ETH zürich

How much does a bus or train line cost?

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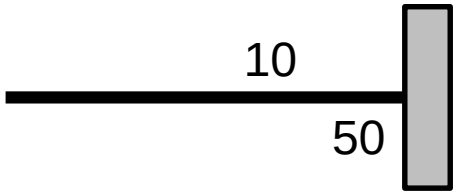
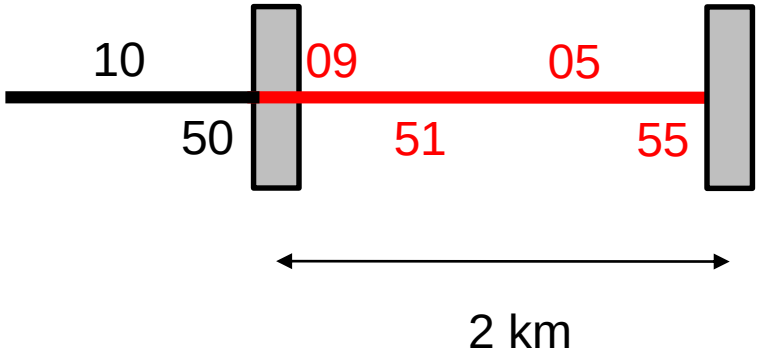
IVV, 26.06.2017

Example 1: Line extension of a bus line

Status Quo



Projected situation

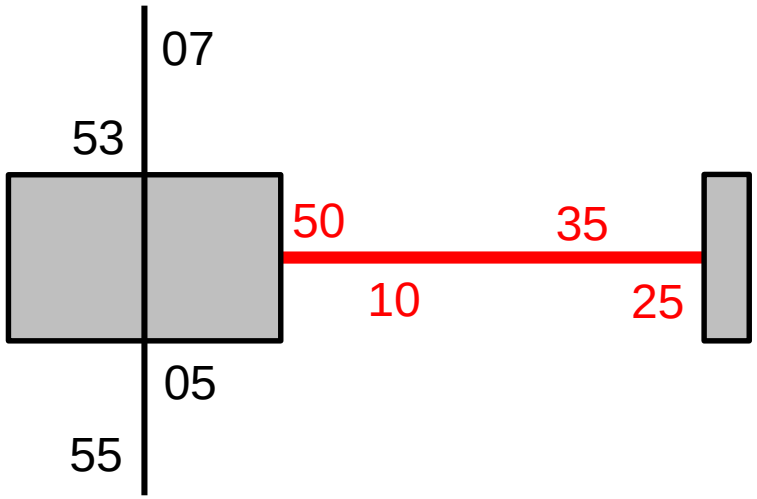


➔ How much does this extension cost?

*BAV statistics: 2 * 2 km * 6,86 CHF/km = 27,44 CHF per course*

Example 2: change of timetable of a connecting line

Status Quo



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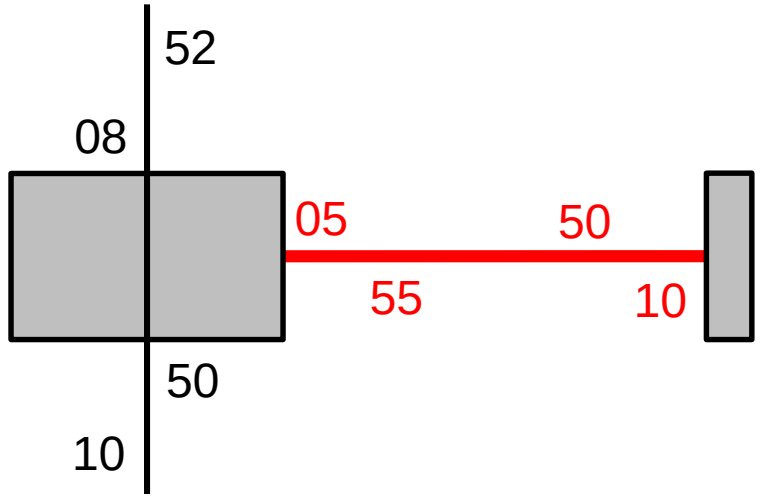


➔ How much does this change of timetable cost?

