Through the Mountain: The Gotthard Base Tunnel and Regional Economic Integration

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Abstract

Governments invest billions in transport infrastructure to integrate isolated regions, yet credible evidence on whether connectivity generates economic convergence remains scarce. I exploit the December 2016 opening of the Gotthard Base Tunnel—the world's longest railway tunnel at 57 km—which cut Zurich–Lugano travel time from 160 to under 120 minutes. Using 30 years of municipal construction expenditure data and 21 years of cantonal tourism statistics from the Swiss Federal Statistical Office, I estimate the tunnel's effect on Ticino, the Italian-speaking canton newly connected to the German-Swiss economic core. I find no statistically significant increase in construction activity (6.5%, SE = 3.3%) and no increase in Swiss domestic hotel overnight stays. With only one treated canton, inference is challenging, but the point estimates are small relative to the project's cost, suggesting that even dramatic reductions in travel time may not generate the regional economic dividends that motivate large-scale transport investments.

JEL Codes: R11, R42, H54, L83

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1. Introduction

On December 11, 2016, the Gotthard Base Tunnel opened to commercial rail traffic, connecting Zurich to Lugano in under two hours for the first time in history. At 57 kilometers, it is the world's longest railway tunnel and the centerpiece of Switzerland's New Railway Link through the Alps (NEAT), a 23-billion-franc investment spanning three decades of planning and construction. The tunnel was designed to solve a fundamental geographic problem: the Alps create a physical barrier that has kept Ticino—Switzerland's Italian-speaking southern canton—economically isolated from the German-speaking north, where the country's major economic centers lie.

Transport infrastructure investments of this magnitude are typically justified by the promise of regional economic integration. The canonical framework of Donaldson (2018) shows that railways can generate large welfare gains by reducing trade costs; Redding and Venables (2004) demonstrate that market access shapes the spatial distribution of economic activity; and a large literature on transport and urbanization documents positive effects of connectivity on land values, employment, and investment (Baum-Snow, 2007; Duranton and Turner, 2012; Gibbons and Machin, 2010). Yet the empirical record is mixed. While Faber (2014) finds that highway connections in China increased GDP in connected cities, Ghani et al. (2016) documents more modest effects of India's Golden Quadrilateral highway, and several studies find that improved transport can harm peripheral regions by facilitating competition from the core (Helpman, 1998; Krugman, 1991).

This paper estimates the causal effect of the Gotthard Base Tunnel on construction investment and tourism in Ticino using a difference-in-differences design. The identification strategy exploits the sharp, discrete nature of the tunnel opening: on a single day, rail travel time between Zurich and Lugano fell by approximately 40 minutes, while travel times between other Swiss regions were largely unaffected. I compare Ticino to alpine control cantons (Graubünden, Valais, and Uri) that share similar topography, tourism dependence, and economic structure but did not receive comparable connectivity improvements. The 30-year span of construction data (1994–2023) provides 22 pre-treatment years, while the 21-year tourism series (2005–2025) offers 12 pre-treatment years.

The main finding is a precisely estimated near-null. Total construction expenditure in Ticino increased by approximately 6.5 percent relative to other Swiss cantons following the tunnel opening, but this estimate is statistically insignificant (SE = 3.3%). In the alpine-only comparison, the point estimate rises to 10.3 percent but remains imprecise (SE = 9.1%). At the municipal level, using 318 municipalities across Ticino and three control cantons, the effect is effectively zero (0.7%, SE = 6.4%). I can rule out construction increases larger than

9.6 percent with 80 percent power in the full-sample specification.

Tourism results reinforce the null finding. Swiss domestic hotel overnight stays in Ticino—the tourist origin most directly affected by the tunnel, since these visitors travel from the north—show no increase and a point estimate of -15.6 percent ($\text{SE} = 13.4\%$). German tourists, who also arrive primarily from the north, show a small positive but insignificant effect. Italian tourists, who arrive from the south and should be unaffected by the tunnel, show no change—consistent with the design's falsification logic.

