LABORATOIRE AMÉNAGEMENT ÉCONOMIE TRANSPORTS | TRANSPORT URBAN PLANNING ECONOMICS LABORATORY

Regional Passenger Rail Efficiency: Measurement and Explanation in the case of France

Séminaire EPOP – 12 mars 2021

Christian DESMARIS & Guillaume MONCHAMBERT

Université de Lyon - LAET

UNIVERSITÉ DE LYON | UNIVERSITÉ DE LYON – SCIENCES PO LYON | cnrs | université lumière LYON 2 | ENTPE L'école de l'aménagement durable des territoires

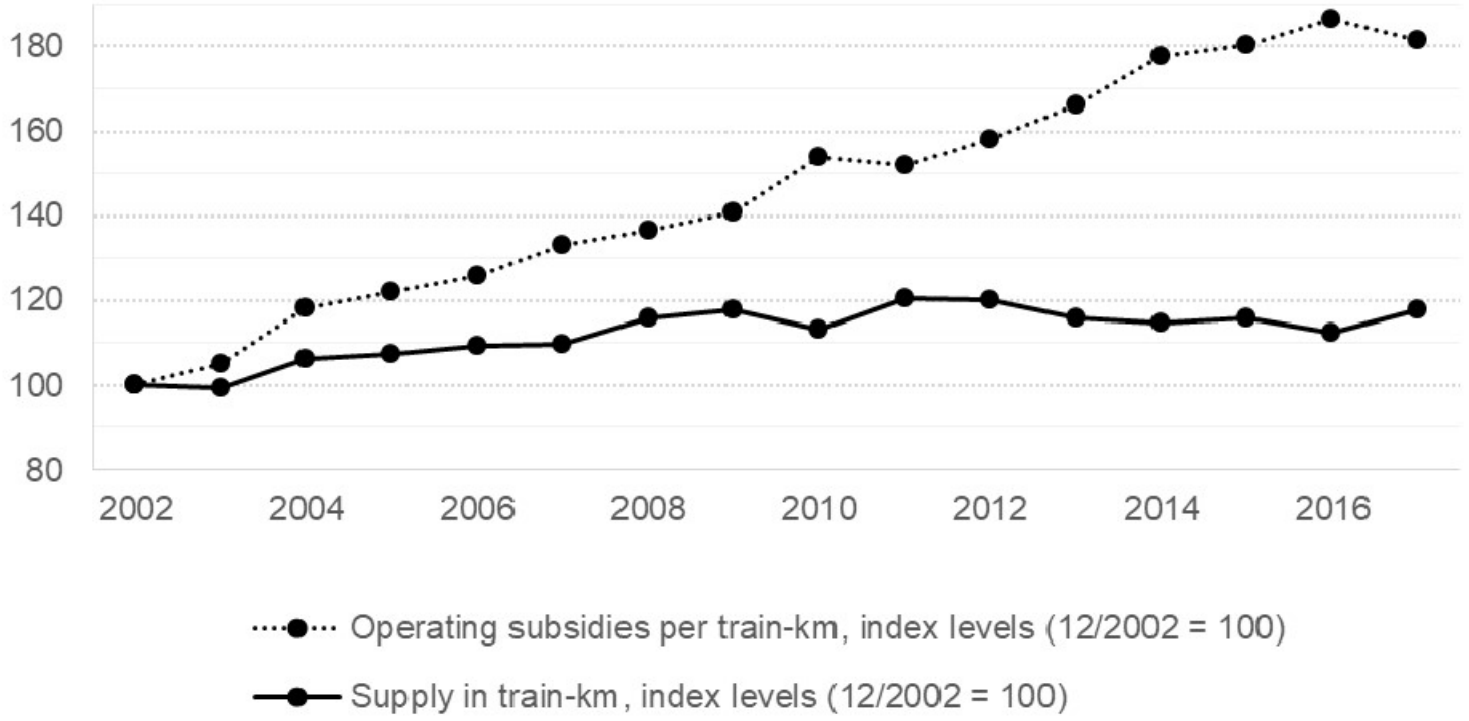
Outline

1. Research question
2. Background
3. Methodology
4. Data
5. Results
6. Concluding comments

Outline

1. Research question
2. Background
3. Methodology
4. Data
5. Results
6. Concluding comments

Operating subsidies and supply in French regional rail (2002-2018)



Source: our calculations from ARAFER, 2018; Region of France, TCR database; CGDD, 2018.

Research context

- Three research opportunities!
  1. Huge evolution of rail regulation in France
  2. Need of knowledge in a special bargaining period
  3. Unique database (financial & contractual)
- Two objectives:
  1. To produce a model that can both measure and explain the productive efficiency of each region, adapted to regional rail passenger transport
  2. To enlighten the understanding of the situation of France on this very crucial agenda

Literature

- Measurement of the productive efficiency of the railway industry by stochastic frontier:
  - Asmild, Holvad, Kronborg, 2009; Bouf and Peguy, 2001; Cantos and Maudos, 1999, 2001; Cantos et alii., 2012; Coelli and Perelman 1999; Cowie and Riddington 1996; Friebel, Ivaldi and Vibest, 2010; Gathon and Perelman 1992; Merkert, Smith and Nash, 2012; Oum and Yu 1994; Oum, Waters and Yu, 1999; Smith and Nash, 2014

- Regional rail passenger transport:
  - Farsi, Filippini and Greene (2005): Swiss regional railway companies
  - Mizutani, Kozumi and Matsushima (2009): Japan
  - Link (2016): rail franchises in Germany.

- Regional rail passenger transport in France:
  - Lévêque, 2004, 2005. Very few data are available due to the monopoly context of our misgiving incumbent operator.

Outline

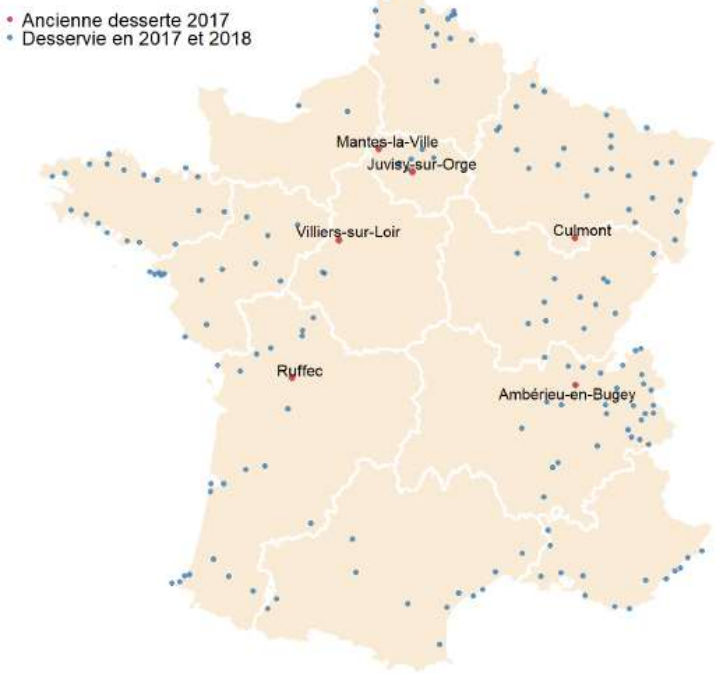
1. Research question
2. Background
3. Methodology
4. Data
5. Results
6. Concluding comments

Background (1/3)
Regional rail in figures

- TER: 272.7 million travellers / year (HSR: 109.6 million) [2018]
  - TER: 13.2 billion Pkm / year (HSR: 48.9 billion annual Pkm)
  - 2 268 cities served *versus* 173 for HSR (TGV)
  - Average speed: 83 km/h
- TER: 50% of SNCF circulation
  - 5,580 circulations per day / 11,200 circulations
  - 18% of “SNCF Mobilités”' turnover
- TER: 2° Regional budget after education and vocational training
  - €3.3 bn (operating subsidies €2.8 bn + €0.5 bn investment) [2010-2017]
  - Cost coverage rate by revenue: 29%

Source: ARAFER, 2019; National Transport Account, 2018.

