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Air Passenger Tax Case Studies
Ireland, Italy and Netherlands

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Contents

Executive Summary

These case studies are part of a broader set of reports commissioned by Airlines for Europe in which PricewaterhouseCoopers LLP (PwC) provide an independent overview of the current air passenger taxes in Europe and an assessment of their economic impact.

In these case studies we are interested in analysing the impact of (i) the abolition of the Irish air travel tax (ii) the temporary increase in the Addizionale Comunale, and (iii) the introduction and abolition of the Dutch air passenger tax. For the case of Ireland, we perform a type of econometric evaluation known as the synthetic control method in order to establish at what level Ireland's passengers numbers would have been had the air travel tax not been abolished.

Our analysis suggests that there were as many as 2.1 million (7.5%) additional passengers in Ireland for the year 2015 as a result of the abolition, equivalent to 1.1 additional arrivals, of which approximately 610,000 would have been additional overseas tourists. The associated additional tourist expenditure is estimated to be €242 million, which scales up to as much as €726 million if we take into account the induced and catalytic effects on GDP. This is a high return on abolishing a tax that raised around €116 million per annum upon its introduction.[1]

Due to data limitations we were not able to apply the same methodology to Italy.[2] However since Italy and Ireland had a relatively similar tax and aviation market we decided it was reasonable to project the change in passenger numbers found in Ireland onto Italy. This methodology suggests that the temporary increase in the Addizionale Comunale reduced departure by 1.05 million (1.7%) in the 9 months between January and September 2016. The fact that Ireland experienced such a large proportional change reflects the fact that the impact is largely driven by airlines rerouting their flights to countries with lower tax burdens, as this had yet to really take hold in the 9 months of the temporary tax increase.

For the case of the Netherlands we were not able to empirically determine the effect of abolishing the Dutch air passenger tax had on the aviation sector, as the tax coincided with the financial crisis. Nevertheless, we draw on evidence from the individual country reports which suggests that the benefits to abolition are closely linked to the relative size of the tax. In all the countries that had a higher passenger tax rate than the Netherlands (UK and Greece) our modelling suggested that the economic benefits to abolishing passenger tax were disproportionately large compared to other countries. As such, it stands to reason that the abolition of the Dutch air passenger tax was similarly impactful.

The remainder of this document is set out as follows. Chapter 1 constructs a Synthetic Control to determine the impact of the abolition of the Air Travel Tax on passenger numbers in Ireland. Chapter 2 reviews the available data on the effect of the increase and decrease of the Addizionale Communale and models its impact on passenger numbers, while Chapter 3 analyses the impact of the introduction and abolition of an air passenger tax in the Netherlands.

[1] Veldhuis & Zuidberg 2009, *The Implications of the Irish Air Travel Tax*
[2] Italy reduced its tax in September 2016, so there was a lack of data following the treatment.

Chapter 1: Ireland

Context

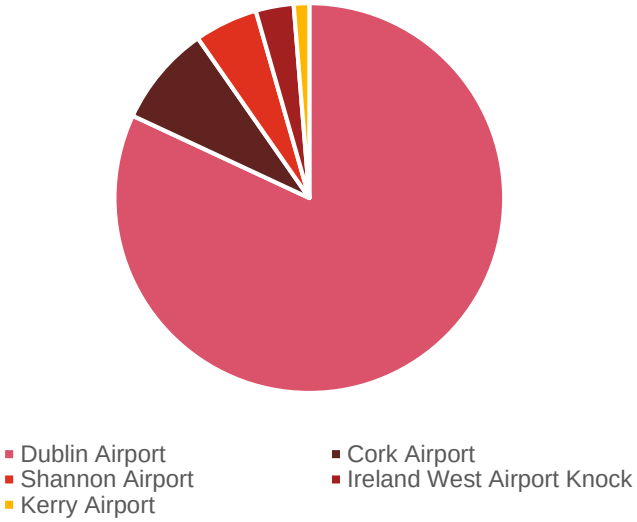
Ireland's air transport sector

Ireland's aviation sector contributes more than €4 billion to Irish GDP each year and employs more than 54,000 people.[3] The sector contributes directly through the output of airlines and airports, as well as indirectly through the supply chain and expenditure of employees. IATA reports that the aviation sector also leads to significant catalytic effects through tourism, which adds a further €5.3 billion to GDP, raising the gross contribution of the industry to €9.4 billion or 5.9% of GDP. [1] These catalytic effects also increase employment supported by the aviation sector to more than 117,000, with the average employee in the sector 40% more productive than the Irish average.

More than 32.5 million passengers travelled to, from, or within Ireland in 2016 on more than 240,000 flights. This is the highest number of passengers carried since 2008, as the financial crisis and the introduction of the Air Travel Tax weighed on the industry, with a significant drop in passenger numbers between 2008 and 2010 before returning to growth thereafter. Nearly 28 million passengers in 2016 travelled to or from destinations in the European Union, around 85% of the total.[4] This ratio that has remained relatively stable over time, increasing marginally around the turn of the decade.

Ireland has 5 major airports.[5] Of these airports, the vast majority of passengers (around 82%) fly through Dublin, which is Ryanair's primary operational base alongside London Stansted. Its most popular destination is London, with UK airports making up its top three destinations. The airport also serves long-haul passengers, although the market for this is much smaller, with New York the most popular destination outside of Europe.

Figure 1: Breakdown of passengers in Ireland by airport



Ireland's Air Travel Tax

The Irish Air Travel Tax (ATT) was announced in October 2008 and became effective on 30th March 2009. The tax was applicable to all departures from airports in Ireland that had more than 50,000 departures, and was set at €2 per passenger on short haul flights (under 300km from Dublin airport) and €10 per passenger on long haul flights (over 300km from Dublin Airport). These rates were changed on 1st March 2011 to a flat rate of €3 per passenger, before being zero-rated in April 2014.

The introduction of the tax was poorly received, with Aer Lingus suing the Irish government for €61m over the introduction.[6] Its implementation was also investigated by the European Commission under state aid rules, on the basis of the difference between short-haul and long-haul flights and the exemption of transit and transfer passengers.

[3] IATA, 2011: https://www.iata.org/policy/Documents/Benefits-of-Aviation-Ireland-2011.pdf
[4] Eurostat data, accessed 15/09/2017.
[5] A major airport is defined as any airport which from which more than 1% of total air passengers depart.
[6] Irish Independent, 2013: http://www.independent.ie/business/budget/air-travel-tax-binned-to-boost-tourism-traffic-29662885.html

The tax formally remains in place, albeit zero-rated. In early 2017, the Irish Finance Minister suggested that the tax could be reintroduced, under the belief that the air travel industry may be undertaxed.[7]

Analysis

Previous studies

Research commissioned by Aer Lingus, Ryanair and Cityjet in 2009 estimated the Air Travel Tax reduced the number of departing passengers by between 0.5 and 1.2 million in the first full year,[8] with a further study by Ryanair suggesting that traffic at the main Irish airports declined by 7 million between 2008 and 2012, from 30.5 million to 23.5 million.[7]

The resulting reduction in passenger numbers impacted airlines and airports, as well as the wider economy through the tourism industry. The study suggested that due to the competitive nature of the aviation industry, airlines would have to absorb the cost of the tax, rather than passing it on to the consumers, causing airlines to redeploy resources and increase investment in other, lower cost, countries. [6] According to the study, this reduced investment and the associated fall in passenger numbers would lead to direct job losses of between 2,000 and 3,000 as well as a decline in revenue across a number of sectors within the Irish economy. The fall in revenue across these sectors was forecast to be greater than the amount of tax expected to be collected from its introduction, with the negative impact compounded by lower revenues from income tax, corporate tax, and VAT, minimising any net positive effect the introduction of the tax may have.