Event study estimates reveal an important caveat: the full-sample event study shows some evidence of differential pre-trends, with Ticino's construction expenditure growing faster than the national average in the years 2008–2012. These pre-trends, which coincide with the construction phase of the tunnel itself, may reflect direct stimulus from the infrastructure project rather than anticipation of connectivity gains. The placebo tests at 2010 and 2013 generate coefficients of similar or larger magnitude than the actual treatment, suggesting that disentangling the construction-phase stimulus from the operational-phase connectivity effect is challenging.

This paper contributes to three literatures. First, it adds to the evidence on transport infrastructure and regional development. While Donaldson (2018) and Hornbeck and Rotemberg (2024) study historical railway expansions that connected previously autarkic regions, the Gotthard Base Tunnel connects two already-integrated regions with an incremental travel time reduction. The near-null result suggests that the returns to connectivity may be highly concave: the first rail connection transforms a region, but a 30 percent reduction in already-feasible travel time does not. This is consistent with Ahlfeldt et al. (2015), who find that transport improvements generate larger effects when they cross a threshold from "infeasible" to "feasible" commuting.

Second, the paper contributes to the literature on infrastructure and tourism. Koster et al. (2019) find that transport accessibility affects hotel demand in the Netherlands, while Donaldson and Hornbeck (2016) documents trade effects of the Suez Canal. The Gotthard result suggests that faster rail connections may not boost overnight tourism if they make day trips more attractive—a substitution effect identified by Gutiérrez (2020) in the context of high-speed rail in Spain.

Third, the paper provides rare causal evidence from a European alpine context. Most transport infrastructure studies focus on highways in the United States or China, or railways in historical settings. The Swiss setting offers unusually clean data: the Federal Statistical Office provides 30 years of municipal-level construction statistics and 21 years of hotel statistics, all freely accessible through the PXWeb API. This data richness, combined with Switzerland's small geographic scale and well-defined cantonal boundaries, makes the Gotthard opening a natural laboratory for studying regional integration.

2. Institutional Background

The Gotthard Base Tunnel and NEAT. The New Railway Link through the Alps (NEAT) is Switzerland's largest infrastructure project, conceived in 1992 and approved by referendum in the same year. The centerpiece is the Gotthard Base Tunnel, which runs 57 km from Erstfeld (Canton Uri) to Bodio (Canton Ticino) at an elevation of approximately 550 meters above sea level—far below the existing Gotthard Railway, which climbs to 1,151 meters. Construction began in 1999 and cost approximately 12.2 billion Swiss francs (SBB, 2016).

The tunnel opened to freight on June 1, 2016 and to passenger service on December 11, 2016. The immediate effect was a reduction in Zurich–Lugano travel time from approximately 2 hours 40 minutes to under 2 hours, with further reductions following timetable optimization. A second tunnel, the Ceneri Base Tunnel (15.4 km), opened in December 2020 and cut the Bellinzona–Lugano segment from 30 to 12 minutes, completing the NEAT flat-route corridor.

Ticino's Economic Position. Canton Ticino occupies a unique position in the Swiss economy. It is the only predominantly Italian-speaking canton, with a population of approximately 354,000 (2015). Geographically isolated by the Alps, Ticino has historically maintained stronger economic ties to northern Italy than to German-speaking Switzerland. Its economy depends heavily on tourism, finance, and cross-border commuters from Italy. Per capita income is approximately 15 percent below the Swiss average, making Ticino one of the less prosperous cantons despite its favorable climate and cultural assets.

The tunnel was expected to reduce Ticino's economic isolation by making it accessible for day trips from Zurich and other northern cities. Proponents argued it would boost tourism, attract residential investment from workers commuting to Zurich, and stimulate commercial development. The Swiss government's own projections anticipated significant economic benefits for the southern region (BAV, 2016).

Control Cantons. The primary control group consists of three alpine cantons: Graubünden (population 198,000), Valais (339,000), and Uri (36,000). These cantons share Ticino's alpine topography, tourism dependence, and relative economic peripherality. Critically, none received comparable travel time reductions during the study period. Graubünden's main external connection is via the A13 highway and Rhaetian Railway; Valais connects to the Rhone Valley and French-speaking Switzerland; Uri, while on the Gotthard route, saw limited direct benefit since it was already well-connected to the northern lowlands.

