WP New Series
No 21/2017

Airport De-hubbing and International Trade: Evidence from Lombardy

by Flavia Cifarelli and Marco Percoco

Università Commerciale
Luigi Bocconi

CERTeT (*Centre for Research on Regional Economics, Transport and Tourism*)
GraftonBuilding (3–B2), Via Roentgen, 1 – 20136 Milan – Italy
www.certet.unibocconi.it

CERTeT was established at the end of 1995. It focuses on the following research areas: territorial economics (both regional and urban); transportation economics and the analysis of transport infrastructure (railways, highways, airways, waterways); the economics of tourism (the Centre organizes an advanced course on this subject); the evaluation of regional and local policies, paying specific attention to the use of EU structural funds; and the economics and management of water resources, and their role in local development.

New Working Paper Series

The *New Working Paper Series* circulates research in progress, policy notes, and discussions on economic issues falling within the competences of **CERTeT**.

We host researchers working in "Regional Science" from inside Bocconi University as well as researchers belonging to the wide relational networks built up by **CERTeT** in its more than 20 years of activity.

Series Coordinator: Prof. Alberto Bramanti

Proposals for new working papers may be submitted to the coordinator:
alberto.bramanti@unibocconi.it

Source: *word cloud of the 'abstract'*

Editorial Assistant: Paola Calogero paola.calogero@unibocconi.it

CERTeT (*Center for Research on Regional Economics, Transport and Tourism*), Grafton Building (3–B2), Via Roentgen, 1 – 20136 Milan (Italy) — www.certet.unibocconi.it

The WP series can be downloaded from the **CERTeT**'s site:
https://www.unibocconi.it/wps/wcm/connect/Cdr/Centro_CERTET/Home/Working+Papers/

Airport De-hubbing and International Trade: Evidence from Lombardy

by Flavia Cifarelli and Marco Percoco

FLAVIA CIFARELLI is one-year research grantee, Department of Policy Analysis and Public Management, Bocconi University, Milan. Her interests include economic geography, transport policy and international economics.
flavia.cifarelli@unibocconi.it

MARCO PERCOCO is Associate Professor of Applied Economics, Department of Policy Analysis and Public Management, and CERTeT, Bocconi University, Milan. His research interests are in the fields of transport policy and geography, historical economic geography, policy evaluation and local development. He has published extensively in major transportation and regional studies journals.
marco.percoco@unibocconi.it.

ABSTRACT

This study aims to evaluate the impact of the de-hubbing of Malpensa Airport, which occurred on 31 March 2008, on regional trade. By using a novel dataset consisting of a panel of 28 European countries and 30 sectors, for which we have data concerning trade from/to Lombardy, we have detected a substantial impact of the de-hubbing on regional exports, whereas a limited impact was found on imports. At the sectoral level, the de-hubbing has harmed those sectors that rely more on airfreight to export their products.

Keywords INTERNATIONAL TRADE, AIR TRANSPORT, DE-HUBBING, LOMBARDY.

JEL classification: F1, R4.

Airport De-hubbing and International Trade: Evidence from Lombardy

by Flavia Cifarelli and Marco Percoco

1. Introduction

Expanding infrastructure capital to improve regional connectivity and accessibility is widely considered by policymakers as a viable policy to promote local development. In recent years, an increasing body of literature has considered the impact of airport activity on regional development. The early contributions by Brueckner (2003) and Percoco (2010) have presented evidence that the intensity of air traffic, assumed as a proxy for air accessibility of the region, more significantly affects employment in the service sector. These results were in line with the hypothesis that air accessibility is crucial, especially for face-to-face interactions, which in turn affect the productivity of tertiary firms, given their labour productivity.

This paper considers the de-hubbing of Malpensa Airport in 2008 as an exogenous variation in airport activity, which is useful for estimating economic impact in terms of international trade with Lombardy, the region where the airport is located.

By considering the event as a natural experiment, we implement an interrupted time series design to evaluate the effect of the de-hubbing decision on trade between Lombardy and European countries. The results indicate a negative and statistically significant effect of the event on exports, while no impact was detected on imports. The drop in the volume of exported goods is sharper for sectors using more air transport services if they are earmarked for European Union (EU) member states, especially countries in the Schengen Area and even more so those in the eurozone.

This paper is connected to the growing body of literature on the consequences of de-hubbing decisions, particularly the study by Cattaneo *et al.* (2016) who found that the de-hubbing of Malpensa Airport negatively affected employment in areas with a high density of export-oriented firms. This paper differs, however, as we explicitly consider export and import flows, which are differentiated across sectors according to the quantity of air transport services used in the production function.

