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INCORPORATING CONSUMER CHOICES TO ASSESS TRANSPORTATION DEMAND SUBJECTED TO TRAVEL TIME CONSTRAINTS

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Tese de Doutorado apresentada ao Programa de Pós-graduação em Planejamento Energético, COPPE, da Universidade Federal do Rio de Janeiro, como parte dos requisitos necessários à obtenção do título de Doutor em Planejamento Energético.

Orientador(es): Roberto Schaeffer
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The Brazilian composer Caetano Emanuel Viana Telles Veloso wrote, around 1979, the song *Oração ao Tempo*, released on the LP *Cinema Transcendental*. The melody, metric and rhythm are maintained throughout the music, in which the author makes appeals and recognizes how much his existence is subjected to the action of time.

És um senhor tão bonito
Quanto a cara do meu filho
Tempo, tempo, tempo, tempo
Vou te fazer um pedido
Compositor de destinos
Tambor de todos os ritmos
Entro num acordo contigo
Tempo, tempo, tempo, tempo
Por seres tão inventivo
E pareceres contínuo
És um dos deuses mais lindos
Que sejas ainda mais vivo
No som do meu estribilho
Ouve bem o que eu te digo
Peço-te o prazer legítimo
E o movimento preciso
Quando o tempo for propício
De modo que o meu espírito
Ganhe um brilho definido
E eu espalhe benefícios
O que usaremos pra isso
Fica guardado em sigilo
Apenas contigo e migo
E quando eu tiver saído
Para fora do teu círculo
Não serei nem terás sido
Ainda assim acredito
Ser possível reunirmo-nos
Num outro nível de vínculo
Portanto peço-te aquilo
E te ofereço elogios
Nas rimas do meu estilo
Tempo, tempo, tempo, tempo

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Nanos gigantum humeris insidentes. If I got this far, it was because I was standing on the shoulders of giants. There were many, but I must start by thanking the two skinny giants who guided my steps during this journey: Roberto Schaeffer and Alexandre Szklo. You are outstanding professionals, mentors and human beings. Heartfelt thanks for all the opportunities.

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I made it but would not if you were not there, my dear giants.

Resumo da Tese apresentada à COPPE/UFRJ como parte dos requisitos necessários para a obtenção do grau de Doutor em Ciências (D.Sc.)

INCORPORANDO AS ESCOLHAS DO CONSUMIDOR PARA AVALIAR A DEMANDA DE TRANSPORTE, SUJEITA A RESTRIÇÕES DE TEMPO DE VIAGEM

Camila Ludovique Callegari

Setembro/2021

Orientadores: Roberto Schaeffer

Alexandre Salem Szklo

Programa: Planejamento Energético

O transporte de passageiros é responsável por quase um quinto do uso de energia e por cerca de 15% das emissões de CO_2 no mundo. Dado o rápido aumento do transporte em regiões em desenvolvimento e a demanda ainda crescente em regiões desenvolvidas, espera-se que essa participação aumente nos próximos anos. Nesse contexto, o objetivo deste estudo é investigar como a preferência do consumidor em relação ao setor de transportes pode ser modelada e incorporada em ferramentas de avaliação integrada. Assim, esta tese explora algumas das metodologias recomendadas e as aplica, pela primeira vez, em duas economias avançadas, a União Europeia e o Japão, e em uma economia emergente, o Brasil. O modelo resultante, que se difere das versões anteriores pela atribuição de valores de tempos típicos para cada modal de transporte, é capaz de aferir impactos da economia informal, e também narrativas de futuro sobre a evolução do valor do tempo e mudanças tecnológicas. Os resultados obtidos ajudarão especialistas e planejadores a analisar as melhores métricas para gerenciar a demanda, especialmente para regiões que visam avaliar variações de custos, velocidade porta-a-porta e disposição de viajar dos consumidores.

Abstract of Thesis presented to COPPE/UFRJ as a partial fulfillment of the requirements for the degree of Doctor of Science (D.Sc.)

INCORPORATING CONSUMER CHOICES TO ASSESS TRANSPORTATION DEMAND SUBJECTED TO TRAVEL TIME CONSTRAINTS

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September/2021

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Passenger transport is responsible for almost a fifth of energy use and about 15% of CO_2 emissions globally. Given the sharp increase in transport in developing regions and the still-growing demand in developed regions, these shares are expected to increase in the coming years. In this context, this study aims to investigate how consumer preference in relation to the transport sector can be modelled and incorporated into integrated assessment tools. Thus, this thesis explores some of the recommended methodologies and applies them for the first time in two advanced economies, the European Union and Japan, and in an emerging economy, Brazil. The resulting model, which differs from previous versions due to the attribution of typical time values for each transportation mode, is able to assess the impacts of the shadow economy and narratives about the evolution of the value of time and technological changes. Results obtained will help experts and planners analyze the best metrics to manage demand, especially for regions that aim to assess cost, door-to-door speed and consumers' willingness to travel variations.

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List of Abbreviations

Notation	Description
AIR	High-speed modes
AV	Autonomous Vehicle
BAU	Business As Usual
BLUES	Brazilian Land-Use and Energy Systems model
BRT	Bus Rapid Transit
COFFEE	Computable Framework For Energy and the Environment model
EU	European Union
GCAM	Global Change Assessment Model
GHG	Greenhouse Gas Emission
HERMES	Historical tRends for Mobility assESsment
IAMs	Integrated Assessment Models
IEA	International Energy Agency
IIA	Independence of Irrelevant Alternatives
IMACLIM-R	IMpact Assessment of CLIMate policies-Recursive version
ITS	Intelligent Transport Systems
LDV	Light Duty Vehicle
MNL	Multinomial Logit Model
NLSUR	Non-Linear SUR
NTS	National Travel Survey
OLS	Ordinary Least Squares
PKT	Passenger kilometer travelled
PEST	Political, Economic, Social, and Technological
PUB	Public Transit
RPK	Revenue Passenger kilometre
SEM	Simultaneous Equation Model
SSPs	Shared Socioeconomic Pathways

SUR	Seemingly Unrelated Regression
TIMES	The Integrated MARKAL-EFOM System
TTB	Travel Time Budget
TTI	Travel Time Investment
US	United States
VOT	Value of Time
VTTS	Value of Travel Time Savings

Introduction

Passenger cars, motorcycles, buses, trains, and planes account for about 20% of global energy demand and produce about 60% of all transportation-related Greenhouse Gas (GHG) emissions (IEA, 2020a). In the future decades, global transportation demand is expected to rise as the global population grows, wages increase, and more people can buy automobiles and travel by aeroplanes (RITCHIE, 2020). By 2070, the International Energy Agency (IEA) forecasts global transportation, measured in **passenger kilometres**, to quadruple, vehicle ownership rates to rise by 60%, and demand for passenger aircraft to triple (IEA, 2020a). If these elements are added together, transportation **emissions** will skyrocket.

Most of the demand for cars will come from developing regions, as car travel in developed regions may saturate in the long run. On the other hand, aviation already plays an essential role in many **developed** and **developing regions**, and its importance is expected to increase as the COVID-19 pandemic is overcome (IEA, 2020a). Accordingly, the GHG emissions reduction from the transport sector will require complementary **policies** to improve travel demand management and vehicles' efficiency (IGLIŃSKI; BABIAK, 2017).

For example, given the need to substantially cut on-road transportation emissions, public transportation should be expanded (SHAHEEN; COHEN, 2018). However, it is one of the transportation modes that most lost market share over time (IEA, 2020b). To answer why, how fast and how to change this perspective, **governments** rely on Integrated Assessment Models (IAMs), among other tools like MoMo and AFLEET (IEA, 2020b), to identify the best portfolios of fuels and vehicle technologies given climate goals. Nevertheless, most of these models are ill-suited to examine potential travel demand changes and travel mode shifts given **consumer behaviour** (SCHÄFER, 2012).

Climate change mitigation policies require a focus on transport that should include improved consumer behaviour representation, vehicle efficiency, and low-carbon fuels. However, most available energy-economy-environment **modelling tools** focus on technology and fuel switching and tend to incorporate travel behaviour poorly (PENG et al. 2021).

As such, considerable investments have been made to observe consumer travel behaviour and forecast the future **mobility demand**. As exemplified, one of the significant transport thrusts is reducing car dependency and increasing the share of sustainable travel modes such as walking, cycling, and public transport. Nevertheless, to bring other forms of transport to the level capable of competing with cars, it is necessary to substantially improve their **attributes**, like infrastructure, comfort, safety, accessibility, and facilities related to these modes.

Accordingly, transportation planning tools can help to assess under what conditions, such as cost, speed, and comfort, an individual would like to switch from a car to an alternative travelling mode. Moreover, it is possible to link such tools with optimization energy models. As a result, for instance, one could evaluate specific **measures** that may be implemented to encourage automobile users to use public transportation, taking into account their mobility needs and climate constraints.

In this context, the **main goal** of this study is to investigate how consumer mode choice can be modelled and incorporated into integrated modelling tools. In particular, this thesis assesses how the **travel time budget** influences the demand for mobility services and their evolution in the long term. Thus, this thesis explores and make adjustments to the methodology recommended by Schäfer (2017) and applies it for the first time in two advanced economies, the **European Union** (EU) and **Japan**, and one emerging economy, **Brazil**. Results for the **United States** will also be evaluated to identify possible divergences between approaches.

Fundamentally, the aim is to develop a **mathematical tool** to simulate aggregate transportation trends over time, based on long-term historical data collection of passenger travel. As a result, the new analytical approach introduced allow estimating transportation demand and distribution across modes, subjected to travel time constraints and consumer willingness to pay to travel. It is important to highlight that this thesis is designed with the future connection of the transport module developed here to the IAM tools in mind. Thus, this work establishes an initial communication between both areas. In this regard, work motivation has a climatic origin, however, this thesis specifically addresses consumer behaviour concerning transportation modes.

Furthermore, this **work's importance** stems from its ability to offer specialists and decision-makers at the national level critical information on potential development plans for the transportation sector. Thus, planners and policymakers can strengthen their understanding of consumer travel choice, future transportation demand, and its implications. In this way, this thesis seeks to build a **dialogue process** supported by quantitative evidence on the effectiveness of different measures and actions to reduce or modify transportation demand. The methodology to do so was developed using state-of-the-art travel demand modelling approaches.

Regarding its structure, this work is divided into six chapters, besides this opening part. This short introduction covers the primary topics, objectives and the structure of the remainder of the study. The second chapter provides an overview of all essential issues, definitions, and literature review. The approach and set of equations used to model the passenger demand are given in the third chapter. The fourth chapter describes the data source, exploratory data analysis and parameters estimation. The business as usual transportation demand is provided in the fifth chapter, presenting the historical data compiled to model each analysed region and simulated future demand. The sixth chapter then discusses the storylines examined in this study and the potential development of the transportation sector regarding passenger demand. Final considerations are included in the seventh chapter, which includes the general conclusions of this study and ideas for future complementary experiments.

Chapter 2

LITERATURE REVIEW

Definitions and background

This chapter provides an overview of current knowledge associated with consumer mobility preferences in tools that assess strategies and policies to meet climate targets. Hence this chapter identifies relevant theories, methods, and gaps in the scientific understanding concerning mobility behaviour in integrated assessment modelling and analysis. In this context, subsection 1 presents the set of tools developed by climate scientists to assess solutions that contribute to sustainable development goals. Subsection 2.2 presents how the transport sector is evaluated within the modelling framework, the main approaches, theories, and research frontiers. Subsection 2.3 describes the main statistical methods used in the field and the development of the thesis. And, finally, subsection 2.4 presents the methodology for developing the storylines applied in this thesis. Our findings point out that it has proven not to be easy to replicate consumer choice behaviour in climate change models, which is a significant restriction given that reflecting human behaviour is critical to an accurate social-technical representation. As a result, total passenger mobility and mode travel choice selection are often exogenous. Therefore, one of this thesis's key contributions is to assess consumer travel behaviour models and their interlinks with the climate change modelling framework.

2.1 Modelling transport demand, energy and environmental impacts

One of the critical difficulties facing policymakers today and in the coming decades is figuring out the best **approaches to combat climate change** (EVANS, 2018). To this end, scientists and economists have created a set of tools known as "Integrated Assessment Models" (IAMs) to support politicians in decision-making (SCHAEFFER et al., 2020). These models are used to answer critical concerns about climate change, such as limiting 1.5 degrees Celsius of global warming with the least amount of investment or the implications of the transportation sector's emission to achieve climate targets (ROGELJ et al., 2018).

IAMs are intended to aid our understanding of how human growth and social decisions affect one another and the natural world. They are referred to as "integrated" because they **incorporate several strands of knowledge** to simulate human society alongside elements of the Earth system (EVANS, 2018). Thus, IAMs bring together various fields to investigate how human growth and societal decisions interact with and affect the environment, encompassing natural systems' physical rules and human society's developing habits and preferences.

IAMs accomplish it by **linking modules** that reflect the global economy and the energy, land, and climate systems. Hence, IAMs incorporate different concepts from climate models since they must reflect both human and natural systems. Scientists use unchanging physical principles and rules to predict heat convection through the atmosphere or how the atmosphere absorbs solar radiation when modelling the climate system. Nevertheless, the same cannot be valid for the purchasing and selling of fuels or the connections between income, diet, and different modes of transportation. To overcome these uncertainties, **scientists build equations** that may capture energy demand and socioeconomic behaviour based on economic theories and evidence from historical data (EVANS, 2018).

Furthermore, IAMs are used to respond to a succession of **“what if?” circumstances** (KREY et al., 2019). These inquiries can be broad and exploratory. What if new technologies emerge, such as autonomous vehicles (IGLIŃSKI; BABIAK, 2017) or low-cost, high-speed trains? These types of questions aim to generate strategies that will perform successfully regardless of which futures may occur. The objective is to develop plans that will be robust across a range of plausible futures. Alternatively, the inquiries can be highly detailed and describe a desired, normative future, what an organization wants to happen or wants to be, and is concerned with developing strategies to achieve that desired or asserted future. This type of scenario can also be thought of as a goal or vision statement. For example, what if, by 2035, governments impose the end of internal combustion engines in the transportation sector?

Sophisticated IAMs have links built-in, which allows investigating these questions into cascade effects, co-benefits, and unintended repercussions, tracing how decisions in one area influence the rest of the modelled world. Individual IAMs' ability to examine feedbacks and tradeoffs is determined by their design, with some being able to research specific interactions in greater depth and others not at all (EVANS, 2018).

Accordingly, each component of the model is more or less self-contained, with the various modules "**hard-linked**" via computer code or "**soft-linked**" via data files to share information. Figure 0-1 illustrates how these links are built in the set of models developed by IIASA. As can be observed, depending on the model structure, findings from one module can be passed on to another (EVANS, 2018). Rising energy demand in the economic module, for example, could lead to higher fuel prices in the energy system module. This might be fed back into the economy, depressing demand.

Similarly, increased urban sprawl could raise the need for travel in the transportation module, resulting in higher transportation demand, fuel prices and more greenhouse gas emissions. Thus, with the inclusion of more modules, researchers can go further into their research. These could, for example, simulate urban air pollution or time lost in traffic.

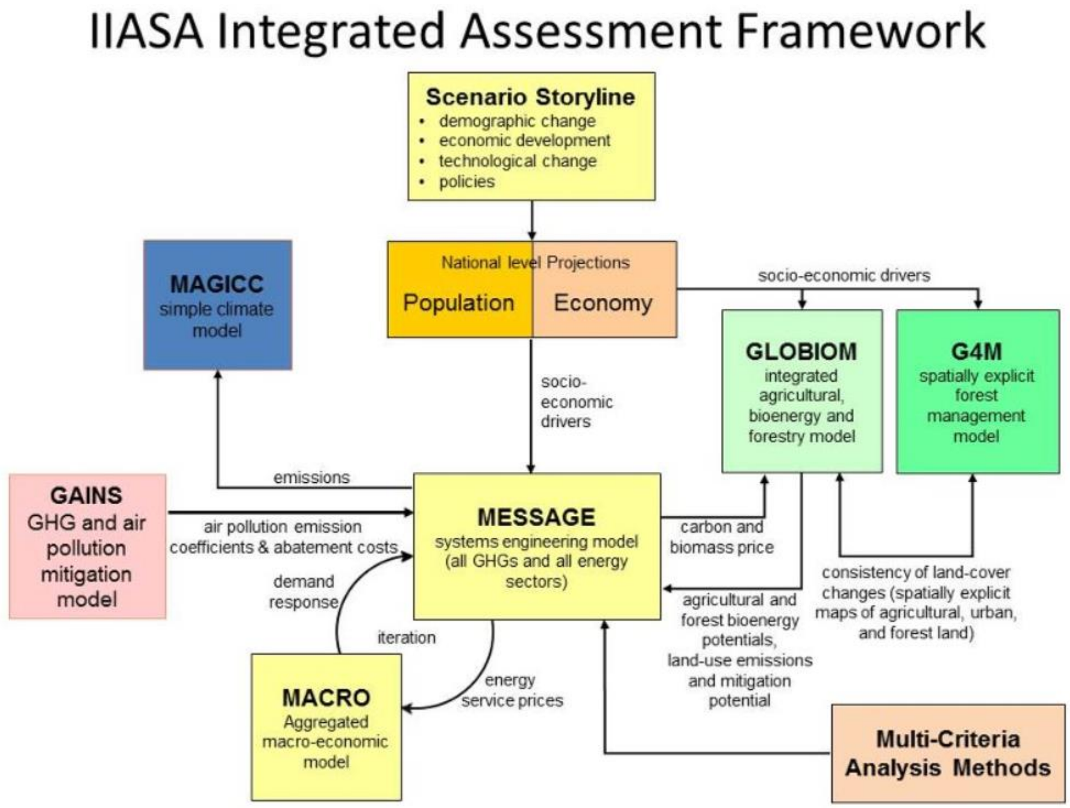

Figure 0-1: IIASA IAM framework
Source: IIASA (2016)

Although the details differ, modellers utilize equations to represent how these relationships have evolved and their best guess for how they will change in the future. Generally, **most IAMs follow a similar logic**, with rising GDP and population driving increased energy demand. The demand may be mitigated depending on assumptions about how effectively energy is used, but it remains an influential underlying factor in most IAM. Similarly, wealthier people are said to demand more transportation services and in a more westernized fashion (VAN VUUREN, 2014).

Complex IAMs are helpful, but they have numerous flaws, not least because they must attempt to reflect current and future society preferences, social mores, habits, and behaviours. Despite their shortcomings, IAMs are valuable tools for examining the choices that will contribute to or restrict climate change. “It does not give you perfect answers...but it is solid policy guidance,” says Dr Bert Metz, who was co-chair of the Intergovernmental Panel on Climate Change (IPCC) (apud EVANS, 2018).

Aside from these concerns, another drawback that must be considered when evaluating IAM’s conclusions are:

Economic theory. One of the significant problems with the framework is that they are based on economic theory, which presupposes that markets and society are rational and make decisions based on perfect knowledge. For example, most models also assume that the economy is "optimized," which means no unemployment or squandered investment. As a result, policy interventions virtually always lower economic activity and are regarded as a cost. A further disadvantage is that the rational, lowest-cost world of a model is not the same as the reality of politics and the driving choices behind politicians (YANG; WEI; MI, 2016);

Future as past. According to Dr Justin Ritchie (EVANS, 2018), IAMs are generally skewed towards "future-as-past," where existing society trends, behaviours, and relationships endure. Indeed, to Ritchie, “what they are doing is balancing energy supply and demand – and there are only a few ways they can accomplish that.”. “The [other] basic story is that the globe is becoming wealthier and that lifestyles in the United States and Western Europe are becoming more similar.” (GAMBHIR et al., 2019);

Supply-side bias. This bias refers to models that favour technological fixes or energy source transitions over changes in energy usage. “Changes in energy end-use in global IAMs tend to be represented at the aggregated sectoral level as a result of shifting incomes and prices,” according to Wilson's research (EVANS, 2018). As a result, supply-side mitigation measures are usually the first option examined when an IAM reduces emissions. In order to study demand-side solutions, researchers are typically constrained to manually adjusting the underlying assumptions that reflect energy demand in their models (GAMBHIR et al., 2019);

Human behaviour. Human behaviour is another important aspect of the picture that IAMs struggle to capture, given that humans are widely different and make decisions based on a variety of criteria, many of which are not financial. Something that differs from the one representative rational customer found in many IAMs. Hector Pollitt (EVANS, 2018) argues that “Cars are an excellent example about the issue”, “We would all be driving Smart cars if everyone was cost-cutting. However, many people do the exact opposite: they buy the most expensive model they can afford.”;

Transparency and documentation (YANG; WEI; MI, 2016)**.** Dr Richard Rosen, a notable critic of the IAM group, contended that model structures and assumptions were not transparent: “Each model has dozens, if not hundreds, of significant input assumptions.”. Adding that: “IAM are inadequately documented, and the models are virtually a black box.”. The IAM community has made significant efforts in recent years to increase the level of transparency surrounding its work, such as the “wiki” documentation site for several IAMs. However, greater transparency and documentation remain a "work in progress," according to Guivarch. She continues, “IAMs are used to drive policy decisions”, “so we understand we must be upfront about our work.”

2.2 Transportation modules in IAM assessment

The **passenger transportation sector is also modelled** within the scope of the IAMs, attempting to include human beings preferences in the assessment (YEH et al., 2017). Nevertheless, most IAMs solutions focus on technology and fuel switching, which do not effectively capture consumer behaviour (EVANS, 2018). Behavioural features affecting the transport sector evolve decisions related to vehicle purchase, modes choice, and demand levels (MCCOLLUM et al., 2017). These behaviours could be represented using a wide range of approach, and each **IAMs have addressed the issue differently**.

For the case of **modal choice**, which is the focus of this thesis, it has proven not to be easy to replicate actual choice behaviour in IAMs (DALY et al., 2012). Mainly because the least system cost governs technology selection in these models, yet travel decisions are mainly determined by user costs and preferences. As a result, mode selection is often exogenous, which is a significant restriction given that reflecting human behaviour is a critical step in achieving a social-technical representation (IEA, 2020c). For example, in a typical **BLUES**[1] and **COFFEE**[2] assessment, developed by the Centre for Energy and Environmental Economics (CENERGIA-COPPE), individual modal travel demand is **exogenously** established over the model time horizon, and while technologies can compete within modes based on costs - like fuel costs, investment costs, and O&M costs - there is no competition between modes (MCTI, 2017).

On the other hand, **MESSAGE-Transport**, developed by the International Institute for Applied Systems Analysis (IIASA), **endogenously determines** the demand projections for passenger travel and mode-switching decisions. MESSAGE-Transport simulates future demand for passenger travel, on a passenger-kilometre (pkm) basis, as a function of per-capita GDP. Transportation demands for the different modes are determined by calculating the **share of each mode via multinomial logit functions** and multiplying it with the total regional travel demand. Furthermore, via a soft-linked, the logit model is incorporated within the MESSAGE-MACRO[3] framework to adjust transport prices, travel-money, and travel-time constraints, thereby creating a triangular arrangement of three soft-linked models (MCCOLLUM et al., 2017).

Another example is the IAM called Global Change Assessment Model; in short, the **GCAM model**, developed at the Pacific Northwest National Laboratory, is a general

[1] Brazilian Land-Use and Energy Systems model. Originally known as Message-Brazil. Time horizon: 2010 to 2050 in 5-year intervals. The demand is divided by macroeconomic sectors, end-users, being the passenger-transportation one of these sectors (BAPTISTA, 2020).
[2] Computable Framework For Energy and the Environment model, built upon a MESSAGE platform. Its main purpose is assessment of potential synergies/trade-offs in energy, environmental and climate policies. It is a global model with 18 regions, time horizon:from 2010 to 2100. (ROCHEDO, 2020).
[3] MESSAGE-MACRO results from the linking of a detailed energy supply model (MESSAGE) with a macroeconomic model (MACRO). The reason for linking the two models is to consistently reflect the influence of energy supply costs, as calculated by MESSAGE, in the mix of production factors considered in MACRO, and the effect of changes in energy demand on energy costs. The combined MESSAGE-MACRO model can generate a consistent economic response to changes in energy prices.

equilibrium model that solves prices, supply, and demand. In this IAM, transportation mode choice is modelled using a **logit model approach**, where the cost of time is included in the generalized cost for transport, so increases in GDP lead to a demand for faster modes. Indeed, GCAM and MESSAGE-Transport share a pretty close set of equations and modelling approaches (GOURI et al., 2013).

A further case is the **IMACLIM-R model**, which stands for IMpact Assessment of CLIMate policies-Recursive version, developed at CIRED. IMACLIM-R maximizes a **utility function subject to travel budget constraints**. Infrastructure is endogenous computed: a decrease in supply leads to congestion and lower speeds, which feeds back into the model (CASSEN et al., 2010).

The **TIMES model**, acronym of The Integrated MARKAL-EFOM System, developed by the Energy Technology Systems Analysis Program (IEA-ETSAP), estimates how different transport modes compete based on fuel and capital costs to deliver overall travel demand. A **constraint on travel time in the system**, representing the Travel Time Budget (TTB) of individuals, ensures that faster and more expensive modes can also compete. Without it, the model will likely switch modes immediately to the cheaper but slower and more time-costly public transit modes, which does not reflect travel behaviour. Additionally, the variable travel time investment (TTI), a proxy for investments to reduce travel time, assesses the possibles impacts of infrastructure improvements on mode choice (DALY et al., 2012).

Predominantly in these models, **travel time constraint**, leading to an increase in the value of travel time, is the **main contribution to modelling consumer travel behaviour**. This rationality derives from empirically observed data that the average daily travel time is constant across many different populations (MARCHETTI, 1994). Figure 0-2 shows the UK National Travel Survey (NTS) results on travel patterns since 1970. It is observed that while total travel distance has grown by approximately 60% in the period, total annual travel time per person has stayed constant. Something that has introduced a fixed travel time budget concept, which is invariant under policy and regions (NTS, 2018). MESSAGE-

Transport uses a TTB of 1.1 hours per day along with a fixed travel money budget to project future levels of mobility and transport mode, which is also followed by TIMES.

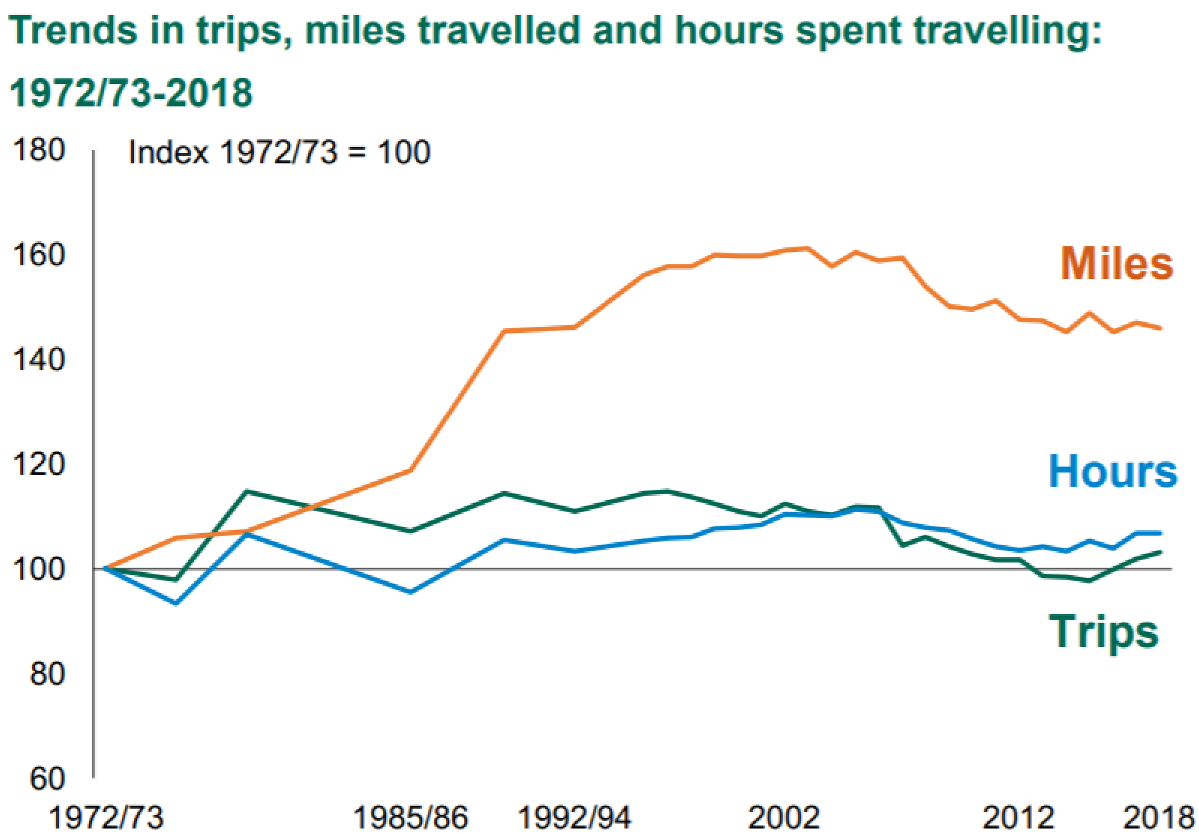

Figure 0-2: Travel time (hours per person per year), distance (miles) and trips in the UK
Source: (STILLWELL; CUMMINGS; SLOCOMBE, 2018)

On the other hand, the practice of putting an **economic value[4] on travel time** can be traced back to as early as the 1940s (WEST, 1946 CITED IN MOSES ET AL., 1963; apud MARCHETTI, 1994 and have evolved so far. Nowadays, most transportation modules

[4] Historically, travel time reduction was typically valued based on average earnings and tended to overstate the travel time benefits and overshadow other benefits (Becker, 1965; Johnson, 1966). In his article titled "A Theory of the Allocation of Time", Becker (1965) uniquely merges goods consumption with time use when defining the preference measurements (i.e. the utility function) over a set of goods and services of the household. He proposed differentiating the value of reductions in travel time by activity (e.g. standard work, overtime hours and leisure). This approach makes it possible to explicitly model trade-offs between spending time on work and non-work activities, which has been fundamental for developing theories beyond the simple view of valuing time based on average earnings.

assume that the value of time spent travelling differs between modals to incorporate aspects of trip distance and people's willingness to pay for higher-quality travel[5].