Background (2/3)
Regional rail network overview



Source: ARAFER, 2019. The French passenger rail transport market.

Background (3/3)
An atypical regulation

- Unlike most European countries, the French regional passenger transport market is not yet open to competition [PSO, European regulation, EC 2007/1370]

- Regional Rail policy [SRU law, 12/2000]: a large local freedom, as result specific contract for each of the twenty (now thirteen) French regions

- Cost-Plus contract: PTAs finance the *ex-post* deficit! Atypical with regard to European rail contracts [ERRAC]. Largely protective of an incumbent monopoly adverse to risk.

- A continual and dramatic production cost drift.

Outline

1. Research question
2. Background
3. Methodology
4. Data
5. Results
6. Concluding comments

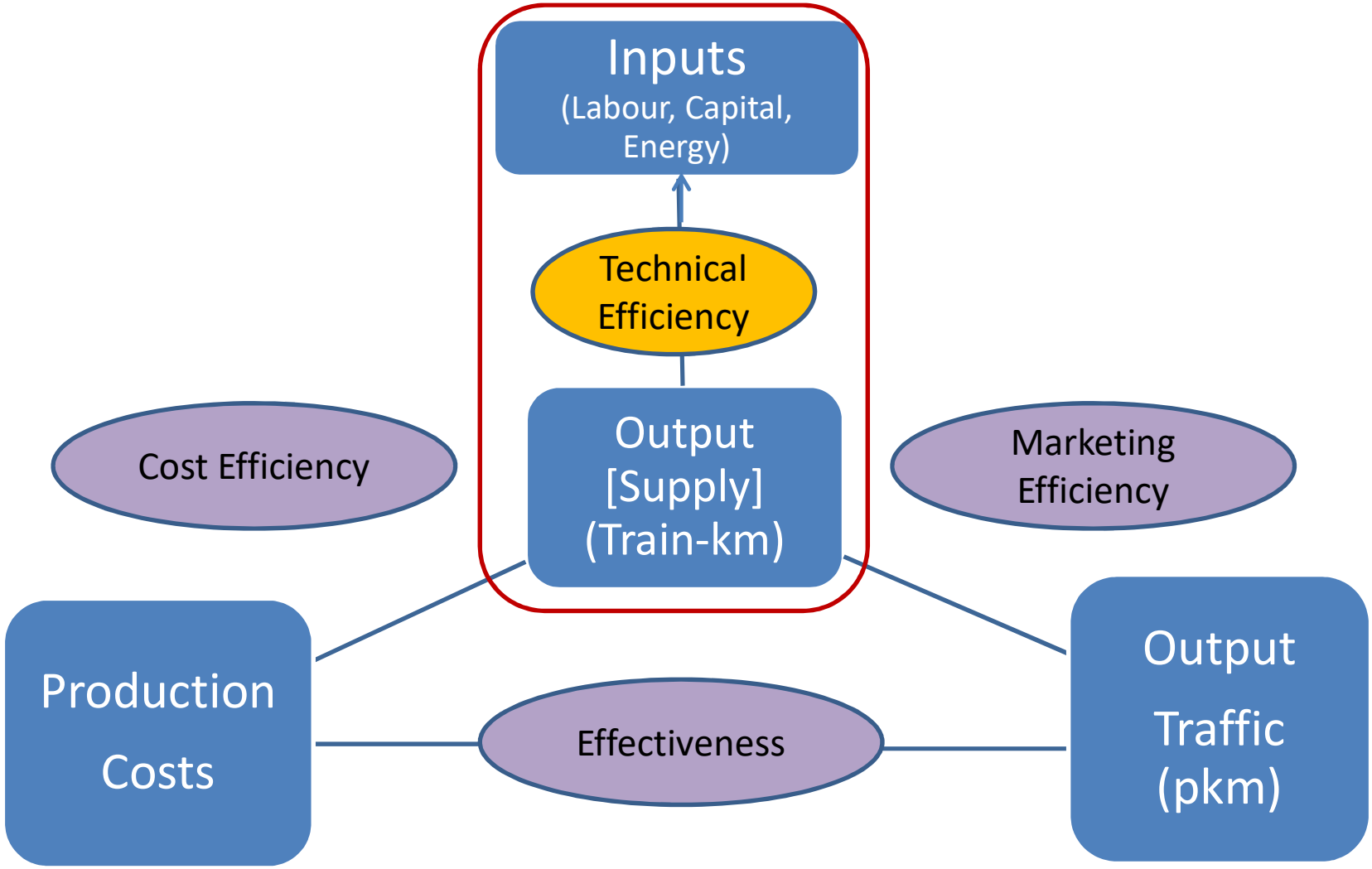
Research hypothesis

We test the following assumptions :

- H. 1. Each SNCF regional rail operator can be considered as an individual firm whose productive performance can differ and be analyzed.

- H. 2. The rail operator's productive performance (minimization of its inputs for an assigned output) depends on the entire system that surrounds it.
  - H. 2.1. The societal environment affects the rail operator's efficiency
    - Population density
    - Delinquency rate
  - H. 2.2. The rail production system affects the rail operator's efficiency
    - Rail network
    - Stations
    - Rolling stock
  - H. 2.3. The type of public contract design and the governance mode affect the rail operator's efficiency
    - Contract accuracy (volume)
    - Share of market governance in the contract
  - H. 2.4. Non-quality in rail production affects the rail operator's efficiency
    - Lateness rate
    - Cancelation rate

A measure of rail productive Efficiency



Source: Own design from Bonnafous & Crozet (2014), ITF.

Model specification (1/2)

We measure and explain productive inefficiency that arises from an excess use of inputs, also called technical efficiency (TE).

- The output is set by the regional rail transport authority.

