Catholic Presence and Immaterial Capital:

A Cross-National Analysis of Spiritual, Moral, and Relational Outcomes

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Abstract

This research examines how Catholic institutional presence relates to country-level stocks of immaterial capital. Drawing on the World Values Survey and the Statistical Yearbook of the Church, we separate three immaterial forms of capital at the country level (spiritual, moral, and relational) and link them to two analytically distinct features of Catholic institutional presence: the scale of its national footprint and the intensity of its pastoral engagement per Catholic. Scale and intensity carry consistently opposite signs across the three forms of capital: scale is negatively associated with spiritual and moral capital and positively correlated with relational capital, while intensity reverses each pattern. These patterns are confirmed under two-stage least squares using historical colonial and confessional instruments, with diagnostic tests supporting the instrumental variables (IV) specification. We can read the results through three mechanisms: secularization and legacy for spiritual capital, a substitution-versus-club-good tension for moral capital, and a bonding-versus-bridging tension for relational capital. The finding on Asia suggests that supply-side accounts of religious vitality may not travel similarly in minority-Catholic contexts, and most of the institutional effects we identify run through the ordained clergy core rather than the broader pastoral community.

Keywords: *spiritual capital; moral capital; relational capital; Catholic Church; cross-national instrumental variables; Annuarium Statisticum Ecclesiae; World Values Survey*

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1. INTRODUCTION

Religious institutions devote large efforts to the pursuit of human development and are widely understood to shape the moral, civic, and social life of the societies in which they operate (Bucciarelli, Mattoscio, and Persico, 2011). The consensus is that they matter, but quantifying this influence at the country level is much harder than the consensus suggests. Part of the difficulty is that the "goods" which religious organizations are said to produce (trust, civic engagement, moral commitment, shared meaning) lack a natural unit of measurement. Moreover,

the survey instruments available do not always map cleanly onto the constructs that the secularization and social-capital traditions actually discuss in the literature. In addition, current studies do not distinguish the impact that comes from religious institutions' organizational footprint in society (i.e., their scale) versus the intensity of their efforts (i.e., the resources per believer). Furthermore, there is also the deeper problem of endogeneity. Religious participation is itself shaped by the socio-economic conditions that influence the very outcomes religion is supposed to produce (Putnam 2000; Norris and Inglehart 2011; Barro and McCleary 2003). Thus, separating the institution's effect from the conditions in which it flourishes has accordingly proved elusive.

1.1 Distinguishing three forms of capital

The sociology of religion has long debated how religious institutions shape the moral and civic life of the societies they inhabit. Two traditions dominate the current empirical conversation. One, anchored in Berger's (1967) classic account of secularization and updated in Norris and Inglehart (2011), reads cross-national religiosity gradients as a picture of secularization at work. The other, associated with Stark and Finke (2000) and with Iannaccone's (1994) club-good account of strict congregations, takes the opposite view. Religious vitality, in this reading, is actively produced by the competitive density and effort of religious suppliers themselves. Both traditions speak primarily to what societies believe and how often they practice. Neither has much to say about a separate question that has gained ground in recent decades: what religious institutions produce alongside religious practice itself.

Putnam (2000) and the broader social-capital literature (Putnam and Campbell 2010; Woolcock and Narayan 2000) have brought this question into focus, identifying religious organizations as primary generators of the civic norms, trust, and associational platforms on which civic life rests. Yet even in this third tradition, the institutional side of religion tends to enter the analysis as a homogeneous block. Empirical work concentrates either on individual religiosity or on aggregate national religiosity, and the internal structure of religious institutions (their territorial network, their workforce, the way pastoral resources are allocated across communities) remains comparatively underexplored. This paper accordingly shifts the lens from religion as belief to religion as institution.

Furthermore, treating all these outcomes under a single heading of religiosity in effect averages outcomes across components that are in fact governed by different mechanisms. A population's religious orientation, its norms of civic honesty, and its stock of relational trust and tolerance are conceptually distinct. A single composite score can mask the very processes the literature wants to isolate. This paper asks how Catholic institutional presence shapes these three forms of immaterial capital in a contemporary cross-national setting. The Catholic Church lends itself well to an empirical study for several reasons. It is the largest single religious institution in the world by membership and historical footprint, which makes its country-level variation substantively important on its own. Its doctrine and internal organization are also broadly

comparable across countries, allowing cross-national variations in its activities to be read more transparently than is possible in more pluralistic traditions. And the Church produces, through the Statistical Yearbook of the Church (hereafter SYC, *Annuarium Statisticum Ecclesiae*), detailed annual statistics on pastoral infrastructure, ordained personnel, lay apostolic workforce, and territorial coverage. These data can be merged with demographic and economic indicators from the World Bank and with attitudinal data from the World Values Survey[1]. Thus, the question we ask is: Once we account for income and historical roots are accounted for, how does the scale of Catholic institutional presence and the intensity of its pastoral engagement relate to country-level of spiritual, moral, and relational capital?

1.2 Distinguishing scale versus intensity

Cross-national research on religion has generally treated religious presence as a single quantity. The measures in widest use fall into two families, and neither separates the dimensions we distinguish here. One family normalizes religion by the national population, as in Protestant missionaries per 10,000 inhabitants (Woodberry 2012) or the share of the population belonging to a hierarchical religion (La Porta et al. 1997). The other uses population rates of individual religiosity, as in monthly attendance and belief in hell or heaven (Barro and McCleary 2003) or attendance modelled with national contextual covariates (Ruiter and van Tubergen 2009). Both families answer the question of how much religion a country contains. Neither asks how thickly the religious institution is staffed relative to the community it actually serves, and a country with many Catholics and few priests can therefore record the same value as a country with few Catholics and many priests.

This matters because the two dimensions need not move together, and in our estimates they frequently move in opposite directions. Catholic institutional density per head of population is negatively associated with Spiritual Capital while clergy per thousand Catholics is positively associated with it; for Relational Capital the signs reverse. A measure that blends the two therefore risks recovering their difference rather than either effect, and the more evenly the dimensions are balanced, the closer the blended coefficient will sit to zero. This offers one candidate explanation for a fragility that recurs in this literature, in which religiosity variables replicate but prove sensitive to model specification (Durlauf, Kourtellos, and Tan 2012), a pluralism measure yields associations of both signs and no general relationship (Chaves and Gorski 2001), and a leading population-normalized missionary measure loses significance under alternative coding of the outcome (Nikolova and Polansky 2021)..

The distinction also has theoretical ground, which is why we introduce it before rather than after the theoretical discussion. The mechanisms available in the literature are not indifferent between

[1] The World Values Survey and World Bank Open Data are publicly available. The Statistical Yearbook of the Church is published by the Vatican; the harmonized country-year extraction, the historical instruments dataset, and full replication code are available from the authors on request.

the two dimensions. Secularization and legacy arguments are claims about how much religion a society carries and therefore speak to scale (Norris and Inglehart 2011; Inglehart 2021). Supply-side and club-good arguments are claims about the effort religious organizations invest in their members and the costs they impose on them and therefore speak to intensity (Stark and Finke 2000; Iannaccone 1994). Social-infrastructure arguments speak to scale, since a platform must exist at population level to be available, while the bonding-versus-bridging tension speaks to intensity (Putnam 2000; Woolcock and Narayan 2000). Testing all of them against one measure requires a single result to justify claims about different dimensions. Separating the dimensions lets each mechanism be tested against the variable it implies, which is what the six hypotheses in Section 2.4 do and what the specifications in Section 3.5 formalize (we also set out why the two cannot simply be entered jointly).

1.3 Outline

The paper follows several analytical steps, only loosely sequential. (1.) The analysis begins by constructing separable composite indices of spiritual, moral, and relational capital at the country level from curated World Values Survey (WVS) item batteries (Waves 6 and 7) using principal component analysis (PCA) with PCA-based imputation. Indices are rescaled to a 0-to-100 scale, with PC1 accounting for 87.0, 75.2, and 57.6 percent of total item variance respectively. (2.) It then merges three sources that have rarely been combined at this level: the WVS for the capital indices, the SYC for Catholic institutional accounting, and World Bank Open Data for economic and demographic covariates. (3.) Working with the merged data, the analysis decomposes Catholic institutional presence into a scale dimension (density relative to the total population) and an intensity dimension (number of clergy relative to the Catholic community) and (4.) find that the two carry opposite implications for the three forms of capital. (5.) For causal identification, we use three nested instrument sets built from historical and confessional-state variables. Because the core instruments are measured largely at or before 1900, they are pre-treatment relative to recent secularization trends, and they address the endogeneity of present-day Catholic presence to the same forces that shape contemporary social capital.

The remainder of the paper is organized as follows. Section 2 develops the theoretical framework and derives six directional hypotheses. Section 3 describes the data, the construction of the PCA-based indices, the Catholic scale and intensity variables, the ten historical instruments, and the OLS and 2SLS strategies. Section 4 presents empirical results. Section 5 discusses three cross-cutting patterns. Section 6 concludes. Appendices A, B, and C provide methodological details, variable documentation, and robustness checks, and Appendix D collects supplementary materials.

2. THEORETICAL BACKGROUND AND HYPOTHESES

Several theoretical traditions are relevant to understanding the phenomena at the core of this analysis, and we keep them distinct because of their different, sometimes opposing, claims. The first, the secularization thesis, holds that economic modernization erodes aggregate religiosity,

with cross-national religiosity gradients reflecting income and existential security more than features of religious institutions (Norris and Inglehart 2011; Inglehart 2021). The second, the supply-side or religious economies tradition, reverses that emphasis and argues that religious vitality is sustained by the activity and competitive density of religious suppliers rather than by the structural conditions of their audiences (Stark and Finke 2000; Iannaccone 1994); Seabright (2024) gives the argument its most recent and general form, treating religious movements as platforms that compete for members and whose reach depends on the terms of participation they offer. The two traditions are opposed rather than continuous: one locates the drivers of religiosity in the demand-side conditions of populations, the other in the supply-side conduct of institutions. A third tradition treats religion as a moral commitment device: shared beliefs and ritual practice produce internalized norms of civic conduct (Fukuyama 1995; Tabellini 2008; Guiso, Sapienza, and Zingales 2003), and dense organizational engagement reinforces them through repeated interaction and mutual monitoring (Iannaccone 1994; Berman 2000). A fourth treats religious organizations as social infrastructure: an insight that goes back to Tocqueville's ([1835] 2000) account of how religious association underpins civic life, and that modern work develops into a whole tradition claiming that parishes, schools, hospitals, and voluntary associations supply the platform on which trust, civic participation, and bridging social capital are built (Putnam 2000; Putnam and Campbell 2010; Woolcock and Narayan 2000).

These distinct traditions map onto the three capital dimensions in a way that lets us derive testable predictions for each. The secularization and supply-side traditions both bear on Spiritual Capital, since both concern the conditions under which formal religious practice grows or declines, but they do so through different channels that the scale-intensity distinction separates: secularization speaks to scale, supply-side vitality to intensity. The club-good and moral-commitment tradition asks how religious organizations solve collective-action problems and inculcate norms, and maps onto Moral Capital. The social-capital and infrastructure tradition traces how religious institutions supply the platforms, networks, and civic habits that generate trust and engagement, and bears most directly on Relational Capital. In each case we argue that the Catholic Church's effect on the relevant outcome works through two analytically distinct channels, the scale of institutional presence and the intensity of pastoral engagement.

The findings of cross-national studies do not always agree with the strong theoretical claims in the literature. The supply-side prediction that religious pluralism raises participation is the clearest case. After a decade of tests pointing in both directions, a review of 26 published articles concluded that the association does not hold in any general sense (Chaves and Gorski 2001), and Voas, Olson, and Crockett (2002) then showed that most of the 193 estimates in that literature reflected a mathematical property of the pluralism index rather than a substantive effect. Evidence on the demand side is similarly uneven: multilevel analysis of 60 countries finds religious regulation and existential insecurity to be strong predictors of attendance while education effects are small (Ruiter and van Tubergen 2009), and the United States, long treated as the decisive counterexample to secularization, turns out to follow the same generational

pattern of decline as other Western societies once trends rather than levels are examined (Voas and Chaves 2016). The economics of religion displays comparable fragility, with a reexamination of Barro and McCleary's (2003) growth findings judging them replicable but potentially sensitive to model specification (Durlauf, Kourtellos, and Tan 2012).

2.1 Spiritual Capital: Legacy, Secularization, and Supply-Side Vitality

Spiritual Capital indexes the aggregate religiosity of a national population: the share that holds core religious beliefs, assigns importance to God and to religion in daily life, and expresses confidence in the churches. It is the stock of active religious orientation at the country level, independent of any denominational content (Woolcock and Narayan 2000; Barro and McCleary 2003). The term spiritual capital itself has earlier usage in the economics of religion literature, where Iannaccone and Klick (2003) treat it as an individual-level stock of religious knowledge, ritual practice, and denominational attachment that yields spiritual returns. Our operationalization differs in two ways. We treat the construct at the country rather than the individual level, and we restrict it to its attitudinal core (belief, salience, and institutional confidence) rather than to denomination-specific knowledge. For our purposes the index is theoretically measuring the height of the aggregate religious signal, not its confessional shape, although it retains some western-based features related to the World Values Survey design as discussed below.

Although WVS-based spirituality measures may have limited cross-cultural equivalence particularly in East Asian contexts, where conventional indicators can reflect Western/monotheistic conceptions of religion (Höllinger & Eder, 2016) they remain useful for broad comparative analyses. This is especially appropriate when the indicator is treated as an operational measure rather than a culturally neutral measure of spirituality, and its cross-national comparability is interpreted cautiously (Remizova, Rudnev, & Davidov, 2024). The concern is more specific to religious/spiritual measures than to moral and social value items, for which the same Western-religion bias has not been identified as a central problem.

The dominant account of cross-national variation in this stock remains the secularization thesis. On its strong version, economic modernization erodes popular religiosity through a cluster of reinforcing pathways: rising material security reduces existential uncertainty, rational bureaucracy displaces supernatural explanations, and pluralist education undermines doctrinal authority (Norris and Inglehart 2011). Inglehart's (2021) updated longitudinal evidence makes the case sharply, with aggregate religiosity declining steeply in the wealthiest societies since the mid-twentieth century while remaining stable or rising in low-income countries with high survival insecurity. Applied to a contemporary cross-section like ours, the logic predicts a negative association between Catholic institutional presence and Spiritual Capital, and it does so for a reason that is specific to how institutional presence is measured.

The Statistical Yearbook counts a stock (dioceses, parishes and other pastoral centers, incardinated clergy) that is accumulated over centuries and depreciates slowly, whereas the

Spiritual index measures current belief. Where secularization has advanced furthest, the inherited stock outlives the practice that built it, and a cross-section observes the two together at the same date. What the scale coefficient should recover is therefore a legacy correlation rather than the production of current pastoral activity. Because this is the one sign in the paper that no single tradition delivers on its own, we set out the legacy account in full in Section 5.1. Moreover, the clergy counts reported in the Statistical Yearbook of the Church do not distinguish active from retired priests, so in long-established Catholic majorities with ageing clergy the intensity variable may partly capture pastoral overhead rather than active pastoral effort, attenuating or even reversing its expected sign. We cannot separate the two here, but a natural check is the Yearbook's count of seminarians, which proxies the active pastoral workforce.

The supply-side or religious economies model offers a sharply different reading (Stark and Finke 2000). On this view, religious vitality is not eroded by modernization but actively produced by competitive religious markets and by the density and effort of religious suppliers. Iannaccone (1994) extends the same logic to congregational strictness: organizations that impose high membership costs screen out free riders, concentrate engagement on committed members, and raise average religious practice. This could be broadly captured by our intensity setting. However, the intensity signal could prove context-contingent, since it is a ratio between two catholic-derived variables while the capital indexes result from nation-wide surveys affected by the western-bias discussed above.