As seen, the **most common approach to modelling mode choice** is the logit models, commonly used to model the relationship between variables that could affect travel choices, such as household structure, income, or the quality of public transport. This method is a simulation, not an optimisation model and involves **non-linear probability functions**. The use of logit modelling was investigated and deemed unlikely to be compatible with the linear optimisation approach of IAMs (DALY et al., 2012). Thus, the logit models are usually integrated by soft-link approaches.

Last, one paramount research related to modelling behavioural in the transportation field is the paper written by Schäfer (2012), which provides critcal reviews and recommendations on the issue. More recently, another essay launched by Schäfer (2017) suggested a new Simultaneous Equation Model (SEM) to estimate passenger demand and modal share subjected to travel time constraints. The set of equations **differs from previous methods** due to the **simultaneity interaction of the variables** in the multinomial logit model proposed, which allows the estimation of consumer choices in a competitive context. This thesis, therefore, evaluates this new proposal and its application into the IAM framework. Thus, as part of this research, the use of standard transport-economic modelling techniques is investigated and defined in the following subsection. The modelling approach prospected in Schäfer (2017) is detailed in Chapter 3 to place adequate emphasis and credit to the author.

2.3 Modal split models

Transportation modelling is a well-established field that decision-makers use to design infrastructure, including airports, highways, railroads, cost-benefit evaluations, and environmental impact assessments. Travel patterns are generally simulated using

[5] To further information on the Value of Time assessment, please see Appendix B.

transportation planning models, including origin and destination, trip purpose, mode of travel, and household demographics. Within this context, mode choices are frequently estimated using logit type models (DALY et al., 2012). Hence, this section defines the main concepts used to build and estimate modal choices using econometric techniques. Furthermore, the aim here is not to present an extensive review of models, forms and derivations, but rather the **main statistical concepts** used in the research.

2.3.1 Theoretical Framework

A **behavioural model** depicts the decisions that customers make when faced with a variety of options (BEN-AKIVA; BIERLAIRE, 1999). These judgments are based on the terms under which different modes of transportation are supplied, such as journey times, prices, and other level-of-service qualities. Therefore, the model aims to reflect consumers' travel behaviour when given a discrete set of options. As a consequence, the models are known as **discrete choice models**.

According to the theory, consumers choose the mode that maximizes his or her **utility** (BEN-AKIVA; BIERLAIRE, 1999). The utility of a travelling mode is then defined as the **usefulness or enjoyment** a consumer can get from a specific mode. As a result, due to numerous mode qualities such as in-vehicle travel time, access time to the transit point, travel charges, parking fees, and so forth, the consumer is likely to pick the modal with the greatest utility. This premise is known as **utility maximisation**, and it underpins all travel demand models.

The utility is usually expressed as a linear function of the attributes weighted by the coefficients, aiming to indicate how much benefit a traveller receives from a specific mode. The **random utility model** treats utility as a random variable with two components: a quantifiable conditioning component and an error component, which account for unobserved effects by the set of variables. Eq. 2-1 shows a potential mathematical description of a utility function of a mode m as (BEN-AKIVA; BIERLAIRE, 1999):

$$U_{mi} = \theta_1 x_{mi1} + \theta_2 x_{mi2} + \dots\dots + \theta_k x_{mik} + E_{mi} \qquad \text{Eq. 2-1}$$

Where:

U_{mi} is the net utility function for mode m for individual i;

$x_{mi1}, \dots, x_{mik}$ are k number of attributes of mode m for individual i;

$\theta_1, \dots, \theta_k$ are k number of coefficients (or weights attached to each attribute) which need to be inferred from the data; and

E_{mi} is the error component (unobserved) of the utility of mode m for individual i.

In order for Eq. 2-1 to be accurate, the population under investigation must be **homogeneous**. In theory, everyone must have access to the same set of options and be subjected to the same limitations (ORTÚZAR; WILLUMSEN, 2011). Although this approach simplifies the procedure in general, there is still significant disparities between individuals and colossal **heterogeneity** in the population (LI; LIU; WANG, 2020). This could be handled by segmenting the population into separate utility functions (AL-SALIH; ESZTERGÁR-KISS, 2021). Nonetheless, it is outside the scope of the thesis.

By disregarding consumer heterogeneity, the utility can be treated as a function of **attributes of available modes** only. As a result, all consumers may be seen as having a single utilitarian function. For the same reason, the error component of the utility can be regarded as independent of socioeconomic factors. The net **utility function** may be written as follows, assuming that the error component has a zero mean and an extreme value distribution (BEN-AKIVA; BIERLAIRE, 1999)

$$U_m = V_m + E_m \qquad \text{Eq. 2-2}$$

Where:

V_m is the systematic component (observed) of the utility of mode m; and

E_m is the error component (unobserved) of the utility of mode m.

Thus, if there are M number of total travelling modes available, the **probability** of an individual selecting mode *m*, such that $m \in M$, is based on its associated utility function U_m, such that:

$$\boldsymbol{U_m \geq U_i} \quad \text{Eq. 2-3}$$

Where:

$\boldsymbol{U_m}$ represents the utility of travelling alternative *m*; and

$\boldsymbol{U_i}$ represents the utility of any travelling alternative in the set of available travelling modes.

To **summarise**, the utility maximisation theory associates a specific utility to modes, determined by its various attributes, and the consumer is supposed to select the alternative possessing the highest utility.

2.3.2 Logit Models

Since logit models can simulate complicated travel behaviours of any population using basic mathematical approaches, they are the most widely utilized modal split model in transportation planning. Ben-Akiva and Lerman describe the mathematical foundation of logit models **based on utility maximization theory** (BEN-AKIVA; BIERLAIRE, 1999). To summarize the framework, the likelihood of an individual *i* picking a mode *m* from a total of *M* possible modes is provided as follows:

$$\boldsymbol{P_m = \frac{exp^{V_m}}{\sum_{m \in M} exp^{V_M}}} \quad \text{Eq. 2-4}$$

Where:

$\boldsymbol{V_m}$ is the utility function of mode *m*;

$\boldsymbol{V_M}$ is the utility function of any mode *M* in the choice set;

$\boldsymbol{P_m}$ is the probability of individual *i* selecting mode *m*; and

$\boldsymbol{M}$ is the total number of available travelling modes in the choice set.

Eq. 2-1 is used to specify all logit models, and Eq. 2-4 is used to apply them. As illustrated in Eq. 2-2, the theoretical foundation of logit models is built on three **fundamental assumptions** about the error term E_m. The following are the assumptions (AL-SALIH; ESZTERGÁR-KISS, 2021):

- E_m is *Gumbel* distributed;
- E_m is *independently* distributed; and
- E_m is *identically* distributed.

These three assumptions serve as the **basic postulates** of the logit model structure. Because the random component is Gumbel distributed, all utilities associated with the different modes of transportation should be regarded as a linear sum of characteristics with the same scale parameter (BEN-AKIVA; BIERLAIRE, 1999). The final two assumptions are commonly referred to as the **Independence of Irrelevant Alternatives (IIA)** property, which essentially states that all transport modes utilized in modelling travel behaviour are independent (BERKELEY, 2002).

Binary and multinomial logit models are the two types of logit models that are commonly used. Binary choice models can only model two discrete choices, implying that the person has only two options to choose from, whereas multinomial logit models suggest a broader range of options (ELSHIEWY; GUHL; BOZTUG, 2017). Figure 0-3 shows an example of a multinomial logit model with three competing alternatives in the decision set: automobile, public transportation and air travel.

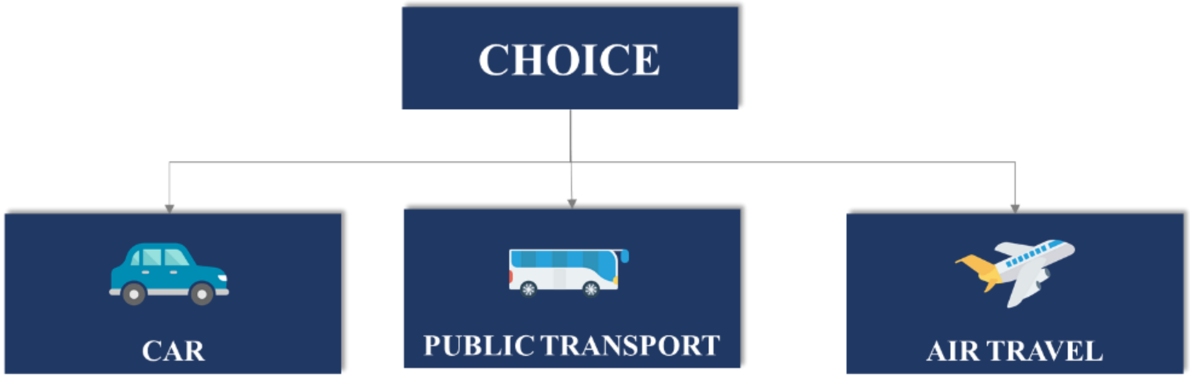

Figure 0-3: Example of a multinomial logit model
Source: Al-Salih; Esztergár-Kiss (2021)

The specifications developed for logit models associate certain **limitations** due to the IIA property. Other mode choice models such as probit and general extreme value models have relaxed the IIA restriction, although at the cost of possessing a highly complex mathematical structure and computational estimation. Thus, the logit model remains **dominant** in the transport modelling arena due to its simple model formulation and estimation techniques (DALY et al., 2012).

2.3.3 Model estimation techniques

In any regression modelling, generally, an equation is considered to represent a relationship describing a phenomenon. Nevertheless, many situations involve a set of relationships that explain the behaviour of a particular variable. For example, in analyzing the market conditions for the transportation sector, a demand equation and a supply equation explain the quantity and price of a service exchanged at market equilibrium. So there are **two equations to explain the whole phenomenon -** one for demand and another for supply (AVERY, 1977).

Hence estimation of parameters under this type of situation differs from those that involve only a single relationship. In particular, the most crucial of ordinary least squares (OLS) assumptions is that the regressors are exogenous — uncorrelated with the error term (CADAVEZ; HENNINGSEN, 2012). This assumption is violated if we have "**reverse**

causality” in which e ‘ → y ‘ → x ‘“, as is the case of the demand model. Therefore, the basic assumption of a regression model, which is that the explanatory variable and disturbance are uncorrelated or explanatory variables are fixed, is violated, and consequently, the OLS estimator becomes inconsistent (PIERSE, 2009). The Equations below further illustrates the problem.

$$\boldsymbol{Y} = \boldsymbol{X} + \boldsymbol{e}^{\boldsymbol{Z}} \quad \text{Eq. 2-5}$$

$$\boldsymbol{Z} = \boldsymbol{k} \quad \text{Eq. 2-6}$$

Where:

$\boldsymbol{Y}$ is the demand for transport;

$\boldsymbol{X}$ is the consumer income level;

$\boldsymbol{Z}$ is the utility of transport;

$\boldsymbol{K}$ is the generalized cost of transport.

Imagine that the demand for transportation is given by the consumer's income plus the utility of transportation services. In this system, income is expected to positively affect demand, while transportation **utility has a negative effect on demand**. In turn, the utility of transport is determined by the generalized costs of the service, which may include the consumer's income level and attributes of the transport mode, such as speed. Accordingly, in this type of system, estimation involves computing the full set of equations with two or more dependent variables on the left-hand side of one equation or the right-hand side of others (AL-SALIH; ESZTERGÁR-KISS, 2021). In the example given, this dependent variable would be the income term presented in both Equations.

Systems of equations that share several right-hand variables are often estimated using **Seemingly Unrelated Regression (SUR)** (TAKADA et al., 1995). A SUR system comprises several relationships that are linked by the fact that their disturbances are correlated. Such models have found many applications, like estimating demand functions for a given commodity, as is the transport case. The correlation among the equation disturbances could come from several sources, such as correlated shocks to household income. Furthermore, equations based on non-linear relationships, like Eq. 2-5, can be estimated using the **non-linear SUR** (NLSUR) format.

There are two primary **motivations** for the use of SUR or the NLSUR version. The first one is to gain efficiency in estimation by combining information on different equations and utilising the **feasible generalized least squares**, a specific form of the variance-covariance matrix. The second motivation is to impose restrictions that involve parameters in different equations (SHENG; SHARP, 2019).

To **summarize**, in regression modelling analyses that involve a set of the equation to describe a phenomenon, with errors correlated, Seemingly Unrelated Regression was found to be the most commonly used estimation technique. Computer estimation packages such as NLSUR are generally used for model calibration purposes, mainly due to their capability to perform numerous mathematical iterations using various already programmed statistical techniques (JOHN; NASH; MURDOCH, 2019). Such tools were widely used in this thesis to estimate the model's parameters, and more information can be found in (JOHN; NASH; MURDOCH, 2019).

2.4 Scenario planning literature and policy analysis

Scenario planning is a process for foreseeing future phenomena employed broadly by planners, policymakers, and academics in different fields. It is based on examining the current situation, establishing well-informed future assumptions, comparing their potential impacts, and assessing players' expected responses. Scenario creation is essentially a **"what-if"** statement that gets rigour via examination (AGREEMENT; COMM, 2021). Thus, this section presents a general method for scenario elaboration, described in subsection 2.4.1, and the scenario structure often used by the climate research community in subsection 2.4.2.

2.4.1 Method definition

Fundamentally, the scenario development process **outlines alternative pathways** to support policymakers and planners in dealing with uncertainties. In this context, the first step of scenario assessment consists of identifying the driving forces, followed by prioritising critical elements. It is possible then to have a global view of the biggest trends impacting the transportation sector. The third step consists of creating alternate storylines, so basically, different worlds might emerge based on those extremes uncertainties. The last step consists of looking at the potential implication of those scenarios for the transportation sector. Therefore, scenario planning helps **anticipate** a couple of alternative pathways and their shock on the sector (AGREEMENT; COMM, 2021). Figure 0-4 illustrates the steps mentioned above and the further explanations.

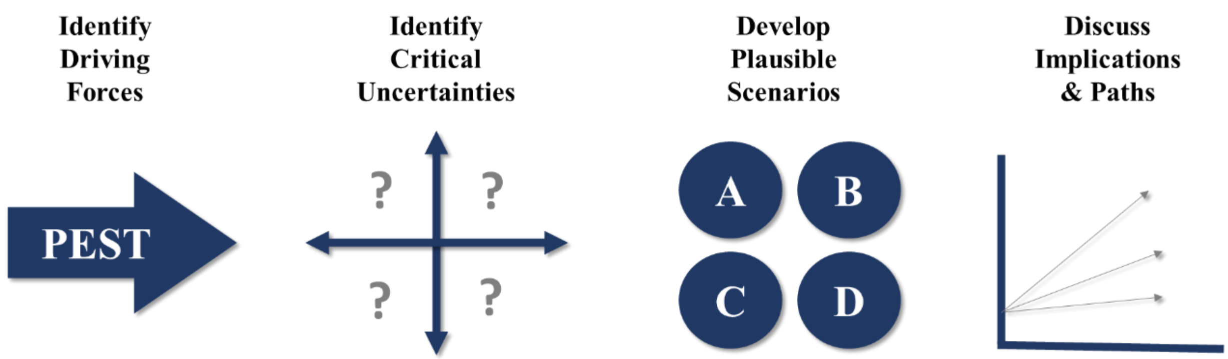

Figure 0-4: Scenario planning overview
Source: Based Yüksel (2012)

To identify the driving factors, it is worth applying tools that scan the external macro-environment. For example, it is common to use **PEST analysis**, the acronym for Political, Economic, Social, and Technological analysis, or some of its variations to look at trends or drivers in industry or social relationships that might impact the transportation sector. Each factor can be described as follows (YÜKSEL, 2012):

Political factors include government regulations and legal issues and define formal and informal rules under which the firm must operate. Some examples include tax policy, employment laws, environmental regulations, trade restrictions and tariffs, political stability;

Economic factors affect the purchasing power of potential customers and the firm's cost of capital. The following are examples of factors in the macroeconomy: economic growth, interest rates, exchange rates, and inflation rate;

Social factors affect the demographic and cultural aspects of the external macroenvironment. These factors affect customer needs and the size of potential markets, which include: health consciousness, population growth rate, age distribution, career attitudes, emphasis on safety;

Technological factors can lower barriers to entry, reduce minimum efficient production levels, and influence outsourcing decisions. Some technological factors include R&D activity, automation, technology incentives, and the rate of technological change;

Moreover, it is crucial to set a **time frame** for the analysis. For example, this thesis looks at possibles changes in the horizon of 2050. Therefore, we can simulate the impacts of technologies that nowadays are not available, but that can exist from 2045 onwards.

After that, the critical uncertainties should be identified: What are the top 2 drivers for the sector that the researcher wants to prioritize? From it, it should be developed potential pathways based on those extremes selected. Lastly, discuss the implications and paths of those **storylines** and address the challenges. Such methodology is applied in this thesis to specify changes and possible pathways for the transportation sector.

2.4.2 Shared Socioeconomic Pathways

The Shared Socioeconomic Pathways (SSPs) were developed as a joint scientific effort to provide a toolkit for the climate change research community. The SSPs are most employed to carry out integrated and multi-disciplinary analysis (IIASA, 2019). The approach has been built upon logically related elements that design a broad **development pattern**, following the basic principles described previously (O'NEILL et al., 2014).

In total, **five alternative socio-economic developments** mix the following quantitative elements to guide the future: population, education, urbanization, GDP and technological progress (IIASA, 2012). The scenarios are:

- SSP1: Sustainability (Taking the Green Road)
- SSP2: Middle of the Road
- SSP3: Regional Rivalry (A Rocky Road)
- SSP4: Inequality (A Road divided)
- SSP5: Fossil-fueled Development (Taking the Highway)

Figure 0-5 illustrates the drivers under different SSPs and how the **SSP2** stands for the "middle of the road or business as usual" scenario. For further details and extended descriptions of the storylines, see O'neill et al. (2014).

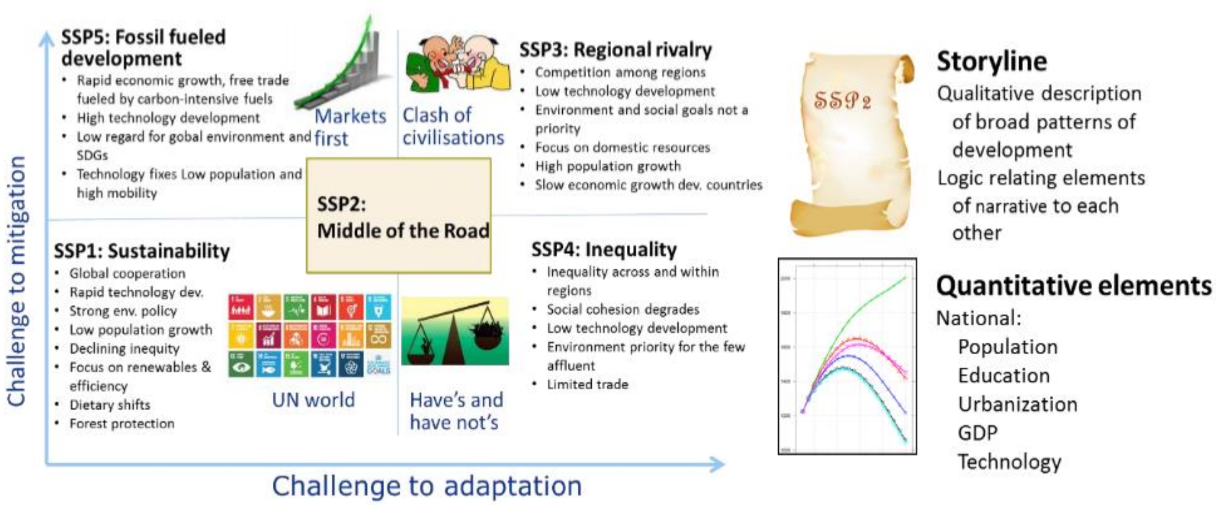

Figure 0-5: Drivers under the different SSPs
Source: (IIASA, 2019)

The **IAM community drew up SSPs** to help formalise possible futures into qualitative and quantitative storylines where, for example, the world focuses collectively on sustainability, grows without regard for the environment, or continues much as things are today (IIASA, 2012). Hence, the SSPs are used to derive greenhouse gas emissions scenarios with different climate policies, and they will be applied later in this research to describe future social-economical development. SSPs are also criticized for simplifying regional and social contexts (O'NEILL et al., 2020), however, this question is beyond the scope of this thesis.

In summary, this chapter provided significant findings on how mobility behaviour is addressed in the IAMs framework. In particular, it was reviewed passenger mode choice modelling and travel demand models. The primary goal of the literature review was to assess modal split models that could be used to predict travel behaviour at macro-regions. Furthermore, methods that subsidize the planning process through scenario approaches were investigated. These two concepts, econometric modelling tools and planning via scenario building, are the basis of all the knowledge explored in the following chapters of this thesis.

Chapter 3

HERMES

HISTORICAL TRENDS FOR MOBILITY ASSESSMENT

Multinomial logit model to simulate passenger transportation demand

This chapter presents the methodological procedure adopted for the development of the HERMES tool. HERMES is the acronym for the Historical tRends for Mobility assESsment tool, which derives from previous research entitled "Long-term trends in domestic US passenger travel: the past 110 years and the next 90 ", published by Schäfer (2017). The new set of equations introduced by Professor Andreas Schäfer allows estimating transportation demand, distribution across modes and can be linked to IAM models to improve its realism. Accordingly, we adjusted the econometric model proposed and applied it to other regions of the globe, namely Brazil, the European Union, and Japan, to assess the model behaviour in different regions whilst contributing to the ultimate goal of building a global model. Thus, subsection 3.1 presents the original version of the model. Subsection 3.2 contextualizes the research agenda and scope of this thesis. Finally, subsection 3.3 describes the implemented procedure, highlighting the changes made to the model, the premises underlying the storylines adopted and the workflow for reproducing the results and using the new tool.

3.1 A model to project transportation trends in the long-term

In the paper entitled "Long-term trends in domestic US passenger travel: the past 110 years and the next 90[6]", Schäfer (2017) proposed a multinomial logit model to project aggregate transportation trends over 2100, based on a long-term historical data collection of US passenger travel. The equations introduced allow estimating transportation demand and distribution across modes by applying the three equations shown below.

Properly, Eq. 3-1 projects per capita total mobility (passenger-km travelled - pkt) based on per capita GDP and the expected utility of travel mode choices, given by Eq. 3-2. The third model component, Eq. 3-3, has the functional form of a logit model, which assigns the projected travel demand to competing transportation modes (SCHÄFER, 2017).

Total travel demand model:

$$\ln pkt_t = \gamma_0 + \gamma_1 \ln pkt_{t-1} + \gamma_2 \ln gdp_t + \gamma_3 \ln gdp_{t-1} + \gamma_4 \ln(\ln \sum_{M} exp^{V_{m,t}}) + \delta d + \varepsilon_t \qquad \text{Eq. 3-1}$$

$$V_{m,t} = \beta_m + \beta_1 Sh_{m,t-1} + \beta_3 (\frac{VOT}{S_{m,t}} + \frac{C_{m,t}}{GDP/h_t}) \qquad \text{Eq. 3-2}$$

Mode choice :

[6] Professor Andreas Schäfer presents an extensive list of publications addressing the transport sector via econometric models. In addition, the author contributed to the creating and definition of several models in the transport area that are used by renowned research institutes, such as IIASA, PNNL and PIK.

$$\boldsymbol{Sh_{m,t}} = \frac{e^{v_{m,t}}}{\sum_M e^{V_{m,t}}} \boldsymbol{with\ m\ \in M} \qquad \text{Eq. 3-3}$$

Where:

pkt_t is the total demand per person in year t

pkt_{t-1} is the total demand per person in the previous period

gdp_t is the per-person GDP in year t

gdp_{t-1} is the per-person GDP in the previous period

$V_{m,t}$ is the utility term of the considered transportation modes

d is the dummy variable that accounts for exogenous shocks on per person demand

$Sh_{m,t-1}$ is the mode share in the previous period

VOT is the fraction of the wage rate that is being spent on transportation

$S_{m,t}$ is the door-to-door speed of each mode

$C_{m,t}$ travel is the travel costs of each mode

GDP/h_t is the wage rate in year t

M are the transportation modes considered: private, public and air/high-speed rail transportations named by LDV, PUB and AIR, respectively. The speed criteria grouped the transportation modes.

The Independence of Irrelevant Alternatives (IIA) property (BERKELEY, 2002) is used to estimate the model parameters, which allows deriving the odds ratios $Sh_{LDV,t}/Sh_{AIR,t}$ and $Sh_{PUB,t}/Sh_{AIR,t}$ and re-written Eq. 3-2 as:

$$\ln\left(\frac{Sh_{LDV}}{Sh_{AIR}}\right)_t = \beta_{LDV} + \beta_1 \ln\left(\frac{Sh_{LDV}}{Sh_{AIR}}\right)_{t-1} + \beta_3\left(\frac{VOT}{S_{LDV,t}} - \frac{VOT}{S_{AIR,t}} + \frac{C_{LDV,t} - C_{AIR,t}}{\left(\frac{GDP}{h}\right)_t}\right) + \varepsilon_t$$

$$\ln\left(\frac{Sh_{PUB}}{Sh_{AIR}}\right)_t = \beta_{PUB} + \beta_1 \ln\left(\frac{Sh_{PUB}}{Sh_{AIR}}\right)_{t-1} + \beta_3\left(\frac{VOT}{S_{PUB,t}} - \frac{VOT}{S_{AIR,t}} + \frac{C_{PUB,t} - C_{AIR,t}}{\left(\frac{GDP}{h}\right)_t}\right) + \varepsilon_t$$

Eq. 3-4[7]

As the equations share several dependent variables, the error terms are likely to be correlated within each equation system. Accordingly, Eq. 3-1 and Eq. 3-4 must be estimated using Seemingly Unrelated Regression (SUR)[8] (AVERY, 1977). In the case of models for transportation demand, the SUR[9] method can be used to estimate all parameters of all equations simultaneously, whilst the correlations among the transportation modes are taken into account.

Thus, the resulting system of equations can then simulate changes in travel demand and mode share in response to changes in income, prices, and door-to-door speeds. Additionally, an iterative procedure embedded in the coding ensures the average amount of per person travel time remains at a pre-specified level by modifying the estimated value of time. The rationality added in the model is that if consumers face a time budget, they will increase their willingness to save time, switching to faster modes to keep travel time stable (SCHÄFER, 2017). In this way, demand simulation aims to optimize travel time, ensuring the maximization of the consumers' action radius**.**

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[7] It is worth noting that the estimation of the model parameters uses version Eq. 3-4, while demand simulation uses version Eq. 3-2.

[8] A set of equations which share a common error structure with non-zero covariance is said to be correlated. Zellner (1962) developed the co-called "Seemingly Unrelated Regression" (SUR) estimator that accounts for these correlations and allows the *p* dependent variables to have different sets of explanatory variables. The SUR method estimates the parameters of all equations simultaneously, so that the parameters of each single equation also take the information provided by the other equations into account. This results in greater efficiency of the parameter estimates compared to Ordinary Least Squares estimator (OLS), because additional information is used to describe the system (CADAVEZ; HENNINGSEN, 2012).

[9] It is worth to highlight that the set of equation has a non-linear form, therefore, the method that is used to estimate the parameters is the nonlinear seemingly unrelated regression.

The justification of the constant travel time derives from an evolutionary perspective, which recognizes the man with the fundamental instinct of extending his territory. According to Marchetti (1994), the man's territory can be measured by "the mean travelling time per day multiplied by a mean speed of moving, which gives a distance, or a range of the territory". He explains that "behaviour is governed by habits rather than by continuous rational weighing of all available options". In this theory, "people are trying to stabilize travel time at 66 minutes per day and suggest that major changes occur if they do not succeed, like changing the workplace or the homeplace".

Besides that, different from other approaches that project travel demand of major transportation modes separately[10], the procedure proposed here simulates the importance of competing transportation modes in an integrated fashion, based on changes in prices and speeds for individual transportation modes. This feature empowers the assessment of consumer behaviour regarding transportation choices and sets the work apart from the previous models (SCHÄFER; VICTOR, 2000).