BAV statistics: nothing because the number of km is the same

Sample of real cost data

- 2 cantons
- 96 train lines
  - 13 companies
- 294 bus lines
  - 15 companies

Bus costs

- Driver cost: 66,61 CHF/h
- Vehicle cost:

	Minibus	Standard bus	Articulated bus
Fixed cost	14’449 CHF/year	30’046 CHF/year	48’273 CHF/year
Km dependent	0,97 CHF/km	1,61 CHF/km	2,03 CHF/km

- Operational side costs:
  - 2,35 CHF/h
  - 0,33 CHF/km for minibus and standard bus
  - 0,52 CHF/km for articulated bus
- Overhead: 11,08 %
- Distribution: 5,13 %

Total bus cost formula

Example for standard bus:

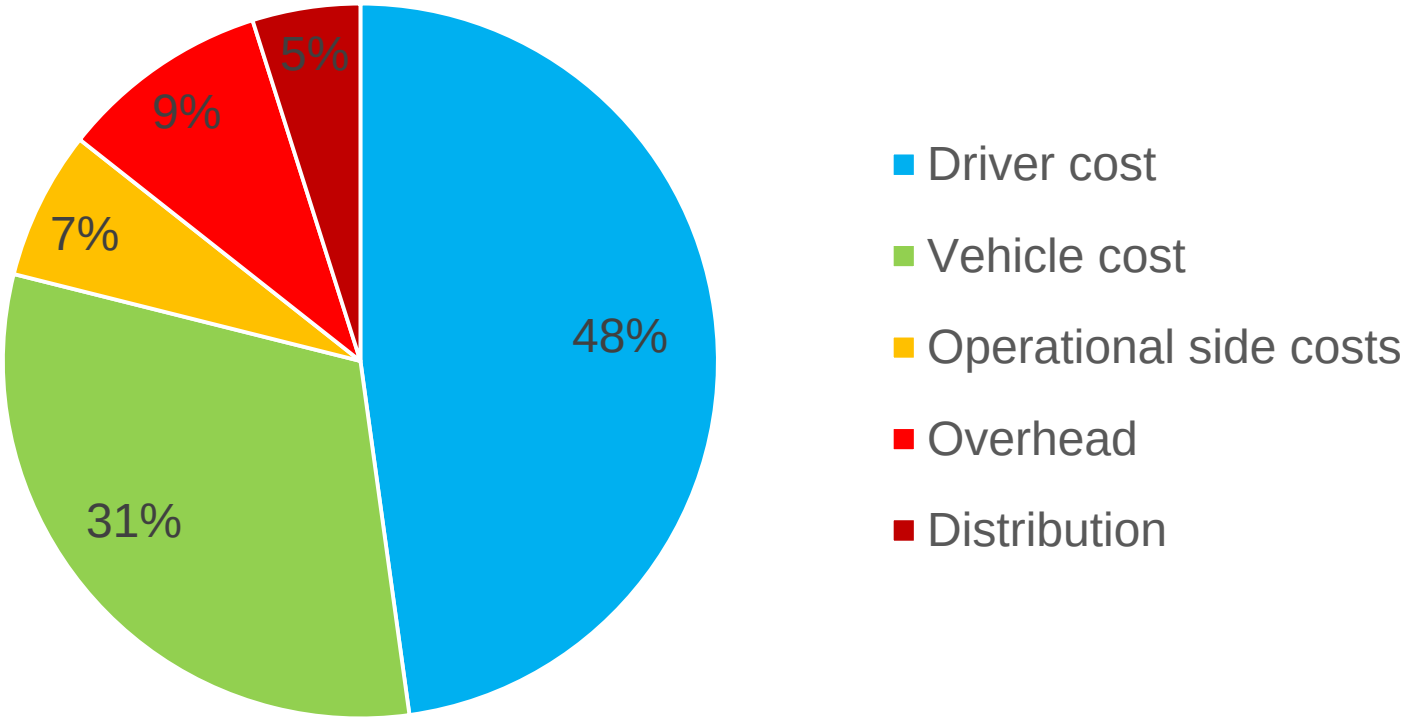
$$\left.\begin{array}{c} h \cdot 68{,}96\ CHF \\ +\ \#vehicles \cdot 30'046\ CHF \\ +\ km \cdot 1{,}94\ CHF \end{array}\right\} \underbrace{1{,}1108}_{overhead} \cdot \underbrace{1{,}0513}_{distribution}$$

Are these numbers plausible?