2. Review of the literature

Starting with the liberalization of the American market in 1978, followed by that of the European market, there have been several examples of de-hubbing decisions. The initial attempt to study this topic in a systematic manner was performed by Redondi *et al*. (2010), who first defined the criteria to assess whether or not de-hubbing occurred by taking account of 37 instances, which had occurred worldwide between 1997 and 2009. In their study, the authors pointed out that airports that suffered from de-hubbing did not experience a new hub condition by any other carrier. Furthermore, these airports failed to return to previous air traffic levels in a five-year time window. Thus, these airports declined, unless low-cost carriers (LCCs) started to offer routes from them. On average, it was observed that a slow recovery pattern began in the third year after de-hubbing. Nevertheless, the drop in connectivity, measured as the number of destinations served, was less significant than the one in traffic.

Following the study by Redondi *et al*. (2010), Bohl (2013) extended the analysis to the effects on tourism, while Bilotkach *et al*. (2014) focused on the welfare effects, which depend on fares, frequencies and travel distances. Effects on welfare are ambiguous, as another study by Luo (2013) revealed an immediate increase in consumer welfare after a de-hubbing event, driven by the decrease in post-merger fares.

Airfares, quantities of direct flights and price effects were further studied by Tanand Samuel (2016), who considered two different scenarios involving seven examples of de-hubbings. In the first, when LCCs offer routes from the airport, a decrease in prices occurs, resulting in an increase in consumers' welfare. In the second, where no LCCs are active, the opposite situation occurs. Indeed, the change in consumers' surplus ultimately depends on the competitive environment.

Rodríguez-Déniz *et al*. (2013) emphasized that the dropin airports' connectivity suddenly reduces the available links for passengers, although de-hubbing cannot be regarded as crucial to the future of the airport. Wei and Grubesic (2015) argued that de-hubbing could also generate opportunities through the creation of a new optimal combination of alternative carriers. Lastly, Rupp and Tan (2016) investigated how de-hubbings affect product, finding an increase in the latter driven by the reduction in travel times and on-time flight schedules.

The paper closest to this article is that by Cattaneo *et al*. (2016), who focused on the consequences of the de-hubbing of Malpensa Airport on local employment through the reduction in connectivity in travel to work areas (TTWAs) surrounding the airport. Their results point to a negative impact on employment in TTWAs close to Malpensa specializing in export-oriented sectors, whilst no impact was found in areas offering service specialization.

3. The de-hubbing of Malpensa

Malpensa Airport is located in Lombardy, Northern Italy. It started its operations in 2000,with the aim that Alitalia with pursue a dual-hub strategy with Fiumicino Airport in Rome. However, on 31 March 2008, Alitalia decided to proceed with de-hubbing Malpensa, ceasing 180 flights and moving most intercontinental routes to Fiumicino, making the latter its only hub. This decision drastically reduced the intercontinental connectivity by 36%, the number of served airports by 19% and, consequently, the number of annual passengers, which dropped from 23,800,000 in 2007 to 17,000,000 in 2009 (Cattaneo *et al*., 2016).

An essential element for the recovery of Malpensa has been the presence of LCCs, as opposed to full-service carriers (FSCs), such as Alitalia. Indeed, in 2010, only two years after Alitalia's decision, international flights increased by 5.2%and national ones by 20%. Still, international flights represented the vast majority of Malpensa's total traffic (Assaeroporti, 2011). One year later, in 2011, the airport registered a growth rate in air traffic of 8%. In the same year, Malpensa alone managed to serve over 50% of Italian freight traffic travelling by air, equal to around 400,000 tons, attaining a level close to the one registered before March 2008[1]. It now has two passenger terminals and a cargo terminal. The first, which opened in 1998 to coincide with the start of the Alitalia "Malpensa 2000" project, is used for passenger flights, while the second is entirely used by easyJet, which selected Malpensa as its main Italian base and the second in Europe. The third terminal, known as CargoCity, is exclusively used for cargo flights, around which two big storage warehouses were built.

4. Methodology and data

To evaluate the impact of the de-hubbing of Malpensa Airport, we make use of a three-dimensional panel containing information on trade flows between 28 European countries (ICCSAI, 2011) in the period 2004-2011, with a further breakdown of 30 sectors.[1] With this set of information, we

[1] Sectors follow NACE 2 classification and include: crop and animal production, hunting and related service activities (01); forestry (02); fishing (03); mining and quarrying (05-06-07-08);food, beverage and tobacco (10-11-12); textile, clothing and fur (13-14-15); wood (16); paper (17); printing (18); manufacture of coke and refined petroleum products (19); manufacture of chemicals (20); manufacture of pharmaceutical products (21); manufacture of rubber and plastic products (22); manufacture of other non-metallic mineral products (23); metallurgy (24); manufacture of fabricated metal products (25); manufacture of computer, electronic and optical products (26); manufacture of electrical equipment (27); manufacture of machinery and equipment not elsewhere

aim to disentangle the impact of de-hubbing across sectors by assuming that the higher the relevance of air transport services for the sector, the larger the impact of the contraction in the intercontinental accessibility of Malpensa Airport.

