

Mutual influence on air transport routes network in the context of a liberalized aviation market. The case of Colombia





- ▶ Introduction - Application case
- ▶ Methodology
- ▶ Results
- ▶ Conclusions
- ▶ References





- ▶ Colombia has followed the regional trend (Latin America) in the management of airport infrastructure concessioning the operation of these infrastructures [1]. Since the mid-1990s, in four temporary phases, called generations, Colombian government granted the operation of several airports in the country (18 airports to date), resulting in a better management, expansion in operation, a bigger commercial exploitation and better maintenance of the most used air terminals



- ▶ The presented paper investigates the mutual influence of the volume of traffic to an airport through the routes that serve the same airport and the effect of liberalization. Linear mixed models [6] and instrumental variables [7] are used to quantify effects. Different models reveal that an increase in a specific route has a positive effect on the number of passengers on the other routes that share an endpoint within the route. Furthermore, the liberalization of the air transport industry has a positive effect on the flow of passengers on routes that share extreme points with the route of interest

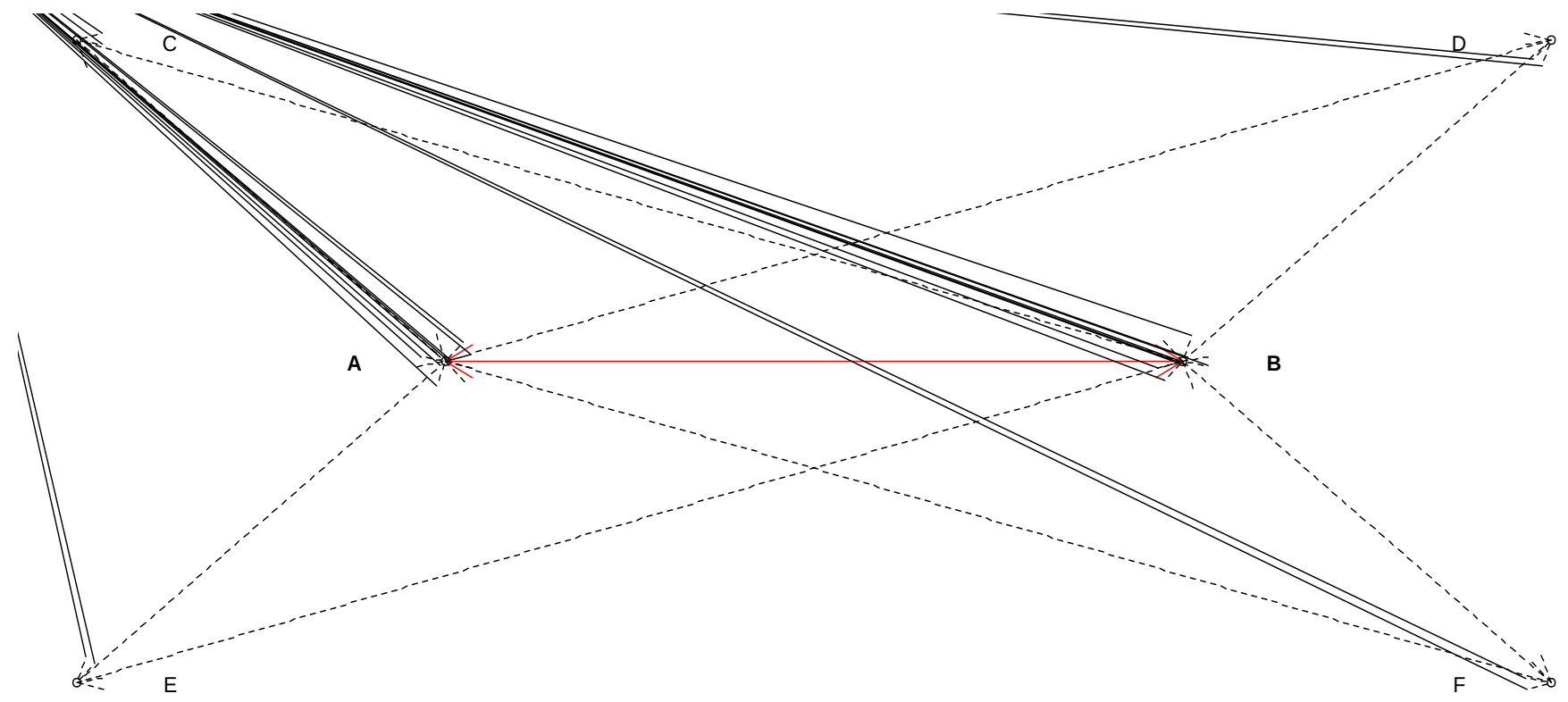


The analysis calculates and determines the mutual influence of traffic passenger volumes across routes serving the same airport through linear regression and two-stage least squares (2SLS) estimation with the use of instrumental variables. The analysis is bounded to routes involving regular (commercial / scheduled) flights and for 15 main Colombian airports and its respective routes, including the country's main airport and hub, Bogotá-El Dorado International Airport (BOG) [4]. Two indicators are considering in the analysis:

- ▶ Q_{rt} as the number of passengers on route r in year t ,
- ▶ $Q_{ot_{rt}}$ as the total number of passengers on routes to or from the endpoint airports of route r , excluding route r itself.