2.2 Moral Capital: Substitution, Club Goods, and the Commitment Device

Moral Capital captures aggregate societal norms: the extent to which populations regard tax evasion, benefit fraud, fare avoidance, and unlawful rule breaking as unjustifiable. It is a construct of generalized civic morality that reaches beyond intra-group solidarity to obligations toward anonymous third parties and the state (Fukuyama 1995; Tabellini 2008; Guiso et al. 2003). Our construction follows closely the prior cross-national measurement of civic values in the literature: Tabellini (2008) and Guiso, Sapienza, and Zingales (2003) build country-level indices from analogous WVS justifiability and trust items, and we treat our index as a natural extension of their measurement strategy to a Catholic-presence research design. The interpretation we attach to it is the same as in that literature; the novelty of our use is the systematic comparison against Catholic scale and intensity rather than against the more usual cultural or institutional regressors.

The primary mechanism linking Catholic institutional presence to this construct at scale is substitution (Norris and Inglehart 2011). Religious participation is elevated where existential insecurity and weak state capacity compensate for inadequate public provision. High Catholic density at the national level is then itself a symptom of an institutional environment that depresses civic norms. The Catholic institution acts as a substitute that thrives precisely where state-backed moral infrastructure is weakest, not as a generator of the trust and rule-following dispositions that strong institutions cultivate. Alesina and Giuliano (2015) document that strong

family ties and informal social structures (both correlated with high religious involvement) are inversely correlated with generalized civic norms. Catholic density at scale should therefore be associated with lower Moral Capital.

The prediction reverses when we turn from scale to intensity. Iannaccone's (1994) club-good theory holds that strict religious organizations solve the free-rider problem by demanding costly signals of commitment: attendance, behavioral restrictions, and adherence to norms that make defection visible and sanctioned. Members who accept these costs sort themselves into a high-commitment equilibrium in which cooperative norms are maintained through repeated interaction, mutual monitoring, and the threat of social exclusion (Berman 2000; Tabellini 2008). What clergy intensity captures, on this reading, is the institutional capacity to drive these environments. At high clergy-to-Catholic ratios, dense pastoral staffing supports the conversion of formal membership into internalized civic norms. We could therefore expect intensity to be associated with higher Moral Capital even where scale depresses it.

2.3 Relational Capital: Social Infrastructure, Bonding, and Bridging

Relational Capital indexes a society's stock of social tolerance, out-group trust, and associational engagement. This composite captures what Putnam (2000) calls social capital broadly construed. According to Putnam (2000) and Woolcock and Narayan (2000), we can distinguish two analytical components: bonding capital (dense ties within homogeneous groups) and bridging capital (weak ties across group boundaries). The Relational Capital index constructed here loads most heavily on out-group tolerance and out-group trust items, making it primarily a tolerance-led measure of bridging capital.

Putnam (2000) and Putnam and Campbell (2010) treat organized religion as a primary generator of social capital. The argument is that congregational membership supplies an associational platform, a stock of reciprocity norms, and the habit of voluntary collective action on which civic life rests. For our purposes, the mechanism runs through the scale of religious infrastructure. Parishes and community centers operated by Catholic pastoral networks function as a form of social infrastructure, providing meeting points, collective projects, and occasions for trust-building across population segments. Where Catholic presence is denser relative to the national population, this platform is available to a larger share of citizens, and aggregate Relational Capital should be correspondingly higher.

Intensity, however, introduces a countervailing mechanism. High clergy-to-Catholic ratios indicate settings in which the pastoral workforce is concentrated on a relatively small Catholic community, and where the Church's activities could turn inward toward tight, well-supervised groups rather than outward toward the wider society. Putnam (2000) himself is careful on this point: religious social capital, he warns, can be of the bonding rather than the bridging variety, fostering within-group solidarity while reinforcing the boundaries that separate the in-group from outsiders. If that is right, high clerical intensity should strengthen within-Catholic networks at the expense of non-Catholic neighbors and institutions, lowering social aggregates.

2.4 Hypotheses

The accounts above yield six directional predictions, stated in terms of the variables defined in Section 3.3. The Catholic scale variables are log Catholics per million, log pastoral centers per million, and log apostolic workforce per million; the intensity variable is log clergy per thousand Catholics.

Hypothesis	Sign
H1a (Spiritual, scale). Higher Catholic institutional density relative to total population is associated with lower Spiritual Capital, controlling for log GNI per capita (legacy correlation amplified by the secularization gradient).	-
H1b (Spiritual, intensity). Higher clergy per thousand Catholics is associated with higher Spiritual Capital, (excluding Asian societies) (supply-side vitality).	+
H2a (Moral, scale). Higher Catholic institutional density relative to total population is associated with lower Moral Capital (substitution / field hospital).	-
H2b (Moral, intensity). Higher clergy per thousand Catholics is associated with higher Moral Capital (club-good enforcement).	+
H3a (Relational, scale). Higher Catholic institutional density relative to total population is associated with higher Relational Capital (social infrastructure platform).	+
H3b (Relational, intensity). Higher clergy per thousand Catholics is associated with lower Relational Capital (bonding crowds out bridging).	-

Sign predictions apply to all scale regressors (Catholics per million, pastoral centers per million, clergy workforce per million). Intensity refers to clergy per thousand Catholics.

3. DATA AND METHODS

3.1 Sources and Sample

The overall analysis is intended as a pilot methodology that integrates different data sources. It therefore focuses on a limited time period and a viable sample of approximately 60 countries. The analysis draws on four complementary sources. Individual-level attitudinal data come from Waves 6 and 7 of the World Values Survey (Inglehart et al. 2014; Haerpfer et al. 2022), which together cover roughly 2010 to 2022. Country-level economic indicators, including Gross National Income (GNI) per capita using the Atlas method and total population, are drawn from World Bank Open Data (World Bank 2024). Institutional Catholic presence data for 2016 to 2023 come from the Statistical Yearbook of the Church (Segreteria di Stato, Ufficio Centrale di Statistica della Chiesa 2016-2023; hereafter SYC). Historical instruments come from an original dataset assembled for this study (see appendix B), which records ten country-level religious and political indicators spanning 1900 to 2000.

The unit of observation is the country at its latest available year. Merging the WVS capital indices with the SYC institutional variables and the World Bank controls yields a baseline cross-sectional sample of n = 58 countries for OLS estimation. Dropping the four countries for which at least one historical instrument is missing reduces the IV sample to n = 54. Two countries are excluded uniformly across all three capital indices because their Catholic communities are vanishingly small (on the order of one thousand total Catholics each) and producing statistical outlier values. Spiritual, Moral, and Relational scores are therefore defined over an identical set of country-wave observations before the cross-sectional aggregation step. Cross-national survey data such as the WVS also exhibit substantial heterogeneity in data quality and representativeness across countries (Glas and Kostenko 2024); observations from countries with documented quality concerns are treated with caution.

3.2 Capital Indices

Three composite indices operationalize Spiritual, Moral, and Relational Capital at the country level. Each index is the first principal component (PC1) extracted from a curated battery of WVS items, linearly rescaled to [0, 100] so that higher values denote more of the theoretical construct. Because PC1 is required to carry the majority of the shared variance in the item battery, this rescaling preserves the latent structure identified by the decomposition while leaving coefficients directly interpretable. Table 1 lists the WVS item codes and substantive content for each capital domain.

Table 1. WVS item batteries by capital domain.

Capital	WVS items (raw codes)	Substantive content
Spiritual	F050-F055, F057, F059-F060, F062-F067, A006, E069_01	Belief in God, the soul, heaven, and hell; importance of God and of religion in life; confidence in the churches
Moral	F114A, F114B, F114D, F115-F117, F125, F127, F129-F130, F139-F140, F142; A193, A196, A197	Justifiability of dishonest or antisocial acts (1-10 scale, reversed); Schwartz universal values (candidates only)
Relational	A001, A002, A007, A013, A041, A064-A106C series, A124_02, A124_06, A124_12, A124_16, A124_43, G007_01, G007_18_B, G007_33_B-G007_36_B	Out-group tolerance (neighbour items); trust in out-groups and first acquaintances; membership in church or religious organizations; voluntary work (candidate pool)

Note: Full variable descriptions and coding rules are reported in Appendix B (Table B.1).

Individual responses are first standardized to the unit interval for each item (details in Appendix A), then aggregated to country-wave means. Items with more than 50 percent of country-wave means missing, and items with zero variance across the analytic sample, are excluded prior to the PCA step. Remaining missing country-wave means at the aggregated level are imputed using PCA-based (Josse and Husson 2016), which iteratively estimates missing values from the

principal component structure. This is the only PCA construction used in the paper; the formal specification, variance share statistics, and orientation convention are reported in Appendix A.

The Spiritual Capital index draws on 17 raw WVS items. After applying missingness and variance filters, 7 items are retained, and PC1 explains 87 percent of their shared variance. The Moral Capital index is built from 13 ethical-judgment items in the WVS Justifiability battery and three Schwartz universal-values items. Four items survive the filters and PC1 captures 75 percent of shared variance. The Relational Capital index starts from a wide candidate pool of raw WVS items spanning organizational membership, voluntary work, out-group tolerance, and interpersonal trust, distilled to an eight-variable PCA input. Seven items are retained after filtering, and PC1 accounts for 58 percent of their shared variance.

3.3 Catholic Scale and Intensity Variables

The SYC provides annual counts of Catholic population, pastoral infrastructure, and apostolic personnel for each ecclesiastical territory. After mapping territories to sovereign countries, the analysis uses three categories of right-hand-side variable.

Scale variables capture the density of Catholic presence relative to the total national population (per million people). Three measures are used: Catholics per million (log-transformed), constructed as thousands of Catholics in the SYC multiplied by 1,000 and divided by total population; pastoral centers per million (log-transformed), defined as total pastoral centers and quasi-parishes divided by total population; and apostolic workforce per million (log-transformed), computed for three nested aggregates. Workforce 1 comprises clergy only (bishops, diocesan priests, and religious priests). Workforce 2 extends Workforce 1 by adding permanent deacons and male and female professed religious. Workforce 3 further adds lay members of secular institutes, lay missionaries, and catechists. The intensity variable captures the density of apostolic personnel relative to the Catholic community itself rather than to the general population. It is defined as total clergy per 1,000 Catholics (log-transformed Workforce1) and measures how well-staffed a community is, independently of its national size.

3.4 Historical Instruments

To address the likely endogeneity of contemporary Catholic presence to unobserved national characteristics correlated with immaterial stocks, the study uses ten historical and institutional instruments. The instruments are organized into three nested sets of increasing size, summarized in Table 2.

Table 2. Nested historical instrument sets.

Set	n	Instruments
A1 (minimal)	3	State Religion 1900; Iberian Colony; pct Catholics 1900
B1 (historical)	6	A1 + State Regulation; Year First Evangelization; Historical Religious Orders

Set	n	Instruments
C1 (full)	10	B1 + State Religion 1970; State Religion 2000; pct Catholics_2000; Religious Pluralism 2000

Note: n denotes the number of instruments in the set. All sets are nested.

The minimal set A1 contains three instruments. State Religion 1900 is an indicator equal to one if Catholicism was the legally established state religion in 1900, capturing pre-democratic confessional arrangements that shaped Catholic institutional entrenchment over the long run. Iberian Colony equals one for countries colonized by Spain or Portugal, whose missionary systems imposed a Catholic institutional template that persists in contemporary ecclesiastical geography. Pct Catholics 1900 records the percentage of the national population that was Catholic in 1900, a pre-modern baseline reflecting centuries of evangelization prior to the dramatic institutional changes of the twentieth century.

The historical set B1 adds three instruments. State Regulationis an ordinal index measuring early twentieth-century state regulation of religious institutions, with higher values indicating more restrictive regimes. Year of First Evangelization records the year in which Catholic missionary activity was first documented, proxying the historical depth of Catholic institutional presence. Historical Religious Orders is a binary indicator for the presence of historically established Catholic religious orders (Dominicans, Franciscans, Jesuits, and comparable congregations) during the colonial or early modern period.

The full set C1 adds four further instruments. State Religion 1970 and State Religion 2000 extend the confessional-state indicator to later reference years. Pct Catholics 2000 provides an intermediate Catholic population share at the turn of the millennium. Religious Pluralism 2000 is a fractionalization index measuring the effective number of religious traditions present in 2000.

The exclusion restriction requires that these instruments affect contemporary social capital only through their effect on present-day Catholic presence. This is plausible on several grounds. The core instruments in A1 and the additional instruments in B1 are all measured at 1900 or earlier, predating the principal social transformations of the twentieth century (mass education, welfare-state expansion, democratization) that directly shaped contemporary social capital. The C1 set includes instruments dated 1970 and 2000, which are chronologically closer to the outcome; over-identification tests are reported for all specifications and serve as the primary diagnostic for the plausibility of the exclusion restriction. Colonial and confessional history plausibly shapes contemporary outcomes through channels other than Catholic presence (legal origins, educational systems, state capacity), and over-identification tests can detect only relative, not absolute, violations. We therefore read the 2SLS estimates in the spirit of Barro and McCleary (2003): as directional confirmation that the OLS patterns are not artefacts of reverse causality or simultaneity, rather than as precise structural point estimates.

3.5 Estimation Strategy

Our empirical strategy proceeds in three connected stages, moving from descriptive baselines to a causal specification. All estimates are cross-sectional, using the latest available year for each country after merging the WVS, SYC, and World Bank sources. The right-hand-side variables of primary interest are the Catholic scale and intensity measures from Section 3.3, all entered in natural logarithm to reduce skewness and to allow coefficients to be read as semi-elasticities.

The estimation therefore rests on five specifications, applied uniformly across the three capitals. Specification 1 (Baseline) regresses the capital index on log GNI per capita alone, establishing the income gradient. Specification 2 (Scale) adds a log Catholic scale variable per million people, run for each of the five scale aggregates (Catholics, pastoral centers, and workforce 1-3), yielding 15 scale regressions. Specification 3 (Intensity) uses log clergy per thousand Catholics, controlling for GNI, for a further three regressions. Specification 4 (Dependency) is the pooled Asia-vs-rest-of-the-world interaction model on the intensity variable. Specification 5 (IV) instruments the endogenous Catholic-presence variables with the three nested historical sets and reports 2SLS coefficients with their diagnostic battery. Compactly, for country i, these correspond to equations (1) through (5b) below:

$$Capital_i = \alpha + \beta_1 \log(GNI_i) + \varepsilon_i \quad (1)$$

$$Capital_i = \alpha + \beta_1 \log(Scale_i) + \beta_2 \log(GNI_i) + \varepsilon_i \quad (2)$$

$$Capital_i = \alpha + \beta_1 \log(ptC_i) + \beta_2 \log(GNI_i) + \varepsilon_i \quad (3)$$

$$Capital_i = \alpha + \beta_1 \log(ptC_i) + \beta_2 Region_i + \beta_3 [\log(ptC_i) \times Region_i] + \beta_4 \log(GNI_i) + \varepsilon_i \quad (4)$$

$$Scale_i = \pi_0 + \pi_1 Z_i + \pi_2 \log(GNI_i) + \nu_i \quad (5a)$$

$$Capital_i = \alpha + \beta_1 Scale_i + \beta_2 \log(GNI_i) + \varepsilon_i \quad (5b)$$

Equations (2) and (3) are by construction projections of the same underlying institutional arithmetic onto two different sides. Given P: priests, N: population, C: Catholics we can define the identity identity log(P/N) = log(P/C) + log(C/N). A hypothetical single regression including both dimensions, equation (6), can therefore be rewritten, using the identity, as equation (7):

$$Capital_i = \alpha_0 + \alpha \log(P/N)_i + \beta \log(P/C)_i + \delta \log(GNI_i) + \varepsilon_i \quad (6)$$

$$Capital_i = \alpha_0 + (\alpha + \beta) \log(P/N)_i - \beta \log(C/N)_i + \delta \log(GNI_i) + \varepsilon_i \quad (7)$$

Equation (7) makes explicit that the coefficient on log(C/N) (Catholic share of the population) is the sign-flipped intensity coefficient. Using raw workforce counts without normalizing by the Catholic population can conflate the two dimensions and hides the sign reversal that Sections 4.3 and 4.4 recover. Estimating scale and intensity separately is the operational way to make the decomposition visible; the two sets of coefficients we report speak, together, to how much of the estimated relationship runs through the scale of the Catholic footprint and how much through the intensity of its pastoral engagement. A single regression that includes both log(P/N) and log(P/C)

simultaneously is, in principle, the more general specification, but in practice the two regressors are highly correlated by construction. Each univariate regression captures only one slice of what is, algebraically, a single two-dimensional relationship, but taken together the two specifications recover a sign pattern that the collinear joint model cannot isolate on its own. [2]

We begin with OLS baselines. For each capital we first regress on log GNI per capita and then add each Catholic presence variable in turn while keeping GNI as a control. Repeating this across all five scale measures and the intensity measure produces a grid of baseline estimates that maps the income-adjusted association between Catholic presence and each capital outcome.

