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On the re-evaluation of the air transport activity in a globalised environment[1]

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[1] This presentation was prepared for the meeting. The views expressed are those of the author and do not necessarily reflect the views of the BIS, IFC, BoP, ECB or the central banks and other institutions represented at the meeting.

On the Re-evaluation of the Air Transport Activity in a Globalized Environment

Marios Papaspyrou[1]

Abstract

Multi-territorial enterprises have always been one of the most challenging items in the Balance of Payments (BOP) statistics, both in terms of methodology and data collection. Aviation and shipping are the industries where the best proponents of these multi-territorial enterprises are fostering. Economic globalization makes identification of BOP transactions for these MNEs even harder. This paper attempts a deep dive into the air transport activity, with the scope to provide some insights to the current methodology and existing data collection methods and to provide, when possible, favorable alternatives. A centralized global model is proposed, based on an International Organization playing the role of data Guardian, collaborating with other international organizations and associations, such as IATA. Practical criteria for identifying the statistical residency are clearly stated, whereas the mechanics of the whole model is explained in detail. The use of big data techniques is suggested when there is lack of adequate data sources or when our model is far too optimistic to achieve the first best. The importance of cooperation and coordination among national authorities and international organizations is highlighted.

JEL Classification: C81, F60, R40.

Keywords: Airline Industry, Globalization, Balance of Payments methodology, Big Data

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Introduction

Balance of payments (BOP) statistics are official statistics referring to external transactions between residents and non-residents from a statistical point of view. If there is physical movement involved in the transaction, as in the case of trade in goods, along with supervisory mechanisms from tax authorities, tracking consistently such cross-border transactions is rather straightforward. However, when we talk about non-tangible output, such as air transport services, and the interest is more statistical than for taxational[2], capturing such BOP transactions can be a really difficult task.

In 2000, the IMF [1] identified four basic aspects of globalization: trade and transactions, capital and investment movements, migration and movement of people, and the dissemination of knowledge. A rough definition of economic globalization could be the increasing economic interdependence of national economies across the world through a rapid increase in cross-border movement of goods, services, technology, and capital.

Merely from their definitions, one realizes that the collection of BOP data and globalization are two competitive concepts. On the one hand, the collection of BOP data requires: a) clear definitions on the statistical residence of all trading partners, b) a clear view of the transaction and c) a measurable way to quantify it properly. In other words, you need to know exactly how and when the change of economic ownership occurs in every transaction. On the other hand, globalization promotes the removal of cross – border trade barriers, smoothing in a way economic environment, while making the daily job of official statisticians far more difficult and tempting at the same time. Hence, it is by no chance that the effect of globalization is more profound in Multinational/Multi-territorial Enterprises, the so called MNEs. MNEs have been of central interest lately in Task Forces and International Conferences [2] and the reason is that identifying "who does what" and "who owns what" can be a very difficult puzzle to solve in a globalized environment. An additional problem is that MNEs act under profit maximization on a worldwide level, whereas BOP statistics are on a national level; so in a sense, MNE's managers do not speak the same language as the one implied in the BOP manuals. Discussions on MNEs mainly focus on issues concerning Foreign Direct Investment (FDI) (stock/flow) transactions and tax avoidance/antitrust policies [3]. However, looking at trade in services at a European level, see Table 1 [4], one can identify that transport services, mostly driven by sea and air transport, account for about 17% of total BOP revenues in services. Given that the shipping and airline companies are structured on a multinational setting, reviewing the trade in services for these multi-territorial enterprises is of great importance and interest on its own.

[2] Main International Transport Services are excluded from the VIES tax declaration.

Table 1.

CURRENCY	Million euro								
BOP_ITEM	Services								
STK_FLOW	Credit								
GEO	European Union - 28 countries								
PARTNER/TIME	2010	2011	2012	2013	2014	2015	2016	2017	2018
European Union - 28 countrie	737.038	788.622	826.578	863.026	955.663	1.042.391	1.097.974	1.184.005	1.258.649
Extra-EU28	565.691	615.440	687.924	725.973	767.575	886.805	875.837	933.448	960.991
CURRENCY	Million euro								
BOP_ITEM	Services: Transport								
STK_FLOW	Credit								
GEO	European Union - 28 countries								
PARTNER/TIME	2010	2011	2012	2013	2014	2015	2016	2017	2018
European Union - 28 countrie	146.961	149.538	154.180	160.735	172.896	181.875	184.201	201.777	212.058
Extra-EU28	122.815	132.828	143.079	139.602	140.491	152.542	142.999	155.300	163.290
CURRENCY	Million euro								
BOP_ITEM	Services: Air transport								
STK_FLOW	Credit								
GEO	European Union - 28 countries								
PARTNER/TIME	2010	2011	2012	2013	2014	2015	2016	2017	2018
European Union - 28 countrie	38.986	38.717	40.208	42.091	46.870	52.246	52.730	58.005	59.405
Extra-EU28	36.960	42.834	47.046	42.572	44.906	48.966	48.546	52.838	54.884

Source of data: Eurostat. International trade in services (since 2010) (BPM6) [bop_its6_det]. Updated 20.01.20.

Investigating mirror data on the current account balance and quantifying current account bilateral asymmetries is a standard practice in the BOP quality assessment. Till now, the main reason for the presence of such bilateral asymmetries is attributed, as cited in EUROSTAT's site on Economic Globalization and Data Asymmetries [5], mainly to different data sources used by Member States for collecting the data, whereas time of recording and different thresholds come as a secondary matter. Under globalization one could fairly add also the inherent difficulty of understanding MNEs transactions and their divergence from standard practice as described in existing manuals. Regarding BOP data collection the EU-official statistician stands on the most difficult point. On the one side, EU monetary and economic integration asks for the lift of all potential barriers to capital and physical mobility among Member States, while on the other side, the requirement to produce official statistics on a national level is retained. In Table 2 below, we can see that within EU-28 for air transport services the balance item (credit minus debit) which unveils data asymmetries, is growing significantly from 2013 and onwards.

Table 2.

CURRENCY	Million euro								
BOP_ITEM	Services: Air transport								
GEO/PARTNER	European Union - 28 countries								
TIME	2010	2011	2012	2013	2014	2015	2016	2017	2018
Credit	38.986	38.717	40.208	42.091	46.870	52.246	52.730	58.005	59.405
Debit	34.682	35.640	37.891	36.134	38.571	43.377	42.397	45.799	47.833
Balance	4.303	3.077	2.317	5.958	8.299	8.869	10.334	12.207	11.572

Source of data: Eurostat. International trade in services (since 2010) (BPM6) [bop_its6_det]. Updated 20.01.20.