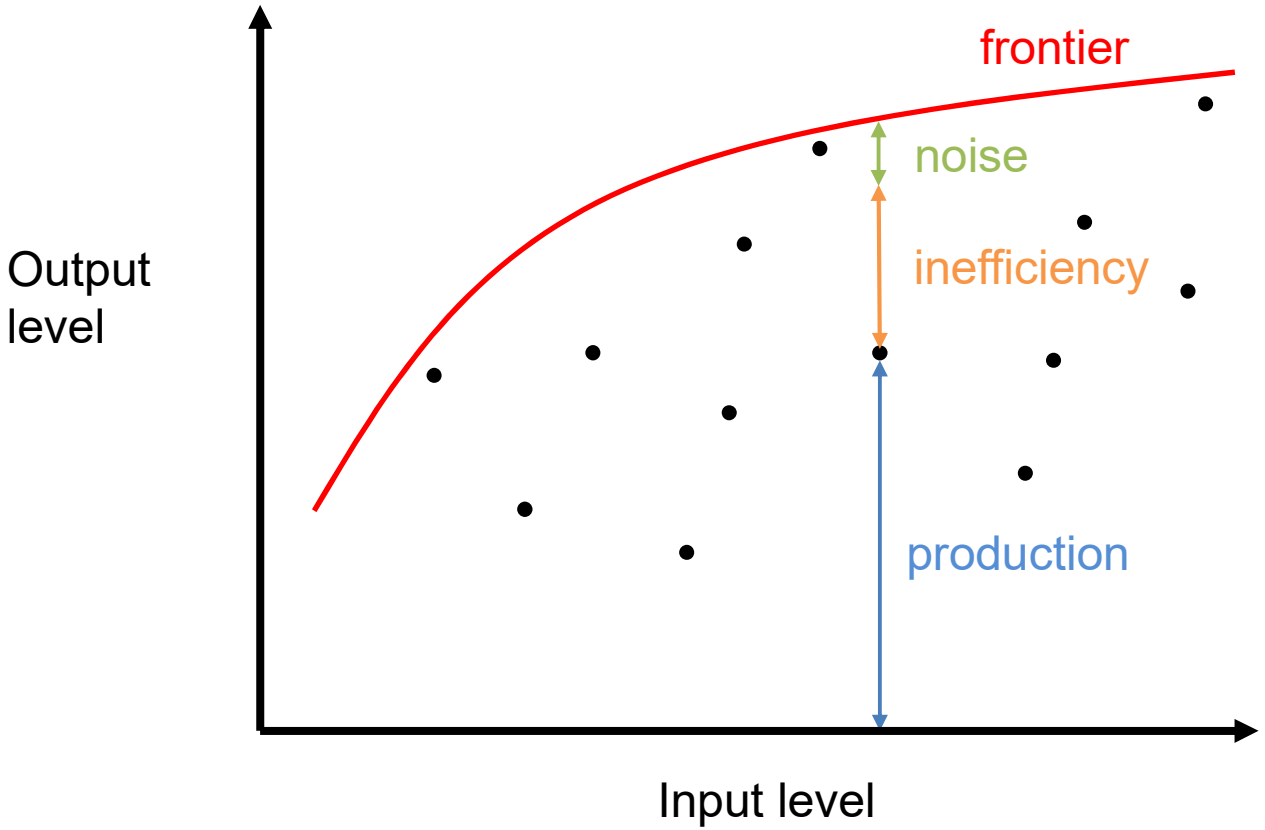
→ The rail operator inefficiency is interpreted as an excess use of inputs to produce a given output, not as a production shortfall given a certain level of inputs.

We use a stochastic production frontier model (Cobb-Douglas-type):

$$\ln(TrKm_{it}) = \beta_0 + \beta_1 \ln RS_{it} + \beta_2 \ln Lab_{it} + \beta_3 \ln En_{it} + \beta_4 TechChange + \varepsilon_{it}$$

- Output: Train-km ($TrKm$)
- Inputs: Rolling stock (RS), Labour (Lab) and Energy (En)
- Time variant: technical change ($TechChange$) // change in frontier
- Error term: ε

Stochastic production frontier model



Source: Own design.

Model specification (2/2)

The specificity of the frontier method is the two-part error term:

$$\varepsilon_{it} = -u_{it} + v_{it}$$

- $u_{it} \geq 0$ accounts for technical inefficiency
- v_{it} is statistical noise

The technical efficiency is defined as the ratio between the observed output and the frontier output (reached when $u = 0$):

$$TE_{it} = e^{-u_{it}}$$

We assume that $v_{it} \rightsquigarrow N\ (0, \sigma_v^2)$ and test

i. $u_{it} = u_i$ with $u_i \rightsquigarrow N^+(\mu, \sigma_u^2)$ - individual inefficiency constant over time

ii. $u_{it} = u_i \times \exp\big(-\eta(t - T)\big)$ with $u_i \rightsquigarrow N^+(\mu, \sigma_u^2)$ - all individual efficiencies change over time at a steady rate η and in the same direction.

To test if some variables explain the inefficiency level, we set :

$$u_{it} \rightsquigarrow N^+(\mu, \sigma_u^2) \quad \mu = \delta_0 + \sum_{j=1}^{J} \delta_j Z_{jit}$$

- δ_j are coefficients to estimate
- Z_{jit} is the quantity of variable j.

Outline

1. Research question
2. Background
3. Methodology
4. Data
5. Results
6. Concluding comments

Dataset

Variable	Label	Mean	sd	Min	Max	No. of obs.
Output						
Train-km (Million km)[1]	$TrKm$	8.66	5.09	3.40	27.98	100
Inputs						
Rolling stock (Tractive Vehicle)[1]	RS	111.03	64.83	37.00	387.00	100
Labour (Million €)[1]	Lab	100.72	61.91	36.91	315.00	100
Energy (Million €)[1]	En	9.00	5.60	2.80	37.51	100
Efficiency determinants						
Population density (Inhab/km²)[2]	$Dens$	108.41	66.96	43.53	327.11	100
Delinquency rate (per 100 inhab.)[3]	$DelRa$	2.40	1.04	0.94	5.54	100
Network length (Thousand km)[4]	$Netlen$	1.09	0.35	0.57	2.00	100
Rolling stock average age (years)[4]	$RSAge$	14.15	3.77	6.70	22.51	100
Number of rail stations[4]	$NbSta$	130.93	54.41	49.00	344.00	100
Contract accuracy[5]	$ConAcc$	85.05	34.03	28.00	178.00	100
Incentive governance (per cent)[5]	$IncGov$	36.55	12.71	18.00	59.00	100
Lateness rate (per 100 trains)[6]	$LatRa$	8.31	3.05	3.42	17.29	73
Cancelation rate (per 100 trains)[6]	$CanRa$	1.95	1.18	0.80	7.33	73

(1) Source: Enquête annuelle sur les Transports collectifs régionaux - DGITM, CGDD, CEREMA – Régions de France - GART – UTP - FNTV, years 2012, 2013, 2014, 2015 and 2016.

(2) Source: INSEE. https://www.insee.fr

(3) Source: Interstats. https://www.interieur.gouv.fr/Interstats/

(4) Source: Ville, Rail & Transport N°564, 574, 587, 598 et 611.

(5) Source: C. Desmaris. Own database.

