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Uncertainty, Trade Openness, and Informal Employment: Income-Group Evidence

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ABSTRACT

Informal employment remains a central obstacle to the decent-work objective of Sustainable Development Goal 8, yet cross-country evidence on how economic uncertainty relates to it relies mainly on estimates of shadow-economy output. This study examines whether country-level economic uncertainty is associated with the share of informal employment, whether trade openness conditions this association, and whether the relationships differ between Middle- and High-income economies. Three hypotheses are tested: that uncertainty is associated with informal employment at a common level of trade exposure, that trade openness moderates this association, and that the association differs between the two income groups. An unbalanced panel combines International Labour Organization data on SDG indicator 8.3.1, the World Uncertainty Index, and World Bank indicators for 986 country-years from 53 Middle-income and 32 High-income economies during 2007–2025, with income groups fixed at the World Bank fiscal year 2027 classification. Linear models include country effects, group-specific year effects, and uncertainty–trade interactions, with small-sample-corrected country-cluster inference and a Holm-adjusted family of seven primary tests. At trade equal to 100% of GDP, a 0.1 increase in the uncertainty index is associated with 1.096 percentage points higher informal employment in Middle-income economies and 0.923 points lower informal employment in High-income economies; the direct difference is −2.019 points, with a 95% confidence interval of [−4.305, 0.267]. None of the seven primary tests rejects at the 5% level, and trade moderation is imprecisely estimated, so the evidence does not support the three hypotheses. The intervals

nonetheless exclude large associations: per standard deviation of annual uncertainty, both groups' intervals lie within about 2 percentage points of zero. Measured precision depends strongly on assumed cross-country dependence, and survey sources differ systematically between the income groups. The findings are inconclusive about direction and do not establish equivalence or causal effects.

INTRODUCTION

Informal employment remains central to the decent work objective of Sustainable Development Goal (SDG) 8. The United Nations estimates that 57.8% of global employment was informal in 2024 (United Nations, 2025). Informality nevertheless covers heterogeneous employment arrangements and earnings prospects, and formalization and higher material well-being are related but distinct objectives (OECD, 2024). Understanding the conditions associated with informal employment therefore requires attention to how work is defined and which populations are compared.

Economic uncertainty is one candidate explanation for changes in employment arrangements. Firms facing costly and partly irreversible commitments may postpone hiring and investment, while demand and matching frictions can alter labor-market adjustment (Bloom, 2009; Leduc and Liu, 2016). These mechanisms concern the scale and composition of activity, but do not imply a unique response of the informal-employment share: formal employment may contract, informal opportunities may also deteriorate, and changes in total employment can move the share even when its numerator moves differently. Trade exposure adds a further source of variation because access to foreign markets and inputs coexists with import competition and exposure to external disruptions.

Existing research links uncertainty with the shadow economy and examines differences across income groups (Nguyen and Su, 2022), and work on Internet usage examines how another country characteristic conditions this relationship (Nguyen et al., 2023). This study does not claim that uncertainty–informality links or moderation are new topics. It examines an employment-based outcome, its association with country uncertainty at specified levels of observed trade exposure, and direct contrasts between Middle- and High-income economies, complementing evidence on hidden production, which measures a different dimension of informality.

The research questions are as follows: How is country-level economic uncertainty associated with informal employment? Does trade openness condition this association? How do the relationships differ between Middle- and High-income economies? The outcome is the International Labour Organization's (ILO) SDG indicator 8.3.1, uncertainty is taken from the World Uncertainty Index (WUI), and trade, gross domestic product (GDP), and governance data come from the World Bank (International Labour Organization, 2026; World Uncertainty Index, n.d.; World Bank, n.d.a; World Bank, n.d.b; World Bank, 2025). The primary sample contains 986 country-years for 2007–2025. Evaluating both groups at a common trade level and estimating their difference directly avoids equating different subgroup significance labels with evidence of different coefficients.

At trade equal to 100% of GDP, the estimated uncertainty association is positive in the Middle-income sample and negative in the High-income sample, but both conditional intervals and their direct difference include zero, and trade moderation is imprecise. The intervals nonetheless exclude large associations in both groups. This paper contributes a transparent employment-based comparison at a common trade level, documents how strongly measured precision depends on

assumptions about cross-country dependence, and shows that survey sources differ systematically between income groups. Section 1 reviews the literature, Section 2 develops the conceptual framework and hypotheses, Section 3 describes the data and methodology, Section 4 presents the results, and Section 5 discusses them before the conclusion.

1. LITERATURE REVIEW

1.1 Uncertainty and labor-market adjustment

Uncertainty is not a single observable object. Baker, Bloom, and Davis developed newspaper-based economic policy uncertainty measures, Jurado, Ludvigson, and Ng measured uncertainty about the unforecastable components of economic series, and Ahir, Bloom, and Furceri constructed the WUI from country reports, permitting broad international coverage (Baker et al., 2016; Jurado et al., 2015; Ahir et al., 2022). These measures differ in information source, scope, and time aggregation; therefore, the results for an identified innovation in one measure cannot be read as the effect of an annual level in another.

