

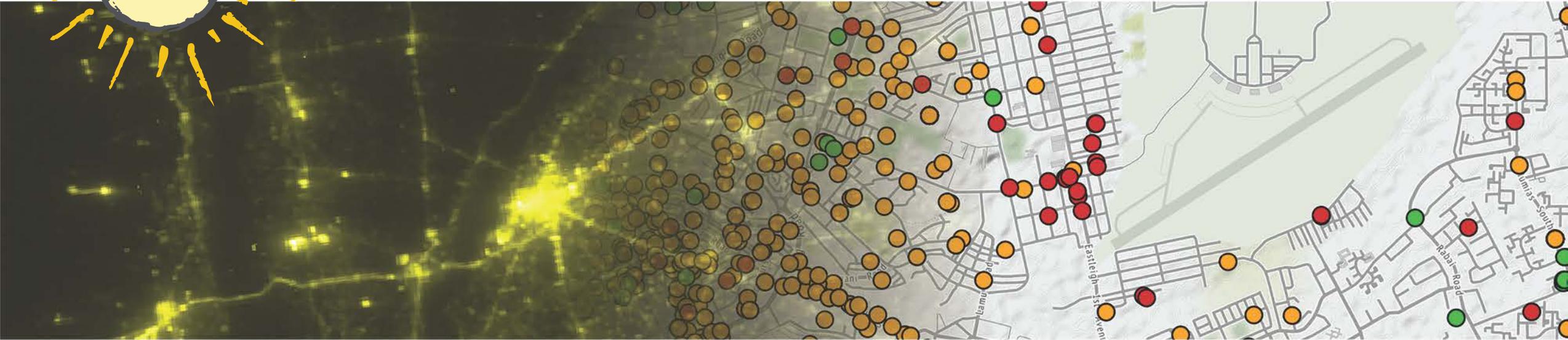


# IE CONNECT FOR IMPACT

Transforming the Growth Potential  
of Transport Investments

## Lessons from transit reforms in intermediate cities of Colombia

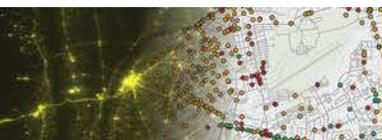
An ex-post evaluation



# Main lesson

## Transit reforms should have users as their main concern

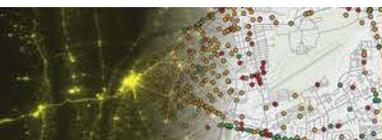
- What will they gain from reform?
  - Waiting time? Access time? Travel time? Fare? Comfort?
- Formalization per se does not benefit users much
- The reduction of externalities (traffic accidents and pollution) should not come at the expense of deteriorating travel experience for transit users
- I will illustrate these points with the case of SITM reforms in Colombia



# SITM reforms in Colombia

## Transit reforms for intermediate cities (more than 600k inhabitants)

- Formalization of operators and labor relations
- Gold standard BRT infrastructure with off-board payment system
- Electronic pre-payment cards
- Fleet renovation and articulated buses in trunk BRT services
- World class fleet management system
- City-wide network route reorganization to “rationalize” fleet and routes
- Trunk-feeder configuration for BRT services

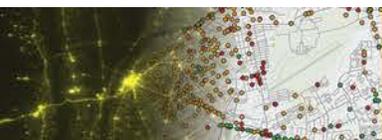


# SITM reforms 2006-2016



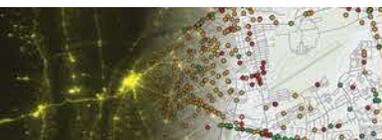
# How to evaluate these experiences?

