# Self-Connectivity: Barriers to European Success


Name: D. Leidelmeijer

Supervisor: F. de Haan


Date: 23/08/18

Words: 6247

# Table of contents

## Summary

Making your own connection between flights has already become an important trend in Europe and airports and airlines have shown willingness to respond to this self-connecting demand. Also, the potential for the development of this trend is present. Thus, this research aims to find potential barriers for airports and airlines in support of passenger self-connectivity in Europe. Results identify three barriers related to passenger inconveniences: the missed connection, the baggage transfer and the passenger tax or charge. Also, barriers related to the booking process were identified: finding a favourable combination and the passenger unawareness barrier. Finally, three airport-related barriers were identified: inter-terminal transfers, the dependence on airlines and the geographic location. On the other hand, this research did not identify any barriers specific to airlines.

# 1. Introduction

## 1.1: Self-connectivity in Europe

In today's European air transportation market, "self-connecting" between flights has already become a popular trend (OAG, 2016). Around 10 years ago, research by Malighetti, Paleari and Redondi (2008) confirmed the existence of the potential for a self-connected trip in Europe: they found that two-thirds of the fastest indirect connections were not made use of by airlines. This way, passengers could effectively make use of this unexploited travel opportunity through "self-help hubbing", as they call it (Malighetti et al., 2008).

Existing research has not yet agreed upon a general definition given to self-connectivity. For instance, Maertens, Pabst and Grimme (2016) present a rather general definition. According to them, self-connecting passengers "… *build their own connections in combining flight segments of (usually) different carriers*" (Maertens et al., 2016). In contrast, Suau-Sanchez, Voltes-Dorta, and Rodríguez-Déniz (2016) define a self-connecting passenger in arguably the same manner, but add the presumptions that the passenger always has the objective to save money and always has to take care of his own baggage transfer. Cserep (2017) gives an even more specific definition, which I argue to be the most complete one. Therefore, in this research a self-connecting passenger will be defined according to her definition:

"*To avoid higher fares, find routes where no direct flight or traditional connecting option exists, or obtain a preferred schedule, a self-connecting passenger purchases two or more separate tickets, often on two different airlines. The self-connecting passenger makes their own connection at an airport either with or without assistance from a third party*" (Cserep, 2017).

The financial concern of the self-connection passenger is echoed in the fact that a flight with a low cost carrier (LCC) is often included in a self-connecting trip (Cserep, 2017). The presumptions about the motives for self-connectivity, mentioned in the definition above, were also mentioned by Cattaneo, Malighetti, Paleari and Redondi (2017). They argue that self-connecting mobility follows from two main drivers: financial incentives and a lack of services from full service network carriers (FSNCs).

Next to this, Cserep (2017) argues that advancements in technology have facilitated easier self-connection and mentions the enormous growth LCCs have undergone as an explanation.
This enormous growth was initiated by the deregulation of the European air transport market in 1997 (Zeigler, Pagliari, Suau-Sanchez, Malighetti & Redondi, 2017), after which airlines in the

European Union were permitted to fly inside any other country (The Economist, 1997). In the past only national airlines have been allowed to do this. The deregulation led to important changes in the route structures of the airlines: point-to-point networks were transformed into hub-and-spoke networks (Brueckner & Spiller, 1994). These hub-and-spoke networks consisted of passengers changing between different planes at a hub airport, finally reaching their end destination. An important rationale behind the development of such hub-and-spoke networks was the exploitation of economies of traffic density, "*… under which the marginal cost of carrying an extra passenger on a nonstop route falls as traffic on the route rises*" (Brueckner & Spiller, 1994). Now, "*… the substantial amount of flight frequencies at low-cost airport bases have created opportunities to transfer between those flights, even though flight connection services are not typically offered by the low-cost carriers themselves*" (Zeigler et al., 2017). While passenger volumes and possible destinations have increased for LCCs, FSNCs have had trouble with the increased competition, leading them to reduce or even withdraw from short-haul markets.

Even though most LCCs today are still focussing on point-to-point transport (Zeigler et al., 2017), many LCCs in Europe have undergone a process of "hybridization" which led them to adopt features that FSNCs normally offer (Suau-Sanchez et al., 2016). Some of these features are price-bundling and operating connecting flights. Thus, through hybridization, the competitive pressures FSNCs face have increased even more. The operation of connecting flights comes from a desire to capture the passengers that are already self-connecting, showing the willingness of European LCCs to respond to the demands of the self-connecting passenger (Maertens et al., 2016).

Being another important player in the self-connecting market, even some European airports have started showing the willingness to respond to the demands of the self-connecting passenger (Fichert & Klophaus, 2016). In Berlin, already in 2006 the airports had decided to facilitate self-connections through a website that displayed potential connections. Additionally, the facilitation included an insurance covering missed connections, a service for transferring between airports in Berlin and special options for stayovers. Another example of an early facilitator is Köln airport (in Germany), which started facilitating the self-connecting passenger back in 2007. Today, there are two programs for facilitating the self-connecting passenger among European airports. Those programs belong to London Gatwick Airport and Milano Malpensa. For London Gatwick, an example of facilitation includes check-in desks located inside of the baggage reclaim hall. This way, the self-connecting passenger saves time which may be crucial in terms of making it to the onward flight. Also, Gatwick offers a protected connection: a replacement ticket is offered to self-connecting passengers that miss their onward flight (Gatwick, 2018). For Milano Malpensa, an example includes a fast track at the security control, which again speeds up the process of self-

connecting through the airport. Both programs include many other forms of facilitation to make the self-connecting process as attractive as possible. Figure 1 demonstrates just how well developed the self-connecting services at Gatwick are today. Potential self-connected flights can easily be booked through their website and certain aspects of the self-connected trip can be adjusted. For instance, the amount of stops (hubs) and the connection time can be altered and many more.