Despite airlines absorbing much of the cost, fares fell following the abolition of the tax, restoring the competitiveness of the sector compared to other markets. Officials have stated, however, that it may be reintroduced if the cut did not lead to sufficient investment. Following the announcement of the abolition, Ryanair said it aimed to increase its traffic at Irish airports by one million passengers per year.[9] By 2015, passenger numbers increased by 3.3m to 29.8m in 2015, with Ryanair responsible for 70% of this growth by adding more flights and routes.[10]

[7] Irish Times, 2017: https://www.irishtimes.com/news/politics/noonan-raises-prospect-of-reintroducing-air-travel-tax-1.2962887
[8] Veldhuis and Zuidberg, 2009: https://www.ryanair.com/doc/news/2009/irish_air_travel_tax.pdf
[9] BBC, 2013: http://www.bbc.co.uk/news/world-europe-24556448
[10] Reform Scotland: https://reformscotland.com/wp-content/uploads/2016/08/The-case-against-Air-Passenger-Duty-August-2016.pdf

Figure 2: Monthly passenger numbers (departures only) in Ireland

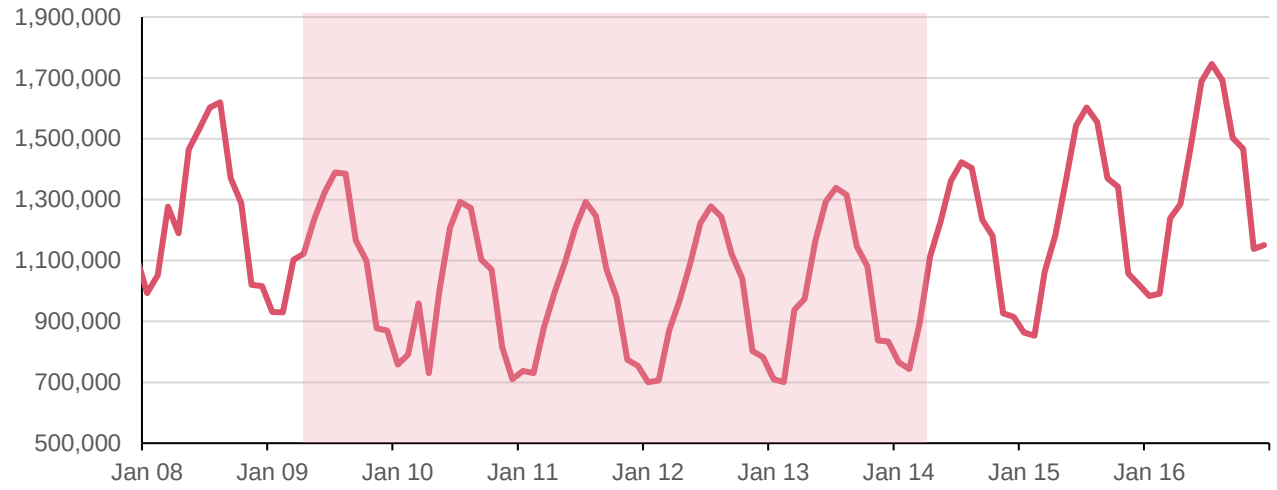


Figure 3: Deseasonalised (monthly) passenger numbers (departures only) in Ireland

Figure 4: Year on year change in monthly passenger numbers (departures only) in Ireland

The above figures provide an initial sense check on the conclusions drawn by previous studies. Consistent with the studies, Figure 2 and Figure 3 show passenger numbers declining following the introduction of the tax in March 2009. This decline was steepest in the period immediately following the introduction of the tax. The decline then tapers off after the tax was reduced in March 2011. This is particularly apparent in Figure 4, which shows that there was a few years of negative growth following the introduction of the ATT, followed by consistent growth of around 10% in the years following the abolition of the tax. It should be noted that the sharp drop of 35% in April 2010, as seen in Figure 4, is due to volcanic ash and cannot be attributed to the introduction of ATT.

Random events like the eruptions of Eyjafjallajökull create noise which obscure patterns in the data. Econometrics can help to determine when it is right to attribute specific trends to specific events. By controlling for countervailing factors, econometric models seek to find true causal relationships between variables. For example, econometrics can be used to determine the extent to which the decline in April 2011 is in fact due to the introduction of ATT. Conversely, econometrics can help to determine the extent to which the abolition of ATT in 2014 increased passenger numbers. In the following section we attempt the latter. We do so using an econometric technique known as the Synthetic Control Method (SCM), first popularised by Abadie et al. (2007).[11] The method is highly regarded in policy research and has been used to evaluate outcomes in areas such as health, international development and political science. PwC has previously applied SCM in the aviation sector in an overview of air transport gaps in the CESE region.[12]

Synthetic Control Method

Synthetic Control Method is an econometric technique designed to evaluate the impact of a "treatment" on an "outcome". In this case, we have employed the method to evaluate the impact that abolishing Air Travel Tax (the treatment) had on the number of air passengers in Ireland (the outcome).

SCM is borne out of another econometric method known as Difference-in-Differences (DiD). Like SCM, DiD is used to calculate the effect of a treatment on a particular outcome. The DiD approach compares a treatment group (i.e. country/countries that had a tax cut) to a control group (i.e. countries that did not receive a tax cut). For DiD to be a viable approach, it requires the data relating to the treatment and control group to display comparable properties (e.g. flight frequency, balance of short-haul and long-haul destinations etc.). This is known as the "parallel trend assumption." The parallel trend assumption is important as it allows the effects of the abolition to be isolated and not clouded by other outside factors that could influence passenger numbers. If the parallel trend assumption were to hold we could simply compare passenger numbers in Ireland with the comparable group before and after the abolition of ATT. The difference in passenger numbers between the two groups is the "treatment effect", which in this case would be the effect of the abolishing ATT on passenger numbers.

A detailed examination of the passenger numbers in potential comparators to Ireland reveals that the parallel trend assumption does not hold. This is not uncommon in these types of analysis. In such circumstances it is possible to apply the SCM. The SCM approach is as the name implies. An artificial or 'synthetic' control group is constructed using the combination of other countries that best aligns with Ireland and allows the parallel trend assumption to hold. The synthetic control thus comprises a weighted sum of other countries, weighted according to their similarity with Ireland. In our case the synthetic control is designed to mirror the relevant characteristics of Ireland, so we will refer to it as "Synthetic Ireland".

As in DiD, we are interested in the extent to which passenger numbers in Ireland diverge from Synthetic Ireland following the abolition of the tax. Since Synthetic Ireland is assumed to mirror Ireland in all ways besides the fact that it was not affected by the abolition of ATT, we can expect that any significant divergence in the periods following the abolition of ATT is the result of the abolition. Synthetic Ireland is in effect the counterfactual: it reveals what would have happened to passenger numbers in Ireland *had it not abolished ATT*. Inasmuch as Synthetic Ireland provides a good counterfactual, the difference between passenger numbers in Ireland and Synthetic Ireland is the difference in passenger numbers with and without the ATT.

[11] Abadie, Diamond, Hainmeuller (2007), *Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program*

[12] https://ec.europa.eu/transport/sites/transport/files/modes/air/studies/doc/internal_market/2014-12-overview-of-air-transport-and-current-and-potential-air-connectivity-gaps-in-the-cese-region-paper-a.pdf

To use as potential comparators for Ireland we collected data on 14 countries across Northern and Western Europe (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Poland, Portugal, Spain, Sweden and UK). For each country we compiled data on the following:

Variable	Description	Units	Source
Number of passengers	Total number of passengers handled by Irish airports	Number	Eurostat
Seat capacity	Total number of available seats on flights departing from a particular country	Number	Milanamos PlanetOptim
Average fare / km	Defined as the average price of a one way ticket departing from the country of interest, divided by the distance of the route in question. When there is more than one airport at either destination, a weighted average of routes is used.	€ / km	Milanamos PlanetOptim/PwC generated
GDP	Gross Domestic Product, a measure of the total output of a country	Percentage change on previous period	Eurostat

These are the characteristics on which countries are matched with Ireland to form Synthetic Ireland. All data is quarterly and seasonally adjusted prior to the modelling to form a balanced panel dataset. [13]