Concerning official *financial* statistics, a lot of effort has been made by International Organizations to mitigate this globalization effect with the adoption, and even with the construction, of international databases. For example, the development of the Centralized Securities Database (CSDB) and the Register of Institutions and Affiliates (RIAD) was vital to the ECB for the production of EU-consistent Securities Holding Statistics (SHS) and Analytical Credit (AnaCredit) data respectively[3]. In CSDB each financial instrument is provided with a "country of the issuer", where this field is firmed up after gathering information from various data providers and "voting" with non-equal weights. The same goes with RIAD where each entity is assigned a country of residence. What is important is that all Member States contribute to these databases, decide in common the statistical residency of the enterprise and, most important, use these databases for the production of their financial data. In this way, internal consistency is achieved and double-counting or under-reporting are minimized. This approach is the way to go when it comes to global consistency. Similar centralized data collection methods for the current account items have not yet come to surface. Lately, Eurostat is paving the way, via a Task Force on Shipping [6], in addressing the issue of globalization on the shipping cluster. A methodological handbook on sea transport is ongoing [7], where the use of international maritime databases is endorsed.

Before presenting our data collection method for the air transport activities, it would be wise to have in mind a reference data collection method under a globalized environment; find out why it works, analyze its strengths and try to see if it is possible to fit some of its principles to our model. Looking at official statistics the BIS report on deposits around the world really stands out. BIS gathers, on a quarterly basis, from the monetary authorities of each country, through Balance Sheet Items Statistics, the deposits resting in the commercial banks. In turn, by having high response is in the position to publish detailed data for deposits on a global level. The key ingredients for this successful collection method can be summarized to the following ones: first, BIS is practically the "Guardian" of the global banking system, and as such, almost all central banks report consistently to the BIS, second, definitions of residence are easy to be followed by all reporting banks worldwide and, third, deposits is a very clear item to measure and declare by the reporting banks. Although all these three characteristics are crucial for data completeness, the first one, that of being the Guardian of the system, appears to be of utmost importance.

The Model

Defining the statistical unit and their residency

The present methodological model has the ambition to set a data collection model for air transport services that will be the "equivalent" of BIS for the deposits. Although, in principle, it is a global model, its contribution appears to be greatest for the case of the European Union (EU). EU is facing an inherent difficulty in collecting BOP air transport statistics and the main reasons are that there is free movement of individuals across Member States, there are no formal check points (such as for

[3] The introduction of the Legal Entity Identifier (LEI) for unique identification of the companies works to the same direction.

migration or customs), mobility of employees is high due to intensive intra-EU trade and there are a lot of MNEs with several affiliates operating within Europe, for which their employees are highly intragroup mobile.

Starting with the definitions, according to the BPM6 CG [8], for the resident economy BOP credits on air transport refer (mainly) to receipts earned from resident airline companies for providing cross-border air transport services, that is international carriage, to non-residents, whereas debits are (mainly) payments to non-residents airline companies for providing such international transport services to residents[4]. Here, although it is not crucial for our model, a clarification needs to be made. From our perspective, the parties involved in a BOP *air passenger* transaction are not always the airline carrier and the passenger. Of course, this holds for the case of travelling for personal vacations, which is, of course, is the main drive of airline revenues. When it comes to business travelling where, the ticket is paid, and most often booked, from the employee's company or the travel agency contracted with the company, then the real BOP transaction is between the airline carrier and the employee's company. To shed more light to this situation, we provide here an interesting example: a Greek travel agency books, on account of a Greek shipping company, an airline ticket for a seaman from Philippines to travel from Manilla (although it could be any place on Earth) to New York to onboard there, using as a carrier Deutsche Lufthansa, let's say. The real transaction, in economic terms, is between the Greek shipping company and the German carrier, so for Greece it should be on the BOP debits. Following the money validates this view also in financial terms. End to end, the money goes from the shipping company to the airline carrier; all other parties are pass-through units. Observe here that, neither the nationality of the passenger nor the port of origin/port of destination plays any role for classifying the transaction[5]. In fact, the passenger is totally indifferent to the ticket's arrangement or/and its cash settlement. And the same story goes practically for all tickets referring to business purposes. The significance of this key point here will be evident later on, when we will try to specify criteria for the residency of the "passenger" [6].

Now that we have identified the statistical units involved in the transactions, we can proceed by determining their residency. The concept of residence of the two trade parties is the most crucial one for compiling BOP statistics. Concerning the residence of the airline company, the answer is fairly clear: it should be the country as designated in the country/region field from the International Civil Aviation Association (ICAO) designators [9]. In addition, the International Air Transport Association (IATA) has an online airline search tool, where, for the IATA airline members, the country/territory of the airline company along with an IATA designator is explicitly provided [10]. Although identifying the residency of airline companies is relatively easy, the big problem arises to identify the residence of the counterpart. As mentioned above, the counterpart should be the individual if the ticket is paid by the

[4] Domestic flights provided by resident carriers are included in the travel item, provided that transportation is not compound to the international carriage. In the case of transit, this also goes to transport services.

[5] The seaman could equally well travel to New York from Hamburg or any other place on Earth.

[6] The travel agency is by definition an intermediator. According to MSITS 2010, "the travel component of EBOPS 2010 differs from most internationally traded services in that it is transactor-based". This means that one could suggest that the individual, not the company, should be the counter-party. However, international carriage is clearly excluded from travel, so this suggestion should not hold.

passenger himself (and never reimbursed), in cases of personal vacation travel, or the company, that the passenger represents, in cases of business travel. Hence, the crucial point here is first, to identify if the counterpart is the individual or the company and, second, to determine the residency in each case.

Compilation manuals, such as MSITS 2010 [11], clearly define residence of individuals as the country where their principal dwelling is located. However, when it comes to explicitly specifying means for practical identification and collection of granular data on the residency of individuals (by simultaneously respecting the latest GDPR standards), manuals remain relatively silent. In the BOP CG the use of migration statistics is suggested for compiling air transport services. From the discussion above, it should be obvious that within EU, migration statistics are not relevant whereas, passport data for EU passengers, can, in fact, be misleading. Within Europe, there is freedom in getting a job in a foreign country and becoming economic resident of that country. However, earning nationality (i.e. passport) is much more difficult. To this end, some countries combine data from Civil Aviation Authorities on air traffic and from the travel survey, to obtain estimates on the residency of the travelers. However, these practices require computationally intensive and stratification methods, which may suffer from small sample biasness. Here instead we opt for a data collection procedure that is as granular and direct as possible.