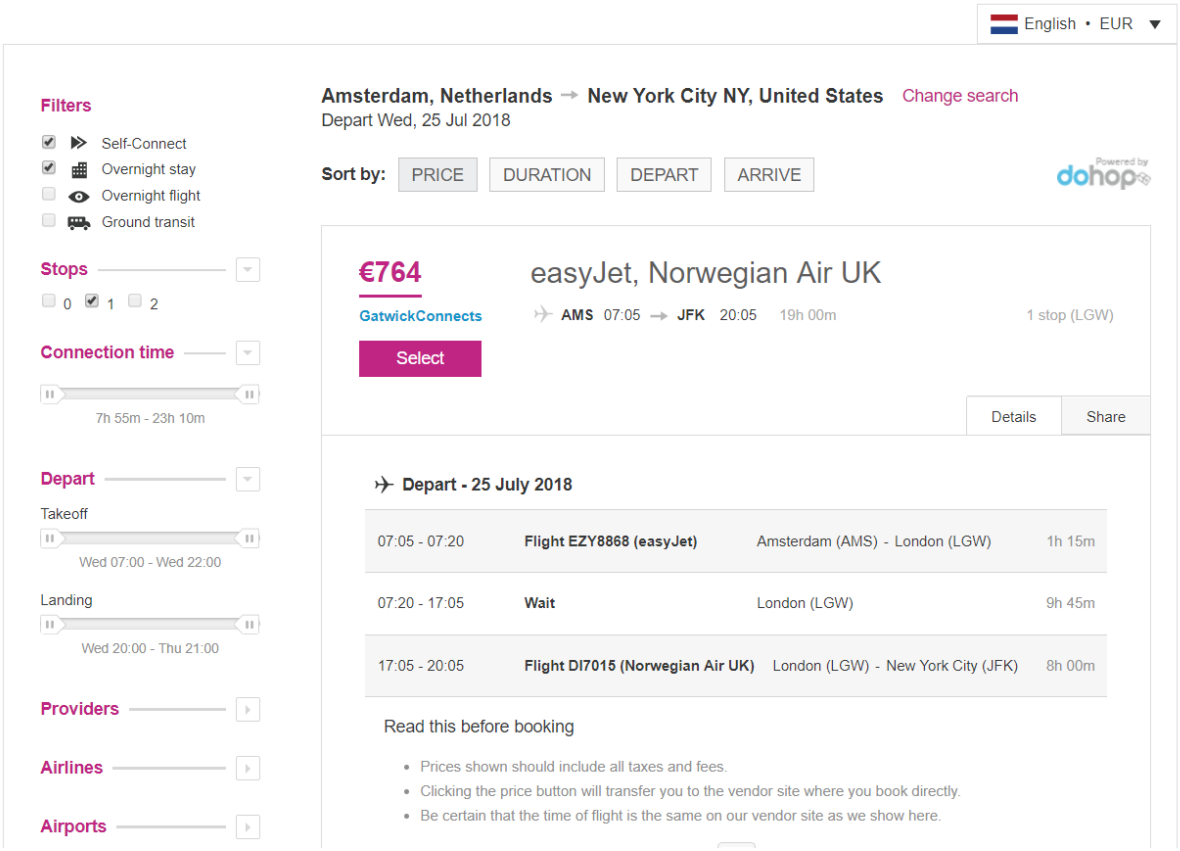


*Figure 1: Screenshot of Gatwick's self-connecting program ("Gatwick Connects") for a selected flight from Amsterdam to New York City on July 25th of 2018. Source: Gatwick Connects.*

With European airlines and even some airports having an interest to respond to the demands of the self-connecting passenger, one could wonder whether there still exists potential to profit from this market development. In response, research by Suau-Sanchez, Voltes-Dorta and Rodríguez-Déniz (2017) confirms that there is a large potential for the development of self-connectivity in Europe. Initially, the authors indicate that in the baseline scenario, 1.5% of all European holiday flights is self-connected. Also, 8.2% of all traffic involves an indirect traditional flight with a FSNC, and 90.3% is a non-stop flight. The total amount of European traffic is indicated to be 3.227.076 weekly flights and the figure below shows the weekly traffic that corresponds to the different itineraries.

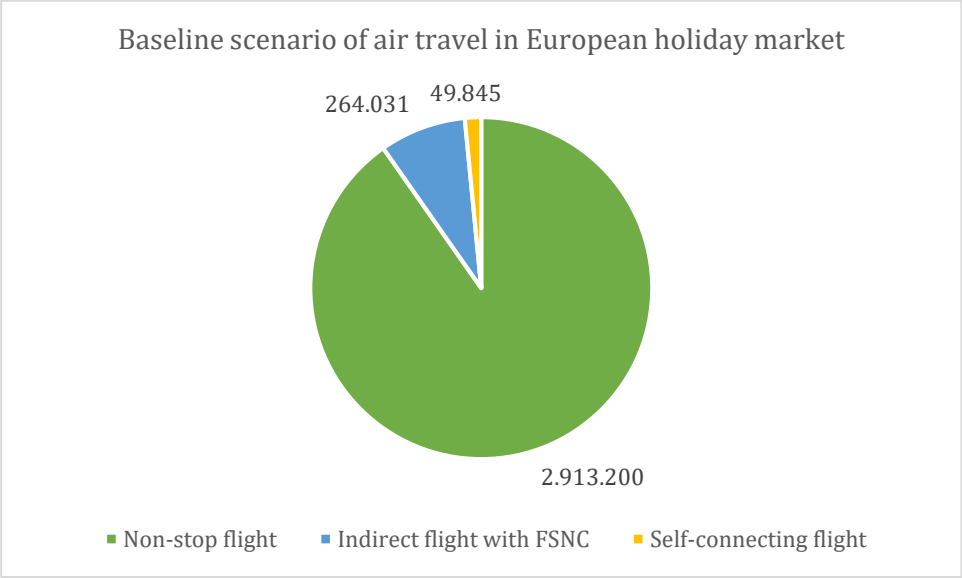


*Figure 2: Baseline scenario of air travel in European holiday market with numbers indicating the weekly traffic in number of flights. Source: Suau-Sanchez et al. (2017).*

The authors then present their development scenario, in which they remove coefficients from their equations to close the "quality" and "visibility" gap between self-connecting flights and traditional transfer flights. They thus try to represent a situation in which airports take care of the self-connecting passenger's baggage and offer insurances (to close the quality gap). Next to this, they assume that an online booking platform will be present which enables the self-connecting passenger to find a self-connected trip as easy as a normal trip, so that no extra efforts are needed (to close the visibility gap).

