



Nominal Value Added and Employment in Canada's Cultural Industries

Accounting Definitions, Provincial Panel Estimates, and Domain Heterogeneity, 2010–2024

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Abstract

This paper describes how employment co-moves with nominal economic value added across Canadian cultural activities, using annual province-level observations from Statistics Canada's Provincial and Territorial Culture Indicators between 2010 and 2024. The accounting distinction between all production undertaken by cultural industries and the production of cultural products within those industries is central to the design. For ten provinces, a two-way fixed-effects regression gives a log-jobs–log-GDP coefficient of 0.444 for the broad industry aggregate, compared with 0.708 for the cultural-product component. For the latter, the estimate is 0.540 over 2017–2024 and 0.667 in a first-difference specification over the full sample. The positive association persists when 2020 or individual provinces are excluded, although the estimate is sensitive to the sample window and particularly to British Columbia. Estimates also differ across nine cultural domains, including heritage, live performance, publishing, audio-visual media, and visual arts. Inference based on ten province clusters is treated cautiously, supplemented by an exhaustive restricted-null wild-cluster bootstrap sensitivity exercise. The analysis identifies conditional associations, not a causal employment response to output. Since GDP is nominal and both variables come from related satellite-account estimates, the coefficients cannot isolate real output, employment intensity, or labour productivity. The evidence nevertheless shows why statistical boundaries and within-sector composition matter for descriptive economic analysis of culture.

Keywords: cultural industries; employment; value added; Canada; panel data; economic measurement
JEL classifications: Z10; J21; L82; C23

Introduction

The expression “cultural industries” brings together firms and institutions with markedly different production arrangements. Book publishing, music recording, film production, libraries, design, cultural education, and live performance do not have a single relationship between value added and paid jobs. Some activities require repeated labour input to deliver a service, while others can reproduce and distribute work across audiences at relatively low incremental cost. A useful empirical starting point is therefore not whether culture is important, but how much of its recorded economic activity is accompanied by measured employment.

That question is harder to answer than it first appears. Official culture-sector statistics are built from classifications that assign production to both industries and products. A firm classified in a cultural industry may produce services that are not themselves cultural products. Conversely, cultural products can be produced by businesses outside cultural industries. These two

perspectives are legitimate but different accounting objects. Conflating them changes both the economic interpretation of a comparison and, as this paper shows, the associated regression estimate.

Canada offers a relatively long annual series with consistent geographic coverage and a detailed cultural-domain hierarchy. We use Statistics Canada's *Culture and sport indicators by domain and sub-domain, by province and territory, industry perspective*, Table 36-10-0453-01 (Statistics Canada 2026a). The main data contain 10 provinces observed annually from 2010 through 2024. We estimate relationships between the logarithm of jobs and the logarithm of nominal GDP, starting with pooled OLS and then including province and year fixed effects. We report annual log-difference alternatives, shorter sample windows, leave-one-province-out diagnostics, and separate results for nine broad culture domains.

Three findings organise the analysis. First, the accounting boundary materially changes the estimate: the broad industry total yields 0.444 under two-way fixed effects, while the cultural-product component within those industries yields 0.708. Second, the latter estimate is positive under several specifications, but its magnitude changes when the observation window is shortened to 2017–2024. Third, the pattern is not homogeneous across domains. The estimates for heritage and libraries, visual and applied arts, and audio-visual activities differ enough to caution against a single characterisation of the cultural economy.

None of these findings identifies an economic multiplier or an employment effect of exogenous GDP growth. A sector's GDP and jobs are outcomes of the same production activity, and the underlying statistics share inputs and construction procedures. The purpose of the paper is a narrower one: to produce an auditable description of the nominal value-added–jobs relationship, and to show how sensitive that description is to definitions and aggregation.

The analysis proceeds with measurement and institutional background, then develops the descriptive regression framework. Results are presented first for aggregates and then for domains. Separate sections address sample sensitivity, limited-cluster inference, and the limits of economic interpretation. Appendices provide classifications, extended tables, and reproduction details.

Background and Related Literature

Why the economics of cultural activity can differ

The economics of cultural production is shaped by a mix of artistic, organisational, and commercial constraints. Baumol and Bowen (1966) emphasise that labour-intensive performing arts may face cost pressure when productivity advances elsewhere in the economy. This is a theory concerning production technology and relative costs, not a prediction that every cultural activity must exhibit the same measured GDP–jobs elasticity. Caves (2000) describes the contractual arrangements through which creative inputs are assembled, financed, and distributed. That perspective suggests potentially different employment arrangements among activities that share a broad cultural classification.

These arguments help motivate examination of heterogeneity, but the present data cannot test the mechanisms directly. We do not observe hours worked, technology adoption, subcontracting, firm-level organisation, or output prices by provincial domain. Domain estimates consequently describe patterns compatible with several competing mechanisms rather than choosing among those explanations.

Recent work using Canadian administrative data provides additional context. Allen et al. (2025) study firms in Canada's cultural supply chain and document changes in firm composition, including the relative importance of small unincorporated firms. This matters because a jobs measure may react differently from value added when work is organised across employers, independent contractors, and organisations of different sizes. The current study does not link its province-level estimates to the firms in that research; it treats organisational structure as a reason to avoid overly narrow causal interpretations.

A measurement question rather than a policy effect

The provincial indicators are derived from the Canadian Culture Satellite Account and the national accounting system (Statistics Canada 2022, 2016). Output, value added, and employment are estimated from accounting and related sources rather than independently randomised observations. The official framework distinguishes production by cultural industries from production of cultural products throughout the economy (Statistics Canada 2022, 2026c). Both are useful: the former concerns the performance of a group of establishments, while the latter concerns a type of output.

Our analytical choice is to retain the industry perspective throughout the main study. We compare its complete culture-industry total with the nested component labelled *Culture products*. That component is narrower than the economy-wide product perspective. We do not silently substitute the product-perspective national totals publicised in the annual headline release, which reports a different scope (Statistics Canada 2026b).

The contribution is therefore partly methodological. When a researcher says “culture GDP”, readers need to know whether the figure covers firms, cultural products, or both. The difference is consequential even before questions of econometric identification arise. The results below make the effect of this classification choice visible using the same years, provinces, functional form, and standard-error convention.

Data and Statistical Construction

Source and selection

Our source is the complete CSV and accompanying cube metadata for Table 36-10-0453-01, released in June 2026 (Statistics Canada 2026a). Three fields define a raw observation: geography, indicator, and industry member; observations also contain a reference year. We select GDP, jobs, and where required output. The monetary series is nominal value added at basic prices. It is not equivalent to sales, turnover, or inflation-adjusted output.

We retain the ten provinces and exclude Yukon, Northwest Territories, Nunavut, the separate Canada total, and outside-Canada entries from the regression sample. This avoids counting national totals alongside component observations. The main 2010–2024 panel contains 150 province–year observations. Each province has a positive value for both GDP and jobs, so logs are defined without imputation. Annual differences are constructed within provinces and yield 140 province–year changes.

The key accounting boundary

The industry dimension’s hierarchy distinguishes three parent components. Member 1, *Culture industries, total*, includes cultural and other products made by establishments classified as cultural industries. Member 2, *Culture products*, records the cultural-product component of these establishments. Member 36, *All other products*, records the residual non-cultural component. The three aggregate series are not interchangeable and must not be stacked together as independent observations.

Table 1. National accounting aggregates: GDP and jobs

Industry-perspective category	2010	2016	2017	2024	2024 jobs (000s)
Culture industries, all products	49.45	47.32	62.18	82.10	748.9
Culture products within culture industries	39.24	40.91	43.39	58.00	615.9
Other products in culture industries	10.21	6.41	18.78	24.11	133.0

Notes: Nominal GDP is shown in CAD billions; 2024 jobs are in thousands. Values are nationwide source rows rather than the ten-province regression sample. Parent/child totals are not independent datasets.