Formally, we estimate the following regression equation:

$$\begin{aligned} log(trade)_{i,s,t} &= a_i + a_s + \lambda log(trend)_t + \beta post_t * log(c)_s * log(dist)_I + \\ &+ \gamma_1 post_t * log(c)_s + \gamma_2 log(c)_s * log(dist)_I + \gamma_3 post_t * log(dist)_I + \delta post_t + s_{i,s,t} \end{aligned} \quad (1)$$

The dependent variable indicates the value of trade (either exports or imports or their sum) from sector *s* in Lombardy to country *i* in year *t*. $Post_t$ is a dummy taking the value 1 if the de-hubbing decision has already occurred, i.e., from 2008 onward. C_s is the technological coefficient for the use of air transport services by sector *s*, and $dist_i$ is the distance in kilometres from $country_i$ to Malpensa Airport. To correctly specify the model, we include the pairwise interaction of these variables, as well as controls for countries and sectors, and time trends, indicated respectively as a_i, a_s and *trend*. All continuous variables are in logs, with standard errors clustered across sectors.

Data on trade (exports and imports) are from the Istituto per il Commercio Internazionale and cover 30 sectors and 28 European countries in the period 2004-2011. Distance is measured according to the road distance between Malpensa Airport and the main airport in the country. Data on technical coefficients are from the supply-use table compiled by ISTAT.

Summary statistics for the variables of interest are presented in **Table A** in the Appendix.

Assuming that, on average, every year in the sample contains the same number of observations, in order to keep the estimation windows equally large before and after the treatment, in the baseline specification, we only take the time interval between 2004 and 2011 into consideration. In this way, the sample is balanced and consists of four pre test years (2004, 2005, 2006 and 2007) and four post test years (2008, 2009, 2010, 2011).

A potential threat to the identification of the effect is represented by the international crisis that began in late 2008, the same year de-hubbing occurred. Given our proposed specification, the international crisis could represent a substantial threat to our identification, but only if the pattern of trade contraction depends on c_s or $dist_i$. Furthermore, it

classified (28); manufacture of motor vehicles, trailers and semi-trailers (29); other transports (30); manufacture of furniture and others (31-32); electricity, gas, steam and air conditioning supply (35); water supply, sewerage, waste management and remediation activities (37-38); publishing activities (58); media (59); software (62); other professional, scientific and technical activities (74); arts, entertainment and recreation (90-91); other personal service activities (96).

should be noted that the crisis first hit European economies in late 2008, but even harder in 2009. For example, Italian GDP decreased by –1.2% in 2008 and by –5.5% in 2009. Therefore, to limit the eventual bias, in most of the specifications, this paper only considers the period between 2007 and 2008. Finally, as a further robustness check, we also present the results of a similar test to a control function approach in order to capture and separate the effect of the international crisis.

5. Results and discussion

The results from the regressions on trade are presented in **Table 1**, where each column refers to a different time interval, while Column (4) includes the output from the baseline regression for the whole period. In each regression, we control for countries' and sectors' fixed effects. The division of the analysis into time intervals is intended to facilitate a better understanding of the dynamics of the change in trade. Indeed, given that the effect is immediate and temporary, it should be stronger in the year immediately after the de-hubbing decision, i.e., in 2009. The logic behind this is to evaluate how long it took for the effect to disappear, keeping the number of observations equal both before and after the treatment.

Table 1 – *Baseline regressions*

	Log(trade)			
	2007-2008	2006-2009	2005-2010	2004-2011
$post_t$*$log(c)_s$*$log(dist)_t$	–0.04	–0.045*	–0.038*	–0.049**
	(0.039)	(0.024)	(0.02)	(0.02)
$post_t$*$log(c)_s$	0.274	0.33*	0.28*	0.349**
	(0.265)	(0.169)	(0.137)	(0.138)
$log(c)_s$*$log(dist)_i$	0.105*	0.097	0.082	0.075
	(0.06)	(0.072)	(0.076)	(0.071)
$post_t$*$log(dist)_i$	–0.315	–0.351**	–0.275**	–0.338**
	(0.28)	(0.138)	(0.12)	(0.134)
$post_t$	2.124	2.502**	1.828**	2.228**
	(1.922)	(0.953)	(0.823)	(0.963)
$log(trend)$	–	–0.168	0.198***	0.176***
		(0.13)	(0.069)	(0.035)
Observations	1,451	2,946	4,446	5,907
Country	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes

Notes: ***p<0.01, **p<0.05, *p<0.10. Standard errors in parentheses, adjusted for 30 clusters in sectors.

The estimate of β in Column (1) is not significant, whereas estimates in Columns (2) and (3) are significant, but only at 10%, meaning that they are not much different from the estimate in Column (4), which is equal to –0.049 and significant at 5%. Indeed, it can be seen that, three years after de-hubbing occurred, there was still an effect, although small.

