Why and How to Reduce Construction Costs

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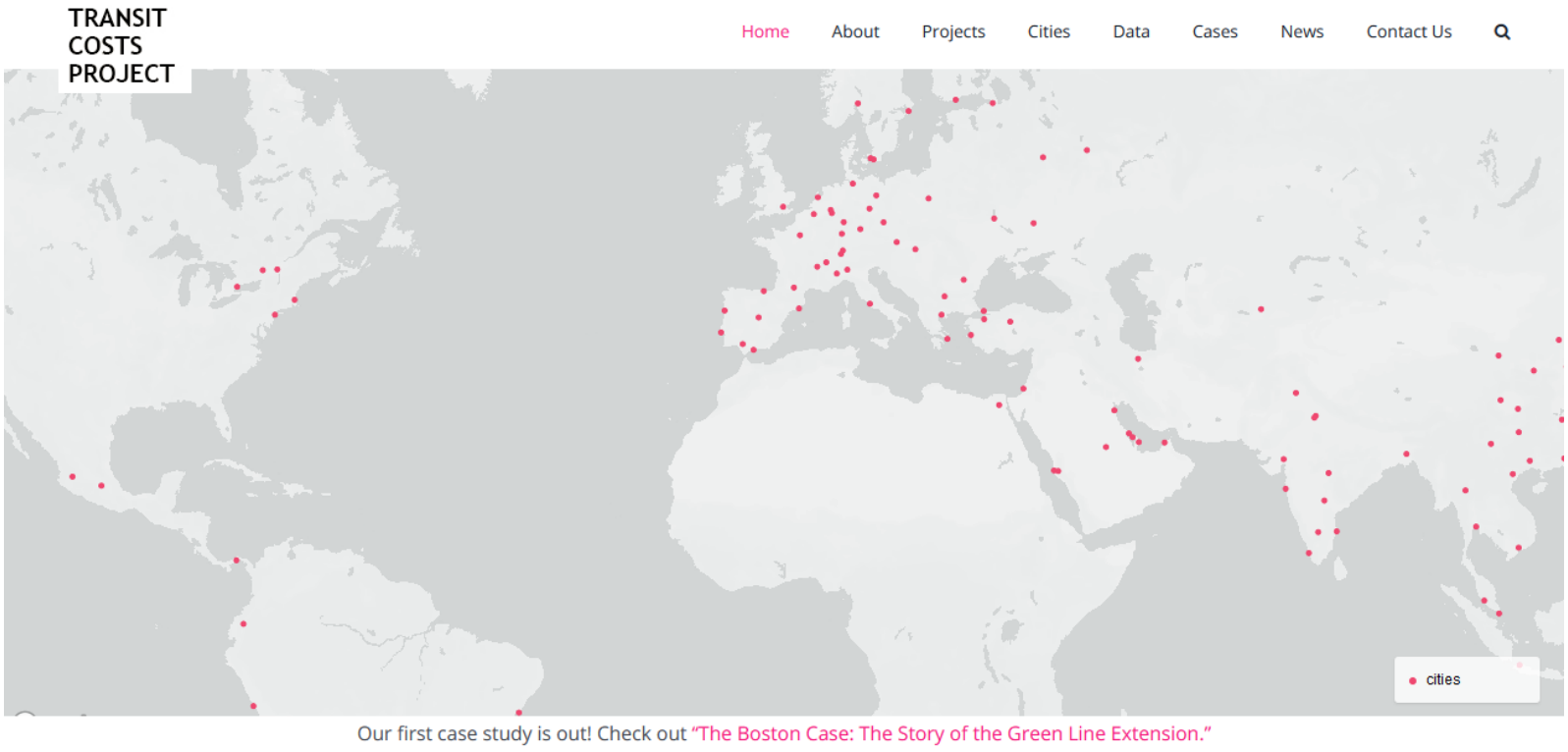
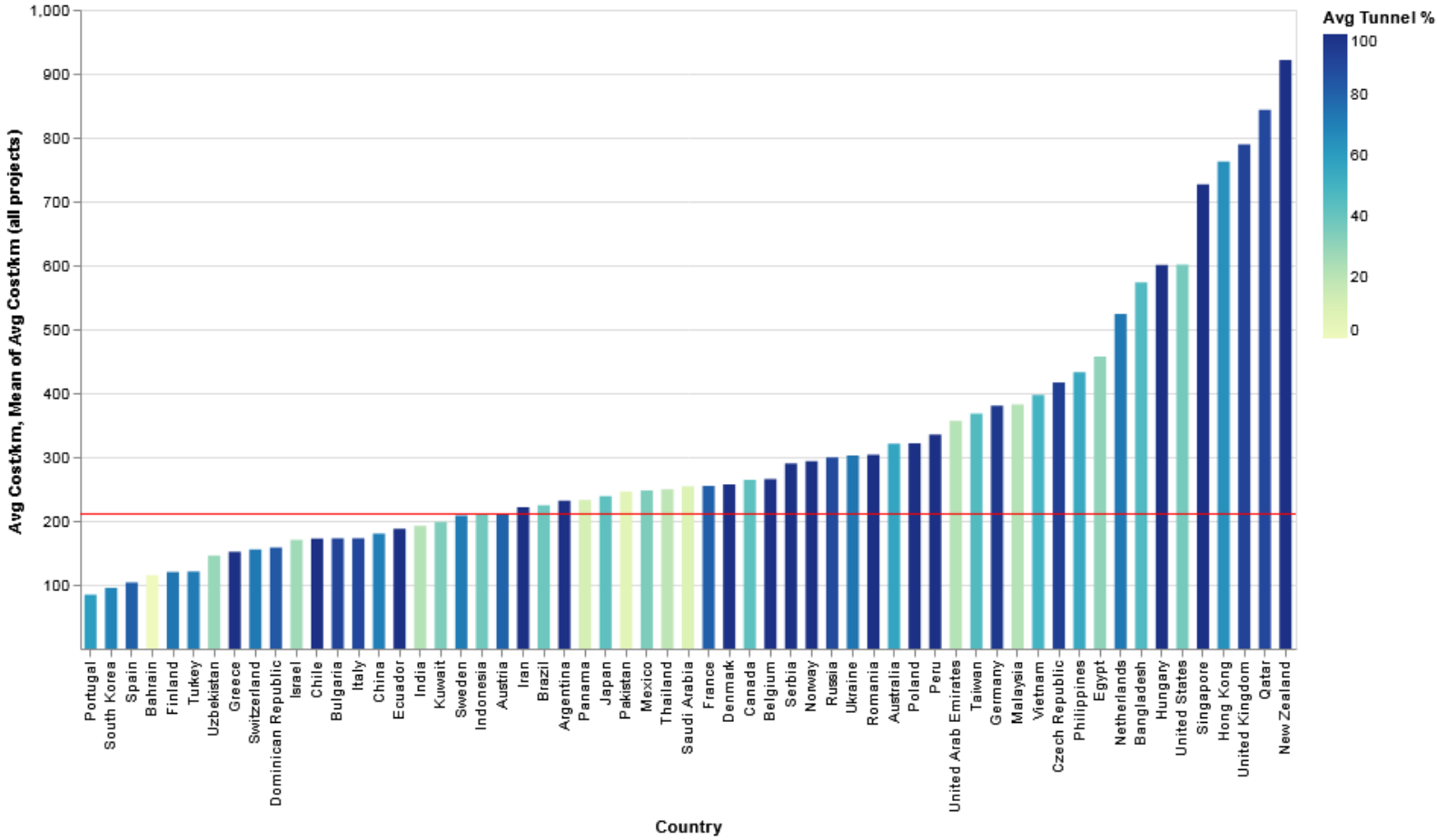
Introduction