Thus, the model enables estimating transportation demand in a competing environment and in the face of a travel time budget, which indicates that, in the absence of structural discontinuities, the long-term historical trends toward higher levels of mobility and faster travel modes may continue well into the future (SCHÄFER, 2017).

3.2 Towards a global transportation model

According to Schäfer (2017), the model presented in the previous section, which was first tested for the US economy based upon a long-term historical data set of US passenger travel, is sufficiently general and straightforward to apply to other parts of the world. Moreover, as stated, "in fact, the intention is to use this approach to ultimately

[10] Examples include the transportation module of the Energy Information Administration's NEMS model (EIA, 2009) and the International Energy Agency's global Mobility Model (FULTON et al., 2009).

arrive at a superior model of global travel demand compared to that described by Schäfer and Victor (2000)".

Due to these indications and the foreseen opportunities to model the value of time introduced by the approach, the model was chosen[11] to assess its feasibility as a first-order transportation demand estimator in other regions. In addition, the proposed model differs from other methodologies as it allows the estimation of transport demand considering the intermodal competition. Hence, the question that motivates our analysis is: can the model proposed in Schäfer (2017) be applied worldwide and, afterwards, linked with IAMs to improve insights and realism regarding consumer travel choices? Figure 3-1 illustrates the research questions underlying this thesis and its scope.

[11] This research began during Callegari's IIASA-CAPES sandwich doctorate. After completing the internship period, the research continued in Brazil.

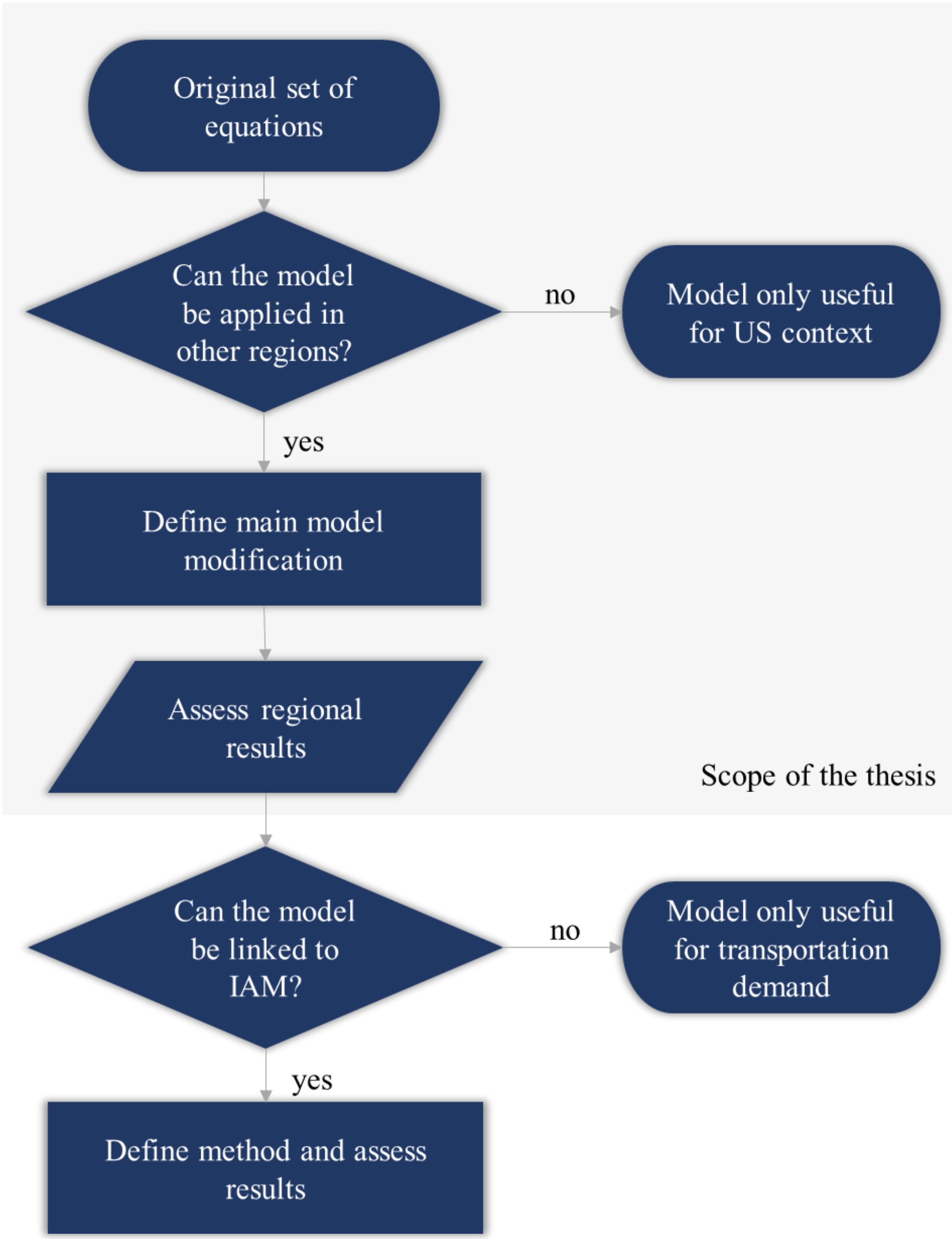


Figure 3-1: Research agenda and thesis scope
Source: Own elaboration

To answer the initial part of these questions, we selected two advanced economies[12], the European Union and Japan, and one emerging economy, Brazil, to analyse how the set of equations could be applied to project transportation demand in

[12] The US is also analyzed with two purposes: i) to assess the replicability of the model and results found in Schäfer (2017), and ii) to evaluate the demand estimate given the changes made to the model.

different conditions. These regions were selected due to data availability, economic context and transportation demand stage, which allows us to assess both the universality of the model proposed by Schäfer (2017) and the passenger transportation evolution in the selected regions.

Therefore, this thesis indicates the opportunities and challenges of building a global transportation demand model, starting from the model proposed by Schäfer (2017). Future studies, thus, can derive from this work to assess transportation demand in other regions not covered herein or to assess its integration, via soft-link or hard-link, with multi-sector analysis tools, like the BLUES and COFFEE models. In this light, the present work should be understood within a broader and interconnected research agenda than the subjects addressed here.

3.3 HERMES methodological approach

This section aims to present the methodological procedure established to apply the set of equations proposed by Schäfer (2017) in other regions. The changes and suggested implementation steps were named as version HERMES of the model. HERMES is the acronym for Historical tRends for Mobility assESsment, and the name of a well-known character from Greek mythology as the god of roads, speed, and travellers; a fact that motivates the name[13] given to the analytical tool.

In this context, subsection 3.3.1 presents the main contributions to improving the model. Subsection 3.3.2 presents the narrative lines developed and applied in the thesis. Finally, subsection 3.3.3 describes the steps to estimate the demand for passenger transport, guiding the following chapters of this thesis.

[13] Naming is one of the functions of language that plays a very important role in the learning process, as it helps human beings organize and classify the ways of perceiving reality. Therefore, it is a powerful way to direct link abstracts concepts, such as regression models, to a broader culture or community (AMARÍLIS; MOREIRA, 2014).

3.3.1 Model adjustment

We applied the MNL model proposed in Schäfer (2017) to other regions, namely Brazil, the EU, Japan, and the US, to assess its behaviour in different contexts and contribute to the ultimate goal of building a global model. However, the set of equations had to be adjusted to be feasible in the regions analyzed[14]. The main alteration is regarding the treatment of the Value of Time (VOT) variable in the model: instead of a coefficient, as in the original U.S model, the VOT variable is treated as an exogenous variable in the HERMES version, differentiated for each transportation mode. Thus, Eq. 3-2 can be re-written as:

$$\boldsymbol{V_{m,t}} = \boldsymbol{\beta_m} + \boldsymbol{\beta_1 Sh_{m,t-1}} + \boldsymbol{\beta_3}\left(\frac{\boldsymbol{VOT_{m,t}}}{\boldsymbol{S_{m,t}}} + \frac{\boldsymbol{C_{m,t}}}{\boldsymbol{GDP/h_t}}\right) \qquad \text{Eq. 3-5}$$

Where:

$VOT_{m,t}$ is the fraction of the wage rate that is being spent on each transportation mode

The Value of Time often referred to as the Value of Travel Time Savings (VTTS) is the marginal rate of substitution between the travel time and cost in the choice models and measures the willingness to pay to reduce the travel time (BROWNSTONE and SMALL, 2005; DE JONG et al., 2007; apud CHAND DEVARASETTY et al., 2012). In general, the VOT[15] multiplier is positive – indicating that passengers dislike travel and consider it a disutility. Though related, there is no reason to assume the VOT is equal for

[14] For the United States, treating VOT as a coefficient is feasible. However, for the other regions it was not possible to estimate the VOT.

[15] The time cost of travel or value of travel time (VOT) is estimated in the transportation literature either in monetary terms ($/hour), or as a multiplier of wage rate. For the current project, we are interested in the latter representation for two reasons (GOURI et al., 2013):
(a) Inter-temporal income elasticity of travel costs: Within any region, a rise in income over the forecast period will lead to changes in travel costs. This is consistent with results from studies estimating inter-temporal income elasticities.
(b) Cross-sectional income elasticity: Travel costs are expected to differ across regions because of differences in income levels. Nearly all studies on travel time costs are based on developed countries; and the estimated travel costs ($/hour) are unlikely to be applicable for developing countries where average incomes are substantially lower.

all transportation modes and regions, as individuals may have different preferences for time saved under contrasting travel circumstances (GOURI et al., 2013).

The factors that affect the willingness to pay, or the quality of the travel experience overall, include comfort, convenience, frequency, reliability and the possibilities to utilise time spent travelling on other activities. Thus, adopting different values of reductions in travel time for different modes (e.g. high-speed rail versus metro) or journey characteristics (e.g. long versus short distances) adds to the sophistication and utility of the model. Besides that, the modification allows assessing possibles modification in the willingness to pay due to new travel conditions and integrating these assessments in the choice functions.

Another issue identified during the research were uncertainties regarding the per capita GDP and wage rate level. Developing economies, like Brazil, present a high share of economic activities that are not captured in the GDP index and therefore are so-called shadow economies. Changes in monetary indicators, labour market rates, working hours, and GDP are some of the repercussions of the shadow economy on the official economy (IMF, 2002). This displacement may depress the official growth rate of the economy, turning official statistics deficient. As a result, models and policies framed based on inaccurate statistics may be inappropriate and self-defeating (SCHNEIDER et al., 2013).

In this sense, we adjusted the methodological procedure to incorporate the shadow economy into the modelling framework. We added the shadow economy into the official GDP, and then we estimate the model parameters using the official GDP and the shadow GDP to assess the shadow economy influences on parameters estimation and model outputs.

3.3.2 Exploratory storylines and pathways

This section presents the approach taken to define the baseline and the counterfactual pathways of development. The aim here is to carry out a qualitative description of the implemented storylines; the quantitative assumptions are discussed in Chapters 4 and 5.

The baseline scenario adopted to estimate the transportation demand from 2010 to 2050 follows the SSP2 assumptions[16], also known as the "Middle of the Road" pathway (VAN VUUREN 2014). This scenario suggests that the world moves down a path where social, economic, and technological tendencies do not deviate significantly from past patterns. In this thesis, the SSP2, and its annual growth rate, provides the future development of macroeconomics and demographic variables applied to all analysed storylines. In addition, it is highlighted that other scenarios can be incorporated into the tool in the future. For example, the current trend is towards regional rivalry, which makes the SSP3 scenario more likely. However, SSP2 was chosen because it is a more neutral scenario.

To identify possible changes in the supply side of transport, we applied the scenario planning methodology presented in the literature review. In general, the approach proposes to map the driving forces, prioritize them and outline development trajectories, composing narratives about the future. Figure 3-2 illustrates the Political, Economic, Social and Technological analysis, in short, PEST analysis, used to identify some of the critical drivers of change in the mobility sector.

Regarding political aspects, the geopolitical instability installed by the pandemic stands out. The increase in health restrictions affected geopolitical transactions, increasing barriers and costs. Accordingly, the movement towards the globalization of the economy may have a long-term impact. In addition, data and information protection laws are vital for the digitization of the economy, and intensification of nationalization could slow these processes down (YÜKSEL, 2012).

[16] Development and wealth growth are unevenly distributed, with some countries making relatively rapid progress while others lagging behind. Global and national institutions try to achieve sustainable development goals, but progress is gradual. Environmental systems deteriorate, but there are some improvements, and total resource and energy usage intensity decreases. Global population growth is moderate, and it will slow down in the second half of this century. Inequality of income persists or improves slowly (IIASA, 2012) .

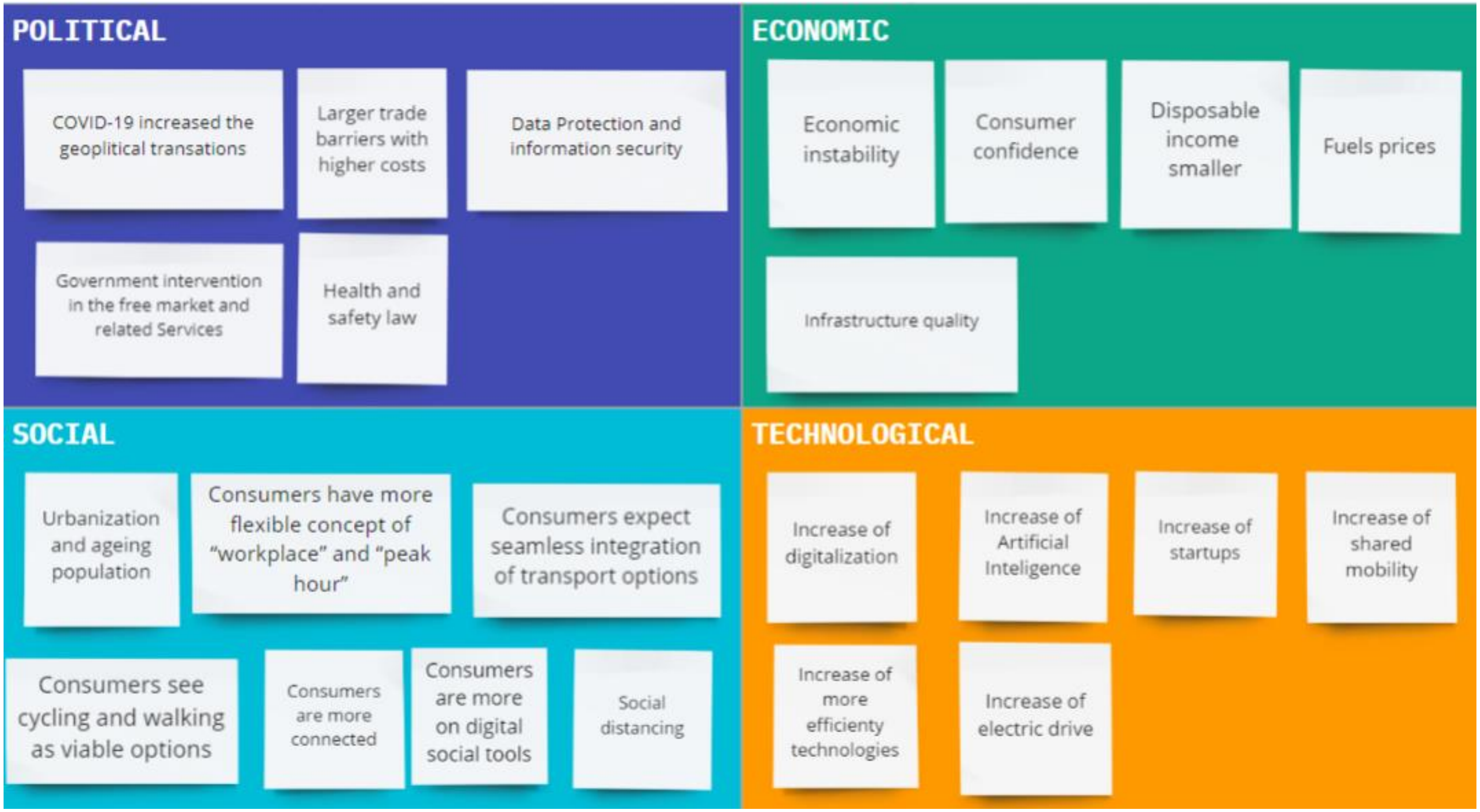


Figure 3-2: PEST analysis for passenger mobility trends
Source: Own elaboration

Regarding economic aspects, the crisis caused by the pandemic can affect consumer confidence and reduce disposable income. Furthermore, due to economic instability, investments in infrastructure can be compromised, affecting the quality of the transport sector (WBG, 2020).

Changes in the social scenario involve urbanization, flexibilization of working hours, digitalization of social interactions and sustainability. Factors that affect how consumers perceive and interact with the transportation system (COHEN, 2019).

The technological landscape points to the growing digitization of products and services. In addition, there is an increasing entry of startups in the market, which decoupled mobility from vehicle ownership. Another trend is the electrification of the economy, which drives the market for electric vehicles and new automotive propulsion solutions (IOVAN; LITRA, 2013).

As seen above, among the critical drivers highlighted the two trends that present the highest impact and uncertainty are:

(i) Digitalization. It was identified as a critical uncertainty concerning the role of technology and whether society would prefer to access people, goods, services and opportunities by virtual, self-automated or by traditional means;

(ii) Structural impacts of COVID-19 pandemic. This critical uncertainty concerns the extension of the pandemic in the economy and consumer habits. Structural impacts can act as a constraint to travel, influencing why and how people will travel.

Accordingly, it was developed narratives to reflect the key drivers of change. Overall, the storylines combined the effects of behavioural changes and technological developments. The scenarios can be summarised as follows:

Business As Usual life. The uncertainties regarding the raised points do not materialize, and the new normal is very similar to the old fashion days. Available technologies remain the same, and consumers maintain their pre-pandemic preferences and habits;

Autonomous vehicles take off. Autonomous vehicles invade the streets from 2035 on, drawing the attention of consumers. New services and utilities are coupled with the new technology, which looks more like iPads or houses on wheels. The disutility of vehicles is reduced in the view of consumers, who start to value less the time spent in vehicles;

Digital transformation in public transit. Digitization improves the operating efficiency of public transport lines. New autonomous vehicles, managed by artificial intelligence, facilitate the meeting of demand and supply, allowing the speed of travel to increase, besides policies that favour public modes. The improvement in the system changes consumers' perception, and public transport starts to attract greater demand;

Domestic aviation in a post-pandemic world. The impact of the pandemic on the aviation sector is high, compromising the financial capacity of companies and the offer of flights. Consumers' willingness to travel by air or long-distance travel is uncertain. In addition, the market may lose a portion of business travel due to the intensification of virtual meetings.

The four pathways demonstrate a spectrum of possibilities regarding the interplay of digitalization and structural impacts of the COVID-19 pandemic. Nevertheless, these are not the only four possibilities of futures; very different futures might emerge. However, in any scenario planning exercise, the purpose is not to settle the future but to be pertinent to the driving forces and bring uncertainty to the fore (LYONS; DAVIDSON, 2016).

3.3.3 Method workflow

This section aims to present the workflow developed to estimate passenger transportation demand using the HERMES version of the model. Figure 3-3 illustrates the main steps involved in the proposed modelling process. The icons linked to the steps represent the software used to implement each phase. In general, to estimate passenger travel demand, it is necessary to: collect and systematize historical data; estimate the model parameters, based on Eq. 3-1 and Eq. 3-4; evaluate the results, considering the effects of informality in the model; elaborate scenarios and premises for social and technological development; compute the model outputs, based on Eq. 3-1, Eq. 3-2 and Eq. 3-3; and, finally, assess the results and implications. The method was applied to this thesis research and can work as a roadmap for future research on the topic.

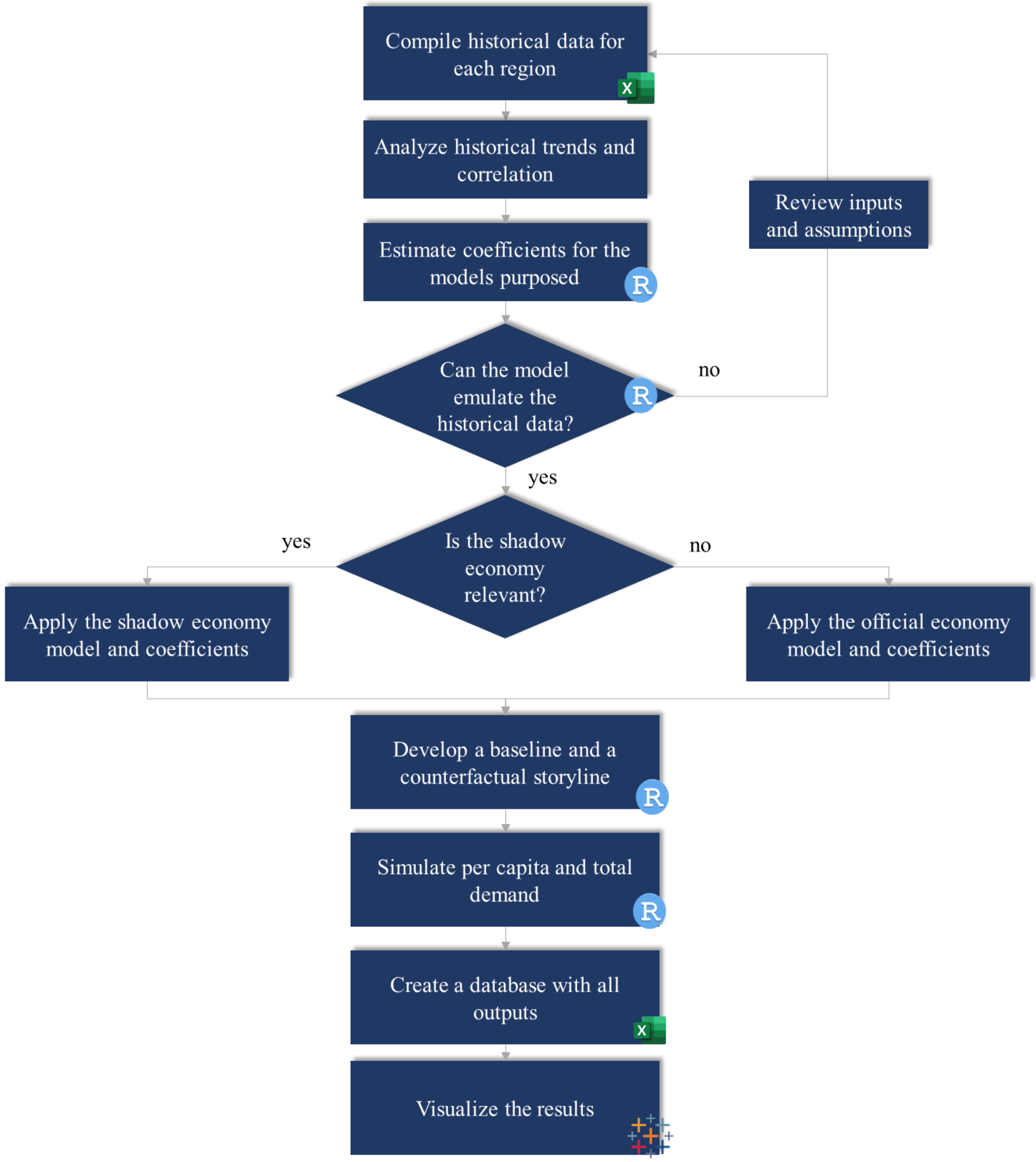


Figure 3-3: Workflow for estimating passenger transport demand
Source: Own elaboration

To summarize, Historical tRends for Mobility assESsment (HERMES) is a travel-economic simulation model designed to capture the transportation system at a macro-scale level for a user-defined analyses timeline. Current, HERMES allows users to examine the next 30-40 years of transportation demand evolution. The model provides long-term prospects for practical and applicable transportation policy solutions, especially for regions that aim to assess cost reductions, door-to-door speed, and willingness to travel. The model outputs reveal how the transportation system can be balanced under different assumptions and how the demand and resulting mode share change concerning those scenarios.

The insights gained from this analysis will help regions and their stakeholders better design policies to manage demand. The benefits of storylines analysis using HERMES include:

- Assess the impact of the informal economy on the estimation of parameters and demand projections for each region;
- Assess the per capita and total transportation trends for a range of mid-to long-range transport scenarios of interest to researchers, policy-makers and partners;
- Conduct scenario exercises to look at medium- to longer-term alternative scenarios and their impact on achieving travel time budget goals;
- Explore how mode share trends in the transportation sector may evolve due to technology adoption or demand shocks.

It should be noted that Appendix A provides all the necessary materials for the HERMES reproduction. The following chapters present the implementation and results for the analysed regions.

Chapter 4

PASSENGER

TRANSPORTATION DEMAND IN AMERICA, ASIA AND EUROPE

The history will provide the most relevant information

Historical data are a major issue to improve the transportation system and policy analysis. Although data are critical to improving management and decision making, there is a gap of information that brings uncertainty to the modelling process. In this context, Chapter 4 describes the analytical approach developed to overcome the lack of historical data and the method applied to estimate the model parameters. Section 4.1 provides the data source used in the HERMES version, and Section 4.2 presents a visual and descriptive data analysis. Section 4.3 describes the exploratory data analysis, which aims to assess uncertainties in economic variables and possible influences on passenger transport demand. Section 4.4 details the parameters estimation, methods and software used, and section 4.5 assesses the best model by contrasting the model's outputs with the historical data. Results indicate that the shadow economy can overestimate the slopes of simple linear regression models, especially in regions with high informality. For the HERMES version analyzed, the main effect of the shadow economy is the increase in the generalized cost coefficient, with no difference being found in the historical projection of the values.

4.1 Data

The requirement for mobility data is at the heart of any transportation policy. However, obtaining accurate, complete data in a cost-effective, suitable, and timely manner is not always straightforward (CLIFFORD, 2017). In general, the challenges include that varied sources of transportation information exist for different modes, but there is little consistency between sources; the data is collected for system monitoring purposes, not planning; the collection methods, reporting formats, and requirements make comparisons across databases complex (LAMBERT, 2015). Thus, to estimate passenger travel behaviour, many transportation researchers rely on expensive, obsolete data or employ time-consuming, assumption-based models, being the last two cases applied in this thesis.

New development in science and advancements of information and communication technology has created an environment that allows more data and information about the transportation system to be collected and analyzed (VERENDEL; YEH, 2019), (ILIASHENKO; ILIASHENKO; LUKYANCHENKO, 2021), pushing forward transportation planning. Nevertheless, there are many research gaps, and further work needs to validate the models, assumptions and access to data (ZANNAT; CHOUDHURY, 2019).

Therefore, the HERMES version relies on data sources collected from various source data systems, such as bureaus, government agencies, and surveys. The raw data collected were compiled and transformed into a suitable form for further analysis and processing, as illustrated in Figure 4-1.

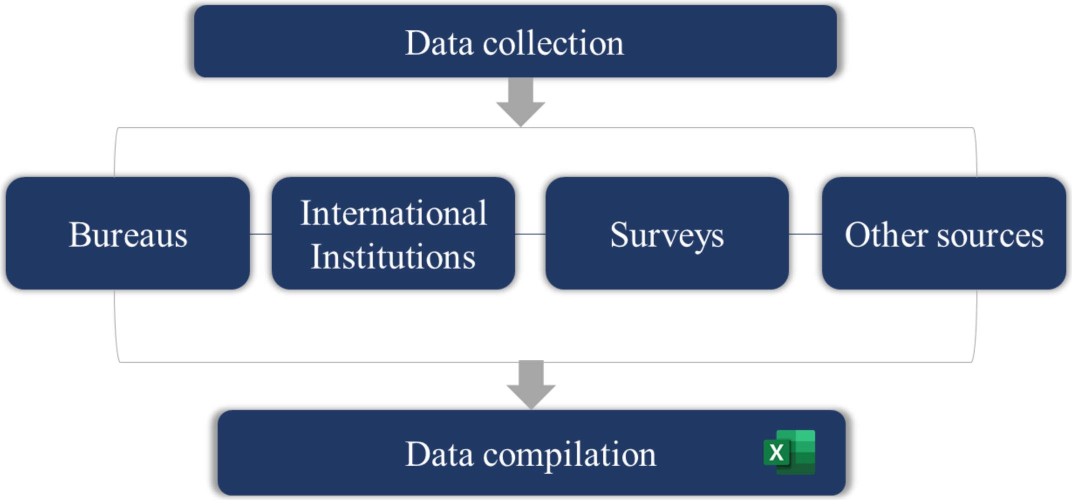


Figure 4-1: Data processing
Source: Own elaboration

Table 4-1 summarizes the sources used to build the analysis; for further details, see Appendix A. Data for Brazil, the EU and Japan were collected by the author. Data for the U.S. are provided by Schäfer (2017). Times series for the EU, Japan and the US are available from 1960 to 2010, and for Brazil from 1970 to 2010. The base year is 2010 due to data available for the Brazilian case.