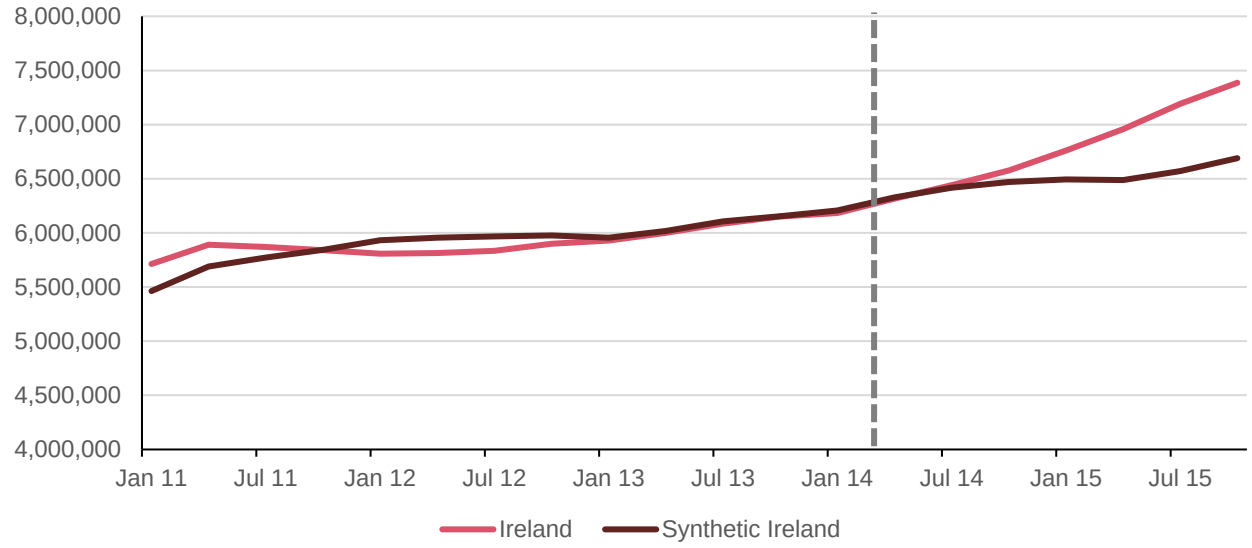
To execute the SCM we used the "Synth" package in Stata. In the SCM model, passenger numbers are regressed on the above covariates. This determines how significant the relationship is between seat capacity, fares and GDP influence the number of passengers. The algorithm then generates Synthetic Ireland by weighting the countries according to their similarity with Ireland based on the variables that most significantly determine passenger numbers. The result of this algorithm is a Synthetic Ireland comprised of Denmark (65%), Finland (28%) and Sweden (6%).

Results

Figure 5 compares passenger numbers in Ireland with passenger numbers in Synthetic Ireland. Note, passenger numbers are seasonally adjusted and presented on a quarterly basis. In the case of Synthetic Ireland, passenger numbers are the weighted average number of passengers in its constituent countries (Denmark, Finland and Sweden). As we observe in Figure 5, Synthetic Ireland closely mirrors Ireland in the pre-treatment period, with a mean average percentage error (MAPE) of 1.47%. This suggests that Synthetic Ireland is a good proxy for Ireland, and therefore ought to provide a reasonable counterfactual.

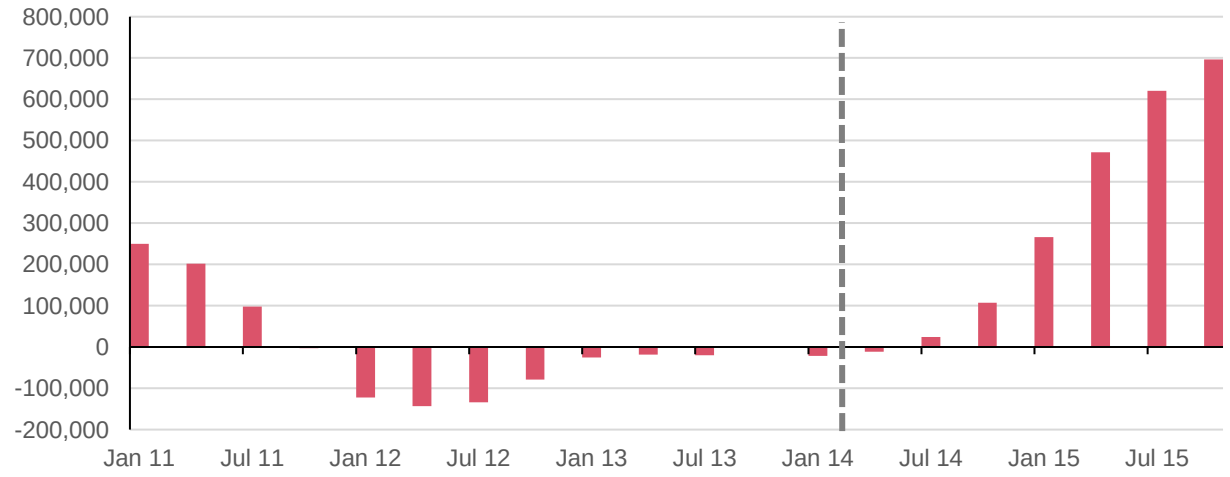
[13] We use the four quarter moving average to seasonally adjust the data

Figure 5: Comparison of passenger numbers (arrivals and departures) in Ireland and Synthetic Ireland



Comparing the two lines after the policy intervention, we see that passenger numbers in Ireland increase at a greater rate than passengers numbers in Synthetic Ireland. Passenger numbers in Synthetic Ireland indicate the number of passengers *had the tax not been abolished*, so this suggests that the abolition increased passengers in Ireland, as we would expect. Not only is an increase in line with expectation, the trajectory is also intuitive. The divergence occurs immediately following the abolition of ATT. Moreover, the divergence tapers off approximately a year after the tax cut; presumably, this is the time it took to reach a new equilibrium as businesses and consumers adjust their pricing and expenditure in response to the abolition. The treatment effect can be seen more clearly in Figure 6, which shows the absolute difference between passenger numbers in Ireland and Synthetic Ireland.

Figure 6: Difference in passenger numbers (departures) between Ireland and Synthetic Ireland



We caution against attributing this divergence solely to the abolition of the tax, but we argue in the next section that the result is significant. If Synthetic Ireland were a perfect counterfactual, it would suggest that in the three quarters between when the tax was abolished to the end of 2014 there were an additional 185,000 passengers, and that there were an additional 2.1 million passengers in 2015.[14] This is equivalent to a 7.5% annual uplift in

[14] This assumes that passenger numbers in Synthetic Ireland and Ireland were equal at the point at which the tax was abolished

the number of passengers for the calendar year 2015. Note, this is in terms of total passengers, the number of additional trips in 2015 is likely to be around half of this (1.1 million).

The fact that there was a such lagged response to the abolition of the tax suggests that it was driven by supply side rather than demand side factors. This is consistent with the response to the introduction of the tax, as reported by Veldhuis and Zuidberg, who argued that airlines absorbed up to 95% of the ATT upon its introduction. Due to the highly competitive nature of the aviation marker, rather than pass the tax directly onto onto consumers in the form of higher air fares, the low cost airlines relocated routes to regions with a lower tax burden. It appears that the abolition of ATT reversed this trend. This is consistent with data provided to us by Ryanair, which states that they had 88 routes from Dublin airport in 2008, declining to 76 routes in 2012 following the introduction of ATT, and now have 100 routes in 2017, three years after ATT was zero-rated.