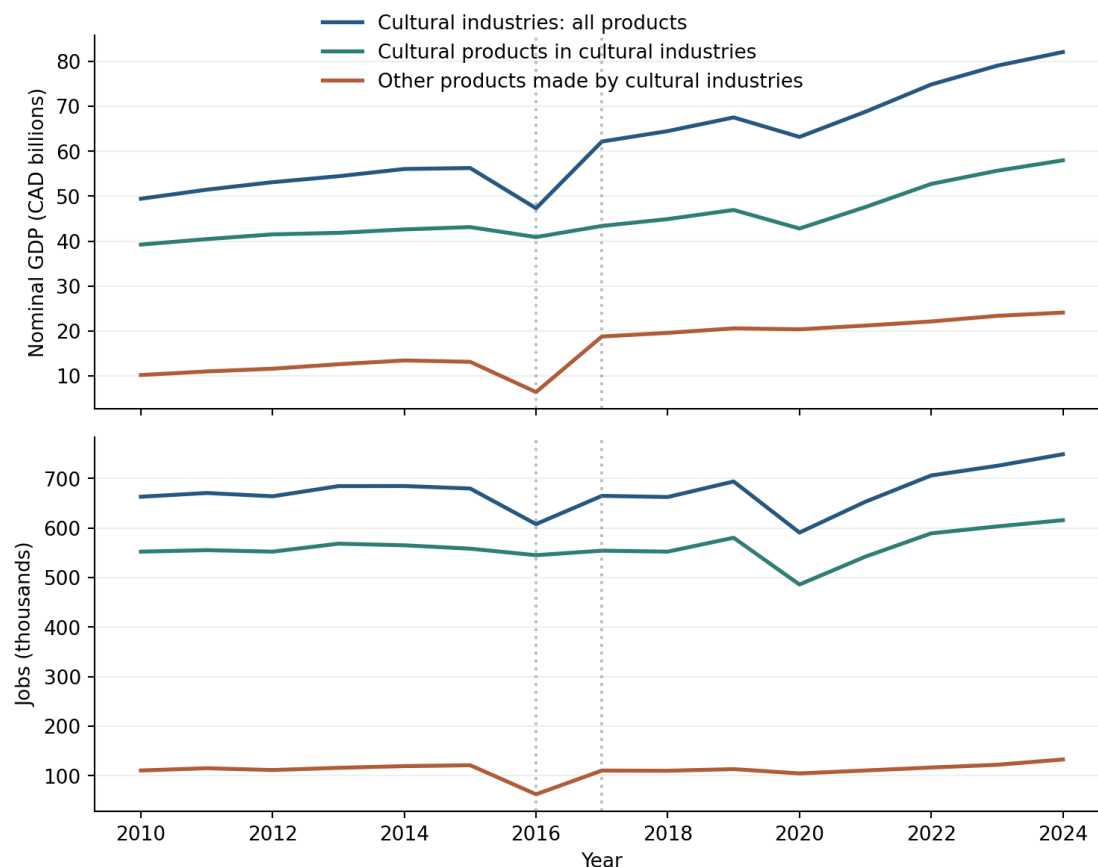


Figure 1. National time series for the industry-perspective accounting categories. GDP is nominal. The 2016–2017 movements in the “other products” component are unusually large. National figures are descriptive only; regressions use province-level observations.

In 2024, the industry total represents approximately CAD 82.10 billion of nominal GDP and 748,942 jobs. Of that, culture products within those industries account for about CAD 58.00 billion and 615,908 jobs. The remaining non-cultural products account for about CAD 24.11 billion of GDP. The culture-product share of industry GDP is therefore roughly 70.6 percent in that year. A regression employing the industry total answers a broader question than one using cultural products alone.

The distinction matters over time as well. National industry-total GDP falls markedly in 2016 and rebounds in 2017, whereas the culture-product component has a much smaller change. The source CSV shows particularly large shifts in *All other products* around those dates. The reason for the discontinuity is not fully established by the uploaded data. We consequently do not describe the movement as a verified economic contraction or attribute it to a particular reclassification. Our sensitivity analysis separately considers 2017–2024 and omits 2016–2017 from some specifications.

Coverage, domains, and measurement notes

Within member 2, the cultural-product component is divided into nine broad, non-overlapping domains. These include heritage and libraries; live performance; visual and applied arts; written and published works; audio-visual and interactive media; sound recording; cultural education and training; governance, funding, and professional support; and multi-domain activities. Each domain has subdomains, which must not be added to the parent again. Several source labels recur in different parts of the hierarchy; therefore the analysis uses numeric industry-member identifiers in preference to names alone.

The source metadata specifically notes a methodological improvement in film and video measurement beginning in 2015. It describes this as a statistical break, with a warning against direct comparison with earlier values in that subdomain. The metadata also identify a reallocation of Internet publishing across subdomains beginning in 2017. These changes are especially important when interpreting publishing and audio-visual trajectories. They also motivate reporting the full period and a shorter 2017–2024 window instead of relying on a single uninterrupted time-series story.

Table 2. Source classification crosswalk used in replication

Industry member ID	Official source label	Analytical treatment
1	Culture industries, total	Broad parent: all products made by culture industries
2	Culture products	Culture-product component within cultural industries
36	All other products	Other products made by culture industries
3, 8, 11, 19, 26, 30, 33, 34, 35	Nine broad culture domains	Non-overlapping children of member 2 used in analyses

Notes: These IDs are taken from the Industry dimension of Table 36-10-0453-01. Repeated text labels occur at multiple positions in the classification hierarchy; numeric industry member IDs are therefore necessary for reproducible data selection.

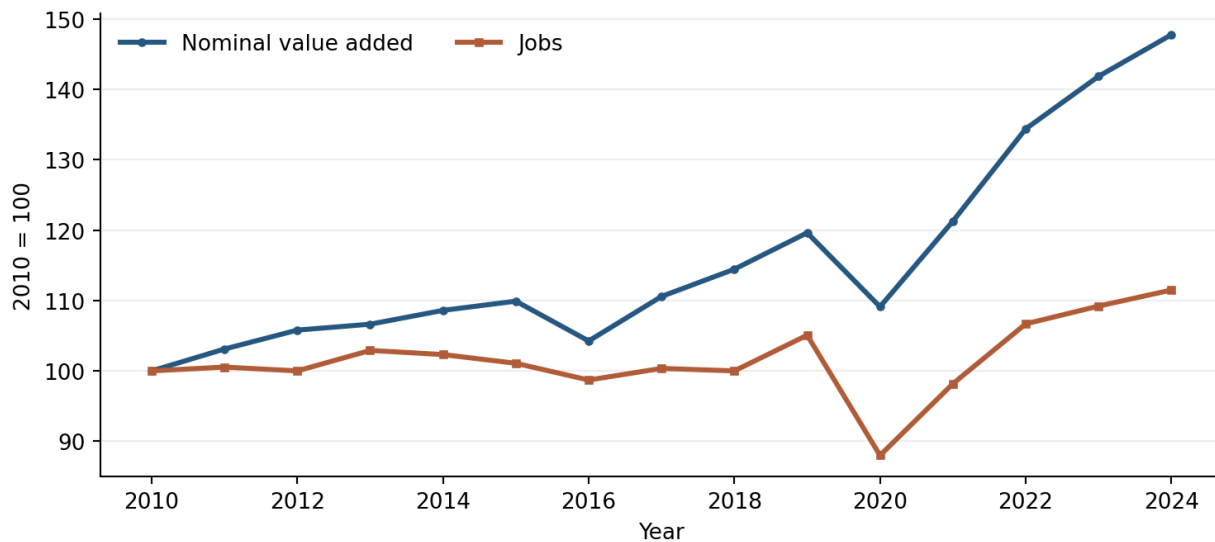


Figure 2. National indexes for the cultural-product component produced within cultural industries, 2010=100. The contrast is between nominal value added and counted jobs, not real output and hours worked.

Provincial and domain composition

Table 3 reports each province's 2024 cultural-product GDP and jobs. Ontario, Quebec, and British Columbia dominate the ten-province totals in absolute size. The range matters for pooled cross-sectional regressions: a large province naturally has more of both economic activity and employment than a small province, even if the within-province relationship is modest. The share columns permit a more useful size comparison than raw totals alone.

Table 3. Province-level cultural-product measures, 2024

Province	GDP (B CAD)	Jobs	GDP share %	Jobs share %	GDP/job CAD
Ontario	25.311	243,049	43.8	39.6	104,140
Quebec	12.735	146,602	22.1	23.9	86,865
British Columbia	10.438	120,269	18.1	19.6	86,786
Alberta	4.454	45,780	7.7	7.5	97,293
Manitoba	1.491	18,878	2.6	3.1	78,974
Nova Scotia	1.086	13,070	1.9	2.1	83,105
Saskatchewan	0.974	11,995	1.7	2.0	81,241
New Brunswick	0.667	7,707	1.2	1.3	86,606
Newfoundland and Labrador	0.451	4,621	0.8	0.8	97,554
Prince Edward Island	0.137	1,809	0.2	0.3	75,682

Notes: GDP is nominal at basic prices. Shares are calculated over ten provinces, omitting territories and any outside-Canada category. GDP per job is an accounting ratio, not real labour productivity.