The second stage takes the regional heterogeneity that Section 2.1 flagged as theoretically important and tests it directly. We therefore estimate, for each capital, a split-sample regression on log clergy per thousand Catholics with GNI as control, separately for Asia (South Asia together with East Asia and Pacific in the World Bank classification) and for the Rest of the World. We then run a pooled interaction model that includes an Asia indicator and its product with the intensity variable, which lets us read off whether the regional difference in slopes is statistically distinguishable.

The third stage confronts the endogeneity problem head-on. Current Catholic institutional density is plausibly co-determined with the very social-capital outcomes it is hypothesised to produce: the same countries that find it easy to sustain dense pastoral networks may, for unrelated historical reasons, also find it easy to sustain trust and civic engagement. OLS estimates are biased in an unknown direction under that scenario. We therefore turn to two-stage least squares (2SLS) using the historical instruments described in Section 3.4. We instrument four endogenous regressors in turn: log pastoral centers per million, log Catholics per million, log total clergy workforce per million (Workforce 1), and log clergy per thousand Catholics. Each endogenous variable is run against each of the three nested instrument sets, yielding twelve first-stage regressions per capital and 36 in total. GNI per capita enters every IV specification as an exogenous covariate.

The credibility of each IV specification rests on four standard diagnostics, which we report alongside every estimate. The first-stage F-statistic tests instrument relevance, with the conventional weak-instrument threshold at $F = 10$ (Stock and Yogo 2005). The Sargan over-identification test (Sargan 1958), applicable whenever the number of instruments exceeds the number of endogenous regressors, examines whether the excluded instruments are jointly orthogonal to the second-stage residuals under the maintained assumption that at least one instrument is exogenous; it is not a direct test of instrument exogeneity, and a non-rejection should be read as consistency with the exogeneity restriction rather than as proof of it. The Wu-

[2] Estimating them jointly produces coefficients that are unstable across specifications and difficult to interpret individually, a symptom of near multicollinearity: the joint model typically remains significant even as the individual scale and intensity coefficients lose precision or shift in magnitude. This is the formal justification for running scale and intensity as separate univariate specifications.

Hausman endogeneity test (Hausman 1978) asks whether the OLS and IV estimates differ significantly and thus provides a check on whether the endogeneity bias we worry about is empirically large. Finally, the Anderson-Rubin reduced-form F statistic (Anderson and Rubin 1949) gives a weak-instrument-robust identification signal that is useful precisely in the rows where the first-stage F is borderline. The pattern across all four diagnostics is summarized in Section 4.6; the full battery for all 36 specifications is tabulated in Appendix C (Table C.2).[3]

4. RESULTS

4.1 PCA Diagnostics and Index Construction

Table 3 reports the PC1 loadings for items retained after the missingness and variance filters, arranged by capital. Across all three indices the first principal component captures a substantial majority of the shared variance, which satisfies the criterion we want from a composite: it represents a single dominant latent dimension.

For Spiritual Capital, 7 of the 17 candidate items survive the 50 percent missingness threshold. PC1 has a standard deviation of 2.467 and explains 87.0 percent of total item variance, and all seven retained items load positively and with nearly equal weight (range 0.339 to 0.396). The composite is therefore close to an equally weighted sum of belief in heaven (F054), the importance of religion in one's life (A006), the importance of God (F063), belief in hell (F053), belief in a soul (F051), belief in God (F050), and confidence in the churches (E069_01): a battery in which core supernatural beliefs, subjective religious salience, and institutional trust in the Church move together as one latent dimension.

For Moral Capital, only 4 items survive filtering from an initial battery of 16, but they load tightly: PC1 has a standard deviation of 1.735 and explains 75.2 percent of variance, carried by four WVS justifiability items (claiming government benefits to which one is not entitled, F115; avoiding a fare on public transport, F116; cheating on taxes, F117; accepting a bribe, F114A).

For Relational Capital the picture is more multidimensional, as the theoretical construct suggests it should be. Seven items are retained from the eight-variable PCA input, itself distilled from a much wider candidate pool spanning organizational membership, voluntary work, tolerance, and trust. PC1 has a standard deviation of 2.008 and explains 57.6 percent of variance. The four A124 out-group tolerance indicators anchor the component (loadings 0.440 to 0.477), followed by trust in people of another religion (G007_35_B, 0.279) and membership in a church or religious organization (A098, 0.190), while trust in people met for the first time (G007_18_B) loads negatively (-0.180), moving inversely to the tolerance-led common factor.

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[3] Throughout, heteroscedasticity-consistent standard errors are used in OLS regressions. Standard errors in IV regressions are heteroscedasticity-robust. Statistical analysis was conducted in R using the ivreg function in the AER package (Kleiber and Zeileis 2008) for 2SLS estimation and the missMDA package (Josse and Husson 2016) for PCA-based imputation. Replication code and intermediate datasets are available from the author on request.

Table 3. PC1 loadings for retained items, by capital.

Code	Short Label	Capital	PC1 Loading	Item Content
F054	Belief in heaven	Spiritual	0.396	Do you believe in heaven? (binary)
A006	Importance of religion	Spiritual	0.391	How important is religion in your life? (1-4, reversed)
F063	Importance of God	Spiritual	0.390	How important is God in your life? (1-10, rescaled)
F053	Belief in hell	Spiritual	0.382	Do you believe in hell? (binary)
F051	Belief in a soul	Spiritual	0.375	Do you believe in a soul? (binary)
F050	Belief in God	Spiritual	0.370	Do you believe in God? (binary)
E069_01	Confidence in churches	Spiritual	0.339	Confidence in the churches (1-4, reversed)
F115	Benefit fraud	Moral	0.530	Justifiability: claiming government benefits not entitled to (reversed)
F116	Fare evasion	Moral	0.508	Justifiability: avoiding a fare on public transport (reversed)
F117	Tax cheating	Moral	0.500	Justifiability: cheating on taxes if you have a chance (reversed)
F114A	Bribe acceptance	Moral	0.459	Justifiability: someone accepting a bribe (reversed)
A124_02	Tolerance: different race	Relational	0.477	Would not like as neighbours: people of a different race (reversed)
A124_12	Tolerance: heavy drinkers	Relational	0.469	Would not like as neighbours: heavy drinkers (reversed)
A124_43	Tolerance: drug addicts	Relational	0.461	Would not like as neighbours: drug addicts (reversed)
A124_06	Tolerance: immigrants	Relational	0.440	Would not like as neighbours: immigrants / foreign workers (reversed)
G007_35_B	Trust: another religion	Relational	0.279	Trust in people of another religion (1-4, reversed)
A098	Religious org. membership	Relational	0.190	Active or inactive membership in church or religious organization (0-2)

Code	Short Label	Capital	PC1 Loading	Item Content
G007_18_B	Trust: first acquaintance	Relational	-0.180	Trust in people you meet for the first time (1-4, reversed)

Note: PC1 standard deviation and variance share by panel: Spiritual SD = 2.467, share = 0.870; Moral SD = 1.735, share = 0.752; Relational SD = 2.008, share = 0.576. Positive loadings denote higher religiosity, greater civic honesty, or higher relational engagement. Source: authors' calculations on WVS.

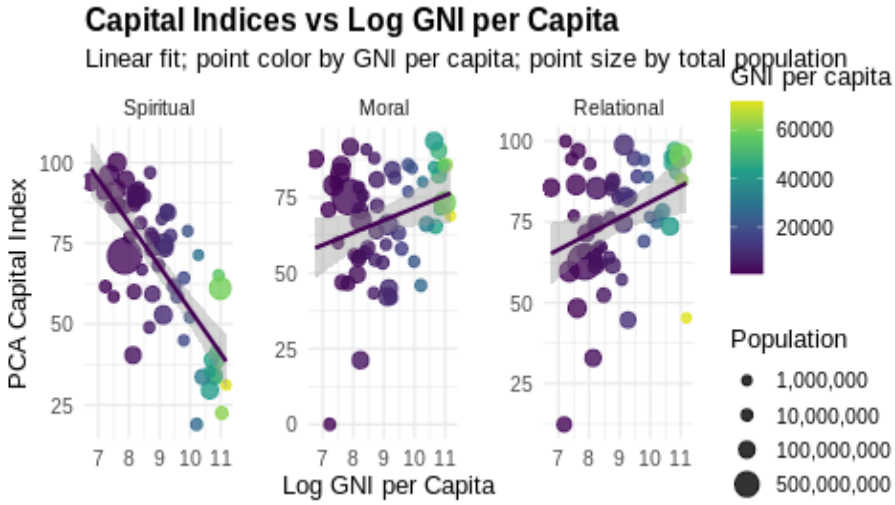


Figure 1. Capital Indexes vs Log GNI per Capita (n = 58). Point size is proportional to total population; color by GNI level. The negative Spiritual slope and the positive Moral and Relational slopes are visible. Source: authors' calculations on WVS, SYC, and World Bank data.

4.2 OLS Baselines: Capital Indices and Income

Table 4. Bivariate OLS regressions of each capital index on log GNI per capita.

	Spiritual Capital	Moral Capital	Relational Capital
Specification	PCA ~ log GNI	PCA ~ log GNI	PCA ~ log GNI
log GNI per capita	-13.503***	4.097*	4.919*
	(1.658)	(1.974)	(1.861)
R-squared	0.542	0.071	0.111

Note: Standard errors in parentheses. Intercepts not reported. Source: authors' calculations on WVS and World Bank data.

Table 4 presents the bivariate OLS regression of each capital index on log GNI per capita. The direction of the GNI association is negative for Spiritual Capital and positive for both Moral and

Relational Capital, which replicates at the cross-national level the well-known secularization gradient on the one hand and the equally familiar positive association between development and civic norms on the other. The magnitude of the Spiritual gradient is by far the largest in absolute terms: a one-unit increase in log GNI per capita is associated with a 13.5-point decline on the 0-to-100 index (SE = 1.66, $p < 0.001$, R-squared = 0.542). The corresponding Moral and Relational coefficients are 4.10 (SE = 1.97, $p = 0.043$, R-squared = 0.071) and 4.92 (SE = 1.86, $p = 0.011$, R-squared = 0.111). GNI alone explains more than half the cross-national variance in Spiritual Capital but only a modest fraction of the Moral and Relational variance, which is itself informative: income-development accounts are considerably less complete for the latter two dimensions, leaving substantial room for the institutional variables we turn to next.

4.3 Scale Regressions: Catholic Presence and Apostolic Workforce

Table 5. OLS scale regressions: Catholic presence and apostolic workforce, controlling for log GNI per capita.

Endogenous variable	**Spiritual**	**Moral**	**Relational**
Pastoral centers per million (log)	-2.98** (0.975)	-2.90* (1.15)	4.16*** (1.04)
	R-sq = 0.596	R-sq = 0.194	R-sq = 0.293
Catholics per million (log)	-2.04* (0.816)	-2.62** (0.929)	3.38*** (0.851)
	R-sq = 0.575	R-sq = 0.215	R-sq = 0.290
Clergy workforce per million (log)	-3.04** (1.09)	-3.30* (1.26)	3.42** (1.22)
	R-sq = 0.586	R-sq = 0.200	R-sq = 0.201
Clergy + religious per million (log)	-3.05** (1.11)	-3.33* (1.29)	3.27* (1.25)
	R-sq = 0.584	R-sq = 0.199	R-sq = 0.189
Apostolic workforce, full (log)	-1.75. (0.931)	-2.67* (1.05)	3.10** (0.993)
	R-sq = 0.555	R-sq = 0.196	R-sq = 0.225

Note: OLS coefficients on the scale regressor with standard errors in parentheses; log GNI per capita is included in all specifications. n = 58 in every row. Source: authors' calculations on WVS, SYC, and World Bank data.

Adding the log Catholic scale variables and log GNI per capita jointly to the model reveals a consistent and statistically significant negative association between Catholic presence and Spiritual Capital, an equally robust positive association with Relational Capital, and a negative-but-smaller association with Moral Capital. For log pastoral centers per million, the Spiritual Capital coefficient is -2.98 (SE = 0.975, $p = 0.003$), which is to say that countries with denser parish infrastructure score systematically lower on aggregate religiosity once we condition on

income. Moral Capital moves in the same direction at -2.90 (SE = 1.15, p = 0.015), though with a slightly noisier estimate. Relational Capital, in contrast, rises with pastoral density: the coefficient is 4.16 (SE = 1.04, p < 0.001.

These patterns hold across all three workforce aggregates, though the magnitude moves modestly as the workforce broadens from clergy alone (Workforce 1) to the full apostolic community including lay missionaries and catechists (Workforce 3). Appending deacons and professed religious to the clergy core does not materially change the sign or significance of the estimates; adding lay personnel in Workforce 3 attenuates the Spiritual and Moral coefficients somewhat (Spiritual: -1.75, SE = 0.931, p = 0.065; Moral: -2.67, SE = 1.05, p = 0.014) while leaving Relational Capital positive and significant (3.10, SE = 0.993, p = 0.003). Figure 2 plots the three capitals against clergy density per million (Workforce 1); supplementary plots for the other scale variables are in Appendix D.

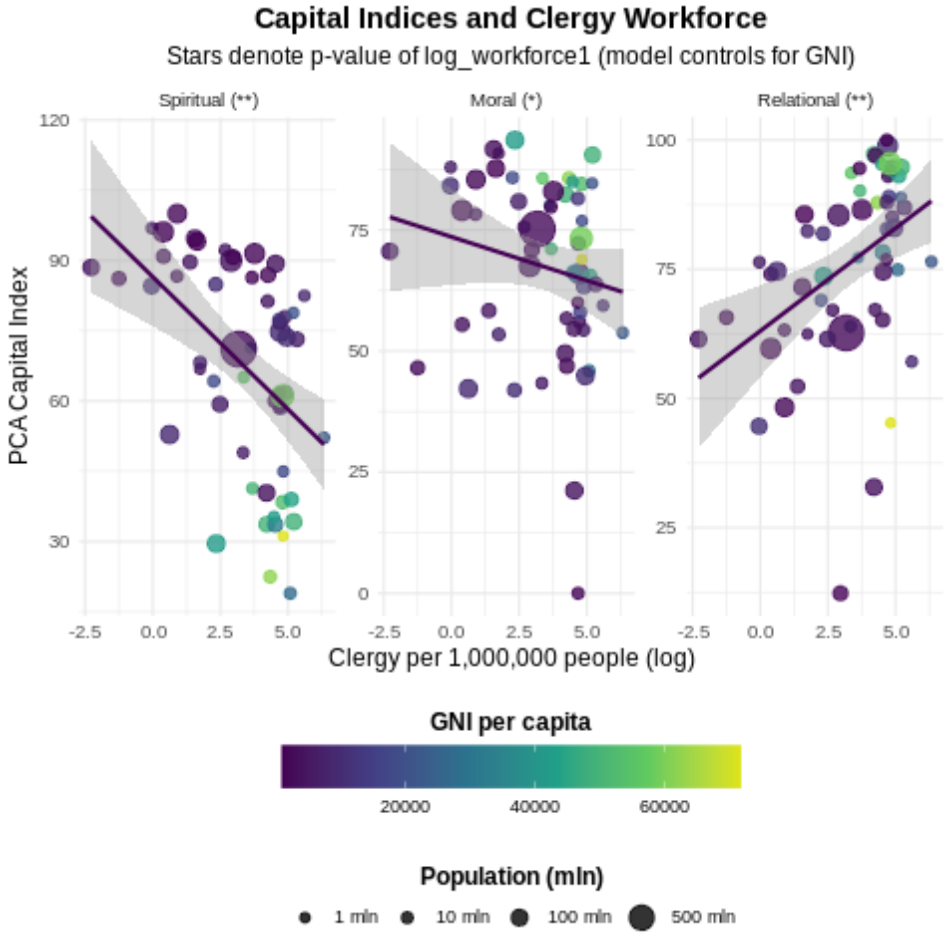


Figure 2. Capital Indices and Clergy Workforce per Million (Workforce 1). Three-panel scatter for Spiritual (left), Moral (center), and Relational (right). Stars in the facet labels denote the p-value of log clergy workforce per million in the GNI-adjusted regression. Source: authors' calculations on WVS, SYC, and World Bank data.