To this end, we propose a practical criterion for identifying the statistical residency that solves simultaneously both problems mentioned above. We suggest that when the phone number of the ticket reservation is available, then *the country code* of this phone number (say +44 for GB) obtains the first best solution. When someone establishes himself to a foreign country to work for a long period of time, one of the first things he does is to obtain a phone number from a domestic telecommunications provider[7]. Hence, in our view, the statistical residency of an individual can be identified most accurately and timely by the country code of the phone number of the individual. Now, for the case of the business travel, an addition observation is very helpful: if the company is contracted with a travel agency for ticket booking, the travel agency would, most often, be a local agency, hence having the same residency as the company. Then, the phone number in the ticket reservation would be that of the travel agency, which captures the correct residency of the company[8]. Of course, when the company books the ticket herself, the phone number of the company would then be indicated, rendering our problem trivial. The issue of availability of such (non-confidential) phone data is discussed later on in the paper. Here it suffices to say that, in principle, phone data are visible to travel agents when the ticket is booked by an agency and to the airline companies when the ticket is booked through the airline's website.

[7] Roaming within EU is financially viable only for short term visits. In long term establishments, which entail most of the times, change of residency, obtaining a local phone number is the standard case.

[8] Although the phone number may not be the correct one, the country code of the phone number signals the desired country.

The major problem of OTAs in the current billing system

In principle, there are two ways to book an airline ticket. Either you visit directly the website of the airline company and book the ticket from there, and this is called direct sales, or you go to a travel agency, which is called most often billing. Direct sales are known only to the airline company, however it comprises only a minor component of the total sales[9]. The predominant turnover of the airline companies however, comes through tickets issued by travel agents. Especially, for the major airline companies, who are IATA members, their ticket settlement passes mainly through the IATA Currency Clearance Service (ICCS), comprising the IATA Billing and Settlement Plan (IATA BSP) and IATA Cargo Agents Settlement System (IATA CASS), along with the IATA Clearing House (ICH) for interline arrangements.

The IATA is a trade association of the world's airlines. Consisting of 290 airlines, primarily major carriers, representing 117 countries, the IATA's member airlines account for carrying approximately 82% of total available seat miles air traffic. IATA has over 50 offices over the world, supporting members in 120 countries[10]. Observing the member list of IATA, we see that practically all major airline companies are members of IATA, whereas most airline companies outside IATA membership are low-cost carriers. In relative terms, one can say that IATA is the guarantor between accredited travel agents and the airline companies.

Travel agents can be either internet-based platforms searching for best prices across airline companies for a specific trip, often called Online Travel Agents (OTAs), or traditional offline travel agencies with physical presence. From 2013 and onwards OTAs have made a strong entrance to the billing system. The BPM6 CG [pg. 12.49] suggests that "the compiler must make a simple, but not altogether unreasonable, assumption that tickets sold in a particular economy are sold to residents of that economy and adjustments made to estimates as necessary, by using surveys of travelers". Indeed, for the case of the offline travel agencies with physical presence, this suggestion is still valid. When a ticket is reserved with physical presence via a local travel agency, then all odds are in favor of assuming that the passenger is a resident. On the contrary, it was with the intrusion of OTAs in the billing system that made the above assumption rather outdated. Large scale resident OTAs tend to inflate a country's billing system, in BOP terms, when they decide to clear tickets in the domestic economy. The reason is that, in such cases, one sees in a domestic economy a high level of IATA BSP for several foreign airline companies when, in fact, the biggest proportion of these sales refers to tickets between non-residents passengers and non-resident airline carriers. Additionally, because OTAs may have several IATA slots to clear their online ticket reservations. The above two observations pressure significantly the whole data collection system in BOP terms[11].

[9] Low-Cost Carriers try to push more their direct sales, but simultaneously have lower turnover. Given that direct sales are known only to the airline company, one can obtain these data either directly from the airline company, credit cards data or by estimations methods. This issue will be discussed later on at the implementation phase of our model.

[10] Source: IATA website https://www.iata.org/en/about/.

[11] Port of origin of the ticket could be a potential solution, but does not reflect completely the concept of residency. In our previous example with the Greek shipping company and the seaman from Philippines, port of origin is totally misleading, whereas our approach appears to be fully robust.

The role of IATA in the data collection model

Regarding the IATA BSP, the system is on a ticket by ticket level. The airline companies (and the IATA) know from the billing report, per travel agent, the number of the ticket, the transaction value, gross sales, commissions, taxes and possible refunds. Although the name of passenger is known to the airline company[12], it is the travel agency who has access to the crucial variable of the country code of the phone number of the ticket reservation[13]. The IATA collects billing statements worldwide from accredited travel agents on airline companies who are IATA members.

The missing link to our model is that travel agencies should submit to IATA the country code of the phone number appearing in the ticket reservation. In the event where such information is not available to the travel agent, as is in the case of group/bulk reservation in an offline setting, the country code of the travel agency itself (as it appears in the billing report) could be used, as suggested earlier in our methodological approach. Then IATA, having the billing reports from all travel agents around the world, could pivot and deliver BOP data per airline carrier and per country of residence. The advantage of this approach is that it mitigates the "noise in the data" produced by OTAs and achieves global consistency within the billing data.

Apart from the IATA BSP, which is the major item for air transport activities, we also have the IATA CASS, which is for cargo transport. The standard practice for IATA CASS cleared in a domestic economy, is that the cargo is dispatched from that economy and most probably from residents, hence, it should be recorded as BOP transaction when the carrier is a foreign airline company.

In addition, an important issue is the "interline market", between airline companies. Interline arrangements, as discussed also in the BPM6 CG, is the case where the actual operating carrier and the airline issuing the ticket differ. In financial terms, interline resembles the interbank market with central bank intermediation. IATA runs the IATA Clearing House, who plays the role of the central "institution" where each airline company uploads her assets/liabilities vis-à-vis all other airline companies and at the end the ICH transfers the net payable to the beneficiaries with positive balance, while requesting money from the those with negative balance. The ICH has a clear view of assets and liabilities *on gross values*, as suggested in the manuals, for each airline company contracted with ICH. Net payables of course may differ.

The IATA-based model presented above, provides a realistic solution to capture BOP transactions regarding ticket sales issued by travel agents within the IATA airline members, which is the big picture of the global airline industry in terms of air transport activity and revenues. However, in order to have the full picture, one needs to have, in addition, the direct sales of the airline companies[14], taking place outside the IATA clearing system. Although for IATA airline members direct sales constitute

[12] The name of passenger is not directly visible to the airline company from the billing report, but it can be retrieved from additional reports.

[13] To the majority of OTAs ticket reservation systems, the country code of the mobile phone number is a mandatory field (with asterisk). The same holds on direct sales ticket reservation of airlines.