Table 4-1: Data source used in the models

	BRAZIL	EU	JAPAN	US
PKT (p-km)	EPE (2012)	European Commission (2019)	SBJ (2014)	Schäfer (2017)
Mode Share (%)	EPE (2012)	European Commission (2019)	SBJ (2014)	Schäfer (2017)
VOT (%)	Gouri et al. (2014); Santos, (2012)	Gouri et al. (2014)	Gouri et al. (2014); Varghese et al. (2020)	Gouri et al. (2014)
Speed (km/hour)	Gouri et al. (2014)	Schäfer (2000); Schäfer (2017)	Schäfer (2000); Schäfer (2017)	Schäfer (2017)
Travel cost ($2010/p-km)	ONTL (2020); ABEAR (2020)	Gouri et al. (2014) Schäfer (2017)	Gouri et al. (2014) Schäfer (2017)	Schäfer (2017)
Travel Time Budget[a] (hour/ per day)	Ahmed and Stopher (2014)	Ahmed and Stopher (2014)	Ahmed and Stopher (2014)	Ahmed and Stopher (2014)
Population	World Bank (2019)	World Bank (2019)	World Bank (2019)	Schäfer (2017)
per capita GDP ($2010)	World Bank (2019)	World Bank (2019)	World Bank (2019)	Schäfer (2017)
GDP hour worked ($2010)	OECD (2015)	OECD (2015)	OECD (2015)	Schäfer (2017)

Shadow (%GDP)	Medina and Schneider (2018)	Medina and Schneider (2018)	Medina and Schneider (2018)	Medina and Schneider (2018)

[a] The TTB is based on stable mean travel time theories and is attributed to the value of 1.1-hours travel per day (AHMED; STOPHER, 2014). This number was set to 1.4 because the US's TTB is over 1.1 hours per day, close to 1.4 hours per day. The model endogenously computed this result.

4.2 Analysis of historical trends

This section aims to describe the compiled times series. Thus, the population growth, the economic context, the passenger demand, and the characteristics of the transportation modes are illustrated and outlined for each analyzed region. The time series is presented until the year 2019, but the historical data comprises until 2010. The values for the period 2011-2019 are simulated and not divergent from those observed in the period.

4.2.1 Population trends

The set of equations proposed to compute transportation demand is based on per capita terms. Hence the analysis is centred on the consumer point of view and how they make choices related to transport, the information regarding how many consumers there are, how they got here, and how fast is core for the research agenda.

Figure 4-2 clarifies the population trends. In 2019, the most populous region in the sample was the European Union, with about 528 million persons were living in it, followed by the United States, Brazil and Japan. As shown on the map, the land cover of the economies are different, which influences the density and mobility pattern of each region, among other factors (CHEN; GONG; PAASWELL, 2008).

For example, geographic and population development establish the primary conditions of contrast between Brazil and Japan. The Japanese transport system occurs at the geographical limits of an island, where 70% of the land area is dominated by mountain ranges (WHITE, 1985). Thus, about 125 million people (WORLD BANK, 2019) are mainly concentrated in lowland areas, forming large urban centres. On the other hand, Brazil is a country of continental dimensions, in which 210 million people are distributed over an extensive territory, covering 8.5 million km² (WORLD BANK, 2019). As a result, population density is modest, with around 22.4 inhab/km², while Japan has a density of 340 inhab/km² (WORLD BANK, 2019). Thus, the average Japanese presents a lower propensity to use automobiles than the average Brazilian due to land constraints.

Another insight is related to their growth, which presented a consistent increase over time. Comparing the expansion regarding the first year, it is clear that Brazil was the economy that most increased its population, pursued by the United States and European Union. Japan seems to be in the oppositive direction. While all major industrialized countries are currently experiencing population ageing, Japan is at the forefront of this demographic trend (MACKELLAR; ERMOLIEVA, 2004), showing negative population growth rates.

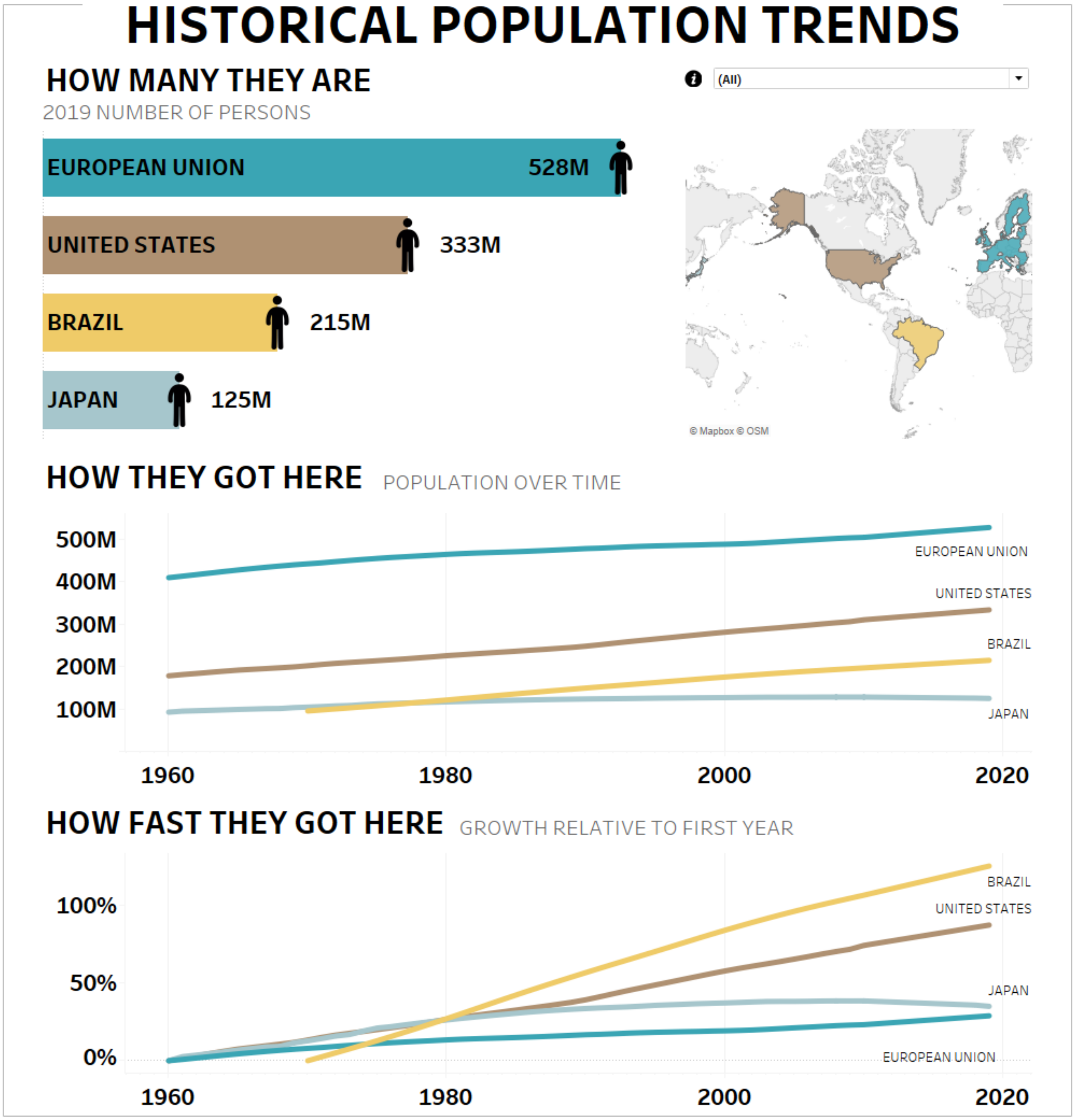


Figure 4-2: Historical population trends
Source: Own elaboration, based on World Bank (2019)

4.2.2 Economic context

Concerning the economic context of the regions, it is noticed that there are two distinctive economic groups in the study. European Union, Japan and the United States are characterized as developed economies due to having advanced technological infrastructure relative to other less industrialized economies, as is the case of Brazil, an agrarian economy. Another feature that differentiates the groups are the level of economic activities that are reported to the government and compose the GDP indicator. In general, developing economies presents a vast number of small and widely distributed transactions that go untaxed and are called by underground or shadow activities (Schneider & Williams, 2013). In Brazil, this phenomena is more or less widespread and is often defined simply as 'informal' instead of 'shadow.'

Studies about the size of the shadow economy may surprise those not familiar with the literature. Broadly, in less developed countries, the informal sector usually accounts for between 25% and 40% of economic output and up to 45% of jobs (OECD, 2017). Conversely, the lowest level of shadow economic activity is in high-income OECD countries with 13.4 per cent, and the average size of the shadow economy throughout the world is 17.1 per cent, as are illustrated in Figure 4-3.

A direct consequence of the shadow economy is to make official statistics, like the ones related to the official labour force and income, unreliable (SCHNEIDER; BUEHN; MONTENEGRO, 2013). The miscounts may depress the official growth rate of the economy, turning official statistics deficient, which can compromise the accuracy of models. For example, due to hidden activities, the economic activity and its pressure for passenger and cargo mobility are underestimated, which influences the parameters estimation and the total demand for goods, special for economies with widespread informality. Thus, the shadow economy was incorporated into the economic variables to assess the impact on the model estimation, further explored in Sections 4.3, 4.4 and 4.5.

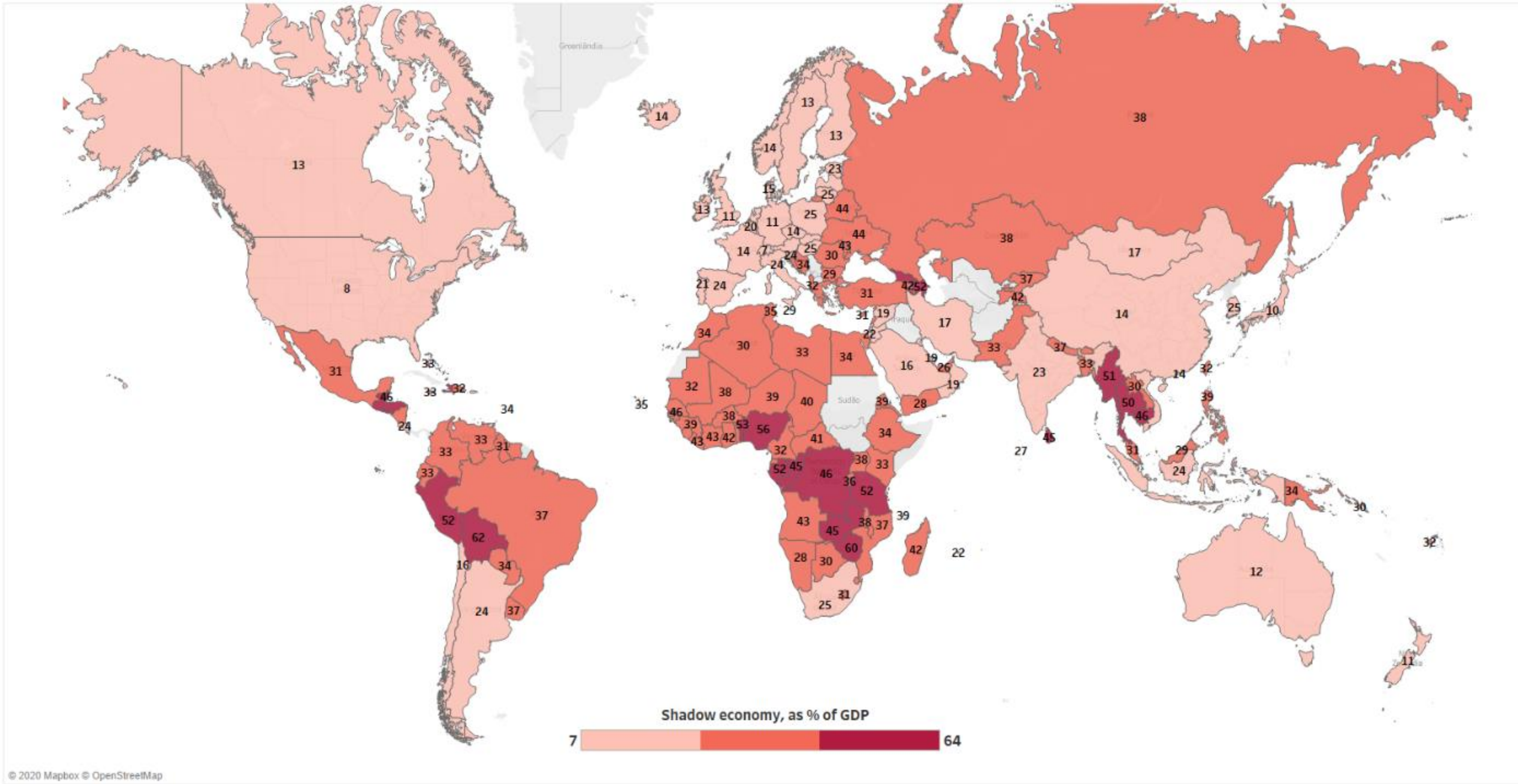


Figure 4-3: Average shadow economy over the period 1991 to 2015, in percentage terms of GDP
Source: Own elaboration, based on data provided by Medina and Schneider (2018)

Figure 4-4 illustrates the per capita GDP trends. The values shown already include the shadow economy. In 2019, the wealthiest citizens were American, European and Japanese, with a similar level of wealth; and Brazilians showed the lowest level, with a third of the wealth of the most developed economies.

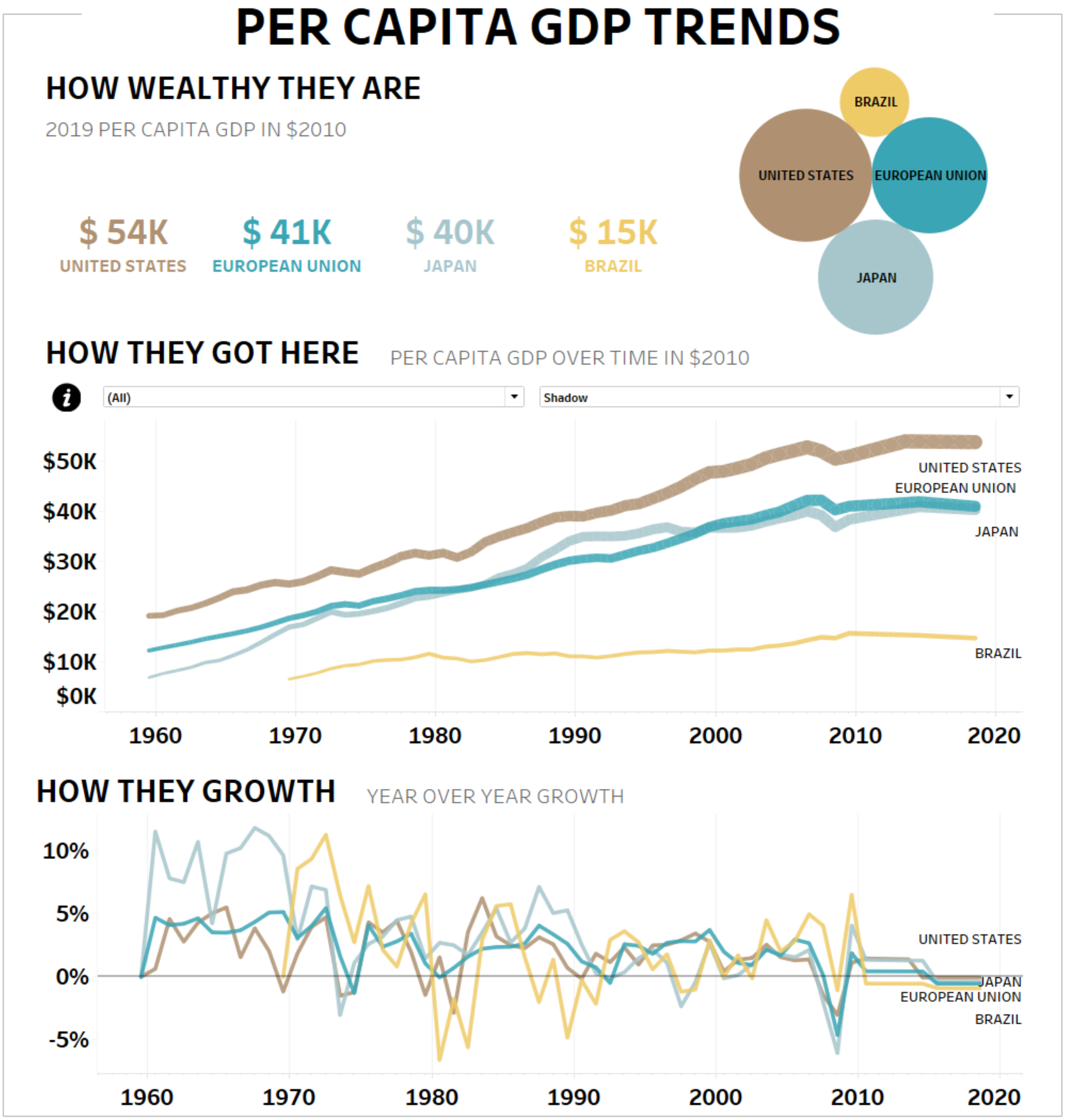


Figure 4-4: per capita GDP trends
Source: Own elaboration, based on OECD (2015), Schäfer (2017), and Medina and Schneider (2018)

The analysis of how they got here shows a lot of the history of each region. It is observed that between the period 1960 to 1970, developed countries had annual growth rates of around 4% per year, with emphasis on Japan, which had growth above 10%. Over decades, the annual rates decrease, marked by global crises, as during the 1970s with the oil shocks (ROGOFF, 2006); or structural and governance crises, such as the 1980s in Brazil (ABREU, 2005). The last decade, and particularly the last five years, seal a period of reduction in the growth rate of the economies analyzed. Another exciting factor to observe is how the growth pattern of developed economies follows a more constant path than developing economies, marked by ups and downs of the short cycles of agricultural and mineral commodities (BEN ZEEV; PAPPA; VICONDOA, 2017), (DRECHSEL; TENREYRO, 2018), (JACKS, 2019).

Another economic variable that is part of the model is the average salary on an hourly basis. As a proxy for income level, we used the GDP indicator per hour worked, which is also applied to indicate the level of labour productivity (FELDSTEIN, 2017). Figure 4-5 shows the results.

In 2019, the Americans received the most for the hour worked, followed by European, Japanese and Brazilian. Simplistically put, assuming that the price of the Big-Mac[17] is the same in all economies, the American with an hour of work could buy ten burgers while the Brazilian only 3. Regarding the pattern of growth over time, it is noted that the average income of the Japanese was the one that showed the most significant increase in the period analyzed, followed by the European, American and Brazilian. On the other hand, in the last years, there has been a stagnation in productivity gains and a fall in the Brazilian case.

[17] It was assumed that the Big-Mac costs $6.5.

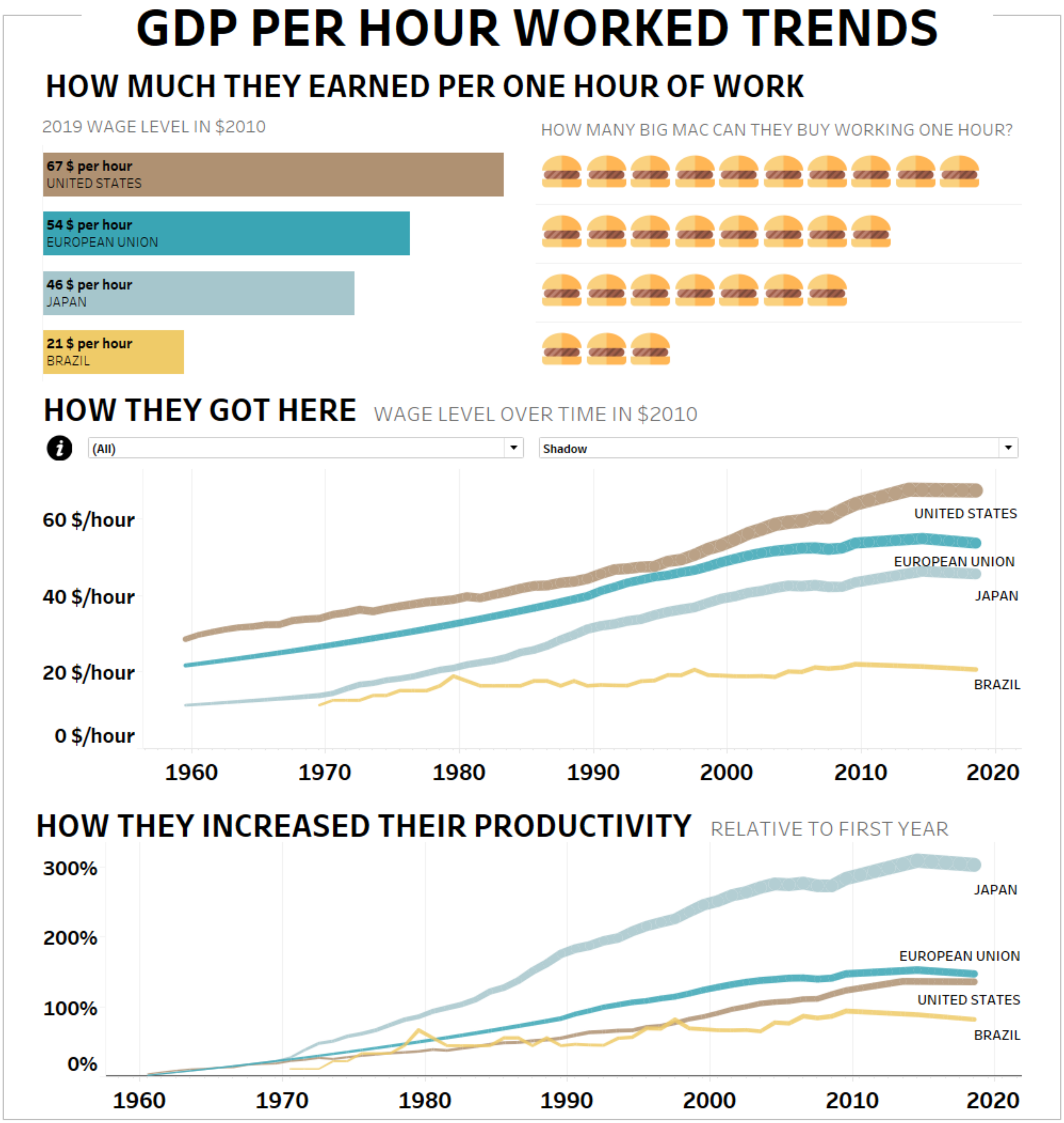


Figure 4-5: GDP per hour worked
Source: Own elaboration, based on OECD (2015), Schäfer (2017), and Medina and Schneider (2018)

4.2.3 per capita Passenger Kilometre Travelled

The per capita passenger kilometre travelled, also called by passenger-kilometre, abbreviated as pkm or PKT, is the unit of measurement representing the transport of one passenger by a defined mode of transport[18], such as road, rail, air, sea, inland waterways, over one kilometre (EUROSTAT, 2016).

Although all categories used in transportation statistics have established definitions, governments may employ different approaches to calculate passenger-kilometers. Methods could be based on traffic, mobility surveys, or various sampling methods and estimation methodologies, affecting the comparability of their statistics. Passengers transported by passenger car or unscheduled coaches are significantly more challenging to track down than passengers transported by rail or regular buses and coaches. Some countries do not register passenger auto transit at all, while others conduct various studies to estimate passenger traffic on their borders (OECD, 2016). Accordingly, comparability of transport data between countries is not always possible worldwide due to the lack of harmonized definitions and methods. Thus, the following historical pkt trends need to be seen under these caveats.

Figure 4-6 illustrates the compiled passenger transport demand data. It is observed in the sample that, in 2019, the United States had the highest demand for transport services, totalling 27 thousand per capita pkt, while the Europeans, the second region with the highest demand, demanded around 14 thousand per capita pkt, followed by the Japanese and Brazilians. Assessed in percentage terms, in 2019, Americans were responsible for 33% of demand, while Europeans and Japanese for 25% and Brazilians for 16%.

[18] In this assessment, the modes of transport considered were grouped by the speed criteria, resulting in three modes categories: private, public and air/high-speed rail transportations named by LDV, PUB and AIR, respectively.

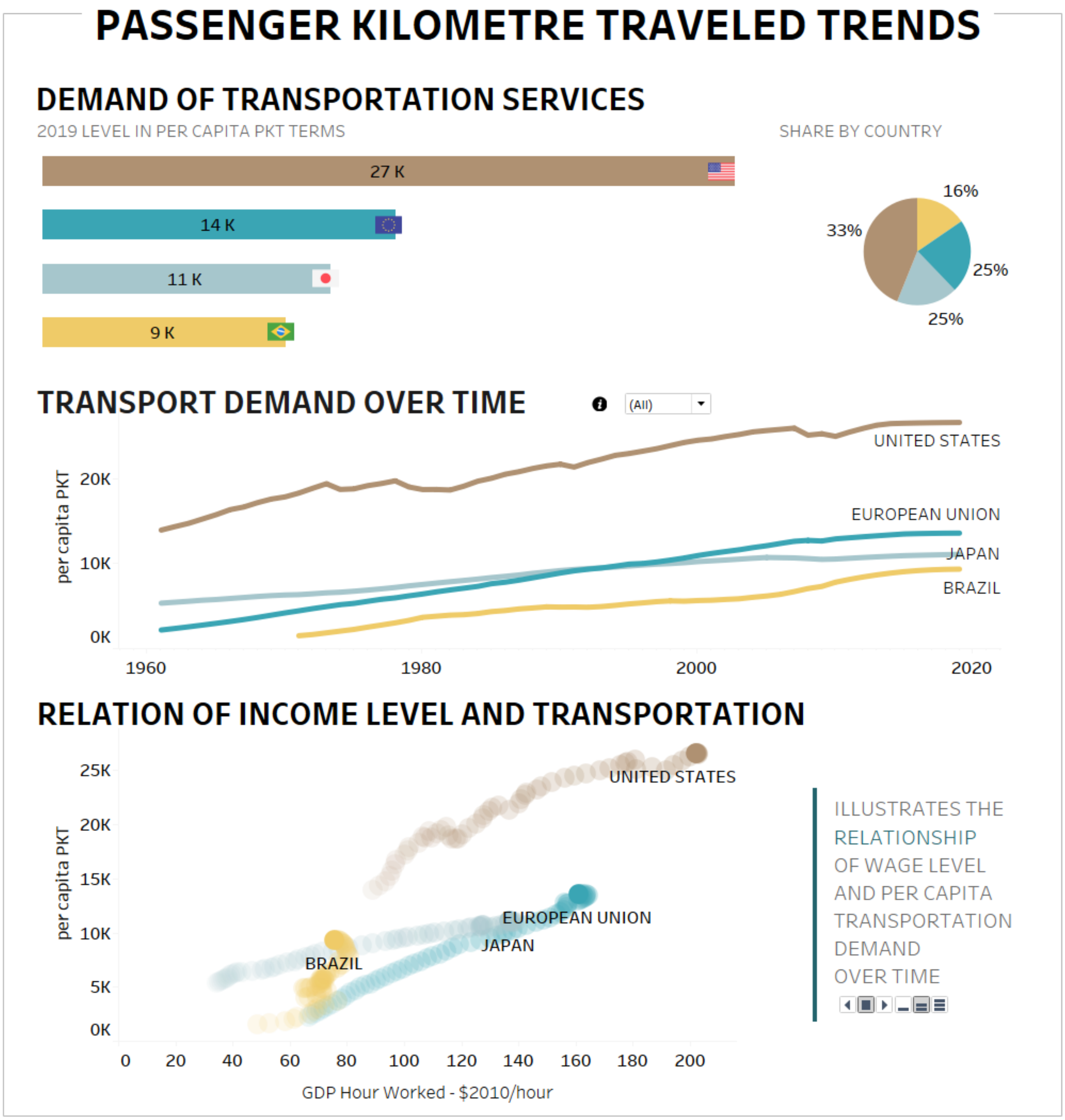


Figure 4-6: Passenger Kilometre travelled
Source: Own elaboration, based on EPE (2012), European Commission (2019), Japan (2014), and Schäfer (2017)

When evaluating the demand over time, it is observed that, in general, the demand for mobility continues to grow in the regions. In addition, it is noted that, historically, Americans have a level of demand for transport much higher than in other regions. For example, in 2019, no region has reached the 1960 American demand level, indicating that a wider socio-technical context, like urbanization patterns and fuel infrastructure, play a crucial role in the transportation sector. Technology such as transportation, communication, housing and supply of energy fulfil societal functions and are combined into a 'seamless web'. In the USA, from 1860 to 1930, the transition from horse-drawn carriages to automobiles, aligned to other historical factors, turned out the American society highly dependent on automobiles (GEELS, 2005), (HERRENDORF; SCHMITZ; TEIXEIRA, 2012).

Besides that, it is noticed that demand growth in Europe surpassed Japanese demand around the 1990s, and Brazil has experienced accelerated growth in recent decades, driven by policies that incentivized the automotive industry and easied financing for private vehicles (DE CASTRO, 2014).

Another central analysis refers to the relationship between the growth of the income level and the demand for transport, represented by the scatter plot. It appears that, as income grows, the demand for transport also increases, indicating a positive correlation between the variables, a result found in previous researches (SCHÄFER; VICTOR, 2000), (SCHÄFER; VICTOR, 1999). In the Brazilian case, despite the ups and downs of the income level, there is a vertiginous growth in the demand for transport, point out that the Brazilian transportation system is in its early years of development. The citizens are expected to convert economic growth into transportation services, reflecting the country's geographic characteristics and the low infrastructure level.