- Let's assume a standard bus
  - making 70'000 km/year
  - running at an average speed of 25 km/h
  - 15 % turnaround time
- Cost per km is:

$$\left(\frac{68{,}96}{25 \cdot 0{,}85} + \frac{30'046}{70'000} + 1{,}94\right) \cdot 1{,}1108 \cdot 1{,}0513 = 6{,}56\ CHF/km$$

Relative share of cost blocks

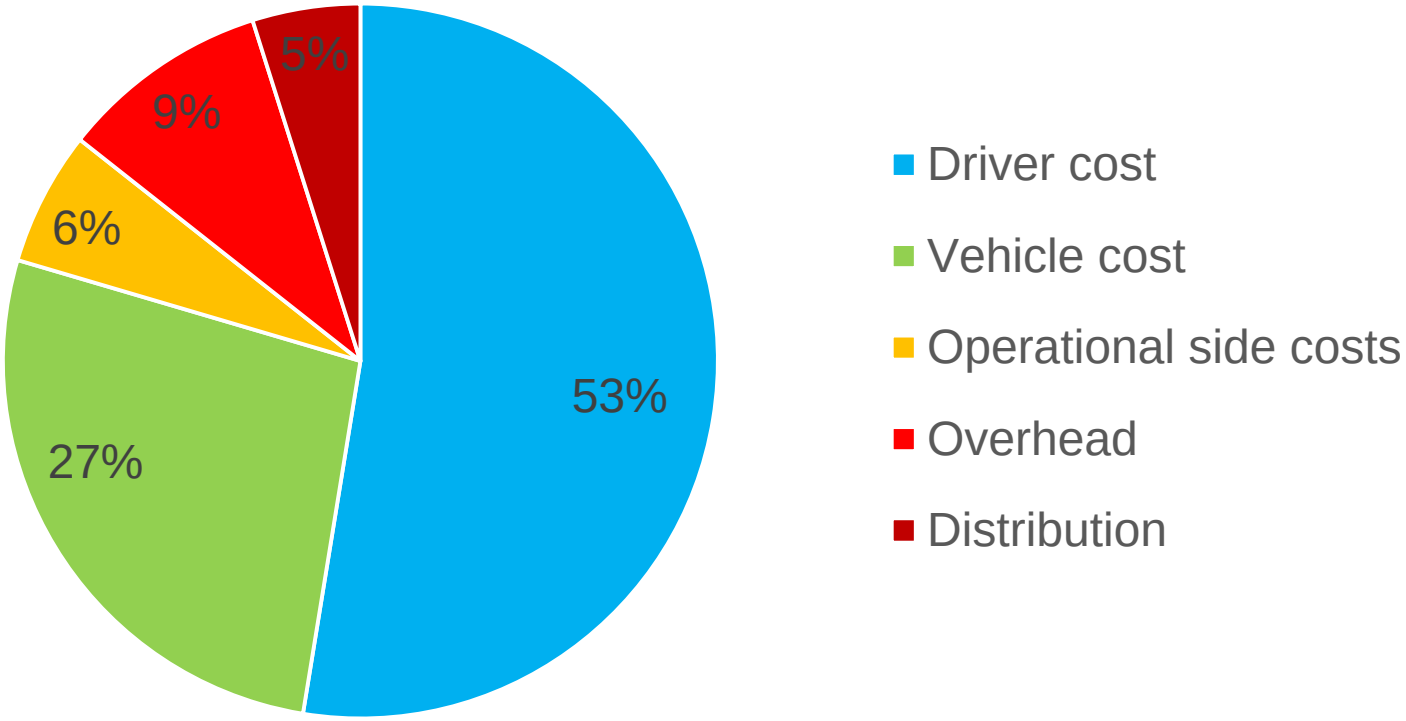


What about city traffic?

- Let's assume a standard bus
  - making 60'000 km/year
  - running at an average speed of 18 km/h
  - 10 % turnaround time
- Cost per km is:

$$\left(\frac{68{,}96}{18 \cdot 0{,}90} + \frac{30'046}{60'000} + 1{,}94\right) \cdot 1{,}1108 \cdot 1{,}0513 = 7{,}82\ CHF/km$$

Relative share of cost blocks



Train costs (1/2)

- Driver cost: 115,01 CHF/h
- Train attendant:
  - 114,86 CHF/h
  - 24,4 % of train hours accompanied (unless fully accompanied)
- Vehicle cost:
  - 153’727 CHF/train
  - 2,25 CHF/km
  - 0,01411 CHF/km/seat

Train costs (2/2)