[14] As mentioned earlier, direct sales occur when the ticket reservation takes place through the airline's own website/call center. For low-cost carriers direct sales form a significant portion of the total turnover, whereas for IATA airline members direct sales represent only a small extent of total sales.

only a small fraction of the total turnover, for low-cost airlines direct sales play the biggest role[15]. From a statistical point of view, direct sales have the advantage that the airline company has "more direct" information on the customer. Most often, in direct sales the phone number is a mandatory field in the reservation process and hence it is available to the airline company. But again, low-cost carriers tend to have minimal physical presence throughout the world, with no branches whatsoever, so obtaining data from these non-resident companies by using standard survey methods can lead to a significant under-sampling. Only for the countries where these low-cost companies have legal registration and physical presence is direct reporting truly feasible. For these countries, BOP credits would be correctly reported, whereas for the counterpart countries it would, most probably, be a missing part from their debits. This is because if a resident physical person books a ticket online with a low-cost non-resident airline company with no established branch, this debit transaction will be very hard to capture, given the small transaction value and the fact that it refers to an individual. Hence, it appears rather inefficient to have all countries trying to collect/estimate such sparse data[16]. What seems to be really efficient, given the inherent deficiencies in collecting such air transport data, is that a centralized body is developed where countries can have access and exchange these data, maybe on a more aggregated basis. Here, the necessity for an International Organization to take the lead and play the role of the "Data Guardian" is more than obvious. Each country should submit to the Guardian data[17] *only* non-IATA data (i.e. data not included in the IATA BSP, CASS, ICH) and only for the airline companies who have their *Headquarters* incorporated to their country. This, in fact, reduces significantly the burden and the number of the respondents.

In turn, the Guardian will be responsible for three main things: first, to gather the relevant BOP data from all countries regarding non-IATA data, second, to establish cooperation with IATA in order to get all data passing through IATA and, third, to arrange for timely and secure data sharing with NCBs and NSIs.

Implementing a full air transport services model in practice – the use of big data.

Establishing a data Guardian with the above responsibilities is, of course, the first best. However, in real life, we all know that implementing such a large-scale project can be time consuming and may fall into the caveats of bureaucracy. As a second best, the step of gathering non-IATA data could be overcome. Lately, with the advent of big data and computational algorithms, the hope has emerged to use this technology to produce official statistics of high quality while reducing the statistical burden. For the above cases, big data tools can prove to be beneficial in two ways: NCBs can employ

[15] However, it deserves to be mentioned here that, even from their definition, low-cost airline companies due to cheaper tickets, smaller distance travel destinations and total operational costs, contribute much less to the total turnover of the global air transport activity.

[16] Of course having a two-sided reporting system is invaluable for data quality checks using mirror data. But this is efficient only when both countries have access to good quality data, such as imports and exports of goods.

[17] These data should use again the country code of the phone number, in case it is available (as it is in direct sales), or the country of the travel agency otherwise.

analytical credit cards data[18] for airline companies outside IATA membership, where the residence of the passenger should now be aligned with the country of the credit institution having issued the credit card. The other, would be to use analytical daily data from Civil Aviation Authorities, proceed by online data extraction and other data mining techniques to find proxies on the daily prices on these low-cost carriers and then employ stratification/clustering methods to estimate the desired BOP values. Such big data applications have been suggested for estimating housing prices in the Real Estate market by Loberto, Luciani and Pangallo (2018) from Banca d' Italia[12][19]. Of course, for better fit, training of such machine learning algorithms can use information from observable databases. For example, there is no reason why the residency allocation within IATA airline companies should differ in the family of non-IATA airline companies.

Finally, to put together all the pieces of the puzzle, there are some additional, although less significant, components relevant to the air transport services, such as port expenses, handling services, catering, route overflown charges (such as Eurocontrol) and others[20]. Most of these expenses have to be reported either from the resident side, from the domestic enterprises offering these services within the standard direct reporting framework or from the branches of the non-residents airline companies operating in the resident economy. Concerning route charges, in the first-best edition of our centralized model, they could actually be collected centrally by our data Guardian within the scheme of bilateral collaboration between International Organizations (such as Eurocontrol for Europe). In the second-best scenario, extracting data from the tracking flights websites (or ICAO directly) could be employed to estimate route charges. Especially for Eurocontrol, a dynamic Route Per State overflown distance tool is available [13], for estimating the incurring route charges within the Eurocontrol charging area. Using the output of this tool as a training dataset, one could estimate the route charges for the non-EU area.

In order to have the whole picture of our centralized model, we present below in Figure 1 and Figure 2 the flow charts for the two scenarios.

[18] For the EU, the ongoing ECB payment statistics regulation should facilitate towards this solution.

[19] However, one should be aware that in our case, stratification can be very difficult. Ticket prices, even for the same flight, tend to vary a lot throughout time, whereas pricing policy of low-cost carriers vs major airlines for the same destination can vary significantly.

[20] The main expenses from the operation of the aircraft are the bunkers and the crew wages. These expenses are, almost always, paid directly from the headquarters.

Figure 1.