(6) Source: Autorité de la qualité de service dans les transports (AQST)

Outline

1. Research question
2. Background
3. Methodology
4. Data
5. Results
6. Concluding comments

Results - Production frontier estimates (1/4)

Models	(1) OLS	(2) SFA Time-inv. eff.	(3) SFA Tech. change	(4) SFA Time-var. eff.
Frontier				
Intercept	-1.357***	-1.354***	-1.441***	-1.432***
ln(Rolling stock)	0.026	0.038	0.049	0.042
ln(Labour)	0.690***	0.722***	0.746***	0.749***
ln(Energy)	0.090***	0.090***	0.058	0.061*
Technical change			-0.005	
Efficiency				
η				-0.022
Residuals				
$\sigma^2 = \sigma_u^2 + \sigma_v^2$		0.023*	0.024*	0.026*
$\gamma = \sigma_u^2/(\sigma_u^2 + \sigma_v^2)$		0.937***	0.941***	0.945***
		(0.024)	(0.034)	(0.058)
R2	0.71			
Residuals skewness	-0.056			
Log likelihood		146.7	147.2	147.9
AIC		-279.34	-278.85	-279.78
BIC		-261.10	-258.01	-258.94
No. of observations	100	100	100	100
No. of individuals	20	20	20	20
No. of periods	5	5	5	5

Notes. This table reports estimations of Eq. (9) using the REM and assuming that $\beta_{0i} = \overline{\beta_0} + e_i$, $e_i \rightsquigarrow N(0, \sigma_e^2)$ and $\varepsilon_{it} \rightsquigarrow N(0, \sigma_\varepsilon^2)$ (column (1)), using SFA and assuming $\varepsilon_{it} = -u_{it} + v_{it}$ with $v_{it} \rightsquigarrow N(0, \sigma_v^2)$ in columns (2), (3) and (4). In columns (2) and (3), $u_{it} = u_i$ and $u_i \rightsquigarrow N^+(\mu, \sigma_u^2)$. In column (4), $u_{it} = u_i \times \exp(-\eta(t - T))$ and $u_i \rightsquigarrow N^+(\mu, \sigma_u^2)$. In columns (2) and (4), $\beta_4 = 0$. The dependent variable is ln(Train-km). The standard deviations are in parentheses.
***p < 0.01, **p < 0.05, *p < 0.1.

Preferred model in column (2):

- No technical change
- no monotonous trend in efficiency variation

Elasticity of rail production frontier wrt

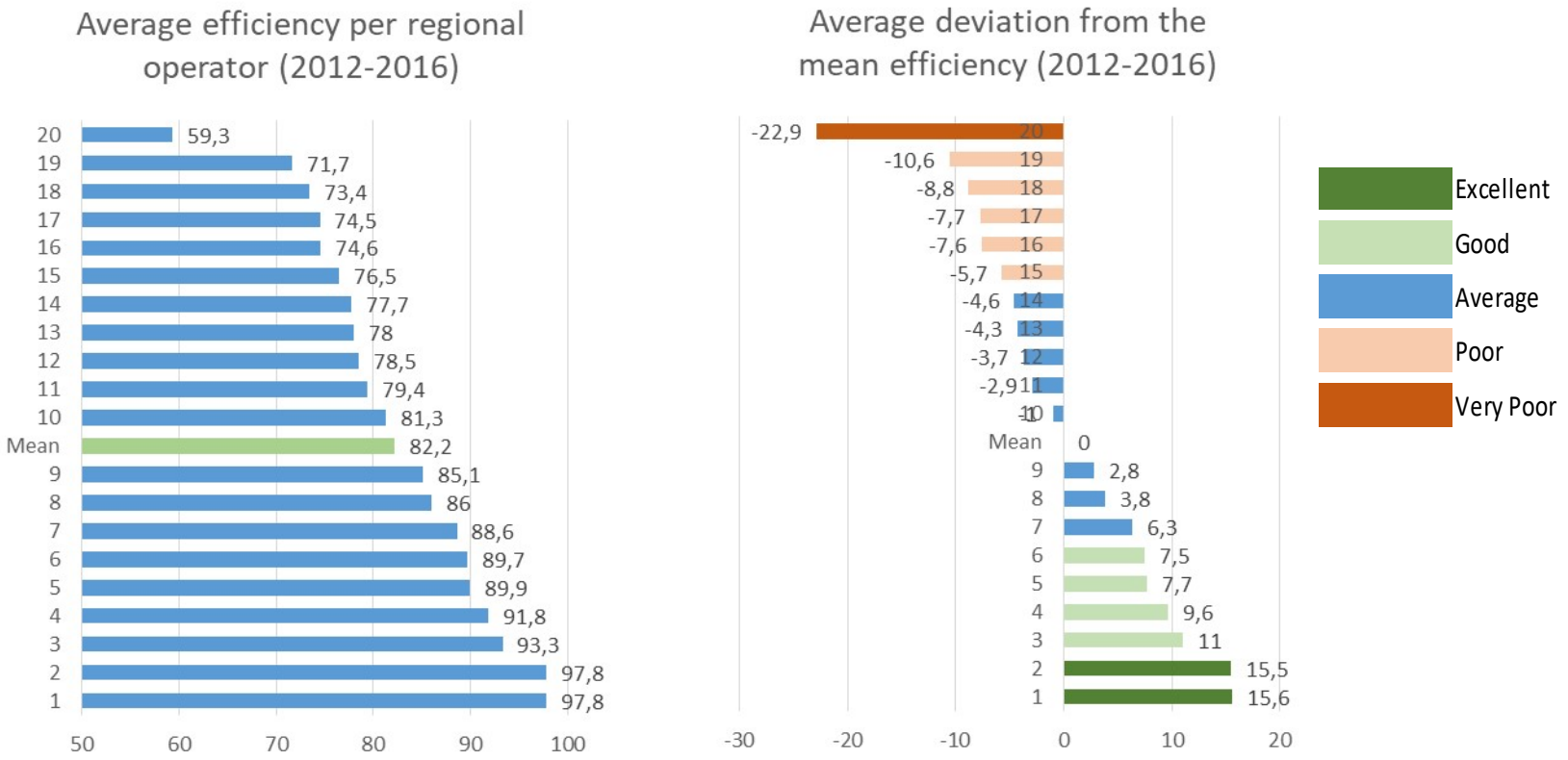
- labour costs ~ 0,72
- energy costs ~ 0,09

Measured total factor productivity in the industry ~ 0,26 ($\exp(\hat{\beta}_0) = 0.258$)

$\sigma^2 > 0$ and $\gamma > 0$: Both inefficiency term u and the statistical residual v are needed to explain the deviations from the frontier.

γ close to 1 → inefficiency is greater than noise

Results: Technical efficiency groups (2/4)



Own results from Enquête annuelle sur les transports collectifs régionaux - DGITM, CGDD, Cerema – REGIONS DE FRANCE - GART – UTP – FNTV

- Average efficiency is rather high at 82% → regions could gain 18pp efficiency, by adopting the best practices of the incumbent.
- A broad range of situations [0,59-0,98] → Many regions could improve their technical efficiency, without changing operator.