4.4 Intensity Regressions: Clergy per Catholic

Moving from scale to intensity completes the picture, and it does so with a systematic reversal of sign relative to the scale results in Section 4.3. Once we condition on GNI, log clergy per 1,000 Catholics is positively associated with Spiritual Capital (2.28, SE = 2.10, p = 0.284, R-squared = 0.537) and with Moral Capital (4.90, SE = 2.36, p = 0.043, R-squared = 0.167), and negatively associated with Relational Capital (-9.17, SE = 2.04, p < 0.001, R-squared = 0.333). The Spiritual coefficient is not statistically significant in the pooled regression, but, as we show in Section 4.5, this is because the pooled estimate is averaging across a sharp regional heterogeneity that goes in opposite directions across the Asia and non-Asia subsamples. The three-panel intensity scatter in Figure 3 makes the sign reversal visible across all three forms of capital simultaneously.

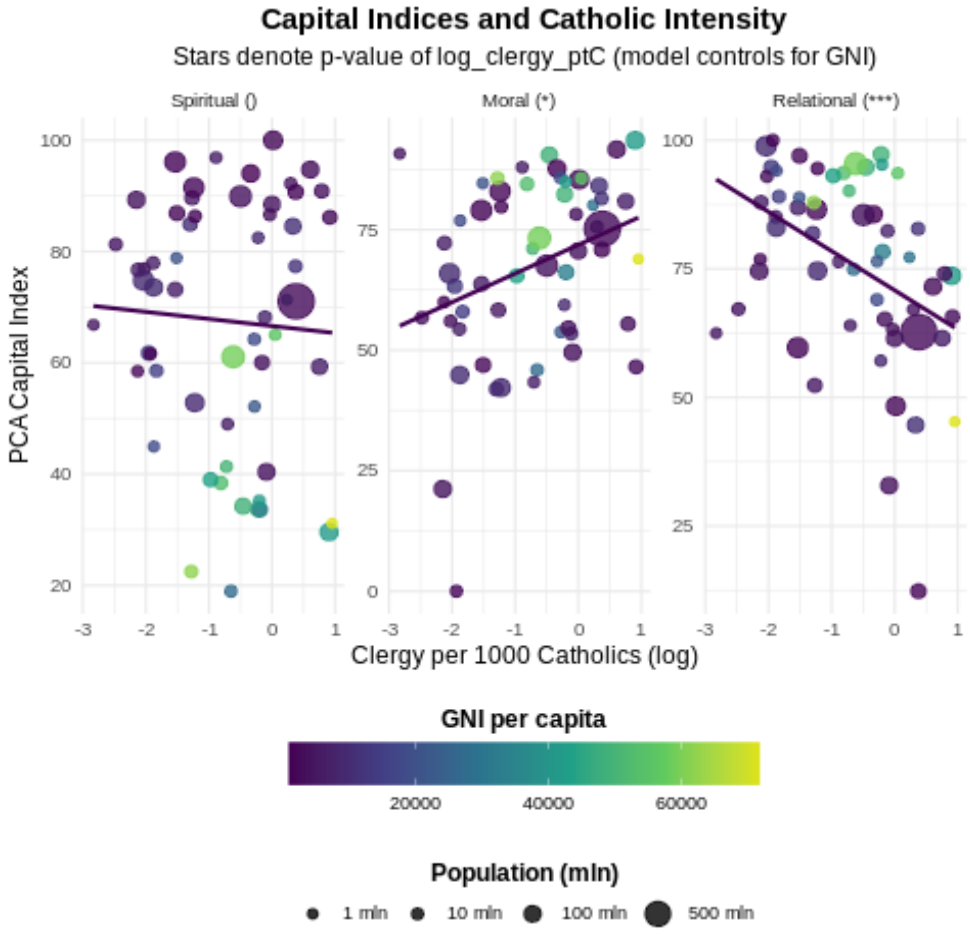


Figure 3. Capital Indices and Catholic Intensity (Clergy per 1,000 Catholics, log). Three-panel scatter for Spiritual (left), Moral (center), and Relational (right). Stars in facet labels denote the p-value of log clergy per 1,000 Catholics in the GNI-adjusted regression. Point size is proportional to total population; color by GNI level. Source: authors' calculations on WVS, SYC, and World Bank data.

4.5 Asia versus Rest of the World Heterogeneity

Table 6 reports split-sample coefficients on log clergy per 1,000 Catholics estimated separately for the Asian subsample (South Asia and East Asia and Pacific, as classified by the World Bank) and the Rest of the World, with the pooled interaction R-squared for all three capital dimensions. The split is motivated by the minority status of Catholicism in most Asian countries and by the WVS western orientation on religious items. [4]

For Spiritual Capital, the Asia coefficient is -6.29 (SE = 6.00, p = 0.316), not distinguishable from zero, while the Rest of the World coefficient is 4.66 (SE = 2.23, p = 0.043). The pooled interaction model reaches R-squared = 0.566, with the interaction p-value at 0.069, marginally significant by conventional standards. The reading is essentially what supply-side theory would predict: in non-Asian majority-Catholic countries, a higher clergy-to-laity ratio is associated with somewhat higher aggregate spirituality after conditioning on income, exactly the pattern that Stark and Finke (2000) would lead us to expect. Figure 4 makes the divergent slopes visible.

For Moral Capital, the finding are consistent with the global results: the Asian coefficient is strongly positive and significant (14.79, SE = 4.45, p = 0.006), while the Rest of the World coefficient is small and insignificant (3.17, SE = 2.87, p = 0.276); pooled R-squared = 0.227 (interaction p-value = 0.065). For Relational Capital, the heterogeneity reveals a uniformly negative intensity effect that is stronger in Asia than elsewhere. The Asia coefficient is -15.83 (SE = 6.35, p = 0.029) and the Rest of the World coefficient is -6.01 (SE = 1.94, p = 0.004); pooled R-squared = 0.415 (interaction p-value = 0.080). Since all three interaction terms are only marginal (p between 0.065 and 0.080), the formal tests of slope differences add little beyond the survey related caveats noted above.

Table 6. Catholic intensity and the three capitals, Asia versus Rest of the World.

	Spiritual: Asia	**Spiritual: RoW**	**Moral: Asia**	**Moral: RoW**	**Relational: Asia**	**Relational: RoW**
Dep. var.	PCA [0-100]	PCA [0-100]	PCA [0-100]	PCA [0-100]	PCA [0-100]	PCA [0-100]
log clergy/1,000 Cath.	-6.29	4.66*	14.79**	3.17	-15.83*	-6.01**
	(6.00)	(2.23)	(4.45)	(2.87)	(6.35)	(1.94)
GNI control	Yes	Yes	Yes	Yes	Yes	Yes

[4] Two caveats apply to the regional comparison. The Asian subsample is small, on the order of seven to nine countries depending on data availability so the split-sample coefficients should be read as suggestive (Japan, South Korea, the Philippines, Vietnam, Indonesia, Thailand, India, Pakistan, and Bangladesh). The World Bank classification is also internally heterogeneous, combining high-income East Asian societies (Japan, South Korea) with low-income South Asian ones (Bangladesh, Pakistan); we therefore present the pattern as a directional comparison rather than as a sharp test of any single regional mechanism.

	Spiritual: Asia	Spiritual: RoW	Moral: Asia	Moral: RoW	Relational: Asia	Relational: RoW
Pooled inter. R-sq	0.566	0.566	0.227	0.227	0.415	0.415

Note: All specifications include log GNI per capita. SE in parentheses. Asia = South Asia and East Asia and Pacific (World Bank classification). RoW = Rest of the World. Source: authors' calculations on WVS, SYC, and World Bank data.

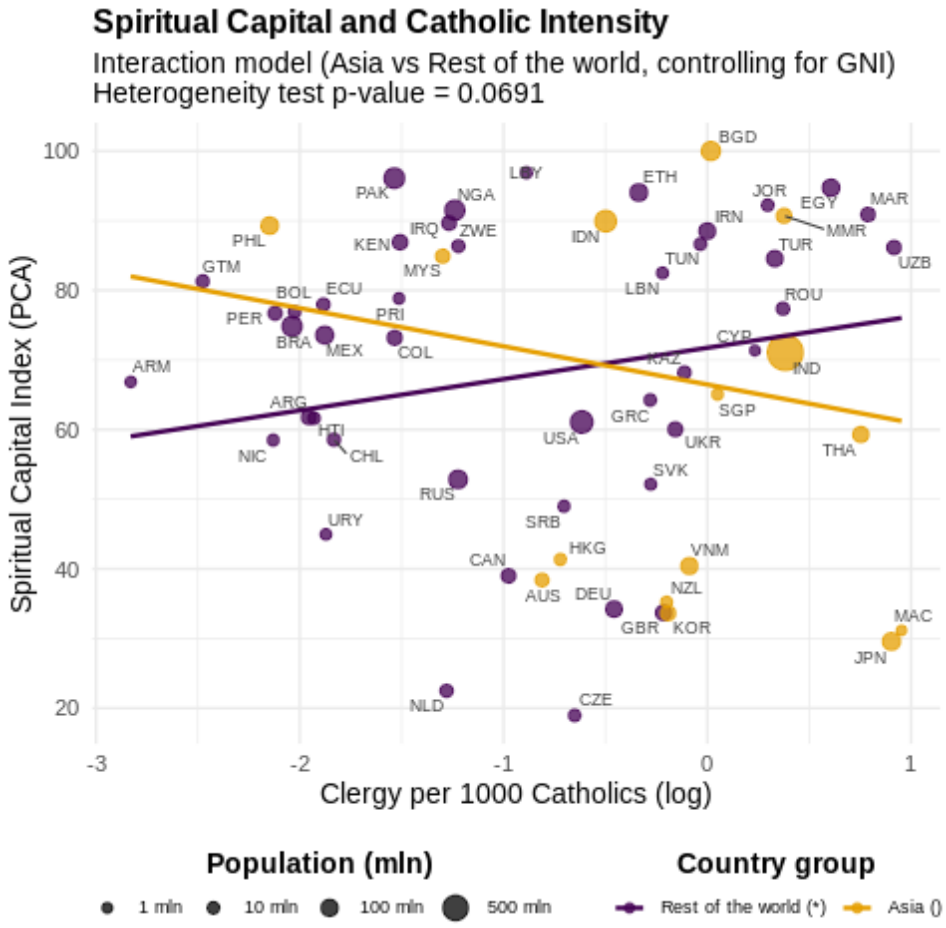


Figure 4. Spiritual Capital and Catholic Intensity, Asia versus Rest of the World. Interaction model (controlling for GNI per capita); group lines are the predicted slopes from the pooled interaction. Source: authors' calculations on WVS, SYC, and World Bank data.

4.6 Instrumental Variable Estimates: Main Findings

Two-stage least squares estimation, using three nested sets of historical instruments (the minimal A1, the historical B1, and the full C1), is consistent with the OLS sign pattern for every endogenous regressor and every capital outcome. For the three scale measures (pastoral centers per million, Catholics per million, and clergy workforce per million), the 2SLS coefficients sit slightly below OLS for Spiritual Capital, well below OLS for Moral Capital, and close to OLS

for Relational Capital. The intensity regressor (clergy per 1,000 Catholics) produces a large positive coefficient on Moral Capital and a large negative coefficient on Relational Capital; for Spiritual Capital it remains noisy in the pooled sample, in line with the regional heterogeneity flagged in Section 4.5.

Table 7 reports the headline 2SLS estimates under the minimal A1 instrument set; the full table across all three nested sets (A1, B1, C1) with first-stage F-statistics is in Appendix C (Table C.1), the diagnostic battery is in Table C.2, and a visual summary of all 36 specifications appears as Figure C.4. The pattern of OLS-IV gaps is consistent with measurement-error attenuation rather than dominant endogeneity bias. Moral Capital is the partial exception, with Wu-Hausman rejecting exogeneity under the headline A1 set for every endogenous regressor, indicating that endogeneity is present but bounded. The signs in Table 7 match those of the OLS scale and intensity regressions in Tables 5 and 6, and the magnitudes for Moral Capital and the intensity regressor are noticeably larger in absolute terms, consistent with the attenuation-correction interpretation we have advanced. Coefficients under B1 and C1 (Appendix C, Table C.1) are quantitatively close to those reported here under A1, which speaks to the stability of the results across different identifying assumptions.

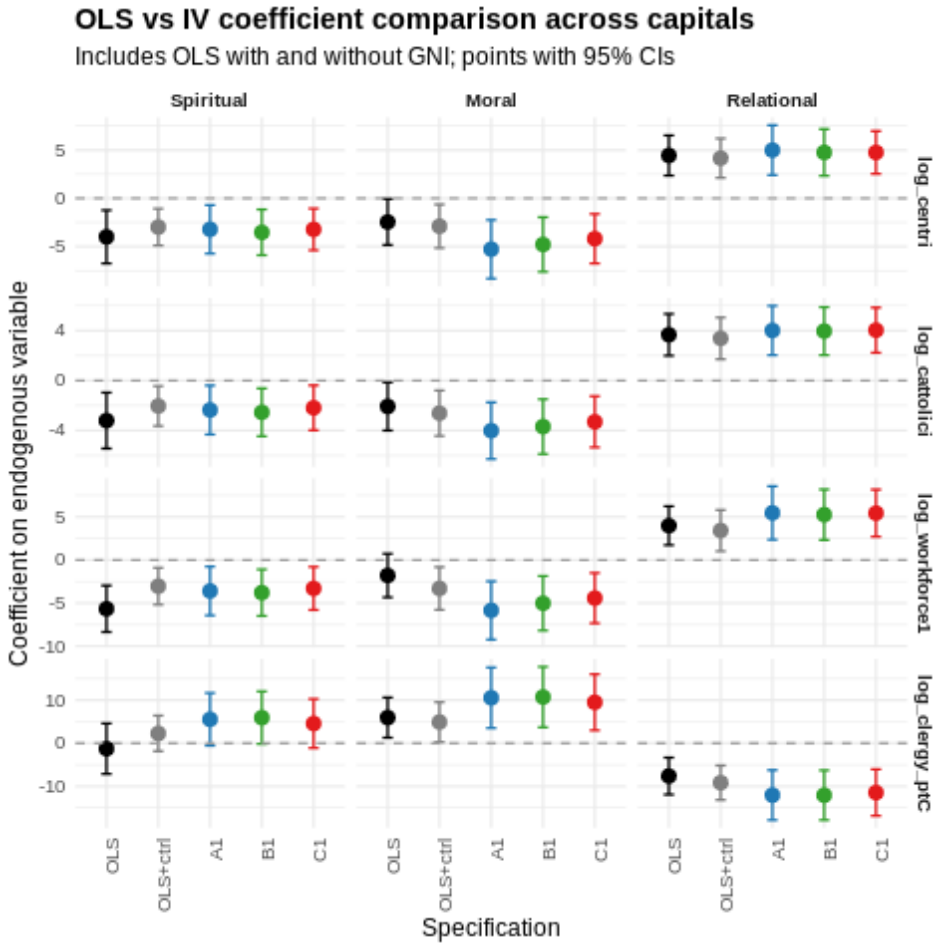


Figure 5. OLS versus IV coefficient comparison across capitals. Rows: endogenous variable. Columns: capital. Black points: bivariate OLS. Grey points: OLS with GNI control. Blue, green, red: IV estimates under instrument sets A1, B1, C1. Whiskers are 95 percent CIs. Dashed line at zero. Source: authors' calculations on WVS, SYC, and World Bank data.

Table 7. Headline 2SLS estimates under the A1 minimal historical instrument set.