To further investigate the effect only in the intervals from 2007 to 2008, and from 2006 to 2009, we distinguish between countries according to three parameters: whether they are EU members, whether they are part of the Schengen Area, and whether they belong to the eurozone. We choose the two aforementioned intervals because we can better isolate the impact before it weakens. The results are shown in **Table 2**. Looking at the coefficients of the variable of interest, de-hubbing has impacted the eurozone countries more strongly, although the effect on EU countries has been higher. At the same time, there has been no significant impact for those in the Schengen Area.

Table 2 – *EU, Schengen Area and eurozone analysis (trade)*

	EU		Schengen Area		Eurozone	
	2007-2008	2006-2009	2007-2008	2006-2009	2007-2008	2006-2009
$post_t*log(c)_s*log(dist)_i$	–0.039	–0.048**	–0.046	–0.043	–0.126*	–0.119**
	(0.041)	(0.021)	(0.035)	(0.027)	(0.073)	(0.049)
$post_t*log(c)_s$	0.272	0.356**	0.332	0.333*	0.878*	0.841**
	(0.272)	(0.154)	(0.24)	(0.185)	(0.495)	(0.344)
$log(c)_s*log(dist)_i$	0.116*	0.111	0.119***	0.111*	0.176***	0.146*
	(0.058)	(0.072)	(0.042)	(0.061)	(0.061)	(0.08)
$post_t*log(dist)_i$	–0.374	–0.424***	–0.343	–0.32**	–0.871	–0.76**
	(0.279)	(0.131)	(0.268)	(0.149)	(0.543)	(0.34)
$post_t$	2.541	3.045***	2.405	2.41**	6.022	5.429**
	(1.904)	(0.95)	(1.85)	(1.02)	(3.714)	(2.4)
log(trend)	–	–0.201	–	–0.185	–	–0.43**
		(0.132)		(0.124)		(0.157)
Observations	1,308	2,599	1,291	2,570	608	1,236
Country	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes

Notes: ***p<0.01, **p<0.05, *p<0.10. Standard errors in parentheses, adjusted for 30 clusters in sectors.

In **Table 3**, Columns (1), (2) and (3) show the coefficients for the regressions for 2007-2008 only, between 2006 and 2009, and between 2005 and 2010, respectively, while Column (4) shows the results from the baseline specification, taking into consideration the whole sample period from 2004 to 2011. It is evident that the largest impact occurred in the time interval in Column (2). Indeed, β is equal to –0.08 and significant at 1% for the period 2007-2008, indicating that, as distance from Malpensa Airport increases by 100 km, the average decrease in log(export) is equal to 2.36, which corresponds to –15.43% or a loss of EUR 13,053,780.

Table 3 – *Baseline regression and time intervals analysis*

	Log(export)			
	2007-2008	2006-2009	2005-2010	2004-2011
$post_t{*}log(c)_s{*}log(dist)_i$	–0.078*	–0.08***	–0.064**	–0.051*
	(0.045)	(0.021)	(0.028)	(0.027)
$post_t{*}log(c)_s$	0.535*	0.571***	0.465**	0.377*
	(0.304)	(0.156)	(0.197)	(0.188)
$log(c)_s{*}log(dist)_i$	0.116*	0.094	0.086	0.076
	(0.064)	(0.068)	(0.072)	(0.063)
$post_t{*}log(dist)_i$	–0.465	–0.546***	–0.452***	–0.393**
	(0.299)	(0.128)	(0.156)	(0.153)
$post_t$	3.158	3.872***	3.067**	2.64**
	(1.998)	(0.967)	(1.121)	(1.089)
$log(trend)$	–	–0.213	0.209***	0.216***
		(0.185)	(0.068)	(0.03)
Observations	1,432	2,904	4,381	5,813
Country	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes

Notes: ***p<0.01, **p<0.05, *p<0.10. Standard errors in parentheses, adjusted for 30 clusters in sectors.

Table 4 – *EU, Schengen Area and eurozone analysis (export)*

	EU		Schengen Area		Eurozone	
	2007-2008	2006-2009	2007-2008	2006-2009	2007-2008	2006-2009
$post_t{*}log(c)_s{*}log(dist)_i$	–0.067	–0.089***	–0.082**	–0.083***	–0.137**	–0.087**
	(0.049)	(0.029)	(0.037)	(0.017)	(0.062)	(0.038)
$post_t{*}log(c)_s$	0.47	0.639***	0.577**	0.605***	0.963**	0.628**
	(0.325)	(0.207)	(0.25)	(0.134)	(0.428)	(0.258)
$log(c)_s{*}log(dist)_i$	0.142**	0.133*	0.127**	0.111*	0.124*	0.059
	(0.067)	(0.073)	(0.052)	(0.061)	(0.072)	(0.063)
$post_t{*}log(dist)_i$	–0.44	–0.638***	–0.485*	–0.558***	–0.647	–0.5*
	(0.305)	(0.166)	(0.263)	(0.113)	(0.415)	(0.246)
$post_t$	3.03	4.498***	3.39*	4.013***	4.534	3.622**
	(2.035)	(1.233)	(1.777)	(0.862)	(2.842)	(1.699)
$log(trend)$	–	–0.199	–	–0.181	–	–0.399*
		(0.176)		(0.178)		(0.197)
Observations	1,293	2,565	1,277	2,534	598	1,216
Country	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes

Notes: ***p<0.01, **p<0.05, *p<0.10. Standard errors in parentheses, adjusted for 30 clusters in sectors.