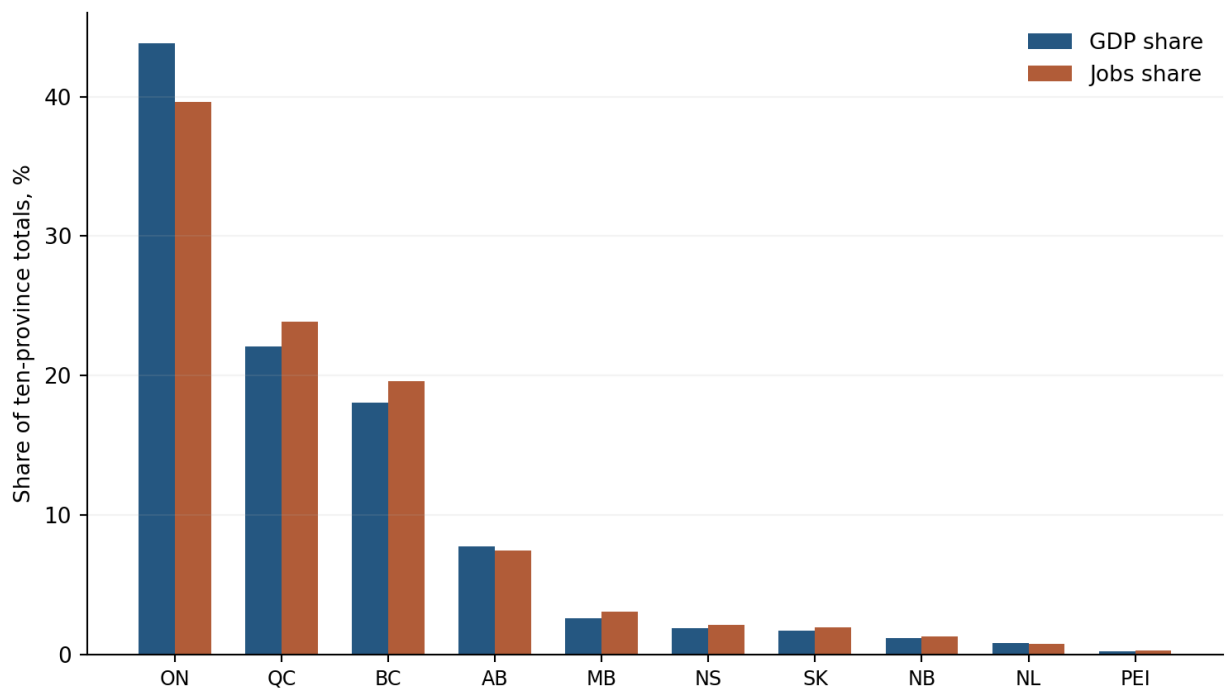


Figure 3. Ten-province distribution of cultural-product GDP and jobs in 2024. The values use the industry-perspective cultural-product component; geographic shares sum to 100 percent across the ten provinces.

There is also a distinct domain-composition issue. In 2024, audio-visual and interactive media accounts for about 27.6 percent of this cultural-product GDP; visual and applied arts contributes 20.7 percent; and governance, funding and professional support contributes 21.2 percent. These three together represent roughly seven-tenths of the aggregate. Their employment shares differ from their GDP shares, demonstrating that a broad industry total combines activities with different nominal value added per recorded job.

Table 4. Nine non-overlapping cultural domains in 2024

Cultural domain	GDP (B CAD)	Jobs	GDP share %	Jobs share %
Heritage and libraries	0.928	17,904	1.6	2.9
Live performance	3.239	61,577	5.6	10.0
Visual and applied arts	12.000	125,195	20.7	20.3
Written and published works	6.545	82,745	11.3	13.4
Audio-visual and interactive media	15.991	152,586	27.6	24.8
Sound recording	0.637	6,307	1.1	1.0
Education and training (culture)	5.087	61,807	8.8	10.0
Governance, funding and professional support (culture)	12.322	101,125	21.2	16.4
Multi domain	1.249	6,661	2.2	1.1

Notes: Shares use the industry-perspective Culture products parent (industry member ID 2), not economy-wide culture product totals. Values refer to Canada. Subdomain totals are not summed separately.

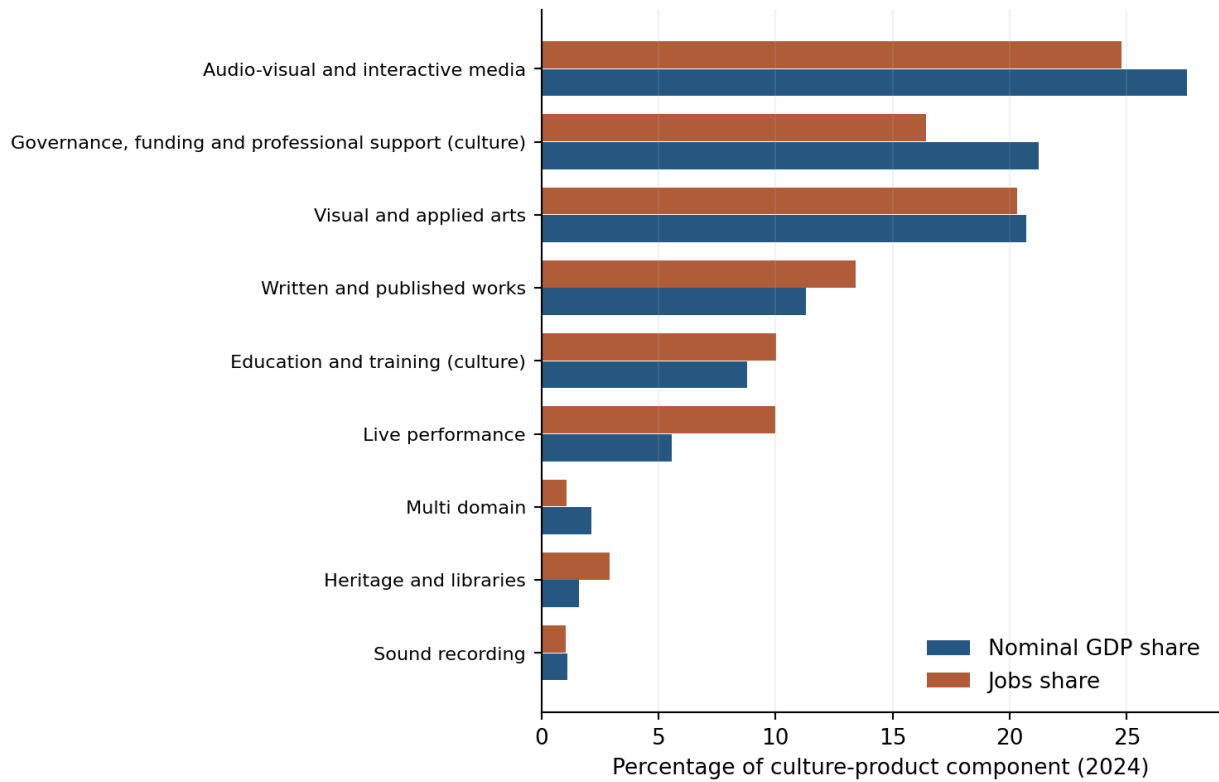


Figure 4. GDP and job shares of nine cultural domains in 2024. The difference between GDP and employment shares is a descriptive feature of the accounts; it should not be read as a real-productivity ranking.

Empirical Framework

Pooled and fixed-effects models

Let $J_{it}^{(k)}$ denote reported jobs in province i and year t for accounting component or domain k , and let $Y_{it}^{(k)}$ denote corresponding nominal value added. We first estimate a pooled log–log regression,

$$\log J_{it}^{(k)} = \alpha + \beta_k \log Y_{it}^{(k)} + u_{it}^{(k)}. \quad (1)$$

The coefficient is a pooled conditional association combining permanent size differences across provinces, common time changes, and within-province movements. Its interpretation as an employment elasticity is descriptive, not causal.

The main specification removes additive province and calendar-year effects:

$$\log J_{it}^{(k)} = \alpha_i^{(k)} + \lambda_t^{(k)} + \beta_k \log Y_{it}^{(k)} + \varepsilon_{it}^{(k)}. \quad (2)$$

Here α_i absorbs differences across provinces that are fixed over the sample, and λ_t absorbs shocks common to all provinces in a particular year. The resulting $\hat{\beta}_k$ is estimated from changes in relative within-province outcomes after removing common calendar variation. There is no instrument, intervention, or exogenous source of GDP change in this design; fixed effects do not create causal identification.

We implement equation (2) separately for industry-total production, culture-product production within cultural industries, and the all-other-products component. We then repeat it for each of nine broad cultural domains. By holding the econometric form constant, these exercises illuminate the measurement and domain dimensions of the association without treating them as equivalent populations.

Annual changes and shorter windows

A complementary transformation uses year-to-year changes in logged GDP and jobs:

$$\Delta \log J_{it}^{(k)} = \delta_t^{(k)} + \gamma_k \Delta \log Y_{it}^{(k)} + \eta_{it}^{(k)}, \quad (3)$$

where $\Delta \log X_{it} = \log X_{it} - \log X_{i,t-1}$, calculated only for adjacent years within a province. This model is not identical to equation (2); it emphasises contemporaneous annual changes and can respond differently to measurement noise. We include year indicators to remove shared annual movements in the differenced series.

Additional sensitivity checks re-estimate the levels model on 2015–2024, 2017–2024, all years except 2020, and a sample excluding 2016–2017. The 2017–2024 subsample is particularly relevant for classification comparability but contains only eight annual observations per province. Removing 2020 is not the same as removing the broader pandemic period, and we label it accordingly.

Inference with ten provinces

Observations in the same province plausibly share persistent shocks, accounting adjustments, and correlated errors. We therefore report heteroskedasticity-robust standard errors clustered by province rather than rely on default independent-observation OLS standard errors. Following the cautions in Cameron and Miller (2015), we treat ten clusters as a small number. The coefficient tables provide cluster-robust HC1 standard errors and, when listed, an approximate two-sided t test with nine degrees of freedom.

For the principal cultural-product estimates, we supplement the usual cluster approximation with a restricted-null wild-cluster bootstrap- t exercise. The procedure enumerates the $2^{10} = 1,024$ province-level Rademacher sign patterns rather than drawing a small random subset. This is a useful sensitivity calculation, but the bootstrap procedure is discrete and retains assumptions concerning the dependence structure. It cannot turn an observational association into an identified policy or production effect (Cameron, Gelbach, and Miller 2008).