3. Data

Construction Expenditure. The primary outcome is annual construction expenditure by canton and municipality, from the Swiss Federal Statistical Office's (BFS) Construction and Housing Statistics. This dataset covers all cantons and approximately 2,200 municipalities from 1994 to 2023, providing 30 years of annual observations. Construction expenditure is disaggregated by building type (Hochbau vs. Tiefbau), work type (new construction, renovation, maintenance), and contractor type (public vs. private). All values are in nominal Swiss francs. I use total construction expenditure as the primary outcome and present decompositions by investment type as robustness checks.

Hotel Tourism (HESTA). The secondary outcome is annual hotel overnight stays from the BFS HESTA survey. Canton-level data are available from 2005 to 2025 (21 years), disaggregated by tourist country of origin. Municipality-level data cover 186 tourism-relevant municipalities from 2013 to 2025. The tourist origin decomposition—Swiss, German, and Italian—provides a natural mechanism test: Swiss and German tourists arrive from the north (via the tunnel), while Italian tourists arrive from the south (unaffected by the tunnel).

Panel Construction. The canton-level analysis panel comprises 26 cantons $\times$ 30 years = 780 observations for construction, and 4 alpine cantons $\times$ 21 years = 84 observations for the alpine-only tourism specification. The municipal-level construction panel includes 318 municipalities (106 in Ticino, 72 in Graubünden, 121 in Valais, 19 in Uri) $\times$ 30 years = 9,540 observations. Population data from BFS are used for per-capita normalization.

3.1 Summary Statistics

Table 1 presents pre-treatment means for the primary outcomes. Before 2017, Ticino's mean annual construction expenditure was 2.43 billion CHF, compared to 1.61 billion for the average alpine control canton. On a per-capita basis, however, Ticino's construction intensity (6,860 CHF per 1,000 residents) was lower than the alpine controls (9,846 CHF), reflecting the controls' smaller populations and relatively high investment rates. Tourism patterns also differ: Ticino received 2.47 million hotel overnight stays annually, of which 57 percent came from Swiss tourists, compared to 3.26 million for the average control canton.

Table 1: Summary Statistics: Pre-Treatment Means

	Ticino (1)	Alpine Controls (2)
Panel A: Construction Expenditure (1994–2016)		
Total expenditure (1000 CHF)	2431	1614
	(674)	(912)
Per 1000 residents (CHF)	6860	9846
	(1903)	(2987)
Investment (1000 CHF)	2338	1474
New construction (1000 CHF)	1489	989
Canton-years	23	69
Panel B: Hotel Overnight Stays (2005–2016)		
Total overnights	2467869	3259564
	(187697)	(2254014)
Swiss tourists	1414398	1677663
German tourists	362422	618691
Italian tourists	192565	91961
Canton-years	12	36

Notes: Standard deviations in parentheses. Alpine controls are Graubünden, Valais, and Uri. Construction data from BFS Construction Statistics (1994–2016). Tourism data from BFS HESTA (2005–2016). Control means are averaged across the three control cantons.

4. Empirical Strategy

4.1 Identification

I exploit the December 2016 opening of the Gotthard Base Tunnel as a sharp, discrete shock to Ticino's connectivity. The identifying assumption is that, absent the tunnel opening, construction expenditure and tourism in Ticino would have evolved along a parallel trajectory to the control cantons:

$$\mathbb{E}[Y_{ct}(0) \mid \text{Ticino}] - \mathbb{E}[Y_{ct}(0) \mid \text{Control}] = \alpha_c + \gamma_t \tag{1}$$

where $Y_{ct}(0)$ is the potential outcome without treatment, α_c is a canton fixed effect, and γ_t is a time fixed effect.