Interestingly enough, estimates over longer time periods are smaller and less significant, possibly indicating that, from 2009, a gradual process of adjustment in the regional economy in response to the new connectivity took place. It should also be noted that estimates for the period 2007-2008 are the most reliable and conservative, given the previous discussion of the international crisis as a confounding factor.

Table 4 presents the results of the regressions carried out while dividing countries according to EU membership, the Schengen Area and the eurozone, respectively. Columns (1), (3) and (5) refer to 2007-2008, while the others widen the time interval by adding 2006 and 2009.

Overall, all these estimates are larger than the one in Column (2) of **Table 3**, suggesting a greater impact of the de-hubbing decision on those countries with fewer barriers to trade and more integrated markets with the Italian one, specifically with Lombardy's market. In turn, this indicates that regional exports suffered mostly from de-hubbing when directed at EU member states, and in particular to those having the same currency.

Table 5 present the results from the regression on imports, as shown in Equation (3). As before, Columns (1), (2) and (3) refer to the different time intervals examined in this study, while Column (4) refers to the entire time interval. It is immediately clear that none of the coefficients reported is significant. The same occurs when running the specifications divided by markets. Thus, these regressions seem to confirm that imports have not played any relevant role in the decrease in trade; in any case, they outweigh the drop in exports.

Table 5 – *Baseline regression and time intervals analysis*

	Log(import)			
	2007-2008	2006-2009	2005-2010	2004-2011
$post_t$*$log(c)_s$*$log(dist)_i$	0.069	0.039	0.03	0.0062
	(0.047)	(0.028)	(0.021)	(0.022)
$post_t$*$log(c)_s$	–0.43	–0.214	–0.162	–0.002
	(0.323)	(0.207)	(0.161)	(0.157)
$log(c)_s$*$log(dist)_i$	0.007	–0.008	–0.031	–0.028
	(0.061)	(0.065)	(0.084)	(0.085)
$post_t$*$log(dist)_i$	0.459	0.315	0.287*	0.116
	(0.332)	(0.203)	(0.157)	(0.152)
$post_t$	–2.926	–1.82	–1.792	–0.684
	(2.288)	(1.487)	(1.19)	(1.104)
$log(trend)$	–	–0.136	0.169*	0.176***
		(0.164)	(0.094)	(0.044)
Observations	1,341	2,717	4,090	5,431
Country	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes

Notes: ***p<0.01, **p<0.05, *p<0.10. Standard errors in parentheses, adjusted for 30 clusters in sectors.

Although we do not explicitly consider the channels for transmitting de-hubbing in relation to exports, we may argue that this is related not only to the displacement of flights by Alitalia from Malpensa to Fiumicino, but also to the related dismissal of its full cargo activity. Indeed, goods are either transported in the hold of passenger aircraft or in "full cargo" planes, which are entirely devoted to airfreight. The reduction in the number of connections damaged those sectors that needed to send small amounts of goods on a daily basis, while the shutdown of full cargo activity harmed the way in which Malpensa used to deal with the large quantities of products from any sector that travelled through the airport. At the same time, LCCs do not operate cargo services, meaning that the replacement of Alitalia activities with those of either easyJet or Ryanair did not extend to freight transport operations.

This explanation finds support in a study by Alderighi and Gaggero (2016). Given the geographical morphology and peripheral location of Italy, they pointed out that air transport is likely to be the preferred means of travel from Italy to the rest of Europe. Starting from the assumption that:

> *«a non-stop flight connection to the country of export destination [...] consolidates the relationship with the existing trading partners, brings potential buyers and sellers closer, augments their reciprocal trust, and, hence, increases the likelihood of trading.»* (Alderighi and Gaggero, 2016: 18).

They found that the offer of non-stop flights fosters exports. This result was confirmed by the analysis on FSCs only, while no effect was detected when looking at LCCs only.

Furthermore, the results of this paper confirm the findings of Cattaneo *et al*. (2016), which indicate that the larger impact of de-hubbing was experienced by export-oriented sectors, leading to the conclusion that direct international connectivity fosters exports.