4.2.4 Characteristics of the transportation modes

This section presents the attributes that each type of modal has and that influence consumer decision making. For example, each type of transport mode has a cost level, a specific speed and comfort level, factors that influence the consumers willingness-to-pay to travel in modal A or B. These factors, in the set of proposed equations, make up the modal utility, which will result in the market share.

As well as the passenger-kilometer data, this information also presents problems of lack of standard definitions and estimation methods that allows comparison between regions. In several situations, assumptions had to be adopted, such as the speed and value of travel time, assumed as constants in the model.

Figure 4-7 consolidates the outcomes; rows represent information about the modals, and columns represent the regions. It is observed that public transport shows a downward trend in all regions, with private transport being the means of transport with the most significant importance. In the United States, the dependence of Americans on the automobile, responsible for 87% of passenger transport in 2019, is evident. The market share of high-speed modes has grown, meeting about 10% of the demand in 2019.

Regarding the attributes, it can be seen that private and air transport suffered a reduction in costs over time, while public transport underwent an increase in all regions. This fact explains, in part, the market share dynamics. With higher prices, lower speed, and lower comfort level, public transport utility decreases for the consumer, impacting the final market share.

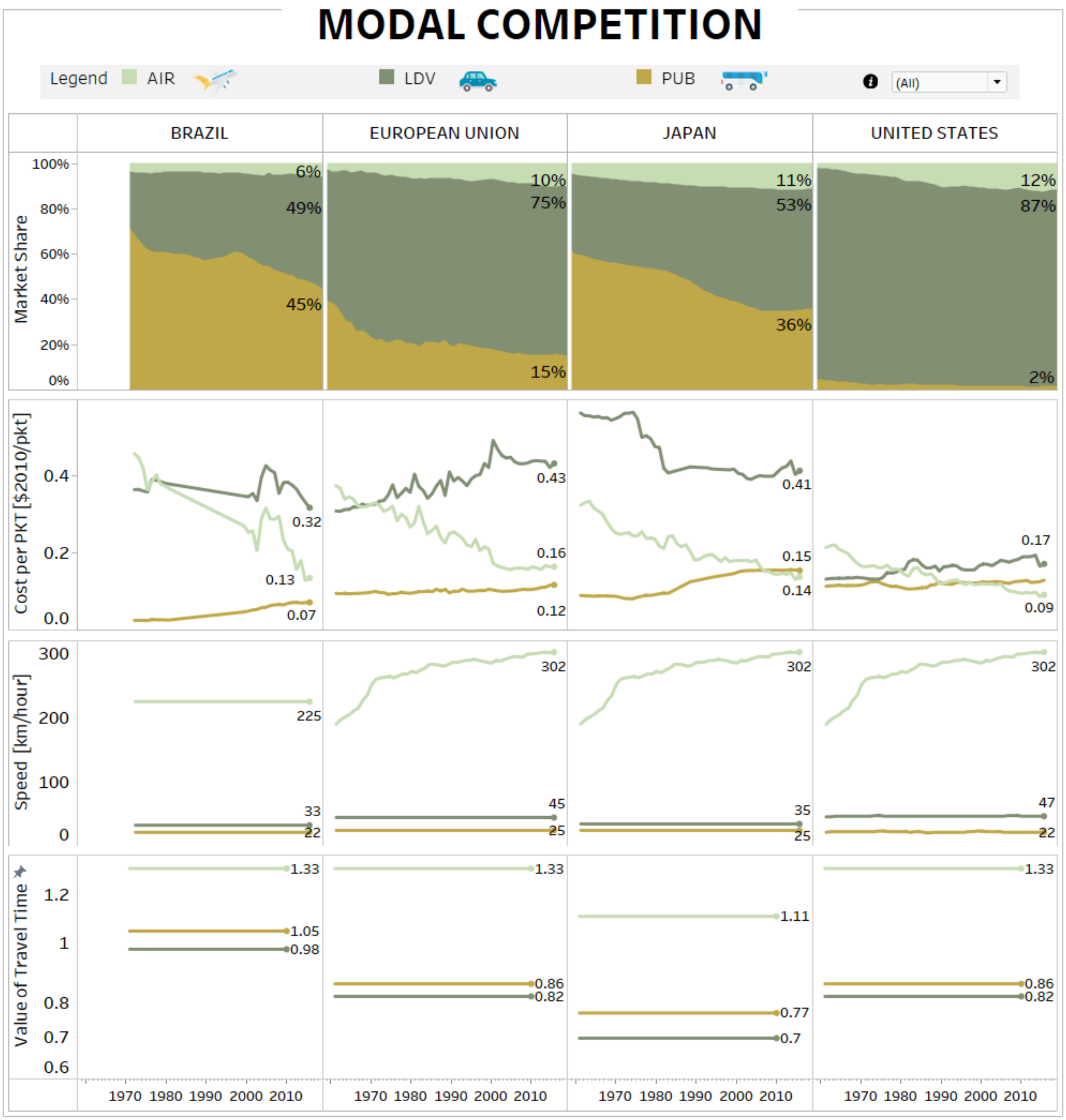


Figure 4-7: Characteristics of the transportation modes
Source: Own elaboration, based on EPE (2012), European Commission (2019), SBJ (2014), Schäfer (2000), Schäfer (2017), Gouri et al. (2014), ONTL (2020); ABEAR (2020), Santos (2012), and Varghese et al. (2020)

4.3 Exploratory data analysis

This section explores the data and evaluates some assumptions raised during the visual analyses, such as the uncertainty regarding the consumer's income level in each region. As seen, the degree of interrelationship between pkt and income level variables is essential in the proposed econometric approach, and, therefore, uncertainties in wealthy quantification could influence the slope between the variables.

The following experiment was developed to assess whether the shadow economy could interfere in the transportation demand estimation. First, shadow economy data were collected and analyzed for each region, and then a simple linear regression between the variables was performed to assess the impact on the coefficients.

The shadow economy data shows that, in countries like Brazil, which has an emerging market structure with a high degree of informal enterprises, the shadow economy corresponds to 37% of the official country's GDP. The European Union displays an underground activity of about 20% over the official statistics due to disparities between the economies. Japan and the United States present the lowest influences of business underreported in their economy, reaching 10 to 8 per cent of GDP (OECD, 2017; Schneider et al., 2013; IMF, 2002).

Figure 4-8 illustrates the relationship between the size of the shadow economy and the per capita GDP over time. As can be observed, as the per capita GDP increases, there is a tendency for the shadow economy to decrease, indicating that the problem of the shadow economy is not just a problem of tax evasion but also a matter of socioeconomic development.

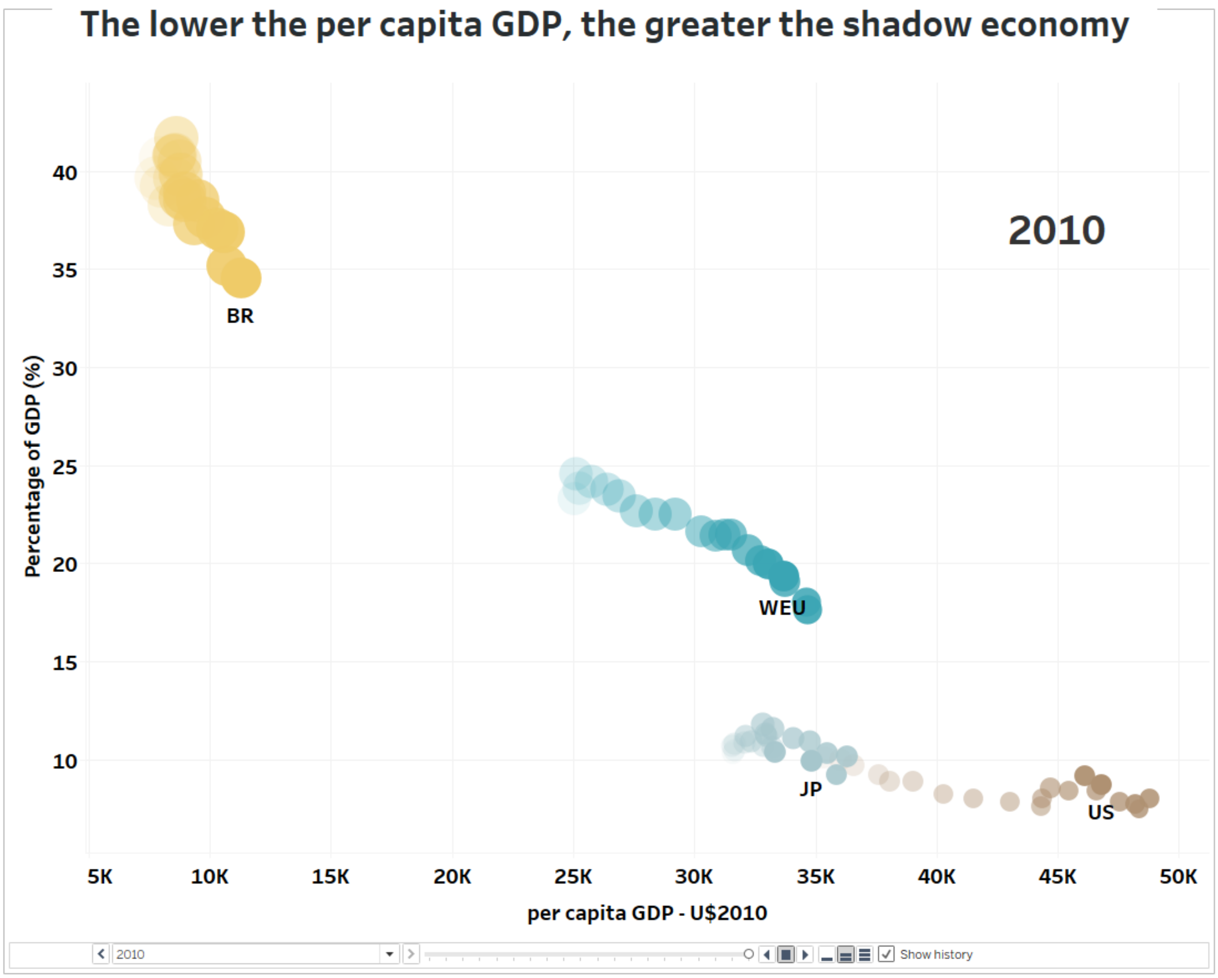


Figure 4-8: per capita GDP versus shadow economy in selected countries
Source: own elaboration, based on data provided by Medina and Schneider (2018)

When analyzing the linear relationship between the per capita mobility and the wage level that incorporates the shadow economy and that does not, it is observed that, due to the underestimated earning rates, the derivative between passenger demand and wage rates could be overestimated, leading to unrealistic regression elasticities.

Figure 4-9 illustrates this: on the left-hand side, the linear regression that assumes official wages is shown, while on the right-hand side, the results assuming the shadow economy are displayed. The Brazilian slope has the highest decrease when the shadow economy is taken into account, as expected. If the informal economy is not assumed in a simple linear regression, the parameter estimation is overestimated by 26% for Brazil, while the impact for the EU, Japan and the US are 16%, 9% and 7%, respectively.

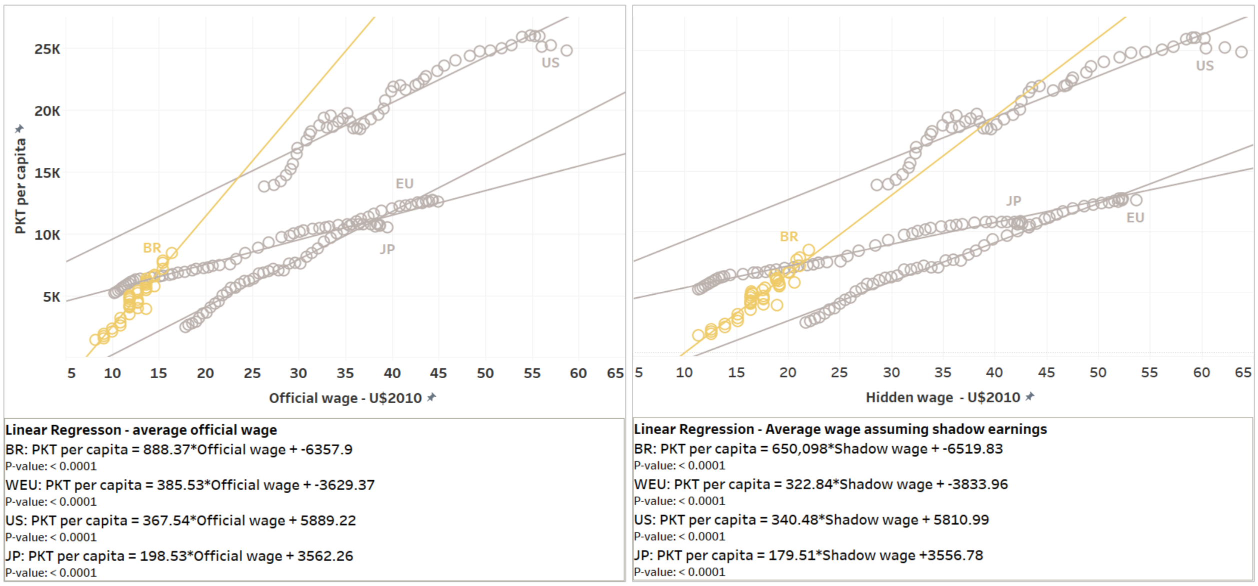


Figure 4-9: The shadow economy - evidence of its size and impact
Source: own elaboration

A developing economy like Brazil, with a high level of informality, tends to have a more significant effect on its parameters than developed economies like Japan and the US, due to an unrealistic rate of substitution between goods, caused by hidden incomes that are not incorporated in official statistics (SCHNEIDER; BUEHN; MONTENEGRO, 2013). Not translating this phenomenon into simple regression analyses can lead to miscalculated long-term trends, particularly for economies with a high degree of informality.

4.4 Parameter estimation

This section presents the regression analysis proposed for the HERMES version and evaluates the variability of the individual coefficients. Two models were estimated to assess which provides the best fit to historical data. The "official GDP" model takes the official GDP data as the economic variables, while the "shadow GDP" model incorporates informal income into the official GDP.

The regression method used to estimate the model parameters was the Nonlinear Seemingly Unrelated Regression (NLSUR), which estimates the coefficients of Eq. 3-1 and Eq. 3-4 simultaneously. We used the R package NLSUR (JOHN; NASH; MURDOCH, 2019) to estimate the coefficients, computed using feasible generalized nonlinear least squares at 95% confidence level.

Figure 4-10 summarizes the main statistical results founding. The first three lines represent the coefficients of determination, R^2, which, overall, are close to 1, independent of the model. That means the modelled values are very close to the observed values. Thus, the set of independent variables proposed can explain over 95% of the variance of the dependent variable (per capita passenger kilometre travelled), which indicate that the models do well to emulate the consumer choice behaviour.

The values of the coefficients found for the two proposed models are specified from the fourth to the penultimate row. As can be noticed, constant LDV, $\boldsymbol{\beta_{LDV}}$, is higher than constant PUB, $\boldsymbol{\beta_{PUB}}$; for all regions. That represents that consumers prefer to travel by medium speed modes, such as private cars or taxis, rather than by low-speed modes, like public transport, which were an expected result.

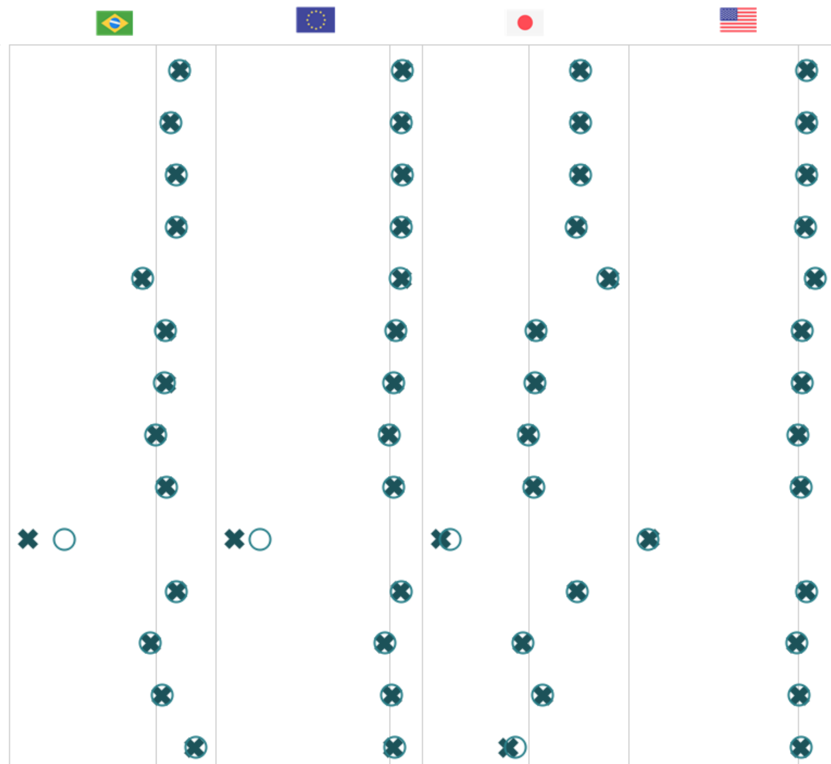
The habit coefficient, $\boldsymbol{\beta_1}$, which is statistically relevant for all situations, indicates that about 90 per cent of the relative preference of one modal over another is due to inertia or, in other words, past choices and propensities. At any time, only 10 per cent to 12 per cent of the relative preference is freely selected.

The generalized cost coefficient, $\boldsymbol{\beta_3}$ It is expected to have a negative impact on travel demand. The negative sign was found for all countries analyzed, meaning that consumers tend to travel less as prices increase. However, for the EU, the variable was not statistically significant. It is also observed that this coefficient is the most affected when the shadow economy is incorporated into the analysis. Except for the United States, all regions show an increase in generalized costs.

PARAMETER ESTIMATION

Legend ■ Official GDP ■ Shadow GDP

	BR		EU		JP		US	
Total demand (Eq.1)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Odds ratio LDV/AIR (Eq.4)	0.62	0.62	0.93	0.93	1.00	1.00	0.99	0.99
Odds ratio PUB/AIR (Eq.4)	0.85	0.85	0.99	0.99	1.00	1.00	1.00	1.00
Autoregressive term	0.87	0.88 [a]	0.91	0.90 [a]	0.92	0.93 [a]	0.76	0.78 [a]
Constant	-0.58	-0.57 [b]	0.78	0.95 [b]	1.53	1.55 [a]	1.96	1.84 [a]
Constant LDV	0.39	0.43 [a]	0.48	0.51 [b]	0.14	0.14 [a]	0.40	0.40 [a]
Constant PUB	0.36	0.41 [a]	0.35	0.40 [b]	0.11	0.12 [a]	0.40	0.40 [a]
Dummy variable	-0.01	-0.01 [b]	-0.01	0.00 [b]	-0.01	-0.01 [b]	-0.03	-0.03 [a]
GDP/capita	0.44	0.44 [a]	0.36	0.39 [b]	0.10	0.10 [b]	0.28	0.31 [a]
Generalized cost coeff.	-3.86	-5.38 [a]	-9.48	-11.33 [b]	-1.53	-1.69 [a]	-17.15	-16.94 [a]
Habit coefficient	0.88	0.88 [a]	0.86	0.86 [a]	0.93	0.93 [a]	0.91	0.91 [a]
Lagged GDP/capita	-0.23	-0.23 [b]	-0.32	-0.36 [b]	-0.12	-0.13 [b]	-0.21	-0.25 [a]
Logsum	0.26	0.25 [b]	0.19	0.24 [b]	0.26	0.27 [b]	0.07	0.07 [b]
Long-run elasticity	1.70	1.64 [a]	0.38	0.32 [b]	-0.27	-0.40 [b]	0.27	0.26 [a]



a P-value is significant at 95% confidence level
b P-value is not significant at 95% confidence level

Figure 4-10: Coefficient of determination, parameter estimation and statistical significance computed using feasible generalized nonlinear least squares (FGNLS) estimator embed in library nlsur, Rstudio.

On the left side of the figure, there is a graphical representation of the tabulated values. Values to the right of the dashed line are positive and the left is negative. Parameters estimated using the "Shadow GDP" model are represented by an x and the "official GDP" model by a circle.

Source: own elaboration

In all cases, the autoregressive term, $\boldsymbol{\gamma_1}$It is relevant and ranges from 0.8 to 0.9. That means that the preceding choices decide 80-90 per cent of overall travel demand choices at time t. The dummy variable, $\boldsymbol{\delta}$**,** accounts for negative impacts in travel demand, like the oil crisis, for instance. Therefore, it is expected to have a negative impact on demand. The signs for all countries were found negative; however, the variable is statistically significant only for the US economy. In the US, the prices of oil products respond faster to parity than in Brazil, which has price control, and in the EU, in which the fuel price is mainly made up of taxes (KEMEZIS, 1979). Thus, the price variation does not affect demand instinctively, as seen in the USA. Another fact could be that most of the pkt time series use indirect methods that do not account for the real variations, compromising the time-series variability (CLIFFORD, 2017).

As expected, the long-run per capita GDP elasticity varies by country and GDP level. For low-income economies like Brazil, the elasticity is greater than 1.0, which means that having access to a motorized transportation mode is almost a luxury. For the EU and US, the elasticity for transportation service is between 0.2 to 0.4, categorizing the service as a normal good. However, for the EU, the results are not significant at 95% confidence level. Japan presents a negative elasticity for transportation services, indicating the per capita passenger kilometres travelled may have peaked, which is likely due to the ageing population. However, the results are also not statistically significant.

4.5 Model validation

This section aims to evaluate which of the two proposed models best fits the historical series. For this purpose, the model's input data will be compared with the historical projections derived from the "official GDP" and "shadow GDP" models.

Figure 4-11 illustrates the results obtained for each region. It is observed that both proposed models reproduce the input data with a low rate of variability, displayed in the pie chart. In other words, for this version of the set of equations, using official GDP data does not overestimate the demand for passenger transport. However, as it is a nonlinear model, the relationship found in the simple linear regression model is not evidenced in this approach, having any practical effect.

However, incorporating the shadow economy into the economic variables allows correcting the parameters, especially for regions with a high part of their economy in the shadow. Because of that, in this HERMES version, the total transportation demand and the mode share will be computed using the parameters from the "shadow GDP" model.

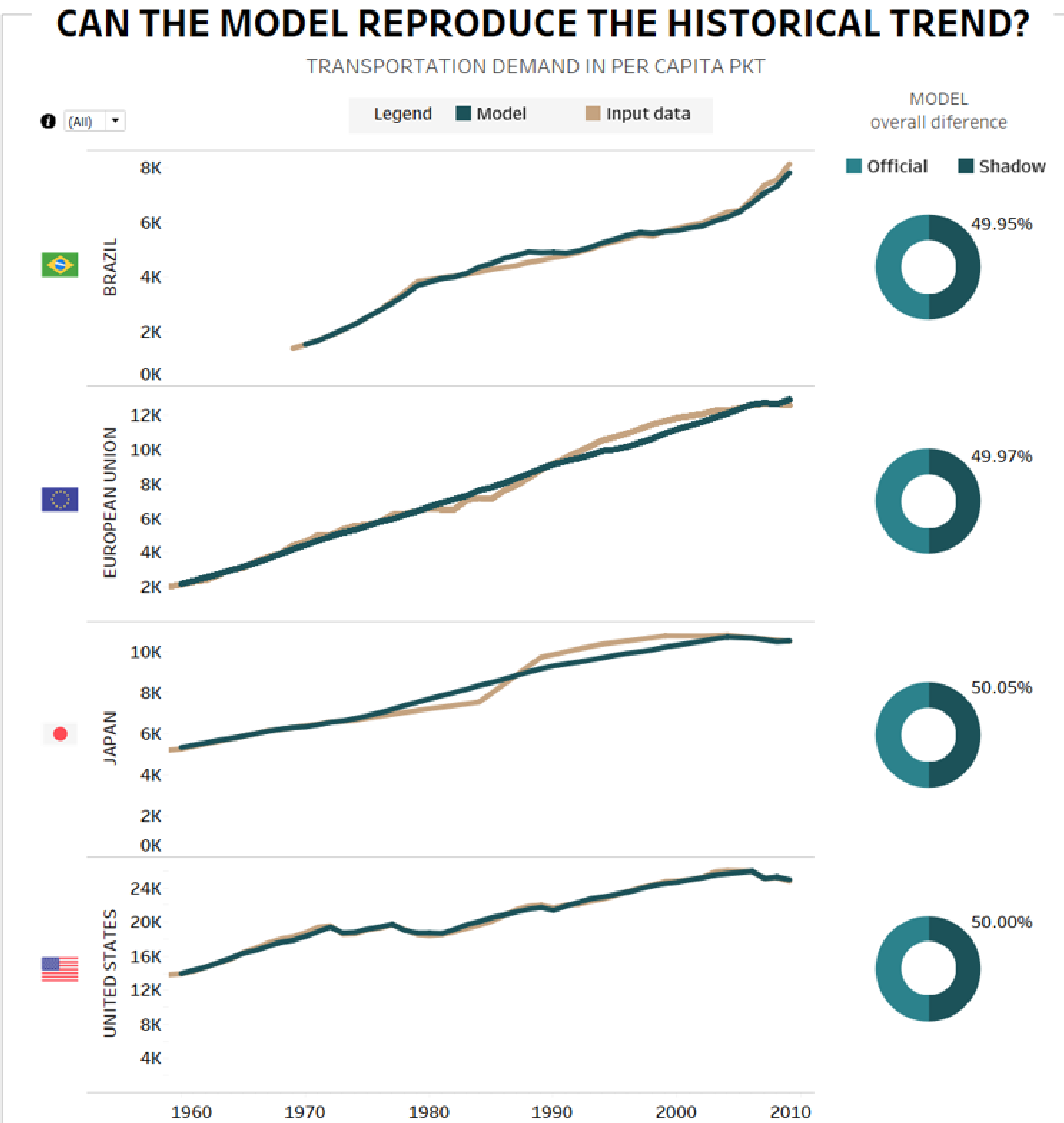


Figure 4-11: Model validation, constraining the input data and the model outputs, based on model outputs
Source: own elaboration

The discussions and results of this chapter will be used in the following sections to estimate the base and alternative scenarios.

Chapter 5

BUSINESS AS USUAL PATHWAY

Let us assume that history repeats itself

Chapter 5 details the "Business As Usual" pathway, also called by BAU, developed for this HERMES version, which is based primarily on the evolution of the variables described in Chapter 4. BAU pathway assumes that no ruptures or abrupt changes are expected in the model's critical variables trajectory. In this regard, subsection 5.1 provides the assumptions and expected growths in demand and supply-side that will determine the projection for the passenger transportation demand and modals share in the 2050 horizon, highlighted in subsections 5.2 to 5.3. The outcomes obtained take into account the current structure and how the sector has evolved so far, making believe that, in the future, the sector's situation will be, in general terms, the extrapolation of the history, accounting for transportation and energy policies currently underway. Under these hypotheses, it was found that the United States will continue to be the region with the highest per capita demand for transport, followed by European Union, Brazil and Japan. The region's total demand indicates that the US is the region with the highest demand for transport, pursued by Europe. Brazil is the region with the highest expected percentage growth in the coming years. In the opposite direction from these regions, Japan will face a drop in demand of about 20% compared to the base year, heavily influenced by demographic factors. Concerning the modals, the BAU pathway foresees for all regions a tendency inherent to the concentration on higher-speed modals at the expense of lower-speed modals due to the increase in the population's purchasing power.

5.1 Transportation demand by 2050: main assumptions

Various social, technological, economic, environmental, and political factors influence the transportation future. For example, urbanization, population and demographics, per-capita GDP and disposable income, emission norms, taxation policies, geopolitical events, and so on are all factors to consider (SARDAR, 2013). Nevertheless, the geopolitical environment and related GDP growth are likely to have the most significant impact and uncertainty; as a result, per capita GDP is the most critical component in determining the characteristics of the future of transportation in this study. However, in a "business as usual" scenario, we may expect the geopolitical picture to remain unchanged and have no meaningful impact on transportation parameters.

In other words, no ruptures or abrupt changes are expected in the trajectory of the model's critical variables. Accordingly, the projection's primary analytic factors are held constant or connected to economic and population growth, characterizing a trend scenario with the maintenance of the current structure of the transportation sector.

To improve assessment, the assumptions and hypotheses used in this investigation are provided separately by the demand-side, described in subsection 5.1.1, and supply-side, detailed in subsection 5.1.2.

5.1.1 Socioeconomic assumptions

As discussed, this study uses an econometric model to estimate passenger activity based on two key variables to model the demand side: the evolution of population and the evolution of the economic context, which provides information about the change in key variables of the model such as per capita GDP, wage level and the shadow economy.

In this HERMES version, the socioeconomic assumption follows the Shared Socioeconomic Pathways (SSPs) narratives, a well-known framework for studying climate-related scenarios (RIAHI et al., 2017). The BAU pathway applies the narrative SSP2, selected to serve as the reference pathway, or 'marker'. The SSP2 narrative describes a middle-of-the-road development in the mitigation and adaptation challenges space, and it has been translated into quantitative assumptions in the IIASA Integrated Assessment Modelling Framework (IIASA, 2012).