4.2 Estimation

The baseline specification is a two-way fixed effects difference-in-differences:

$$\log Y_{ct} = \alpha_c + \gamma_t + \beta \cdot (\text{Ticino}_c \times \text{Post2017}_t) + \varepsilon_{ct} \tag{2}$$

where Y_{ct} is construction expenditure (or hotel overnight stays) in canton c and year t, Ticino_c is a binary indicator for Canton Ticino, Post2017_t indicates years 2017 and later, and β is the treatment effect. Standard errors are clustered at the canton level. I also estimate event study specifications that replace the single Post indicator with a full set of leads and lags relative to the treatment year, omitting $t-1$ as the reference period.

Because there is a single treatment event (no staggered adoption), the TWFE estimator is unbiased under parallel trends (de Chaisemartin and D'Haultfœuille, 2020; Goodman-Bacon, 2021). The forbidden-comparison and negative-weighting concerns that motivate Callaway–Sant'Anna or Sun–Abraham estimators do not apply in this single-event setting.

4.3 Threats to Validity

Three concerns merit discussion. First, *anticipation effects*: the Gotthard Base Tunnel was under construction from 1999 to 2016, potentially stimulating local economic activity through direct construction employment and supply chain effects. I address this by examining whether pre-treatment trends differ between Ticino and controls, and by testing placebo treatment dates.

Second, *COVID-19*: the pandemic disrupted both construction and tourism from 2020 onward. Since the Ceneri Base Tunnel also opened in December 2020, COVID confounds the Ceneri effect. I address this by presenting results both with and without 2020–2021, and by focusing on the clean post-window of 2017–2019.

Third, *few treated clusters*: with one treated canton and three controls in the alpine specification, inference based on cluster-robust standard errors may be unreliable (Conley and Taber, 2011). I address this by presenting the full 26-canton sample as the primary specification and the alpine-only comparison as a robustness check. Even in the full sample, there is only one treated cluster, so reported p-values should be interpreted with caution; the paper's contribution lies in bounding the effect size rather than testing a sharp null.

5. Results

5.1 Main Results

Table 2 reports the main difference-in-differences estimates for construction expenditure. In the full 26-canton sample (Column 1), the Gotthard Base Tunnel is associated with a 5.2 percent increase in Ticino's construction expenditure relative to the national trend, though this estimate is not statistically significant at conventional levels ($\hat{\beta} = 0.052$, SE = 0.032, $p = 0.12$). This corresponds to approximately 126,000 CHF per 1,000 residents, or roughly 45 million CHF annually—a modest return on a 12-billion-franc investment.

Excluding COVID years (Column 2) strengthens the estimate slightly to 6.5 percent (SE = 3.3%), and restricting to the clean 2017–2019 window (Column 3) yields 6.8 percent (SE = 3.4%). The municipal-level specification (Column 4), which exploits variation across 318 municipalities in the alpine region, produces an effectively zero estimate (0.7%, SE = 6.4%). The minimum detectable effect at 80 percent power in the full-sample specification is 9.6 percent, meaning I can rule out construction increases larger than approximately one-tenth.

5.2 Tourism

Table 3 presents the tourism results. Total hotel overnight stays in Ticino show a modest decline relative to alpine controls (−4.7%, SE = 5.3%), driven largely by Swiss domestic tourists (−15.6%, SE = 13.4%). German tourists, who also arrive from the north, show a small positive but insignificant effect (+3.9%, SE = 4.7%). Italian tourists, who enter from the south and should be unaffected by the tunnel, show an 8.4 percent increase (SE = 20.5%), consistent with no meaningful effect.

The pattern across tourist origins—negative for Swiss visitors, near-zero for foreign visitors—is suggestive of a day-trip substitution effect: the tunnel makes Ticino accessible for same-day visits from Zurich, potentially reducing demand for overnight accommodation. This mechanism has been documented in the context of high-speed rail in Spain (Gutiérrez, 2020) and France (Delaplace and Perrin, 2014), where faster connections converted multi-day visits to day trips.

5.3 Robustness

Table 4 presents robustness checks. The alpine-only sample excluding COVID years yields a 10.8 percent estimate (SE = 8.8%), while the short 2017–2019 window produces 14.5 percent (SE = 9.5%). Both are imprecise due to the small number of cantons in the alpine comparison.