Scheme of route A-B (red and solid line) and routes connected with end-points



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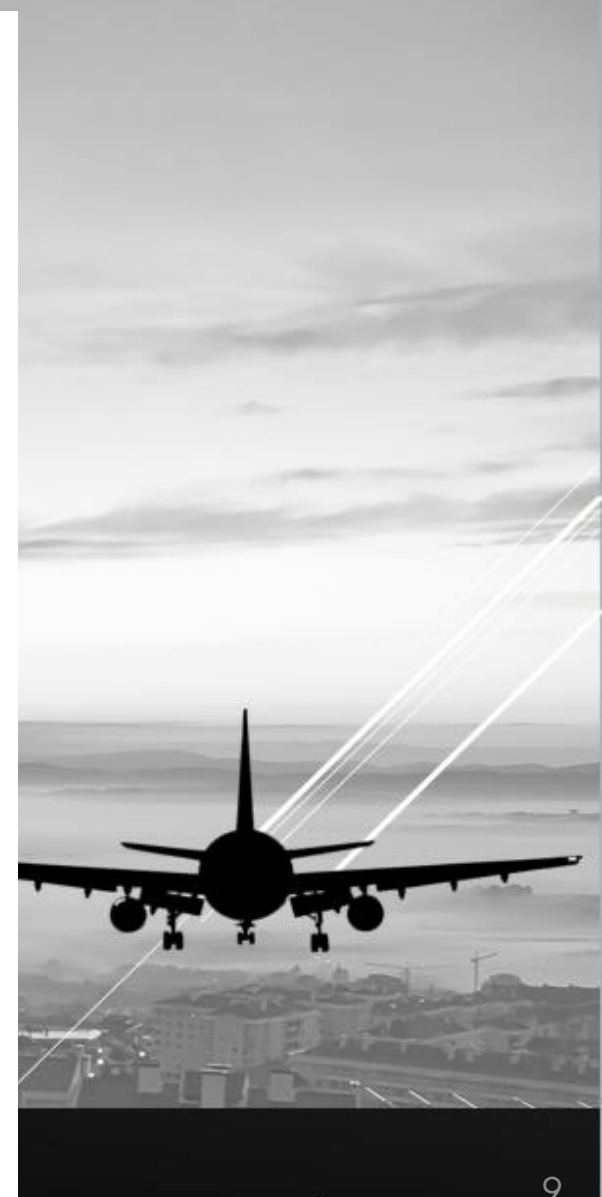
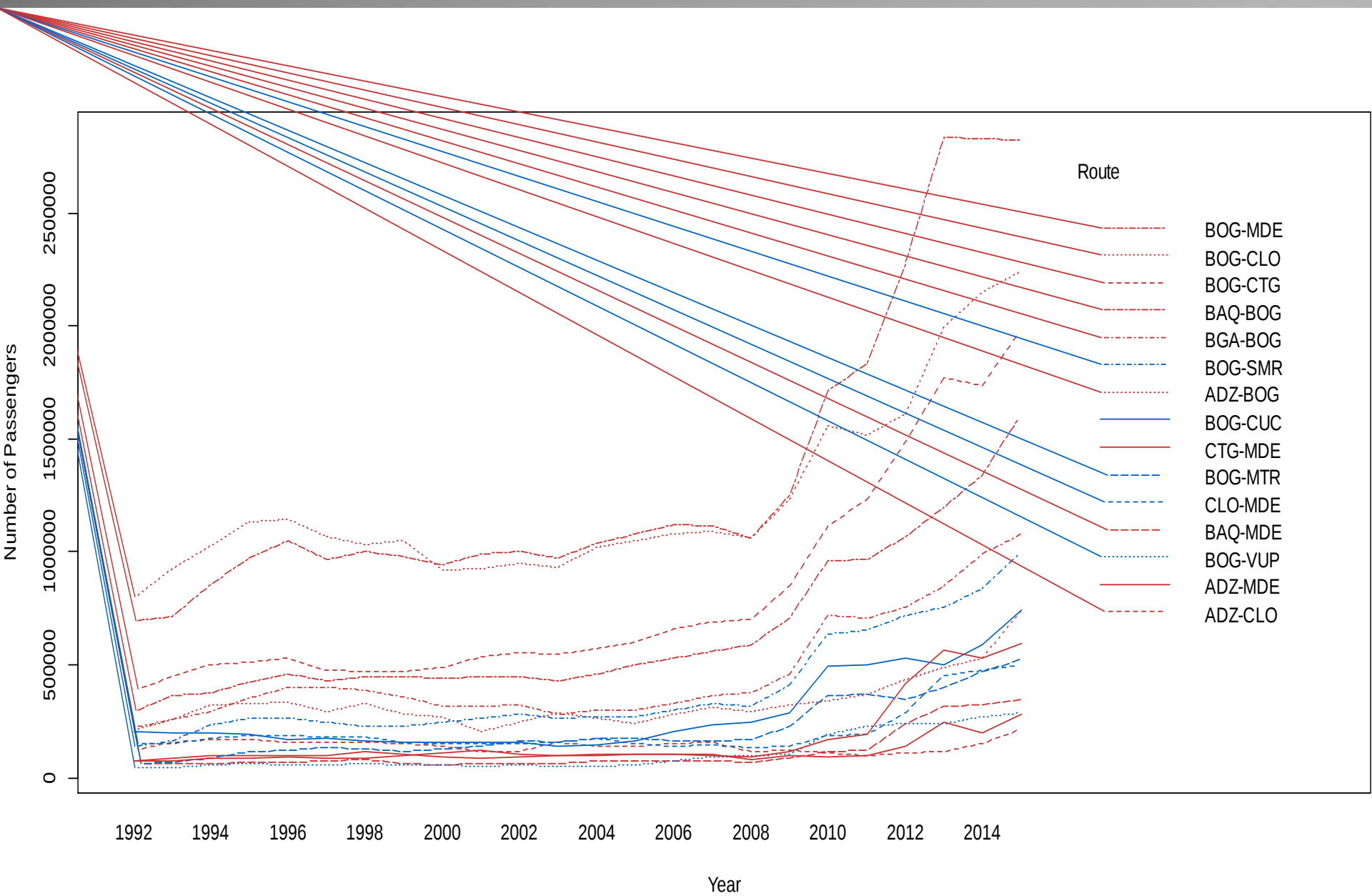
	Observations	Mean	Std. dev.	Min	Median	Max
All Routes						
Q_{rt}	2055	90965.5	262964.47	0	6313	2941788.0
Qot_{rt}	2055	2166984.5	2199231.80	49528	1478510	13563765.0
Routes serving BOG						
Q_{rt}	323	444883.7	525608.41	2	267338	2941788.0
Qot_{rt}	323	5750559.0	2752802.52	2764555	4425569	13563765.0
Other routes						
Q_{rt}	1732	24963.4	54142.34	0	2776	592716.0
Qot_{rt}	1732	1498685.1	1219144.11	49528	1179444	8447792.0