- Operational side costs:
  - 0,33 CHF/km
  - 0,00048 CHF/km/seat
- Infrastructure:
  - 1,63 CHF/km
  - 0,00873 CHF/km/seat
- Overhead: 9,53 %
- Distribution: 8,22 %

Total train cost formula

$$\left.\begin{aligned} & h \cdot (115{,}01\ CHF + 24{,}4\ \% \cdot 114{,}86\ CHF) \\ & + \#vehicles \cdot 153'727\ CHF \\ & + km \cdot 4{,}21\ CHF \\ & + km \cdot seats \cdot 0{,}02332\ CHF \end{aligned}\right\} \underbrace{1{,}0953}_{overhead} \cdot \underbrace{1{,}0822}_{distribution}$$

Are these numbers plausible?

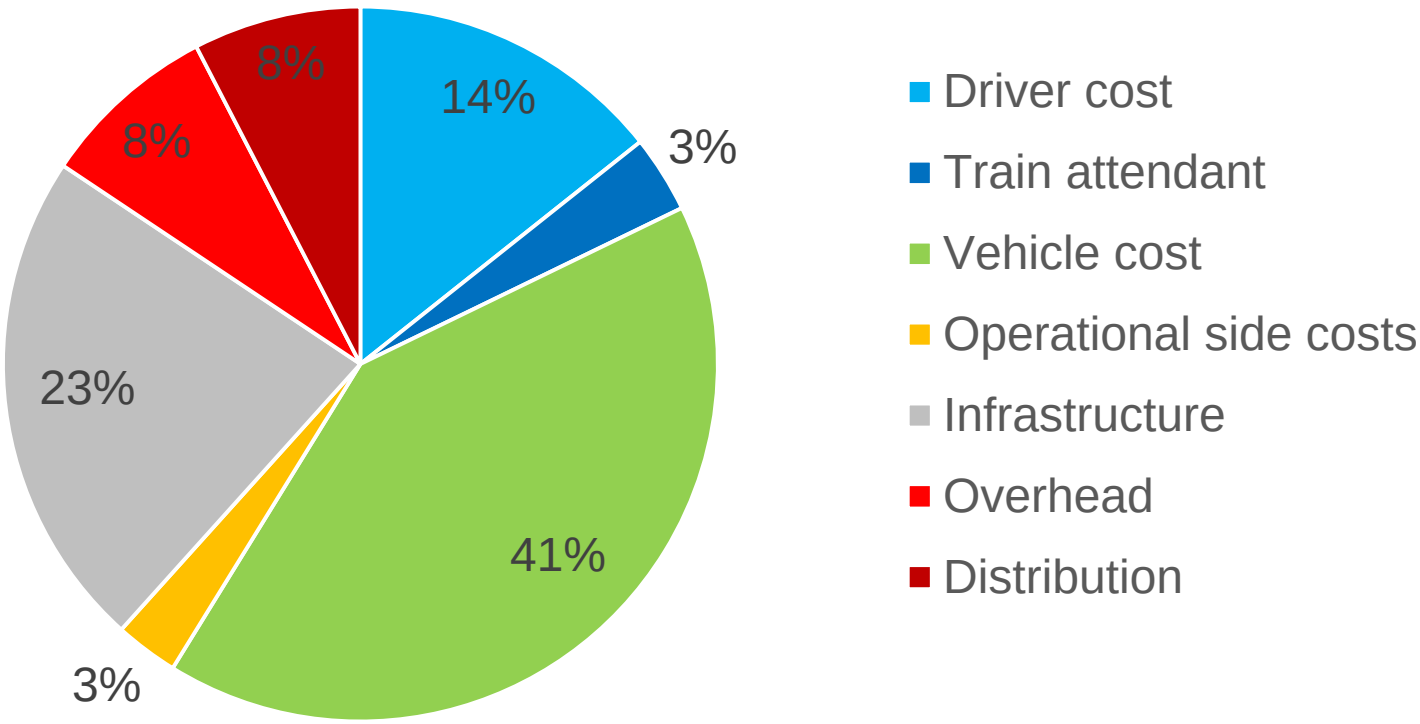
- Let's assume a FLIRT (200 places)
  - making 150'000 km/year
  - running at an average speed of 60 km/h
  - 10 % turnaround time

- Cost per km is:

$$\left(\frac{143{,}04}{60 \cdot 0{,}90} + \frac{153'727}{150'000} + 4{,}21 + 0{,}02332 \cdot 200\right) \cdot 1{,}0953$$