Results - Efficiency estimates (3/4)

Model	(1)	(2)	(3)	(4)
Frontier				
Intercept	-1.927***	-1.605***	-1.655***	-1.869***
ln(Rolling stock)	0.230***	0.177**	0.181***	0.206***
ln(Labour)	0.658***	0.637***	0.655***	0.646***
ln(Energy)	0.061	0.075**	0.047*	0.056
Efficiency				
Intercept	-0.070	0.194*	0.085	-0.255
Societal Environment				
Density	-0.002***	-0.001*	-0.001***	-0.003*
Delinquency rate	0.135***	0.095***	0.095***	0.573***
Rail production system				
Network Length		0.003	-0.128**	0.692**
Average age of rolling stock		-0.000	-0.002	-0.005
Number of stations		-0.002**	-0.002***	-0.007***
Contractual Governance				
Incentive governance			-0.002***	
Contract accuracy			0.002***	
Rail production quality				
Lateness rate				-0.085**
Cancelation rate				0.068
Residuals				
$\sigma^2 = \sigma_u^2 + \sigma_v^2$	0.022***	0.016***	0.005***	0.009***
$\gamma = \sigma_u^2/(\sigma_u^2 + \sigma_v^2)$	0.972***	0.973***	0.881***	0.291
Log likelihood	90.3	95.7	139.0	76.03
LR Test Pr(>Chisq)	0.000***	0.000***	0.000***	0.000***
No. of observations	100	100	100	73
No. of individuals	20	20	20	19
No. of periods	5	5	5	4

Notes. This table reports estimations of Eq. (10) and (11) with $\varepsilon_{it} = -u_{it} + v_{it}$, $v_{it} \rightsquigarrow N(0, \sigma_v^2)$ and $u_{it} \rightsquigarrow N^+(\mu, \sigma_u^2)$. The dependent variable is ln(Train-km). The standard deviations are in parentheses.

***p < 0.01, **p < 0.05, *p < 0.1.

Societal Environment

- Density: Efficiency +
- Crime rate: Efficiency –

Rail system

- Number of stations: Efficiency +
- Network length: unclear
- Age RS: unclear (data?)

Contract & governance

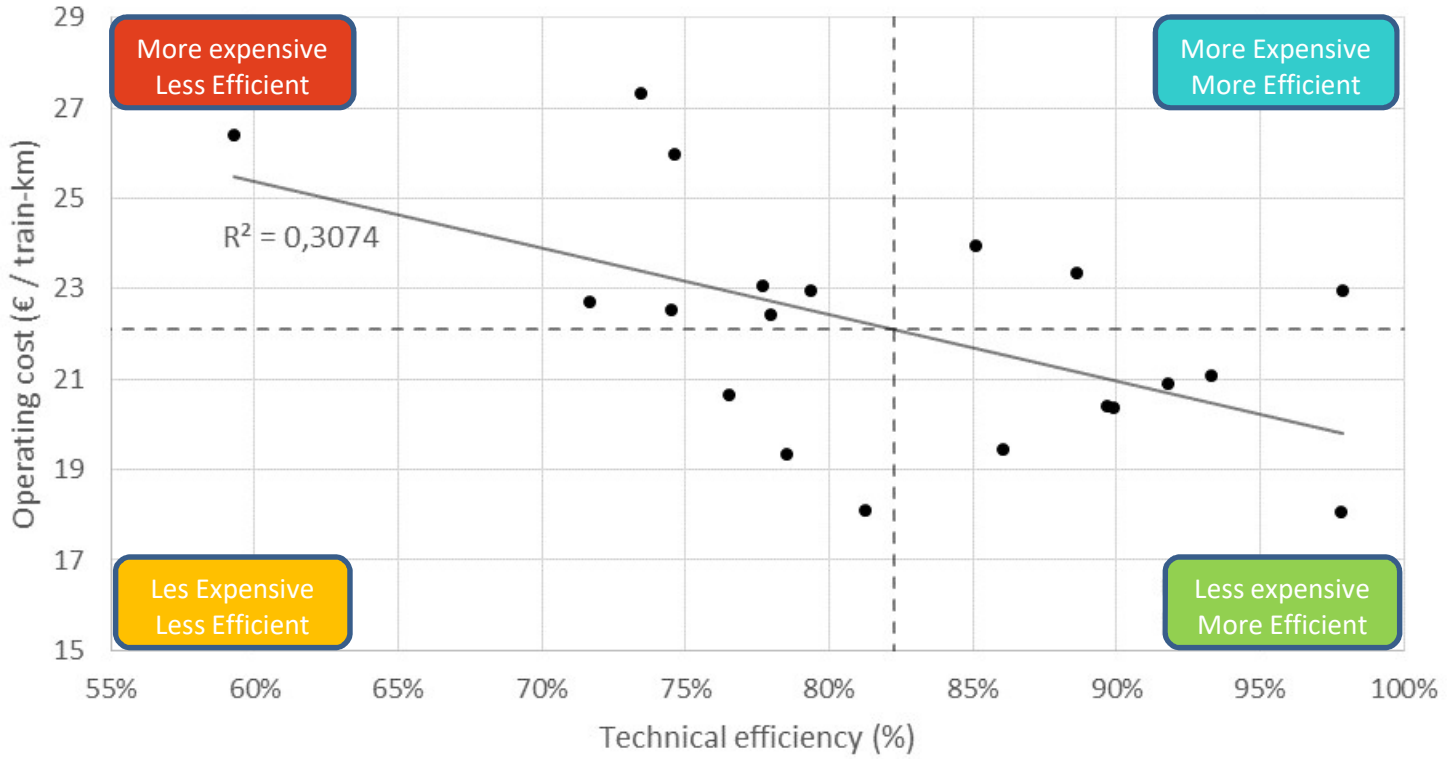
- Contract volume : –
- Incentive governance: Efficiency +

Rail quality

Lateness rate: Efficiency +

Operating cost and efficiency? (4/4)

Technical efficiency and operating cost per regional operator (2012-2016 average)



Source: Own design.

Each dot represents a regional operator. The dashed lines show the sample averages. The full line is the first-order approximation of the relationship between technical efficiency and operating cost.

Outline

1. Research question
2. Background
3. Methodology
4. Data
5. Results
6. Concluding comments

Conclusions (1/2)

1. An enhanced efficiency regional rail model

- A robust technical frontier efficiency model
  - Elasticity of rail production frontier wrt labour costs (0,72) and energy costs (0,09)
  - Inefficiency levels are correlated with
    - Societal Environment: density and crime rate
    - Technical Rail system: number of stations
    - Contract & governance: contract volume and Incentive governance

- An enhanced Explicative Model
  - Interest of "systemic approach" (Leveque 2004, Link, 2016). A broad set of factors affects railway companies performances.
  - Interest of a specific methodology to analyze contractualization in a monopoly situation
    - Impact of Contractual variables
    - Impact of Governance mode based on Williamson and Powell (1990)
    - Ability to choose relevant variables to specific monopoly rail contracts.