- Before and after?
- No, other things were happening at this time:
  - Economic growth
  - International trade agreements
  - Rising motorization rates
  - Motorcycle boom and motorcycles taxis emerged
- Need a counterfactual: what would have happened in these cities if reform has not been undertaken?
  - Use control group of cities without reform



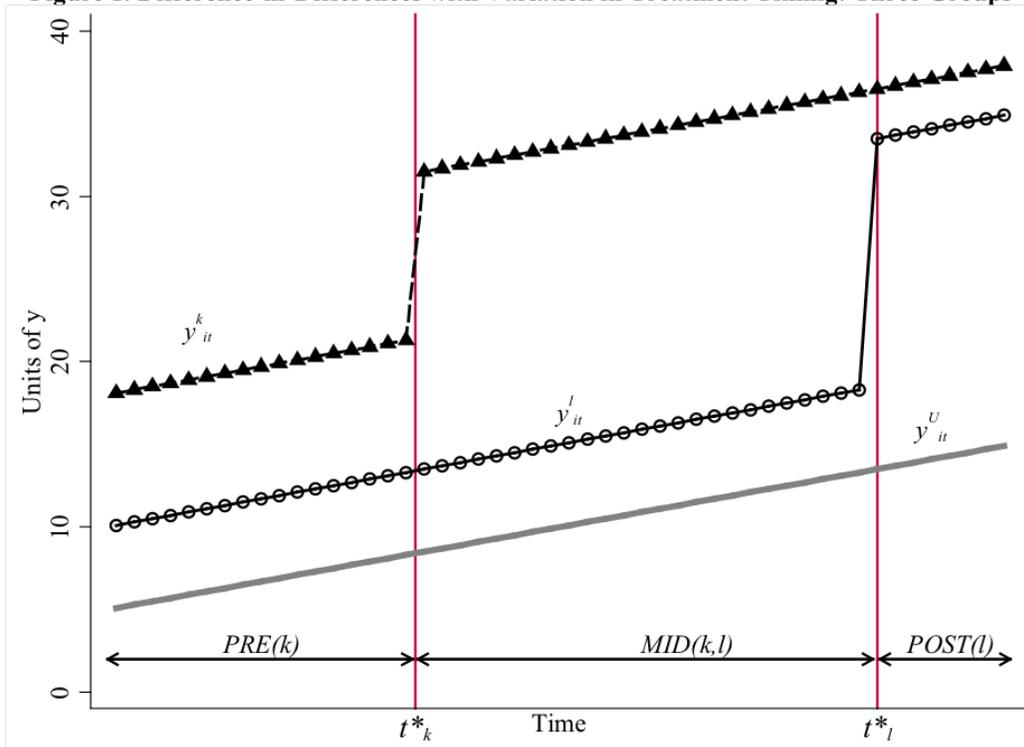
# Data

- National Urban Transport Survey (ENTU)
- 23 cities or metropolitan areas of Colombia
- Monthly information on passengers, commercial kilometers and vehicles in service
- Data for both reformed (SITM) services and traditional services in each city
- January 2005 to March 2018