Aggregate Findings

Measurement changes the central coefficient

Table 5 provides the main comparison. Using the broad cultural-industry total, the two-way fixed-effects coefficient is 0.444. Replacing that measure with the cultural-product component within cultural industries raises the estimate to 0.708. When the other-products component is used instead, the full-period estimate is 0.553. The fact that these estimates differ under identical province and year controls indicates that the outcome of an apparent “culture GDP” regression depends meaningfully on which part of the production accounts is measured.

Table 5. Baseline comparisons across accounting definitions

Accounting definition	Coefficient	Cluster SE	N	G
All products made by culture industries	0.444	(0.092)	150	10
Cultural products only	0.708	(0.078)	150	10
Cultural products only, 2017–24	0.540	(0.045)	80	10
Other products made by culture industries	0.553	(0.082)	150	10
Other products, 2017–24	0.057	(0.245)	80	10

Notes: Dependent variable is log jobs and the regressor is log nominal value added. All models include province and calendar-year fixed effects. Standard errors are province-clustered HC1. G is number of province clusters; coefficients are descriptive associations.

For the cultural-product component, an estimated coefficient of 0.708 means that in the fitted specification a 1 percent higher nominal value added is associated with approximately 0.71 percent more counted jobs, conditional on province and year fixed effects. Because both variables are in logarithms, the coefficient is in elasticity units. This statement does not mean that a policy-induced one percent increase in value added would raise employment by 0.71 percent. Prices, activity mix, joint determination, and statistical imputation remain present.

The corresponding estimated slope for 2017–2024 is 0.540. This is not a small discrepancy relative to the baseline and should be carried into the interpretation. A single elasticity is a summary over a defined sample, not an invariant technological parameter. A reader interested in recent years should not silently substitute the longer-window coefficient.

What variation is left after fixed effects?

The pooled culture-industry model reported during the preliminary stage produced a coefficient near 1.00. The much smaller fixed-effects estimates are consistent with substantial differences in permanent provincial scale and shared annual movements. Pooled plots can be visually persuasive but use many large-versus-small province comparisons that are not the within-province contrast of interest.

Figure 5 residualises logged culture-product GDP and jobs with respect to province and year indicators. This representation is based on the Frisch–Waugh–Lovell equivalence: the slope from regressing one residualised variable on the other recovers the coefficient on log GDP in equation (2). Points are not independent experimental units. The chart is useful because it displays what the principal fixed-effects estimate actually fits after the province and year means are removed.

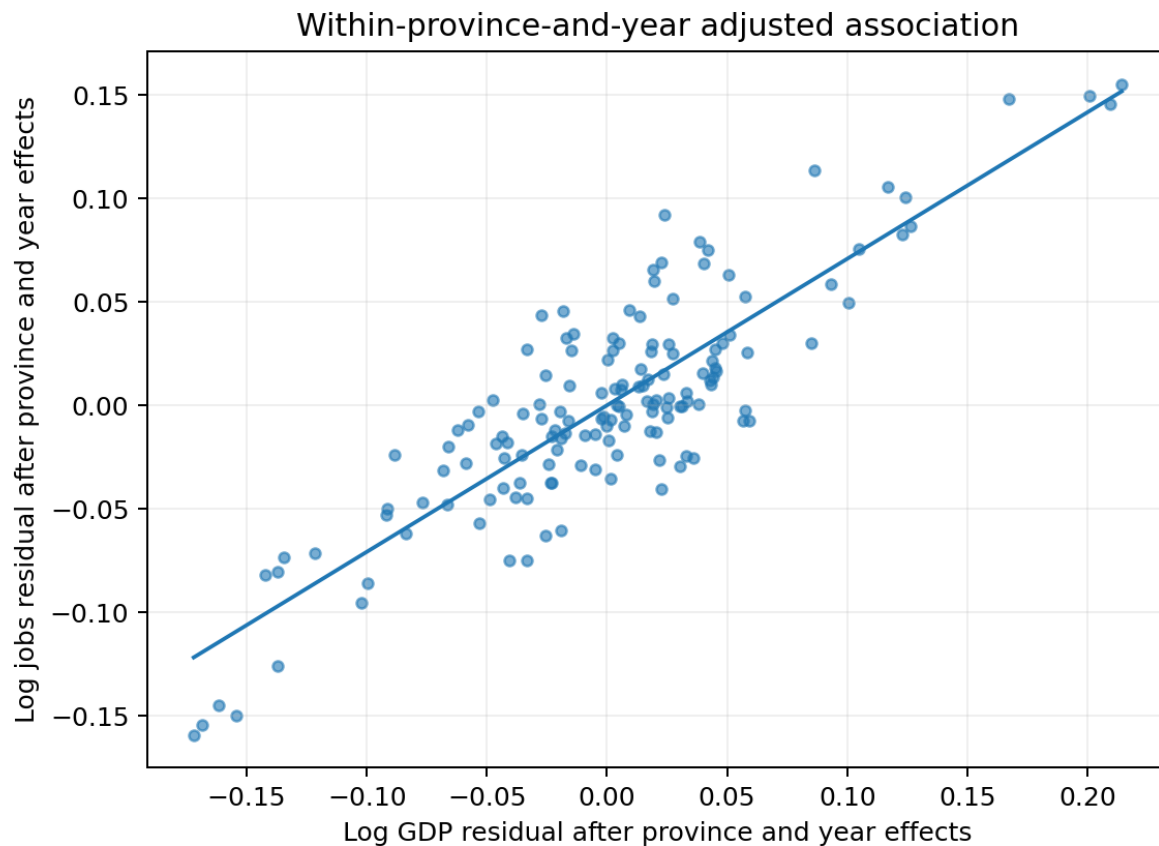


Figure 5. Residualised log cultural-product jobs against residualised log nominal cultural-product GDP, after removing province and year effects. The fitted line represents the descriptive within-association.

The exceptionally high overall R^2 of fixed-effects specifications is not, by itself, evidence of a highly predictive or causal economic relationship. Province indicators explain much of the difference in average market size, and year indicators can absorb common trends. Accordingly, the paper places emphasis on coefficients, definition sensitivity, and inference rather than treating the total R^2 as a scientific result.

Alternative transformations and sample windows

Table 6 shows the cultural-product coefficient across eight specifications. The main result is positive whether the model is estimated in levels with fixed effects or annual differences, though magnitudes vary. The annual difference coefficient over 2010–2024 is 0.667, broadly comparable to the full-sample level estimate of 0.708. For 2017–2024, the corresponding annual-change estimate is 0.651. Because the transformations use overlapping observations and the same underlying accounts, agreement in sign is robustness evidence, not independent validation by a second data source.

Table 6. Alternative time windows and estimation transformations

Specification	Coefficient	Cluster SE	Approx. p	N
TWFE, full period	0.708	(0.078)	0.0000	150
TWFE, 2015–24	0.628	(0.062)	0.0000	100
TWFE, 2017–24	0.540	(0.045)	0.0000	80
TWFE, omit 2016–17	0.704	(0.089)	0.0000	130
TWFE, omit 2020	0.707	(0.082)	0.0000	140
Annual first difference	0.667	(0.062)	0.0000	140
Annual change, from 2017	0.651	(0.051)	0.0000	70
Annual change, omit COVID transitions	0.674	(0.079)	0.0000	110

Notes: GDP is nominal and the sample covers the ten provinces. The first five regressions include province and year fixed effects; first-difference models include year effects only. Approximate p-values use a t distribution with nine degrees of freedom and are not exact few-cluster tests.

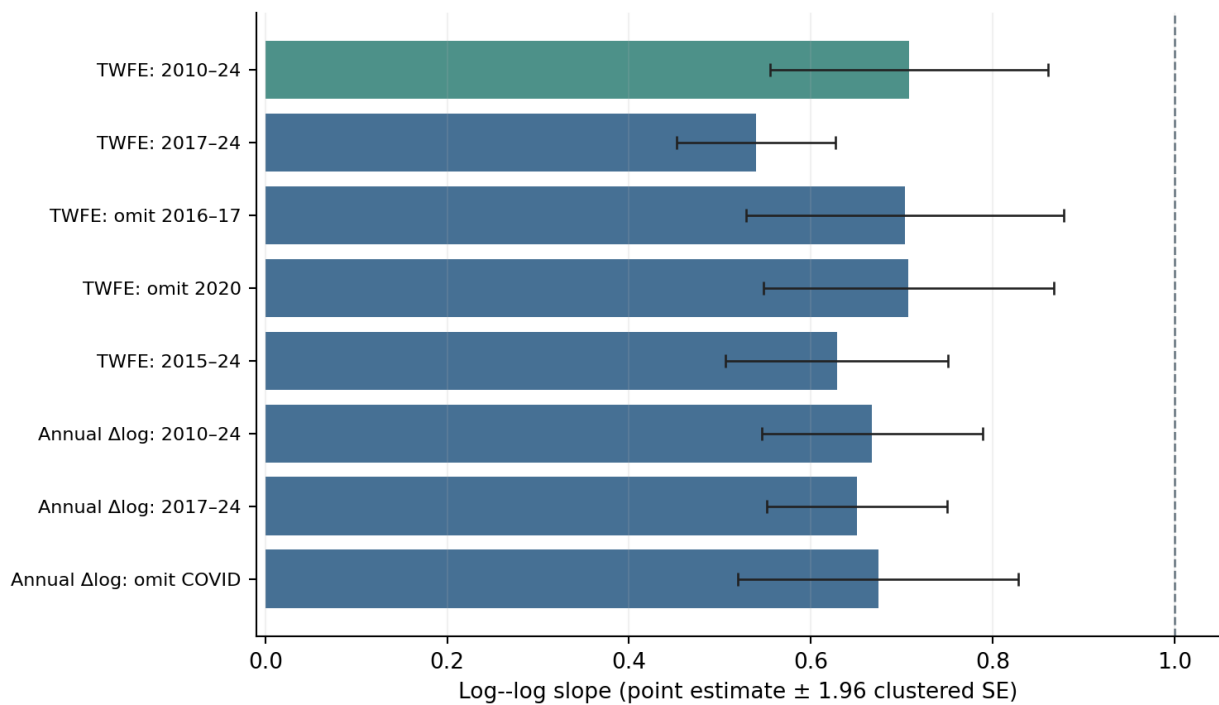


Figure 6. Sensitivity of cultural-product GDP-jobs coefficients to estimation transformation and sample years. Error bars are 1.96 times province-clustered HC1 standard errors for display only; they are not few-cluster-adjusted confidence intervals.