Endogenous regressor (A1 instrument set)	**Spiritual**	**Moral**	**Relational**
Pastoral centers per million (log)	-3.22* (1.28)	-5.28** (1.55)	5.00*** (1.32)
Catholics per million (log)	-2.36* (1.00)	-4.02** (1.16)	4.01*** (1.01)
Clergy workforce per million (log)	-3.60* (1.44)	-5.85** (1.72)	5.46** (1.58)
Clergy per 1,000 Catholics (log)	5.54. (3.11)	10.5** (3.59)	-12.0*** (2.95)

Note: HC1-robust standard errors in parentheses. Each cell reports the second-stage coefficient on the endogenous regressor with log GNI per capita included as exogenous covariate. Full coefficients under the B1 and C1 instrument sets, along with first-stage F-statistics, are in Appendix C. Source: authors' calculations on WVS, SYC, and World Bank data.

The diagnostic battery behind these estimates is tabulated in full in Appendix C (Table C.2). Figure 6 renders the test battery as a specification-level heatmap, providing a visual cross-check of the results. Diagnostic support is standardized to a common 0-1 scale within each row: first-stage strength is the partial F capped at 12, twenty percent above the conventional weak-instrument threshold of 10; over-identification validity is the Sargan p-value capped at 0.20; and the reduced-form identification signal is one minus the Anderson-Rubin p-value, capped at a p-value of 0.10, so that darker cells denote stronger support on each criterion. A separate strip reports the Wu-Hausman classification in three categories (evidence of endogeneity, some endogeneity, no endogeneity).

Because the first stage regresses the endogenous variable on the instruments and GNI alone, it does not vary with the second-stage outcome, so the 36 specifications rest on twelve distinct first stages, one per regressor and instrument set. Ten of the twelve clear the conventional weak-instrument threshold of 10 (Stock and Yogo 2005): the three scale regressors range from F = 12.4 to F = 36.3 across all three sets, and the intensity regressor reaches F = 17.6 under A1. The two exceptions are the intensity regressor under the wider sets, where F falls to 8.39 under B1 and 5.97 under C1 as instruments of diminishing relevance are added. The Sargan over-identification test rejects in none of the specifications, with a minimum p-value of 0.058, which is consistent with the exogeneity restriction.

The Anderson-Rubin statistic is likewise a reduced-form test and does not vary with the endogenous regressor, giving nine distinct tests across capitals and instrument sets. Here the three capitals separate sharply. The reduced-form signal is strong for Moral Capital (p = 0.0089, 0.0065, and 0.043 under A1, B1, and C1) and for Relational Capital (p = 0.0007, 0.0091, and

0.0091), but weak for Spiritual Capital, where it is not significant at the 5 percent level under either A1 (p = 0.110) or B1 (p = 0.152) and reaches significance only under the full C1 set (p = 0.037). Since the Anderson-Rubin test remains valid under weak instruments, it is the appropriate check for the intensity regressor in the two weak-first-stage rows. For Spiritual Capital it should be read alongside the Wu-Hausman results reported below rather than as an isolated failure. [5]Where the instruments are strong, which is every Spiritual scale row (F = 12.4 to 36.3), conventional 2SLS inference remains valid, and the Anderson-Rubin statistic is the less powerful of the two tests.

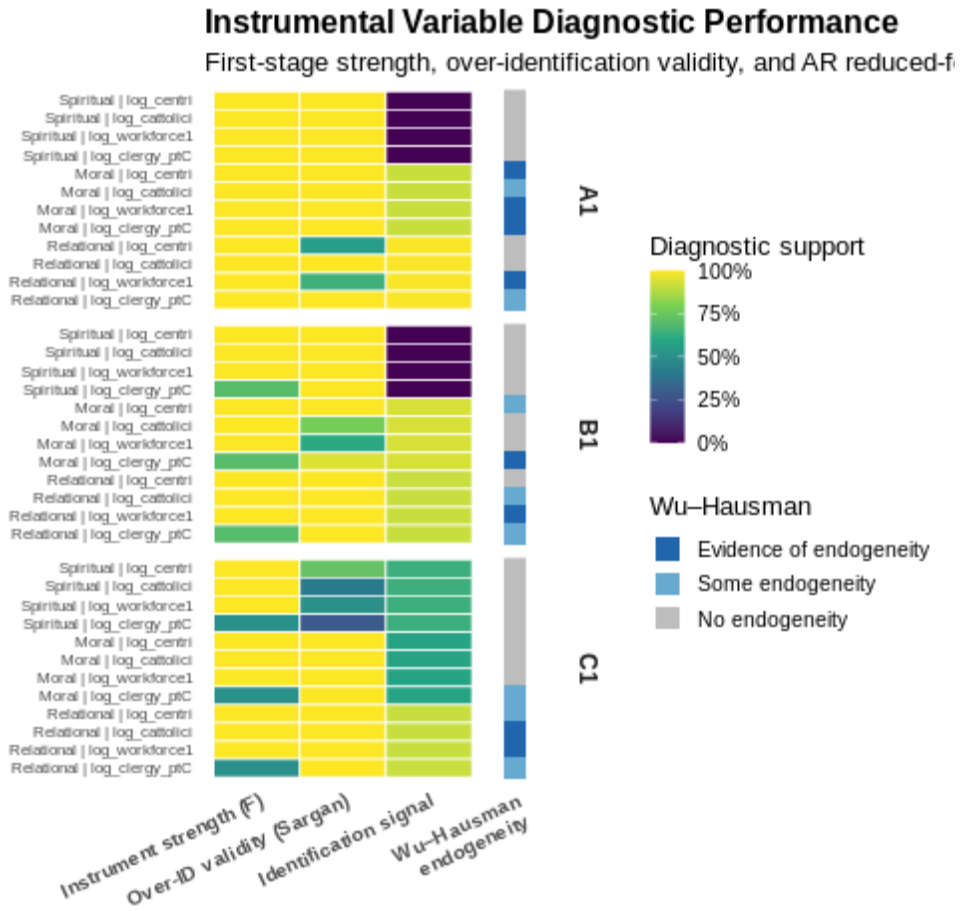


Figure 6. IV Diagnostic Heatmap across all 36 regressions. Diagnostic-support color scale encodes standardized scores for first-stage strength, over-identification validity, and reduced-form identification signal. The Wu-Hausman side strip indicates evidence of endogeneity. Source: authors' calculations on WVS, SYC, and World Bank data.

The Wu-Hausman test is the one diagnostic that varies with both the regressor and the outcome, and its pattern shifts as the instrument set widens. Under the headline A1 set, exogeneity is

[5] A weak reduced-form signal and the absence of any rejection of exogeneity are two readings of the same underlying fact, namely that conditional on income the historical instruments have limited independent purchase on aggregate religiosity. Both point to OLS rather than 2SLS as the appropriate estimator for that capital, and the Spiritual scale results reported in Section 4.3 do not depend on the instruments.

rejected at the 10 percent level for all four Moral Capital regressors, for two of four Relational Capital regressors (clergy workforce per million and clergy per thousand Catholics), and for none of the four Spiritual Capital regressors (Table 7). A1 is the only set for which every regressor has a strong first stage, the endogeneity correction matters most for Moral Capital, is partial for Relational Capital, and is not required for Spiritual Capital.[6]

5. DISCUSSION

The results are broadly consistent with the six directional hypotheses of Section 2, but the more interesting finding is the structure that aggregate religiosity measures would have obscured. Scale and intensity reverse signs almost everywhere: whatever scale does to a given capital, intensity tends to undo (the Asian/Rest-of-the-world subsamples carry qualitatively different intensity signals for Spiritual Capital). And the workforce gradient thins as the aggregate widens from the ordained core to the broader pastoral community. We discuss each capital in turn and close with a joint sign matrix in Table 9.

5.1 Spiritual Capital: Reading the Negative Scale Coefficient, and the Asian Exception

The scale coefficients for Spiritual Capital are negative, statistically significant, and stable: negative for all five scale measures, under OLS and under 2SLS, and across the three instrument sets (Tables 5, 7, and C1). It is also the only sign in the paper that no single tradition in literature delivers on its own. The secularization thesis is a claim about income and existential security rather than about institutional scale, and the supply-side tradition, if anything, predicts the opposite sign. We therefore gather the explanation here rather than distributing it across the paper. Two readings are available: a legacy reading and a compositional reading tied to minority-Catholic and measurement contexts. They are complementary rather than rival, each would generate a negative coefficient on its own, and the present design cannot fully separate them.

The most substantial explanation is legacy which is built on the premises of the secularization tradition. What the Statistical Yearbook supplies is institutional capacity: dioceses, parishes and other pastoral centers, and incardinated clergy. Capacity is a stock, built up over centuries of establishment, endowment, and territorial organization, and it depreciates far more slowly than the religious practice that once justified it. Belief and attendance can fall within a generation, but parish boundaries, church buildings, diocesan structures, and the priests already ordained into them persist for decades afterwards. The consequence in a contemporary cross-section is a large residual institutional footprint in precisely those countries where secularization has gone furthest. Historically Catholic societies retain dense parish networks and substantial clergy rolls that now serve congregations a fraction of the size they were built for, and a good deal of that capacity is nominal rather than active: pastoral centers carried on the books without a resident parish priest,

[6] Moving to the wider sets reverses the ordering: Moral Capital rejections fall to two of four under B1 and one of four under C1, while Relational Capital rejections rise to three of four and then four of four. Spiritual Capital rejects in no specification under any set.

and clergy counted on the rolls but withdrawn from active ministry. On this reading the negative coefficient is not a finding that Catholic institutions suppress religiosity. It records that dense institutional capacity is disproportionately located where religious practice has already receded (Berger 1967; Norris and Inglehart 2011; Inglehart 2021).

Two features of the estimates fit the legacy reading, and one qualification bounds it. First, the account is about stocks, so it is not disturbed by the fact that log GNI per capita is held constant. At any given income level, countries differ in how much inherited Catholic capacity they carry, and it is that residual variation the scale coefficient uses. Second, the instrumented estimates point the same way. The excluded instruments are all historical, so the first stage isolates exactly the component of present-day Catholic presence that deep institutional history predicts, which is the component the legacy account is about. The qualification is that the Yearbook records capacity rather than activity, bearing on the legacy account unevenly.

Table 8. Catholic institutional footprint measures regressed on log GNI per capita.

Dependent variable	Slope	SE	p	R-sq
Seminarians per member of clergy	-0.0261***	0.0071	0.0005	0.195
Share of centers without resident parish priest	0.0333.	0.0194	0.091	0.050
Pastoral centers per 1,000 Catholics (log)	-0.157	0.0942	0.100	0.048
Pastoral centers per million population (log)	0.336	0.212	0.120	0.043
Infant baptisms per 1,000 Catholics (log)	-0.143	0.101	0.165	0.034

Note: Each row is a separate OLS regression of the stated measure on log GNI per capita, with no further controls. n = 58 in every row. Source: authors' calculations on SYC and World Bank data.

Table 8 regresses five Catholic footprint measures on log GNI per capita over the analytic sample. Only one is estimated with strong precision: seminarians per member of clergy fall with national income, which is the staffing-renewal implication of the legacy reading. The share of pastoral centers without a resident parish priest rises with income in the predicted direction but is only marginally estimated, and infant baptisms per thousand Catholics fall with income without reaching conventional significance. Pastoral centers per thousand Catholics decline with income which runs against the expectation that more secular countries carry the heavier infrastructure per remaining member. We read this as a limitation of the denominator rather than as evidence against the account because the staffing evidence remains consistent with the legacy reading (without establishing it).

The second explanation is compositional. The scale variables normalize Catholic institutional presence by the total national population, but the Spiritual index measures the religiosity of that whole population, Catholic and non-Catholic alike. The two bases align only where Catholics are

a large share of the population. Pooling these countries with majority-Catholic ones means the estimated scale slope is an average taken over settings in which the regressor does not carry the same power. Moreover, respondents in non-Christian majority settings may score low on items that would register their religiosity poorly even where it is high, while the confidence-in-churches item, which is one of the seven retained components of the index, could capture anticlerical sentiment or post-scandal criticism. The legacy reading says the coefficient is real and interpretable; the compositional reading says the coefficient averages across contexts in which the regressor could mean different things. However, the first reading supports a substantive interpretation, it is confirmed by staffing consideration, and it is the one the instrumented estimates confirm directly.

The intensity dimension yields a theoretically interesting finding of this section. Considering that the intensity metrics is fully dependent from catholic-related variables, while the religious index rely on nation-wide survey, we supposed that this metrics was the most exposed to minority-related and survey-related issues. For this reason, we reported the regional split for intensity but not for scale. Outside Asia, higher clergy-to-Catholic ratios are positively associated with Spiritual Capital, which is what supply-side theory would predict (Stark and Finke 2000). Whenf the Church invests heavily in pastoral personnel per believer, the religious signal it sustains is correspondingly louder. In East and South Asian societies, the same ratio is essentially nil and trends slightly negative.

The more plausible reading is that intensity in Asian settings indexes the pastoral overhead of serving a small minority rather than supply-side cultivation of a religious public. The mechanism that supports the supply-side prediction in majority-Catholic countries has no comparably large audience to act on in Asia. Two caveats qualify the resulting pattern. It is partly consistent with a minority-context reinforcement reading, in which dense pastoral coverage cultivates small communities without registering on the aggregate national signal. It may also reflect survey design, for the reasons set out above: the belief items that anchor the Spiritual index carry a Western and Christian imprint whose measurement properties in Asian religious contexts are plausibly different, so part of the regional contrast on intensity, like part of the pooled scale gradient, could be an artefact of the instrument rather than of the underlying construct.

Against the hypotheses set out in Section 2, H1a is supported and H1b is supported only conditionally. The negative scale association predicted by H1a holds across all five scale measures, under OLS and under 2SLS, and across the three instrument sets, though the discussion above should make clear that we read it as a legacy correlation rather than as evidence of a suppressive effect, and that the Spiritual estimates rest on OLS rather than on the instruments. H1b fares less well. The pooled intensity coefficient is positive but indistinguishable from zero, and the predicted supply-side association emerges only once Asia is separated out, where it is relevant in size and significant at conventional but not stringent levels. We therefore treat H1b as supported for non-Asian societies and unsupported in the pooled cross-section,

which is a weaker claim than the hypothesis anticipated and one that the qualifying clause in H1b conceded.

5.2 Moral Capital: Substitution, the Field Hospital, and the Club

The negative scale coefficients for Moral Capital are consistent with H2a and with what we have called the field-hospital reading. Catholic institutions are disproportionately dense precisely in societies with weak state capacity and depressed civic norms, where the Church is filling voids in moral and welfare infrastructure rather than adding to a surplus on top of strong institutions (Norris and Inglehart 2011; Alesina and Giuliano 2015). The gap between OLS and IV is informative here: the IV coefficient is sharply more negative than its OLS counterpart (-5.28 against OLS -2.90 for pastoral centers under A1), Wu-Hausman rejects exogeneity for several Moral specifications, and the historical instruments identify an institutional effect that is larger, in the long run, than the contemporaneous OLS gradient captures. An alternative reading, older in the sociology of religion, points to saturation rather than substitution: where Catholic affiliation is near-universal, membership tends to become nominal and its normative content thins, a licensing dynamic anticipated in Weber's ([1922] 1978) treatment of routinised religious authority and in Berger's (1967) account of taken-for-granted religious monopolies. The data cannot separate the two readings, but both predict the negative scale association we observe.

The intensity dimension yields the club-good reversal anticipated by H2b. The IV coefficients of 9.5 to 10.7 under A1 and B1 are substantively large: countries with densely staffed pastoral workforces per Catholic exhibit appreciably higher aggregate civic-honesty norms, even after conditioning on income. The pattern is consistent with the mechanism Iannaccone (1994) and Berman (2000) identified, in which tight pastoral networks impose reputational costs for defection and sustain cooperative norms through mutual monitoring, and which later work has connected to schooling and to the transmission of cooperative values within religious communities (Glaeser and Sacerdote 2008; Tabellini 2008). What looks at first sight like a contradiction (the same institution depressing Moral Capital at scale and raising it through intensity) is more naturally read as a theoretically separable dual pattern: scale tracks the structural environment in which the Church operates; intensity tracks the depth of engagement it sustains within its actual membership. Of the three capitals, Moral Capital offers the cleanest theoretical illustration of the paradox, not because its reversal from the positive relationship with GNI, but because it is unclouded by the regional confound that qualifies the Spiritual results and maps directly onto a single, well-specified mechanism: aggregate organizational size dilutes the normative intensity that smaller, more densely served pastoral communities generate, so the club-good logic operates through relational intensity rather than through mass coverage.