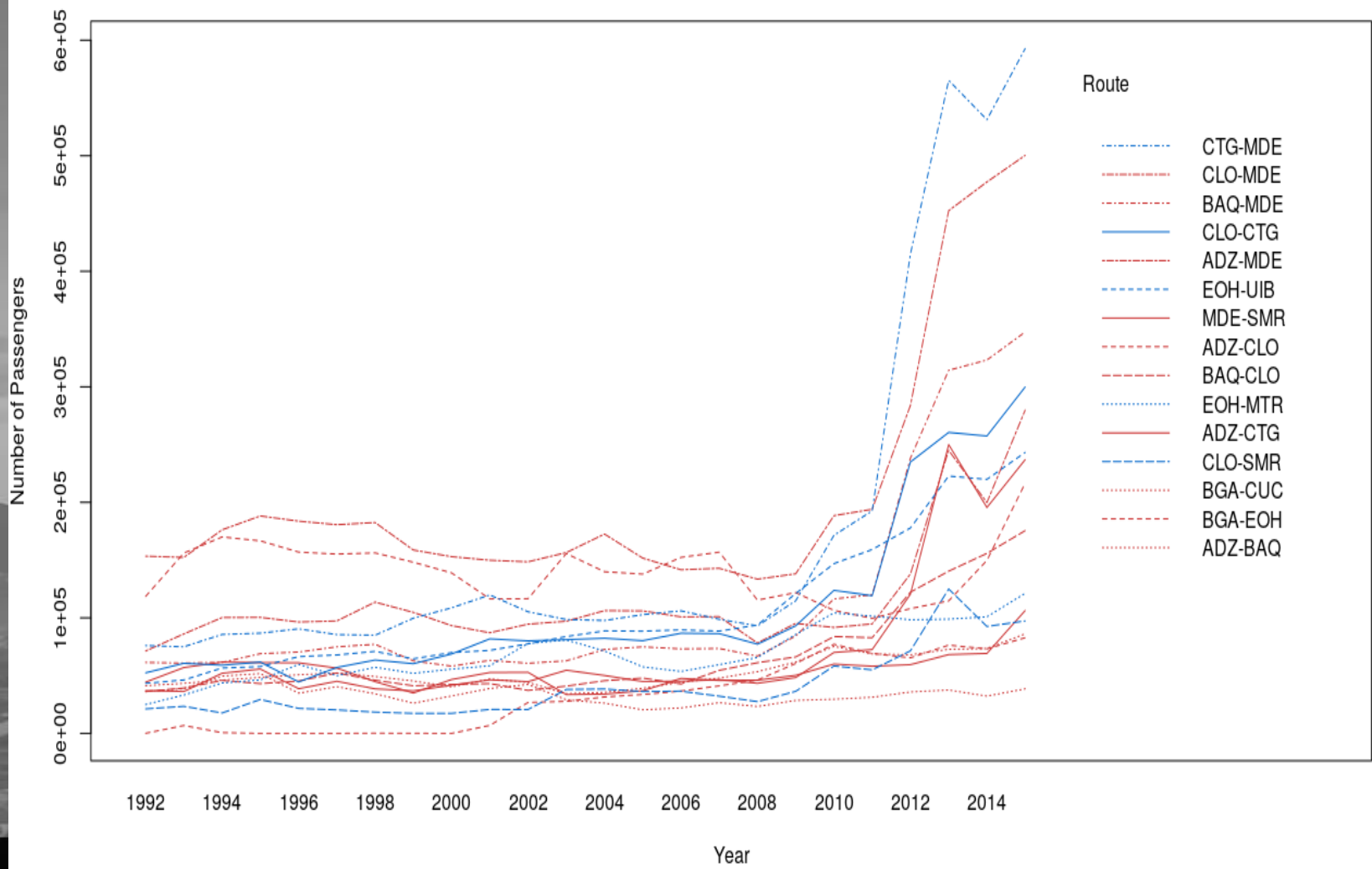
Municipality	IATA Airport Code
Medellín	EOH
Rionegro	MDE
Barranquilla	BAQ
Cartagena	CTG
Valledupar	VUP
Quibdo	UIB
Montería	MTR
Bogotá	BOG
Rioacha	RCH
Santa Marta	SMR
Cúcuta	CUC
San Andrés	ADZ
Bucaramanga	BGA
Corozal	CZU
Cali	CLO