Bloom (2009) links heightened uncertainty to a temporary pause in hiring and investment when these adjustments are costly. Leduc and Liu (2016) show how uncertainty can operate through aggregate demand when the labor markets experience friction. Choi et al. (2024) distinguish responses through employment and hours, a margin that differs from formal versus informal status. Trade-specific evidence is narrower: Poilly and Tripier (2025) report state-level labor market responses to tariff-related uncertainty in the United States, and Firooz et al. (2025) model how trade uncertainty can encourage reshoring and automation without corresponding employment gains. These studies motivate possible mechanisms but do not determine the sign of an aggregate informal employment share or supply a benchmark for a realized trade-to-GDP interaction.

1.2 Uncertainty and dimensions of informality

The closest uncertainty literature measures the shadow economy as hidden production rather than informal employment. Nguyen and Su (2022) find that uncertainty levels and volatility are positively related to shadow economy size, with stronger relationships in lower-income groups, and Nguyen et al. (2023) report, for 124 economies during 1996–2017, that Internet usage conditions this relationship. Cetin (2024) finds reciprocal positive responses between policy uncertainty and model-based shadow output in a panel vector autoregression, a reason to take simultaneity seriously rather than a basis for a causal reading of a same-year regression.

Employment studies show why a single informal category can conceal different processes. Loayza and Rigolini (2011) used a self-employment proxy to relate informality to development and the business cycle, Bosch and Maloney (2010) distinguished transitions involving self-employment and informal salaried work, and Bizimana and Arzoumanian (2023) documented the buffering role of self-employment in ordinary downturns that the pandemic disrupted. These outcomes should not be relabeled as the SDG 8.3.1 series, and their mechanisms cannot be recovered from an aggregate share.

1.3 Trade openness and employment formality

The trade literature offers competing channels rather than an invariant sign. Goldberg and Pavcnik (2003) emphasize labor-market institutions in the response of informality to trade liberalization in Brazil and Colombia; Ben Yahmed and Bombarda (2020) distinguish responses by sector and worker characteristics in Mexico; and McCaig and Pavcnik (2018) study labor reallocation in Viet Nam after improved access to the US market. Ponczek and Ulyssea (2022) show that adjustment to trade liberalization depends on labor regulation enforcement, and Dix-Carneiro et al. (2026) separate the buffering role of informality for unemployment from its welfare implications. Ulyssea (2020) stresses the heterogeneity of informal firms and workers. A tariff change, improved export access, and a high realized trade ratio describe different exposures; therefore, the trade ratio is treated here as an observed conditioning variable. The literature was selected through a targeted narrative search rather than a systematic review. The literature identifies several relevant but largely separate relationships: uncertainty affects labor-market adjustment, uncertainty is associated with informal economic activity, and trade exposure can alter the allocation of workers across formal and informal activities. However, limited evidence considers these dimensions jointly at the cross-country level using a consistent measure of informal employment and explicitly examines whether the association between uncertainty and informal employment varies with realized trade openness and income group. This study addresses this gap by examining the relationship between uncertainty and informal employment while allowing the association to vary with trade openness and country income group.

2. CONCEPTUAL FRAMEWORK AND HYPOTHESES

A higher informal-employment share could emerge if uncertainty discourages formal hiring more than informal work or if workers displaced from formal jobs find informal alternatives, consistent with adjustment-cost mechanisms and informality as a buffer (Bloom, 2009; Loayza and Rigolini, 2011). Conversely, weaker spending, tighter financing, or disrupted informal markets could reduce informal opportunities, and the pandemic showed that an employment buffer cannot be assumed (Bizimana and Arzoumanian, 2023). Cross-country evidence also differs: banking crises have been followed by a rise in the self-employment share, used as an informality proxy, with a significant increase mainly outside high-income economies (Colombo et al., 2019), whereas informal employment has been found to be largely acyclical rather than rising systematically during recessions (Ohnsorge and Yu, 2021). Because the outcome is a ratio, formal and informal employment can both decline while the share rises, falls, or remains stable.

Trade exposure can amplify the association if uncertain external conditions raise the cost of formal activity or attenuate it if export opportunities, imported inputs, or diversification sustain formal production, and import competition and enforcement can alter the composition of adjustment (Ben Yahmed and Bombarda, 2020; Ponczek and Ulyssea, 2022; Dix-Carneiro et al., 2026). Income grouping summarizes differences in development, institutions, and production structure without isolating any one of them. Therefore, the study tests three two-sided hypotheses:

H1: At a common trade level of 100% of GDP, annual uncertainty is associated with the informal employment share within each income group.