Conclusions (2/2)

- 2. A better understanding of the French context with incumbent operator in monopoly, just before the market competition
  - Production frontier estimates
    - No technical change / No real trend of Efficiency
    - Large effect of labor cost
  - Efficiency measure
    - Technical efficiency average gap with SNCF ± 18%
    - Heterogeneity in TE performance between French regions operators [97,8 /59,3]
    - Complementary cost production performances view→ Overcome the ratio approach
  - Correlation with efficiency
    - Societal (delinquency rate) : to capture additional costs associated with anti-social behavior
    - Rail production: the larger a network is, the greater the potential impact of the optimisation of rolling stock and staff
    - Contract volume: to face opportunistic behavior & risks associated with uncertainty
    - Incentive governance : suggest impact of incentives contracts and market coordination (Table1)

Lessons for public policy evaluation

- Results
  1. SNCF faces a TE 18pp gap. Incumbent pressed to be more efficient.
     - Does management matter? Labor has a large impact on output.
     - Deal with severe social constraints: reinvest costs saving in increase of volume (and staff)?
  2. Regions with law TE → 2 complementary options:
     a) Tender a large part of their network (test performance improvement with another operator);
     b) More ambitious contract with incumbent.
  3. Regions with high TE → Diffuse best practices / More train!
  4. Heterogeneity in TE → More benchmark to improve performances
  5. Efficiency factors → Inform incumbent or new entrants in this negotiation period time…
  6. Societal environment effect → Understand and make do with structural constraints (?)
  7. Effect of contract & governance mode? Design contract. Need more data. New Regulator's duty!
- Methodology
  1. Develop complementary method to the more classical approach of ratios
  2. Need for panel and detailed data

Further improvements

- Model improvements
  - Measure. Introduce more explanatory variables about rail system:
    - Network (age and morphology); Intensity of network use (Tkm/Km of ligne); Intensity of charge: Vok/Tkm
    - Management impact (Social firm climate - strike)
  - Explain. Develop deep analysis of contract design or governance mode impact (Desmaris, 2004):
    - Contract size, contract duration, subsidies, rail market share, Continuity of Service (offer deductible, penalty for non-performance)…
    - Grasp the dynamics of contracts
    - Improve our methodology to approach governance mode
- French regional rail analyze improvements
  - Obtain full transparency and more quality on the data
  - Adapt the study to the new administrative geography (13 regions since 2016)
  - Use complementary methods (cost frontiers) to better understanding of French situation

Thank you!
WP avalaible:

http://www.laet.science/Working-Papers-du-LAET

christian.desmaris@sciencespo-lyon.fr
g.monchambert@univ-lyon2.fr

Appendix 2 - Regional passenger rail productive efficiency studies

References	Model specifications	Main variable to be explained	Explanatory variables
FARSI, FILIPPINI, GREENE, 2005.	Switzerland. 1985-1997. 50 railway companies. Cost function. Test of 5 Models.	T_C: total annual costs (prices of labour, energy, capital)	Length of network Dt : year dummies (technical progress)
LEVEQUE, 2004.	France. Regional rail passenger services. 1997-1998. Cost function. Test of 3 Models.	(3) C_k: Costs relating to Driving, Ticket inspection, Energy, Maintenance, Ticket selling, Shunting, Management structure.	Six explanatory variables: Regional delinquency rate, Load factor, Traffic, Commercial speed, Rolling stock capital, regional regulatory system (dummy variable)
LEVEQUE, 2005.	France. Regional rail passenger services. 1993-1998. Cost function. Test of 1 Model.	C_H: Endogenous SNCF operating costs (3) Length of network, Train-Km	Two explanatory variables: traffic (Pkm), Regional delinquency rate.
LINK, 2016.	Germany. Regional rail passenger services. 1996-2010. Production frontier. DEA + Tobit Model. Test of 4 Models.	3 inputs: Public monetary subsidies, Infrastructure charges, Track length. 2 ouputs: Tkm, Pkm	Two sets of explanatory variables: set of policy variables (1) and environmental variables (2): - (1) Share of tendered train-km; Share of train-km covered by net contracts, Average size of contracts, Average contract duration. - (2) Population density, Car density, Rate of unemployment.
MIZUTANI, KOZUMI, MATSUSHIMA, 2009.	Japan. 1985-2005 for every five years. 34 private railway companies. Cost function. Test of 3 Models.	Cv: short-run variable cost (prices of labour, energy, equipment.	Yardstick regulation *versus* Market competition (modal share of no annual rail trip / person) Length of network
SMITH and WHEAT, 2012.	Great-Britain. Measure impacts of efficiency on costs of new arrangements after franchise failure.	C_H: controllable total TOC costs (excluded track access charges)	2 kinds of new public authority arrangements : management contract (cost-plus) / renegotiated contract (new franchise)
WHEAT and SMITH, 2015.	Great-Britain. 2000-2010. 28 TOCs. Hedonic cost function.	3 outputs (route-kms, train-hours, number of stations operated). Service heterogeneity (train speed, TOC type)	Sophisticated and complete model: measurement of the impact of heterogeneity of output on costs, scale and density.
JENSEN, STELLING, 2007.	Sweden. 1970-1999. All Swedish rail operators (passenger and freight).	C_{kt}: total costs with k = rail segment (infrastructure or not, incumbent or all operators)	Degree of competitiveness pressure (number of private entrants) Vertical separation

Appendix 1 - Items observed in French regional rail contracts

Technical aspect
Number of service quality guidelines
Operator's level of autonomy for defining the quality-of-service targets
Tolerance as regards the volume of unrealised annual supply
Financial penalty per train-kilometre for unrealised supply
Existence of a minimum service
Financial Incentive Agreements
Main recipient of quality penalties
Financial incentive for the compliant transmission of reports to PTA
Contract control and management clauses
Number of documents required
Time limit for monthly dashboard transmission
Length of the prior notice period before an audit
Institutional clauses
Duration of the original contract
Degree of contract accuracy in number of pages
Frequency of Monitoring Committee meetings
Duration of the conciliation period in a dispute
Accounting and financial clauses
Tolerance for non-achievement of revenue target
Share of commercial risk borne by the operator
Additional operator remuneration for risk

Table 1. Stylized characteristics of the governance modes

	Market	**Hierarchy**	**Network**
Key to coordinate	Mutual interest / "Invisible hand"	Constraints / Visible hand of management	Cooperation / Mutual trust
Means of communication	Prices and contracts	Procedures / Routines / Administrative fiat	Relational
Climate or tone	Accuracy / Complete contracts	Formal / Bureaucratic	Open-ended / Mutual benefits
Methods of conflict resolution	Resort to court for enforcement	Supervision / Constraints	Reputational concerns
Major penalty type	Financial (bonus, malus, penalty)	Entry of competitors (new operators)	Declining reputation
Operating conditions	Incentive contracts	Quality of information and reporting	Common culture

Source: Adapted by the Authors from Powell (1990), Desmaris (2004) and Sørensen, Gudmundsson (2010).

