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Revamping travel estimates in the balance of payments: mid- and post-Covid-19 models[1]

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[1] This contribution was prepared for the conference. The views expressed are those of the authors and do not necessarily reflect the views of the European Central Bank, the Bank of Spain, the BIS, the IFC or the other central banks and institutions represented at the event.

Revamping Travel estimates in the BOP: Mid- and Post-Covid 19 Models

Executive Summary

The COVID-19 pandemic has drastically affected tourism sector worldwide due to sudden and prolonged travel restrictions imposed by authorities of most countries. Suspension of airports and border checkpoints have resulted in large number of stranded travelers; and state quarantine imposed in later stage have considerably changed spending pattern and length of stay of travelers from the pre-pandemic behavior, both for inbound and outbound travel. These have triggered a need to rethink and reshape the estimation models for travel receipts and payments in the balance of payments compilation.

This paper discusses the Bank of Thailand's (BOT) adoption of the new methodology in estimating travel receipts and payments, shifting from 'arrival basis' to 'stock basis', which rely on the use of granular data from the Immigration Bureau (IB).

The 'arrival basis' would not allocate travel receipt to the month in which the spending occur, but rather the month in which travelers enter Thailand. The quality of estimates particularly deteriorates when the average length of stay stretches across months, which is a widely observed pattern for mid-pandemic travels. The 'stock basis' was developed to overcome this drawback, as it focuses on the number of 'remaining' travelers each day during respective month, regardless of the arrival date. The estimates based on this approach, thus, reflects a more realistic level of daily travel receipts as well as monthly summation thereof.

This stock approach would not be feasible without availability of granular data from the IB. During the pilot stage (2020 to mid-2023), the stock was estimated based on initial stock from the IB and data on daily arrivals and departures. Starting 2023, granular data (by masked ID of each traveler, date of arrival/departure, and other supplementary information) became available, enabling better data cleansing and a more precise derivation of stock of travelers. Main findings, the way forward in 'refining stock estimates', and potential use for analysis of regional tourism, cross-border workers, and so on are also highlighted in this paper.

Section 1: Introduction

Thailand is considered one of the popular tourist destinations due to its geographical diversity and cultural charm. It has some of the most exquisite beaches, temples and savory foods, ranging from street food to top-rated restaurant cuisines. As such, the tourism industry has long served as one key driving engines for the Thai economy in the past decade.

As the COVID-19 pandemic unexpectedly emerged in late-2019, the global tourism in subsequent years had been severely affected due to travel restrictions imposed by authorities in many countries. Closure of airports and border checkpoints at the early stage had left thousands of travelers stranded in the destination country for unexpectedly prolonged period. Despite no new incoming travelers, stranded visitors still had to shell out their costs of living which, in turn, generating income to the host economy. Conventional estimation model was not able to accommodate such scenario. Similar phenomenon was also observed for outbound travel. This leads to a decision to adopt the "stock basis" model as a new method in estimating travel receipts and payments in the balance of payments. Besides, granular data recently obtained from the Immigration Bureau (IB) were introduced into the model for better measurement of the stock of tourists.

This paper discusses how the 'stock-basis' model was developed and illustrates its pros and cons over the conventional model or 'arrival basis' in approximating the actual level of travel receipts. Section 2 iterates conventional model and its constraints. Section 3 provides conceptual framework of the 'stock basis'. Section 4 introduces the usage of granular data from the IB to enhance the precision of measuring the stock of tourists. Section 5 draws on a conclusion and a way forward.

Section 2: Conventional Model: 'Arrival Basis'

The conventional model has been widely adopted by most national compilers due to its simplicity and ease of use. The model had worked well for decades till the arrival of the global COVID-19 pandemic. During the onset of the crisis, cross-border travelling was highly restricted. Quarantines (both in the host country for the incoming trip, as well as in the home country upon their return) and higher travel costs (particularly, the air fare) induced a complete change in (i) category of travelers, (ii) spending behaviour, and (iii) average length of stay. This deteriorates the validity of the conventional estimation.

Conventional Model: Presumption and Implications

The conventional model involves three variables: 1) number of tourist arrivals; 2) expenditure per day; and 3) average length of stay. The product of the three variables approximate travel receipts as shown below:

Arrival basis

arriving travelers* during the month | spending/day *(from tourism survey)* | average length of stay *(from tourism survey)*

Monthly travel receipt = arriving travelers* x spending per day x average number of days stayed

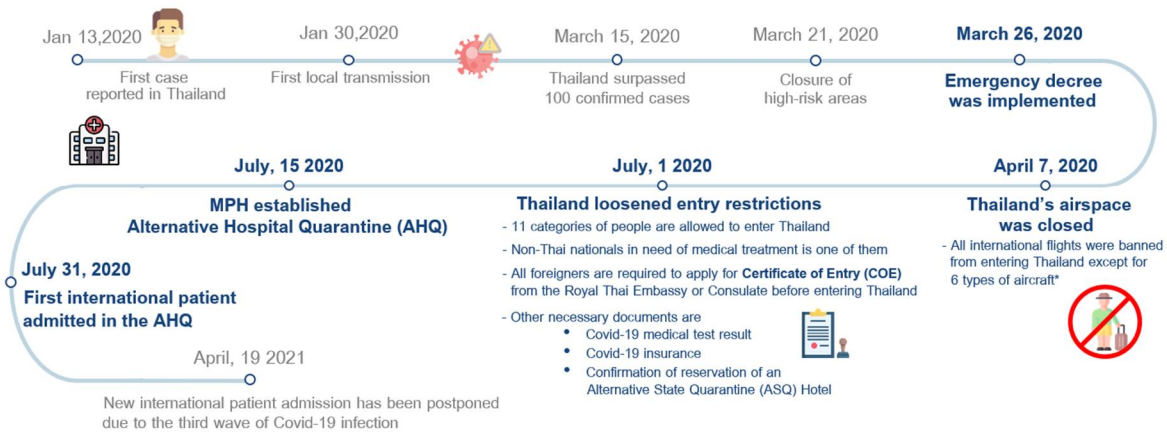
The conventional model relies on a strong assumption that all tourism revenue is generated on the same month at which tourists arrived. In other words, compilers record the entire travel receipts in the arrival period. This is behaviorally contrary to the nature of earned income which, in reality, is generated day by day as tourists stay and spend during their entire stay in the destination country. Deviation from the actual level of travel receipts could be worsened in the event that a shift in travelers' behaviour is discernible.