H2: The uncertainty association varies with trade openness within each income group.

H3: The uncertainty association differs between Middle- and High-income economies.

The seven tests addressing these hypotheses form the primary testing family. The family was fixed after inspecting diagnostic point estimates and before the covariance estimates and p-values were computed; the study was not described as preregistered.

3. DATA AND METHODOLOGY

3.1 Sample construction

The analysis uses an unbalanced panel of Middle- and High-income economies. Income groups are held fixed at the World Bank fiscal year 2027 (FY2027) classification, with lower-middle and upper-middle income combined as Middle income (World Bank, 2026); the groups are retrospective comparison strata, not historical classifications or treatments. The ILO general series register for total sex and total economic activity contains 3,422 country-years. ILO-modeled estimates are not used; only survey- and census-based observations are eligible. Urban-only sources and records with explicit conflicts in the employment boundary are held out: 19 metropolitan observations for Argentina, the Republic of the Congo's urban-only 2009 observation, and the Bosnia and Herzegovina 2020 and Viet Nam 2019 observations that exclude own-use production.

The eligible Middle/High core inventory for 2000–2025 contains 1,038 observations. The primary window begins in 2007 because only three High-income observations precede that year, whereas 24 High-income economies are observed in 2007. This yields 465 Middle-income and 521 High-income country-years from 53 and 32 economies (Table 1). Coverage is availability-based, no minimum number of years is imposed, and eight Middle-income economies and one High-income economy contribute a single observation. Low-income observations were too sparse and uneven for a defensible third comparison (52 country-years from 17 economies) and are retained only for description. An earlier stage, which estimated pooled specifications for 68 economies over 2005–2024 with alternative outcomes, temporal specifications, covariance estimators, and estimators such as common correlated effects and panel quantile regression, is reported with its results in Supplement S1 and is not part of the primary testing family.

Table 1. Sample scope and alternative samples

Scope and years	Middle-income (rows / economies)	High-income (rows / economies)
Eligible core inventory, 2000–2025	514 / 53	524 / 32
Primary sample, 2007–2025	465 / 53	521 / 32
Start-year sensitivity, 2010–2025	419 / 53	450 / 32
Endpoint sensitivity, 2007–2024	446 / 53	495 / 32
Timing branch, 2007–2025	456 / 52	506 / 32
LFS branch, 2007–2025	355 / 43	71 / 5

Source: Authors' calculations based on ILO, World Uncertainty Index, and World Bank data. Note: Rows are country-years; alternative samples are separate restrictions of the primary sample, not successive exclusions.

3.2 Variables and measurement

The outcome is the published ILO SDG indicator 8.3.1, which is the share of informal employment in total employment for total sex and total economic activity. Informal employment concerns the nature of the job and is not limited to employment in informal enterprises (International Labour Organization, 2026); the values are not replaced by self-employment, vulnerable employment, or shadow-economy estimates, and the separate 19th ICLS series is not spliced in the data. Provider harmonization supports a qualified comparison but does not guarantee identical age ranges, questionnaires, territories or reference periods. Source composition differs sharply by group: 76.3% of Middle-income observations come from labor force surveys (LFS), whereas 83.9% of High-income observations come from the European Union Statistics on Income and Living Conditions (EU-SILC), whose reference-period conventions require care (Eurostat, n.d.). Country effects absorb stable source-related level differences but not source-specific slopes, and the LFS-only branch retains only five High-income economies (Chile, Costa Rica, Panama, the Russian Federation, and Uruguay).

Annual uncertainty is the arithmetic mean of the four published quarterly values of the trailing-smoothed WUI series (T6) (Ahir et al., 2022; World Uncertainty Index, n.d.). A value is constructed only when all four quarters are available, and the series is not smoothed again. It measures the annual uncertainty context rather than an exogenous shock, and later quarters may follow a survey conducted earlier in the year. Associations are reported for a 0.1 index-unit increase, approximately 1.5 standard deviations of annual uncertainty in the Middle-income sample and 1.8 in the High-income sample. Trade openness is exports plus imports of goods and services as a percentage of GDP (World Bank, n.d.b), centered at 100% of GDP, so that the uncertainty coefficients refer to the same exposure in both groups. Conditioning specifications add the log of real GDP per capita in constant 2015 US dollars (World Bank, n.d.a) and the Worldwide Governance Indicators Regulatory Quality estimate (World Bank, 2025), which is available until 2024. Table 2 summarizes the primary sample.