Appendix 3 – Provence-Alpes-Côte d'Azur (PACA) Regional rail contract analysis

	Critères	Variables	Mode de gouvernance		
Clauses techniques			Autorité	Incitation	Confiance
1	Degré de précision des directives (+)	Nb de domaines d'objectifs qualité	Elevé : >5	Moyen : 5	Faible : <5
2	Nature du processus de décision des objectifs de service	Degré de liberté de la SNCF à la définition du niveaux des objectifs	Faible : Domaine de la Région / Programmation ex-ante	Moyenne : Consultation ou concertation avec l'exploitant	Forte : Codécision (Négociation annuelle d'un contrat d'objectifs)
3	Franchise - Importance (+)	Tolérance de TKm non réalisés en % de l'offre par an	Faible : <2	Moyenne : 2	Forte : >2
4	Pénalité financière pour non exécution (+)	Pénalité du TKm en euros HT (sans substitution)	Forte : >6	Moyenne : [5-6]	Faible <5
5	Service minimum (+)	Existence d'un service minimum	OUI : "Organisé"	OUI : "Evoqué"	NON
Clauses incitatives (financières)			Autorité	Incitation	Confiance
6	Qualité- Affectation du malus (+)	Destinataire (dominant)	Région	Région	Compte commun
7	Transmission Doc AO - Dureté des incitations financières (+)	Existence d'un dispositif d'incitation	OUI (dur, distinction par type de document)	OUI	NON
Clauses de contrôle et pilotage			Autorité	Incitation	Confiance
8	Contrôle exécution du service	Nombre de documents exigés	Elevé : >3 - (ou moins, si note quotidienne)	Moyen 3 : (TBM/TBT/RAA)	Faible : 2 (RAA et TBM ou TBT)
9	Contrôle exécution du service	Délai de transmission du TBM en nombre de jours	Faible : <45	Moyen : 45	Elevé > 45
10	Audit externe (+)	Délai de prévenance, en jours, avant audit	Faible : <10	Moyenne : [11-14]	Forte : >14
Clauses institutionnelles			Autorité	Incitation	Confiance
11	Durée de la convention (+)	Nombre d'années inialement prévues	Faible : < 7	Moyenne : [7-8]	Forte : > 8
12	Degré de précision contractuelle (+)	Nb pages : Convention + Cahier des charges éventuels	Elevé : >90	Moyen : [80-90]	Faible : < 80
13	Comité de pilotage	Fréquence des rencontres du Comité de suivi (nb minimal de rencontres par an)	Forte : > 2 /an	Moyenne : = 2 /an	Faible : NP / ou < 2/an
14	Règlement des litiges (+)	Délai de conciliation en nb de mois	Court : < 2	Moyen : 2	Long : > 2
Clauses comptables et financières			Autorité	Incitation	Confiance
15	Tolérance par la Région pour non-réalisation de l'objectif de recettes	Borne du taux central autour de zéro (en +/-%)	Faible : <= 2%	Moyenne :]2%-4%[	Forte : >=4%
16	Importance du risque commercial supporté par la SNCF	Imputation en % à SNCF de l'écart / Objectif de recettes	Majoritaire : SNCF > 50%	Totale : SNCF 100%	Faible : SNCF < 50%
17	Rémunération de l'exploitant	Mode de calcul de la rémunération de l'exploitant : incluse C1 ou en sus C1	Incluse dans C1	Pourcentage des recettes de la SNCF ou < 3% de C1	En sus de C1 : >3% de C1

Source: Own contractual Database.

Governance modes SNCF/ Regions

Typology of urban public transport contracts

Contractual form		*Production risk borne by*	*Revenue risk borne by*	*Payment received by the operator*
Fixed-Price contracts	Net Cost contracts	Operator	Operator	$s = s^e$
	Gross cost contracts	Operator	Local Authority	$s = s^e + (r^e - r)$
Cost-Plus contracts	Management contracts	Local Authority	Local Authority	$s = s^e + (r^e - r) - (c^e - c)$

Where s^e is the amount of subsidies the local authority is expected to give to the operator[5] and s the amount he finally receives;
r^e is the expected commercial revenues and r the realised revenues;
c^e is the expected operating costs and c the effective operating costs.

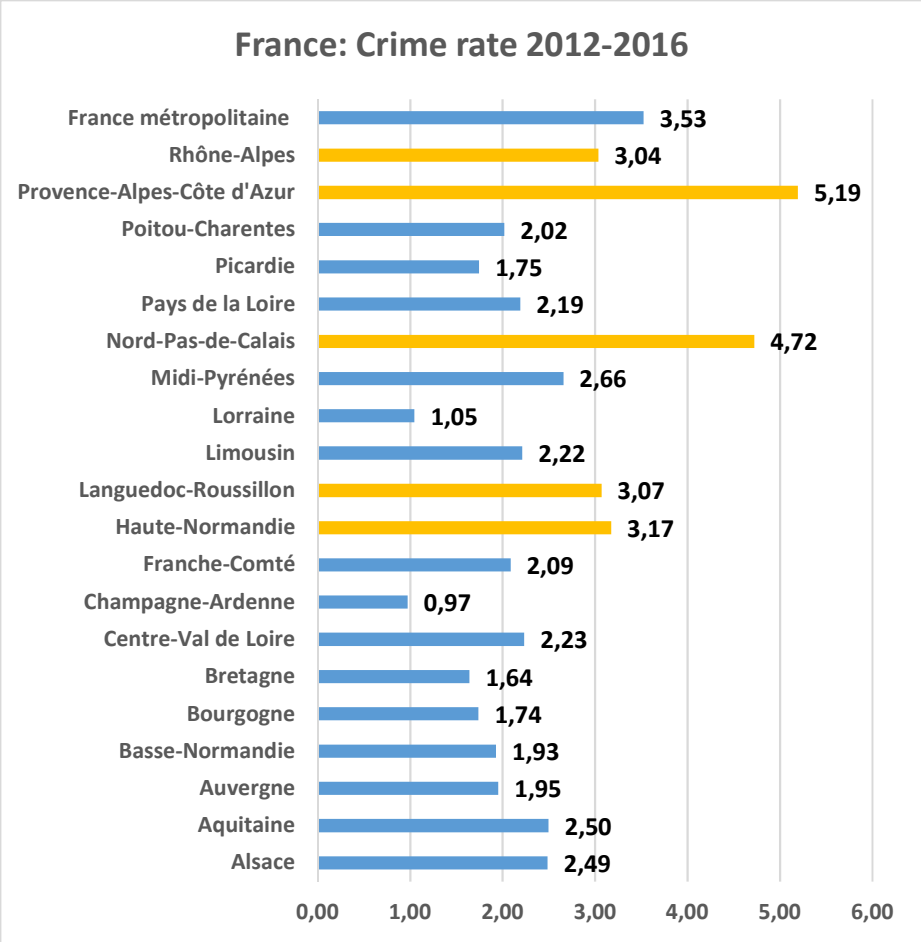
William ROY, Anne IVRANDE-BILLON, 2007. Ownership, Contractual Practices and Technical Efficiency: The Case of Urban Public Transport in France, *Journal of Transport Economics* and Policy, 41, table 1. Adapted from QUINET and VICKERMAN, 2004.