Thus, the assumptions adopted to estimate the transportation demand over 2010 to 2050 follows the SSP2[19] scenario growth rates. IIASA (2012) provides the population growth for each economy, and the GDP growth rates derive from Garaffa et al. (2020), which updated the GDP growths by adjusting the observed rates between 2011 and 2020. The shadow economy is not taken into account by the SSP narratives, neither in qualitative nor quantitative terms, though in this HERMES version, the shadow effect on GDP is held constant at the level of 2010.

Figure 5-1 illustrates the expected growth of the demand variables for the regions analyzed. Each row represents a variable, and the columns show the percentage growth over the base year and the absolute growth. According to the IIASA (2012) data, in percentage terms, the American population will show the most significant growth concerning the base year, around 30%, followed by the Brazilian and European populations. As shown in Figure 5-1, the population of Brazil will sharp grow until 2040 and reduce after 2040. On the other hand, Japan's population will suffer a 20% decrease relative to the 2010 level. In absolute terms, Europe will continue to be the most populous region, followed by the US, Brazil and Japan.

In the macroeconomic scenario adopted, last two rows of Figure 5-1, GDP projections were adjusted to reflect actual data for 2010 to 2020, contemplating, in part, the economic shock caused by the COVID-19 in 2020 (GARAFFA et al., 2020). As a premise,

[19] In SSP2 the world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns. Development and income growth proceeds unevenly, with some countries making relatively good progress while others fall short of expectations. Global and national institutions work toward but make slow progress in achieving sustainable development goals. Environmental systems experience degradation, although there are some improvements and overall the intensity of resource and energy use declines. Global population growth is moderate and levels off in the second half of the century. Income inequality persists or improves only slowly and challenges to reducing vulnerability to societal and environmental changes remain (IIASA, 2012).

it was assumed that the economic recovery would have a V shape[20], a drop in growth followed by a recovery, as shown.

In this context, Brazil presents the most significant growth concerning the base year, reaching around 70% growth in wealth. However, it is noteworthy that, in the last decade, the region had the worst economic performance, followed by Europe. On the other hand, Japan and the United States had the best economic performance in recent decades; however, the adopted projection assumes that this trend will be reversed, with Japan and the US showing a reduction in growth from 2030 onwards, while Brazil and Europe grow sharply. Thus, globally, the GDP will grow at approximately 1.29% per year. In absolute terms, in 2050, the Americans will continue to be the wealthiest and the highest-paid, followed by the Europeans, Japanese and Brazilians.

[20] The COVID-19 pandemic crisis is associated with extraordinary uncertainty due to the combination of the worst characteristics of previous crises: simultaneous supply and demand shock; domestic, regional, and global scope; a projected long duration (Altig et al. 2020, apud (LOAYZA et al., 2020)). In this context, each region presents potential shapes of the recovery. However, it is beyond its scope to go deeper into this question, given the very fact that we are still immersed in it. Therefore, for the sake of simplicity, we decided to assume a V-recovery for all regions.

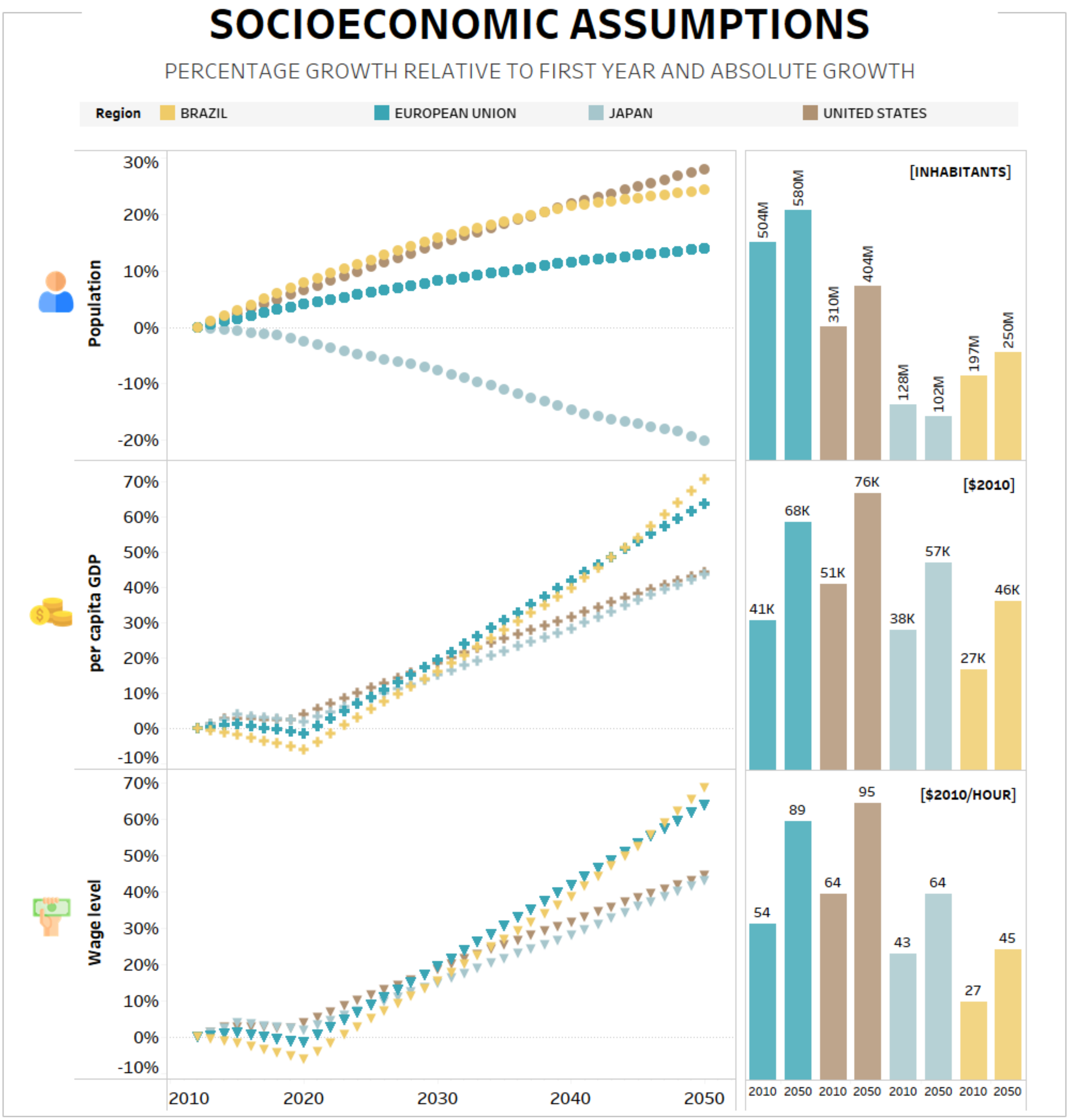


Figure 5-1: Socioeconomics assumptions
Source: own elaboration, based on IIASA (2012) and Garaffa et al. (2020)

5.1.2 Transportation modes' attributes

Regarding the attributes of the passenger transport sector, the BAU trajectory assumes that cost and speed will remain constant, as shown in Figure 5-2. This premise is adopted, imagining that current levels of the sector will be maintained in the future. As a result, future consumers will not be influenced[21] by changes in the level of service delivered. In other words, the consumers will face a stable transportation system[22], held constant at the level of 2010.

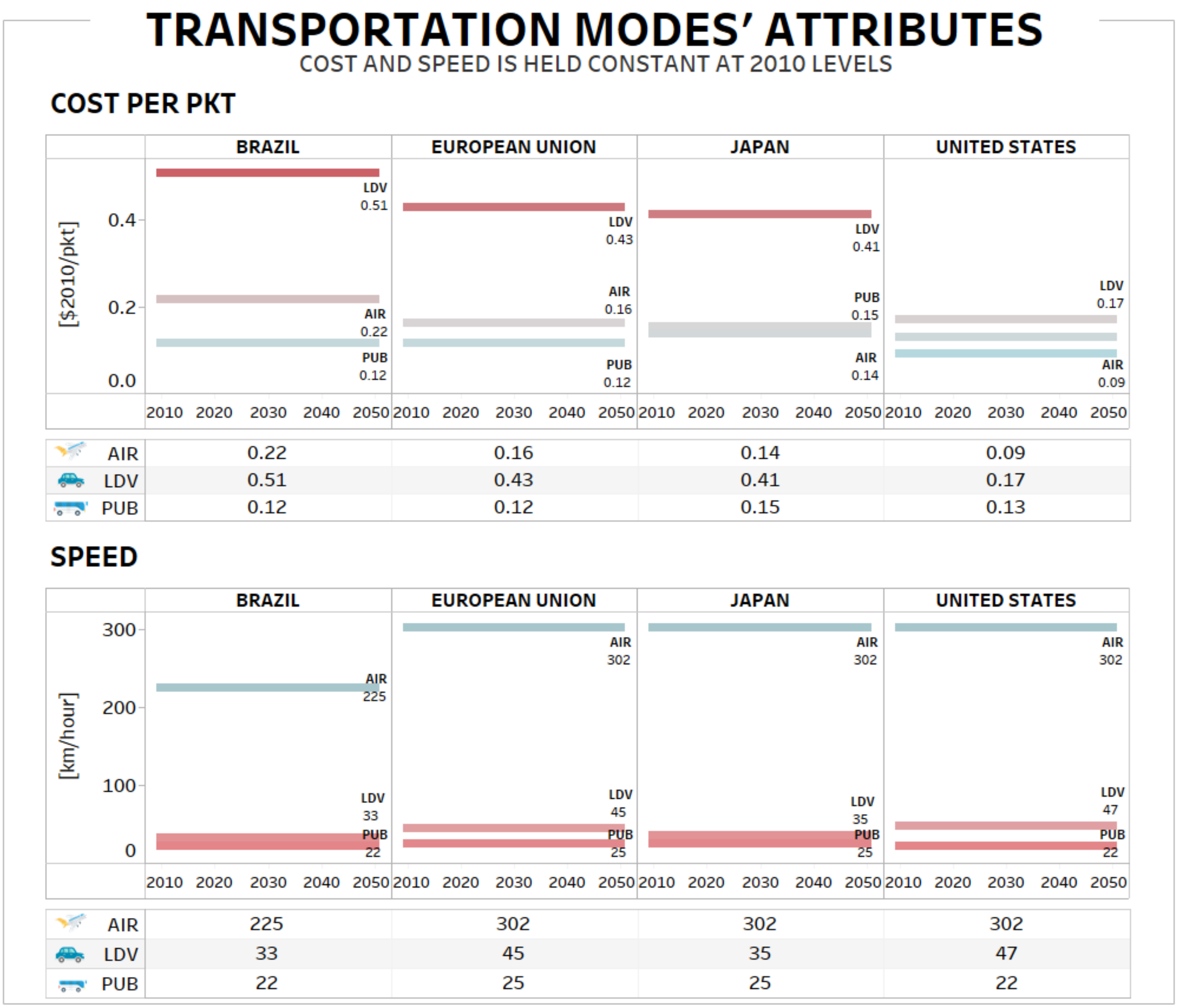


Figure 5-2: Transportation modes' attributes are held constant at 2010 levels in the BAU pathway
Source: own elaboration

[21] It is worth highlighting that higher cost has a negative impact on consumer choice, while higher speed positively impacts.

[22] A possible effect of the pandemic has been a reduction in demand for mobility with consequences on the price of gasoline, diesel and QAV. Following the downward trend in the different transport markets, QAV, a fuel used in aviation, was the one that fell the most, followed by gasoline and diesel. However, it is assumed that these effects will be of short duration under the proposed scenario.

5.2 Transportation demand in BAU pathway

BAU pathway regional results from 1960 to 2050 are presented in this section. First, subsection 5.2.1 presents the per capita demand for transport, which can be interpreted as the average mileage travelled by citizens in each region. Next, subsection 5.2.2 presents the total demand by region, particularly the total number of passengers-km transported per year in each region. Finally, subsection 5.2.3 presents the modes share in each market, explaining how time variables influence consumer choice.

5.2.1 per capita Passenger kilometre Traveled

It is noteworthy that the developed pathway considers the maintenance, or slight variation, of the region's current situation. In other words, the outcomes take into account the current structure and how the sector has evolved so far, making us believe that, in the future, the situation of the sector will be, in general terms, the extrapolation of the history, accounting for transportation and energy policies currently underway.

Figure 5-3 illustrates the per capita passenger transportation demand under these caveats. As can be seen, the United States will continue to be the region with the highest per capita demand for transport. Contrary to the results that indicate a saturation in demand for mobility in the US (NEWMAN; KENWORTHY, 2011), the outcomes found suggest that the North American demand will continue to grow in the coming years, albeit at a slower pace. This trend was also found by Keithand Moody (2019), which found that the peak car is not yet in place in the US. Remarkably, they argue that given the same economic incentive, millennium consumers have the same consumption pattern as baby-boom consumers; they just delayed their choices. Therefore, in light of the rise of income, the demand is expected to continue to increase (KNITTEL; MURPHY, 2019).

Per capita growth is also expected for Europeans, who have increased transportation demand from around 12,000 pkt to 17,000 pkt. This conclusion was also found by Focas and Christidis (2017), which stated that it is still too early to talk about a peak in demand in Europe. Brazil is also following an upward trend in demand, as expected (MCTI, 2017). In absolute values, the average demand will grow from around 8 thousand pkt to 12 thousand pkt, being the region that will present, in percentage terms, the most significant increase, as identified by the graph in the lower left quadrant of Figure 5-3.

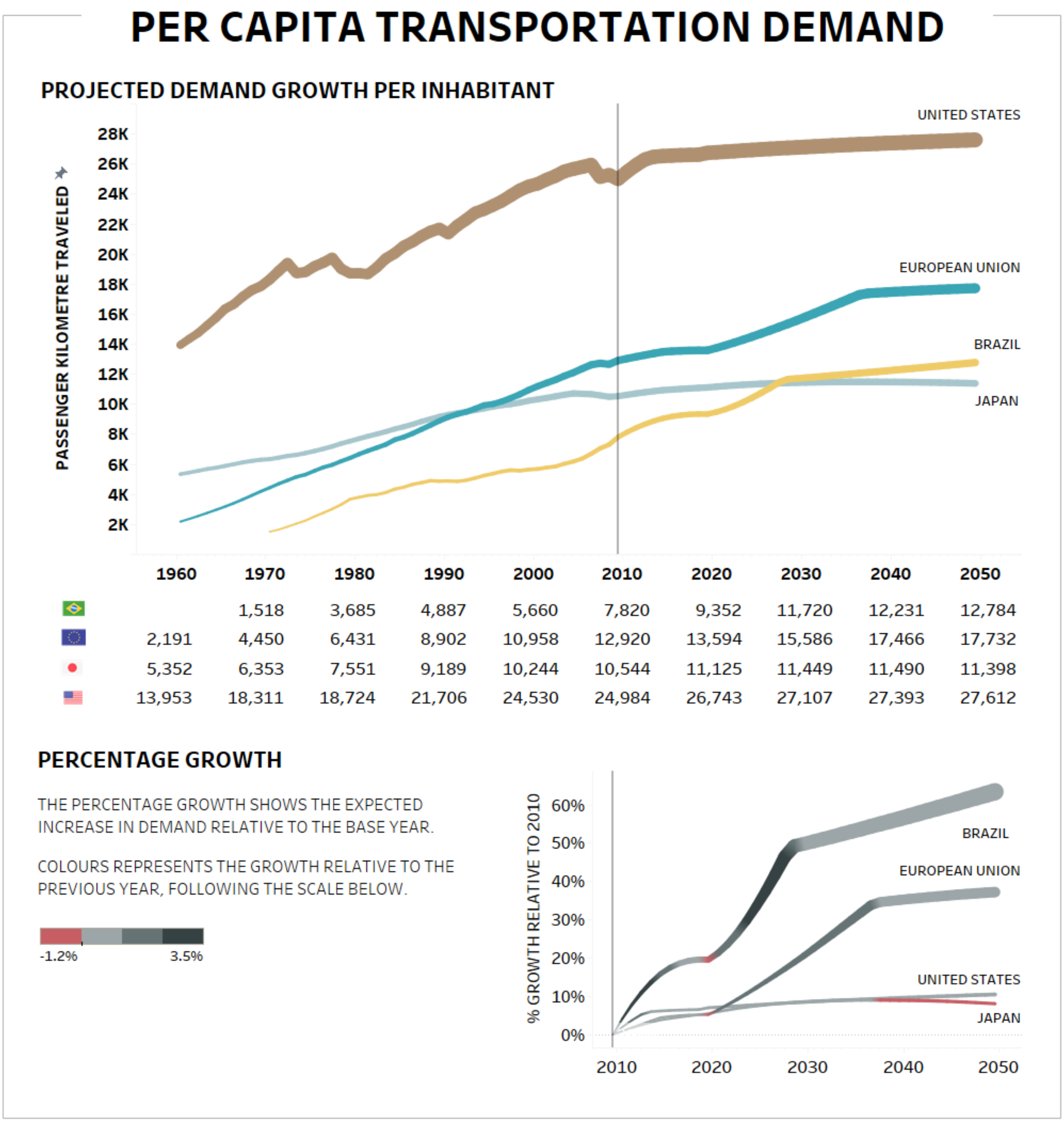


Figure 5-3: per capita transportation demand
Source: Own elaboration

The plot shows the percentage growth over the first year, and the colours represent the annual growth rate. Note that demand growth in Brazil will be more accentuated until approximately 2030, and afterwards, the annual rate slows down. The same happens for Europe; however, the deceleration starts from 2035. The travel time budget is the factor behind this effect: upon reaching the limit of 1.1 hours per day, time-constrained consumers start to maximize their commuting distance through higher-speed transport modes, increasing their travel distance still at a slower pace.

On the other hand, Japan follows a trend contrary to that found in other regions; on average, the Japanese have stabilized their demand for transport, and negative annual growth is expected from 2040 onwards. Part of this is associated with accessibility to utilities - such as shops, workplaces, and so forth - be better in Japan due to the natural concentration of activities in high-density urban areas (ISHIDA; OKAMOTO, 2011). However, another part is associated with the demographic transition that the region is facing; with an older population, the rate of displacement decreases, affecting the average values (WILSON, 2012).

5.2.2 Total Passenger kilometre Traveled

The same analysis is elaborated to illustrate the total passenger demand of each region, as shown in Figure 5-4. When adding the population effect, it is noted that the US is still the region with the highest demand for transport; nevertheless, the difference for second place, Europe, diminishes. As seen, the European population is larger than the American one, which influences the aggregated values[23]. In addition, it is observed that Brazil, a region also of continental dimensions, has a demand four times lower than the demand of developed economies. Not surprisingly, it is the region with the highest expected percentage growth in the coming years. In the opposite direction from these regions, which

[23] Total demand is computed by multiplying the per capita value by the total population in each year.

will continue to increase demand, Japan will face a drop in demand of about 20% compared to the base year, heavily influenced by demographic factors.

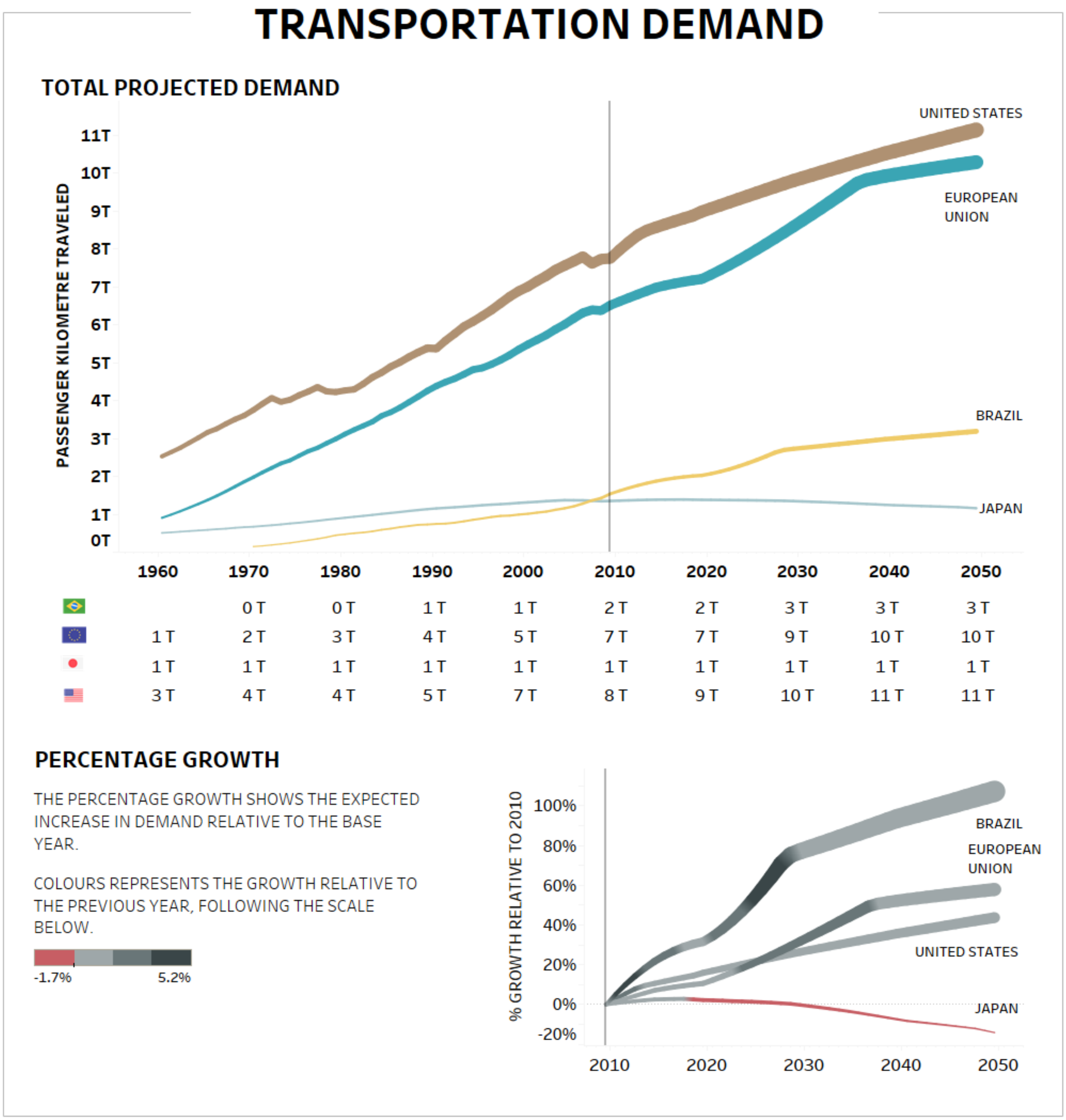


Figure 5-4: Demand for passenger transport in each region
Source: Own elaboration

5.2.3 Modal share

Figure 5-5 illustrates the estimated transportation modes share, in percentage terms, for the analyzed regions. It is observed that the historical trend of decreasing participation of public transport at the expense of faster transportation modes will continue in the future. For example, public transport falls from 41% to 26% in the Brazilian case and 15% to 12% in the European case. In the American case, the share is reduced to 1% of the market, mostly dominated by private transport and aviation. Japan has a slight drop, from 35% to 33%, reflecting the region's characteristics.

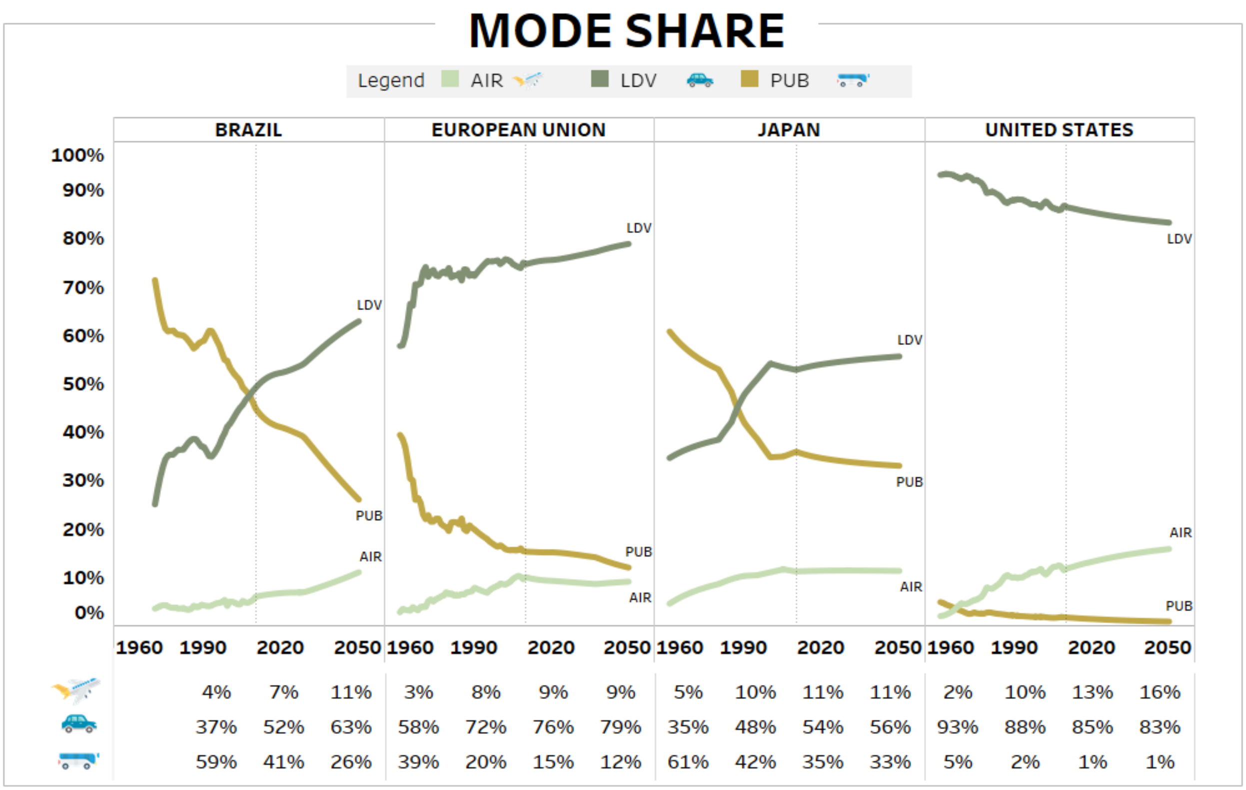


Figure 5-5: Modal competition
Source: Own elaboration

When analyzing the market dynamics in percentage terms concerning the base year, shown in Figure 5-6, it is observed that the Brazilian case is the one with the most abrupt variations, with a 42% reduction in the share of public transport, while the high-speed sector grows 84% and private transport 28%. In addition, it is noted that Brazil and Europe show a change in rates, while Japan and the United States presents only one constant trend.

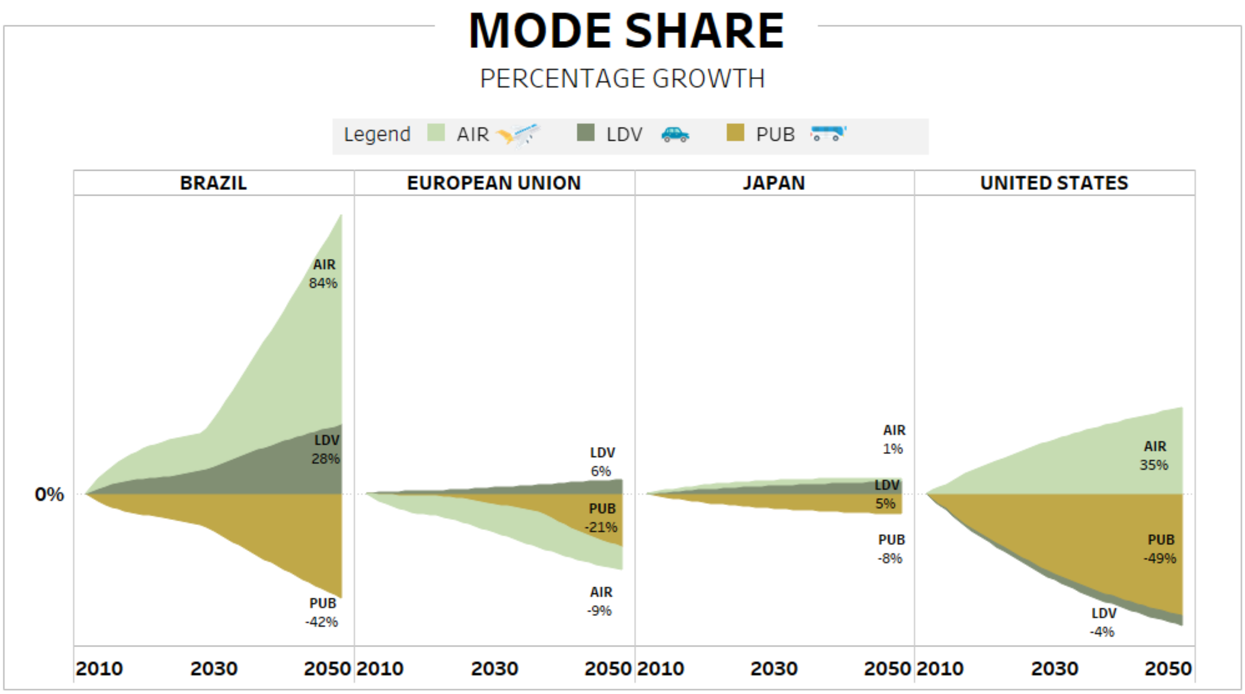


Figure 5-6: Percentage growth relative to the first year
Source: Own elaboration

These results are due to the rationality incorporated in the set of equations, which evaluates consumers' decisions by estimating the utility of each modal, as explained in Chapter 2. Recalling, the factors that drive consumer choice are given by the generalized cost of the modal, which computes both the economic and time value of the modal. Also, consumer choice is constrained by a daily travel time budget, which, when reached, forces consumers to increase their travel aversion[24].