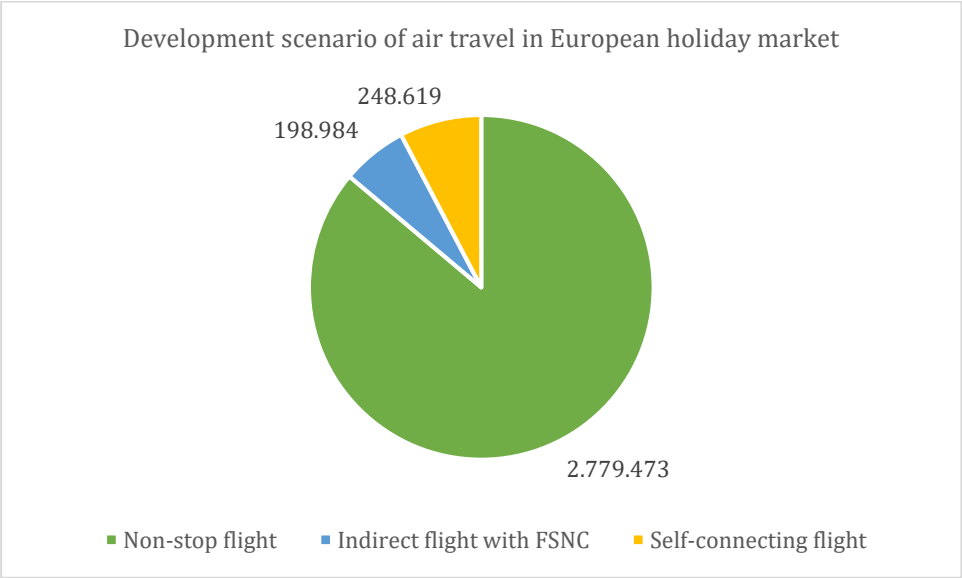

*Figure 3: Development scenario of air travel in European holiday market with numbers indicating the weekly traffic in number of flights. Source: Suau-Sanchez et al. (2017).*

In the development scenario, assuming the total weekly traffic does not change, self-connecting flights grow to 7.7% at the expense of both other forms of itineraries. In fact, self-connecting traffic will outnumber traditional connecting traffic. Thus, the results say that if self-connectivity were actively marketed, it could increase five-fold. This is evidence that the self-connecting trend is a threat for FSNCs. If certain barriers were to be overcome (and thus the quality and visibility gaps would be closed), the demand for transfer services from FSNCs would decline considerably.

I now argue that it would be needful to discover the potential barriers that hinder the support of self-connectivity. Therefore, I will define the following research question:

*What are potential barriers for airports and airlines in support of passenger self-connectivity in the European air transportation network?*

Being aware of these potential barriers is crucial for airports and airlines if they want to successfully implement a program to help the self-connecting passenger. Overcoming these barriers, that is successfully supporting those passengers, would provide substantial benefits for European airports and airlines, as I will discuss in section 1.2.

## 1.2: Relevance of overcoming barriers

First of all, airports would enjoy significant benefits, among which a greater passenger number, which leads to increased non-aeronautical revenues and ancillary revenues (Cserep, 2017). The former includes revenues from food and drinks, while the latter consists of secondary revenues such as advertising. Fichert and Klophaus (2016) align with these arguments, but add to the discussion the potential for increased passenger fees and the potential for an airport to charge airlines for flights and passengers that are booked through their self-connection program or website.

Second, airports could "*…also benefit in terms of route development, particularly if self-connections help improving the way in which short-haul low-cost frequencies feed passengers to long-haul flights, thus making international routes more sustainable in the long term* […] *and potentially developing the airports' position as international gateway*" (Suau-Sanchez et al., 2016).

More generally, existing research confirms that a good airport connectivity could bring both economic- and social benefits to cities, but also to regions (Zeigler et al., 2017).

Next, airlines would benefit too. While some additional activities may be needed, such as the operation of check-in desks close to the baggage hall, there exists potential for substantial airline benefits. As mentioned before, LCCs could increase their economies of traffic density. Furthermore, "… *even legacy carriers would benefit if they relied on LCCs as feeders and concentrated on more profitable long hauls instead*" (Maertens et al., 2016).

For both airports and airlines, the implementation of a self-connectivity program presents a valuable opportunity to enhance customer satisfaction through the facilitation of the connectivity process and minimization of possible barriers (OAG, 2016). This again points to the importance of discovering such barriers.

In short, one could certainly argue that both airports and airlines have shown interest to respond to the needs and wants of the self-connecting passenger, while at the same time existing research points to the huge potential for self-connectivity development. Moving forward, it is crucial for both airports and airlines to get a general overview of the potential barriers towards successful implementation, and this research will deliver such an overview. Today, the topic of self-connectivity received much attention, while a specific research into barriers received relatively little attention. Due to the fact that most research regarding the self-connectivity trend is centred around the European air transportation market, this research will be restricted to this market only.

The remainder of this research will be organized as follows: the methodology section will elaborate upon the selection and categorization process of barriers. Then, a literature review of potential barriers will be given, which critically argues why and how certain barriers could pose a threat and how certain barriers relate to each other. Following is the discussion and conclusion, where findings will be analysed and limitations will be discussed. Lastly, I will come up with a policy advice for airports and airlines.