Table 2. Descriptive statistics for the primary sample

Variable	Group	N	Mean	SD	Min	Max
Informal employment (%)	Middle	465	63.23	20.22	9.69	99.64
Informal employment (%)	High	521	11.14	11.99	0.53	58.69
Annual uncertainty (T6)	Middle	465	0.086	0.067	0.000	0.418
Annual uncertainty (T6)	High	521	0.080	0.055	0.000	0.357
Trade (% of GDP)	Middle	465	72.57	32.96	22.11	186.68
Trade (% of GDP)	High	521	104.99	44.47	33.71	258.78
Log real GDP per capita	Middle	465	8.27	0.65	6.50	9.67
Log real GDP per capita	High	521	10.13	0.67	8.71	11.56
Regulatory Quality	Middle	446	−0.22	0.44	−1.83	0.88
Regulatory Quality	High	495	1.04	0.59	−1.07	2.16

Source: Authors' calculations based on ILO, World Uncertainty Index, and World Bank data. Note: Unweighted country-year statistics; Regulatory Quality is available through 2024; GDP is in constant 2015 US dollars before logs.

3.3 Model and inference

For economy i in fixed income group g and year t, the core model is

$$\mathrm{IE}_{it} = \alpha_i + \lambda_{gt} + \beta_g U_{it} + \gamma_g(T_{it} - 100) + \delta_g U_{it}(T_{it} - 100) + \varepsilon_{it}. \quad (1)$$

where IE is the informal employment share in percentage points, U is annual uncertainty, T is trade as a percentage of GDP, α_i are country effects, and λ_{gt} are group-specific year effects. The coefficients β, γ, and δ vary by income group, both constituent terms of the interaction are retained (Brambor et al., 2006), and each country-year receives an equal weight. The model describes conditional associations over the observed support; its slopes are not causal effects. The uncertainty association for a 0.1 increase at trade level T, $m_g(T)$, and the direct High-minus-Middle contrast, Δm(T), are

$$m_g(T) = 0.1[\beta_g + \delta_g(T - 100)], \quad (2)$$

$$\Delta m(T) = 0.1[(\beta_H - \beta_M) + (\delta_H - \delta_M)(T - 100)]. \quad (3)$$

where H and M denote the High- and Middle-income groups. Moderation, the change in the association per 10 percentage points of trade/GDP, equals δ_g numerically. Associations are evaluated at trade values of 50, 100, and 150% of GDP, with 100 as the primary anchor. Eight pooled specifications are estimated: the primary core and GDP-conditioned models; the 2010–2025 and 2007–2024 windows; branches that exclude records with provider reference-period cautions (timing) or retain only LFS sources; and matched 2007–2024 GDP and GDP-plus-governance specifications.

Inference uses country-cluster covariance with the CR2 bias-reduced linearization correction, contrast-specific Satterthwaite degrees of freedom, and an approximate Hotelling T-squared (HTZ) test for joint equality of the uncertainty curves across groups (Pustejovsky and Tipton, 2018). Country clustering allows dependence within countries but restricts dependence between them (Cameron and Miller, 2015). The primary family comprises the Middle and High associations at trade = 100 and their difference, the two moderation coefficients and their difference, and the joint curve-equality test; Holm adjustment is applied to these seven p-values, and all other tests are exploratory. As a sensitivity analysis, pooled scores are aggregated by calendar year with Bartlett-weighted heteroscedasticity and autocorrelation consistent (HAC) covariance at maximum lags of one and two; with only 16–19 annual scores, only standard errors are compared. Diagnostics include leave-one-country-out refits (MacKinnon et al., 2023), counts of observations near each trade anchor, and summaries of residual persistence and cross-country correlation. The analysis was run in R 4.6.1 with clubSandwich 0.7.0, and a complete rerun from the archived source files on 28 September 2026 reproduced all reported values (Supplement S2).

4. EMPIRICAL RESULTS

4.1 Primary associations and trade moderation

Informal employment averages 63.23% in the Middle-income sample and 11.14% in the High-income sample, and trade averages 72.57% and 104.99% of GDP, respectively (Table 2). At trade equal to 100% of GDP, a 0.1 increase in annual uncertainty is associated with 1.096 percentage points higher informal employment in Middle-income economies (95% interval −0.678 to 2.870)

and 0.923 points lower informal employment in High-income economies (−2.531 to 0.686). The direct High-minus-Middle difference is −2.019 (−4.305 to 0.267), as shown in Table 3 and Figure 1.

Table 3. Primary estimates and inference (primary core specification)

Contrast	Estimate	CR2 SE	95% CI	df	Raw p	Holm p
Association at 100, Middle	1.096	0.817	[−0.678, 2.870]	12.46	0.204	1.000
Association at 100, High	−0.923	0.746	[−2.531, 0.686]	13.32	0.238	1.000
Association at 100, High − Middle	−2.019	1.107	[−4.305, 0.267]	23.67	0.081	0.566
Moderation, Middle	0.167	0.168	[−0.199, 0.534]	12.23	0.339	1.000
Moderation, High	0.058	0.147	[−0.340, 0.455]	4.26	0.712	1.000
Moderation, High − Middle	−0.110	0.223	[−0.582, 0.363]	16.43	0.630	1.000

Source: Authors' estimates. Note: Associations are informal employment percentage points per +0.1 uncertainty at trade = 100% of GDP; moderation is the change in that association per +10 percentage points of trade/GDP. CR2 = bias-reduced country-cluster covariance; df = Satterthwaite degrees of freedom; intervals are pointwise. The Holm adjustment covers the seven-test primary family, including the joint test reported in the text.