The conventional model works well with short-term and intra-month travelers. However, it is evident that such presumptions are not in line with reality. Usually, visitors taking long-haul fights tend to have extended stay in the destination country compared to those living in countries in the same region and taking short-haul flights. Some even extended their stay across month (or several months), a phenomenon which was more pronounced during the global pandemic. In some countries, checkpoints along the border and airports were temporarily suspended. As situation became more stable, countries started easing travel restrictions, yet with some conditionalities such as a 'state quarantine'.

For instance, certain countries in Asia including Thailand imposed quarantine measures for cross-border travelers. Inbound passengers, regardless of nationality, were required to go through a state quarantine, usually for one, two, or three weeks in designated facilities provided by the government. Given such restrictions, coupled with much higher air fare/travel costs as compared to the pre-pandemic period, tourists tend to spend much longer period in the destination country so as to make the best out of the journey after the mandatory quarantine.

Chronicle of Pandemic Control Measures in Thailand

"Emergency decree" has been imposed to control the pandemic since March 26, 2020.



The required state or alternate state quarantine induced travelers to incur additional travel costs, as compared to normal travels. Firstly, travelers were allowed to choose to spend their quarantine in a state or private facilities; i,e., in selected luxury hotels approved by the authority, at their own expenses. Secondly, after the quarantine period, most travelers tend to compensate for the lost period (detention) by having longer stay than usual. Unavoidably higher travel costs (caused by the two aforementioned factors as well as higher air fare), had naturally discouraged common and budget travelers, leaving only those with much higher average daily spending as reflected by the tourism survey conducted by the tourism authority. Put it differently, the adverse effect of having less number of visitors was partially offset by their higher daily spending and longer stay.

Post-pandemic travel behaviour also differs from the pre-pandemic observation. 'Workation' and 'digital nomads' become increasingly observable, both domestically and internationally. Thailand, among others, became a popular destination for this type of travelers. Additionally, many airlines resumed their operation and air fare started to decline towards the pre-pandemic level. Lower travel costs have induced common and budget travelers back into the market. More variety of traveler categories as mentioned above has undoubtedly resulted in a wider range of length of stay and daily spending.

Constraints and Validity of Conventional Model

Incidents stated above exhibit some failures of the conventional estimation model in attributing the estimated travel receipts to respective period. First, 'arrival basis' led to over-estimating travel receipts for the month at which tourists arrived. Since the quarantine measure was imposed, travelers in many cases had extended their stay to two to three months. Hence, the validity of the arrival basis needs to be reassessed against changing travel behaviour/conditions.

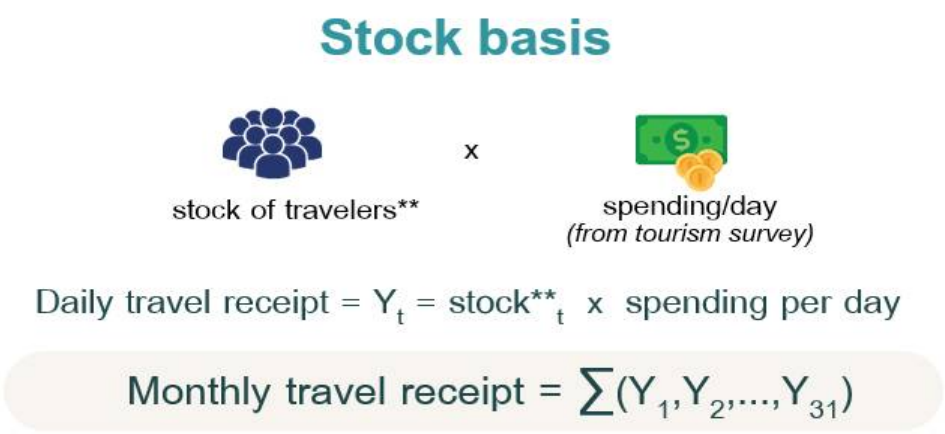
Second, conventional model fails to realise travel receipts even when there is no new tourist arrival. Right after the closure of airports and land checkpoints, no traveler was allowed to enter the country. However, travelers who had entered the country prior to the airport closure unexpectedly had to remain in the host country for some time, awaiting evacuation flights/commercial flights to bring them back to their home countries. These stranded travelers would still incur expenses everyday as long as they remain in the host country. The arrival-basis model fails to capture the revenue generated in subsequent period by these remaining visitors.

Third, even in the post-pandemic period when quarantine measure was lifted, the arrival-basis model could not accommodate the case where tourists stay longer than a month, including but not limited to the case of 'workation' and 'digital nomads'. Based on this model, all revenue would be attributed to the month at which tourists arrived; thus, under-estimating travel receipts of subsequent months over which the same tourists remained in the host country.

Last but not least, the conventional model usually relies on the use of historical data for average length of stay to derive preliminary figures while awaiting actual survey-based results, which are usually made available several months thereafter. Past data may not be a good proxy if structural change or travel behavioral shift is evidenced, such as what we widely observed during mid- and post-pandemic.

Section 3: New Approach: Stock Basis

In an attempt to overcome drawbacks of the 'arrival-basis' model, the BOT explored another method by deriving the existing stock of travelers remaining in Thailand each day, so-called the 'stock basis'.