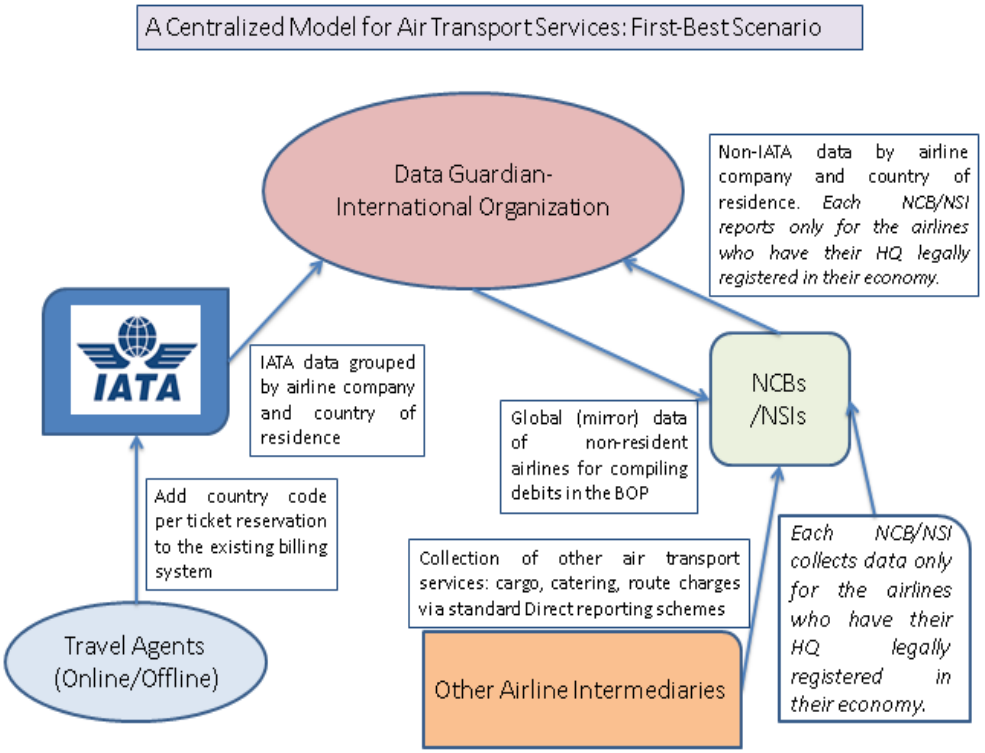
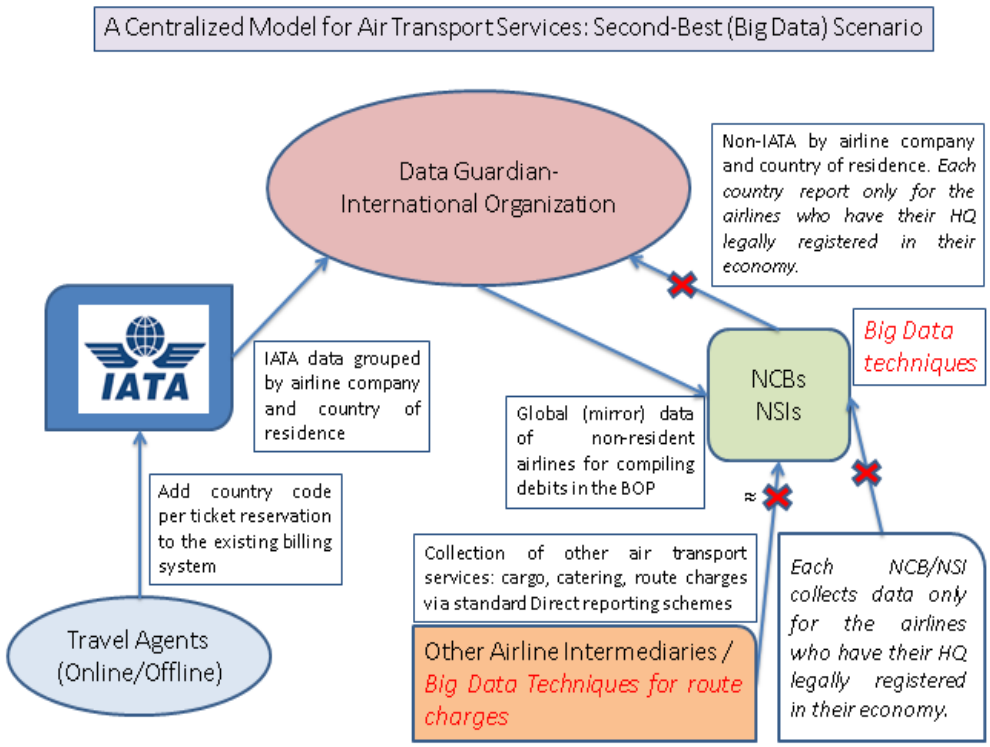


Figure 2.



From Figures 1 and 2 above, one can see that the IATA and the NCBs/NSIs play a key role as primary data source providers. The IATA captures the big bulk of the wholesales from travel agents, whereas national authorities are engaged with the collection of the sparsely distributed air transport data. It is evident that the introduction of novel big data techniques is beneficial to the statistical authorities and hence, it is to their best interest to develop relevant tailor made statistical methods.

Pros and Cons of the Guardian-based data collection model

Our proposed model on air transport activity combines three important merits. First, concerning the major part of the air transport services passing through IATA Clearing system, full consistency is achieved. Second, the definition on statistical residency is followed in the tightest possible manner. Third, amounts are exact, reflecting real cash transactions avoiding estimation techniques that may suffer from lack of robustness or misspecification. In order to make the whole project a reality, we allow deviation from the first-best solution and we seek for estimation/big data techniques only for the smaller part of the total turnover, that is outside the IATA billing, whereas the main bulk remains to be calculated accurately. One should not forget that following closely cash transactions minimizes the net errors and omissions item of the BOP. Finally, this centralized data collection, with the parallel use of big data from the NCBs will reduce significantly the burden to the respondents.

Although quite promising, the model comes with two relatively minor deficiencies. The first has to do with time availability of the data. Specifically, IATA clearing is materialized at *T+30*, meaning that for BOP compilation purposes all data dissemination and compilation from Member States regarding IATA data shall take place at the last available week before the BOP compilation deadlines. This narrow window for compilation can be stressful for official data compilers who compile monthly BOP seriers, but less stressful for those who compile quarterly or annually data, especially if such data have a provisional phase.

The second, and most important, is that in order for our model to work and be viable in long term, international coordination is explicitly required. The International Organization (data Guardian) will need to take the lead and establish bilateral agreements with IATA in order to guarantee timely transmission, solve confidentiality problems, data ownership and technical issues among others. These issues should not be undermined in any way, as experience has shown that these obstacles require coordinated global effort to be overcome. Observing existing frameworks, efficiency of International Organizations is high when these Organizations, apart from being data guardians, have a "constitutional" leverage on the declarants. For example BIS, IMF, ECB have such leverage in hand, making data collection on financial instruments much easier. On the contrary, most current account models dealing with the real economy and the non-financial sector lack of such leverage. Here, the necessity for global coordination has to be placed upon the importance of official statistics itself for the common good.

Conclusion

The present methodological paper addresses the issue of how globalization complicates the collection and compilation of official statistics, taking the airline sector as a study case. We identify the standards that a generic model (irrespective of the industry involved) has to respect in order to bypass the effects of globalization; BIS deposits report is such a model. For the air transport services, concerning the statistical residency we propose the country code of the phone number as indicated in the ticket reservation to be the best proxy for residency, as passports can be highly misleading especially within EU. Our proposal is a centralized model, where an International Organization will be the data Guardian and collect data from IATA for all air transport services that are cleared through IATA, whereas for non-IATA data, only the countries where such airline companies have their Headquarters legally incorporated (hence resident) will report vis-à-vis rest of the world to the Guardian. The proposed model overcomes the imputed noise in geographical allocation from the presence of online travel agents in the billing system. In order to reduce even more the statistical burden, a second-best solution is proposed, where for the non-IATA data we rely on big data techniques. The importance to develop international cooperation for better official statistics in a globalized environment is strongly highlighted.