None of the seven primary tests rejects at the 5% level, even before Holm adjustment, and the smallest adjusted p-value is 0.566 for the group difference. The joint curve-equality test gives HTZ F = 1.603 with 2 and 19.889 degrees of freedom (raw p = 0.226). Moderation is imprecise: ten points more trade/GDP changes the association by 0.167 in the Middle group (−0.199 to 0.534) and by 0.058 in the High group (−0.340 to 0.455), with only 4.257 effective degrees of freedom for the latter. Hypotheses H1–H3 are therefore not supported at conventional levels.

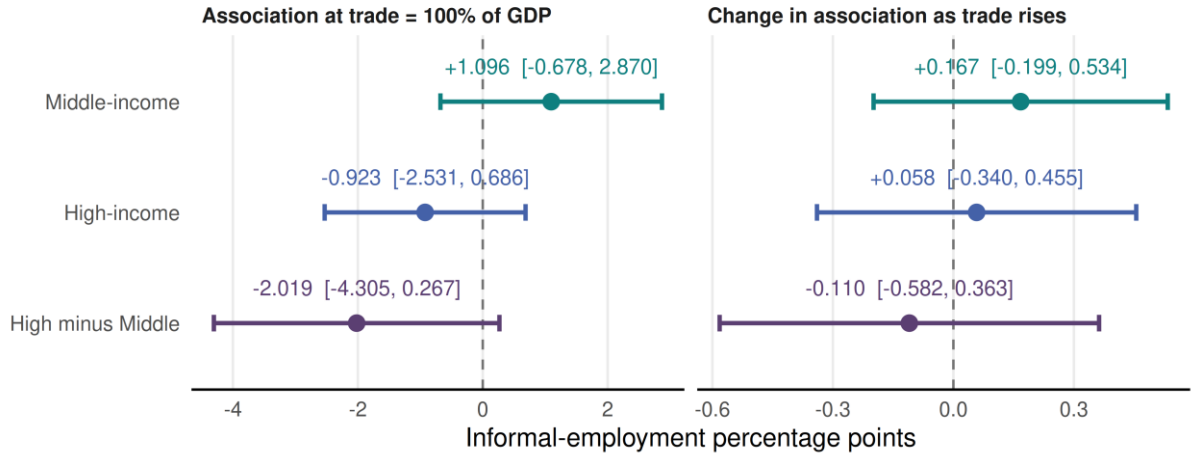


Figure 1. Primary uncertainty associations and trade moderation

Source: Authors' estimates. Note: Primary sample 2007–2025. Left panel: association for +0.1 uncertainty at trade = 100% of GDP; right panel: change in that association for +10 percentage points of trade/GDP. Pointwise 95% intervals under the model and country cluster (CR2) assumptions. The exact values are provided in Table 3.

The intervals include associations of materially different sizes and directions, and no equivalence margin was specified; therefore, they do not establish equal curves or negligible associations (Lakens, 2017; Wasserstein and Lazar, 2016). However, they bound the size of the associations. Per standard deviation of uncertainty, the 95% intervals at trade = 100 are [−0.46, 1.93] percentage points for Middle-income and [−1.39, 0.38] for High-income economies; therefore, associations larger than about 2 percentage points in either direction are not supported under the model and country-cluster assumptions. Given the realized CR2 standard errors, associations of about 2.5 (Middle) and 2.3 (High) percentage points per 0.1 increase, and a group difference of about 3.2 points, would be needed for detection with 80% power at the 5% level.

4.2 Robustness and diagnostics

Table 4 reports the associations at trade = 100 across all specifications. Adding GDP per capita to identical observations gives 0.890 for Middle and −1.028 for High, and the 2010 start, 2024 endpoint, timing, and Regulatory Quality specifications retain the opposite signs. Only one of the 96 scalar references had an unadjusted p-value below 0.05: the timing-branch group difference at trade = 100 (−2.201, interval −4.370 to −0.031, raw p = 0.0471), which lies outside the primary family and does not replace the primary result. The LFS-only High estimate (1.436, interval −8.984 to 11.856, 2.218 effective degrees of freedom) rests on five economies and one observation near the central anchor. All 24 moderation intervals include zero, and all eight joint tests have raw p-values above 0.05.