5.3 Relational Capital: Social Infrastructure and Bonding Crowding Out Bridging

The positive scale coefficients for Relational Capital are the most consistently estimated in the paper. They replicate across all five scale measures and all three instrument sets, with IV estimates (4.0 to 5.5) in close agreement with OLS (3.4 to 4.2), though the Wu-Hausman results

reported in Section 4.6 indicate that this OLS-IV correspondence rests more securely on the headline A1 set than on the wider ones. The reading is straightforward and Putnamesque: Catholic pastoral networks supply the associational platforms, schools, hospitals, and community organizations that are associated with cross-cutting social trust, tolerance, and voluntary participation (Putnam 2000; Woolcock and Narayan 2000; Putnam and Campbell 2010). The intensity dimension, however, carries a strong negative coefficient, a pattern consistent with the bonding-versus-bridging tension that Putnam himself flagged in his own work. Where pastoral staffing is concentrated on a small Catholic community, the Church's relational work plausibly runs inward rather than outward, and the bonding it cultivates among its own members appears to come alongside weaker cross-cutting ties to the wider society. The Asian subsample shows the stronger version of this pattern (-15.83 against -6.01 for the Rest of the World), as one would expect if community boundaries were sharper in minority-Catholic contexts. In the vocabulary of institutional economics, intense vertical structures can shade from inclusive to extractive (Acemoglu and Robinson 2012): pastoral density that binds members tightly to the institution may, past a point, absorb the relational energy that would otherwise flow into cross-cutting civic ties.

Both H3a and H3b are supported, and with less qualification than in the other two cases. The positive scale association predicted by H3a is the most robustly estimated relationship in the paper, replicating across all five scale measures and all three instrument sets with OLS and IV in close agreement. The negative intensity association predicted by H3b is likewise recovered in every specification and is the largest coefficient in the study in absolute terms. Two caveats attach to the strength of that verdict rather than to its direction. The Wu-Hausman test rejects exogeneity for a growing share of Relational specifications as the instrument set widens [Section 4.6], so the OLS-IV correspondence here rests on the headline A1 set more than on the wider ones. And because H3b was framed for the pooled sample, the sharper Asian coefficient reported above is a strengthening of the hypothesis.

5.4 The Joint Sign Matrix

The results are collected into six theoretical mechanisms, one or two per form of capital. A legacy effect ties Spiritual Capital negatively to income, the secularization thesis operating through the development gradient, and negatively to Catholic scale through the residual institutional footprint. A substitution-or-saturation effect ties Moral Capital negatively to Catholic scale. A social-platform effect ties Relational Capital positively to that same scale, while a bonding or crowding-out effect ties it negatively to pastoral intensity. A normative club effect ties Moral Capital positively to intensity. And a context-limited effect, the Asian exception, confines the supply-side reading of Spiritual intensity to majority-Catholic settings.

Three implications follow. The first is methodological: once Catholic presence is decomposed into scale and intensity, the apparent contradictions that arise when the two are aggregated dissolve and lumping them together averages opposing signs into a misleading null. The second

is comparative: the Asia exception cautions against universalising claims about religious institutions derived from majority-Catholic or Western models, since the same intensity variable does not index the same mechanism in minority-Catholic contexts. The third is structural: because the scale gradient attenuates when lay personnel are added (Workforce 3), the ordained clergy core appears to carry most of the action, both at scale and at intensity. Finally, the Church's association with these capital outcomes runs through the people most fully embedded in its institutional life, i.e. the clergy and religious members.

Table 9. Joint sign matrix of Catholic institutional measures across the three capitals.

Group	Indicator (log scale)	Spiritual	Moral	Relational	Theoretical label
Economic development	Log GNI per capita	- ***	+ *	+ *	Income gradient
Scale (per million total pop.)	Catholics per million	- *	- **	+ ***	Legacy / Substitution / Platform
	Pastoral centers per million	- **	- *	+ ***	Legacy / Substitution / Platform
	Clergy per million (Workforce 1)	- **	- *	+ **	Legacy / Substitution / Platform
	Clergy + Religious per million (Workforce 2)	- **	- *	+ *	Stronger with ordained
	Clergy + Rel. + Lay per million (Workforce 3)	- .	- *	+ ** (weaker)	Attenuated with lay
Intensity (per 1,000 Cath.)	Clergy per 1,000 Cath.	+ * (RoW) / - ns (Asia)	+ *	- ***	Supply-side / Club / Bonding

Note: Signs represent the direction of the conditional association controlling for log GNI per capita. The pooled coefficient is used for the intensity row except where marked Rest of the World (RoW) or Asia. Source: authors' calculations on WVS, SYC, and World Bank data.

5.5 Which Dimension Dominates: Scale-Driven versus Intensity-Driven Capitals

The dimensional analysis in Section 3.5 indicates that the sign pattern is not symmetric across different forms of capital: Spiritual and Moral Capital are predominantly scale-driven, with the scale coefficient carrying most of the explanatory weight relative to intensity, while Relational Capital is predominantly intensity-driven, with the negative intensity coefficient dominant over the positive scale association. We rely on the joint specification of equation (6), in which the scale variable (clergy workforce per million) and the intensity variable (clergy per thousand Catholics) enter the same regression alongside the GNI control. When two collinear regressors

are entered together, the coefficient that retains statistical significance is the one the data can distinguish from the other, and this is what we mean by the dominant dimension.

Table 10. Joint scale-and-intensity specification, by capital.

Capital	Scale α: log(P/N)	Intensity β: log(P/C)	Joint p	R^2
Spiritual	-3.18* (1.25)	-0.51 (2.28)	0.027	0.586
Moral	-2.62. (1.44)	2.61 (2.64)	0.026	0.215
Relational	1.31 (1.27)	-8.02** (2.32)	0.0001	0.346

Note: Joint OLS regression PCA_index ~ log(P/N) + log(P/C) + GNI, equation (6), with clergy workforce per million as the scale variable P/N and clergy per thousand Catholics as the intensity variable P/C. Standard errors in parentheses. Joint p is the F-test of the two Catholic-presence terms against the GNI-only baseline. Source: authors' calculations on WVS, SYC, and World Bank data.

Table 10 reports this joint specification. In every case the joint model as a whole is jointly significant (joint p = 0.027, 0.026, and 0.0001 respectively), which confirms that the loss of an individual coefficient reflects collinearity between the two dimensions rather than the absence of a relationship: the data contain one strong signal per capital, and the joint model simply cannot always say which of the two collinear regressors carries it. For Spiritual Capital the scale coefficient is negative and significant (-3.18, p = 0.014) while the intensity coefficient is small and far from significant (-0.51, p = 0.825), so the scale dimension dominates. For Moral Capital the scale coefficient is the more clearly identified of the two (-2.62, p = 0.075) and the intensity coefficient is not significant once scale is present (2.61, p = 0.327), so Moral Capital is likewise scale-driven. For Relational Capital the ordering reverses: the intensity coefficient is large, negative, and significant (-8.02, p = 0.001) while the scale coefficient is indistinguishable from zero (1.31, p = 0.305), so Relational Capital is intensity-driven.

This reading is consistent with the univariate estimates reported in Sections 4.3 and 4.4, where the dimension we identify as dominant is also the one whose univariate coefficient is larger in absolute magnitude and more strongly significant.[7] The joint specification and the univariate estimates therefore point to the same asymmetry: secularization-type mechanisms, which operate through scale, dominate the two belief-and-norms capitals, while the bonding-versus-bridging mechanism, which operates through intensity, dominates the relational capital.

[7] For Spiritual Capital the univariate scale coefficient (-3.04, clergy workforce per million) is significant while the univariate intensity coefficient (2.28) is not; for Relational Capital the univariate intensity coefficient (-9.17) is far larger than the univariate scale coefficient (3.42) and more strongly significant.

6. CONCLUSION

We set out to ask how the scale of Catholic institutional presence and the intensity of its pastoral engagement relate to country-level stocks of immaterial capital, decomposed analytically and empirically into Spiritual, Moral, and Relational dimensions. The three-way decomposition, paired with the separation of Catholic presence into scale and intensity, has been the analytical lever throughout: a single composite religiosity index would have averaged across mechanisms that, in the data, pull in opposite directions, and would have produced a comfortable but limited results.

Four findings follow. First, scale and intensity carry paradoxically and systematically opposite signs across the three forms of capital. At scale, Catholic institutional density is negatively associated with Spiritual and Moral Capital and positively associated with Relational Capital; intensity reverses each of these signs, running positive for Spiritual Capital outside Asia and for Moral Capital, and negative and large in absolute magnitude for Relational Capital. Second, this reversal is not symmetric across the three capitals: Spiritual and Moral Capital are scale-driven while Relational Capital is intensity-driven. Third, the Spiritual intensity effect is context-dependent, holding outside Asia but not within it, where Catholic intensity indexes a minority rather than a societal religiosity environment. Fourth, the effects are carried by the ordained core of the Catholic workforce: the clergy aggregates (Workforce 1 and Workforce 2) produce coefficients of essentially the same magnitude, both clearly larger than the lay-inclusive Workforce 3, and this points to ordained and consecrated religious life, rather than the wider lay apostolate, as the primary institutional carrier of the described effects.

The findings survive 2SLS estimation using three nested sets of historical instruments dated to 1900, 1970, and 2000, and both organizing patterns (the scale-versus-intensity reversal and the Asian exception) are robust to instrument-set choice and to alternative scale aggregates. How much weight the instrumented estimates carry differs by. The Moral Capital results lean most heavily on 2SLS: under the headline A1 set, Wu-Hausman rejects exogeneity for every endogenous regressor and the reduced-form signal is strong. The Relational Capital results occupy an intermediate position, with exogeneity rejected for two of four regressors under A1 and for progressively more as the instrument set widens. The Spiritual Capital results are identified by OLS rather than by the instruments and are corroborated, weakly, by 2SLS: Wu-Hausman rejects exogeneity in none of the twelve Spiritual specifications, and the Anderson-Rubin reduced-form signal is significant only under the full instrumental set. We therefore treat OLS with GNI controls as the operative estimator for Spiritual Capital, where the evidence gives no reason to prefer the instrumented estimates, and read the 2SLS results there as a consistency check rather than as the source of identification.

On the central theoretical debate in cross-national research on religion, the findings can relate to different academic traditions. The scale results side with the secularization thesis (Norris and Inglehart 2011): Catholic institutional density and aggregate religiosity are negatively associated

in the long run, an association we read in Section 5.1 as the residual institutional footprint left behind where practice has receded. The intensity results outside Asia side with the supply-side reading (Stark and Finke 2000; Iannaccone 1994): more clergy per Catholic in majority-Catholic settings goes with measurably higher religious engagement. The two readings have looked incompatible because the underlying measures have not been kept separate; once they are, secularization and supply-side become statements about different dimensions of Catholic presence rather than rival explanations of the same one.

The findings carry implications on three levels. For the sociology of religion, they argue for moving beyond religion as a single variable: the scale of an institution's footprint and the intensity of its engagement are distinct dimensions with different correlates. For social capital theory, they offer cross-national evidence that the same religious institution can generate both bridging and bonding forms of social capital, depending on which dimension of its presence is in play. And for Church governance, they suggest, with all the caution a cross-sectional design imposes, that pastorally intensive ministry may be associated with stronger normative outcomes than uniform expansion. Nonetheless, hypothesis about the allocation of pastoral resources warrants validation with finer-grained, sub-national data in order to serve in a spirit of authentic stewardship.

Some limitations bound what we can claim. The design is cross-sectional, and the IV strategy identifies long-run institutional effects rather than within-country dynamic adjustment, so the estimates speak to the legacy of historical Catholic geography more than to the impact of current-period pastoral decisions[8]. The PCA indexes, though internally coherent, depend on survey-item selection, harmonization choices, and alternative constructions could yield partially different structures. National-level aggregation masks within-country heterogeneity in religious practice, institutional presence, and civic norms, so the estimated relationships capture macro-level associations rather than local or individual dynamics. And the C1 instrument set adds variables measured in 1970 and 2000 that are closer to the outcome and therefore harder to defend as strictly exogenous, but residual exogeneity concerns remain a fair worry. Several extensions follow naturally. Panel designs exploiting larger WVS-SYC dataset would trace dynamic adjustment. Work on other minority-religion and multi-tradition expansions would test whether the scale-versus-intensity decomposition itself travels beyond Catholicism. Multilevel designs combining individual-level survey responses with diocesan or regional institutional data would help distinguish personal religiosity effects from institutional mechanisms. And sub-

[8] This identification claim follows from the source of variation the instruments exploit. The excluded instruments are all historical, so the first stage isolates only the component of present-day Catholic presence that is predicted by this deep institutional history. The 2SLS estimates are therefore built on cross-country differences in long-established Catholic geography, not on recent changes in pastoral staffing, thus recovering the long-run associations rather than the effect of any current-period pastoral decision. Since the design is a single cross-section, it contains no within-country time variation that could identify short-run dynamic adjustment in the first place.

national geographic IV designs exploiting missionary-archive variation could sharpen identification further.

The analysis suggests that the secularization and religious economies traditions may be describing different margins of the same phenomenon, rather than contradicting one another. Whether this reconciliation holds beyond our limited case is a natural next step for this research, and the decomposition proposed here provides a feasible way to explore it. Moreover, if the scale-versus-intensity paradox generalizes, the relevant question is not simply how much institutional religion a society retains, but what role its religious institutions play. This shifts the focus toward questions of organizational model, networks, and impact: questions that existing literature has yet to ask.

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APPENDIX A: METHODOLOGICAL APPENDIX

A.1 Principal Component Analysis and Index Construction

The paper uses one PCA construction. Items with more than 50 percent of country-wave cell means missing, and items with zero cross-national variance, are dropped prior to PCA. Let i = 1, …, n index countries and k = 1, …, p index the WVS items surviving the missingness and variance filters for a given capital dimension. The (n by p) data matrix X has generic element x_ik, the country-wave mean of WVS item k for country i after standardization to the unit interval. The sample covariance matrix used for PCA is S = X'X / (n - 1). PCA decomposes S through its eigen decomposition S w_j = lambda_j w_j, where eigenvalues are ordered lambda_1 >= lambda_2 >= … >= lambda_p >= 0 and each eigenvector w_j has unit length. The index is the first principal component PC1 = X w_1, with variance share VS1 = lambda_1 / sum(lambda_j).

Remaining missing cells are imputed via missMDA::imputePCA (Josse and Husson 2016) with the number of components selected by leave-one-out cross-validation using missMDA::estim_ncpPCA (method = "Kfold", ncp.max <= 5). The procedure iterates between PCA estimation and cell imputation using a rank-ncp low-rank approximation until convergence. PCA is then run on the completed matrix with centering and scaling.

PC1 is identified only up to sign; the orientation convention requires that the mean of the loadings on PC1 be positive, so that higher scores reflect more of the construct. If this fails, the eigenvector is reflected. The resulting score vector is rescaled to the closed interval [0, 100] by linear min-max normalization: countries with the lowest PC1 score map to 0 and those with the highest map to 100. This is the only PCA construction used in the paper; alternative constructions are not considered at this stage.

A.2 Two-Stage Least Squares Estimation

Let Y_i be one of the three PCA-based capital indices for country i, let D_i be the endogenous Catholic presence variable, let X_i be the vector of exogenous controls (log GNI per capita), and let Z_i be the vector of q excluded historical instruments. The structural equation is Y_i = beta D_i + gamma' X_i + u_i, where u_i is the structural error potentially correlated with D_i. The first-stage regression projects D_i onto the full instrument vector and the controls: D_i = pi' Z_i + xi' X_i + v_i.

Consistency of the 2SLS estimator requires two identification conditions. Relevance: pi is nonzero, that is, Cov(Z_i, D_i | X_i) is nonzero. Exclusion: E[Z_i u_i] = 0; the instruments affect Y_i only through D_i. Exclusion is not testable when the system is exactly identified (q = 1) and is tested via the Sargan over-identification statistic when q > 1. Standard errors are heteroscedasticity-consistent (HC1). All 2SLS estimates are computed using the ivreg function in the AER package (Kleiber and Zeileis 2008).