The advantage of this model is that it is neutral for all length of stay. Daily stock of travelers measures the total number of travelers who remain in the host country, regardless of the month of arrival. Daily travel receipt is the product of the daily stock and daily spending. Monthly travel receipt is derived as a summation of the daily travel receipt during respective month. This way, travel receipts are recorded on the day travelers incur expenses rather than the period at which they enter the host country, in line with the balance of payments' recommended basis for 'time of recording' of the transactions.

The superiority of this new approach is that it can resolve the problem of exceptionally lengthy stay (e.g., when quarantine was imposed, the case of workation and digital nomads, etc.). This applies to both inbound and outbound travel; and valid across all length of stay.

Section 4: Use of Granular Data from the IB

The success behind the 'stock-basis' model largely depends upon the use of granular data from the IB to verify the imputed stock of travelers. To comply with the Personal Data Protection Act (PDPA), the data request had to go through several rounds of intensive discussion and consideration by the management of both the BOT and the IB, as well as technical preparations by IT staff of both organizations (e.g., in masking the IDs; and preparing sufficient data storage and software to handle the processing of this big data).

The individual tourist arrival data (with masked IDs) have been shared to the BOT fortnightly, with breakdown into daily data, starting 1 January 2023. This granular data comprises seven data fields as shown below:

1. Date of Entry / Exit
2. Unique ID (masked ID)
3. Nationality
4. Visa Type/Entry Document Type
5. Direction of Travel (Inbound / Outbound)
6. Airport / Check Point
7. Flight No. (airplane) / License Plate (automotive) / Vessel Registration (ship) / Others

Data Preparation for Imputing Stock of Tourists for Inbound Travel

First, data were processed at the masked ID level to segregate only foreign tourists and detect for their visiting pattern:

1) Filtering only foreign nationals (excluding those with migrant visa)
2) For each ID, detect for frequency of visits for the entire period analyzed (1 January – 15 December 2023)
3) Matching entry and exit dates to calculate length of stay for each ID and each visit (in case of repeated visits)
4) Reversing the entry and exit dates to calculate length of stay outside of Thailand (to detect for potential cases of expats living in Thailand and traveling abroad for leisure/work)
5) Analyzing nationality against the frequently used checkpoints, and proximity to home country
6) Analyzing the length of stay against visa type or type of entry document.

Following the six steps above, a set of IDs were identified as 'plausible cases of expats or informal workers', and hence removed from the imputation of the stock of inbound tourists.

a) Those with longer stay in Thailand, compared to the period they remained abroad during the entire period observed.
b) Those nationals entering Thailand with visa-free status; staying in Thailand for the maximum number of days allowed; exiting and re-entering Thailand on the same day to 'roll-over' the visa-free status; and repeating this pattern many times during the entire period observed.

After removing the IDs in a) and b), the stock of inbound tourists has been estimated, ranging from around 460,000 to 730,000 persons per day. Once having a full year data in the database, additional criteria will be introduced so as to remove those IDs staying in Thailand for longer than a year (and hence become Thai residents).

Stylized Fact

Overview

- From 1 January – 15 December 2023 (50 weeks), there were 88 million cross-border travels (inbound & outbound). Out of this, Thai residents and foreign travelers account for 28% and 72% respectively.
- Mode of Travel (MOT): Apparently, "Air Mode" is the main MOT, accounting for 63%, followed by "Foot & Land" (35%), and "Sea" (2%),
- Number of in- and outbound activities is quite symmetric, with only a small discrepancy between the two categories (around 288,000 records).

Thai Travelers

- There were 3.9 million Thai nationals traveling outbound, crossing the border for around 12.2 million times.
- Based on country of immediate destination, Cambodia, Myanmar and Laos were the most visited countries for Thai travelers, accounting for 70% of total outbound trips.
- Specifically for air travel, Japan was the most visited country by the Thais, followed by Hong Kong and Vietnam. Countries of major transit hub such as the UAE and Qatar ranked 9th and 12th, respectively.
- Average length of stay for "Land Mode" was around four days.

- On continental analytics, Thai travelers had the longest length of stay for North America (20 days), followed by Africa (16 days), Oceania (14 days), Europe (13 days), and East Asia (7 days)
- As of 15 December 2023, 37% of Thai travelers have been staying abroad for less than 2 months, and 63% staying abroad for more than 2 months.

Foreign Travelers

- There were 21.8 million foreign visitors traveling into Thailand, totaling around 22 million entries.
- Majority of foreign travelers were short-stay tourists (89.5%).

Section 5: Conclusion and Way Forward

Conclusion

- Travel receipt has been one major income sources for Thailand for the past decades. Ensuring accurate measurement of travel revenue is, therefore, vital for proper assessment of current account and external sector surveillance.

- In estimating tourism income, the 'arrival basis', the conventional method adopted for many years, could not function properly during the pandemic when travel restrictions were imposed. For instance, in a situation of airport or checkpoint closure, there was no new tourist arrival when airport and checkpoint closure was in effect, but 'arrival-basis' model failed to capture spending of stranded travelers.

- 'Stock-basis' model was developed to better derive the travel receipts (for inbound travel) and travel payments (for outbound travel). This new method requires only two variables: 1) daily stock of travelers, and 2) spending per day. Conceptually, 'stock basis' yields a more realistic outcome since it attributes travel income to the period in which the travelers' spending was incurred, rather than the time at which travelers enter the host country.

- To further enhance the quality of tourist stock computation, the BOT explored the granular data on cross-border visitors recently obtained from the IB. Both the BOT and the IB strictly obliged to the PDPA; the shared data were based on 'masked ID', enabling the BOT to fully utilize the individual/entry-level data and all supplementary details without identifying the person itself.

- Details available in the granular dataset enable inferencing of potential cases of expats and some informal workers and exclude them from the tourist stock.

Way Forward:

- The BOT will further develop a common dataset where these granular inputs are clustered and mapped to provide users with additional useful data dimensions, such as regional block, airlines used, provincial breakdown of border checkpoints, frequency of visits (short-stay, long-stay), etc. This additional information would be of interest to a wider range of data users, not limited to only for external sector.