Table 2: The Effect of the Gotthard Base Tunnel on Construction Expenditure

Dependent Variable:	log_construction			
	Full Sample	Excl. COVID	2017–2019	Municipal
Model:	(1)	(2)	(3)	(4)
Variables				
treat_post	0.0515	0.0647*	0.0678*	0.0066
	(0.0323)	(0.0328)	(0.0340)	(0.0642)
Fixed-effects				
canton	Yes	Yes	Yes	
year	Yes	Yes	Yes	Yes
muni_id				Yes
Fit statistics				
Observations	780	728	676	9,540
R^2	0.98423	0.98408	0.98405	0.79738
Within R^2	0.00091	0.00117	0.00089	3.68×10^{-6}

Clustered (canton) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Standard errors clustered at the canton level in parentheses. Columns 1–3 report canton-level regressions with 26 cantons over 30 years (1994–2023). Column 4 reports the municipal-level regression with 318 municipalities. The dependent variable is log total construction expenditure. "Full Sample" uses all 26 cantons. "Excl. COVID" drops 2020–2021. "2017–2019" restricts to the pre-COVID post-treatment window. "Municipal" uses municipal-level data from Ticino, Graubünden, Valais, and Uri. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: The Effect of the Gotthard Base Tunnel on Hotel Overnight Stays

Dependent Variables:	log_nights_total	log_nights_swiss	log_nights_german	log_nights_italian
	Total	Swiss	German	Italian
Model:	(1)	(2)	(3)	(4)
Variables				
treat_post	-0.0472	-0.1560	0.0385	0.0836
	(0.0528)	(0.1340)	(0.0474)	(0.2045)
Fixed-effects				
canton_abbr	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes
Fit statistics				
Observations	84	84	84	84
R^2	0.99792	0.99497	0.99619	0.98602
Within R^2	0.03298	0.11135	0.01277	0.01145

Clustered (canton_abbr) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*
Standard errors clustered at the canton level in parentheses. The sample includes Ticino, Graubünden, Valais, and Uri (2005–2025). The dependent variable is the log of annual hotel overnight stays. "Swiss" guests travel from the north via the tunnel. "German" guests also primarily arrive from the north. "Italian" guests arrive from the south (falsification). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The placebo tests reveal an important limitation. Setting the placebo treatment date to 2010 generates a coefficient of 22.5 percent (SE = 7.6%), and the 2013 placebo yields 15.4 percent (SE = 9.4%). These large placebo effects suggest differential pre-trends, likely driven by economic stimulus during the tunnel's construction phase (1999–2016). The full-sample event study (Section B) confirms this pattern: Ticino's construction expenditure was elevated relative to the national average from 2008 to 2012, before returning to trend in the years immediately preceding the opening.

The per-capita specification using all 26 cantons yields a point estimate of 401 CHF per 1,000 residents (SE = 244), which represents 5.8 percent of Ticino's pre-treatment per-capita construction spending—consistent with the log specification. The leave-one-out exercise shows that dropping Valais increases the estimate to 18.6 percent, while dropping Graubünden or Uri produces estimates of 5.5–6.8 percent, indicating some sensitivity to the choice of control cantons.

6. Discussion

The central finding is that the world's longest railway tunnel—a 12-billion-franc investment that cut travel time between Zurich and Lugano by 40 minutes—produced no statistically significant increase in construction investment or tourism in the connected region. The point

Table 4: Robustness Checks

Dependent Variables:	log_construction				construction_pc
	Excl. COVID	2017–2019	Placebo 2010	Placebo 2013	Per Capita
Model:	(1)	(2)	(3)	(4)	(5)
Variables					
treat_post	0.1079	0.1454			400.8
	(0.0883)	(0.0946)			(244.2)
treat_placebo			0.2247*	0.1535	
			(0.0756)	(0.0944)	
Fixed-effects					
canton	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	112	104	92	92	780
R^2	0.98473	0.98446	0.98844	0.98602	0.78070
Within R^2	0.03462	0.04289	0.23405	0.07406	0.00088

Clustered (canton) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Standard errors clustered at the canton level in parentheses. Columns 1–2 use the alpine sample (TI, GR, VS, UR). Columns 3–4 use only pre-treatment data (1994–2016) with placebo treatment dates. Column 5 reports the full 26-canton sample with construction expenditure per 1000 residents as the dependent variable. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

estimates are modestly positive for construction (5–10%) and slightly negative for Swiss domestic tourism, but none approach conventional significance levels.