Les contrats TER : complexité et diversité contractuelle (7/12)

	Alsace	Centre	Limousin	NPC	PDL	PACA	Rhône-Alpes
Objectif pluriannuel de recettes (OR)	Déterminé en f° : composante tendancielle, modif offre, divers (tarifs, conjoncture)	Annuellement par conjointement après proposition SNCF 7.2.3.	Montant absolu prédéterminé (+ 1%/ an ≈) Rencontre en 2006	Annuellement par les parties sur proposition SNCF	Conjointement par Région et SNCF lors du devis C.5.2.2.	Annuellement par négociation sur proposition SNCF	Revalorisé en f° ΔPIB en volume : >2,2% : OR +1,6% ; <0%:OR +0,5% ; linéaire. Si > 2 ans suite+3%, rg spéciale.
Partage risque commercial SNCF/ Région	+/- 2% : 50-50 +/- 2 à 4% : 75-25 +/- 4 à 6% : 100-0 < +/-6 % : Rencontre	Non prévue	Non prévue	+/- 2% : 50-50 +/-2 à +/-4% : 100-0 +/- 4% : Rencontre	+/- 4% : 50-50 + 4 à +6 % : 40-60 -4 à-6 % : 60-40 +/-6 % : Rencontre	Obj mini SNCF : 93% de l'OR –> 93%, 50-50 –+/- 7%, rencontre	> 3% : 50-50 +/- 3% : 100-0 -3 à - 5% : 0-100 < -5 % : Rencontre
Incitation à la baisse des charges	**OUI** $C1_N = C1_{N-1}$ * (P- 0,001) P : index en %	**OUI** Baisse de 1%/an des charges de structure CST	NON	**OUI** Comparaison Index et Δ PIB nominal A&B A<B : A ; A>B : moy AB	NON	**OUI** Frais de structure N : 2002* (0,96 *$RS6S_{n/2002}$) +0,04)	NON
Rémunération exploitant	**Comprise dans C1**	**Comprise dans C1** (implicite)	En sus : 2,146% de C1	**Comprise dans C1**	**En sus** : Rém service : 2% C1 ; Rém risque : 1,25% C1	**En sus** : % des charges C1 2002 : 3,2% ; 2003: 3,4% ; 2004: 3,6% ; 2005: 3,7%	**En sus** : % des charges C1 : 3% en 2002 ; 3,5% après

Results. A huge societal environment impact on rail TE (2/6)

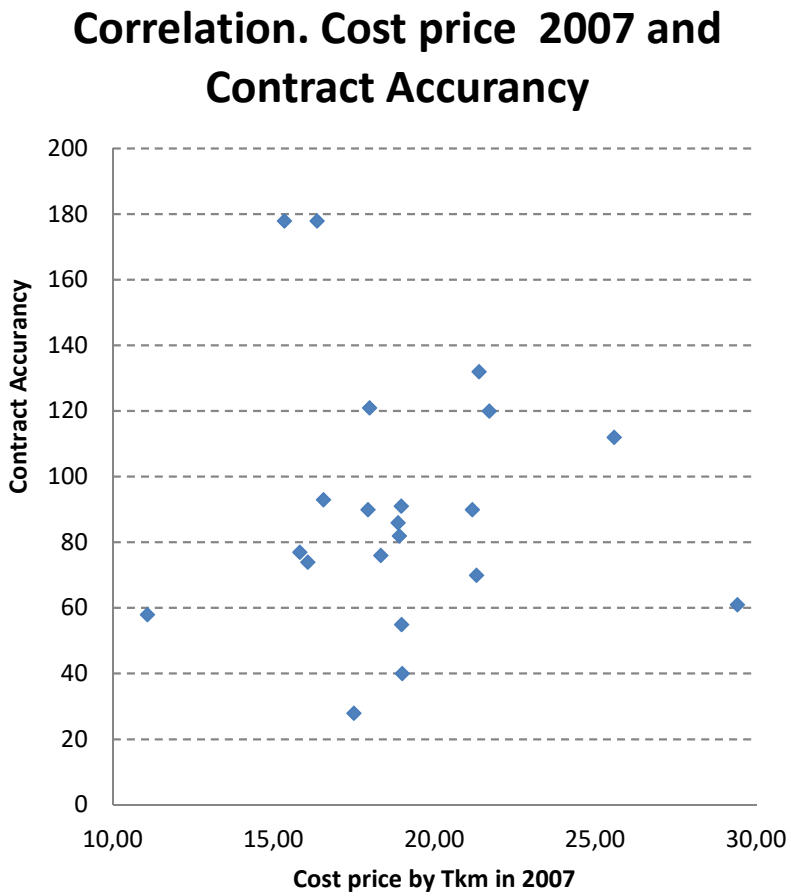
- **Crime rate**

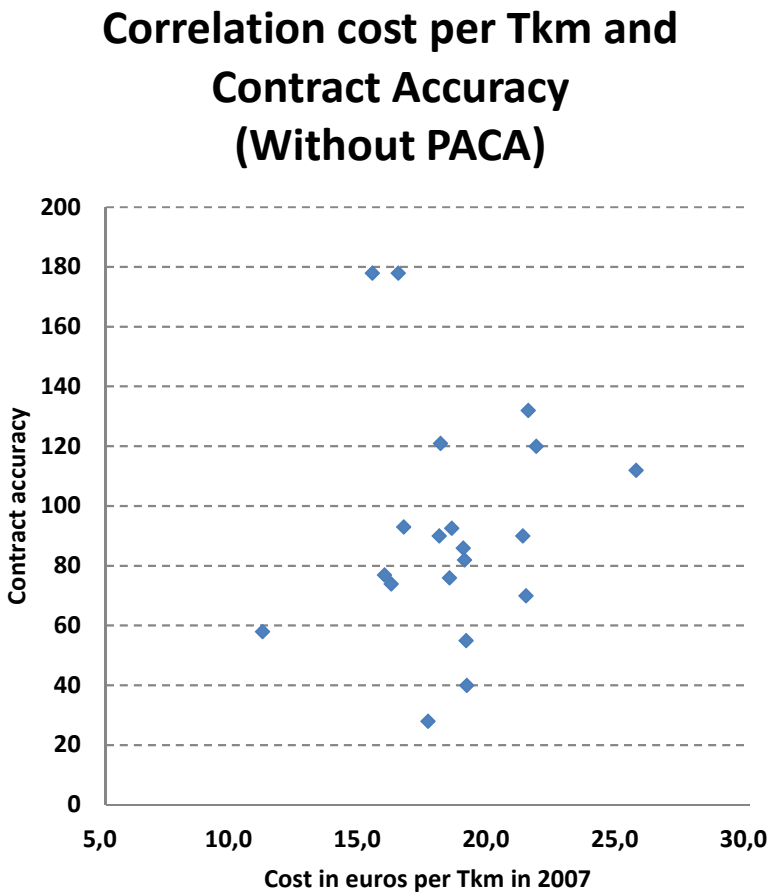


- **Rail TE impact (Confidential)**

- **Validation J. Leveque (2004, 2005) hypothesis.**
  - More safety costs: filtering staff on docks; security guard on board .
  - Disruptions scheduling costs: more regulatory, more operating (material, staff on board)…
  - Railway production is a delicate and sensitive technical system.

Results. A huge contractual impact on rail TE





Actual Contract accuracy depends on **the previous cost performance**. PTA's search to protect from operator inefficiency.

- High production cost in 2007 → Very huge contract (PACA excepted)
- Low production cost in 2007 → Less accurate contract (Bourgogne, HN excepted)