- The IB is planning towards designing an 'e-immigration' system. Once operationalized, the system should enable collection of more details of cross-border travels, which should potentially provide richer information for the compilation and analysis of tourism statistics and travel receipts/payments as part of the balance of payments.

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Revamping Travel Estimates in the BOP:

Mid- and Post-Covid 19 Models

Prepared for the Conference on

External Statistics after the pandemic: addressing novel analytical challenges

12-13 February 2024

Madrid, Spain

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Discussion Topics

1. “Arrival” vs “Stock” basis: Why is a methodological change necessary?
    - Limitation of Conventional Model
    - Understanding Stock Basis
2. Granular Data
3. Key Findings
    - Estimated Stock based on Granular Data
    - Other Stylised Facts from Granular Data
4. Conclusion and Way Forward

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https://www.travelonline.com/thailand/attractions/wat-arunelonline.com

https://bk.asia-city.com/travel/news/thailand-best-mountains

https://theculturetrip.com/asia/thailand/articles/21-beautiful-islands-thailandom

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Limitation of Conventional Model

Arrival basis

Monthly travel receipt = arriving travelers* x spending per day x average number of days stayed

i.e., This model assumes that all travel receipts are generated only in the month of arrival !!

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Limitation of Conventional Model

Conventional model inhibits some drawbacks:

- Time of recording of travel receipts
  - Not all tourists stay & complete trips within a month
  - Not all receipts are generated on the month in which tourists arrive
- Not applicable to unusual circumstance or conditions
- Not accommodate long-stay vistors

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New Approach: Understanding Stock Basis

Stock basis

stock of travelers**

x

spending/day
(from tourism survey)

Daily travel receipt = Y_t = stock**$_t$ x spending per day

Monthly travel receipt = $\sum(Y_1, Y_2, \ldots, Y_{31})$

Mechanism

- Daily travel receipt is a product of daily stock and daily spending
- Travel receipt is estimated daily, then accumulated to monthly data

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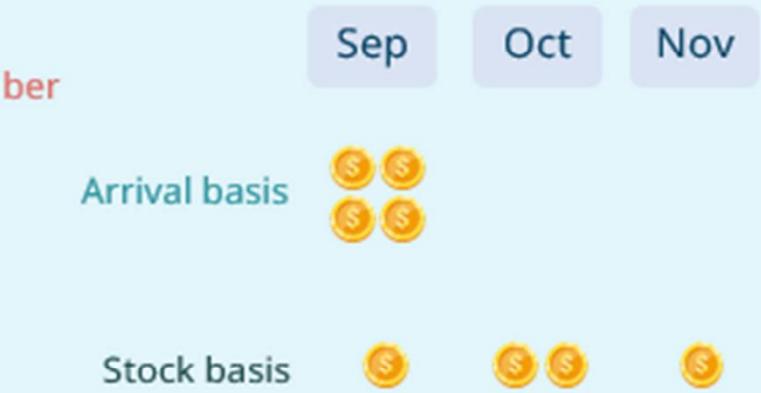
New Approach: Understanding Stock Basis

Recording travel expenses: Arrival vs Stock-basis

Example: Tourists arrive in September and gradually depart in September, October, and November

Arrival basis records all travel expenses in the month tourists arrive (Sep.)

Stock basis records travel expenses in the month which tourists actually incur expenses.



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New Approach: Understanding Stock Basis

Stock basis: Advantages over 'Arrival basis'

- Consistency: Valid across all travel conditions
  - Time horizon
    (neutral results whether tourists arrive on 1st week, mid-month, or last week of the month)
  - Duration of stay
    (short-, long-stay tourists)
  - Exceptional circumstances
    (pre-, mid-, and post-pandemic)
- Quality of Estimation:
  Reflect more realistic level of travel revenue generated (daily → monthly)

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Granular Data

The success behind “stock basis” model depends upon the use of granular data. Verifying the imputed stock of travelers requires:

- Entries and exits are recorded, processed, and used by the Immigration Bureau (IB)
- Previously, data obtained from IB are aggregated by nationality and checkpoints.
- After rounds of intensive discussion between BOT and IB, IB agreed to share granular data, containing individual records of persons entering and exiting Thailand.

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Granular Data

Issues of concern in sharing granular data:

- Confidentiality issue: ***Personal Data Protection Act (PDPA)***
  → Use of 'masked ID', allowing segregation of data by individual traveler without identifying the person
  (i.e, sharing 'UUID' instead of actual passport number)
- Technical issues:
  → Masking ID: IB replacing actual passport number with UUID
  → IB sharing large-size data via *'Secured File Transfer Protocol (Secured FTP) or BOT SecureNet'*
  → BOT processing the data on Hadoop using Python

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Granular Data

Data fields comprising:

1. Date of Entry / Departure
2. Unique ID (masked ID)
3. Nationality
4. Visa Type / Entry Document Type
5. Direction of Travel (Inbound / Outbound)
6. Airport / Checkpoint
7. Flight No. (airplane) / License Plate (automotive) / Vessel Registration (ship) / Others

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Estimated Stock based on Granular Data

Data processing for stock of inbound tourists: Processed at masked ID level, segregating foreign tourists and detecting their visiting pattern

1. Filtering only foreign nationals
2. For each ID, dectect for frequency of visits during entire period in the database (1 January – 15 December 2023)
3. Matching entry and departure dates to calculate length of stay for each ID and each visit (for frequent visitors)

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Estimated Stock based on Granular Data

Data processing for stock of inbound tourists: Processed at masked ID level, segregating foreign tourists and detecting their visiting pattern *(cont.)*

4. Reversing the entry and departure dates to calculate length of stay outside Thailand
5. Analalysing nationality against the frequently used checkpoints and proximity to home country
6. Analalysing the length of stay against visa type or type of entry document

A set of IDs were identified as **"possible cases of expats" or "informal worker"** → removed from imputation of stock of inbound tourists