Three interpretations merit consideration. First, the returns to transport connectivity may be highly concave. Donaldson (2018) documents transformative effects of railways connecting previously isolated regions in colonial India, but Ticino was never autarkic: it had rail, highway, and air connections to northern Switzerland before 2016. Reducing travel time from 160 to 120 minutes may lie on a flat portion of the connectivity-returns curve, where the marginal benefit of additional time savings is small. This interpretation is consistent with Ahlfeldt et al. (2015), who find that German reunification produced the largest agglomeration effects in areas where the Berlin Wall had created a discontinuous barrier, not in areas with gradual distance gradients.

Second, the construction-phase stimulus may have front-loaded the economic benefits. The tunnel was under construction for 17 years (1999–2016), employing thousands of workers and generating demand for materials and services in the Ticino region. If the construction phase captured most of the tunnel's direct economic impact, the opening itself—while celebrated—may have been economically anti-climactic. The elevated pre-treatment construction activity in Ticino, visible in the event study, is consistent with this interpretation.

Third, for tourism, faster rail connections may substitute day trips for overnight stays. A visitor who previously would have traveled to Ticino for a weekend can now make a comfortable day trip from Zurich, reducing hotel demand while potentially increasing total visitor volume. This is a general equilibrium effect that standard infrastructure evaluations may miss: improved connectivity benefits visitors (through time savings) but may harm the local hospitality industry (through reduced overnight spending).

These results have implications for the cost-benefit analysis of major transport projects. At a construction cost of 12.2 billion CHF and an annual construction expenditure increase of at most 45 million CHF in Ticino, the direct investment return is negligible. Even accounting for benefits not captured in construction data—commuter welfare, freight efficiency, reduced road congestion—the Gotthard Base Tunnel's economic case rests primarily on transit traffic and national-level gains, not on regional economic convergence for Ticino.

7. Conclusion

This paper finds no evidence that the Gotthard Base Tunnel—the world's largest transport infrastructure investment of the 21st century—generated significant regional economic dividends for the canton it was designed to integrate. The result is not that the tunnel was a bad investment; it may well generate large benefits through freight transport, reduced road congestion, and environmental gains. The result is more specific: dramatic reductions in passenger rail travel time do not automatically translate into increased investment and tourism in the connected peripheral region.

The finding challenges a common justification for transport megaprojects: that connectivity drives convergence. When a region is already integrated by road and legacy rail, a faster tunnel may change how people travel without changing where they invest, build, or sleep. Several caveats apply: the tunnel likely generates substantial national benefits through freight efficiency and reduced road congestion that are not captured in Ticino-specific outcomes; the design identifies local effects only, not network-level gains. Additionally, the pre-treatment construction-phase stimulus (1999–2016) may have front-loaded benefits that the operational-phase design cannot capture. Future work exploiting continuous treatment intensity, monthly tourism data, and direct measures of rail ridership would sharpen identification. Policymakers evaluating transport infrastructure should distinguish between projects that create new connections and those that improve existing ones. The marginal returns to connectivity may diminish faster than the marginal costs of ever-larger tunnels.

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References

Ahlfeldt, Gabriel M., Stephen J. Redding, Daniel M. Sturm, and Nikolaus Wolf, "The Economics of Density: Evidence from the Berlin Wall," *Econometrica*, 2015, *83* (6), 2127–2189.

Baum-Snow, Nathaniel, "Did Highways Cause Suburbanization?," *Quarterly Journal of Economics*, 2007, *122* (2), 775–805.

BAV, "NEAT: Neue Eisenbahn-Alpentransversale," Technical Report, Bundesamt für Verkehr 2016.

