic and human-rights conditions differ more substantially. These differences indicate that functional form matters for some dimensions of the analysis and reinforce the value of treating the OLS and PPML estimates as complementary rather than assuming that one necessarily provides the correct representation of the data.

The exclusion of Germany provides an additional robustness check. The coefficients on prewar Jewish population and occupation status remain statistically significant, while aggregate GDP and the Human Rights Index remain significant in the specification using total GDP. The sensitivity observed when GDP per capita is used is therefore concentrated in the joint relationship between economic development and human-rights conditions rather than in the principal demographic and occupation findings.

An additional set of robustness checks reinforces this asymmetry. Progressively restricting the sample to countries with larger prewar Jewish populations leaves the demographic, occupation, and GDP-per-capita coefficients virtually unchanged, and the GDP-per-capita association grows stronger, not weaker, once Germany is excluded from these restricted samples. The Human Rights Index result does not display the same stability: it is significant whenever Germany is included but statistically indistinguishable from zero whenever Germany is excluded. This pattern strengthens confidence in the demographic, occupation, and economic findings while reinforcing the case for treating the institutional association as tentative.

Several limitations qualify these conclusions. The dependent variable measures recognized rescuers rather than the complete population of individuals who assisted Jews, and recognition depends on surviving documentation and Yad Vashem's recognition procedures. The country-level analysis cannot capture the local administrative, social, geographic, and interpersonal mechanisms emphasized by historical research on rescue. In addition, the observational design does not establish causal effects, and the prewar Human Rights Index is a broad institutional measure rather than a direct measure of altruism, tolerance, or individual attitudes.

Taken together, the results suggest that cross-country variation in recognized Jewish rescue is associated with the demographic scale of the population at risk and with the wartime context of occupation, while economic and institutional conditions provide additional but more specification-dependent explanatory dimensions. The evidence therefore supports a multidimensional approach to understanding Jewish rescue rather than attributing cross-country differences to a single economic, demographic, or institutional factor.

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Appendix A. Sources of Data

Number of non-Jewish rescuers. Data on the number of non-Jewish rescuers by country were obtained from Yad Vashem's *Righteous Among the Nations by Country* database, which reports the number of individuals recognized as Righteous Among the Nations in each country. Available at: <https://www.yadvashem.org/righteous/statistics.html>

Jewish population before World War II. Data on the Jewish population by country prior to World War II were retrieved from the Holocaust Encyclopedia, United States Holocaust Memorial Museum (USHMM). Available at: <https://encyclopedia.ushmm.org/content/en/article/jewish-losses-during-the-holocaust-by-country>

Human rights in 1938. The Civil Liberties Index from the Varieties of Democracy (V-Dem) project, as presented on the Our World in Data (OWID) Human Rights index is used. The index is labeled as "Human Rights Index" on OWID and is available at <https://ourworldindata.org/human-rights>. The index corresponds to V-Dem indicator of civil liberties. It is a composite measure on an interval scale from 0 (low respect) to 1 (high respect) and is aggregated from three sub-indices: (a) physical integrity rights: freedom from political killings and torture by the government; (b) Private civil liberties: freedom from forced labor, property rights, freedom of domestic and foreign movement, and freedom of religion; and (c) Political civil liberties: freedom of association and freedom of expression.

Population before World War II. Population data were obtained from Our World in Data (2024). Available at: <https://ourworldindata.org/grapher/population>