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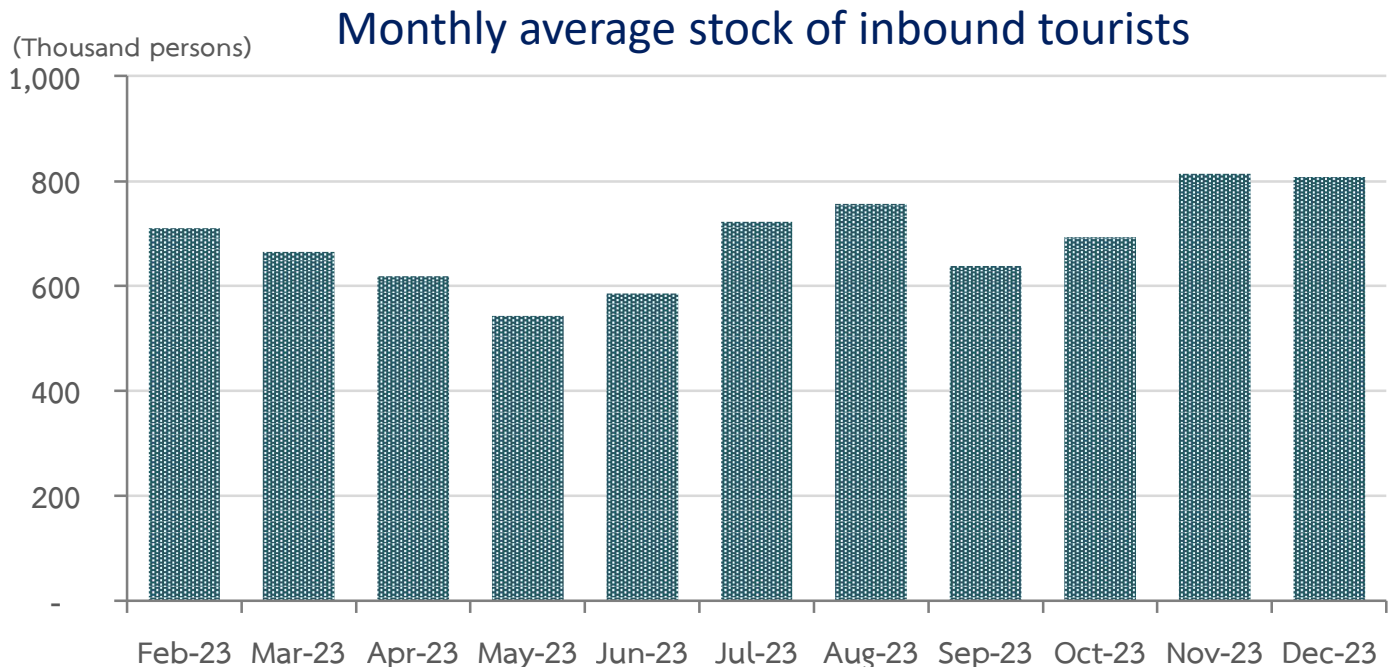
Estimated Stock based on Granular Data



Source: Immigration Bureau, calculated by Bank of Thailand

Note: Data as of 23 December 2023

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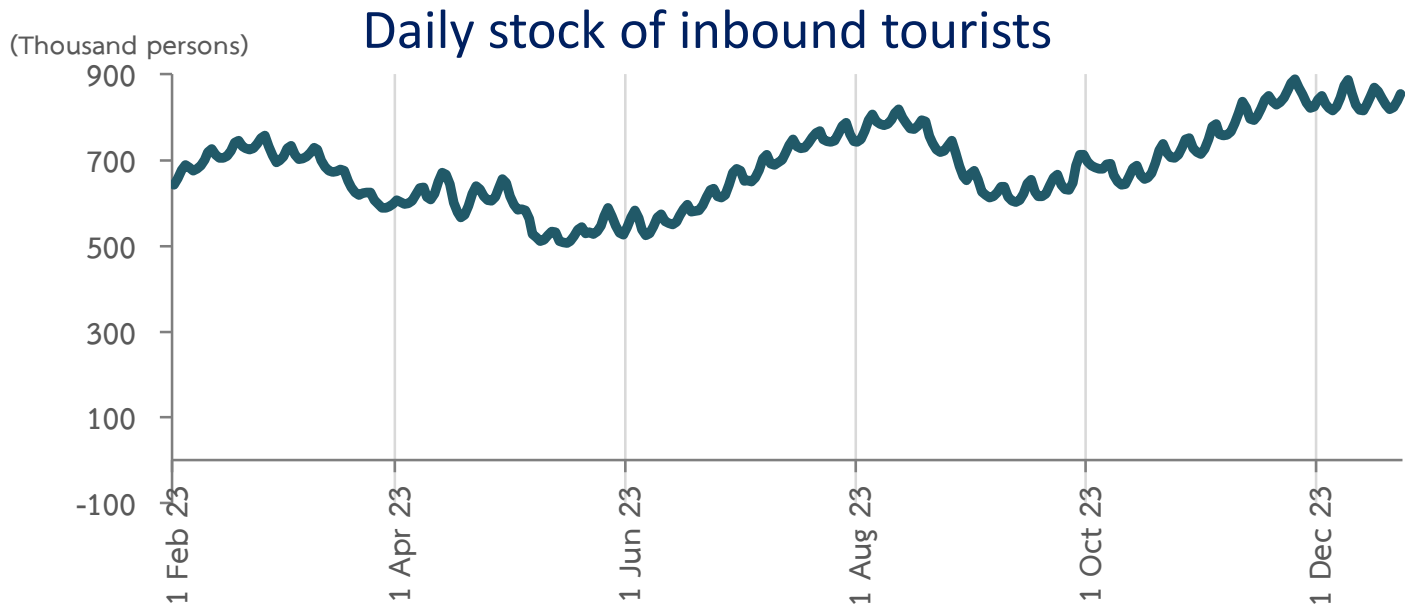
Estimated Stock based on Granular Data