Omitting 2020 changes the full-period level coefficient from 0.708 to 0.707. This narrow comparison indicates that the association does not hinge mechanically on the 2020 observation. It does not exclude pandemic effects in 2021–2024 or statistical revisions. Removing 2016–2017 similarly retains a positive coefficient, but exclusion should be motivated by the documented accounting concern rather than selected because it improves statistical significance.

We also examined the earlier preliminary claim that the pandemic may have changed the slope. A model allowing province effects to differ between 2010–2019 and 2021–2024 gives split-period estimates around 0.411 and 0.491 for the wider industry-total measure, with the difference far from statistically distinguishable from zero under province-clustered inference. This check is retained as ancillary context only: short post-2020 coverage and changing statistical definitions make a strong structural-break conclusion inappropriate.

Province influence

Removing provinces one at a time offers a direct check of whether the principal national conclusion is carried by a single geographic unit. The coefficient remains positive for each nine-province sample. The range, however, is notable: approximately 0.554 without British Columbia and 0.726 without New Brunswick. The smaller estimate without British Columbia identifies that province as an influential component of the fitted within-association; no claim is made about why it is influential.

Table 7. Leave-one-province-out influence diagnostics

Excluded province	GDP coefficient	Cluster SE	N	G
British Columbia	0.554	(0.085)	135	9
Newfoundland and Labrador	0.705	(0.080)	135	9
Ontario	0.708	(0.073)	135	9
Prince Edward Island	0.710	(0.094)	135	9
Quebec	0.715	(0.073)	135	9
Saskatchewan	0.718	(0.086)	135	9
Nova Scotia	0.721	(0.073)	135	9
Manitoba	0.721	(0.080)	135	9
Alberta	0.725	(0.094)	135	9
New Brunswick	0.726	(0.052)	135	9

Notes: Each regression re-estimates the main cultural-product province/year fixed-effects specification on the remaining nine provinces (135 observations). Clustered SE use the remaining nine provinces. The full-sample coefficient is 0.708.

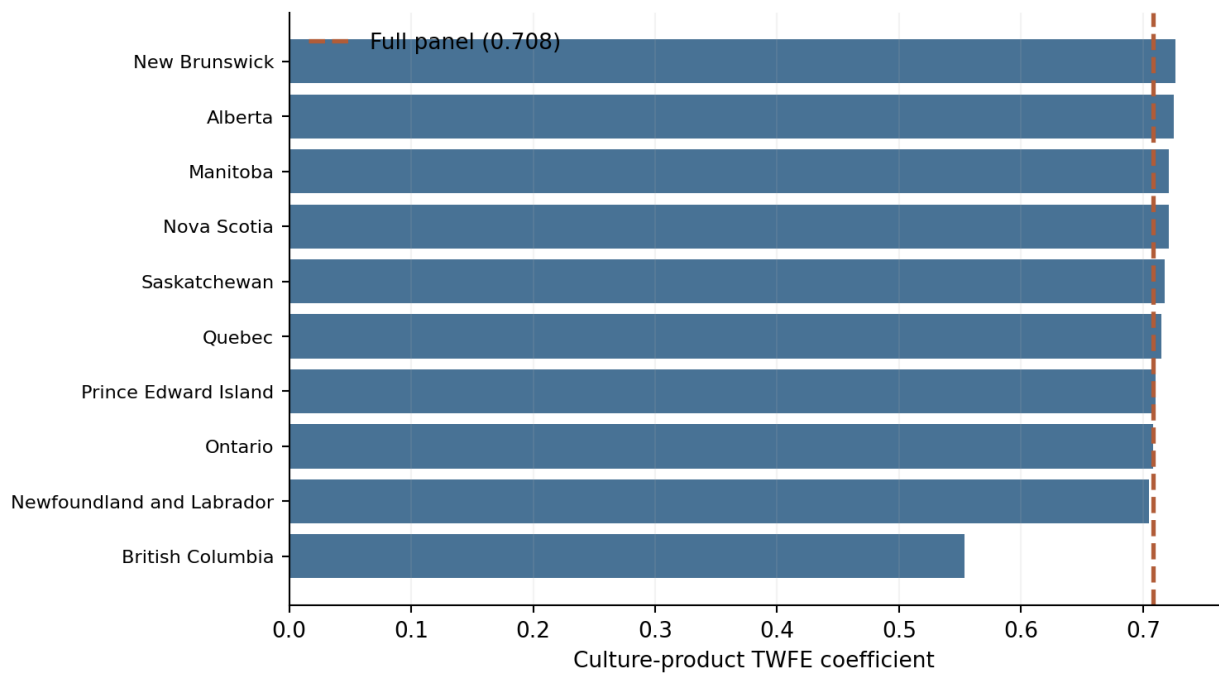


Figure 7. Influence of excluding one province from the full-period cultural-product two-way fixed-effects model. The vertical reference is the ten-province estimate.

Cultural-Domain Heterogeneity

Why the aggregate may hide useful differences

The nine cultural domains differ in the nature of output, the conditions under which paid jobs are recorded, and the prominence of cultural goods versus services. Aggregate relationships may therefore reflect both changes inside individual domains and changes in their relative weights. We estimate equation (2) separately by domain, using the same provinces and the same years for each series. The estimands are domain-specific conditional associations within the satellite-account classifications; they are not estimates of comparative production technologies.

The 2024 composition table gives a preliminary reason to expect heterogeneity. Audio-visual and interactive media represents a larger share of GDP than jobs, while live performance has a larger jobs share than GDP share. In the accounts, the nominal GDP-per-job ratios differ across domains. These comparisons are descriptive ratios affected by prices, classification, and job-count conventions; they do not isolate worker output per hour.

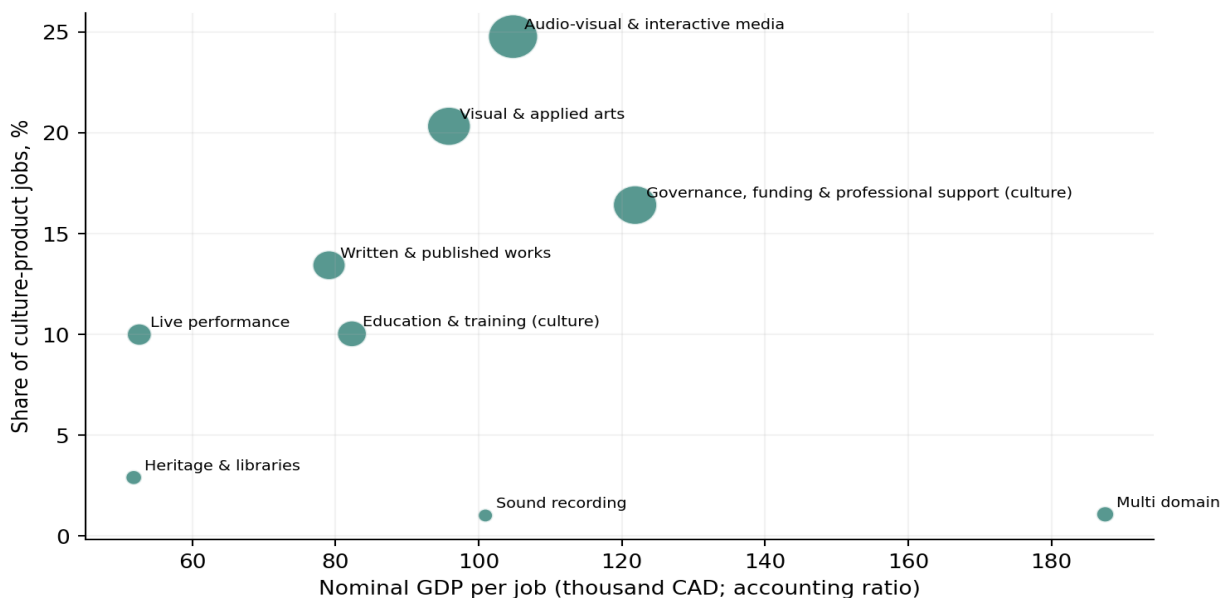


Figure 8. Cultural-domain nominal GDP per job against each domain's share of jobs in 2024. Bubble area increases with GDP share. The horizontal variable is an accounting ratio and is not a measure of real productivity.