Conley, Timothy G. and Christopher R. Taber, "Inference with "Difference in Differences" with a Small Number of Policy Changes," *Review of Economics and Statistics*, 2011, *93* (1), 113–125.

de Chaisemartin, Clément and Xavier D'Haultfœuille, "Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects," *American Economic Review*, 2020, *110* (9), 2964–2996.

Delaplace, Marie and Julie Perrin, "Multiplication des dessertes TGV et modification de l'offre ferroviaire autour des gares nouvelles," *Géotransports*, 2014, *3*, 15–34.

Donaldson, Dave, "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure," *American Economic Review*, 2018, *108* (4-5), 899–934.

_ **and Richard Hornbeck**, "Railroads and American Economic Growth: A "Market Access" Approach," *Quarterly Journal of Economics*, 2016, *131* (2), 799–858.

Duranton, Gilles and Matthew A. Turner, "Urban Growth and Transportation," *Review of Economic Studies*, 2012, *79* (4), 1407–1440.

Faber, Benjamin, "Trade Integration, Market Size, and Industrialization: Evidence from China's National Trunk Highway System," *Review of Economic Studies*, 2014, *81* (3), 1046–1070.

Ghani, Ejaz, Arti Grover Goswami, and William R. Kerr, "Highway to Success: The Impact of the Golden Quadrilateral Project for the Location and Performance of Indian Manufacturing," *Economic Journal*, 2016, *126* (591), 317–357.

Gibbons, Stephen and Stephen Machin, "Valuing Rail Access Using Transport Innovations," *Journal of Urban Economics*, 2010, *67* (2), 148–169.

Goodman-Bacon, Andrew, "Difference-in-Differences with Variation in Treatment Timing," *Journal of Econometrics*, 2021, *225* (2), 254–277.

Gutiérrez, Javier, "Transport and Accessibility," *International Encyclopedia of Human Geography*, 2020, pp. 407–411.

Helpman, Elhanan, *The Size of Regions*, Cambridge University Press, 1998.

Hornbeck, Richard and Martin Rotemberg, "Railroads, Reallocation, and the Rise of American Manufacturing," *American Economic Review*, 2024, *114* (4), 1057–1100.

Koster, Hans R. A., Ilias Pasidis, and Jos van Ommeren, "Shopping Externalities and Retail Concentration: Evidence from Dutch Shopping Streets," *Journal of Urban Economics*, 2019, *114*, 103194.

Krugman, Paul, "Increasing Returns and Economic Geography," *Journal of Political Economy*, 1991, *99* (3), 483–499.

Redding, Stephen and Anthony J. Venables, "Economic Geography and International Inequality," *Journal of International Economics*, 2004, *62* (1), 53–82.

SBB, "Gotthard Base Tunnel: Facts and Figures," Technical Report, Swiss Federal Railways 2016.

A. Data Appendix

Construction Data. The BFS Construction and Housing Statistics (Bau- und Wohnbaustatistik) provides annual construction expenditure at the cantonal and municipal level from 1994 to 2023. Data are accessed via the BFS PXWeb API (table px-x-0904010000_201). Construction expenditure is measured in nominal Swiss francs and disaggregated by contractor type (public/private), building type (Hochbau/Tiefbau), and work type (new construction, renovation, maintenance). I use total construction expenditure (all types combined) as the primary outcome.

Tourism Data. Hotel overnight stays come from the BFS HESTA survey (Beherbergungsstatistik), available at the cantonal level from 2005 to 2025 (table px-x-1003020000_102) and at the municipal level for 186 tourism-relevant municipalities from 2013 to 2025 (table px-x-1003020000_101). I use annual totals and decompose by tourist country of origin: Swiss, German, and Italian.

Municipal Identification. Municipalities are identified by BFS Gemeindenummer. Ticino municipalities have codes in districts 50–53; Graubünden in 35–39; Valais in 60–62; Uri in 12. Population data from BFS (2015 mid-year estimates) are used for per-capita normalization. I do not apply the SMMT municipal merger harmonization because the construction data already reflects merged municipal boundaries for each reporting year.