Source: Immigration Bureau, calculated by Bank of Thailand

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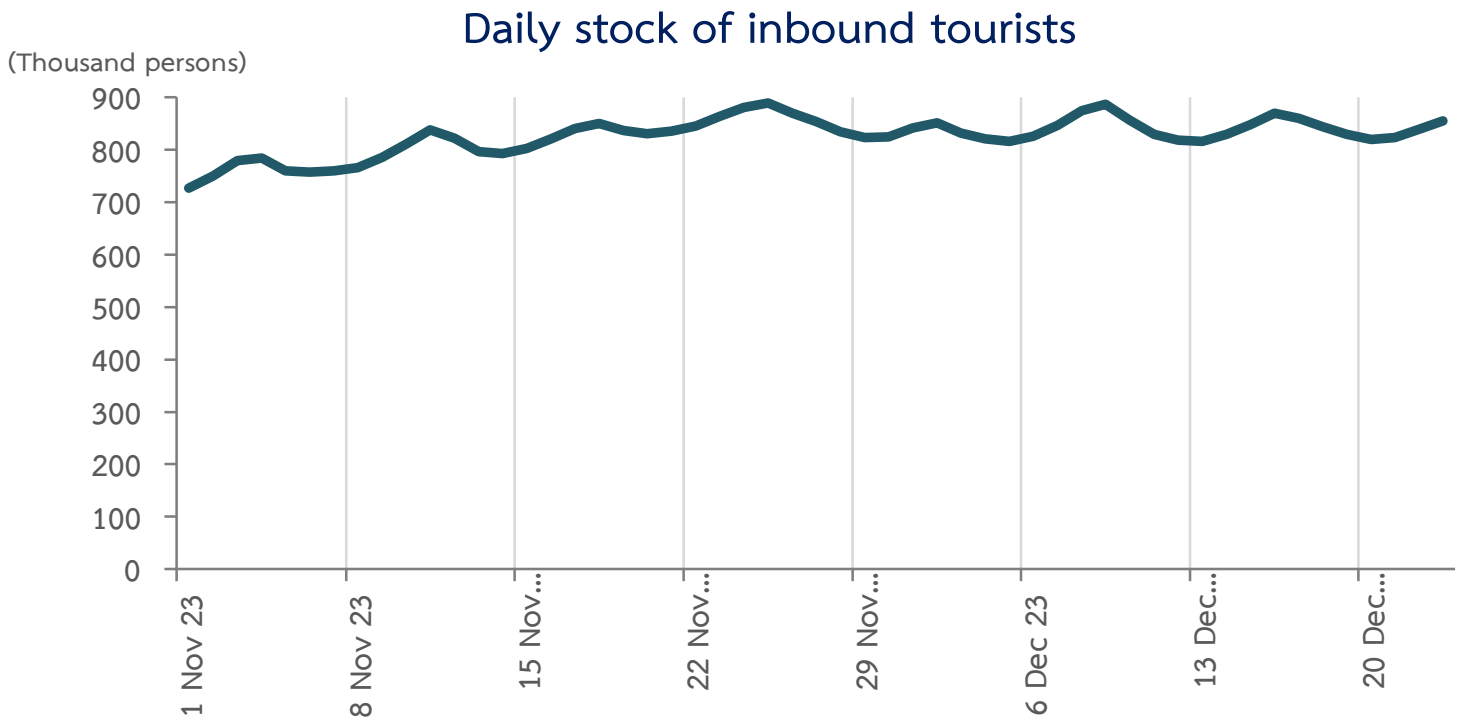
Estimated Stock based on Granular Data



Source: Immigration Bureau, calculated by Bank of Thailand

Note: Data as of 23 December 2023

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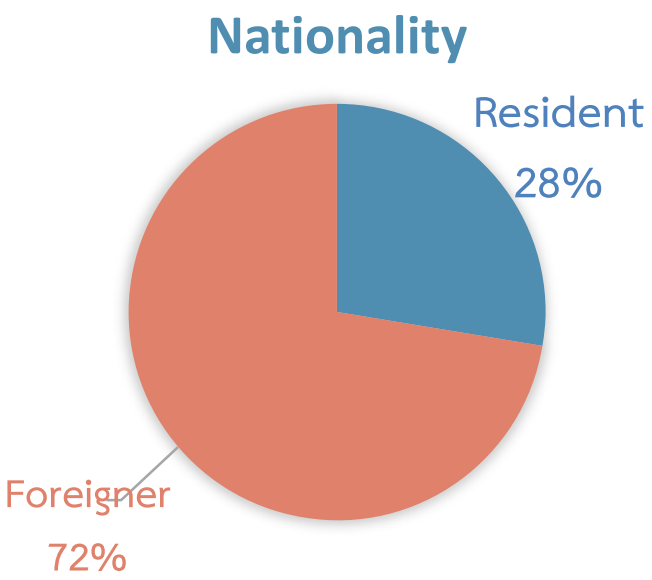
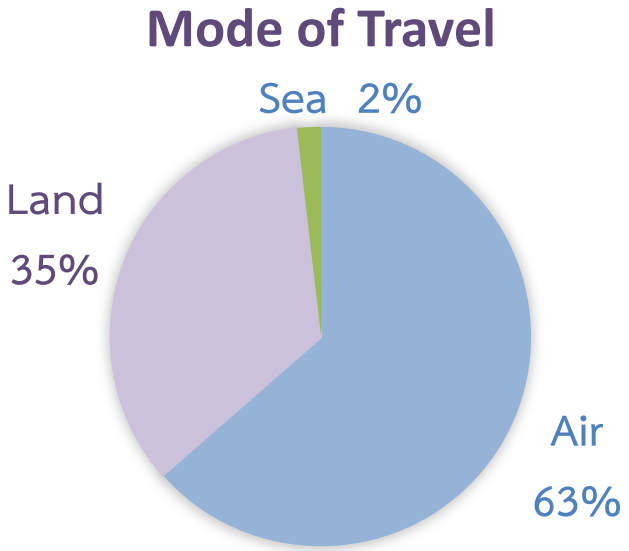
Other Stylised Fact: Granular Data