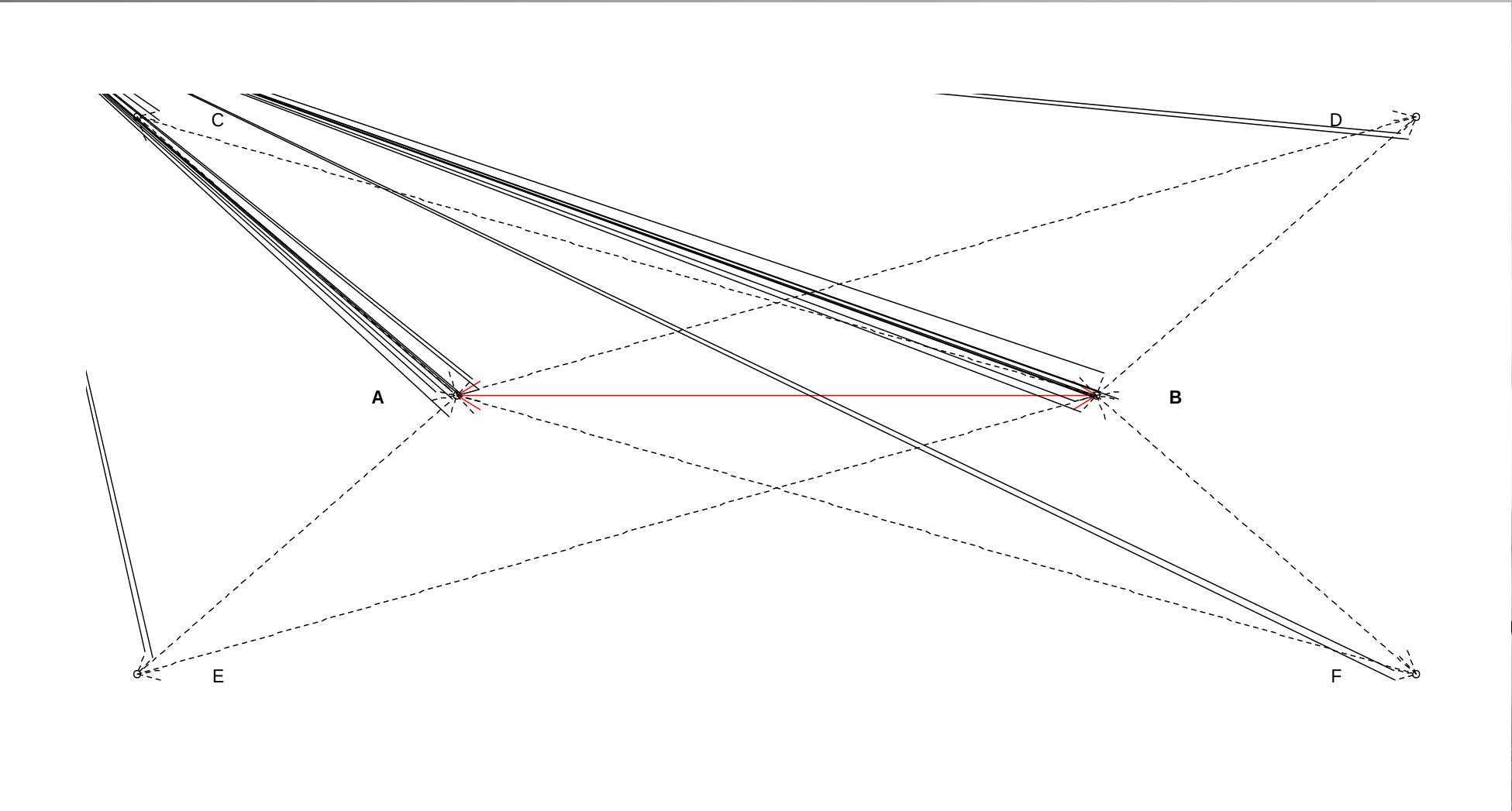
Data: top Colombian routs (Number of passangers)



Data: top Colombian routs (Number of passangers), excluding BOG



Scheme of route A-B (red and solid line) and routes connected with end-points



- ▶ the influence of the routes related to the terminal points in the domestic passenger traffic between the routes is quantified, controlling possible problems of bias in the estimates through the use of instrumental variables (demographic and socioeconomic). The model allows to understand the dynamics of the behavior of the network in terms of **passenger traffic** and to **analyze the connectivity of the network** indirectly through the model of instrumental variables.
- ▶ The influence of the routes related to the terminal points on the passenger traffic between routes is positive and of an important magnitude. Nevertheless, **if we consider routes not involved the country's main hub, this effect is much lower**, which is an evidence that there is a huge influence in the network by country's main hub. The particularity of this air transport market is that in the case where the country's main hub is not included there is a very small effect of the routes that involve the nodes of a route on the traffic of the same route.



- ▶ This effect is approximately 1000% smaller than the effect observed when performing the same analysis including the country's main hub. The results allow to conclude that the network analyzed has a **strong heterogeneity**.
- ▶ A great effort is required to strengthen other airports to generate a greater volume of traffic in the Colombian air transport network.
- ▶ Finally, the results show a strong increase in recent years in the routes that involve the country's main hub, this is especially noticeable since the total deregulation of air fares (2012).





Thank you!