# Staggered difference in difference panel data model

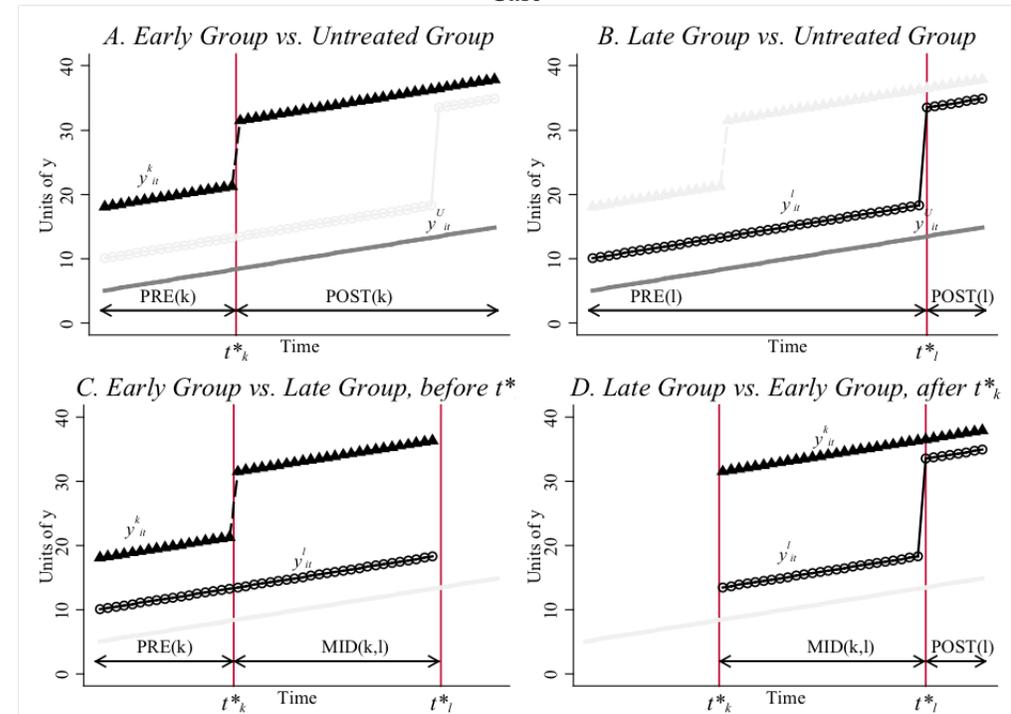
Figure 1. Difference-in-Differences with Variation in Treatment Timing: Three Groups



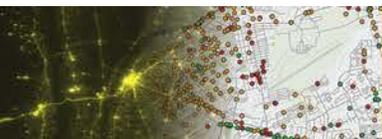
Notes: The figure plots outcomes in three groups: a control group,  $U$ , which is never treated; an early treatment group,  $E$ , which receives a binary treatment at  $t_k^* = \frac{34}{100}T$ ; and a late treatment group,  $L$ , which receives the binary treatment at  $t_l^* = \frac{85}{100}T$ . The x-axis notes the three sub-periods: the pre-period for group  $k$ ,  $[1, t_k^* - 1]$ , denoted by  $PRE(k)$ ; the middle period when group  $k$  is treated and group  $l$  is not,  $[t_k^*, t_l^* - 1]$ , denoted by  $MID(k, l)$ ; and the post-period for group  $l$ ,  $[t_l^*, T]$ , denoted by  $POST(l)$ . I set the treatment effect to 10 in group  $k$  and 15 in group  $l$ .

Source: Goodman-Bacon (2018)

Figure 2. The Four Simple (2x2) Difference-in-Differences Estimates from the Three Group Case



Notes: The figure plots the groups and time periods that generate the four simple 2x2 difference-in-difference estimates in the case with an early treatment group, a late treatment group, and an untreated group from Figure 1. Each panel plots the data structure for one 2x2 DD. Panel A compares early treated units to untreated units ( $\hat{\beta}_{kU}^{DD}$ ); panel B compares late treated units to untreated units ( $\hat{\beta}_{lU}^{DD}$ ); panel C compares early treated units to late treated units during the late group's pre-period ( $\hat{\beta}_{kl}^{DD,k}$ ); panel D compares late treated units to early treated units during the early group's post-period ( $\hat{\beta}_{kl}^{DD,l}$ ). The treatment times mean that  $\bar{D}_k = 0.67$  and  $\bar{D}_l = 0.16$ , so with equal group sizes, the decomposition weights on the 2x2 estimate from each panel are 0.365 for panel A, 0.222 for panel B, 0.278 for panel C, and 0.135 for panel D.