Acknowledgements

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On the Re-evaluation of the Air Transport Activity in a Globalized Environment

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Intro

Globalization and Official Balance of Payments (BOP) Statistics

Globalization promotes the removal of cross-border barriers to foster economic interdependence and increase cross-border movement of goods, services, individuals and capital.

BOP statistics refer to the transactions between residents and non-residents based on the sharp identification of the change of economic ownership.

By *definition* the two concepts are rivals **!**

Official Statisticians need to work more on globalization by providing:

1) clearer definitions and practical guidelines for each industry.
2) exploitation of new technologies.

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Multi-National Enterprises (MNE) are the wranglers of globalization.

- Till now, focus on MNE has been given to: Foreign Direct Investment (FDI) and Tax Avoidance.
- Transport Services represent 17% of Total Services for the EU.
- In turn, Sea and Air Transport have the biggest share to Transport Services and the two industries are built up in a multinational setting.
- Main International Transport Services are excluded from the EU-VIES tax declaration, so data collection is harder.

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Difficulties in the Air Transport Services Item

- Statistical residency can be difficult to capture in an analytical way. Globalization promotes the mobility across countries and with no-migration/residency barriers (such as EU), identification of residency is harder.

- Various data collection methods across countries (business surveys, estimation methods, cash transaction data, credit cards, use of travel survey data and others).

- Strong presence from 2013 and onwards of the Online Travel Agents (OTA) in the issuance of air tickets.

- Non-physical presence of branches of airline companies in the reporting country.

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Difficulties in the Air Transport Services Item

Looking at EU data asymmetries for air transport services, we see an increase from 2013 and onwards in the trade in services balance.

Credits increase faster than debits.

CURRENCY	Million euro								
BOP_ITEM	Services: Air transport								
GEO/PARTNER	European Union - 28 countries								
TIME	2010	2011	2012	2013	2014	2015	2016	2017	2018
Credit	38.986	38.717	40.208	42.091	46.870	52.246	52.730	58.005	59.405
Debit	34.682	35.640	37.891	36.134	38.571	43.377	42.397	45.799	47.833
Balance	4.303	3.077	2.317	5.958	8.299	8.869	10.334	12.207	11.572

Source of data: Eurostat. International trade in services (since 2010) (BPM6) [bop_its6_det]. Updated 20.01.20.

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Financial Statistics have moved forward to this end.

- **ECB** has developed for EU-consistency:

I. Centralized Securities Database (CSDB). Identification of debt securities.

NCB, combine various data sources, along with information from commercial data providers, and decide the residency and other characteristics of each securities.

Once decision is solid, every NCB uses the CSDB for producing the Securities Holding Statistics (SHS).

II. Register of Foreign Affiliates (RIAD). Identification of companies.

NCB feed the RIAD with companies along with various fields. Using primary keys from RIAD, AnaCredit loan data collected from the commercial banks can be grouped for each company.

- **BIS report on deposits.**
  Collection from monetary authorities of data on deposits hold in commercial banks. A really global analytical report of granular financial data.

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Globalization asks for a centralized airline data collection model.

Financial Account (FA) statistics fit more in a centralized data model. Financial markets are heavily regulated and information is more accessible to the public.

Current Account (CA) statistics, reflecting the real economy, especially in the case of MNE, lack uniformity in the data collection methods and the bilateral use of an international reference registry.

Latest efforts (within EU) towards this end have been:

- The cross-country investigation of Large Case Units.
- The development of shipping models using international databases.

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Globalization asks for a centralized airline data collection model.

The key characteristics of a centralized data model are:

a) Presence of a data Guardian.

b) Uniform definitions and an ultimate step of finalizing the variables.

c) Cooperation between member states.

d) Access to these data by all compilers and compilation of statistics based on these finalized data.

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The Model

Defining the statistical unit and their residency

- *Concerning the airlines*: Go to International Civil Aviation Organization (ICAO) and get the country as designated in the ICAO (or IATA) airline designators.

Airline codes

IATA	ICAO	Airline	Call sign	Country	Comments
LX	SWR	Swiss International Air Lines	SWISS	Switzerland	

- *Concerning the BOP counterpart*: For personal vacations the passenger is the counterpart unit. For business travel the company, who eventually pays the ticket, should be the counterpart unit.

- *Criterion for counterpart residency*: The country code of the phone number of the ticket reservation is the first-best approach to residency. People tend to get a new phone number from local telecommunications provider as soon as they establish themselves. For the case of business travel, if a travel agency intermediates, we assume that companies generally contracts with local travel agencies.

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Example:

A Greek shipping company, using a Greek travel agent, books an flight ticket with the German carrier Lufthansa for a Philippine seaman to fly from Manilla (or any other place on Earth) to New York to on board on a ship there.

Statistical units & Residency: The BOP parties are the Greek shipping company and German carrier Lufthansa. The phone number would be either that of the shipping company or of the local travel agent. In either case, the country code would be correct as “GR”. Money leave the same trace.

The seaman is totally indifferent (even ignorant) of the ticket reservation, departure/arrival, cash settlement.

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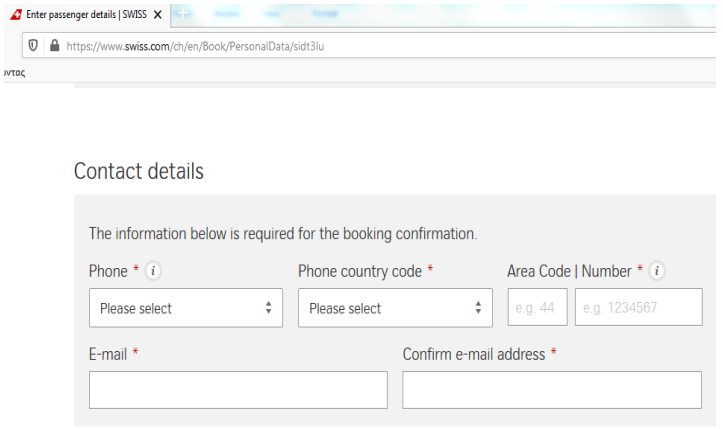
IATA and Online Travel Agents (OTA)

There are two ways to book a ticket:

- Either you go to the airline's website and book the ticket directly. These are called the "Direct Sales" known only to the airline company. The field **phone country code** is mandatory to proceed for the reservation.



- Or, you go a travel agent. Travel agents can be either with physical presence (offline) or online, such as Kiwi, Ctrip, Lastminute, Etraveli and others.