An Overview of Cross-border Activity

Share of cross-border activity



Share of the MOT



Source: Immigration Bureau, calculated by Bank of Thailand

Note: Data as of 23 December 2023

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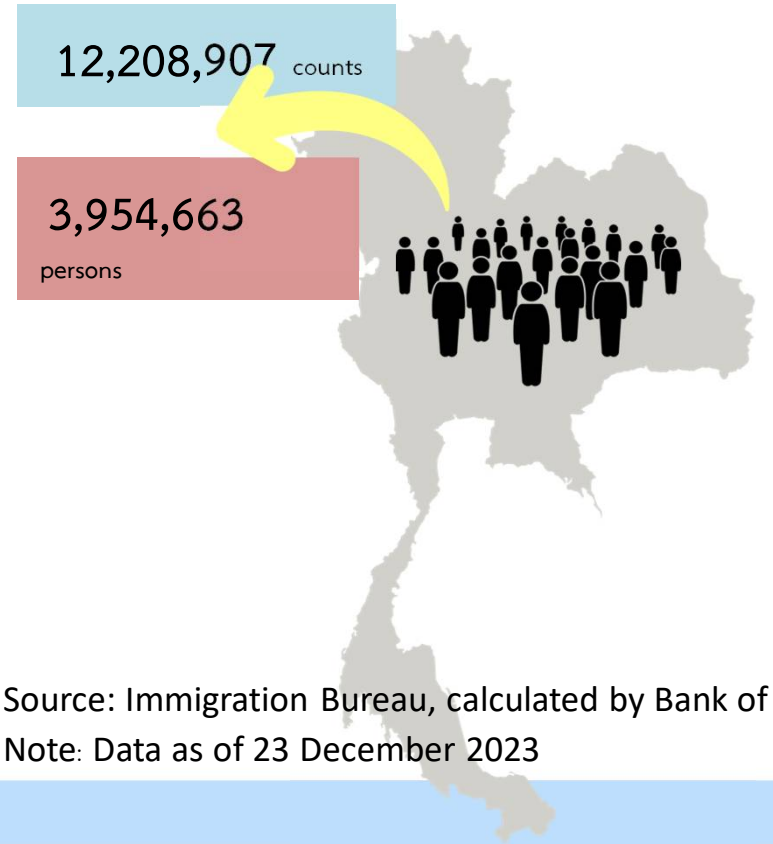
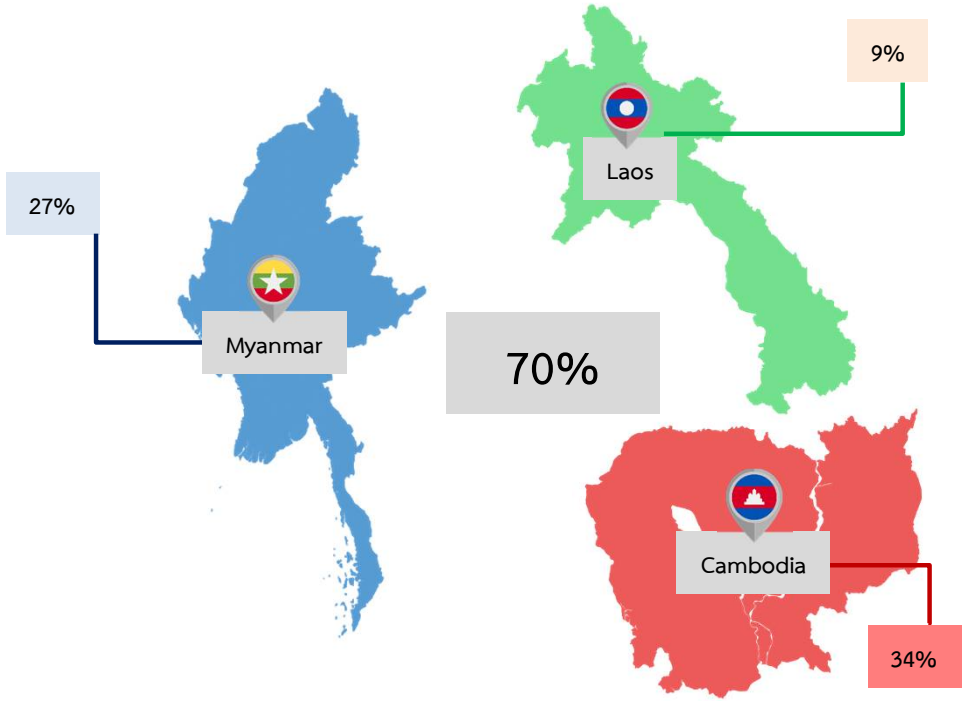
Other Stylised Fact: Granular Data

Total Outbound : Thai Travelers



Top 3: Most visited countries (All MOT)

(Share in Percentage)