Significance test

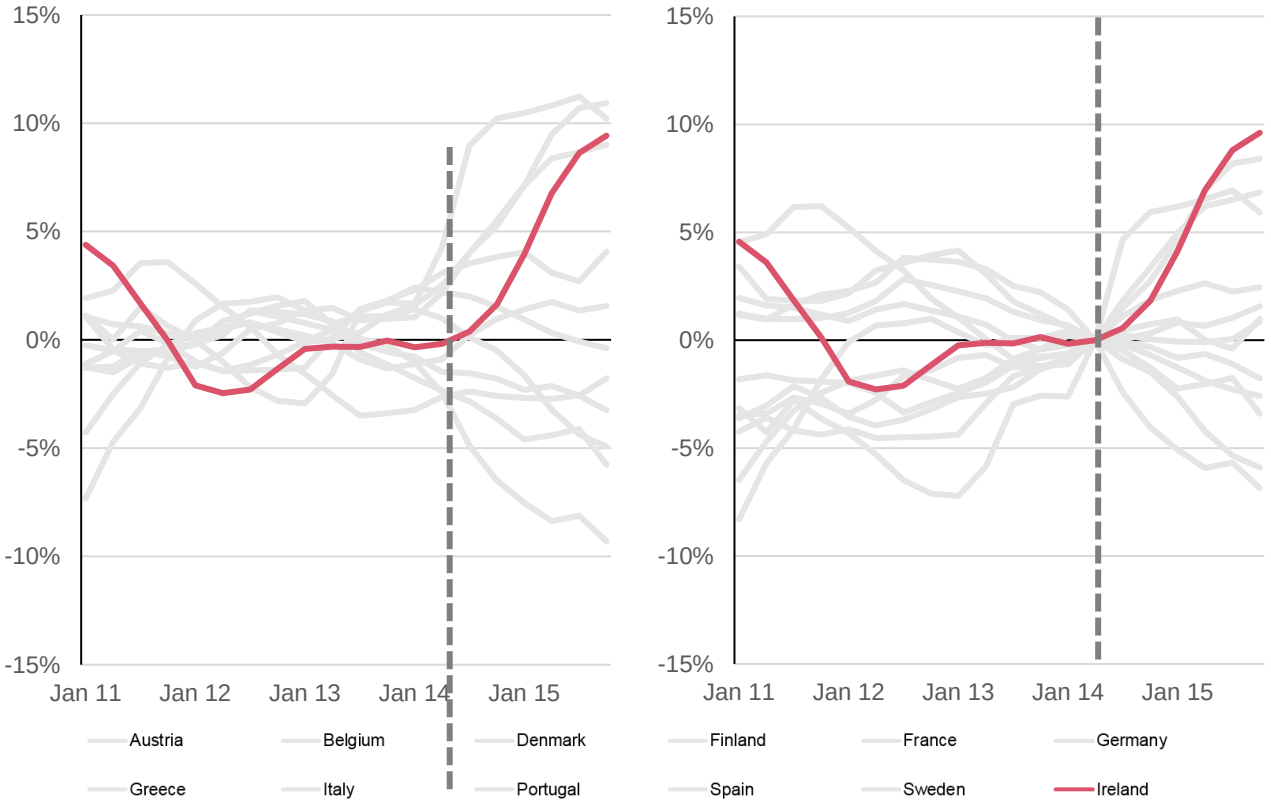
Synthetic Control Method does not allow for a traditional significance test. Instead, the convention is to run what is known as a "placebo" test of significance, which tests "whether the results originating could be driven entirely by chance".[15]

Placebo tests are conducted by applying the same SCM model to all the countries in the sample. If the placebo tests estimate treatment effects of magnitude comparable to the original estimated treatment effect for Ireland, then the original results would be considered to be inconclusive. On the other hand, if the treatment effect of the abolition of ATT on passenger numbers is substantially larger in magnitude than the treatment effects estimated by the placebo tests for other countries, then this would be interpreted as evidence that the abolition had a significant impact on passenger numbers. In this instance, we could conclude that the results were not being generated by wider economic factors, such as random fluctuations in income, as these factors would also be present in the other countries. Figure 7 displays the results of the placebo test. Ireland has been highlighted in pink and the placebos are grey, as we are interested in the distribution rather than any country in particular.

Figure 7: Placebo test of significance[16]

a) Percentage difference between Synthetic and Treated *b) Percentage difference, starting at the date of abolition*

[15] Abadie et al. (2010)
[16] Note, we have excluded the largest and smallest countries from these results, as no possible positive weighting of other countries can form a reasonable synthetic control for the extremes. We have also excluded any country with a mean average percentage error (MAPE) of greater than three times that of Ireland (Poland).



The difference between the Synthetic and the Treated groups is relatively large for Ireland when we present the results in terms of the percentage difference between the Synthetic and Treated groups (left-hand chart). This result is even stronger when we set the difference to 0% at the time of abolition (right hand chart). In this example Ireland emerges as having the largest difference between the Synthetic and Treated groups by the end of the results period (December 2015). We note that there are some placebos whose treatment effect was larger immediately following the treatment period. This is cause for caution, but as we have argued above we would only expect to see the full scale of the response after airlines have re-optimised their routes.

On balance, the placebo test serves as evidence that the abolition had a significant effect on passenger numbers in Ireland, but given the level of noise in other countries we ought not to rule out the possibility that some of the 2.1 million additional passengers were the result of other factors.

Economic impact

Given that the result is significant we will proceed on the assumption that the additional passengers observed in Ireland as compared with Synthetic Ireland can be attributed to the abolition of ATT. If there were 2.14 million additional passengers as a result of the abolition we can assume there were about half as many additional trips (since each passenger it counted as an arrival and a departure). Of the 1.07 million additional trips, we estimate that 57% (610,000) of these are overseas tourists who would not have otherwise travelled to Ireland.[17] Conversely, 43% (460,000) of the trips are Irish passengers that would not have otherwise gone overseas. In 2015 there were 8 million overseas tourists who spent a total of €4.3 billion, meaning that the average tourist spent €538.[18] Domestic tourists spent an average of €187.[19] We therefore estimate that the additional 1.07 million trips is comprised of 610,000 overseas tourists who spend a total of €328 million.

Using data from the World Travel & Tourism Council, we estimate that each additional euro spent by tourists contributed a total of €3 in GDP. When the induced and catalytic effects have been taken into account, this

[17] The ratio of outbound to inbound passengers (9.5 million : 7.1 million) is calculated using data from the World Tourism Organisation (2017), Compendium of Tourism Statistics dataset
[18] Failte Ireland, National Tourism Development Authority (2016) Tourism Facts 2015
[19] 9.1 million domestic tourists trips with a total expenditure of €1.7 billion, as estimated by Failte Ireland, National Tourism Development Authority

multiplier implies that the abolition of ATT increased GDP by €726 million in 2015, assuming Synthetic Ireland represents a reasonable counterfactual.[20] This is a high return on the abolition of a tax which raised €116 million a year, demonstrating the distortive nature of aviation taxes.

[20] In 2016 the direct contribution from tourism was €4.9 billion and the total contribution to GDP was €15.1 billion (World Travel & Tourism Council), implying a multiplier of 3.

Chapter 2: Italy

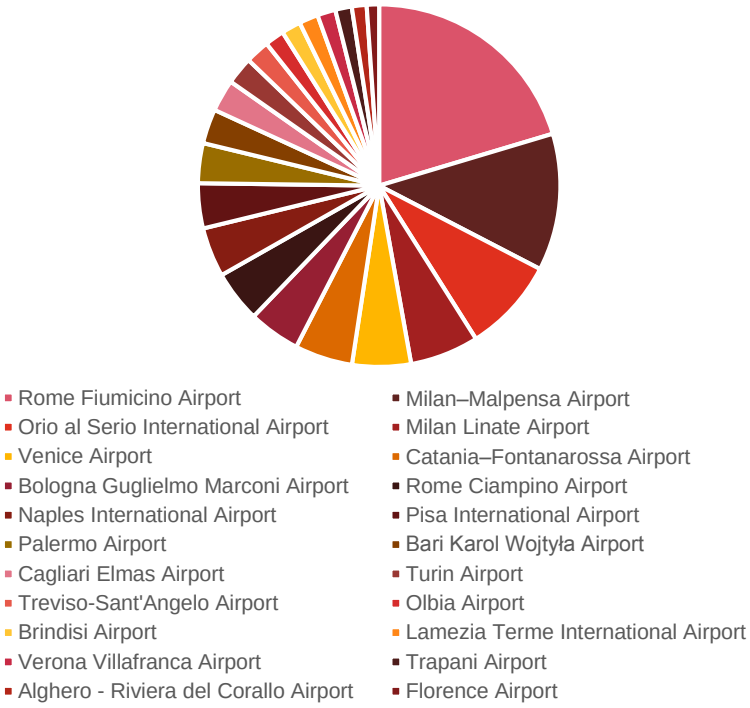
Context

Italy's air transport sector

Italy's aviation sector contributes more than €12.7 billion to GDP each year and supports more than 195,000 jobs. The sector contributes directly through the output of airlines and airports, as well as indirectly through the supply chain and expenditure of employees. [21] IATA reports that the aviation sector also leads to significant catalytic effects through tourism. These effects add a further €10.9 billion to GDP, raising the gross contribution of the industry to €23.6 billion. The catalytic effects also increase employment supported by the aviation sector to more than 385,000, with the average employee in the sector 120% more productive than the Italian average. The sector contributes a significant amount of tax, with aviation firms and their employees paying more than €2.1 billion to the government in tax, rising to €5.8 billion when including supply chain and catalytic effects.