Table 4. Uncertainty associations at trade = 100% of GDP across specifications

Specification	Middle	High	High − Middle
Primary core	1.096 [−0.678, 2.870]	−0.923 [−2.531, 0.686]	−2.019 [−4.305, 0.267]
Primary + GDP	0.890 [−0.972, 2.752]	−1.028 [−2.552, 0.496]	−1.918 [−4.214, 0.378]
2010–2025 core	0.905 [−0.659, 2.469]	−1.003 [−2.637, 0.631]	−1.908 [−4.063, 0.247]
2007–2024 core	1.429 [−0.390, 3.247]	−0.874 [−2.675, 0.928]	−2.302 [−4.733, 0.128]
Timing core	1.245 [−0.328, 2.817]	−0.956 [−2.600, 0.688]	−2.201 [−4.370, −0.031]
LFS core	0.885 [−1.134, 2.904]	1.436 [−8.984, 11.856]	0.551 [−9.314, 10.417]
2007–2024 + GDP	1.251 [−0.698, 3.200]	−0.967 [−2.663, 0.728]	−2.218 [−4.670, 0.234]
2007–2024 + GDP + RQ	1.246 [−0.772, 3.264]	−0.986 [−2.745, 0.773]	−2.232 [−4.781, 0.317]

Source: Authors' estimates. Note: Estimates with pointwise 95% CR2 intervals for +0.1 uncertainty. GDP = log real GDP per capita; RQ = Regulatory Quality; LFS = labor force survey. Only the primary core belonged to the primary testing family; the timing-branch difference had a raw p-value of 0.0471.

Leave-one-country-out refits preserve the signs at trade = 100: the core Middle association ranges from 0.737 to 1.605 and the High association from −1.261 to −0.208. High moderation is more fragile, changing from 0.0578 to −0.0191 without Chile and to 0.2635 without Ireland. Support is uneven: within ten points of trade = 150, the Middle sample has only nine observations

from five economies, compared with 47 observations from 13 Middle-income and 65 from 12 High-income economies at trade = 100. Residuals are persistent (median adjacent-year correlations of 0.630 and 0.685), and median absolute cross-country residual correlations of 0.42–0.47 signal unresolved international dependence. Calendar-score HAC standard errors are smaller than CR2 in all 192 comparisons, at 0.168 to 0.923 times the CR2 values, so measured precision depends strongly on the dependence assumptions. Four High-income fitted values, all for Switzerland, fall below zero (minimum −1.005); values are not clipped.

5. DISCUSSION

The study does not establish a directional association between uncertainty and informal employment in either income group; the opposite point-estimate signs are descriptive. These employment-share estimates do not contradict the positive uncertainty–shadow-economy associations reported by Nguyen and Su (2022) and Nguyen et al. (2023) because hidden output and informal work measure different phenomena whose relationship depends on the composition of informality (Ulyssea, 2020). Nor does an imprecise interaction show that channel-specific trade mechanisms are absent (McCaig and Pavcnik, 2018; Ponczek and Ulyssea, 2022): the aggregate trade ratio combines several exposures, and the share cannot reveal whether informal work expanded or formal work contracted (Bosch and Maloney, 2010; Loayza and Rigolini, 2011).

Four findings are informative despite the absence of statistically established associations. First, the intervals exclude large contemporaneous associations in both groups. Second, the positive Middle and negative High point estimates recur in seven of the eight specifications and in every single-country omission from the core and GDP-conditioned models; this regularity is descriptive. Third, measured precision depends heavily on the dependence structure: HAC standard errors are 17–92% of their CR2 counterparts, and in the earlier pooled specification, an uncertainty–trade interaction had a raw p-value of 0.021 under CR1 and 0.101 under CR2 (Supplement S1). Significance claims for such interactions in short cross-country panels therefore warrant explicit scrutiny of their covariance assumptions. Fourth, the survey family is closely aligned with income group in the ILO general series; therefore, income-group comparisons of this indicator partly compare survey families.

The main limitations of this study are as follows. Measurement differences between the LFS and EU-SILC sources cannot be removed by country effects, and a stronger comparison would require harmonized microdata with a common employment definition (International Labour Organization, 2026; Eurostat, n.d.). The sample is availability-based and gives more weight to economies with longer records. Uncertainty, trade, GDP, and labor market conditions may respond to common developments or to one another (Cetin, 2024), and country-cluster inference remains conditional on restrictions on international dependence (Cameron and Miller, 2015; Pustejovsky and Tipton, 2018). The evidence does not support using trade exposure as a policy instrument against informality under uncertainty, and it cannot speak to job quality, earnings, or social protection within informal employment (OECD, 2024).