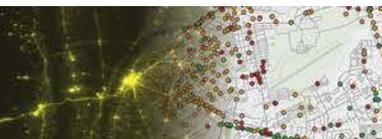
# Results

- Total passengers transported (both in reformed as well as traditional services) fell between 6% and 10% in cities with SITM
- Troubling since transit reform should aim at promoting public transport and not other, often less sustainable, modes of transport

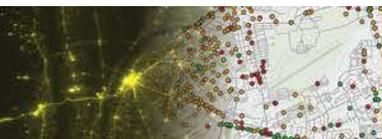
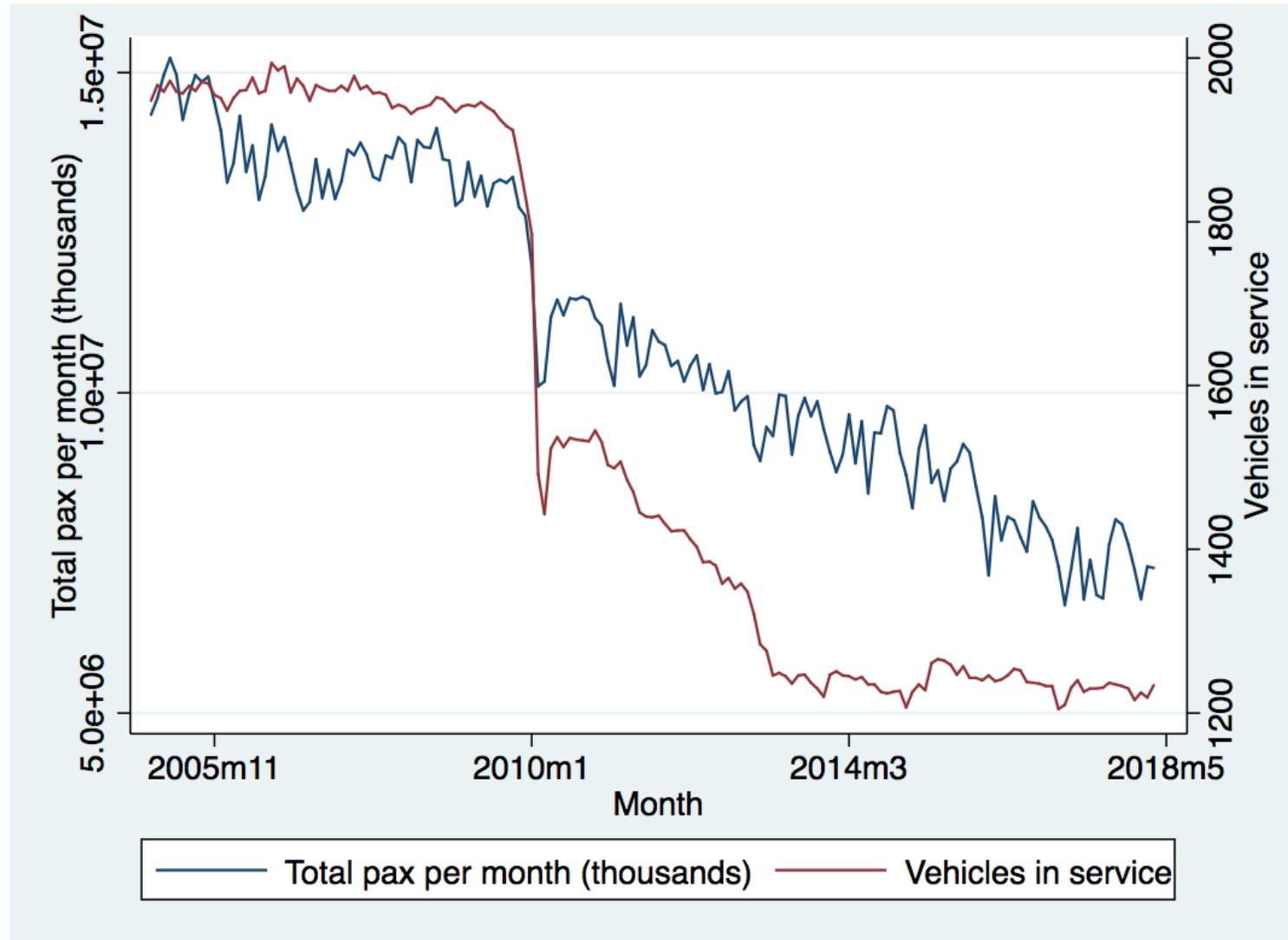
Table 5: Results for the logarithm of total passengers per month, 2005-2018