Over 127.5 million passengers travelled to, from, or within Italy during 2015. International passengers make up the majority of journeys, and have been growing since 2010 at an average rate of 5%, with slower growth during 2008-2009 and 2012-2013, when the country experienced economic contraction. In 2015, 75% of these passengers were travelling to or from a destination within the European Union - a ratio which has remained relatively constant over time. The number of domestic passengers has remained relatively stable over the last decade, with nearly 30 million journeys in 2015.

Figure 8: Breakdown of Italy's passengers by airport



Italy has 22 major airports. The airports are more evenly distributed than in Ireland and the Netherlands. [22] Rome Fiumicino Airport is the largest airport in the country, with around 20% of all departures, followed by Milan–Malpensa, Airport with around 12% of departures. Around 53% of the air traffic departing these airports is by full service airlines, compared to 47% by low cost carriers, of which Ryanair holds the largest market share.[23]

Italy's air passenger tax

Italy's Addizionale Comunale, translated as the Council City Tax, was introduced in March 2012. Historically it had been set at €6.50 in all airports except those in Rome, where it was €7.50. On 1st January 2016, Italian authorities unexpectedly increased the tax rates by €2.50 per passenger, raising the rates to €9 and €10, respectively. This increase was designed to subsidise the costs associated with layoffs at flag-carrier Alitalia, which has struggled for a number of years to manage costs. The increase was reversed in September 2016.

21 IATA, 2011: https://www.iata.org/policy/Documents/Benefits-of-Aviation-Italy-2011.pdf
22 A major airport is defined as an airport from which more than 1% of civillian passengers depart.
23 Statista: https://www.statista.com/statistics/671695/air-traffic-market-share-of-international-flights-by-type-of-airline/

Analysis

Other studies

Oxford Economics published an in-depth review of the impact of the aviation sector on the Italian economy in 2011.[24] The paper focusses on quantifying aviation's direct, indirect, induced and wider 'catalytic' economic benefits in terms of jobs and value-added.[25] This study is complemented by a series of reports published by the International Air Transport Association (IATA) which analyse the importance of air transport in Italy and update the figures presented in Oxford Economics' earlier report.[26]

These reports are useful in understanding the importance of the sector to the economy, but they do not specifically analyse the effect of the shocks associated with the raising and lowering of the City Council Tax, on which there has been relatively little research. In our review of the literature, we were only able to find quantitative research undertaken by IATA following the announcement of the rate hike, which estimated that passenger numbers would fall by over 755,000 per year and cost the Italian economy €146 million. This was forecast to cause 2,300 job losses per year, totalling 9,000 by 2020.[27] We also found qualitative information regarding the impact of the reduction, following which Ryanair announced that they would increase investment in Italian tourism, introducing 10 new aircrafts and 44 new routes while creating an additional 2,250 jobs in 2017.[28]

Observations

The above diagrams show the number of departures from Italian airports over the last decade and allow us to form an initial impression of the impact of the temporary increase of the tax. We present Eurostat data augmented with official statistics from the Italian Civil Aviation Authority, which runs until the end of the first quarter of 2017, covering the entire period of the tax increase, and the 6 month period following its reduction. Figure 9 presents the raw data and shows that the cyclical and seemingly upward trend in passenger numbers continues throughout the period of the taxation. This data highlights how the airline industry operates in a cyclical environment in which periods of strong demand are routinely followed by periods of weaker demand and economic instability.

Figure 10 presents this same data on a de-seasonalised basis, allowing us to view the underlying trends by removing the cyclical swings. As with the raw data, there appears to be little change from the trend while the tax increase is in force, although this is to be expected in the context of the short period over which the tax increase was in force. Due to the availability of data and the methodology used to de-seasonalise data, passenger numbers are only available until October 2016, leaving us unable to discern any effect following the reduction in the tax.

[24] 'Economic Benefits from Air Transport in the Italy', Oxford Economics, 2011
[25] Direct economic impacts refer to the value-added produced and the number of those employed by firms in the aviation industry. Indirect economic impacts refer to the value-added produced and the number of those employed by firms in the aviation industry's supply-chain. Induced benefits refer to the value-added produced and the number of those employed by firms who are supported by the spending undertaken by the employees of the aviation sector and those in its supply chain. Wider 'catalytic' impacts refer to the value-added produced and the number of those employed by firms in the tourism sector who benefit from the facilitating role aviation plays in their industry.
[26] https://www.iata.org/policy/Documents/benefits-of-aviation-italy-2017.pdf
[27] http://www.iata.org/pressroom/pr/Pages/2016-01-25-01.aspx
[28] https://markets.ft.com/data/announce/full?dockey=1323-12934377-7527SBADSS63BHS3PPSOOHSFUE