## 2. Methodology

A general overview of barriers suggested by research from trustworthy journals was created. In this research, a barrier is seen as anything that hinders the implementation of a successful self-connectivity program, for all parties involved. Parties involved are the airports and airlines, but not the self-connecting passenger. To be specific, a barrier for the self-connecting passenger is regarded as a barrier for airports and airlines, since they are the ones that want to facilitate the process of self-connecting. This is exactly why this research (and its research question) focusses on barriers for airports and airlines only. Next, barriers were categorized according to their specific nature. The figure below will demonstrate the methodology of the selection and categorization process.

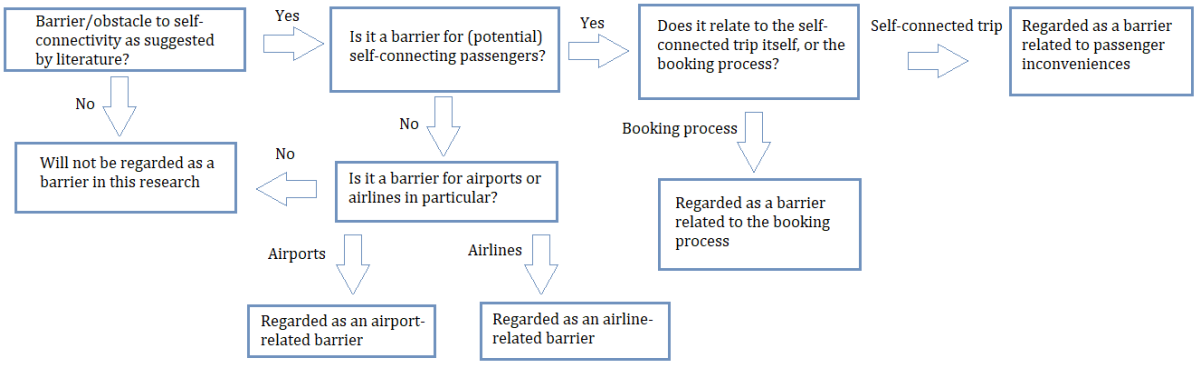


*Figure 4: Methodological approach for selecting and categorizing barriers to self-connectivity.*

Different research has conducted different types of research methods, often coming up with different types of barriers. In order to capture the potential barriers involved in the process of self-connectivity, a literature review combining several research papers will be given. Furthermore, complementary findings on potential barriers will be highlighted and if possible, potential barriers will be attenuated.

This research aims to combine existing research concerning the European air transport market only. However, some research papers regarding the global transport market were included too. If some conclusion was drawn based on the global air transport market, I decided not to include it in my research which is restricted to the European air transport market. Often, a more general research was merely used to present a clear definition or describe the general development of a trend. An exception might be present, which I will defend as follows: if in the global air transport market a potential barrier is found and there exists no reason to think why this would not be a barrier in the European air transport market, I decided to include it. However, if a barrier in the

global market was already identified in the European market, it was not included. If applicable, a clear distinction between barriers identified in the global market and in the European market will be made.

## 3. Literature review

While a clear focus on the theme of barriers is still absent, existing research has pointed out relevant barriers for airlines and airports in the support of self-connectivity. Below, I will elaborate upon those barriers.

### 3.1: Passenger inconveniences

As one could expect, the process of connecting between flights yourself is often more laborious than the process of being connected by an airline or airport (or third party in general) and requires additional efforts from the passenger at the hub airport. Not surprisingly, Fichert and Klophaus (2016) argue that the risk of missing a connection is a potential barrier for the self-connecting passenger. If for example the first flight (or any other non-final flight) is cancelled or delayed, a critical connection could be missed. The fact that a self-connecting passenger may have to go through security and other queues again at the hub only slows down the process of self-connecting (Fichert & Klophaus, 2016). EU air passenger rights entitle passengers to a reimbursement or other form of compensation such as a return flight, if their flight were to be delayed or cancelled (Your Europe, 2018). Still, chances are those passengers would miss their critical connection at the hub to their onward flight. Thus, they would have to rebook, experiencing increased costs and distress. A survey by OAG (2016) indeed confirms that passengers are primarily concerned that they would miss a connecting flight and not be automatically rebooked.
On the other hand, Maertens et al. (2016) attenuate this barrier by arguing that insurance premiums can offset the risk of a missed connection. This way, if a missed connection were ever to occur, the self-connecting passenger would be covered and would not have to experience increased costs. Next to offering these insurances, the authors show that air-side pathways can ensure that the self-connecting passenger could stay air-side, thereby speeding up the process of self-connecting. They demonstrate an example for Düsseldorf airport, which introduced such pathways.

Next to the risk of missed connections, much uneasiness lies in the fact that the self-connecting passenger has to make sure his baggage is successfully transferred between flights at the hub (Fichert & Klophaus, 2016). Indeed, survey results suggest that 21% of travellers were primarily concerned that their baggage would not make it to the final airport, if they were ever to choose for a self-connected trip. These concerns could potentially lead to passengers refraining from a self-connected trip.

This so called “baggage through-check” problem might occur at the airport of origin, if the airlines check-in system does not have access to the onward flight (Maertens et al., 2016). This would mean that at the hub airport the self-connecting passenger would have to reclaim the baggage from the baggage hall, after which the passenger would have to check-in his baggage for the onward flight. Next to this, the problem occurs at the hub airport, due to inexperienced airports having problems with the baggage transfer. Both instances align closely with the missed connections barrier. After all, if re-checking your baggage takes up too much time, a critical connection could be missed. This baggage transfer barrier could thus lead to the missed connection barrier. Also, if an airport fails to successfully transfer the baggage between flights, chances are the self-connecting passenger will decide not to attend the onward flight, if he knows his baggage is not successfully transferred yet.