Construction costs for subways vary greatly between countries.



Source: http://transitcosts.com

Costs by Country



Costs in Different Countries

Lesson #1 from our database: costs are primarily national (sometimes city-specific), so subways in the same city cost about the same, and usually also in the same country.

A dummy variable that takes the value 1 in the Anglosphere and 0 elsewhere has a correlation of 0.4 with cost per km, more than any other (the tunnel percent is only 0.15).

That and other context tells us that cost differences are almost entirely institutional, not geological.

The differences are massive: Southern European subways are around $150-200 million/km, medium-cost countries (France, Germany, China) around $250-350 million/km, the Anglosphere is $600+ million/km and New York is $2+ billion/km.

Cost History

In most places, costs are rising.

Historic costs, underground only, all in PPP 2022 dollars:

- 1910s-20s: New York is around $60 million/km, Paris around 40
- 1930s: New York explodes to $180 million/km, Paris and London are both around 40
- Postwar: New York rises to $350 million/km, Milan and Stockholm begin building around 60
- 1970s: New York rises to $630 million/km London builds at 170, Berlin is similar, Milan and Rome explode to around 200 (due to bribes), Stockholm stays cheap
- Present: New York is at $2+ billion/km; London and other non-US Anglo cities have exploded; Milan and Rome are slightly down (mani pulite), Nordic costs have exploded to $250-300 million/km

Transportation and Housing

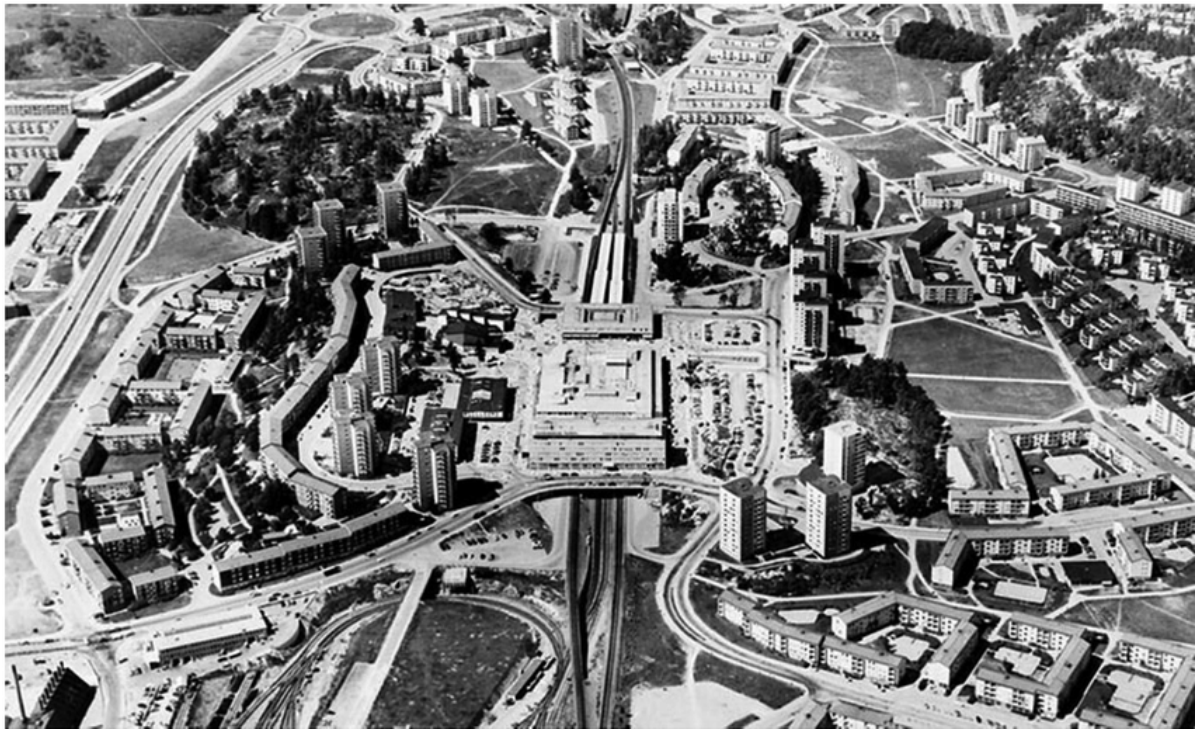
High housing costs are a well-known economic drag, caused by zoning restrictions (e.g. Hsieh-Moretti).

But in the absence of mass transit, higher congestion levels eat most welfare benefits from upzoning (Bunten).

In practice, upzoning tends to come together with rail construction programs (e.g. Stockholm, Paris, Vancouver, to some extent Washington).

Transit-Oriented Development

Vällingby, built simultaneously with the Stockholm Metro Green Line:



In Börjesson, it is found the original 1950s-70s Stockholm Metro had a benefit-cost ratio of 6.

Case Studies

In addition to the large-N database, we conducted five in-depth case studies:

- New York Second Avenue Subway: highest costs in the world
- Boston Green Line Extension: light rail for the cost of a subway
- Stockholm Nya Tunnelbanan: low but rising costs
- Italian cities: generally low and stable costs, even falling since the 1990s
- Istanbul Metro and Marmaray: low costs due to very good public planning

Why Do Costs Differ?

The differences are institutional, and solving them requires American cities to consciously imitate low-cost places (none of which natively speaks English).