Figure 5-7 depicts these concepts in a dashboard view and explain how the time budget drives, value of travel time, utility and ultimately, the mode share. As an illustration,

[24] The value of travel time in the HERMES version is a dimensionless variable with an economic interpretation, although a physical meaning can also be given. Dimensionless numbers in engineering are collections of variables that provide order-of-magnitude estimates about the behaviour of a system. In fluid mechanics, non-dimensional numbers are those which are useful to determine the flow characteristics of a fluid or its inertia. In this regard, VOT can be interpreted as an order-of-magnitude to estimate the behavior of a consumer related to the transportation system, as the VOT per mode change, the consumer behaviour becomes more prone to a certain modal or to another.

in the Brazilian case, it is observed that the time budget, the last row of the graph, is reached around 2030, which makes the consumer's willingness to travel decrease, represented by the increase in VOT, second row. As consumers are also earning more for the hour worked, they increase their preference for saving travel time using faster modes, resulting in the utility of each mode, first row. The same model behaviour is repeated for Europe, but around 2040, and for the United States, already in 2014. However, in the Japanese case, the time restriction is not reached, and, therefore, consumers do not have their choices limited, showing the same historical behaviour.

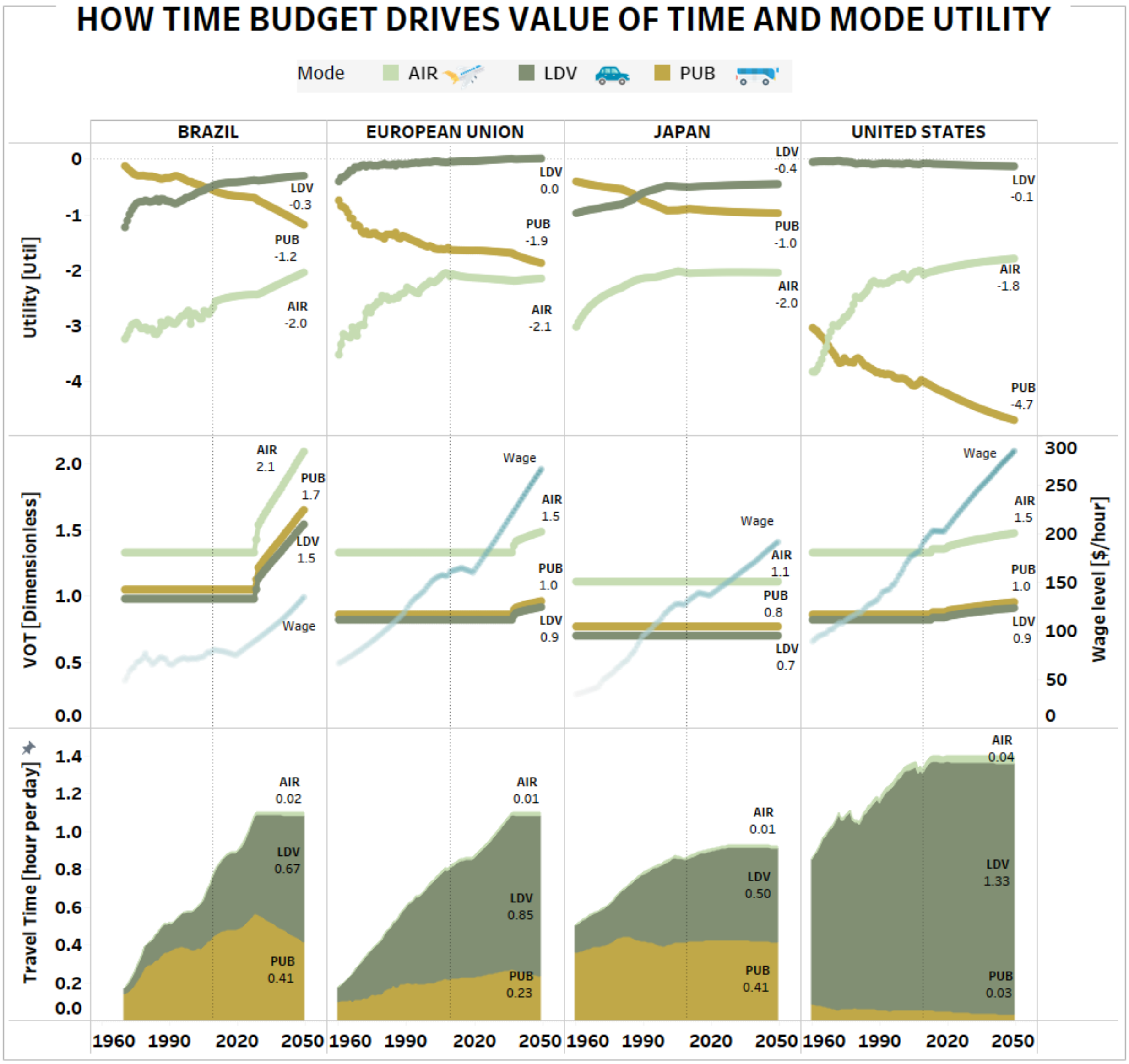


Figure 5-7: The inter-relationship between key-variables in HERMES version
Source: Own elaboration

5.3 Discussion

The BAU pathway, built upon the dimensions of the SSP2 marker, reflects an extension of the historical experience, particularly in terms of total demand and modal share improvements in its baseline, which will lead to a steady emissions increase over the 21st century. Concerning the modals, the BAU pathway foresees for all regions a tendency inherent to the concentration on medium-speed modals at the expense of low-speed modals due to the increase in the population's purchasing power.

This trend increases the level of congestion in cities, which, with the absence of adequate infrastructure, impacts the energy performance of vehicles and, consequently, affects the sector's fuel consumption. Moreover, the accentuated use of private transport in the BAU pathway harms the population's quality of life due to increased traffic jams and travel speed reduction. These factors stress the consumer travel time budget and the vehicles energy performance, creating a possible issue of counter-productivity (MCTI, 2017).

The inclusion of time budget constraints and the increase of VOT into the consumer choice tends to counteract, to some extent, these effects. To compute transportation demand subjected to travel time constraint allows for balancing the income response on future demand growth, while it also tends to shift the modal composition towards even higher-speed modes as incomes rise, reflecting the behaviour observed in historical trends (GOURI et al., 2013), (SCHÄFER; VICTOR, 1999). Accordingly, the HERMES version presented consistency to represent the evolution of the transportation system in the regions analyzed, which indicates the approach is helpful as a first measure to assess the size of regional markets and their continuation into the future.

The next chapter will explore different mobility pathways whilst assess the model behaviour.

Chapter 6

STORIES

ABOUT THE FUTURE OF THE TRANSPORTATION SECTOR

How many surprises does the future hold for us?

Chapter 6 evaluates the model's behaviour under alternative pathways and explores future total demand and mode share dynamics. Three trajectories of development for the transport sector were elaborated. The storylines, in general, aim to assess the possible impacts of the fourth industrial revolution on transportation modes. Therefore, they are not predictions but analyses associated with exploratory narratives. Section 6.1 analyzes a possible impact of private autonomous vehicles diffusion on the sector by establishing premises related to the Value of Time evolution. Section 6.2 assesses impacts on transportation demand due to improvements in collective transport services, and, finally, Section 6.3 assesses trajectories for the aviation sector in the context of digitalization of business travel combined with the shock caused by COVID-19 in the sector. Our results indicate that: in addition to the discussed potential benefits of self-driving cars, like safety, there is a possibility that the technology will exacerbate rather than solve traffic-related concerns; projects that prioritize public transport, making it faster and more efficient, can motivate the change from car to public transport; if a gradual recovery of consumer confidence concerning the aviation travel takes place, the simulated recovery of aviation sector could take 12 to 18 years.

6.1 Autonomous vehicles take off

People can obtain positive utility from various activities undertaken during travel time, including work activities, leisure activities and even sleep. These offset some of the loss of utility resulting from time spent travelling and lower the marginal value of travel time changes (ITF, 2019) (KOLAROVA et al., 2018). Furthermore, in recent years, improved information and telecommunication technology have expanded the range of business and leisure activities undertaken while travelling, suggesting that the emergence of autonomous vehicles can enable users to use time spent travelling productively (LYONS, 2019).

This section examines the effects of autonomous LDV on travel behaviour and the implications for transportation demand using the approach established in the HERMES version. The section is structured as follows: subsection 6.1.1 discusses the VOT assumption and how much it should be modified due to the introduction of AV. Last, subsection 6.1.2 points out the main model's behaviour and findings.

6.1.1 Willingness-to-pay: assumptions

According to ITF (2019), consumer preferences vary over time, affected by lifestyle choices, culture, social norms, safety and demographics. In order to understand what changes have occurred in the way travellers evaluate the quantity and quality of travel time, willingness-to-pay studies should be done at regular intervals. In addition, a survey should be conducted every five to ten years to ensure that the values continue to reflect new preferences. However, only a few economies have a standard and robust estimation methodology on the subject. The United Kingdom stands out with a program that aims to maintain a robust valuation of travel time savings (FINLEY; MACKIE; MARSDEN, 2017). On the other hand, developing economies suffer from the lack of clear information about the issue (SANTOS, 2012a).

Given this context and the scope of this thesis, this study relies on secondary information provided by the ITF Roundtable meeting that brought together 30 experts from 14 countries[25] to argue on the rationale and methods for segmenting the value of reductions in travel time (ITF, 2019), along with other sources.

As known, information and communication technology has revolutionized how people work, the place where they work, their leisure time, and what they do while travelling. Nowadays, consumers can undertake some work and leisure activities while travelling, which implies that some utility is generated, reducing travel time value (MOKHTARIAN AND SALOMON, 2001; ORY AND MOKHTARIAN, 2005; LYONS AND URRY, 2005; apud ITF, 2019). Moreover, within the prospect of AVs, users would be freed from the task of controlling the vehicle, which might suggest opportunities for using time more productively or more enjoyably during travel on the highway network (PUDANE, ET AL. 2018; MEUNIER, 2019; apud ITF, 2019).

Accordingly, investigating how travellers use their travel time is crucial to assess how much the value of reductions in travel time appraisal should be modified. Evidence of time use and its value, derived from the UK's Department for Transport (BATLEY, DEKKER AND STEAD, 2019; apud ITF, 2019) and the Dutch Government (DE JONG AND KOUWENHOVEN, 2019; apud ITF, 2019) were used to evaluate time value development trajectories in this study. They suggest that time use while travelling can vary with culture and travel distance. However, most evidence on time use indicates that less than 20% of passengers conduct work-related tasks. In other words, only a minority of travel time is spent working, even for business travellers, and the proportion of travel time spent working does not seem to have increased with this potential for productivity gains. That may be because some of the utility of travel time, when travel conditions permit,

[25] The meeting asssessed six papers: the fundamental principles of valuing reductions in travel time (Fosgerau, 2019), how such valuations might change with mobility patterns (Meunier, 2019) and in the light of behavioural choices (Goodwin, 2019) as well as on the methodologies available for evaluating time use while travelling (de Jong and Kouwenhoven, 2019; Batley, Dekker and Stead, 2019 and Molin, 2018). Discussions also covered evidence of time use in South Korea, the United Kingdom and the Netherlands (ITF, 2019).

derives from leisure activity, relaxation and "time spent doing nothing". A world full of AV could change this scenario altogether; however, current evidence of consumer behaviour does not point to a drastic reduction in the value of time, suggesting that the time spent travelling in an AV was perceived more similar to public transportation than in a conventional one (KOLAROVA et al., 2018).

For example, a VOT equal to zero implies that travellers would be willing to travel for long, even infinite periods of time because their ability to use the time productively or enjoyably would be as great as when not travelling. This will not happen because of competitive uses for time for different purposes at different locations. There is a temporal budget constraint that prohibits VOT from approaching zero. Baumol (1973) apud ITF (2019) argued:

> "if our individual had additional time, he could make more money, but the twenty-four-hour limit prevents that to his day…money income is congealed time and not vice versa. Additional time will purchase more income, but additional income does not purchase more time. So the wage increase does ease the budget constraint, but does not loosen the constraint that really binds."

Therefore, as a premise, it was assumed that the value of reductions in travel time could be 20-25% lower than conventional values, which is in line with ITF (2019) and Kolarova et al. (2018). Another huge uncertainty is when AV will take off; besides perfecting the technology, there are other challenges to overcome, such as poor road infrastructure and the communication systems needed to connect these cars (GESSNER, 2020). Thus, for simplicity, it was assumed that AV would be available for consumers in all regions from 2035 onwards (GLOBALDATA, 2021). Table 6-1 summarizes the assumption that allows assessing the model behaviour under the emergence of AV.

Table 6-1: Autonomous vehicles take off: main assumptions

Storyline	Qualitative	Model's Variable	Quantitative assumption
Digital Revolution allows AV to take off	Decreases the perception of LDV time cost concerning other modes	VOT_LDV	From 2035 onwards, VOT decreases up to 25%

Source: Own elaboration

6.1.2 Results

Our results indicate that if AV becomes a reality, and its impact on VOT is in line with our assumptions, the demand for medium-speed vehicles may increase by 25% in Brazil, 15% in Europe and Japan and around 5% in the United States. All regions show an increase in total demand, except for the US (see Figure 6-1). This increase in vehicle miles travelled after introducing AV, caused among other factors by VOT reduction, were also found by (CHILDRESS ET AL. 2015; GUCWA 2014; KRÖGER, KUHNIMHOF AND TROMMER 2016; GRUEL AND STANDFORD 2016; OECD/ITF 2015; apud ITF 2019). Hence, besides the discussed potentially positive effects of automated driving, there is also a risk that the technology might cause traffic-related issues instead of solving them (KOLAROVA et al., 2018) or can cause a new movement towards suburbans as shown by Igliński and Babiak (2017).

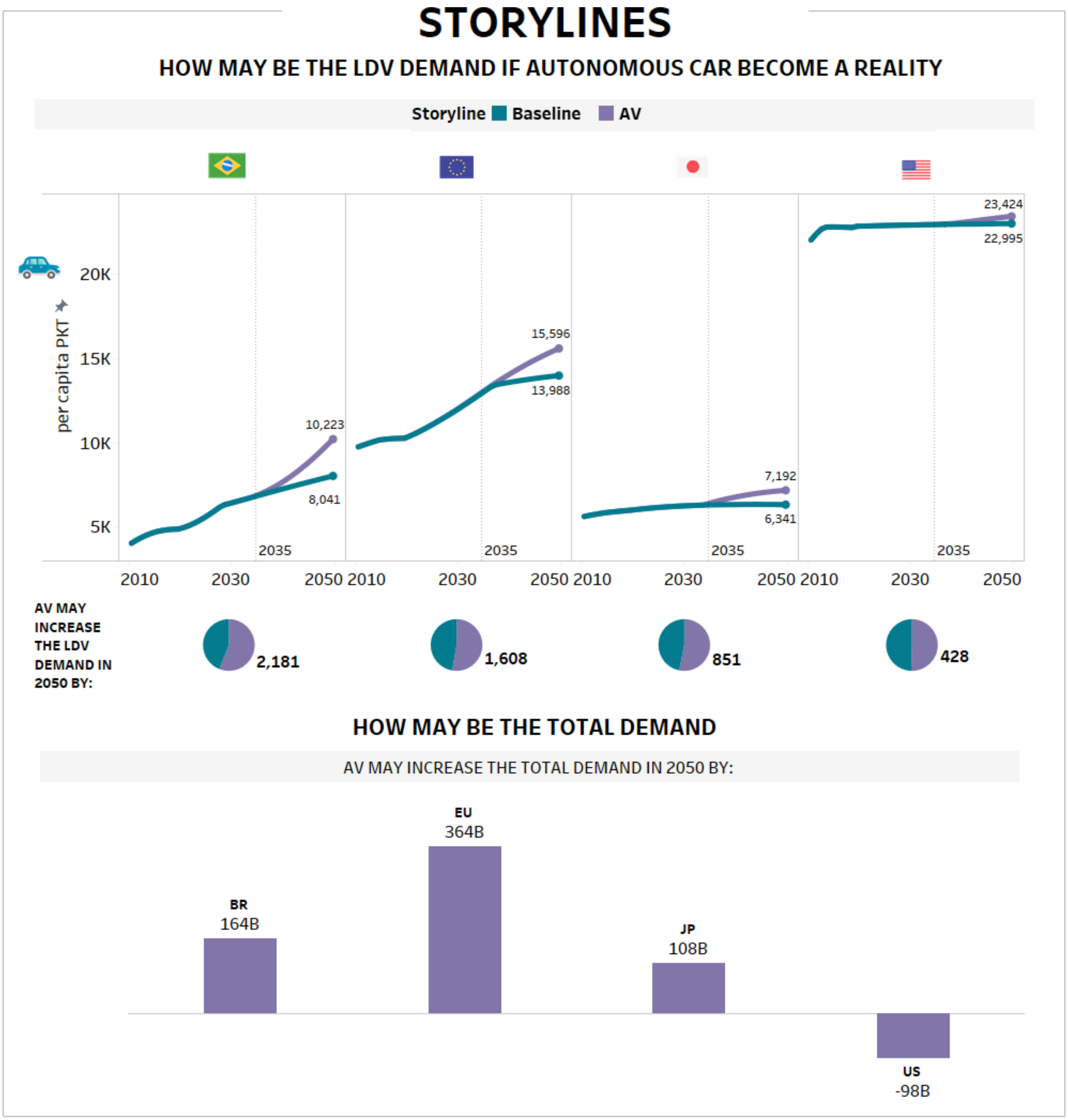


Figure 6-1: Autonomous vehicles take off: per capita LDV demand and total demand
Source: Own elaboration

Figure 6-2 illustrates the time value behaviour for each region and modal under the travel time budget constraint, which helps to enlighten the HERMES version approach. As in 2035, all regions, except for Japan, have already reached their time budget. In this context, the increased willingness to travel by LDV implies reducing the consumer interest in other modes. If one of the modes becomes more preferable in a competitive and restrictive system, the others lose preference. Something that does not happen when the consumer has not yet reached his budget, as is Japan's case, which increased its travel time per day concerning the BAU pathway without affecting the perceived preference of other modes.

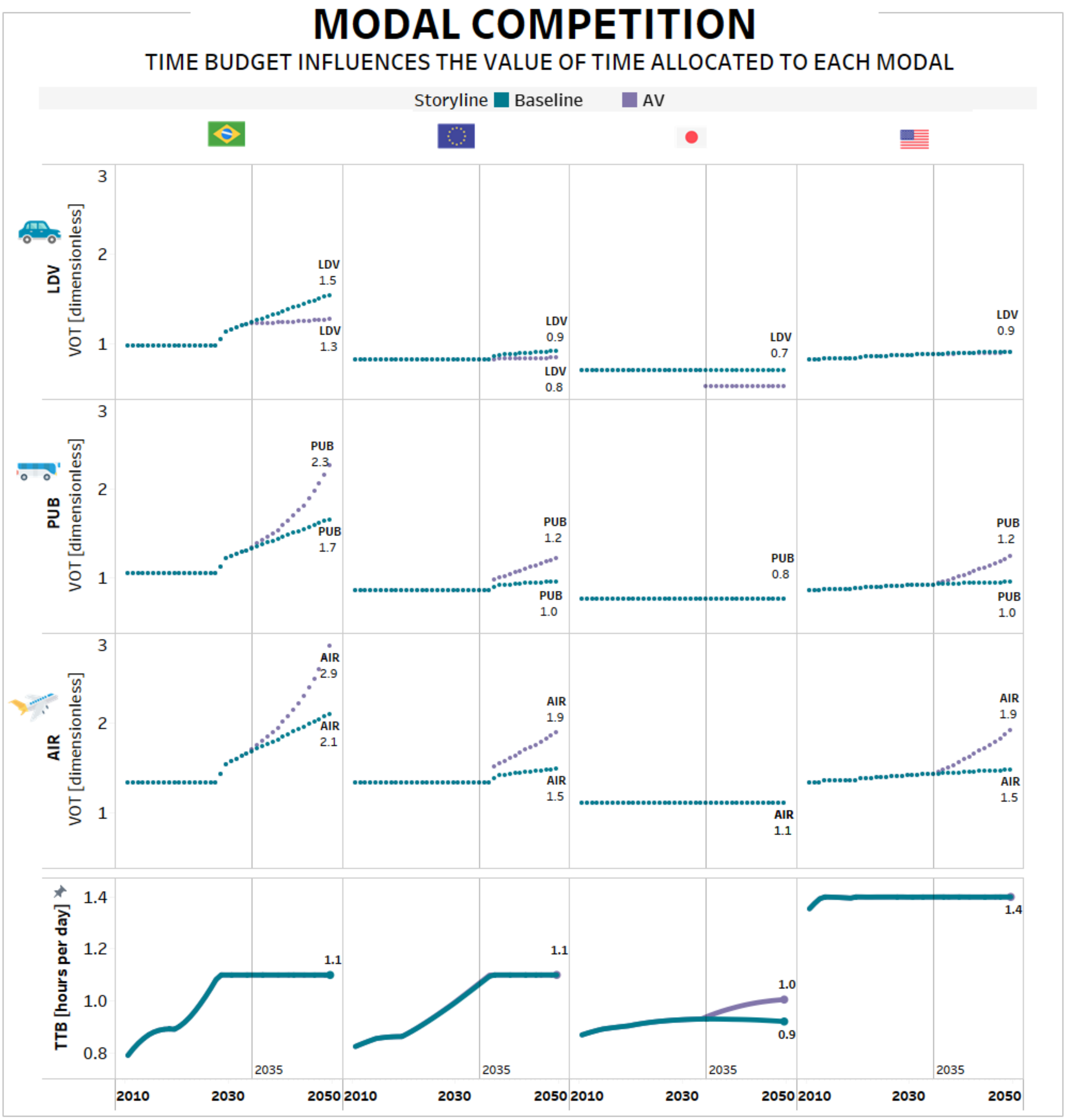


Figure 6-2: Autonomous vehicles take off: dynamics of the value of time subject to competition and constraint
Source: Own elaboration

Figure 6-3 illustrates the growth of modals in each scenario. It is observed that AVs compete mainly with low-speed modes, and the American airline sector is the most likely to lose market to AV. The American case is interesting because increasing the already high participation of private modes in the transport system implies a reduction in air travel, which reduces the total demand in the region, which can bring positive repercussions in terms of CO_2 emissions since aeroplanes are more energy-intensive than road vehicles (GÖSSLING; HUMPE, 2020).

Furthermore, a lower VOT attributed to personal cars can also impact urban form, resulting in people opting for longer-commuting trips, thus resulting in decentralization and urban sprawl (KOLAROVA et al., 2018). The comfort of AV (less stressful and tiring) will encourage people to make longer and more frequent trips, as travel time can now be used efficiently. One aspect might be, that people may prefer to live even further in the suburbs (IGLIŃSKI; BABIAK, 2017), which will lead to increased energy demand. Although lower VOT might make longer commutes more acceptable, the increases in congestion in cities can counteract that, making locations close to work attractive - to those capable of affording it (ITF, 2019).

Another uncertainty factor to be highlighted is that research that addressed the differences between the two addressed concepts of AV – privately owned vehicle and vehicle available on-demand – found that privately owned vehicle was perceived as a more attractive alternative than a shared vehicle (KOLAROVA et al., 2018). In this sense, AV can counteract mobility as a service, as consumers prefer their own car to benefit from time, hedonistically.

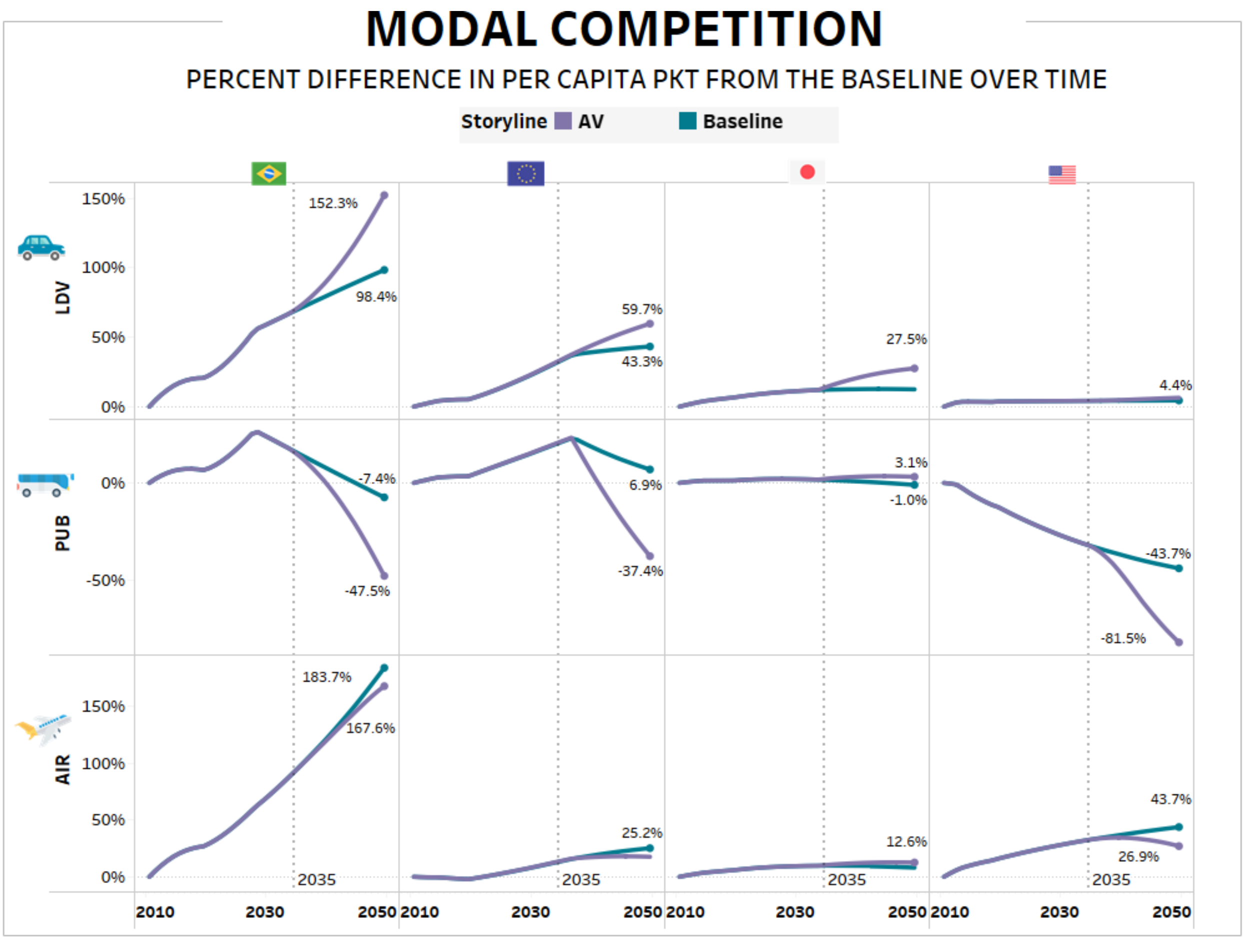


Figure 6-3: Autonomous vehicles take off: modal market share
Source: Own elaboration

6.2 Digital transformation in public transit

Public transport is at the core of the mobility transition due to embody digitalization and sustainable solutions to mobility challenges, contributing to a higher quality of urban life (UITP, 2020). Moreover, seamless travel with collective transportation is key into the future because it is the only option available that enables people to address individual needs - to get from origin to destination - while making the system more efficient (WATKINS, 2018). However, as seen in the BAU pathway, the public transport system is the one that becomes less important over time.

This section assesses how the digital transformation and policies may affect this current trend and the implications for transportation demand. The section is structured as follows: subsection 6.2.1 examine improvement in public transit key variables and how much it should be modified. Last, subsection 6.2.2 discuss the results.

6.2.1 Operational speed: assumptions

Managing traffic in urban areas is a complex, multi-layered and multi-functional process generally involving diverse agencies. In a successful traffic management system, each partner will have a clearly defined role, distinct yet complementary to other partners. In this context, Intelligent Transport Systems (ITS) play a crucial role in supporting and facilitating system governance (WEIDMANN; LUETHI; SPACEK, 2013). As pointed by Weber et al. (2014), a critical feature of ITS is its ability to deliver significant traffic management benefits through new information technology for simulation and real-time control, which offers the opportunity to address issues such as urban traffic management in an innovative manner. However, to achieve this, policies must be adopted with clear goals and definable outputs.

In this regard, policies concerning spatial priority must be constructed favouring the collective transportation modes. According to Albertin et al. (2020), the transportation network must be designed to give exclusive right-of-way corridors to collective transportation modes. High-occupancy vehicle lanes, transit lanes, and priority corridors must become the norm in the transportation system. Hence, individuals who are using space efficiently must receive priority over those who congest the network.