6. Robustness checks

The analysis reported in Section 5 could be affected by endogeneity in the form of omitted variable bias, since our treatment variable post may also capture the effect of the international crisis. To deal with this issue, we rely on the fact that we have used two outcome variables (imports and exports), but only one variable seems to be sensitive to de-hubbing (exports). Import flows have not reacted to de-hubbing, but are likely to have been affected by the international economic crisis, such that we can include this variable as a control in the export equation.

By including this control variable, the independent variable of interest is exogenous as imports will capture the effect of the crisis; meanwhile, although the endogeneity of this control prompts some concerns, it does not contaminate the correlated variables. To implement this strategy, we estimate the following regression:

$$log(export)_{i,s,t} = a_i + a_s + \lambda log(trend)_t + \beta post_t{*}log(c)_s{*}log(dist)_i + \gamma_1 post_t{*}log(c)_s + \gamma_2 log(c)_s{*}log(dist)_i + \gamma_3 post_t{*}log(dist)_i + \delta post_t + \zeta log(import)_{i,s,t} + s_{i,s,t} \quad (2)$$

The results from Regression (2) are reported in **Table 6**, which shows the coefficients from the different intervals considered in Columns (1) to (3), while estimates from the baseline regression are found in Column (4). It immediately emerges that controlling for imports reduces the significance of all the estimates, except for the one in Column (2), which shows estimates that are smaller in magnitude with respect to Table 3, in line with the hypothesis of omitted variable bias.

Table 6 - *Robustness check with an additional control*

	Log(export)			
	2007-2008	2006-2009	2005-2010	2004-2011
$post_t{*}log(c)_s{*}log(dist)_i$	−0.031	−0.06**	−0.051	−0.026
	(0.036)	(0.027)	(0.036)	(0.032)
$post_t{*}log(c)_s$	0.226	0.425*	0.375	0.213
	(0.239)	(0.209)	(0.259)	(0.227)
$log(c)_s{*}log(dist)_i$	0.081	0.083	0.088	0.073
	(0.079)	(0.076)	(0.075)	(0.067)
$post_t{*}log(dist)_i$	−0.171	−0.466***	−0.412**	−0.268*
	(0.207)	(0.153)	(0.185)	(0.156)
$post_t$	1.241	3.259**	2.786*	1.838
	(1.376)	(1.204)	(1.363)	(1.142)
log(trend)	–	−0.262	0.164**	0.193**
		(0.156)	(0.067)	(0.033)
log(import)	0.134***	0.139***	0.140***	0.131***
	(0.041)	(0.036)	(0.035)	(0.034)
Observations	1,322	2,675	4,025	5,337
Country	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes

Notes: ***p<0.01, **p<0.05, *p<0.10. Standard errors in parentheses, adjusted for 30 clusters in sectors.

Our baseline regression in (1) assumes that the impact of de-hubbing depends on the technological coefficients for the use of air transport services. To verify this assumption more explicitly, for each of the 30 sectors in the dataset, we run the regression in (3), which differs from the baseline regression because we remove log(c) from among the regressors, as well as controls for sector-level characteristics.

$$log(export)_{i,t} = a_i + \lambda log(trend)_t + \beta post_t * log(dist)_i + \delta post_t + s_{i,t} \quad (3)$$