- Overbuilding: New York stations built too big for the trains they serve
- Systems: low standardization raises the costs of systems
- Labor: the Northeastern US has severe overstaffing of blue- and white-collar workers
- Procurement: the ongoing privatization of planning doubles Anglo procurement costs
- Soft costs: Anglo soft costs are atypically high

Stations and Tunneling

The ratio of civil infrastructure costs to systems and finishes in Stockholm, Milan, Rome, Paris is about 3:1.

In New York, it's 53:47.

The New York premium is small in tunneling and very large in stations, consistent with a station-specific New York premium of a factor of 3.

Second Avenue Subway stations are 2-3 times too big for the trains, and two out of three are also built with expensive deep-mining techniques instead of cut-and-cover.

Labor

In Sweden, Italy, and Turkey, labor is 20-30% of hard costs.

High Swedish wages (about $90,000/year for miners in gross salary; benefits and taxes double this) match high Swedish labor productivity in construction.

In the Northeastern US, labor is 50% of hard costs: wages and benefits are similar to those of Sweden but labor productivity is lower than in Turkey.

Blue-Collar Labor

There is severe overstaffing in New York, about 1.5x relative to Italy and Turkey even for the same tasks. There's also reluctance to use more capital- and less labor-intensive tunneling methods.

There are multiple unique institutional problems with Northeastern US unions:

- Rigid overtime rules (2x in New York, inc. weekends; Sweden: no overtime; France: 1.25-1.5x), combined with a seniority system in which workers deliberately seek out shifts with overtime; this also reduces safety
- Mostly local labor force, low intra-national and no international mobility
- Unions are perceived as a veto point even on changes that are pure tradition, not contractual

White-Collar Labor

There is severe overstaffing in Northeastern infrastructure projects. But its not purely about union problems:

- White-collar supervisor efficiency is particularly low: the Green Line Extension employed a supervisor per 1.8 trades worker (New England private-sector norm: 1 per 2.5-3)
- Utility conflict means that New York utilities demand that their own supervisors be in the tunnel at MTA expense, adding more supernumeraries

Procurement and Soft Costs

In interviews, scores of contractors in New York and other US cities have pointed out the same procurement problems doubling costs.

Soft costs in Italy and France add around 7-8% on top of the hard costs, and all ancillaries like insurance are together about 20%; soft costs in New York are 21% and all non-hard costs are about 45%. Why?

Good Procurement Practices

The Anglo world has privatized state planning, leading to a cost explosion. Infrastructure construction is best done through a top-down, state-led program. US/UK consultants are pushing a program that does not work, which we call the globalized system.

Traditional	Globalized
Design-bid-build	Design-build
Itemized contracts	Fixed price contracts
Public-sector risk	Private-sector risk
In-house expertise	Greater use of consultants

The globalized system has been adopted in the last 25-30 years out of dialog between London, Singapore, and Hong Kong consultants teaching one another bad practices, and is exported everywhere the UK has soft power.

Project Delivery

The lowest-cost countries consistently use the following procurement system:

- Technical scoring: contracts are given by a technical score (50-80% of bid), rather than lowest-bid
- Itemized costs: changes are pre-priced, reducing change order friction (Bolotnyy-Vasserman, Ryan: 10-20% cost savings)
- Flexibility: builders can do substantial changes to the design (des-bid-ign-build)
- Fast response: in-house staff can make quick decisions if a change is needed, without needing to go through a consultant or senior manager

Procurement and Risk

The Italian experience is instructive: the reforms in the 1990s that lowered costs included a rule requiring public, transparent itemized pricing for all big contracts.

Privatization of risk leads contractors to raise opening bids, essentially guaranteeing cost overruns (and relabeling them as a higher budget) instead of merely risking them.

Large design-build contracts are a vehicle to privatize decisionmaking and risk to large consultancies, which combines the worst aspects of the market (lack of coordination if each part of the government picks a different consultant) and state (lack of competition).

Good Political Practices

High costs of megaproject often boil down to politics and political meddling. The lowest-cost, highest-impact systems are built by an apolitical professional civil service. This means all of the following:

- Political macro- but not micromanagement of planning and engineering decisions, even in highly politicized, polarized systems (Italy, Turkey)
- Consultants may assist, but there must always be sufficient in-house capability to supervise them, rather than other consultants supervising consultants and contractors (bring back the bureaucrats)
- Consistent regulations: if something works, dont tighten rules and dont impose unfamiliar regulations on contractors
- Limited contingencies - projects must be rated on absolute costs, not overruns