Source: Immigration Bureau, calculated by Bank of Thailand

Note: Data as of 23 December 2023

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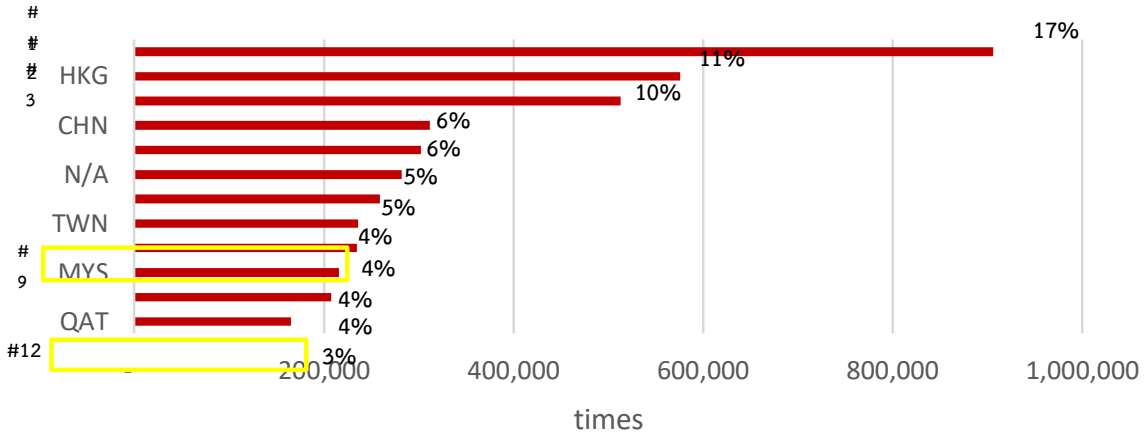
Other Stylised Fact: Granular Data

Air Mode: Most visited countries

(Share in Percentage)



Average length of stay for "Land Mode"

4 days

Source: Immigration Bureau, calculated by Bank of Thailand

Note: Data as of 23 December 2023

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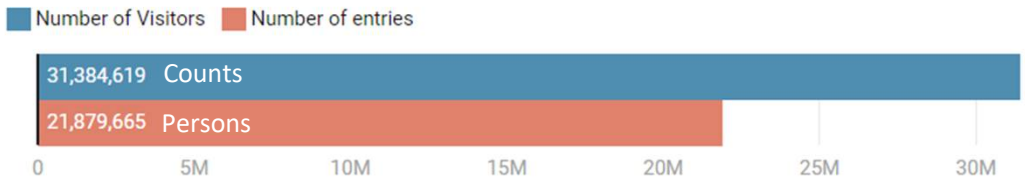
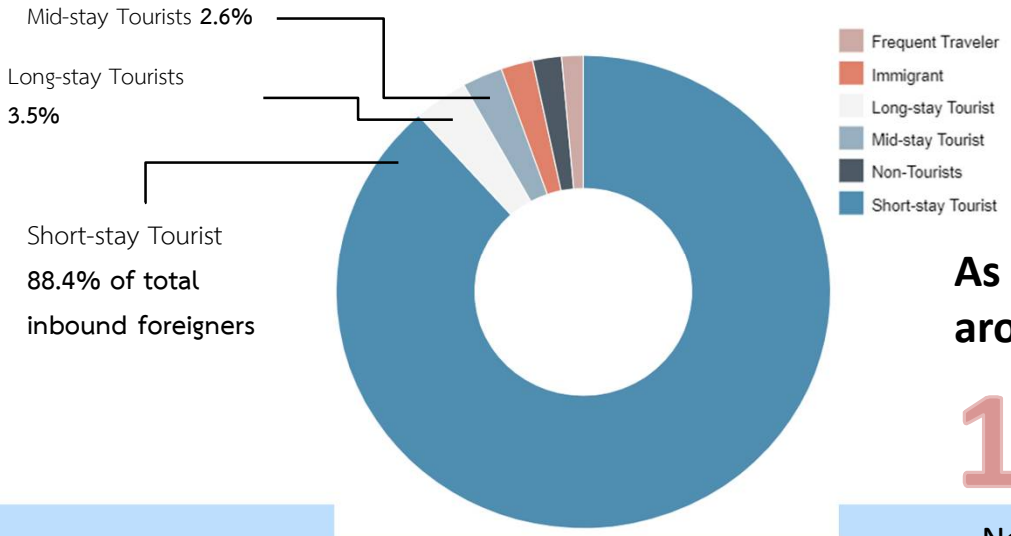
Other Stylised Fact: Granular Data

Total Inbound : Foreigners



Inbound : By Duration of Stay

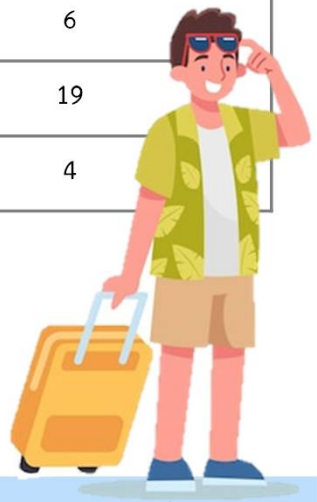


Top 5 : Inbound By Nationality

Nationality	Visitors (persons)	Length of stay (days)
Chinese	3,447,557	8
Korean	1,621,799	6
Indian	1,605,372	6
Russian	1,286,589	19
Malaysian	1,126,890	4

As of 23 December 2023, there are roughly around

1.8M foreigners in Thailand



Souce : Immigration Bureau, calculated by Bank of Thailand

Note : Data as of 23 December 2023

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Conclusion

- Travel receipt as Thailand's major income source
  → accurate measurement is vital for external sector surveillance
- "Arrival Basis" understates travel receipt during the pandemic
- "Stock Basis" developed to better derive travel receipts (for inbound travel) and payments (for outbound travel)
  (1) Daily stock of travelers
  (2) Spending per day
- "Stock Basis" yields a more realistic estimation
  (attributes travel income to period when spending was incurred)

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Conclusion

- BOT explored granular data from IB to enhance computation of stock of travelers.
- Shared data were based on “masked ID” to comply with the PDPA
- BOT can now fully utilize individual / entry-level data and all supplementary details without identifying the person itself.
- Potential cases of expats and some informal workers can be inferred from available data fields and exclude from tourist stock.

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Way Forward

- BOT to further develop a common dataset where granular inputs are clustered and mapped to provide additional data dimensions; e.g.,
  - Regional block
  - Airlines used
  - Provincial breakdown of border checkpoints
  - Frequency of visit
  - etc.
- Additional information would be of interest to non-ESS users as well.
- IB plans to design “e-immigration” system, which should enable collection of more details of cross-border travels.

Thank You