Figure 1 – *β vs. technological coefficients*

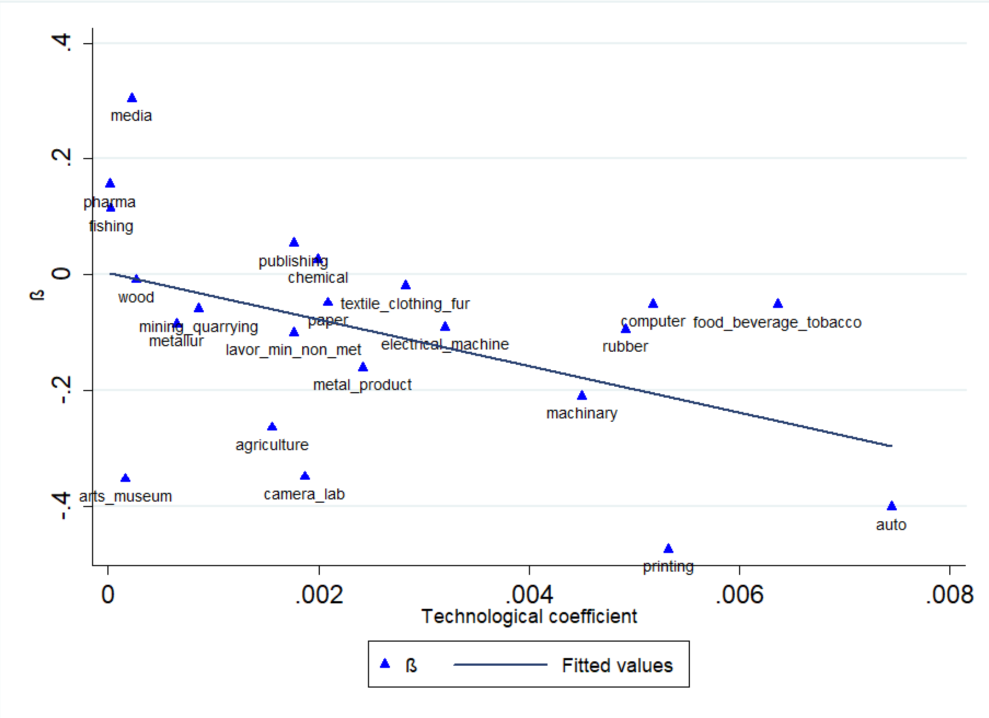
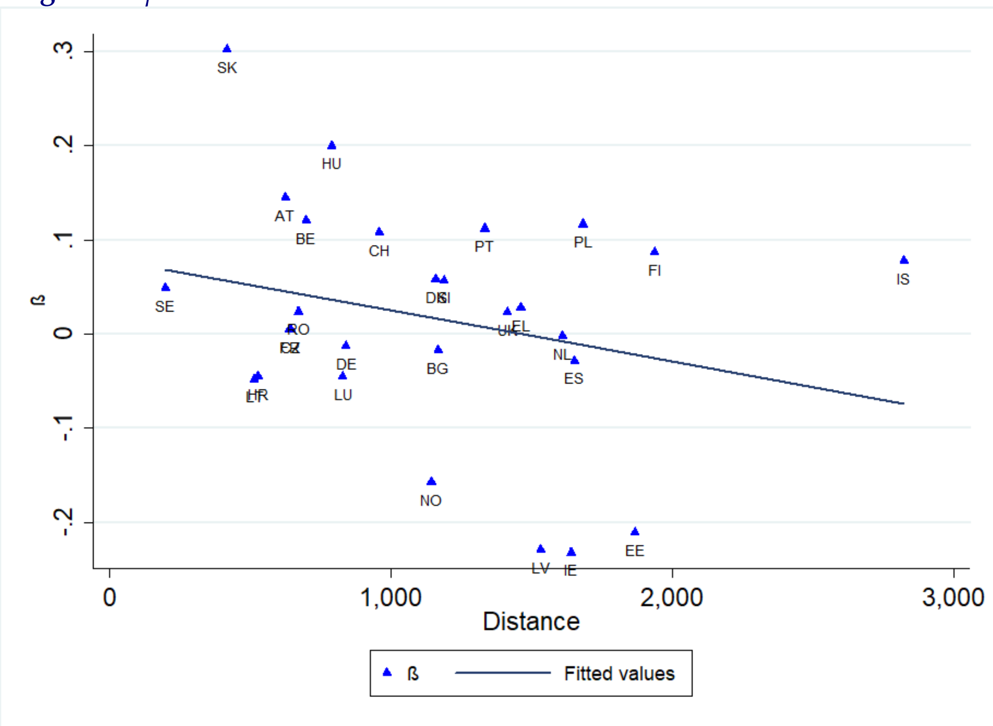


Figure 2 – *β vs. distance*



For each sector, we then plot the β coefficient against the corresponding technological coefficient. **Figure 1** illustrates the relationship. It immediately emerges that there is an overall negative correlation between the technological coefficients and those obtained by running (3) such that the higher the former, the stronger the effect on the relative sector.

On the other hand, following the same method as above, we here use Regression (4) to further understand the way in which the distance between each country and Malpensa Airport has an impact on exports. We then estimate Equation (4) for each of the 28 countries and plot the β coefficients against distance:

$$log(export)_{s,t} = as + \lambda log(trend)_t + \beta post_t * log(c)_s + \delta post_t + s_{s,t} \quad (4)$$

Figure 2 shows the correlation between the distance and the coefficients from the regression, which is clearly negative, indicating that the greater the distance from Malpensa Airport, the greater the negative effect on exports.

7. Conclusions

In this paper, we have analysed the impact of the de-hubbing of Malpensa Airport on international trade. By using three-dimensional panel data on the values of trade, exports and imports involving 30 sectors active in Lombardy and 28 European countries, in the period from 2004 to 2011, we implemented an interrupted time series design. The regressions were estimated in logs and through OLS. We first estimated the baseline regression equation on trade, then on exports and finally on imports. The results indicate that the impact of the treatment on trade, which was small but statistically significant, was entirely due to the significant repercussions for exports. At the same time, imports seem to have not been affected by de-hubbing. The effect on exports vanished after 2009, i.e., two years after the de-hubbing decision. Moreover, it increased with distance and technological coefficients.

These findings suggest that, during the two-year time window after the treatment, the airport's activities suffered from the displacement of both passenger and full cargo flights by Alitalia. The reduction in the number of connections damaged those sectors that rely on airfreight to export their products.