For passengers travelling with hand-luggage only, however, this barrier turns out to be less crucial (Maertens et al., 2016; OAG, 2016), as passengers would never lose sight of their baggage. Indeed, in this case passengers turn out to be more willing to self-connect. Also, current operations at Gatwick use a luggage checker for the self-connecting passenger, which reduces the uncertainty self-connecting passengers have regarding their baggage. This way, chances are that passengers are more likely to choose for a self-connected trip. Furthermore, self-connecting passengers are protected by European regulations that enforce airlines to compensate passengers if their baggage were to be lost, damaged or delayed (Your Europe, 2018), again making the process of self-connecting less unattractive. Still, delayed baggage would lead to a risk of missed connections.

Finally, in some countries (such as the UK) a passenger tax or passenger charge is levied (Fichert & Klophaus, 2016). While the taxes aim to raise government revenues, the passenger charges exist to improve airport facilities or services (IATA, 2009). The time at which the fee is collected, for instance at the time of ticket sale or at the time of arrival, differs between instances. Transfer passengers are sometimes exempted from paying such a fee, under certain conditions such as staying at the hub airport for no longer than 24 hours. In other instances, there exists a transfer charge that those passengers are liable for. Regardless, self-connecting passengers usually pay a higher fee, making their total journey more expensive and thus less interesting. This barrier could be connected with the missed connection barrier, as paying a passenger tax or charge is again a process that slows down the self-connecting passenger at the hub.

This problem cannot simply be overcome by airports and airlines. After all, airports cannot just decide to exempt all self-connecting passengers from the tax, as airports only have limited influence on government regulations. In the EU only 10 countries manage some form of passenger tax (PWC, 2017), but those countries could be regarded as relatively popular holiday destinations (such as Greece and Italy), stressing the importance of this barrier.

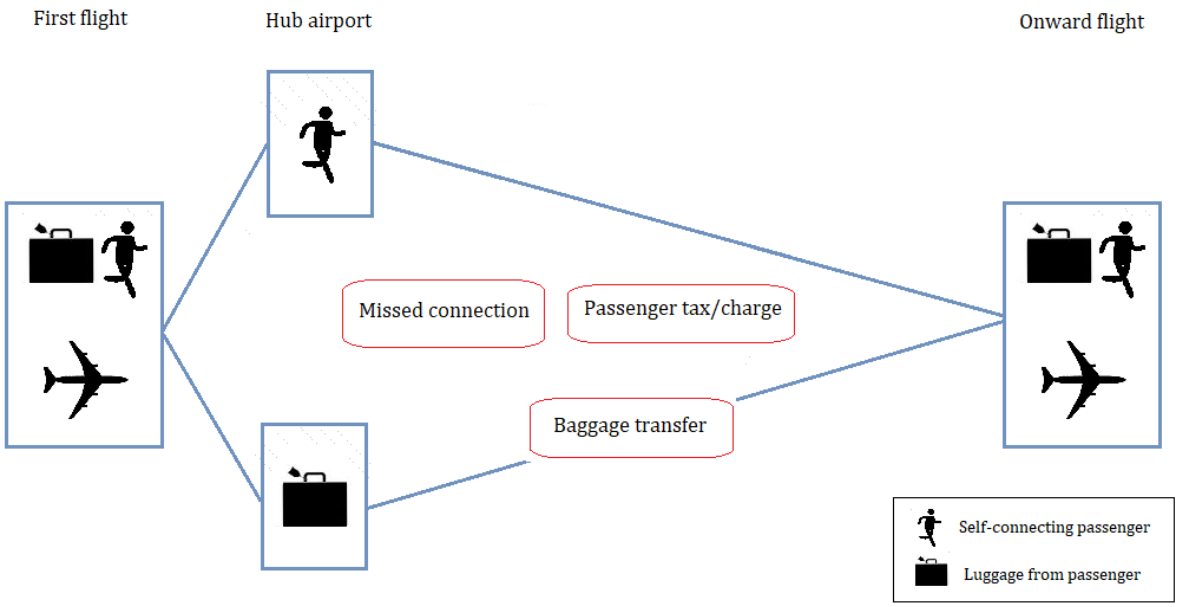


*Figure 5: Overview of a self-directed trip involving one hub airport and inconveniences involved for the self-connecting passenger indicated in red.*

Figure 5 depicts the process of self-connecting through one hub and shows passenger inconveniences involved as discussed in section 3.1. A self-connecting passenger and its baggage arrive at a hub in the same airplane. Then, the passenger and its baggage are separated, leading to potential barriers involved in the process. One could imagine that if a self-connected trip were to involve multiple transfers (multiple hub airports), the process of self-connecting would become even more laborious and less attractive, as the probability of a missed connection increases, multiple baggage transfers would have to be made and the passenger is due more taxes or charges.

## 3.2: The booking process

Next to all the physical hassle involved in a self-connected trip, one could argue that the self-connecting booking process requires additional efforts from potential passengers, as compared to the efforts involved in a normal booking process.

First, finding a favourable combination is a relatively complicated task. Initially, 22% of surveyed travellers indicate that they do not even know where to start when booking a self-connected trip (OAG, 2016). Next to this, a favourable combination of stand-alone flights has to be booked and it might occur that after booking the first flight, pricing or availability of the second flight might change (Fichert & Klophaus, 2016). After all, a self-connected trip only works if all actors are in place. Directly aligning with the missed connection barrier, a simple delay of the first flight could

disrupt the complete self-connected trip. In many cases a good connection via a hub can only be acquired for either the inbound or the outbound trip (Maertens et al., 2016). This is described as the "unidirectionality" problem, where LCC routes are only intended for one-way traffic. This way, combining flights for a favourable self-connection is a relatively complicated process since stand-alone flights in no way take into account any change in circumstances from another stand-alone flight. "*With a vast array of hubs, airlines and online search tools, finding the time to research and uncover the best self-connecting flight schedule is a hurdle for many travellers*" (OAG, 2016). When this hurdle of time and effort to find a good combination of flights outweighs the potential for cost savings, the target group will probably not choose for a self-directed trip.