	excluding Bogota		excluding Bogota and Medellin	
	(1)	(2)	(3)	(4)
	All cities	Large cities	All cities	Large cities
SITM	-1.571 (0.967)	-2.261** (0.629)	-1.509 (0.985)	-2.119* (0.671)
<i>Obs.</i>	3,338	1,749	3,179	1,590
<i>r</i> <sup>2</sup>	0.202	0.634	0.208	0.672
$\Delta$ pax	-6.4%	-9.2%	-7.0%	-9.8%

*Notes:* Robust (Huber-White) standard errors in parenthesis (\*  $p < 0.05$ , \*\*  $p < 0.01$ ). This estimation excludes the municipalities of Envigado and Rioacha. Large cities are those with at least five million passengers per month on average in 2007. All models include city fixed effects and monthly time effects.  $\Delta$ pax is the impact of reform on the number of passengers at the average value of the variable SITM for the treatment period for cities that implemented these reforms.



# Example. Bucaramanga



# Demand was much lower than expected for SITM

Table 2: Ex-ante projections and effective demand for SITM (pax/day)

	Barranquilla	Bucaramanga	Cali	Cartagena	Medellin	Pereira
Projected	305,000	387,500	960,000	452,000	176,500	140,000
Real	102,463	137,585	468,398	90,682	133,557	90,288
Real/projected	33.6%	35.5%	48.8%	22%	75.7%	64.5%

*Source:* DNP (2016) except for Cartagena. This information is as of March 2015 for these cities and is consistent with that reported by Fedesarrollo (2013) a few years earlier. The information from Cartagena is for 2017 and comes from Cartagena *cómovamos* (2017). In this last city, projected demand is for 2020 when all routes are in operation while effective demand is for 2017. The system currently operates with 170 buses. There are 329 additional buses expected to enter operation by 2020. Even under an optimistic assumption that the additional services carry the same demand per bus as those already in operation, total demand would be 175.5 thousand passengers per day, less than 40% of expected demand.

# Financial and operational problems for new systems

**EL  
UNIVERSAL**

Alcaldía solicitó \$20 mil millones para garantizar la operación de Transcibe

MIÉRCOLES, 25 DE ABRIL DE 2018 | 12:01 AM  
MEDIANOCHE, CAROLINA | @ElUniversalC | @ElUniversalC | 21 de agosto de 2018, 11 AM



miércoles 25 de abril de 2018 - 12:01 AM  
**Metrolínea se convirtió en un 'muerto andante': Alcal**  
Según el mandatario local, no hay garantías en la prestación del servicio y los estados financieros actuales entidad no son capaces de cubrir sus pasivos.