A.3 Diagnostic Tests

Four diagnostic statistics are computed for each IV specification and reported in Appendix C. The first-stage F is the partial F from regressing the endogenous variable on the excluded instruments and GNI; conventional weak-instrument threshold is F >= 10 (Stock and Yogo 2005). The Sargan over-identification test (Sargan 1958), applicable when q > 1, evaluates whether the excluded instruments are jointly orthogonal to the second-stage residuals under the null of joint exogeneity. The Wu-Hausman endogeneity test (Hausman 1978) evaluates whether OLS and 2SLS differ significantly; rejection implies that endogeneity bias in OLS is statistically meaningful. The Anderson-Rubin reduced-form F (Anderson and Rubin 1949) (computed from the regression of the outcome on the full instrument vector plus GNI, against the restricted regression on GNI alone) provides an additional weak-instrument-robust identification signal.

APPENDIX B: DATA APPENDIX

This appendix documents the variables used. Table B.1 lists every WVS item considered for each capital index together with its recoding rule and retention status. Table B.2 defines the Catholic institutional variables constructed from the SYC merged file. Table B.3 describes the ten historical instruments and their nested-set membership.

B.1 WVS Item Batteries by Capital Dimension

Table B.1. WVS item batteries by capital dimension, with coding rules.

Code	WVS Label	Raw Scale	Recoding Rule	Retained
Panel A: Spiritual Capital (17 candidate items; 7 retained; PC1 var. share = 0.870)				
F050	Do you believe in God?	Binary 0/1	yes to 1, no to 0, else NA	Yes
F051	Do you believe in a soul?	Binary 0/1	yes to 1, no to 0, else NA	Yes
F053	Do you believe in hell?	Binary 0/1	yes to 1, no to 0, else NA	Yes
F054	Do you believe in heaven?	Binary 0/1	yes to 1, no to 0, else NA	Yes
F063	How important is God in your life?	1-10	rescale 1-10 to [0,1]	Yes
A006	How important is religion in your life?	1-4	(4 - x)/3, reversed	Yes
E069_01	Confidence in the churches	1-4	(4 - x)/3, reversed	Yes
F052, F055, F057, F059, F060, F062, F064, F065, F066, F067	Other religiosity items	varies	excluded by filters	No (NA > 50%)
Panel B: Moral Capital (16 candidate items; 4 retained; PC1 var. share = 0.752)				
F114A	Justifiable: someone accepting a bribe	1-10	(10 - x)/9, reversed	Yes
F115	Justifiable: claiming government benefits not entitled to	1-10	(10 - x)/9, reversed	Yes

Code	WVS Label	Raw Scale	Recoding Rule	Retained
F116	Justifiable: avoiding a fare on public transport	1-10	(10 - x)/9, reversed	Yes
F117	Justifiable: cheating on taxes if you have a chance	1-10	(10 - x)/9, reversed	Yes
F114B, F114D, F125, F127, F129, F130, F139, F140, F142	Other justifiability items	1-10	excluded by filters	No (NA > 50%)
A193, A196, A197	Schwartz universal values	1-6	rescale to [0,1]	No (NA > 50%)
Panel C: Relational Capital (8 PCA inputs from wider candidate pool; 7 retained; PC1 var. share = 0.576)				
A124_02	Would not like as neighbours: people of a different race	Binary 0/1	1 - x (tolerance)	Yes
A124_12	Would not like as neighbours: heavy drinkers	Binary 0/1	1 - x	Yes
A124_43	Would not like as neighbours: drug addicts	Binary 0/1	1 - x	Yes
A124_06	Would not like as neighbours: immigrants / foreign workers	Binary 0/1	1 - x	Yes
G007_35_B	Trust: people of another religion	1-4	(4 - x)/3, reversed	Yes
A098	Membership: church or religious organization	0-2	rescale to [0,1]	Yes
G007_18_B	Trust: people you meet for the first time	1-4	(4 - x)/3, reversed	Yes (neg. loading)
Voluntary work composite	Aggregate of A080-A096 membership items	Binary 0/1	mean of sub-items	Dropped by filters

Note: WVS code prefixes follow the Wave 6/7 harmonised questionnaire (Haerpfer et al. 2022). Higher coded values denote more of the construct under the + Convention. Items dropped are those whose country-wave cell means are missing in more than half the analytic sample. Full variable descriptions are available at www.worldvaluessurvey.org.

B.2 Catholic Institutional Variables from the Statistical Yearbook of the Church

Table B.2. Catholic institutional variables constructed from the Statistical Yearbook of the Church.

Analysis variable	SYC column name(s)	Definition	Used as
Panel A: Scale measures (per million total population)			
log_cattolici	Migliaia_cattolici	Catholics (thousands) * 1000 / total population * 1e6	Scale regressor (log)
log_centri	Parrocchie_quasi_parrocchie, Totale_centri_pastorali	Total pastoral centers and quasi-parishes / total population * 1e6	Scale regressor (log)
log_workforce1	Vescovi + Sacerdoti_Diocesani + Sacerdoti_Religiosi	Bishops + diocesan priests + religious priests / population * 1e6	Scale regressor (log)
log_workforce2	Workforce 1 + Diaconi_permanenti_* + Religiosi_non_sacerdoti_professi + Religiose_professe	Plus permanent deacons and male and female professed religious	Scale regressor (robustness)
log_workforce3	Workforce 2 + Membri_laici_Ist_Sec_* + Missionari_laici + Catechisti	Plus lay secular institute members, lay missionaries, catechists	Scale regressor (robustness)
Panel B: Intensity measure (per thousand Catholics)			
log_clergy_ptC	Vescovi + Sacerdoti_Diocesani + Sacerdoti_Religiosi	Total clergy / Catholics * 1000	Intensity regressor (log)

Note: All per-capita denominators use total resident population for scale variables and Catholic population for intensity variables. (*) Workforce aggregates are cumulative. Source: Segreteria di Stato, Ufficio Centrale di Statistica della Chiesa (2016-2023).

B.3 Historical Instruments

Table B.3. The ten historical instruments and their nested-set membership.

Instrument	Sets	Year(s)	Type	Source
State_Religion_1900	A1-C1	1900	Dummy	Barro and McCleary 2005
Iberian_Colony	A1-C1	Pre-1900	Dummy	CEPII; ICOW

Instrument	Sets	Year(s)	Type	Source
pct_Catholics_1900	A1-C1	1900	Continuous	Barrett et al. 1982; WRP
State_Regulation_0_2	B1-C1	c. 1900	Ordinal 0-2	Barro and McCleary 2003; RAS
Year_First_Evangelization	B1-C1	Year AD	Continuous	World Christian Encyclopedia
Historical_Religious_Orders	B1-C1	Pre-1900	Dummy	Barrett WCE; Woodberry 2012
State_Religion_1970	C1	1970	Dummy	Barro and McCleary 2005
State_Religion_2000	C1	2000	Dummy	Barro and McCleary 2005
pct_Catholics_2000	C1	2000	Continuous	WRP; Maoz and Henderson 2013
Religious_Pluralism_2000	C1	2000	Continuous (1 - HHI)	WRP

Note: Sets are nested (A1 is a subset of B1, B1 is a subset of C1). All A1 and B1 instruments are measured at or before 1900, predating the major twentieth-century social transformations. The C1 instruments add three variables measured at 1970 and 2000.

B.4 Country-Year Coverage and Missing-Data Audit

Table B.4. Country-year coverage and missing-data audit.

Capital / Sample	OLS n	IV A1-B1 n	IV C1 n
Spiritual Capital	58	54	54
Moral Capital	58	54	54
Relational Capital	58	54	54
Joint (all three capitals)	58	54	54

Note: All coverage counts refer to the cross-sectional analytic sample (latest available year per country after merging WVS, SYC, and World Bank). Mongolia and Kyrgyzstan are excluded prior to PCA because their Catholic communities (around one thousand total Catholics each) are too small to register material institutional presence and produce outlier values on the Catholic-density variables. Source: authors' calculations on WVS, SYC, and World Bank data.

APPENDIX C: ROBUSTNESS APPENDIX

C.1 Full Instrumental Variable Estimates

Table C.1 presents the full 2SLS results in a wide format. Rows run over the twelve (endogenous variable, instrument set) combinations, organised into four panels corresponding to the four Catholic-presence measures. The three capital indices appear as separate coefficient columns, allowing direct comparison of sign, magnitude, and significance across outcomes for each specification. Because the first stage regresses only the endogenous variable on the instruments and GNI per capita, it does not depend on which capital index is the second-stage outcome; the first-stage F-statistic is therefore a single shared value per row, and rows marked [W] indicate first-stage F < 10. Section 4.6 summarises instrument relevance and the remaining diagnostics across all 36 specifications; this table gives the corresponding coefficients and standard errors in full.

The OLS-versus-IV comparison is reported in the main text (Figure 5). Adding the GNI control moves the Spiritual OLS estimate toward zero and the Moral estimate away from it; the 2SLS estimates then sit consistently more negative than GNI-adjusted OLS for both forms of capital, with the larger shift for Moral Capital, where Wu-Hausman rejects exogeneity. A1, B1, and C1 point estimates cluster tightly for the scale regressors, confirming cross-set stability, while log_clergy_ptC shows wider intervals and larger cross-set variation, in line with its weaker first stages (Table C.1).

Table C.1. Full 2SLS estimates across the three nested instrument sets.

Inst. set	n_iv	First-stage F (shared)	Spiritual coef. (SE)	Moral coef. (SE)	Relational coef. (SE)	Note
Panel A: Pastoral centers per million (log), scale measure						
A1	3	24.4***	-3.22 (1.28)*	-5.28 (1.55)**	5.00 (1.32)***	Minimal
B1	6	15.8***	-3.53 (1.21)**	-4.80 (1.44)**	4.76 (1.24)***	Historical
C1	10	17.4***	-3.23 (1.10)**	-4.19 (1.31)**	4.75 (1.13)***	Full
Panel B: Catholics per million (log), scale measure						
A1	3	36.3***	-2.36 (1.00)*	-4.02 (1.16)**	4.01 (1.01)***	Minimal
B1	6	20.5***	-2.54 (0.976)*	-3.69 (1.12)**	3.96 (0.981)***	Historical

Inst. set	n_iv	First-stage F (shared)	Spiritual coef. (SE)	Moral coef. (SE)	Relational coef. (SE)	Note
C1	10	19.7***	-2.18 (0.916)*	-3.30 (1.04)**	4.03 (0.923)***	Full
Panel C: Clergy workforce per million (log), scale measure						
A1	3	23.0***	-3.60 (1.44)*	-5.85 (1.72)**	5.46 (1.58)**	Minimal
B1	6	13.9***	-3.79 (1.38)**	-5.02 (1.61)**	5.25 (1.49)***	Historical
C1	10	12.4***	-3.30 (1.27)*	-4.42 (1.49)**	5.43 (1.40)***	Full
Panel D: Clergy per 1,000 Catholics (log), intensity measure						
A1	3	17.6***	5.54 (3.11).	10.5 (3.59)**	-12.0 (2.95)***	Minimal
B1	6	8.39 [W]	5.92 (3.11).	10.7 (3.58)**	-12.1 (2.94)***	Historical [W]
C1	10	5.97 [W]	4.57 (2.90)	9.48 (3.32)**	-11.4 (2.75)***	Full [W]

Note: SE in parentheses alongside the 2SLS coefficient. First-stage F significance are, in every row, far beyond the 0.001 threshold; they are retained here only to flag the two rows where F itself falls below 10, marked [W]. The first-stage F is the partial F from regressing the endogenous variable on the excluded instruments and GNI per capita; it is shared across the three capital columns. Source: authors' calculations on WVS, SYC, and World Bank data.

C.2 IV Diagnostic Battery

Table C.2 reports the full diagnostic battery for the 36 IV specifications, underlying the summary given in Section 4.6. Columns report the first-stage F, the Sargan over-identification p-value (which tests joint orthogonality of the excluded instruments to the second-stage residuals under the maintained assumption that at least one instrument is exogenous; it is not a direct test of exogeneity), the Wu-Hausman endogeneity p-value, and the Anderson-Rubin reduced-form F p-value. The diagnosis column flags specifications with first-stage F below 10, which should be read alongside the Anderson-Rubin signal, itself valid under weak instruments; it does not separately flag Wu-Hausman rejections, whose dependence on the choice of instrument set is discussed in Section 4.6.

Table C.2. IV diagnostic battery for all 36 specifications.

Capital	Endog. variable	Set	FS F	Sargan p	WH p	AR p	Diagnosis
Spiritual	Pastoral centers p.m.	A1	24.4	0.680	0.981	0.110	Acceptable
Spiritual	Pastoral centers p.m.	B1	15.8	0.773	0.637	0.152	Acceptable
Spiritual	Pastoral centers p.m.	C1	17.4	0.147	0.959	0.0365	Acceptable
Spiritual	Catholics p.m.	A1	36.3	0.535	0.923	0.110	Acceptable
Spiritual	Catholics p.m.	B1	20.5	0.572	0.642	0.152	Acceptable
Spiritual	Catholics p.m.	C1	19.7	0.0814	0.756	0.0365	Acceptable
Spiritual	Clergy workforce p.m.	A1	23.0	0.720	0.727	0.110	Acceptable
Spiritual	Clergy workforce p.m.	B1	13.9	0.673	0.527	0.152	Acceptable
Spiritual	Clergy workforce p.m.	C1	12.4	0.0998	0.960	0.0365	Acceptable
Spiritual	Clergy per 1,000 Cath.	A1	17.6	0.233	0.246	0.110	Acceptable
Spiritual	Clergy per 1,000 Cath.	B1	8.39	0.325	0.176	0.152	Weak inst.
Spiritual	Clergy per 1,000 Cath.	C1	5.97	0.0577	0.416	0.0365	Weak inst.
Moral	Pastoral centers p.m.	A1	24.4	0.988	0.0346	0.00886	Acceptable
Moral	Pastoral centers p.m.	B1	15.8	0.210	0.0614	0.00648	Acceptable
Moral	Pastoral centers p.m.	C1	17.4	0.358	0.114	0.0425	Acceptable
Moral	Catholics p.m.	A1	36.3	0.929	0.0661	0.00886	Acceptable
Moral	Catholics p.m.	B1	20.5	0.156	0.150	0.00648	Acceptable
Moral	Catholics p.m.	C1	19.7	0.291	0.307	0.0425	Acceptable
Moral	Clergy workforce p.m.	A1	23.0	0.970	0.0335	0.00886	Acceptable
Moral	Clergy workforce p.m.	B1	13.9	0.122	0.131	0.00648	Acceptable
Moral	Clergy workforce p.m.	C1	12.4	0.247	0.258	0.0425	Acceptable
Moral	Clergy per 1,000 Cath.	A1	17.6	0.321	0.0316	0.00886	Acceptable
Moral	Clergy per 1,000 Cath.	B1	8.39	0.189	0.0246	0.00648	Weak inst.
Moral	Clergy per 1,000 Cath.	C1	5.97	0.326	0.0507	0.0425	Weak inst.
Relational	Pastoral centers p.m.	A1	24.4	0.111	0.163	0.000723	Acceptable
Relational	Pastoral centers p.m.	B1	15.8	0.445	0.194	0.00910	Acceptable
Relational	Pastoral centers p.m.	C1	17.4	0.467	0.0642	0.00911	Acceptable

Capital	Endog. variable	Set	FS F	Sargan p	WH p	AR p	Diagnosis
Relational	Catholics p.m.	A1	36.3	0.250	0.101	0.000723	Acceptable
Relational	Catholics p.m.	B1	20.5	0.709	0.0898	0.00910	Acceptable
Relational	Catholics p.m.	C1	19.7	0.662	0.0131	0.00911	Acceptable
Relational	Clergy workforce p.m.	A1	23.0	0.128	0.0211	0.000723	Acceptable
Relational	Clergy workforce p.m.	B1	13.9	0.484	0.0175	0.00910	Acceptable
Relational	Clergy workforce p.m.	C1	12.4	0.613	0.000675	0.00911	Acceptable
Relational	Clergy per 1,000 Cath.	A1	17.6	0.422	0.0565	0.000723	Acceptable
Relational	Clergy per 1,000 Cath.	B1	8.39	0.827	0.0532	0.00910	Weak inst.
Relational	Clergy per 1,000 Cath.	C1	5.97	0.447	0.0649	0.00911	Weak inst.