- Since 2013 Online Travel Agents (OTA) have made a big entrance in the flight reservations market. The reason is: they help potential passengers to view simultaneously the best ticket regarding price and time schedule.

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IATA and Online Travel Agents (OTA)

International Air Transport Association (IATA) is a trade association of the world's airlines. Consists of 290 airlines, primarily major carriers, representing 117 countries, and accounting 82% of the total seat miles air traffic. IATA has 50 offices around the world supporting members in 120 countries. IATA travel agents are about 60,000 globally.

IATA has three major clearing services:

I. IATA Billing and Settlement Plan (IATA BSP) for passengers.
II. IATA Cargo Agents Settlement System (IATA CASS) for cargo.
III. IATA Clearing House (ICH) for interline arrangements.

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The “Noise” from Globalized Online Travel Agents (OTA)

- BPM6 CG [pg. 12.49] suggests “the compiler must make a simple, but not altogether unreasonable assumption that tickets sold in a particular economy are sold to residents of that economy and adjustments made to estimates as necessary, by using surveys of travelers”.
- This was generally true till 2010 when BPM6 was written. Also generally true for the offline flight reservation till now.
- Not valid for 2020, with the presence of the OTA. Large OTA tend to inflate the IATA BSP of the resident economy by clearing, in the domestic economy, tickets of non-residents with foreign airlines.
- IATA BSP of one country contains information relevant for the BOP of other countries.

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IATA

The Role of IATA in the Data Collection

IATA billing report is on ticket-by-ticket level.

Airline company has the information on the reservation, gross sales, refund, commissions. From other reports, the name of passenger can be retrieved by the airline companies.

The travel agency has direct access to the crucial variable of the country code of the phone number of the reservation.

IATA BSP collects billing statements from all IATA travel agencies and makes the clearing twice a month back to the IATA carriers.

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The Role of IATA in the Data Collection

The **missing link** of our model from the current practice is that travel agencies need to feed this billing report to IATA with the variable of the country code of the ticket reservation.

For online reservation this field is mandatory. For offline reservation, this field could be missing (due to group reservations). The country code of the travel agency itself could be safely used instead.

Having gathered flight tickets reserved from travel agencies from all around the Globe, with country code indication on a ticket level, we could produce consistent BOP data regarding the IATA BSP for every country.

IATA BSP is a major contributor to the total airline turnover.

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The Role of IATA in the Data Collection

IATA CASS refers to cargo shipment. In general, IATA CASS has much smaller turnover than BSP. Refers mainly to transactions between companies (local couriers and carriers), so countries of residence should be easily identified.

ICH refers to interline agreements between IATA airlines. IATA plays the role of the clearing house. ICH has centralized data on assets and liabilities in gross terms from all IATA airlines vis-à-vis the rest airlines.

In all cases, IATA plays the role of the intermediate guardian like a standard financial clearing house.

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Completing the Picture of the Whole Model

Suppose, for now, that we assign an International Organization as our Data Guardian, who will establish data sharing with IATA and will be the keeper of all these monthly IATA datasets (BSP, CASS, ICH).

This is a big step: we have captured most of the total turnover!

We are now missing:

I. Direct sales from IATA airline companies.

II. Data from non IATA airline companies, mainly Low Cost Carriers (LCC).

III. Other air transport related expenses, such as tolls, route overflown charges (i.e. Eurocontrol), port expenses, handling, catering and others.

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Completing the Picture of the Whole Model

- Low Cost Carriers have minimal presence in most countries, with very few branches established. Survey sampling of these airlines will be inefficient for all national authorities (except for the country of incorporation).

- This could be a reason why Credits >> Debits in the air transport services balance.

- Direct Reporting can be truly feasible only for the countries where the Headquarters are legally and physically incorporated. Data collected should refer to the activities of the airline all around the world.

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Completing the Picture of the Whole Model

This is the way to go for a complete centralized airline data model !

- The Guardian will collect all IATA data.
- Each country should submit to the Guardian analytical data only for airlines legally incorporated in their domestic economy.
- Data collected from each country would be only for Direct Sales of IATA airlines and all data for non IATA airlines, along with relevant expenses.

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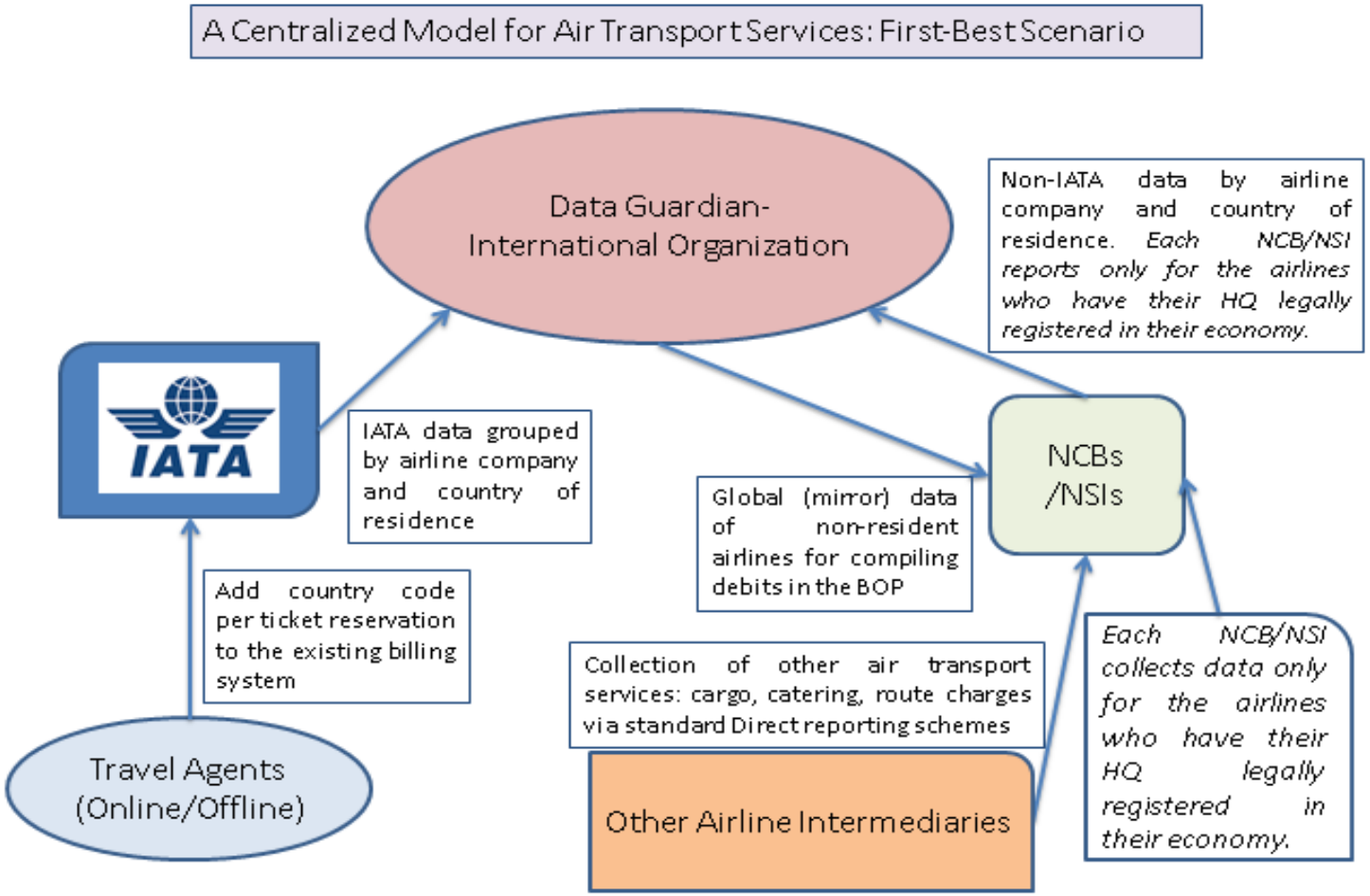
First – Best Approach.