Figure 9: Monthly passenger numbers (departures only) in Italy

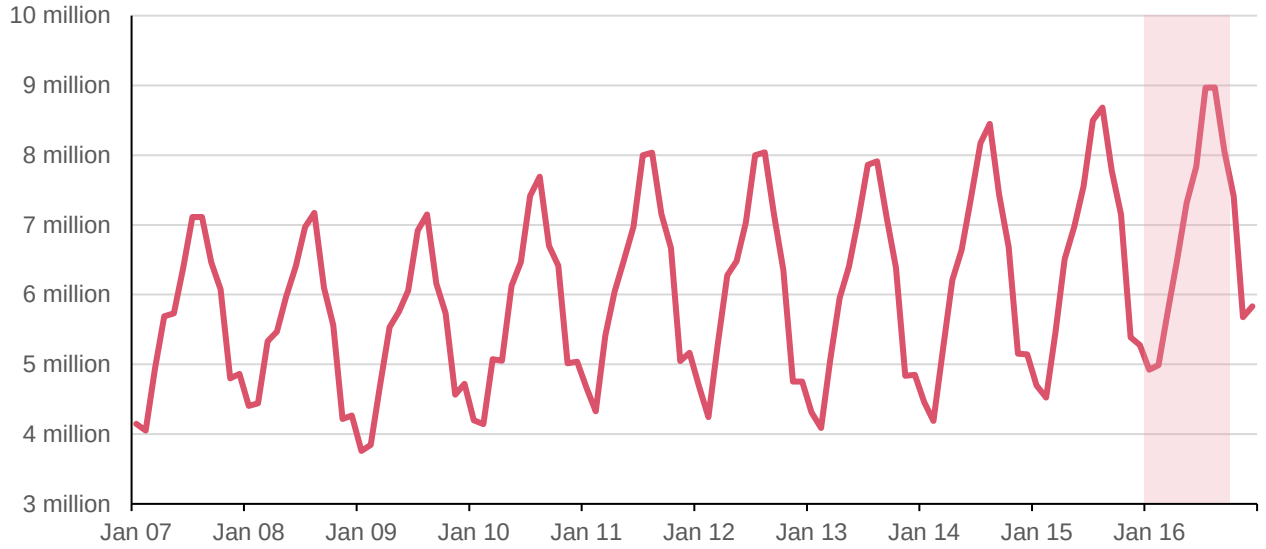


Figure 10: Deseasonalised (monthly) passenger numbers (departures only) in Italy

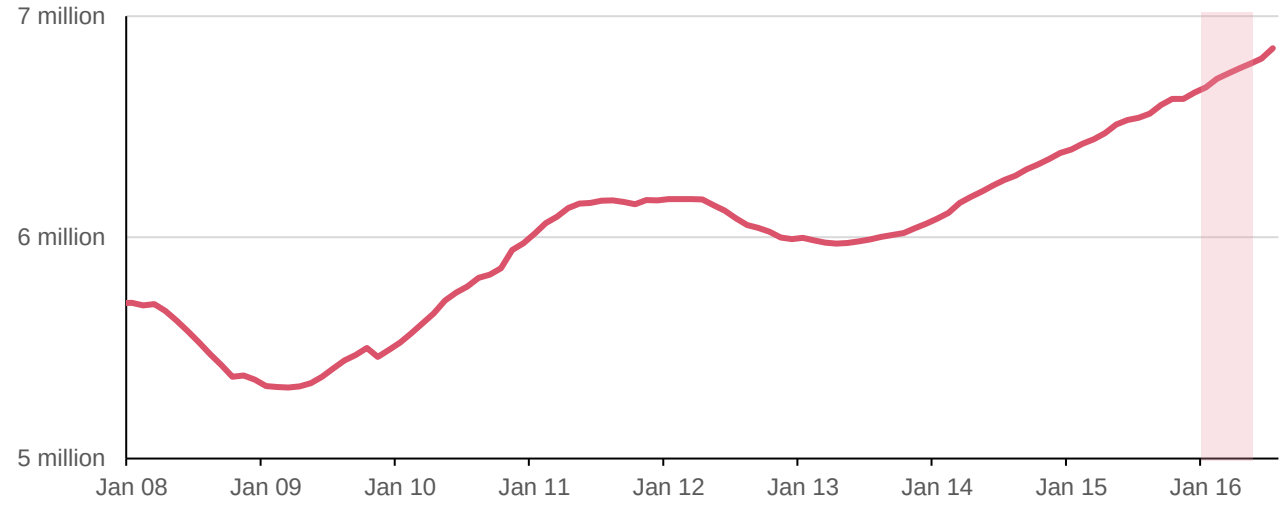


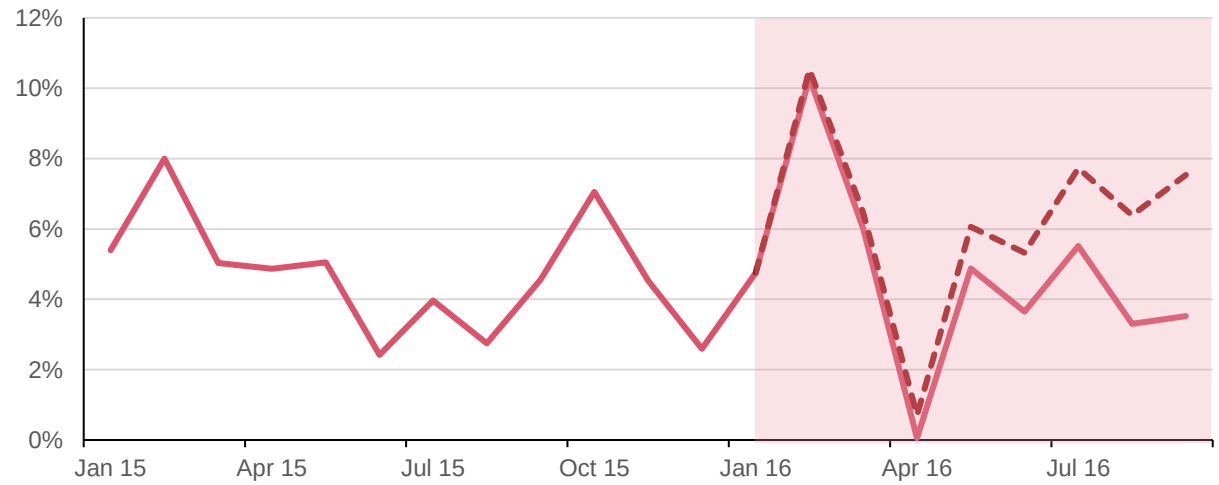
Figure 11: Year on year change in monthly passenger numbers (departures only) in Italy

To probe deeper, we calculate the annual growth rate of passenger numbers, which we present in Figure 11. Initially looking at the period over which the tax increase was in place, there appears to be greater volatility in the first half of 2016, though this is not outside the range of typical volatility seen over the last decade and likely attributable to other factors. Annual growth of 10% in February is likely skewed upwards by the leap year, and the 0% growth in April may be due to Easter shifting from April in 2015 to March in 2016. Otherwise, there does not appear to be a discernable structual break in growth rates following the temporary tax change.

While there appears to be little change in the data for the period of the taxation, the growth rate does seem to increase following the reduction of the charge in September. This suggests that the tax cut may have stimulated an increase in passenger numbers. This increase was also likely augmented by people deferring their plans while the tax was in place. It is important to note that there remains some volatility, with a 10.5% peak in December 2016, which is echoed across other countries such as Greece, and a 1.0% trough in February adjusting for the extended month in the previous year. However, this should not detract from what otherwise appears to be an improved rate and, following the logic of our argument, we assume that the growth rates of these outliers would have been lower if the higher tax rate was still in force.

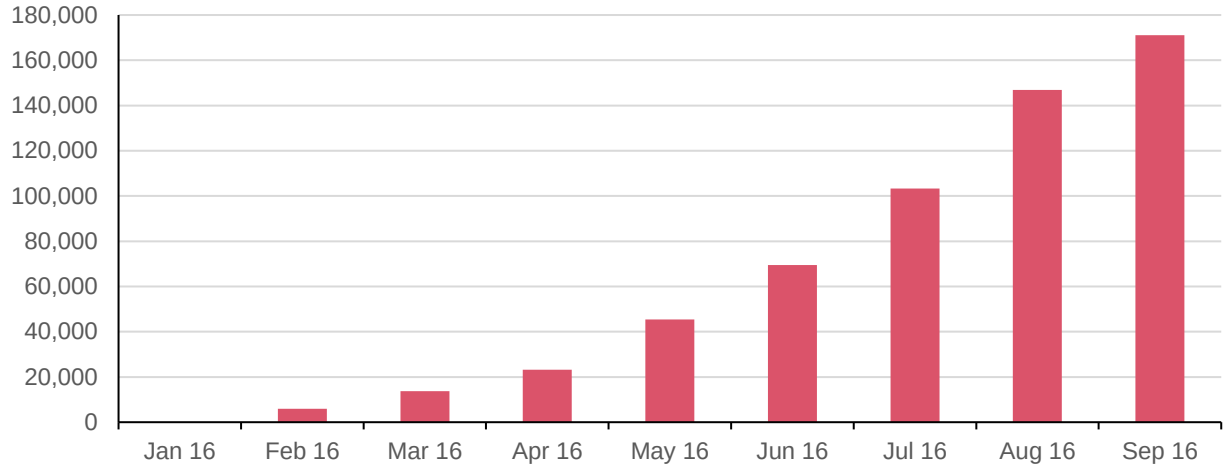
This increase may suggest that growth was dampened over the period that the increased tax was in force. However, simply reviewing the data does not allow us to determine the impact and as such, we construct a counterfactual to enable a comparison. Due to a lack of availabile data and the short period under which the tax increase was in place, we are not able to construct a reliable synthetic control as we did for the Irish ATT. Instead, we attempt to build a counterfactual by imposing the same change we found in Ireland, adjusted for the relative size of the tax cut. For example, we assume that if there was a 6% increase in passenger numbers in the quarter following the abolition of Irish Air Travel Tax (a cut of €3), we assume that there would have been a 5% increase in passenger numbers in the quarter following the €2.50 reduction in City Council Tax, since Italian tax cut was 5/6ths the size of ATT. Clearly there would not have been exactly proportional response in Italy, but we believe the comparison is valid because (i) the taxes are of the same structure (a simply flat rate) (ii) the tax shocks are a similar size (€2.50 and €3), and (iii) the airline markets are similar, with Ryanair being the largest airline in both countries.[29,30]

Figure 12: Projected growth rate of depatures with and without the tax



[29] http://www.anna.aero/2016/10/14/italy-set-to-pass-160-million-passengers-in-2016/
[30] One difference between our analysis in Ireland and Italy is that in Ireland we are interested in the response to a *decrease* in tax whilst in Italy we are analysing the response to an *increase* in tax. However the main reason for an asymmetric response, is the presence of people who travel over the border for flights and do not revert to domestic airports after the tax has been abolished, but this effect would be minimal in the case of Ireland as it only has one land border.

Figure 13: Projected difference between departures in Italy with and without the tax increase



While growth was positive throughout the period of the tax increase, our analysis suggests that the temporary increase in tax reduced departures by a total of 1.05 million (1.7%). Due to the lagged nature of the reponse, the number of passengers lost per month builds over time, and is at a maximum in September at which point growth was over 4% lower than it might otherwise have been. In the case of Italy the lag may have been augmented by the fact that the tax hike came as a surprise, giving airlines less opportunity to pass the tax on to passengers.

Thus although we expect the tax increase had a large negative effect on passenger numbers, the response would have been a lot more extreme had the tax increase been sustained for longer, as this would have given airlines more time to relocate routes to destinations with a lower tax burden. The data from Ireland suggests that this process takes approximately one year. As such, governments will get the largest economic return on a reduction in air passenger tax if the cut is expected and permanent, as in the scenarios we model in the associated country reports.