B. Identification Appendix

Event Study. The full-sample event study (all 26 cantons) shows that Ticino's construction expenditure was elevated relative to the national average from approximately 2008 to 2012, with coefficients of 0.07–0.22 log points (relative to $t - 1 = 2016$). This differential trend narrows in 2013–2015 and is close to zero in the treatment year (2017). Post-treatment coefficients are small and centered around zero, with no evidence of a sustained positive break after the tunnel opening.

This pattern is consistent with construction-phase stimulus: the Gotthard Base Tunnel was under active construction throughout the pre-treatment period, with peak construction activity in 2008–2012. The placebo tests at 2010 and 2013 generate positive coefficients of 0.22 and 0.15, respectively, further suggesting that the pre-trends reflect tunnel construction rather than anticipation of connectivity benefits.

Covariate Balance. The treated canton (Ticino) and control cantons share alpine topography, tourism dependence, and peripheral geographic position. However, Ticino differs in language (Italian vs. German), proximity to Italy, and economic structure (higher share of cross-border commuters). These level differences are absorbed by canton fixed effects; the identifying assumption requires only that trends would have been parallel absent the tunnel.

C. Robustness Appendix

Leave-One-Out. In the alpine-only specification, dropping Valais increases the coefficient to 18.6 percent (SE = 1.4%), while dropping Graubünden yields 5.5 percent (SE = 12.5%) and dropping Uri yields 6.8 percent (SE = 13.9%). The sensitivity to dropping Valais suggests that Valais's construction trajectory was particularly divergent from Ticino's in the post-treatment period.

Per-Capita. Using construction expenditure per 1,000 residents instead of log levels yields a point estimate of 401 CHF (SE = 244) in the full sample, representing 5.8 percent of Ticino's pre-treatment per-capita mean of 6,860 CHF.

D. Standardized Effect Sizes

Table 5: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
Panel A: Pooled						
Construction expenditure (canton)	0.0647	0.0328	1.0985	0.0589	0.0299	Moderate positive
Construction expenditure (municipal)	0.0066	0.0642	1.5164	0.0043	0.0424	Null
Swiss hotel overnights	-0.1560	0.1340	1.4022	-0.1112	0.0956	Moderate negative
German hotel overnights	0.0385	0.0474	1.1865	0.0324	0.0400	Small positive
Panel B: Heterogeneous (COVID vs. Non-COVID Post-Period)						
Construction (excl. COVID)	0.0647	0.0328	1.0985	0.0589	0.0299	Moderate positive
Construction (COVID period)	0.0107	0.0295	1.0985	0.0097	0.0268	Small positive

Notes: **Country:** Switzerland. **Research question:** Does the opening of the Gotthard Base Tunnel (December 2016), which cut Zurich–Lugano rail travel time from 2 hours 40 minutes to under 2 hours, increase construction investment and hotel tourism in Ticino relative to other alpine cantons? **Policy mechanism:** The 57 km Gotthard Base Tunnel eliminates a major topographic barrier between German-speaking northern Switzerland and Italian-speaking Ticino, reducing rail travel time by 30–45 minutes and integrating a linguistically isolated region with the national economic core. **Outcome definition:** Log annual construction expenditure (all types, CHF) from BFS construction statistics; log annual hotel overnight stays by tourist origin from BFS HESTA. **Treatment:** Binary, Ticino canton (treated) vs. control cantons. **Data:** BFS Construction Statistics (1994–2023, 26 cantons, 780 canton-year observations) and BFS HESTA tourism statistics (2005–2025, 4 alpine cantons, 84 canton-year observations). **Method:** Two-way fixed effects difference-in-differences with canton and year fixed effects; standard errors clustered at the canton level. **Sample:** Full 26-canton sample for construction; Ticino, Graubünden, Valais, Uri for tourism. SDE = $\hat{\beta}/\text{SD}(Y)$ where SD(Y) is the pre-treatment standard deviation. Classification refers to magnitude, not statistical significance: Large ($|\text{SDE}| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).