# Why did this happen?

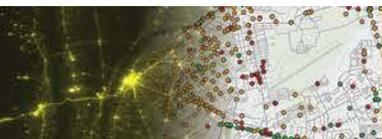
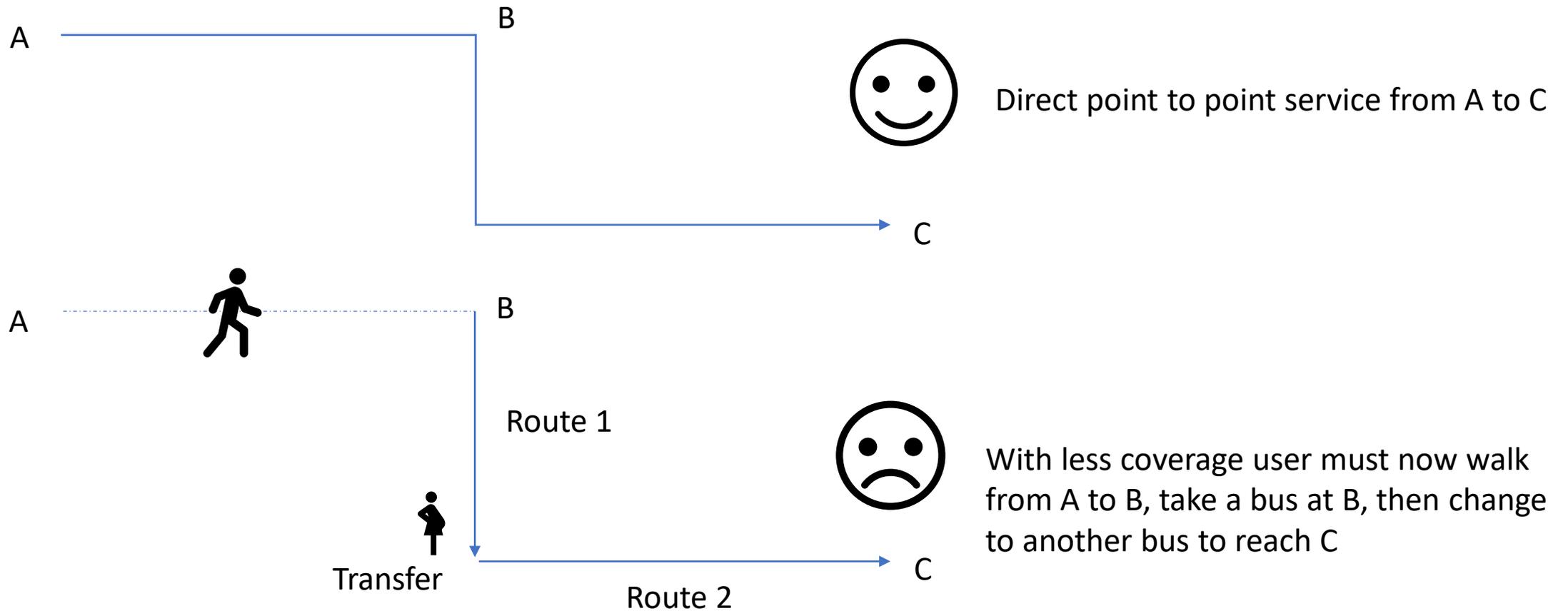
## Reforms were expensive:

- Bus renovation
- Electronic payment and fleet management systems
- Formalization of operators and drivers
- Infrastructure

## How these additional costs were funded:

- National government funded large part of infrastructure investment
- But no operational subsidies, so additional operational and fleet costs were funded by:
  - Reducing fleet size
  - Network restructuring (less routes, more transfers between services)

# Impact on users: less coverage and transfers



# Impact on users: less fleet

*Big fleet = more frequency = less waiting time*



Waiting time



Waiting time

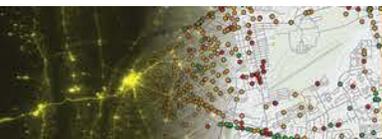


Waiting time

*Small fleet = less frequency = higher waiting time and more crowded buses*

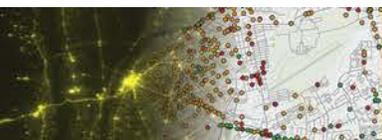


Waiting time



# Summary of SITM reforms in Colombia

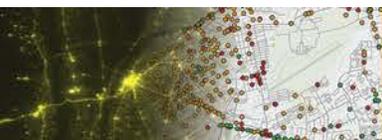
- Well meant but costly reforms
- No subsidies to fund additional operational costs (only for infrastructure), nor were fares increased
- Reforms were funded implicitly by reducing fleet size, reducing route coverage and a trunk-feeder network configuration that forced users to make more transfers to complete their trips
- This increased the cost (time and money) of travel by public transport and users decided to use other modes