CONCLUSION

This study examined economic uncertainty, trade openness, and informal employment in 53 Middle-income and 32 High-income economies during 2007–2025. At a common trade level, the estimated uncertainty association was positive in the Middle-income sample and negative in the High-income sample, but both intervals and their difference included zero, and the seven-test primary family established neither association, a group difference, nor trade moderation. The intervals nonetheless excluded associations larger than about 2 percentage points per standard

deviation of uncertainty in either group, and the precision of such estimates depends strongly on the assumed cross-country dependence. The findings are inconclusive about the direction rather than evidence of absent relationships or equivalent groups. Future work should prioritize better aligned employment measurement, longer comparable coverage, and a credible account of uncertainty timing before seeking stronger substantive or causal conclusions.

REFERENCES

Ahir, H., Bloom, N., Furceri, D. (2022), "The World Uncertainty Index", working paper, No. 29763, National Bureau of Economic Research, Cambridge, MA, https://doi.org/10.3386/w29763.

Baker, S.R., Bloom, N., Davis, S.J. (2016), "Measuring Economic Policy Uncertainty", The Quarterly Journal of Economics, Vol. 131, No. 4, pp. 1593-1636, https://doi.org/10.1093/qje/qjw024.

Ben Yahmed, S., Bombarda, P. (2020), "Gender, Informal Employment and Trade Liberalization in Mexico", The World Bank Economic Review, Vol. 34, No. 2, pp. 259-283, https://doi.org/10.1093/wber/lhy020.

Bizimana, O., Arzoumanian, S. (2023), "Informality, Labor Market Dynamics, and Business Cycles in North Africa", working paper, No. 2023/182, International Monetary Fund, Washington, DC, https://doi.org/10.5089/9798400250583.001.

Bloom, N. (2009), "The Impact of Uncertainty Shocks", Econometrica, Vol. 77, No. 3, pp. 623-685, https://doi.org/10.3982/ECTA6248.

Bosch, M., Maloney, W.F. (2010), "Comparative Analysis of Labor Market Dynamics Using Markov Processes: An Application to Informality", Labour Economics, Vol. 17, No. 4, pp. 621-631, https://doi.org/10.1016/j.labeco.2010.01.005.

Brambor, T., Clark, W.R., Golder, M. (2006), "Understanding Interaction Models: Improving Empirical Analyses", Political Analysis, Vol. 14, pp. 63-82, https://doi.org/10.1093/pan/mpi014.

Cameron, A.C., Miller, D.L. (2015), "A Practitioner's Guide to Cluster-Robust Inference", Journal of Human Resources, Vol. 50, No. 2, pp. 317-372, https://doi.org/10.3368/jhr.50.2.317.

Cetin, I. (2024), "Dynamic Interactions between the Shadow Economy and Economic Policy Uncertainty: A Panel VAR Approach", Politická ekonomie, Vol. 72, No. 3, pp. 431-445, https://doi.org/10.18267/j.polek.1427.

Choi, S., Furceri, D., Yoo, S.Y. (2024), "Heterogeneity in the Effects of Uncertainty Shocks on Labor Market Dynamics and Extensive vs. Intensive Margins of Adjustment", Journal of Economic Dynamics and Control, Vol. 162, Article 104859, https://doi.org/10.1016/j.jedc.2024.104859.

Colombo, E., Menna, L., Tirelli, P. (2019), "Informality and the Labor Market Effects of Financial Crises", World Development, Vol. 119, pp. 1-22, https://doi.org/10.1016/j.worlddev.2019.03.001.

Dix-Carneiro, R., Goldberg, P.K., Meghir, C., Ulyssea, G. (2026), "Trade and Domestic Distortions: The Case of Informality", Econometrica, Vol. 94, No. 2, pp. 573-618, https://doi.org/10.3982/ECTA19378.

Eurostat (n.d.), "Methodology: Income and Living Conditions (EU-SILC)", European Commission, available at: https://ec.europa.eu/eurostat/web/income-and-living-conditions/methodology (accessed 11 September 2026).

Firooz, H., Leduc, S., Liu, Z. (2025), "Reshoring, Automation, and Labor Markets under Trade Uncertainty", Journal of International Economics, Vol. 156, Article 104091, https://doi.org/10.1016/j.jinteco.2025.104091.

Goldberg, P.K., Pavcnik, N. (2003), "The Response of the Informal Sector to Trade Liberalization", Journal of Development Economics, Vol. 72, No. 2, pp. 463-496, https://doi.org/10.1016/S0304-3878(03)00116-0.