Note: n_obs = 54 for every row. The Sargan over-identification test is undefined when the model is exactly identified (q = number of endogenous regressors); degrees of freedom equal q - 1 = 2 for A1, 5 for B1, and 9 for C1. Sargan tests joint orthogonality of the excluded instruments to the residuals; it is not a direct test of instrument exogeneity. Wu-Hausman null = exogeneity of the endogenous regressor. AR p reports the F-test of the reduced-form regression of the outcome on instruments and GNI against GNI alone. 'Weak inst.' = first-stage F < 10. Source: authors' calculations on WVS, SYC, and World Bank data.

C.3 PCA Diagnostics: Scree and Correlation Circles

The notebook produces correlation circles and radial diagrams for the three capital indices. For Spiritual Capital, the elbow is sharp between PC1 (SD = 2.467, share 0.870) and PC2 (SD = 0.643, share 0.059); all seven retained items load uniformly on PC1, and PC2 separates confidence in the churches (E069_01, loading -0.801) from belief in a soul (F051, +0.490). For Moral Capital, the elbow is equally clear (PC1 SD = 1.735, share 0.752; PC2 SD = 0.724, share 0.131); all four justifiability items cluster tightly on PC1. For Relational Capital, the elbow is softer (PC1 SD = 2.008, share 0.576; PC2 SD = 1.061, share 0.141), reflecting genuine multidimensionality: the four A124 out-group tolerance items lead on PC1 (0.440 to 0.477), followed by trust in people of another religion (G007_35_B, 0.279) and church-organization membership (A098, 0.190), with trust in first-time acquaintances (G007_18_B) loading negatively (-0.180); the voluntary-work composite is dropped by the filters. Figures C.1 to C.3 reproduce the correlation circles.

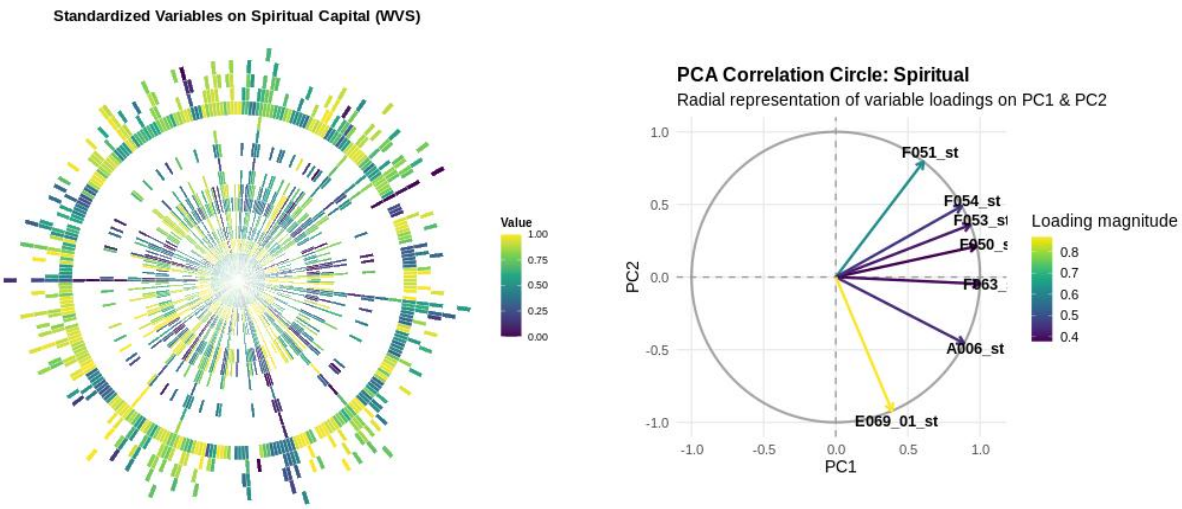


Figure C.1. Spiritual Capital: (Left) Radial item-coverage map Each concentric ring is one standardized WVS item and each angular sector one country; fill denotes the item value rescaled to the unit interval, and gaps denote country-item combinations with no observation. (Right) PCA Correlation Circle and Radial loadings on PC1 and PC2 for the retained items. Source: authors' calculations on WVS.

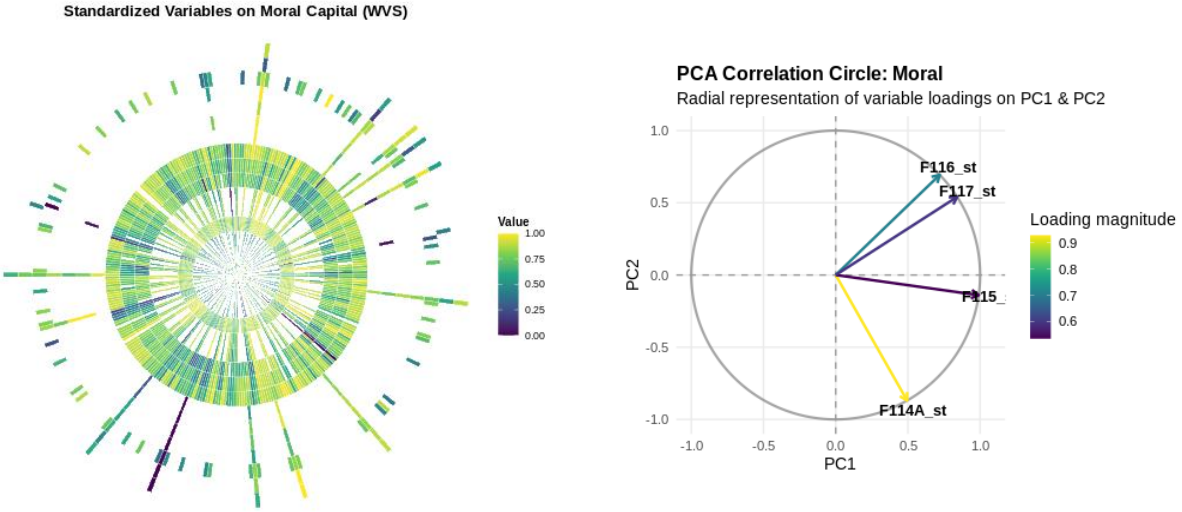


Figure C.2. Moral Capital: (Left) Radial item-coverage map Each concentric ring is one standardized WVS item and each angular sector one country; fill denotes the item value rescaled to the unit interval, and gaps denote country-item combinations with no observation. (Right) PCA Correlation Circle and Radial loadings on PC1 and PC2 for the retained items. Source: authors' calculations on WVS.

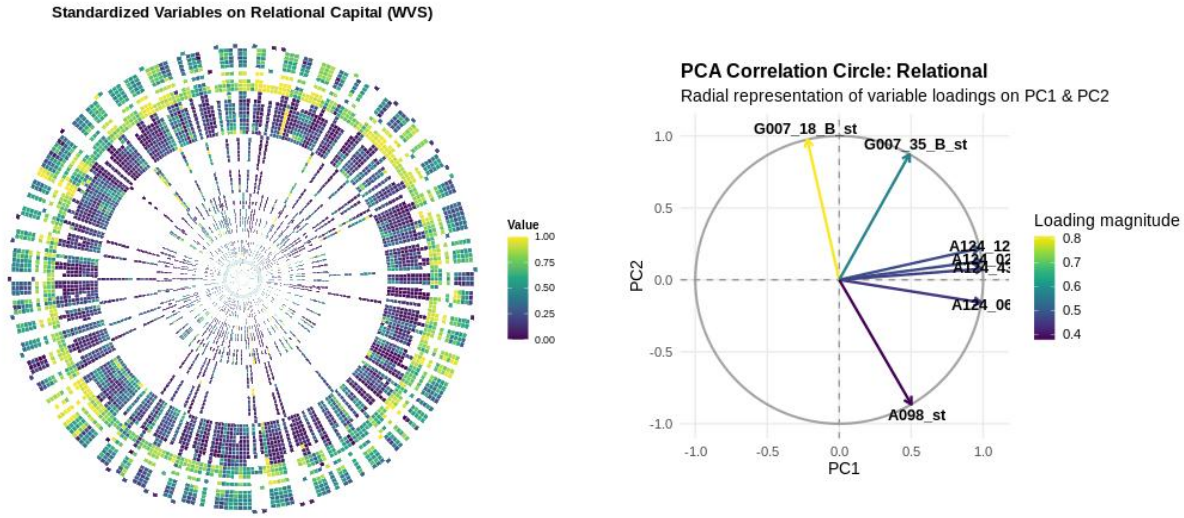


Figure C.3. Relational Capital: (Left) Radial item-coverage map Each concentric ring is one standardized WVS item and each angular sector one country; fill denotes the item value rescaled to the unit interval, and gaps denote country-item combinations with no observation. (Right) PCA Correlation Circle and Radial loadings on PC1 and PC2 for the retained items. Source: authors' calculations on WVS.

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APPENDIX D: ADDITIONAL SCALE REGRESSION PLOTS

This appendix collects the scale-regression scatter plots for the Catholic-presence variables other than the clergy workforce, which is shown in Figure 2 of the main text. Each three-panel figure plots Spiritual (left), Moral (centre), and Relational Capital (right) against the relevant log scale variable, with point size proportional to population and colour by GNI per capita. Stars in the facet labels denote the p-value of the scale regressor in the GNI-adjusted specification. All plots come from authors' replication materials.



Figure D.1. Capital Indices and Pastoral Centers per Million. Source: authors' calculations on WVS, SYC, and World Bank data.

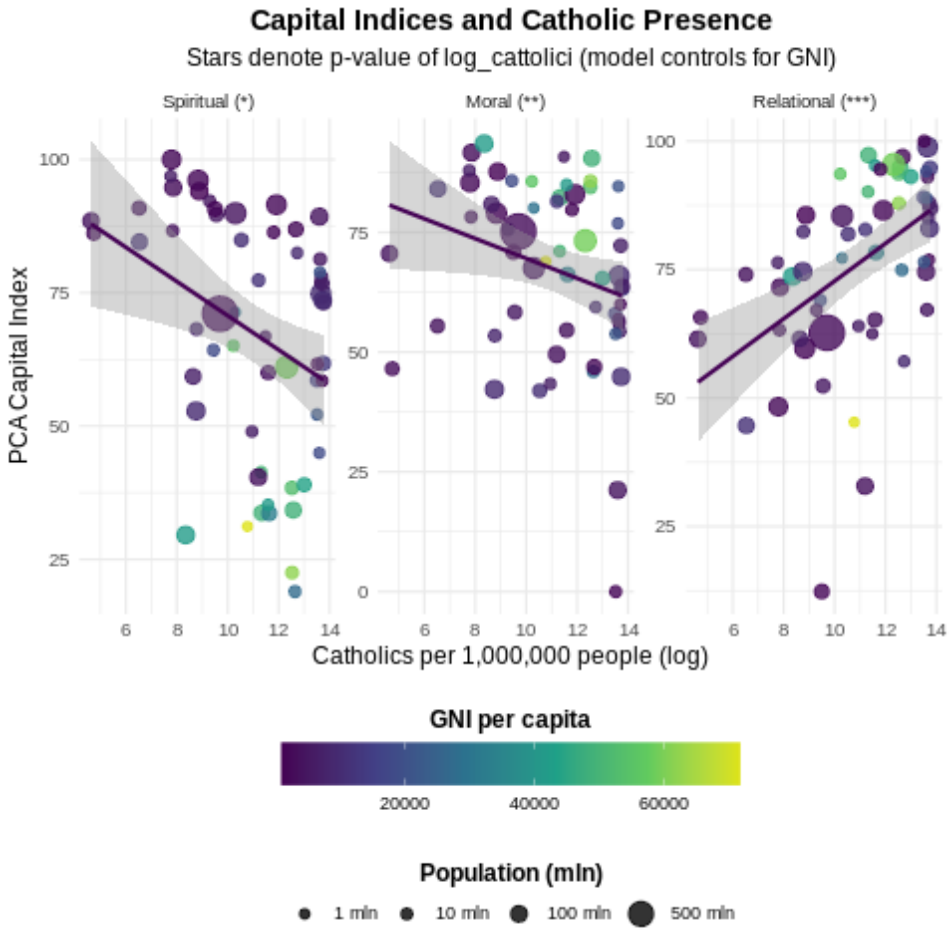


Figure D.2. Capital Indices and Catholic Presence per Million. Source: authors' calculations on WVS, SYC, and World Bank data.

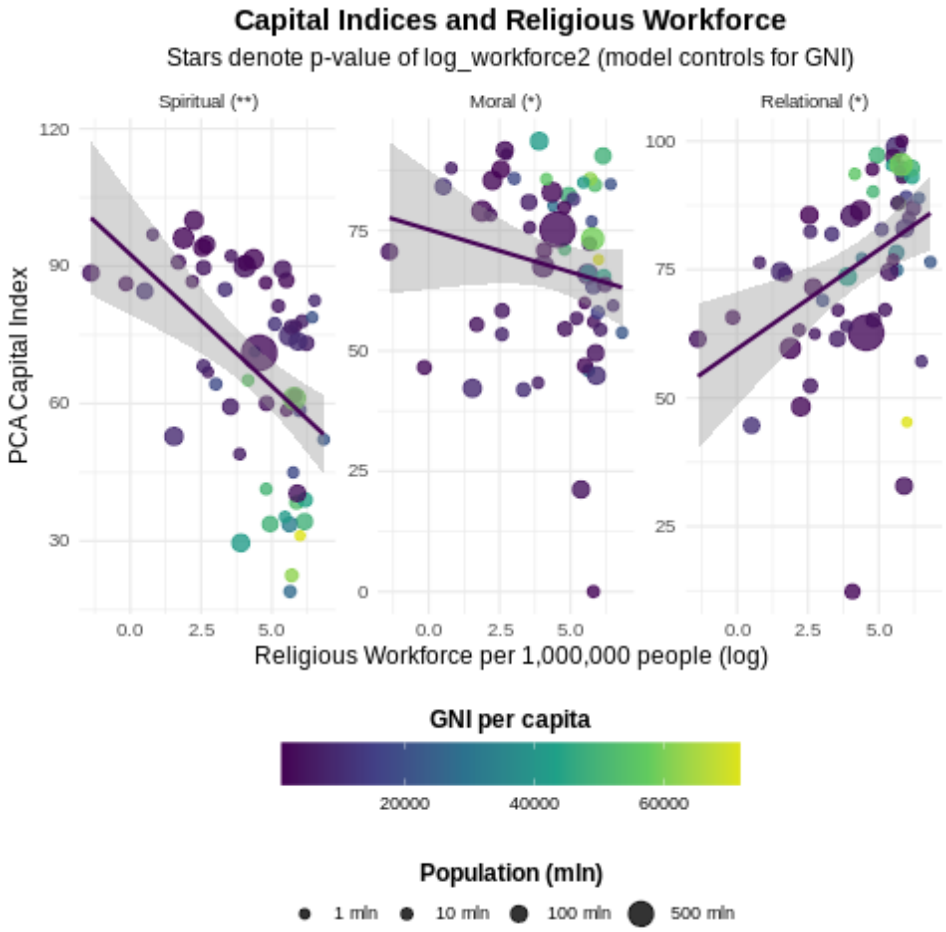


Figure D.3. Capital Indices and Religious Workforce per Million (clergy plus permanent deacons and professed religious). Source: authors' calculations on WVS, SYC, and World Bank data.

The signs and significance stars across these three figures match those reported in Table 5 of Section 4.3: Spiritual and Moral Capital decline with each Catholic-presence measure (negative slope, significance varying from $p = 0.003$ to $p = 0.065$), while Relational Capital rises (positive slope, $p < 0.001$ to $p = 0.011$). The workforce-3 specification, which adds lay personnel (catechists, lay missionaries, lay secular-institute members), attenuates the Spiritual and Moral coefficients (Spiritual at $p = 0.065$ and Moral at $p = 0.014$) while preserving the positive and significant Relational coefficient (3.10, $p = 0.003$).