Chapter 3: Netherlands

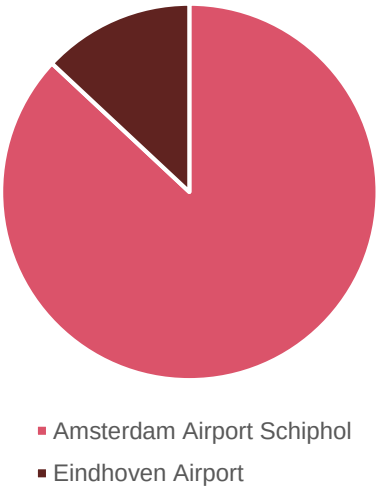
Context

The air transport sector in the Netherlands

The aviation sector in the Netherlands contributes more than €11.8 billion to GDP each year and supports more than 175,000 jobs. [31] The sector contributes directly through the output of airlines and airports, as well as indirectly through the supply chain and expenditure of its employees. IATA reports that the aviation sector also leads to significant catalytic effects through tourism, adding a further €5.8 billion to GDP and raising the gross contribution of the industry to €17.5 billion or 3.1% of GDP. These catalytic effects also increase the total level of employment supported by the aviation sector to more than 287,000, with the average employee in the sector twice as productive as the Dutch average. The sector is a significant tax contributor, with aviation firms and their employees paying more than €2 billion to the government in tax, rising to €4.9 billion when including the supply chain and catalytic effects.

Over 70 million passengers travelled to, from, or within the Netherlands during 2016. The market for domestic flights is very small, with fewer than 2,000 passengers carried in 2016. International passengers therefore make up the majority and of these, the majority (around 63%) were travelling to or from a destination within the European Union. Passenger numbers have been growing since 2010 at an average rate of 6%. Prior to this, the financial crisis caused a contraction of around 8%. The ratio of passengers travelling to a destination in the European Union has grown from around 60% in 2007, with a slight dip during the financial crisis.

Figure 14: Breakdown of the Netherland's passengers by airport



The Netherlands has two major airports, of which Amsterdam Airport Schiphol is by far the largest with around 87% of all passenger journeys and 480,000 flights. [32] The airport is a major transit hub, with nearly 24 million transit passengers in 2016.[33] The airport is the operational base for KLM, who were responsible for carrying 30.5 million passengers to and from the airport in 2016, followed by easyJet with 5.3 million passengers.[34]

Air passenger tax in the Netherlands

The Netherlands introduced an air passenger tax on 1 July 2008 which was applied to departing passengers (excluding transfer passengers and freight shipments) and was expected to raise €350 million in annual tax revenues. [35] The amount of the tax varied depending upon the destination of the flight. A levy of €11.25 was imposed upon passengers flying to destinations in the EU or up to a distance of 2,500km, while all other destinations were charged at a rate of €45. The tax was designed to curb environmental pollution, and was part of the government's wider national tax plan in 2008, which aimed to transfer the burden of tax imposed on labour and profits to taxes on activities which cause environmental degradation. The Dutch Government reduced the air passenger tax to zero (€0.00) from 1 July 2009 then abolished it on 1 January 2010.

31 IATA, 2011: https://www.iata.org/policy/Documents/Benefits-of-Aviation-Netherlands-2011.pdf
32 A major airport if defined as an airport from which more than 1% of civillian passengers depart.
33 Eurostat data, accessed 15/09/2017.
34 Schiphol Group: http://www.annualreportschiphol.com/results/our-results/top-connectivity
35 Ministerie van Financiën (2008). Factsheet vliegbelasting. Den Haag: Ministerie van Financiën.

Analysis

Other studies

The introduction of the tax was predicted to cause an 8-10% decline in passenger numbers at Amsterdam Airport Schiphol – the main airport in the Netherlands and one of the largest in Europe - which was deemed by the government as acceptable in the context of expected growth in the aviation sector of around 4%.[36] However, the global economic downturn (an indicator which is highly correlated with passenger numbers), alongside an increasing tendency for passengers to use low-cost airlines which operated out of regional airports in Germany and Belgium, compounded the decline. The introduction of the tax impacted both low-cost airlines and legacy carriers. In early October 2008, KLM estimated 230,000 fewer passengers had made journeys since the tax introduction, increasing to 400,000 by the end of 2008. In late October 2008, easyJet estimated the tax had cost them 200,000 passengers. Further, a study for the KiM Netherlands Institute for Transport Policy Analysis found that following the introduction of the tax, the number of passengers departing from Amsterdam Airport Schiphol decreased (as forecast by the government prior to its introduction), while the number of transfers continued to increase. The effect was estimated to be around 2 million fewer passengers flying through Amsterdam Schiphol Airport, with around 1 million more passengers flying from regional airports in Belgium and Germany than would have been the case if the tax had not been introduced.

As a result of this, the Dutch Government reduced the air passenger tax to zero (€0.00) from 1 July 2009 and abolished it on 1 January 2010. A government study estimated that the tax had cost the Dutch economy €1.3 billion in lost revenue.[37]

Observations

Figure 15 presents data on total passenger departures, which shows the annual seasonality of the industry. To explore the trends in the market we have transformed the data to provide both a de-seasonalised view (Figure 16) as well as an annual growth rate view (Figure 17). One anomoly to be noted in the data is the sharp fall in passenger numbers in April 2010, and the commensurate increase in April 2011. This was caused by the eruption of Eyjafjallajökull in Iceland, which caused flights to be cancelled across Europe.

Figure 17 shows that the annual growth rate of passenger departures becomes negative immediately following the introduction of the aviation tax on 1st July 2008, with a contraction of 1.68%. This immediate response is to be expected as the tax was widely publicised in the media prior to its introduction, allowing both consumers and airlines time to plan for its introduction. Negative growth continued until the end of 2009, with a total decline of 4.6% between June 2008 (the month prior to the introduction of the tax) and March 2009 (the month with the fewest passenger departures during the period of taxation).

The tax was zero-rated by the government in July 2009, and passenger numbers started to increase around this time. Since this change, departures from the Netherlands have increased consistently at an average rate of 6.4%, with more than 35 million trips in 2016. This strong growth supports the view that the tax dampened demand. However, this rate may still be below what it would have been should the tax never have been introduced. Research has suggested that the tempered growth following the introduction of the tax may continue following the abolition as some passengers find options available at other airports and change their preferences permanently.[38]

[36] Significance, SEO Economisch Onderzoek en To70 (2007). Effecten van verschillende heffingsvarianten op de Nederlandse luchtvaart. Leiden: Significance.
[37] Veldhuis 2009, *Implicaties van de invoering van de ticket-tax*
[38] Gordijn & Kolkman 2011, *Effects of the Air Passenger Tax: Behavioral responses of passengers, airlines and airports*

Figure 15: Monthly passenger numbers (departures only) in the Netherlands

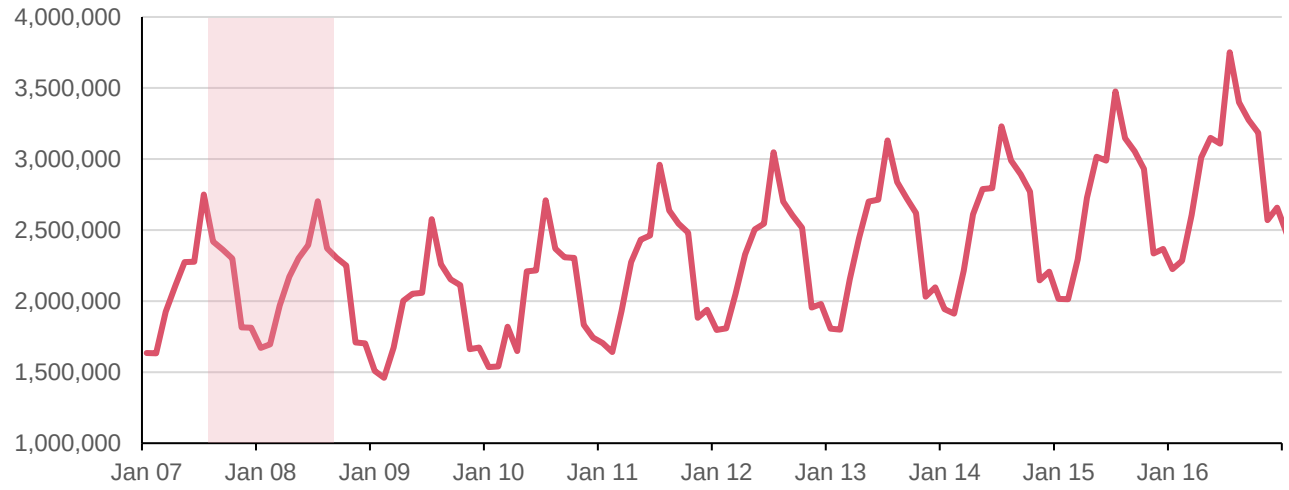


Figure 16: Deseasonalised (monthly) passenger numbers (departures only) in the Netherlands