Second, the potential self-connecting passenger is usually not aware of a facilitating platform at a potential hub-airport (Maertens et al., 2016), adding to the complexity of the booking process. As an example, "*How should someone wishing to travel from Pisa to Gdansk come up with the idea of searching for a suitable flight on the website of Cologne/Bonn airport?*" (Maertens et al., 2016). See figure 1 for an actual example. This is described as the "passenger unawareness" problem and is a barrier to a self-connected trip.

If airports and airlines were to address these barriers, they would have to inform passengers and decrease the extra efforts potential self-connecting passenger would have to undergo. The combining process of multiple standalone flights would have to be facilitated and awareness about airport-managed connections would have to be spread among potential self-connecting passengers. Existing research concludes that airports and airlines alone are not capable of doing just this: help from a third party will be needed (Cattaneo et al., 2017). This way, a complex collaboration between multiple parties will ensure that market opportunities are further exploited.

## 3.3: Airport-related barriers

### 3.3.1: Barriers in the European air transport market

Research identifies some barriers specific to airports in Europe. Complementary to the baggage through-check problem at a hub airport, where airports have troubles with the baggage transfers, are findings by Suau-Sanchez et al. (2017). The authors present some airport-specific indicators regarding the complexity of the implementation of a self-connecting program in Europe and present the share of self-connecting bookings that would require an inter-terminal transfer as such an indicator. This indicator signals the disruption that would be caused by implementing self-connecting services. If an airport decides to start facilitating the self-connecting passenger, its current infrastructure and resources could lack the capability to

handle the increased pressures on transfer handling. The authors present a top-25 airports according to self-connectivity in Europe, in which proportions of self-connections that require an inter-terminal transfer range from 0.0% to 93.9%. Below, a table indicates some of those airports, together with the amount of self-connections and their share of self-connections that would need an inter-terminal transfer at the airport. Furthermore, total passenger numbers and total connections are shown for each airport.

*Table 1: Four airports taken from top-25 airports in Europe according to self-connectivity in the baseline scenario. Self-connections are reported as weekly traffic. Self-connections with inter-terminal transfer are rounded to integers. All data are from 2014. Source: Suau-Sanchez et al. (2017) and ACI Europe (2018).*

| Airport | Total passenger number | Total connections | Self-connections | Inter-terminal share | Self-connections with inter-terminal transfer |
|---|---|---|---|---|---|
| London Gatwick | 38.117.322 | 4049 | 2605 | 46.4% | 1209 |
| Barcelona | 37.540.326 | 11.864 | 2379 | 22.2% | 528 |
| Paris CDG | 63.813.756 | 10.333 | 1103 | 93.9% | 1036 |
| Palma de Mallorca | 23.112.700 | 4265 | 1030 | 0.0% | 0 |

According to the authors, these rates are significant for the implementation of self-connectivity services since airport operations should be able to incorporate additional inter-terminal transfers. As an example, Paris-Charles de Gaulle would have to incorporate 1036 additional inter-terminal transfers every week if self-connectivity were to remain as it is now. This represents an increase of approximately 10% in total connections. Now, the development scenario is shown in the table below.

*Table 2: Four airports taken from top-25 airports in Europe according to self-connectivity in the development scenario. Self-connections are reported as weekly traffic. Self-connections with inter-terminal transfer are rounded to integers. All data are from 2014. Source: Suau-Sanchez et al. (2017) and ACI Europe (2018).*

| Airport | Total passenger number | Total connections | Self-connections | Inter-terminal share | Self-connections with inter-terminal transfer |
|---|---|---|---|---|---|
| London Gatwick | 38.117.322 | 12.503 | 11.365 | 47.3% | 5376 |
| Barcelona | 37.540.326 | 23.173 | 13.480 | 22.8% | 3073 |
| Paris CDG | 63.813.756 | 11.938 | 6348 | 93.8% | 5954 |
| Palma de Mallorca | 23.112.700 | 9452 | 6354 | 0.0% | 0 |

Because the share of self-connections that require an inter-terminal transfer do not change considerably between the scenarios, the results thus indicate that if self-connectivity were to develop, significant additional inter-terminal transfers would have to be incorporated in airport operations. Paris-Charles de Gaulle would now have to handle an increase of approximately 50% in total weekly connections.

On the other hand, the authors attenuate their claim by arguing that the "… *variability across airports, however, suggests that the self-connecting fees charged to the passengers could be different depending on the size and complexity of the airport's terminal layout, with the objective to reflect any differences in operating cost associated to the self-connection"* (Suau-Sanchez et al., 2017). Also, airports could bring airlines involved in self-connectivity closer together in the terminal. Furthermore, smart pathways could be used. This way, flights would be brought closer together which would mean that passengers would have to walk shorter distances and baggage transfers might happen faster.

Another barrier for airports in Europe lies in the dependence on LCCs and airlines in general. Generally, the amount of airlines that sign up for the self-connecting program of an airport determine the success of that program (Suau-Sanchez et al., 2016). After all, a low amount of airlines involved would by definition result in a low amount of potential indirect connections. This way, fewer potential self-connecting passengers would be targeted. For the European case, research stresses the importance of LCC presence at an airport for the implementation of a self-connecting program (Malighetti et al., 2008; Fichert & Klophaus, 2016; Suau-Sanchez et al., 2016; Suau-Sanchez et al., 2017). "*In general, LCC-dominated airports benefit from larger increases in self-connecting traffic in the development scenario*" (Suau-Sanchez et al., 2017). To be

specific, the authors argue that a high LCC presence would result in higher inline connectivity (between the same airlines), from which the implementation of self-connectivity services would benefit. After all, interline negotiations would then be less important. Thus, in the European air transport network, the presence of LCCs at airports allows for the success of a self-connecting program. As an example, research shows that Frankfurt, with its lack of LCC traffic, has had leakages in traffic towards other hubs with superior travel options.