Regression estimates by domain

Table 8 reports estimates for all nine broad domains. The full-period coefficient is approximately 0.935 for heritage and libraries, 0.744 for live performance, 0.488 for visual and applied arts, 0.526 for written and published works, and 0.757 for audio-visual and interactive media. Sound recording is estimated at 0.595. Culture-related education and training yields 1.057, but its standard error is relatively wide. The multi-domain category has a low and imprecise full-period coefficient, illustrating that a point estimate alone should not be presented as evidence of a reliable difference.

Table 8. Cultural-domain employment–value-added associations

Domain	Full β	Cluster SE	2017–24 β	Annual $\Delta \beta$
Heritage and libraries	0.935	(0.053)	0.833	0.763
Live performance	0.744	(0.160)	0.584	0.510
Visual and applied arts	0.488	(0.072)	0.293	0.576
Written and published works	0.526	(0.123)	0.676	0.332
Audio-visual and interactive media	0.757	(0.240)	0.585	0.853
Sound recording	0.595	(0.141)	0.554	0.419
Education and training (culture)	1.057	(0.206)	0.697	0.502
Governance, funding and professional support (culture)	0.682	(0.080)	0.424	0.584
Multi domain	0.175	(0.234)	0.258	0.843

Notes: Each domain is estimated separately. Full-sample and 2017–2024 columns use province and year fixed effects; annual differences include year fixed effects. All nominal GDP. There are 150 observations per full-period panel, 80 for recent period, and 140 for annual differences; all use 10 province clusters. Cross-domain comparisons are exploratory.

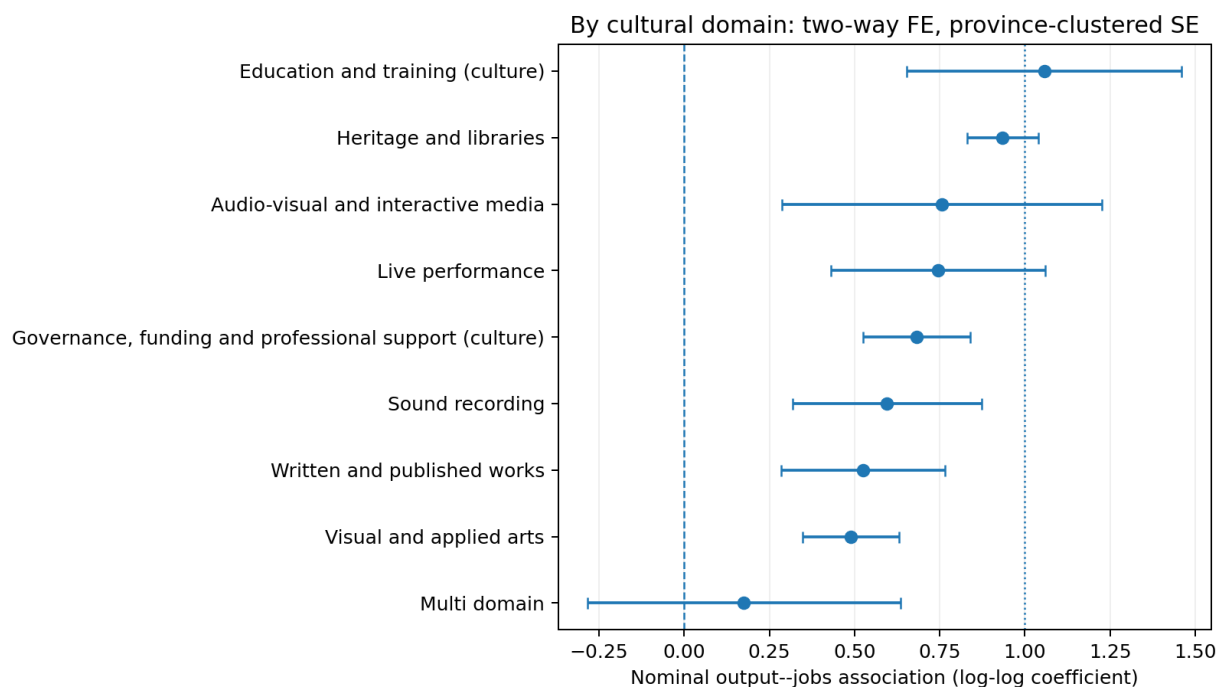


Figure 9. Full-period domain-specific two-way fixed-effects estimates with approximate conventional 1.96-standard-error bars. Bars reflect clustered HC1 uncertainty but not exact few-cluster inference; the figure is exploratory.

The pattern is informative partly because it resists a single simple explanation. Heritage and libraries and live performance both have positive associations, but their estimated levels and uncertainty differ. Audio-visual activities display a coefficient closer to 0.76 in the full period, yet the official film/video measurement break cautions against interpreting the entire 2010–2024 change as market behaviour. The estimates describe co-movement of observed satellite-account series and should be interpreted at precisely that level.

Recent-period variation

Comparing the full sample with 2017–2024 reveals heterogeneous sensitivity. Heritage and libraries decreases from about 0.935 to 0.833, and visual and applied arts from 0.488 to 0.293. Written and published works moves in the other direction, from about 0.526 to 0.676. Several of these estimates remain imprecise, especially with only eight years per province. The patterns warn against a claim that the apparent overall response is identical across cultural activities or periods.

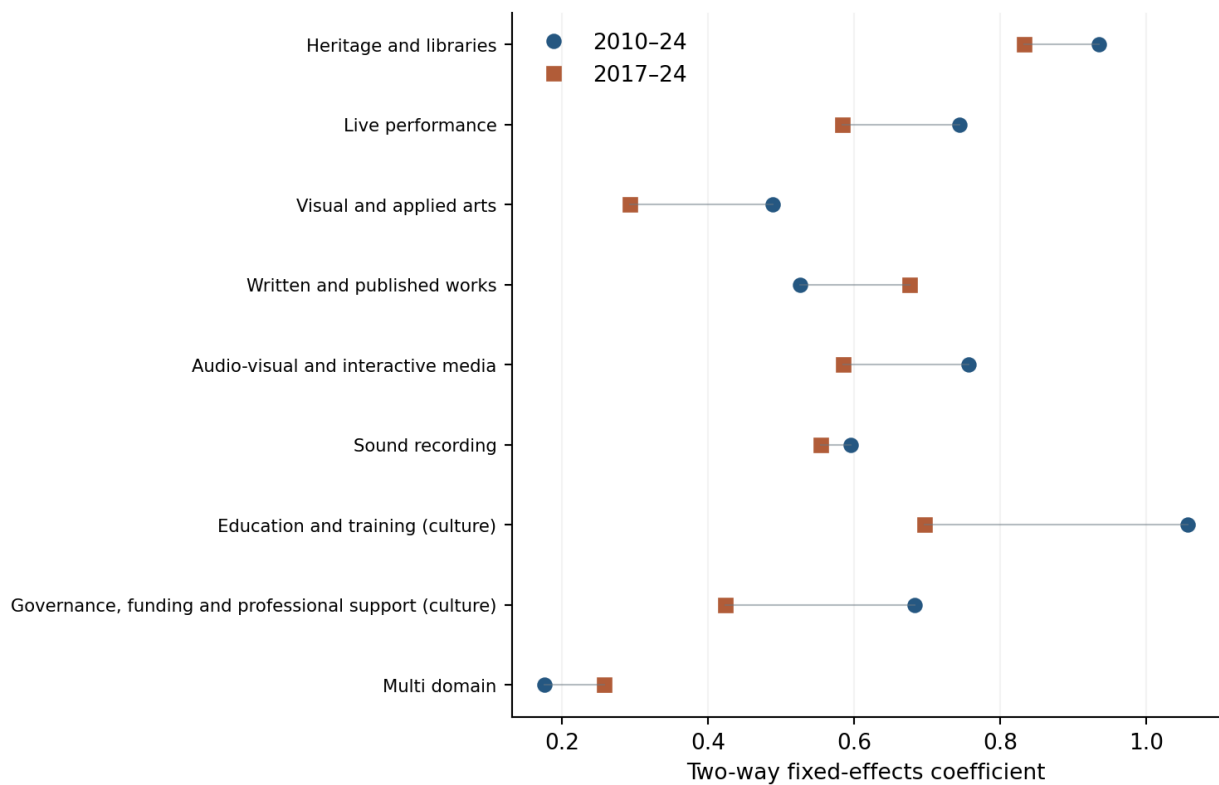


Figure 10. Estimated domain slopes over 2010–2024 and 2017–2024. The connected symbols show changes in estimates when the same model is fitted to a shorter sample; they are not formal tests of a structural break.

To clarify the distinction between point-estimate heterogeneity and statistically supported differences, Table 9 reports a few illustrative pairwise interaction models. Each model allows separate domain-by-province and domain-by-year effects. Some selected comparisons appear different under approximate inference, while others do not. These exploratory comparisons have not been corrected for the many potential pairs of domains and time windows; they are therefore not a ranked set of definitive hypotheses. More comprehensive work would prespecify a limited number of comparisons and use few-cluster procedures appropriate for joint inference.