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Implementing the Model in Practice – the use of Big data.

Collecting smaller parts of the model can be time consuming and inefficient. Latent items can be estimated using Big data. Direct Sales, non IATA and other expenses could be replaced with:

- Analytical credit card data (for direct sales).
- Web scraping and clustering algorithms for finding daily prices per destination. Banca d'Italia has an equivalent project for real estate prices. (non IATA sales)
- Tracking flights websites for estimation of route charges. Eurocontrol, has a dynamic Route Per State overflown distance tool is available. Use this output as a training dataset for the rest of world route charges. Similar methods for catering, handling, port expenses.
- The IATA dataset could be used for training algorithms used for non IATA airline companies. No reason for different geographical allocation. Numerous classification alternatives exist.

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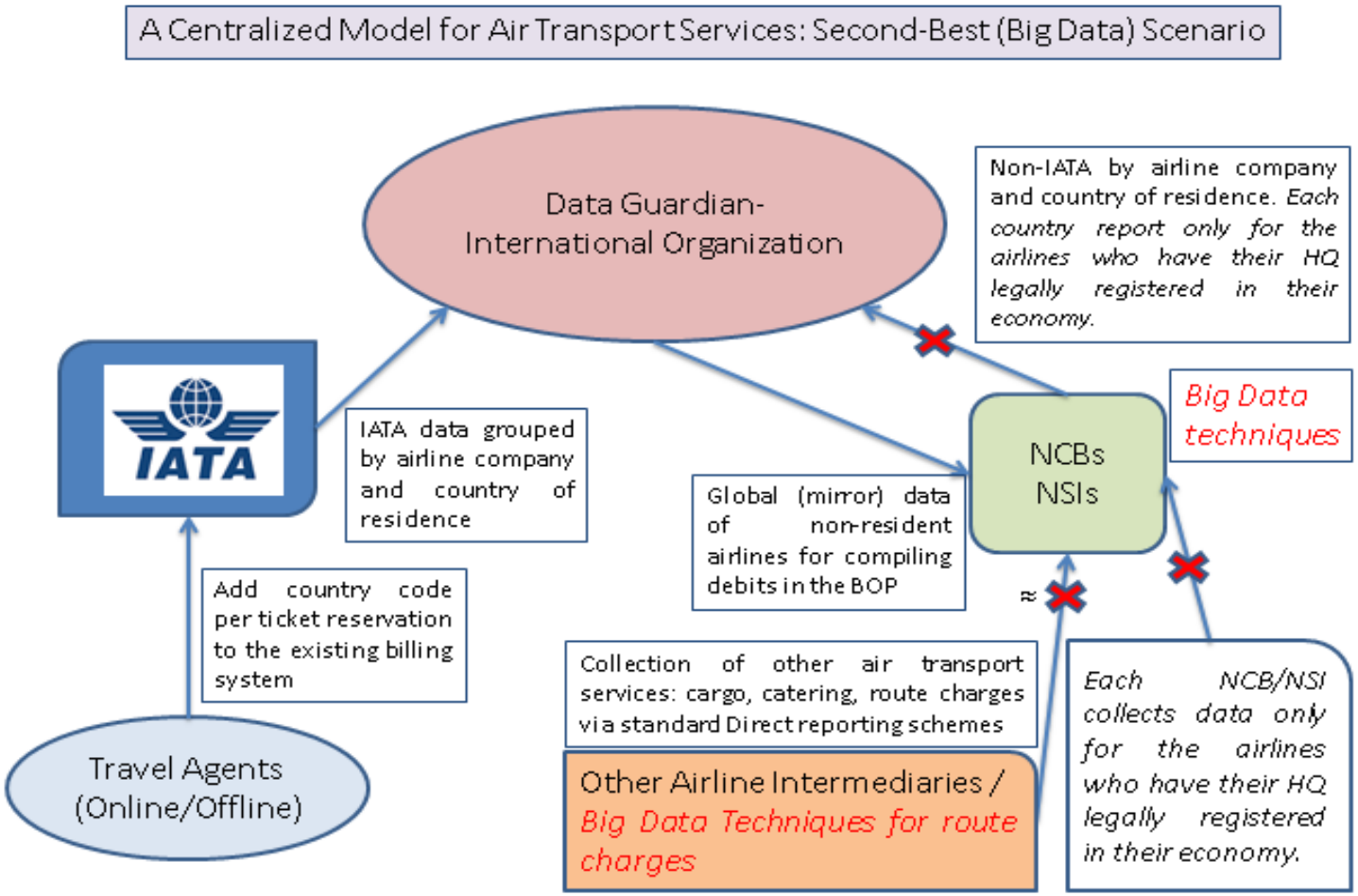
Second – Best Approach.



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Pros and Cons of our Centralized Model for Air Transport Services

Pros

- Achieves almost global consistency for the BOP data on air transport services.
- Statistical residency is followed as closely as possible, avoiding globalization effects, such as expatriates.
- Data are based on real cash, leaving estimation techniques only for the residual parts of the model.
- Efforts to reduce the reporting burden by centralized reporting. Application of big data methods for latent or hard to collect data.

Cons

- Establishment of a data Guardian and coordination between International Organizations and Associations.
- Data Timeliness. Date of IATA clearing is close to BOP reporting deadlines.

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Any Questions ?

Thank you !!!