### 3.3.2: Barriers in the global air transport market

This research also identifies an additional barrier from existing research into the global air transport market.

Suau-Sanchez et al. (2016) stress the importance of geographic location of an airport in arguing that "betweenness centrality" had the largest impact on self-connection potential in their regression results, next to the number of available flight connections. The variable betweenness centrality measures the share of worldwide flight-pairs for which the airport lies in the shortest path. "*Airports that lie in a high proportion of shortest-path itineraries between other airports will generate more opportunities for passengers to build attractive travel itineraries on their own*" (Suau-Sanchez et al., 2016). Below, a simple air transport network with 4 airports is shown. Using the argumentation above, we observe that airport D has a higher betweenness centrality than the other airports, giving the airport a greater potential for self-connectivity.

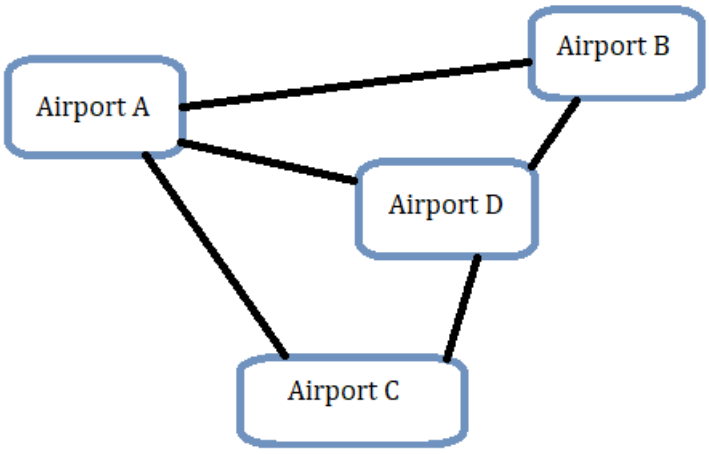


*Figure 6: Simple air transport network with 4 airports: A, B, C and D. Airport D has a higher betweenness centrality than the other airports.*

One could now argue that a potential barrier, also for European airports, lies in an unfavourable geographic location, for it would mean that there will be less opportunity to create indirect links and thus self-connectivity potential will be low at this airport.

In order for airports to address this barrier, they would have to improve on their central position within the air transport network, which is a thing they have no control over. Rather, the betweenness centrality in a transport network of an airport is a given fact which positively or negatively influences self-connectivity potential.

### 3.4: Airline-related barriers

Using the methods from this research, no barriers specific to airlines were identified.

### 3.5: Overview of potential barriers

Below, an overview of potential barriers to self-connectivity is given in table 3. The table combines the findings from sections 4.1 through 4.4.

*Table 3: Overview of barriers to self-connectivity as suggested by literature.*

| Barrier category | Barrier | Mentioned by |
|---|---|---|
| | | |
| Passenger inconveniences | Missed connection | Fichert & Klophaus (2016), Maertens et al. (2016), OAG (2016), Zeigler et al. (2017) |
| | Baggage transfer | Fichert & Klophaus (2016), Maertens et al. (2016), OAG (2016), Zeigler et al. (2017) |
| | Passenger tax or charge | Fichert & Klophaus (2016) |
| | | |
| The booking process | Finding favourable combination | Fichert & Klophaus (2016), Maertens et al. (2016), OAG (2016) |
| | Passenger unawareness | Maertens et al. (2016) |
| | | |
| Airport-related barriers | Inter-terminal transfers | Suau-Sanchez et al. (2016), Suau-Sanchez et al. (2017) |
| | Dependence on airlines | Fichert & Klophaus (2016), Malighetti et al. (2008), Suau-Sanchez et al. (2016), Suau-Sanchez et al. (2017) |
| | Geographic location | Suau-Sanchez et al. (2016) |
| | | |
| Airline-related barriers | None | None |

# 4. Discussion and conclusion

## 4.1: General discussion and concluding remarks

After establishing that European airports and airlines have started showing interest to respond to the demands of the self-connecting passenger, existing research was brought up which confirmed the potential for self-connectivity development in Europe. This way, I have argued that an overview of potential barriers towards self-connectivity support would be needed for airports and airlines involved. After all, the relevance of overcoming such barriers was great: substantial airport and airline benefits could be enjoyed, if a successful self-connectivity program was to be implemented. This research thus aimed to find potential barriers in support of passenger self-connectivity in Europe, in which it regarded barriers for passengers as barriers for airports and airlines since they are the ones that aim to facilitate the passengers.

Three general barriers related to passenger inconveniences were identified in this research. All three of them turned out to be interrelated, as the baggage transfer barrier and the passenger tax or charge barrier both have the potential to slow down the self-connecting process at the hub.

Next, barriers related to the booking process were discussed. It turned out that a self-connecting booking process requires additional efforts from a passenger. Finding a favourable combination of standalone flights is a laborious process due to the unidirectionality problem and complementary to this, a passenger unawareness barrier exists that makes the complete booking process for a self-connecting passenger even more complex.

Also, barriers specific to airports were discussed, in which a distinction was made between those identified in the European market and in the global market. Both the inter-terminal transfer barrier and the dependence on airlines barrier were identified in the European air transport market, while a more general geographic barrier was regarded as also being relevant for European airports.

Finally, no barriers specific to airlines were identified in existing literature.

In total, eight barriers were identified for airports and airlines as something that hinders the implementation of a self-connectivity program. Five of them were a barrier for the self-connecting passenger itself, while three of them were directly related to the airport and its operations.

## 4.2: Limitations of this study and further research

This research does have some limitations which I will discuss.

First, regression results from Suau-Sanchez et al. (2016) regarding their measure of betweenness centrality should be interpreted with caution, as the regression is likely to exhibit some form of bias (such as omitted variables). Even though the authors used control variables, such as country fixed effects, there might still be other drivers to self-connecting potential not accounted for in

their regression. This way, the effect of betweenness centrality on self-connecting potential is probably not the true effect.