International Labour Organization (2026), “SDG Indicator Metadata: Indicator 8.3.1, Proportion of Informal Employment in Total Employment, by Sector and Sex”, United Nations Statistics Division, updated 27 March 2026, available at: https://unstats.un.org/sdgs/metadata/files/Metadata-08-03-01. pdf (accessed 6 September 2026).
Jurado, K., Ludvigson, S.C., Ng, S. (2015), “Measuring Uncertainty”, American Economic Review, Vol. 105, No. 3, pp. 1177-1216, https://doi.org/10.1257/aer.20131193.
Lakens, D. (2017), “Equivalence Tests: A Practical Primer for t Tests, Correlations, and Meta-Analyses”, Social Psychological and Personality Science, Vol. 8, No. 4, pp. 355-362, https://doi.org/10.1177/1948550617697177.
Leduc, S., Liu, Z. (2016), “Uncertainty Shocks Are Aggregate Demand Shocks”, Journal of Monetary Economics, Vol. 82, pp. 20-35, https://doi.org/10.1016/j.jmoneco.2016.07.002.
Loayza, N.V., Rigolini, J. (2011), “Informal Employment: Safety Net or Growth Engine?”, World Development, Vol. 39, No. 9, pp. 1503-1515, https://doi.org/10.1016/j.worlddev.2011.02.003.
MacKinnon, J.G., Nielsen, M.Ø., Webb, M.D. (2023), “Leverage, Influence, and the Jackknife in Clustered Regression Models: Reliable Inference Using summclust”, The Stata Journal, Vol. 23, No. 4, pp. 942-982, https://doi.org/10.1177/1536867X231212433.
McCaig, B., Pavcnik, N. (2018), “Export Markets and Labor Allocation in a Low-Income Country”, American Economic Review, Vol. 108, No. 7, pp. 1899-1941, https://doi.org/10.1257/aer.20141096.
Nguyen, C.P., Su, T.D. (2022), “When ‘Uncertainty’ Becomes ‘Unknown’: Influences of Economic Uncertainty on the Shadow Economy”, Annals of Public and Cooperative Economics, Vol. 93, No. 3, pp. 677-716, https://doi.org/10.1111/apce.12336.m
Nguyen, C.P., Nguyen, B.Q., Tran, D.T.L. (2023), “The Internet, Economic Uncertainty, and the Shadow Economy: ‘The Good, the Bad, and the Unknown’?”, International Social Science Journal, Vol. 73, No. 247, pp. 9-28, https://doi.org/10.1111/issj.12381.
OECD (2024), Breaking the Vicious Circles of Informal Employment and Low-Paying Work, OECD Publishing, Paris, https://doi.org/10.1787/f95c5a74-en.
Ohnsorge, F., Yu, S. (2021), The Long Shadow of Informality: Challenges and Policies, World Bank, Washington, DC, https://doi.org/10.1596/35782.
Poilly, C., Tripier, F. (2025), “Trade Policy Uncertainty and the Labor Market: State-Level Evidence”, AEA Papers and Proceedings, Vol. 115, pp. 172-176, https://doi.org/10.1257/pandp.20251009.
Ponczek, V., Ulyssea, G. (2022), “Enforcement of Labour Regulation and the Labour Market Effects of Trade: Evidence from Brazil”, The Economic Journal, Vol. 132, No. 641, pp. 361-390, https://doi.org/10.1093/ej/ueab052.
Pustejovsky, J.E., Tipton, E. (2018), “Small-Sample Methods for Cluster-Robust Variance Estimation and Hypothesis Testing in Fixed Effects Models”, Journal of Business & Economic Statistics, Vol. 36, No. 4, pp. 672-683, https://doi.org/10.1080/07350015.2016.1247004.
Ulyssea, G. (2020), “Informality: Causes and Consequences for Development”, Annual Review of Economics, Vol. 12, pp. 525-546, https://doi.org/10.1146/annurev-economics-082119-121914.
United Nations (2025), The Sustainable Development Goals Extended Report 2025: Goal 8, United Nations Statistics Division, New York, available at: https://unstats.un.org/sdgs/report/2025/extended-report/Extended-Report-2025_Goal-8. pdf (accessed 28 September 2026).
Wasserstein, R.L., Lazar, N.A. (2016), “The ASA’s Statement on p-Values: Context, Process, and Purpose”, The American Statistician, Vol. 70, No. 2, pp. 129-133, https://doi.org/10.1080/00031305.2016.1154108.

World Bank (2025), “Worldwide Governance Indicators, 2025 Revision” [data set and methodology], available at: https://www.worldbank.org/en/publication/worldwide-governance-indicators (accessed 6 September 2026).
World Bank (2026), “World Bank Country and Lending Groups: Fiscal Year 2027 Income Classification”, available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups (accessed 28 September 2026).
World Bank (n.d.a), “GDP per Capita (Constant 2015 US$) (NY.GDP.PCAP.KD)”, World Development Indicators, available at: https://data.worldbank.org/indicator/NY.GDP.PCAP.KD (accessed 6 September 2026).
World Bank (n.d.b), “Trade (% of GDP) (NE.TRD.GNFS.ZS)”, World Development Indicators, available at: https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS (accessed 6 September 2026).
World Uncertainty Index (n.d.), “World Uncertainty Index: Data Portal and Index Description”, available at: https://worlduncertaintyindex.com (accessed 6 September 2026).