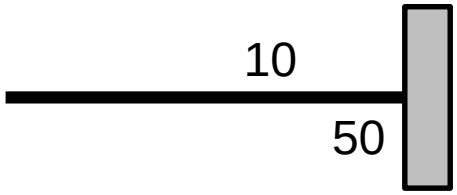
$$\cdot\, 1{,}0822 = 14{,}87\ CHF/km$$

Relative share of cost blocks

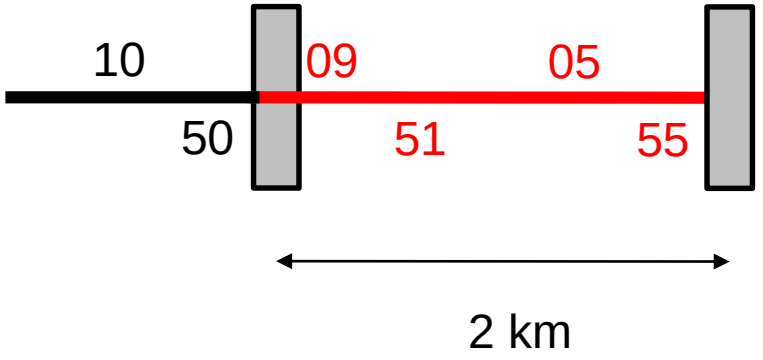


Example 1: Line extension of a bus line

Status Quo



Projected situation

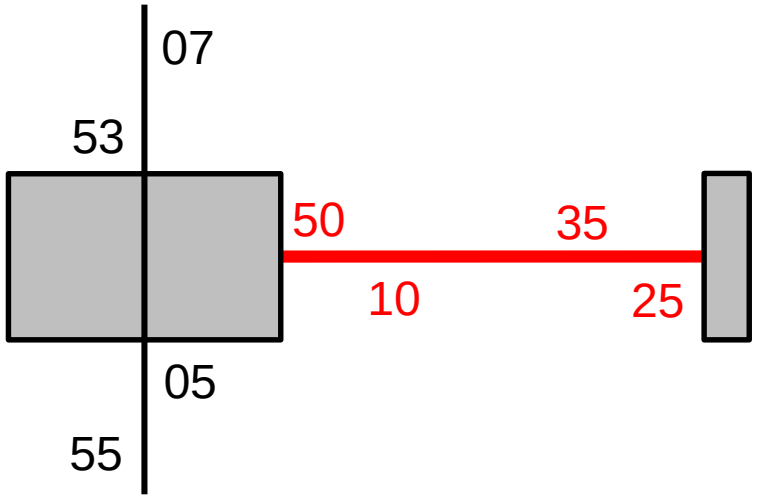


➔ How much does this extension cost?

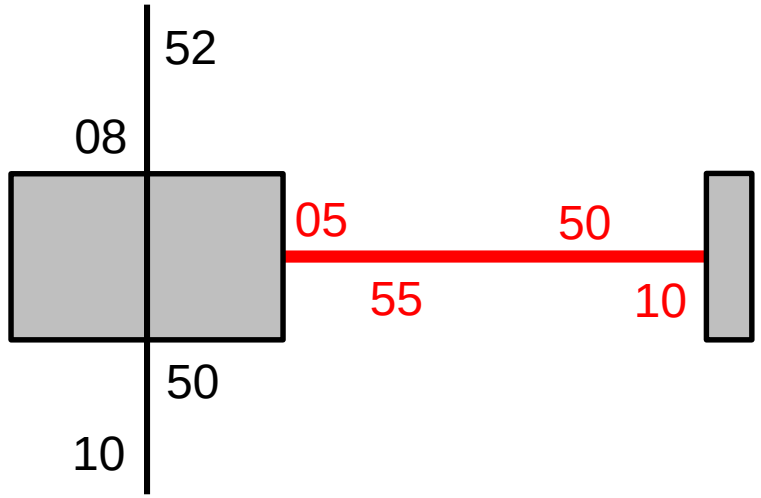
*With standard bus: 2 * 2 km * 2,27 CHF/km = 9,08 CHF per course*

Example 2: change of timetable of a connecting line

Status Quo



Projected situation



➔ How much does this change of timetable cost?

One additional vehicle, one additional driver: ca. 75 CHF per service hour

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Discussion