# Other cases in Latin America

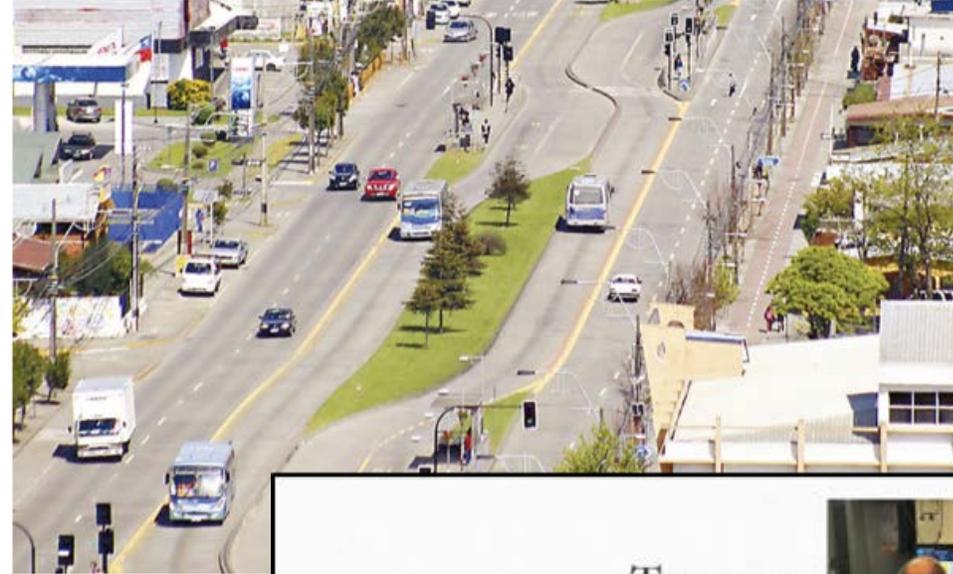
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- Transantiago (Chile)
- Panamá City
- SITP, Bogotá (Colombia)



# Are there cheaper and simpler options?

- Need not implement all elements of reforms from the start
- Bus priority systems do not need to be full BRT (Concepción, Chile)
- Other bus priority options (Temuco, Chile)



Temuco

VÍA EXCLUSIVA para transporte público en Manuel Rodríguez entre Barros Arana y Vicuña Mackenna

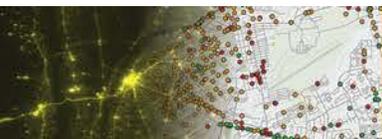
ttm

Menor tiempo de viaje ✓ Mejor transporte público ✓

DE LUNES A VIERNES, EXCEPTO FESTIVOS, DE 07:00 A 20:00 HORAS, la vía exclusiva es sólo para el transporte público.

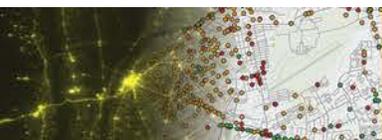
ORGANIZACIÓN TRANSPORTES

The graphic includes a map of the exclusive bus lane, a photo of a control room operator, and a street-level view of the bus lane.



# Conclusions I

- Another example of a well meant reform with unexpected results
- Without Impact Evaluation the diagnosis was not so clear to academics and authorities, even years after some of the reforms were implemented
- I understand that the Colombian government is now revising its transport policy (SETP, SITP)



# Conclusions II

- Always ask yourselves: how will the average passenger (existing or potential) benefit from the reform?
- Will she/he walk less to a bus stop?
- Will she/he wait more or less for a bus?
- Will she/he travel faster once in the bus?
- Will she/he travel seated more often?
- If the answers to these questions are “no” then reform must be revised and re-designed, not only for the benefit of users but also for the financial and operational success of reform