Table 9. Illustrative differences in domain-specific slopes

Domain pair	Period	Difference	Cluster SE	Approx. p
Heritage and libraries vs. Visual and applied arts	Full 2010-24	+0.447	(0.076)	0.000
Heritage and libraries vs. Visual and applied arts	2017-24	+0.540	(0.119)	0.001
Visual and applied arts vs. Audio-visual/interactive	Full 2010-24	+0.268	(0.250)	0.311
Visual and applied arts vs. Audio-visual/interactive	2017-24	+0.292	(0.119)	0.037
Written and published works vs. Audio-visual/interactive	Full 2010-24	+0.231	(0.278)	0.428
Written and published works vs. Audio-visual/interactive	2017-24	-0.091	(0.196)	0.654
Live performance vs. Visual and applied arts	Full 2010-24	+0.256	(0.202)	0.236
Live performance vs. Visual and applied arts	2017-24	+0.291	(0.193)	0.165
Culture products inside industries vs. Total industries	Full 2010-24	+0.264	(0.079)	0.008
Culture products inside industries vs. Total industries	2017-24	+0.063	(0.063)	0.346

Notes: Pooled pairwise models allow separate province and year effects by domain. The sign depends on the model coding and order of the contrast; magnitude and approximate p-value are the relevant descriptive summaries. These are exploratory multiple comparisons, not family-wise adjusted tests.

Longer-run domain trajectories

The national accounting series show contrasting changes between the endpoints. From 2010 to 2024, written and published works falls from approximately 130,692 to 82,745 counted jobs, a 36.7 percent decline. Over the same interval, audio-visual and interactive media increases from about 107,288 to 152,586 jobs, an increase of 42.2 percent. Changes in nominal GDP are often materially different from those in jobs. Such trajectories are compatible with changes in product mix, price, organisation, and activity, but cannot establish a particular mechanism.

Table 10. National domain-level change between 2010 and 2024

Domain	GDP 2010	GDP 2024	GDP $\Delta\%$	Jobs 2010	Jobs 2024	Jobs $\Delta\%$
Heritage and libraries	0.42	0.93	+121.0	11,544	17,904	+55.1
Live performance	1.74	3.24	+85.7	46,667	61,577	+31.9
Visual and applied arts	6.27	12.00	+91.5	110,107	125,195	+13.7
Written and published works	9.41	6.54	-30.4	130,692	82,745	-36.7
Audio-visual and interactive media	10.66	15.99	+50.0	107,288	152,586	+42.2
Sound recording	0.40	0.64	+60.8	7,254	6,307	-13.1
Education and training (culture)	3.00	5.09	+69.7	46,510	61,807	+32.9
Governance, funding and professional support (culture)	6.83	12.32	+80.5	88,317	101,125	+14.5
Multi domain	0.53	1.25	+136.8	4,030	6,661	+65.3

Notes: GDP is in billions of nominal Canadian dollars, reported separately from job counts. Percent changes are endpoint comparisons, not annual growth rates, and do not account for statistical breaks or inflation.

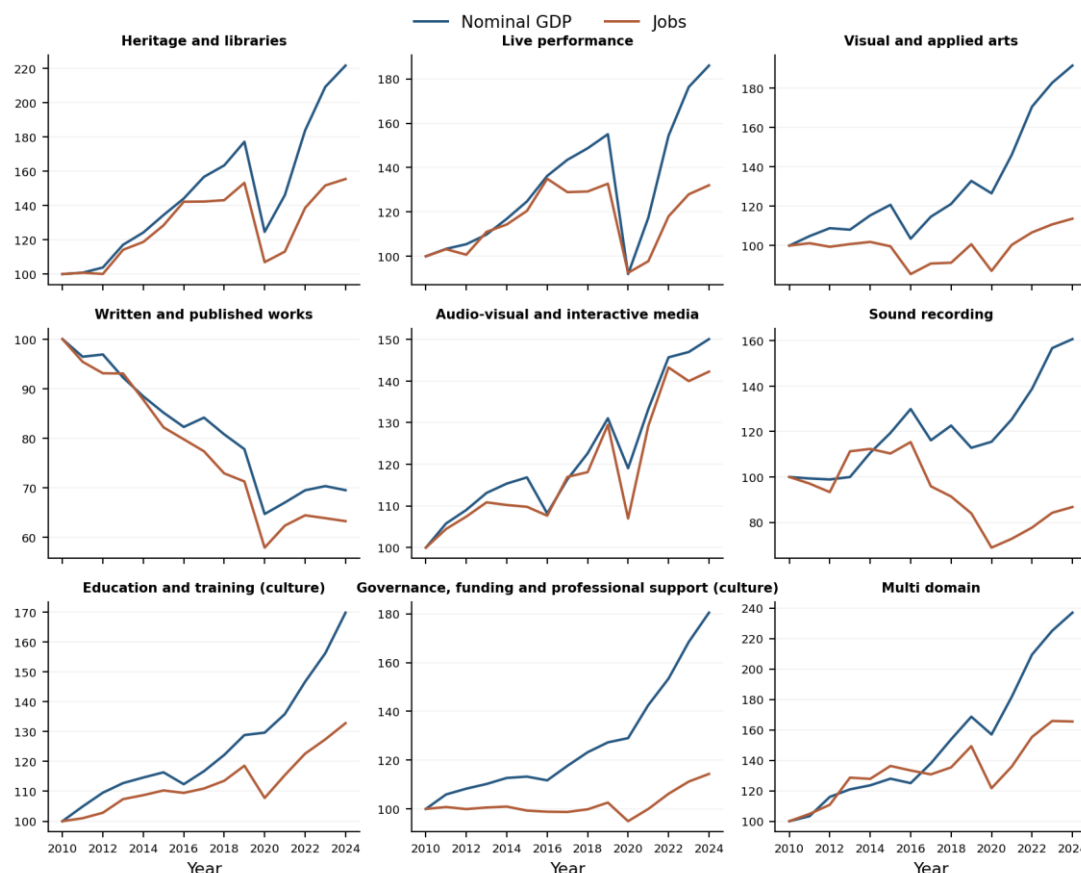


Figure 11. National cultural-domain indexes of nominal GDP (blue) and counted jobs (orange), each normalised to 2010=100. Source classification changes affect some domains; these are descriptive accounting series, not causal trends.

This variation is relevant to the study's scope, but it should not be turned into a technological narrative unsupported by direct evidence. In particular, the difference between media and publishing cannot be attributed solely to digital distribution, automation, or trade exposure using the current variables. The data identify sector and time, not the firms' specific technology decisions or the product-level price indexes required to separate nominal revenue-type changes from volume changes.

Inference, Interpretation, and Limitations

Statistical uncertainty with only ten clusters

For the full-sample cultural-product model, the province-clustered HC1 standard error is about 0.078 around an estimated coefficient of 0.708. The conventional cluster-robust normal approximation would suggest a narrow interval, but with ten clusters asymptotic tests can reject too frequently (Cameron, Gelbach, and Miller 2008; Cameron and Miller 2015). We therefore report both the cluster standard errors and a small-cluster sensitivity exercise. Under an exhaustive restricted-null Rademacher wild-cluster bootstrap- t procedure, the two-sided p -value for zero association is about 0.0127, while the p -value for a slope of one is about 0.0488. These are model-based checks, not guarantees of finite-sample coverage.

Table 11. Few-cluster inference: exhaustive province-sign sensitivity

Sample	TWFE coefficient	Bootstrap $p: \beta=0$	Bootstrap $p: \beta=1$
2010–2024	0.708	0.0127	0.0488
2017–2024	0.540	0.0020	0.0020

Notes: Restricted-null Rademacher wild-cluster bootstrap- t with all 1,024 possible provincial sign assignments and 10 clusters. Values are the outputs previously computed with the included `wild_cluster_bootstrap.py` script. This remains a sensitivity procedure with discrete p -values; it does not address identification or measurement error.

The reported inference should be read as sensitivity to a specified province-level error structure. Clustering at the province level addresses within-province dependence but not all possibilities of spatial or cross-province dependence. Calendar-year fixed effects remove shocks shared equally across provinces but cannot guarantee independence between provinces. Domain-level models compound the challenge because many comparisons are examined with the same ten provinces. This is a major constraint on strong claims about differences in coefficients.

GDP is nominal: price and activity cannot be separated

Every GDP value in the provincial table is nominal. Let nominal value added be Y_{it}^N and an appropriate province- and domain-specific price index be P_{it} . A conceptual real-value-added quantity would satisfy

$$\log Y_{it}^N = \log P_{it} + \log Y_{it}^R. \quad (4)$$

The uploaded source does not supply the matched P_{it} series. A 0.708 slope therefore relates jobs to nominal rather than real output; inflation, changes in product prices, and valuation shifts enter the regressor alongside changes in activity.