GDP per capita and total GDP before World War II (1938). GDP per capita is expressed in 2011 international dollars, adjusted for purchasing power parity (PPP). The data were obtained from Bolt and van Zanden (2023). This series does not include data for a number of countries, and in some cases, estimates for 1938 were not available. In such cases, we use the year closest to the prewar period for which data are available. For Estonia, Latvia, and Lithuania, we use the 1938 estimates reported by Norkus (2023). See also Klimantas and Zirgulis (2020) for a discussion of prewar GDP in Lithuania. For Belarus, Russia, and Ukraine, we use the 1938 GDP-per-capita figure for the USSR. For Bosnia, Croatia, and Serbia, we use the available 1938 GDP-per-capita figure for Yugoslavia. For Moldova, we use the same GDP-per-capita figure as for Romania. For Luxembourg, GDP per capita in 1938 was estimated using the Luxembourg-to-Belgium GDP-per-capita ratio of 1.41 reported by the International Bank for Reconstruction and Development (1948), applied to Belgium's 1938 GDP per capita in the Maddison series. This procedure yields an estimated GDP per capita for Luxembourg of approximately 10,860 international dollars in 2011 prices. Total GDP was calculated as GDP per capita multiplied by population.

Appendix B. Data

	Country	Number of Rescuers (Rescuers)	Jewish Population before the 2 nd WW (JEWPOPWW)	Not occupied Country (NOTOCC)	Human Rights prewar (HR)	GDP prewar (GDPWW)	GDP per capita prewar (GDPPCWW)	Population prewar (POPWW)
1	Albania	75	200	0	0.356	1.6	1476	1077319
2	Armenia	24	1000	1	0.014	4.2	3427	1223765
3	Austria	115	191000	0	0.371	38.1	5673	6709158
4	Belarus	683	400000	0	0.014	24.3	3427	7101141
5	Belgium	1819	60000	0	0.861	63.6	7702	8260429
6	Bosnia	49	14000	0	0.475	4.9	1991	2442896
7	Bulgaria	20	48500	0	0.388	15.4	2389	6450459
8	Croatia	133	21000	0	0.067	6.9	1991	3486699
9	Czech Rep.	129	117000	0	0.813	50.0	4594	10877000
10	Denmark	22	5700	0	0.932	34.7	9185	3777862
11	Estonia	3	4560	0	0.689	4.6	4068	1120653
12	France	4303	250000	0	0.841	287.0	7119	40314566
13	Georgia	1	30000	1	0.014	10.8	3427	3137913
14	Germany	666	525000	0	0.044	566.2	7960	71128740
15	Greece	365	73000	0	0.237	30.5	4267	7156751
16	Hungary	887	445000	0	0.486	38.6	4232	9122132
17	Ireland	1	3800	1	0.879	14.4	4865	2970000
18	Italy	810	48000	0	0.174	213.9	4981	42940295
19	Latvia	138	95600	0	0.648	8.7	4527	1915624
20	Lithuania	924	155000	0	0.527	8.8	3619	2443847
21	Luxembourg	1	2000	0	0.748	3.3	10860	300394
22	North Macedonia	10	8000	0	0.475	2.2	1991	1124999
23	Moldova	79	60000	0	0.014	3.4	1604	2103663
24	Montenegro	1	200	0	0.361	0.9	1991	429911
25	Netherlands	6137	156000	0	0.849	72.4	8368	8654613
26	Norway	68	1400	0	0.849	20.1	6794	2953771
27	Poland	7318	3000000	0	0.678	100.7	3478	28959278
28	Portugal	3	1200	1	0.246	20.8	2785	7477915
29	Romania	69	756000	0	0.388	24.9	1604	15526960
30	Russia	231	900000	1	0.014	314.2	3427	91688756
31	Serbia	141	16000	0	0.475	9.4	1991	4713927
32	Slovakia	639	135000	0	0.813	15.1	4594	3293881
33	Slovenia	16	1500	0	0.475	2.6	1991	1302989
34	Spain	9	4000	1	0.344	66.6	2633	25280177
35	Sweden	10	6700	1	0.891	49.4	7812	6323489
36	Switzerland	49	18000	1	0.881	40.2	9609	4181632
37	Turkey	1	20000	1	0.268	37.5	2209	16957374
38	Ukraine	2713	1200000	0	0.014	114.2	3427	33314431
39	U.K.	22	300000	1	0.856	476.0	9988	47661620