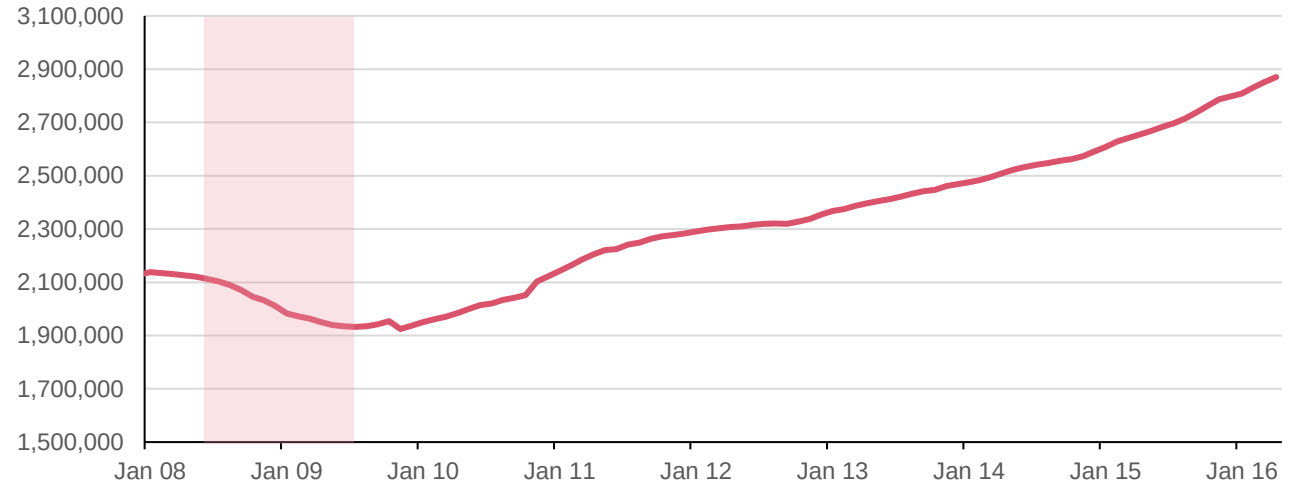
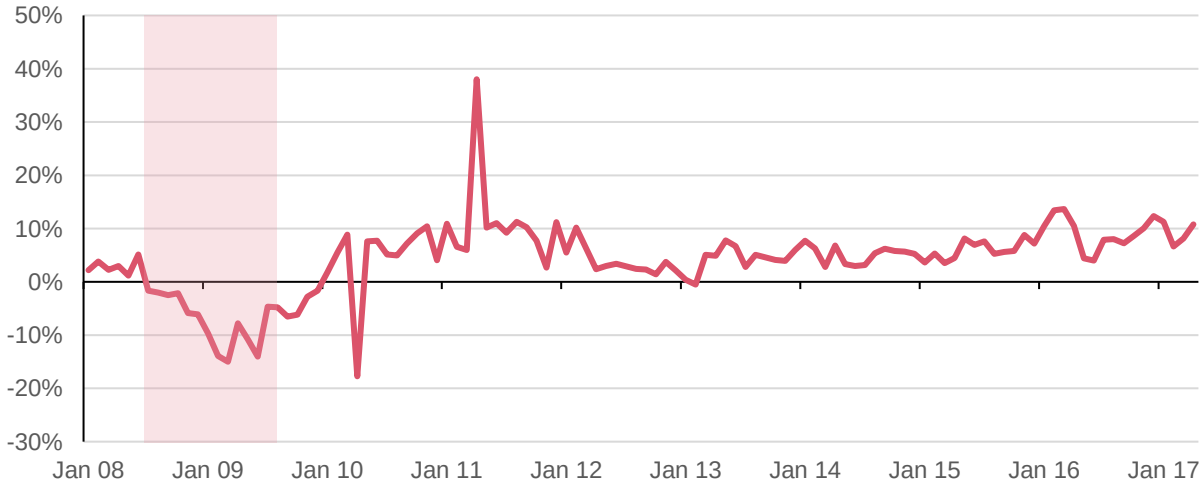


Figure 17: Year on year change in monthly passenger numbers (departures only) in the Netherlands

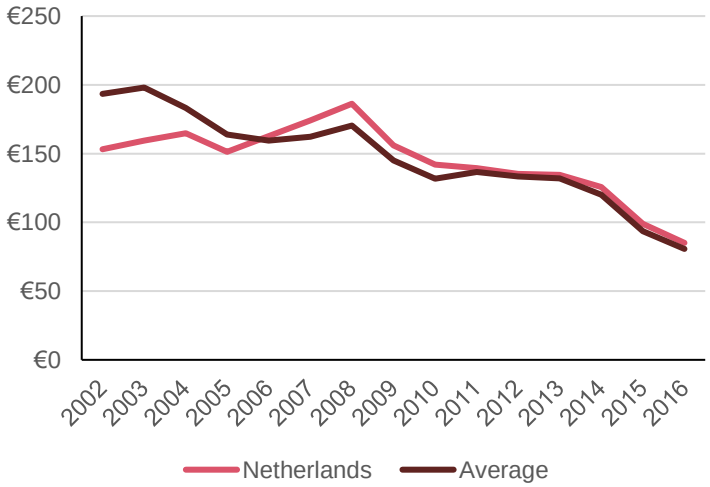


It is important to note that other factors may have been involved and compounded the impact of the introduction of an aviation tax. These factors mean we cannot construct an accurate counterfactual for the Netherlands as we did in Ireland. With the tax only in place for 12 months, there is also insuffcient data to properly examine the effect of the tax, with lag times on both the demand and supply side causing short term volatility, and the tax abolished before the market could equilibrate.

The most significant factor was the global financial crisis, which slowed the Dutch economy over much the same period as the tax; GDP growth turned negative in the first quarter of 2009 before becoming positive again in the second quarter of 2010. Passenger numbers and economic growth are highly correlated, meaning that the financial crisis had a heavily distortive impact on the European aviation market. Many other aviation markets were subject to similar economic forces, but the extent to which each country was affected depended upon the unique dynamic of each economy.

As noted by Netherlands Institute for Transport Policy Analysis, the impact of low-cost airlines also complicates the calculation of the impact of the tax.[39] Prior to the tax low-cost airlines were primarily using regional airports in Belgium and Germany (as they had lower costs than in the Netherlands). This point is reflected in Figure 18, which shows that prior to the tax change the average price of an airplane ticket was becoming more expensive in the Netherlands relative to the rest of Europe. As such, the trend towards using Belgian and German airports cannot be solely attributed to the tax. Nevertheless, it is apparent that following the abolition of the tax Amsterdam Airport Schipol came into favour amongst low-cost airlines, and easyJet is now the second largest carrier at the airport.

Figure 18: Average airfare in the Netherlands compared to the EU28 average



For the above reasons it is different to draw any robust empirical conclusions regarding the impact the Dutch air passenger tax. Nevertheless, one key lesson from our forward-looking modelling in the individual country reports is that the impact of abolishing passenger tax is linked with the relative size of the tax. For example, we found that the three countries that would have the highest fiscal return to abolishing passenger tax were the three countries with the highest tax rates (UK, Germany and Greece). This reflects the competitive nature of the European aviation market, and the willingness of airlines to focus routes on the countries with the lowest costs. The Dutch air passenger tax would have ranked as the third highest short haul tax rate (third to the UK and Greece) and the second highest long haul tax rate (second to the UK). If the benefits of abolishing air passenger tax in the Netherlands are proportional to those we have modelled in the UK, Greece and Germany, then the economic impact could have been much larger than in many other countries.

[39] Gordijn & Kolkman 2011, *Effects of the Air Passenger Tax: Behavioral responses of passengers, airlines and airports*