A common national deflator that depends only on year would be absorbed by the year effects in equation (2). To see this, replacing $\log Y_{it}^N$ with $\log Y_{it}^N - \log P_t$ simply transfers $\beta \log P_t$ into the unrestricted year indicators. A common deflator would not change the slope in that exact two-way fixed-effects specification. This algebraic observation is not evidence that inflation is irrelevant: province- and domain-specific relative price movements remain uncontrolled, and an annual-change model without the same year structure may be affected differently. We do not substitute a convenient but conceptually mismatched general price index and label the result “real cultural GDP.”

A mechanical accounting link and simultaneity

If measured nominal value added is Y and measured jobs are J , the ratio Y/J is nominal value added per counted job. By construction,

$$\log Y = \log J + \log(Y/J). \quad (5)$$

A slope smaller than one in a regression of log jobs on log nominal GDP therefore reflects the joint variation of these quantities, including variation in nominal GDP per job. The regression does not separately identify the effect of improved labour efficiency, wage and profit changes, prices, hours worked, or sectoral composition. Moreover, employment contributes to the production underlying GDP; treating GDP as exogenous would be untenable without additional identification.

Satellite-account measurement introduces a second connection. Both variables are estimated using overlapping accounts, surveys, and allocation methods (Statistics Canada 2022, 2026c). Co-movement can partly arise from statistical construction rather than two independently observed economic outcomes. Fixed effects cannot remove this dependence. A stronger causal study would need an externally justified shock, more direct measures of real activity and work input, and a design that separates statistical revisions from economic changes.

Time-series breaks and sample composition

The documented 2015 film/video break, 2017 reallocation of Internet publishing activities, and unusual changes in the other-products category are three reasons to resist a timeless interpretation of the full-sample estimates. We report a shorter 2017–2024 series and other exclusion exercises as safeguards, but they are not a repair of every measurement problem. Excluding years can itself change the economic environment studied, so it is not sensible to declare whichever sample gives the most favourable estimate to be the correct one.

Figure 12 provides the national annual changes for cultural products within cultural industries. The graph clarifies the size of the nominal-output and jobs movements in particular years. Year-on-year growth is volatile, especially around the pandemic. The figure is descriptive and does not by itself show that the relationship estimated across provinces was caused by these events.

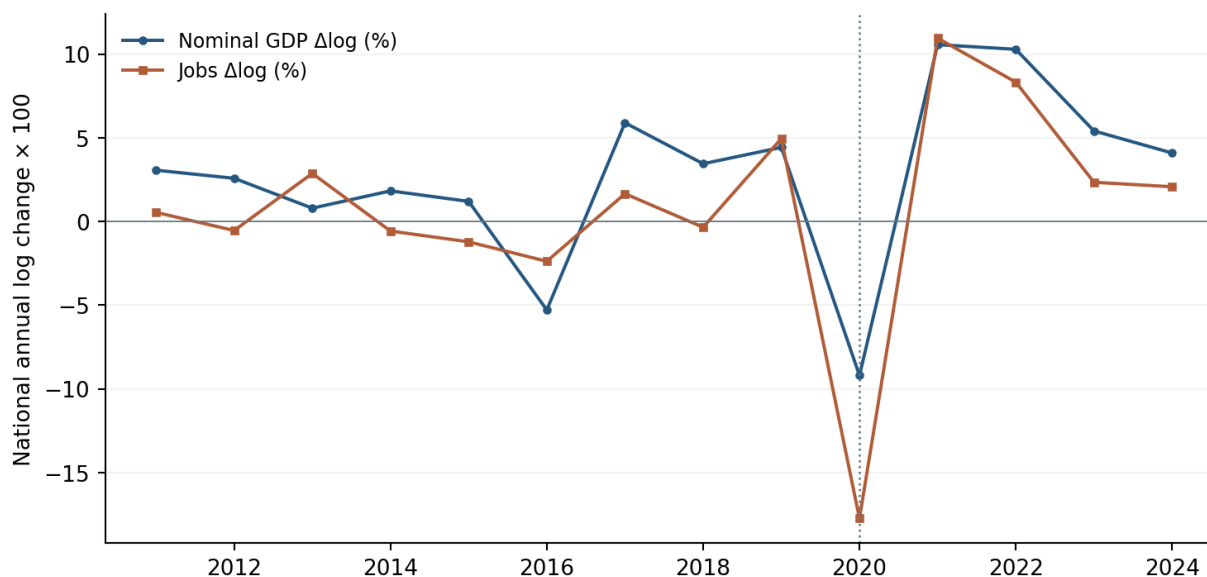


Figure 12. Year-to-year percentage log changes in national cultural-product nominal GDP and jobs (industry perspective). Differences are calculated from annual logs and multiplied by 100.

What the present results can and cannot establish

Four conclusions are supported by the analysis. The nominal GDP–jobs association is positive within the specified satellite-account series. Accounting definitions change its estimated magnitude. Some sample exclusions and transformations preserve the sign but alter the slope. Distinct cultural domains exhibit different measured relationships. Beyond those statements, stronger causal interpretations require additional evidence. The available panel does not reveal whether increased output creates jobs, whether digitalisation reduces labour demand, whether jobs rise because of subsidies, or whether nominal GDP per worker has increased in real terms.

A useful extension would build matched province-by-domain price measures where suitable official indexes exist, compare the industry-perspective dataset with the separate economy-wide product-perspective table, and add direct measures of hours or firm composition. Another extension could investigate specific policy or market shifts, but only after defining a credible comparison and its identifying assumptions. These are extensions of a descriptive study, not analyses completed here.

Conclusion

Using Canadian provincial cultural accounts for 2010–2024, this paper has shown that the estimated employment–nominal GDP association depends on the boundary used to measure cultural activity. The industry-wide total produces a two-way fixed-effects coefficient of 0.444, while the narrower cultural-product component produced within cultural industries gives 0.708. The latter association is positive across several checks, but falls to 0.540 in the 2017–2024 window and changes when influential provinces are excluded. Separate domain models and national trajectories further demonstrate that aggregate measures combine different activities.

The paper's contribution is primarily one of measurement and carefully delimited description. The same source provides both GDP and jobs, GDP is nominal, and only ten province clusters are available. These restrictions limit the economic claims that can be drawn from a statistically strong association. For research on Canadian cultural activity, accounting definition and sub-sector composition are not preparatory details; they determine what the headline estimate describes. Future work should begin with those definitions before attempting a causal explanation of employment patterns.

Appendix: Extended Accounting and Replication Tables

Annual national aggregates

For transparency, Table 12 records the annual national series underlying the accounting discussion. Values are taken from the national records of the source file and are not included as observations in the province regressions. The 2010–2024 cultural-product component grows from approximately CAD 39.24 billion to CAD 58.00 billion in nominal value added and from 552,410 to 615,908 jobs. Those percentage changes are descriptive comparisons in nominal quantities and should not be described as real growth rates.

Table 12. Annual national accounting aggregates, 2010–2024

Year	Culture GDP (B)	Culture jobs	Industry GDP (B)	Culture share %
2010	39.24	552,410	49.45	79.4
2011	40.46	555,409	51.47	78.6
2012	41.52	552,407	53.14	78.1
2013	41.85	568,483	54.46	76.8
2014	42.62	565,230	56.07	76.0
2015	43.13	558,387	56.28	76.6
2016	40.91	545,248	47.32	86.4
2017	43.39	554,353	62.18	69.8
2018	44.92	552,418	64.50	69.6
2019	46.95	580,433	67.55	69.5
2020	42.82	486,054	63.21	67.7
2021	47.59	542,291	68.80	69.2
2022	52.74	589,336	74.87	70.4
2023	55.67	603,285	79.05	70.4
2024	58.00	615,908	82.10	70.6

Notes: Industry perspective only. Culture GDP refers to culture products made within cultural industries. Industry GDP includes all other products of the same industries. Nominal CAD billions. These are Canada rows for visual and descriptive audit, not data included in province fixed-effects regressions.

Reproduction workflow and data integrity checks

The downloadable Overleaf and replication package includes the source CSV and metadata, a wide province–year–domain dataset keyed by source member ID, the principal culture-product panel, estimated coefficient files, diagnostic results, and scripts. The data pipeline reads the geographic and industry dimensions, selects indicators by their official labels, creates logs only for strictly positive observations, and verifies that province/year records are unique. The aggregate culture-product series is not formed by inadvertently double-counting its children. Domain sums are compared against the member-2 parent and differ only by integer rounding in the reviewed years.

In practical terms, a replication should: (i) load the source file and its cube metadata; (ii) use numerical industry-member IDs to select the accounting category; (iii) isolate ten provinces and 2010–2024; (iv) pivot GDP and jobs into a single province-year record; (v) construct logs and adjacent-year changes; (vi) estimate fixed-effects specifications with province-clustered standard errors; and (vii) regenerate graphics from processed datasets. Both Python analysis files and an R reproduction script are included. The regression estimates described in the study were computed from the provided raw CSV and are reproducible with the packaged scripts; R replication should be run in the receiving environment rather than assumed to be executed here.

Study boundaries

The industry-perspective cultural-product component is not the same as the economy-wide culture GDP often quoted in public releases. The Canada total is used only for accounting figures. The territories are excluded from the ten-province regressions. Estimates count jobs, not full-time-equivalent workers or hours. A year fixed effect is a nuisance control, not a year-specific treatment effect. No regression in this paper estimates the employment effect of an exogenous change in GDP.

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