Overall, the findings of this work are confirmed on two sides. On the one hand, they are in line with the conclusion reached by Cattaneo *et al.* (2016), who argued that the decrease in local employment due to the drop in international connectivity, which followed the Malpensa de-hubbing, was statistically relevant, but only in export-oriented sectors.

References

Alderighi, M. and Gaggero, A. (2016), *Fly and Trade: Evidence from Italian Manufacturing Industry*. Working Papers CERTeT–New Series, No. 6.

Assaeroporti (2011), *Comunicato Stampa 2010*.

Bilotkach, V., Mueller, J. and Németh, A. (2014), "Estimating the Consumer Welfare Effects of De-hubbing: The Case of Malév Hungarian Airlines". *Transportation Research, Part E*, Vol. 66, pp. 51-65.

Bohl, P. (2013), "The Consequences of De-hubbing for Airports and Tourism - A Case Study". *European Journal of Business and Management*, Vol. 5, No. 25, pp. 168-178.

Brueckner, J.K. (2003), "Airline Traffic and Urban Economic Development". *Urban Studies*, Vol. 40, No. 8, pp. 1455-1469.

Cattaneo, M., Percoco, M. and Malighetti, P. (2016), *The Impact of Intercontinental Air Accessibility on Local Economies: Evidence from the De-hubbing of Malpensa*. Working paper.

ICCSAI (2011), *ICCSAI Fact Book 2011*.

Luo, D. (2014), "Airline Network-structure Change and Consumer Welfare". Working paper.

Percoco, M. (2010), "Airport Activity and Local Development: Evidence from Italy". *Urban Studies*, Vol. 47, No. 11, pp. 2427-2443.

Redondi, R., Malighetti, P. and Paleari, S. (2010), "De-hubbing of Airports and Their Recovery Patterns". *Journal of Air Transport Management*, Vol. 18, No. 1, pp. 1-4.

Rodríguez-Déniz, H., Suau-Sanchez, P. and Voltes-Dorta, A. (2013), "Classifying Airports According to Their Hub Dimensions: An Application to the US Domestic Network". *Journal of Transport Geography*, Vol. 33, pp. 188-195.

Rupp, N. G. and Tan, K. M. (2016), *Mergers and Product Quality: A Silver Lining from De-Hubbing in the U.S. Airline Industry*. Working paper.

Tan, K. M. and Samuel, A. (2016), "The Effect of De-hubbing on Airfares". *Journal of Air Transport Management*, Vol. 50, pp. 45-52.

Wei, F. and Grubesic, T. H. (2015), "The De-hubbing of Cincinnati/ Northern Kentucky International Airport (CVG): A Spatiotemporal Panorama". *Journal of Transport Geography*, Vol. 49, pp. 85-98.

Appendix

Table A – *Descriptive statistics*

	Mean	Std. dev.	Min.	Max.	Obs.
Trade	191,000,000	527,000,000	1.1	8,150,000,000	8,053
Exports	84,600,000	215,000,000	1.1	2,420,000,000	7,923
Imports	116,000,000	370,000,000	2	6,490,000,000	7,439
Distance	1,124.46	550	199	2,822	8,053
Technological coefficient	0.019	0.064	0.00001	0.324	8,053

Anno | *Year* 2017

N. 12	«'Missing links' e 'bottlenecks': cause, effetti e possibili soluzioni» *di Angela Airoldi, Tatiana Cini e Roberto Zucchetti*
N. 13	«Italian Industrial Districts Today: Between Decline and Openess to Global Value Chains» *by Elisa Giuliani and Roberta Rabellotti*
N. 14	«Evaluation of the Socioeconomic Impacts of the Drought Events: The Case of the Po River Basin *by Dario Musolino, Alessandro de Carli and Antonio Massarutto*
N. 15	«Introduzione del "dibattito pubblico" in Italia: motivi, obiettivi, rischi e proposte operative» *di Angela Airoldi, Tatiana Cini e Roberto Zucchetti*
N. 16	«La stima del valore aggiunto a livello territoriale fine: nuovi sviluppi nell'ambito delle statistiche strutturali» *di Giovanni Barbieri, Alessandro Faramondi e Francesco Truglia*
N. 17	«EUSALP and the Challenge of Multi-level Governance Policies in the Alps» *by Alberto Bramanti and Francesca Teston*
N. 18	«La costruzione del capitale territoriale negli spazi di frontiera: verso una tipologia» *by Alberto Bramanti and Remigio Ratti*
N. 19	«Cities in Movement: The Emergence of Social Incubators in Metropolitan Areas» *by Niccolò Pieri*
N. 20	«Convergence through Clustering? An Inquiry into Industrial Policy in the Developing World with an Ethiopian Application» *by Josiah Littlehales*
N. 21	«Airport De-hubbing and International Trade: Evidence from Lombardy» *by Flavia Cifarelli and Marco Percoco*