Second, one could question whether OAG's survey from 2016 is really representative for potential European self-connecting passengers. The size of their sample is less than 3000 people (n < 3000) and the origin of the respondents is not listed (so probably not all Europeans). It could certainly be the case that Europeans alone behave much less sceptical towards baggage handling (as an example) in a self-connected trip, thereby making the results from this research less convincing. Maybe some barrier in the global transport market turns out not to be a barrier in the European transport market, for self-connecting passengers.

Third, the research by Suau-Sanchez et al. (2017), from which two airport-related barriers were identified, focusses on air transport routes from the European Economic Area (EEA) to destinations in the Mediterranean during the first week of June 2014. Thus, an overview of the holiday market is given by this research. However, one could argue that the European holiday market is a subgroup of the total European air transport market. For instance, business travellers that self-connect are not taken into account this way (unless they would coincidentally be travelling to the Mediterranean for business). In order to get a complete overview of potential barriers related to self-connectivity, one should consider the total European air transport market.

Further research into the topic of self-connectivity barriers could elaborate upon shortcomings. A research into the European market only should be conducted in order to fully capture the needs and wants of potential self-connecting passengers. At this stage, a worldwide survey by OAG with less than 3000 respondents is probably not representative enough. Also, a more complete overview of the European air transportation market could be given if future research were to consider other self-connections (next to only the holiday trips). Lastly, as this research did not identify barriers specific to airlines, further research could closely investigate airline operations and consider if maybe all airline-related barriers are ones that originate from passenger inconveniences and the booking process or if maybe there exist barriers specific to airlines and their operations after all.

### 4.3: Policy advice to airports and airlines

Current operations at airports, such as Gatwick, seem to be aware of some of the identified barriers. With the help of smart pathways, insurances against missed connections, a dedicated website for self-connections and security lanes (and more), those airports try to overcome barriers such as the missed connection barrier, the baggage transfer barrier, and the barrier of finding a favourable combination (relating to both passenger inconveniences and the booking process). There still remains room for improvement, as this research has identified some barriers

that those airports may or may not be aware of. I want to advise airports and airlines to be aware of a potential barrier related to passenger inconveniences: the passenger tax or charge. Also, I want to make them aware of the passenger unawareness barrier and improve their marketing strategies to make those (potential) self-connecting passenger more aware. Finally, I want to advise airports to be aware of three potential barriers that relate directly to them: an increased pressure on inter-terminal transfers, a dependence on airlines (and LCCs in particular) and an unfavourable geographic location. Regarding the increased pressure on transfers, airports might want to consider redesigning their infrastructure in order to cope with those pressures better. While airports cannot alter their location in the air transport network, they should aim to make their airport more attractive as opposed to another airport with a higher betweenness centrality. Potential self-connecting passengers might accept a small detour if the hub airport involved would be much more interesting to travel through.

## 5. References


ACI Europe (2018). Top 30 European airports – 2017. Retrieved from https://www.aci-europe.org/policy/position-papers.html?view=group&group=1&id=11

Brueckner, J. K., & Spiller, P. T. (1994). Economies of traffic density in the deregulated airline industry. The Journal of Law and Economics, 37(2), 379-415.

Cattaneo, M., Malighetti, P., Paleari, S., & Redondi, R. (2017). Evolution of the European network and implications for self-connection. Journal of Air Transport Management, 65, 18-28.

Cserep, K. (2017). Win or Lose: The Airport Opportunity in the Growing Self-Connecting Passenger Market. Retrieved from https://www.icf.com/resources/white-papers/2017/growing-self-connecting-passenger-market

Fichert, F., & Klophaus, R. (2016). Self-connecting, codesharing and hubbing among European LCCs: From point-to-point to connections?. Research in Transportation Business & Management, 21, 94-98.

Gatwick (2018). Gatwick Connects. Retrieved from https://www.gatwickairport.com/at-the-airport/flying-in/gatwickconnects/

IATA (2009). IATA LIST OF TICKET AND AIRPORT TAXES AND FEES. Retrieved from http://clacsec.lima.icao.int/2016-P/Estudios/IATA-tax.pdf

Maertens, S., Pabst, H., & Grimme, W. (2016). The scope for low-cost connecting services in Europe—Is self-hubbing only the beginning?. Research in Transportation Business & Management, 21, 84-93.

Malighetti, P., Paleari, S., & Redondi, R. (2008). Connectivity of the European airport network: "self-help hubbing" and business implications. Journal of Air Transport Management, 14(2), 53-65.

OAG (2016). Self-connection: The rise and roadblocks of a growing travel booking strategy. Retrieved from http://www.oag.com/self-connection

PWC (2017). The economic impact of air taxes in Europe: European Economic Area. Retrieved from https://a4e.eu/wp-content/uploads/2017/10/The-economic-impact-of-air-taxes-in-Europe-EEA-1.pdf

Suau-Sanchez, P., Voltes-Dorta, A., & Rodríguez-Déniz, H. (2016). Measuring the potential for self-connectivity in global air transport markets: Implications for airports and airlines. Journal of Transport Geography, 57, 70-82.

Suau-Sanchez, P., Voltes-Dorta, A., & Rodríguez-Déniz, H. (2017). An assessment of the potential for self-connectivity at European airports in holiday markets. Tourism Management, 62, 54-64.

The Economist (1997). Freedom in the air. Retrieved from https://www.economist.com/node/146627

Your Europe (2018). Air passenger rights. Retrieved from https://europa.eu/youreurope/citizens/travel/passenger-rights/air/index_en.htm

Zeigler, P., Pagliari, R., Suau-Sanchez, P., Malighetti, P., & Redondi, R. (2017). Low-cost carrier entry at small European airports: Low-cost carrier effects on network connectivity and self-transfer potential. Journal of Transport Geography, 60, 68-79.