Following this line, Bus Rapid Transit (BRT) systems, which are compared to a light rail vehicle but has a 4 to 20 times lower cost, could be integrated into ITS tools and implemented in urban areas helping to increase the operational speed of public transit. As an illustration, Curitiba's BRT, the first in Brazil and one of the first in the world, introduced in 1974, at a low cost, managed to promote a reorganization in the urban space, improving the consumer experience in public transit. BRT does not share the road with cars, which directly influences travel efficiency for users. Albertin et al. (2020), which analyzed gains in time travel in Curitiba's BRT, suggest that the travel time is reduced by 18 to 44% in the exclusive lane.

Accordingly, the combination of intelligent systems and policies that give the proper signal to consumers can benefit the average transport speed. Thus, to assess the model's behaviour under such a storyline, it was assumed that similar measures could be gradually implemented in all regions from 2025 onwards, increasing by 25% the PUB speed, as illustrated in Figure 6-4.

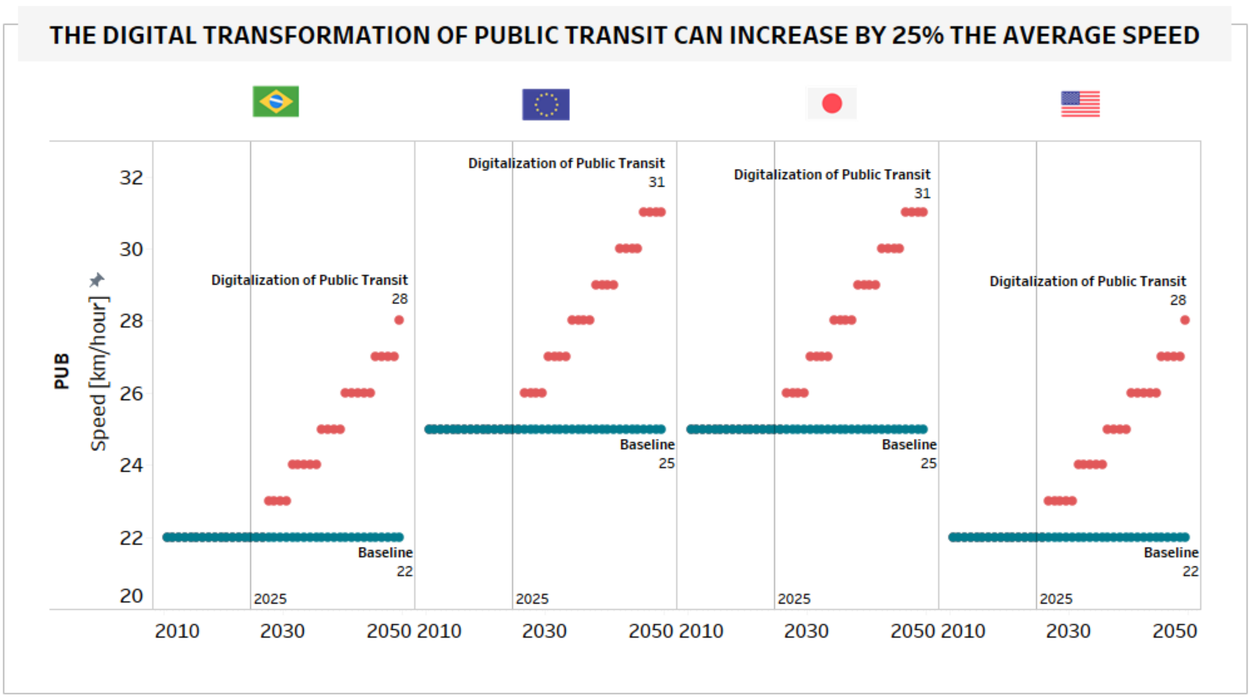


Figure 6-4: Digital transformation in public transit: speed assumption
Source: Own elaboration

6.2.2 Results

Implementing policies that make public transport more accessible and friendly to consumers indicates that gradual improvements in travel speed can increase the demand for public services, in 2050 relative to 2010 levels, by around 52% in Brazil, 62% in the European Union, 32% in Japan, and by 80% in the United States (see Figure 6-5). Regional demand would also increase, except for the USA. In other words, consumers would travel more, using, however, a more efficient transport mode.

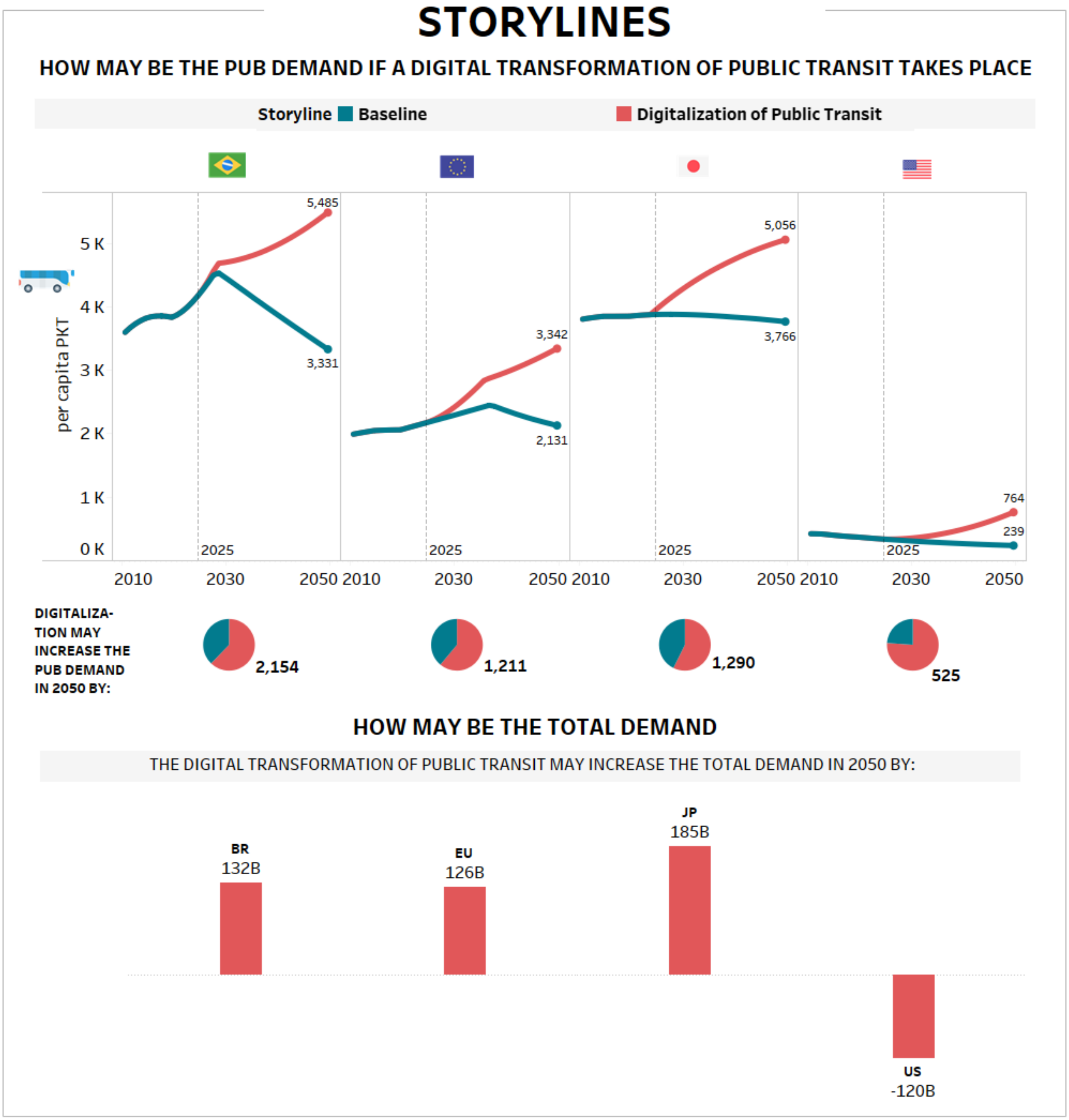


Figure 6-5: Digital transformation in public transit: per capita PUB demand and total demand
Source: Own elaboration

As seen, projects that prioritize public transport, making it faster and more efficient, can motivate the change from car to public transport. Figure 6-6 illustrates the modal competition concerning consumer travel time and market share. As can be seen, there is direct competition between private cars and the public transport system. Thus, policies and improvements in the public system can reverse the historical trend of market loss, replacing travel time and market share with more competitive and resource-efficient modes.

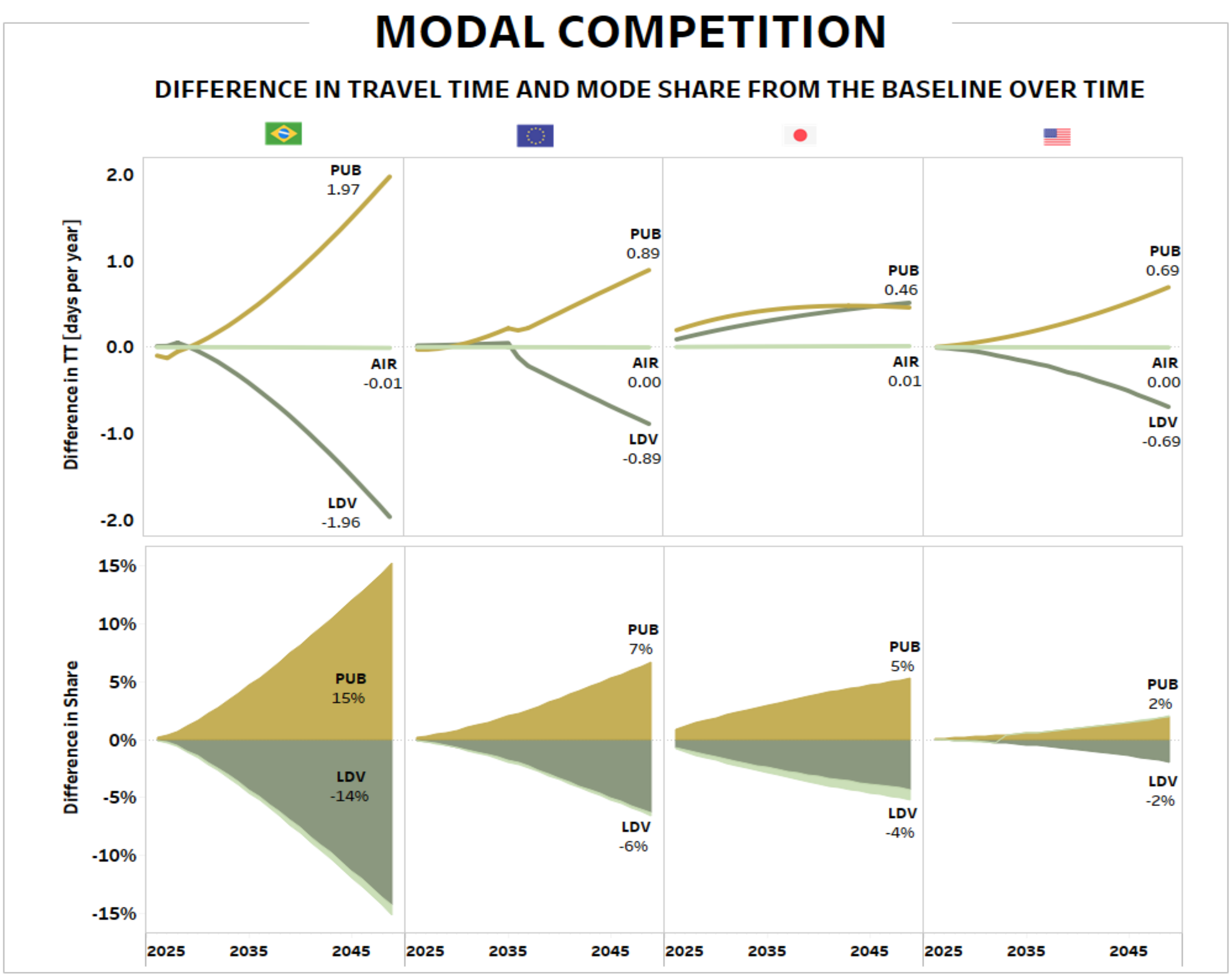


Figure 6-6: Digital transformation in public transit: modal competition
Source: Own elaboration

Another result derived from the modelling is the number of days that consumers spend travelling per year. Brazil and the European Union present, in 2050, a daily budget of 1.1 hours a day, which results in around 16 days of the year spent within a mode of transport. On the other hand, Americans spend around 21 days travelling, 20 of which in an automobile. The improvement in public services provokes the partial replacement of the time allocated in private vehicles for collective systems. That can reduce congestion, impacting travel time and reliability, air pollution, and fuel consumption. In addition, it would also have a particularly positive effect on the economy and efficiency of distribution services (WEIDMANN; LUETHI; SPACEK, 2013).

MODAL COMPETITION

TRAVEL TIME IN 2050 BY STORYLINE

Unit: per capita days per year travelling	Baseline	Digitalization of Public Transit	Baseline	Digitalization of Public Transit	Baseline	Digitalization of Public Transit	Baseline	Digitalization of Public Transit
PUB	6.2	8.2	3.5	4.4	6.2	6.6	0.4	1.1
LDV	10.0	8.0	12.8	11.9	7.4	8.0	20.0	19.3
AIR	0.3	0.2	0.2	0.2	0.2	0.2	0.6	0.6
Grand Total	16.5	16.5	16.5	16.5	13.8	14.8	21.0	21.0

Figure 6-7: Digital transformation in public transit: days per year travelling
Source: Own elaboration

6.3 Domestic aviation in a post-pandemic world

The social and economic activity is reflected in traffic and transportation operations. During the pandemic, the efforts taken to prevent the spread of the disease resulted in significant mobility restrictions, which naturally influenced most types of transportation. However, air travel was the kind of transportation most severely impacted. Its activity dropped by 90%, in terms of Revenue Passenger kilometre (RPK), during the epidemic peak, and the high capital expenses of airlines and airports make the long-term viability of numerous actors uncertain (ICAO, 2021).

The medium-term outlook for aviation is equally dismal, as a drop in tourism and corporate travel demand will substantially impact air travel, for as long as the epidemic is not completely overcome (ICAO, 2021). The risk of becoming stranded in a foreign country, the perception of disease exposure while travelling by plane or through airports, the inconvenience caused by additional airport controls that may be implemented, and the replacement of business meetings with telematics solutions are all factors that will influence future demand (JRC EUROPEAN COMMISSION, 2020).

In order to estimate the future of aviation, a description of future pathways for aviation is necessary, given the high uncertainty surrounding the sector (AGREEMENT; COMM, 2021). In this regard, this section explains how it was derived and analyzed three pathways dedicated to assessing aviation developments, especially related to passenger demand, using the HERMES version. The section is structured as follows: subsection 6.3.1 discusses the scenario assumptions. Last, subsection 6.3.2 evaluates the model's behaviour and findings.

6.3.1 Underlying assumptions and context

The COVID-19 crisis is already being regarded as one of the most severe shocks in the last 60 years, capable of altering future requirements and social values (LOAYZA et al., 2020). Several shifts in personal priorities may last for some time, even after the recovery is complete. Teleworking, video conferencing, and other forms of remote cooperation, for example, have long been considered viable options for lowering transportation demand but hardly implemented. Nowadays, because many businesses widely adopted such solutions during the crisis, a larger number of companies and employees will likely continue to use them once the austerity restrictions are lifted. Whether they are employees or consumers, many people will restrict travels that can be avoided by technology or that they feel unnecessary (JRC EUROPEAN COMMISSION, 2020).

Regardless of how quickly the COVID-19 threat is over, the uncertainty about new waves of the virus or other pandemics will persist for some time, leading to a strong risk aversion to transportation and travel, affecting ultimately consumer willingness to pay to travel by aeroplane. Aside from reducing travel frequency at the individual level, user preferences for journey durations may also change[26] (ICAO, 2021).

Data was collected for the regions to assess demand changes and possibles impacts of the above. Table 6-2 systematizes the demand shock caused by COVID-19 on domestic aviation and the share of business trips in the aviation sector in each region. In all regions, the demand reduction was around 60% compared to the year before COVID-19. The participation of business trips in each region exposes the possible loss of market that the sectors can suffer if most of these trips are replaced by telecalls. For example, the loss of business travel in Brazil would represent around 49% of the domestic aviation market.

Table 6-2: Pandemic shock on aviation demand (RPK) and the percentage of business travel in the aviation sector

Region	The pandemic shock on demand (RPK) 2020 average compared to 2019 average	% of Business travel in the aviation sector
BR	- 62% (ANAC, 2016)	49% (BRAZIL, 2014)
EU	- 60% (EUROCONTROL, 2021)	20% (LAPLACE; LENOIR; CASSAN, 2007)
JP	- 53% (IATA, 2021)	32% (ADARA, 2016)
US	- 60% (BTS, 2021)	29% (STATISTA, 2017)

Source: Own elaboration

Once the restrictions are lifted and activity begins to return, demand for air transportation and mobility services is likely to rebound. Nonetheless, the recovery rate will

[26] High Speed rail face to a certain extent-similar challenges. Trips in the 400 km to 1000 km distance band though will probably not be affected as much as the longer distance trips by air, and rail may benefit from the substitution effect of trips not realised by air (JRC EUROPEAN COMMISSION, 2020).

differ by region and will be influenced by the speed of economic recovery, the cost of support measures, and changes in the supply and demand for transportation services due to the pandemic's direct and indirect effects[27].

We created three alternative pathways for post-pandemic evolution to assess uncertainty from the influence of the current pandemic crisis and possible developments. Three key storylines are employed, all of which are based on the BAU scenario with COVID-19 consequences and top-down assumption, mainly regarding the consumer willing-to-pay to travel by aeroplane. Table 6-3 summarizes the alternative pathways and the rationality embedded in the model.

Table 6-3: Description and overview of alternative pathways for in a post-pandemic world

Storylines	**Qualitative**	**Variable**	**Quantitative**
Digitalization of Business Travel	COVID-19 shock followed by a shift in passenger business behaviour	Exogenous	• Incorporation of the 2020 demand shock • Recovery of leisure travel in 2021
Gradual Aviation Recovery	COVID-19 shock followed by a gradual recovery in consumer travel willingness	VOT_AIR	• Incorporation of the 2020 demand shock in the consumer willing-to-pay • In 2021 willing-to-pay gradual decrease, but above or equal the BAU pathway
Incentives to Aviation Recovery	COVID-19 shock followed by a fast recovery in consumer travel willingness	VOT_AIR	• Incorporation of the 2020 demand shock in the consumer willing-to-pay

[27] A clear picture of the full impacts will most likely not be possible before the end of 2021, and the repercussions will probably still be visible at least three years after the crisis. At the time of writing this thesis, early 2021, the turmoil was still in place, requering us to work with different scenarios.

Storylines	Qualitative	Variable	Quantitative
			• In 2021 willing-to-pay decrease below the BAU pathway and increase if it reaches the 2019 level

6.3.2 Results

Figure 6-8 presents an initial estimate of the differential reaction of the aviation sector, assuming that each mode reached minimum activity during the crisis and will gradually converge towards its baseline level (Gradual Aviation Recovery an Incentives to Aviation Recovery). Changing mobility patterns, represented by the substitution of business travel by telecalls, are represented by the Digitalization of Business Travel pathway, which would impose more severy impact in the medium term.

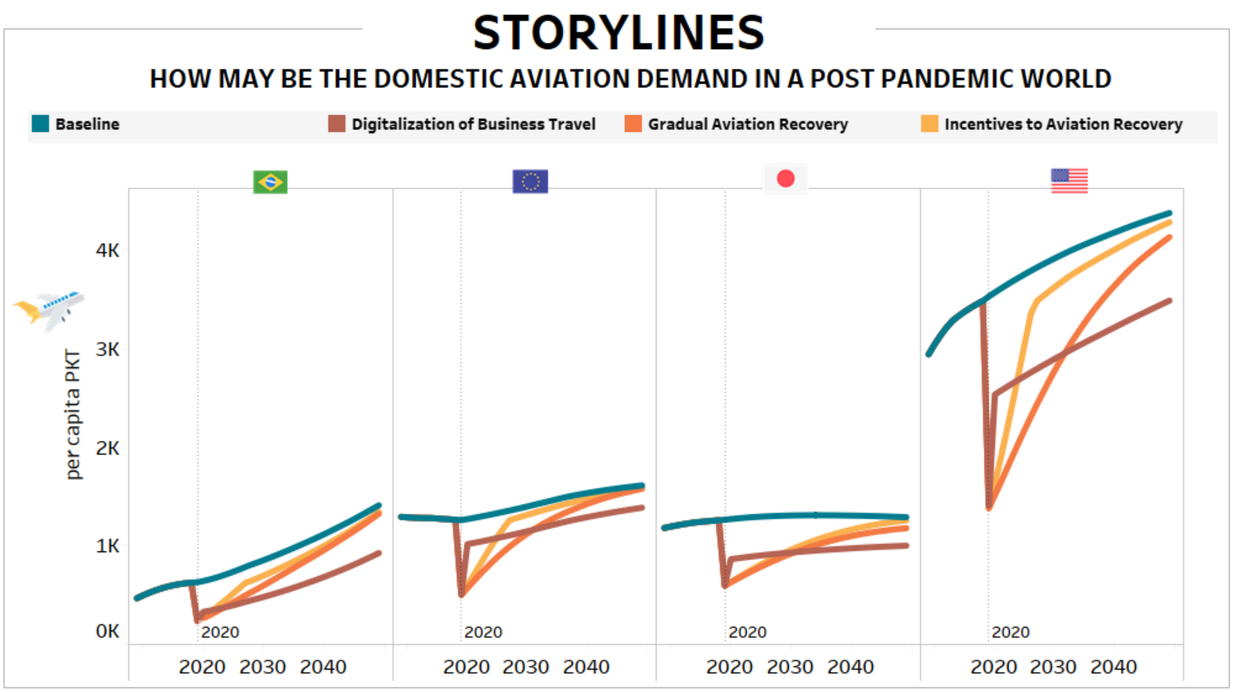


Figure 6-8: Domestic aviation in a post-pandemic world: per capita high-speed transportation volume pathways, in passenger-kilometre
Source: Own elaboration

As can be seen, each region presents a reaction, with Brazil, the European Union and the US, in the "Incentive to Aviation Recovery" pathway, managing to reach the 2019 passenger-km volume in 8 years afterwards the crisis. In the absence of incentives, through a gradual recovery in consumer confidence, the recovery could take 12 to 18 years, depending on the region. In the Japanese case, even with incentives, demand is not recovered in the short term, greatly influenced by the already sluggish demand expected for the region. Furthermore, it is observed that in none of the regions, except for the European Union, does demand reach the levels of the reference scenario. In the case of structural changes in the market and loss of part of business travel, the rebound would be even longer, which would also cause a restructuring of the supply side.

The short-term consequences of the COVID-19 pandemic have been studied by ICAO (ICAO, 2021), which came up with two potential recovery scenarios for the short term. Quick recovery with a 45% annual mean decrease in available seats compared to a baseline and a more pessimistic recovery with a 63% annual mean decrease in available seats compared to a baseline. Here we point out that, in the 2030 horizon, the drop in passenger-km volume varies from 8 to 40% in the less pessimistic recovery, depending on the region.

Another study Grewe et al. (2021) used the ICAO scenarios but allowed 3 and 15 years for recovery and introduced a scenario where web conferences replace face-to-face meetings and allowed a 20% decrease in RPK after the 15 years of recovery. That is in line with what we proposed herein; however, to assess the impact of the digitalization of business travel, we subtract the share of business travel from demand[28], allowing for a gradual resumption of 30% of the market, but in the end, each region loses 70% of business travel.

In the other scenarios, the shock in the willingness to pay was used to assess the possible recovery trajectories. Figure 6-9 illustrates the simulated dynamics. The

[28] The period of the lockdown initiated many more work meetings via the internet. However, currently, it is unclear whether this may initiate a sustained change in working habits.

accumulated per capita demand in the horizon of the study is presented in the upper part of the figure; as it can be noticed, Brazil is the region that presents the smallest volume of demand, with about 35 thousand pkt per year. This result derives from the reference scenario of willingness to pay and the utility of the mode of transport, a trajectory highlighted in turquoise.

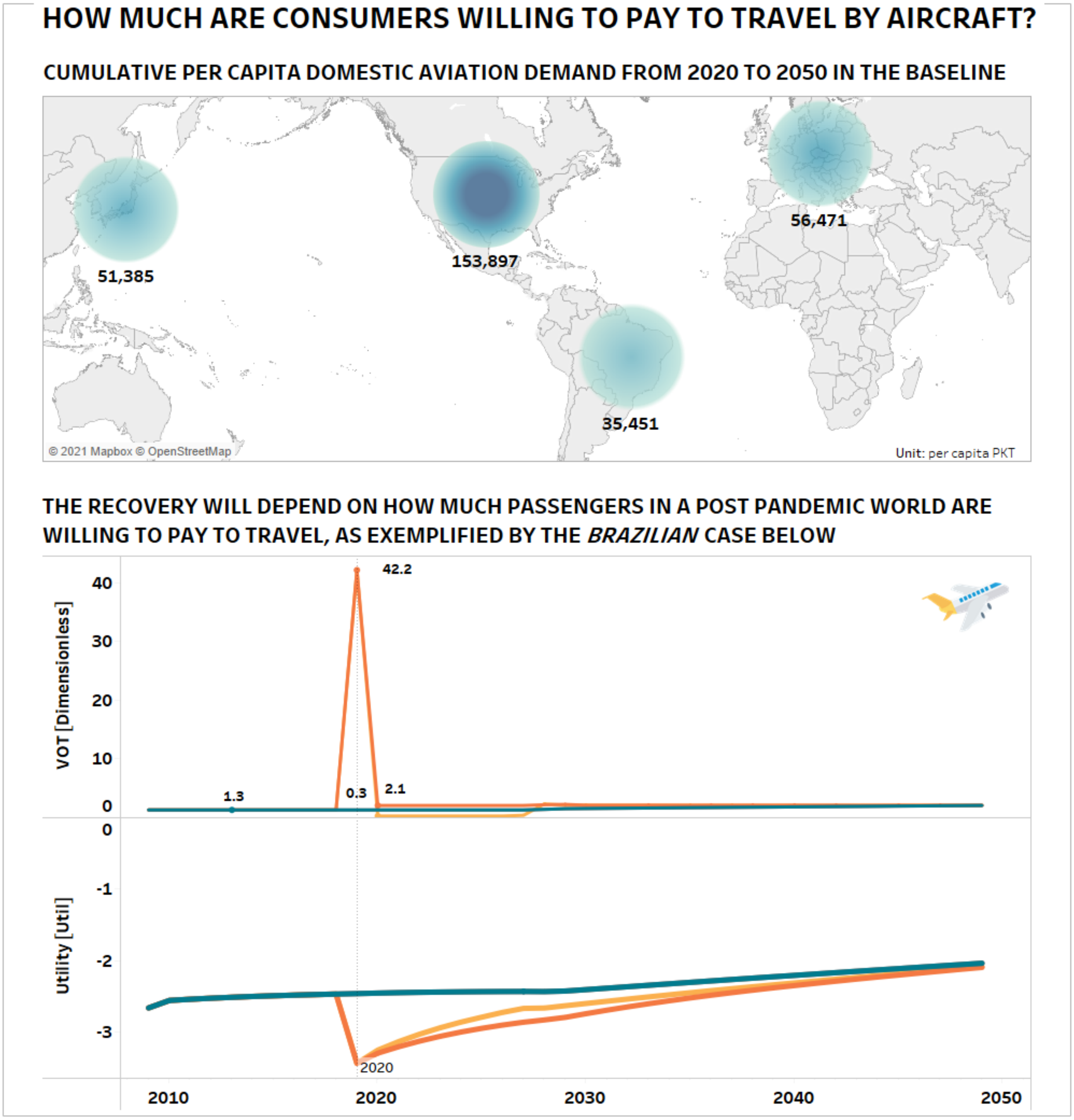


Figure 6-9: Domestic aviation in a post-pandemic world: The shock caused by COVID-19 on the willing-to-pay to travel on airlines and possible development pathways
Source: Own elaboration

However, in 2020, the 60% demand drop makes the willingness to travel by aeroplane increases drastically, with a natural impact on the mode — results calculated endogenously by the model. After 2020, it is assumed that the restrictions imposed by the pandemic are lifted, and consumers can travel again. In the pathway of gradual recovery, in 2021, the willingness to pay drops (from 42.2 to 2.1) but above the reference level (1.3). On the other hand, the incentive scenario allows the willingness to pay to be below the reference value, but above zero, since mathematically, the willingness to pay cannot be negative. This approach is justified by pent-up demand and incentives for longer trips, which can warm up consumers' will to travel, promoting a faster recovery. Thus, utility recovers more sharply but below the reference level, which would only be reached if possible to have a negative time value, offsetting the 2020 shock.

Finally, Figure 6-10 shows the participation of road modals in this context. Part of the demand in the airline industry is transferred to private and collective vehicles as consumers continue to use their travel time budget.

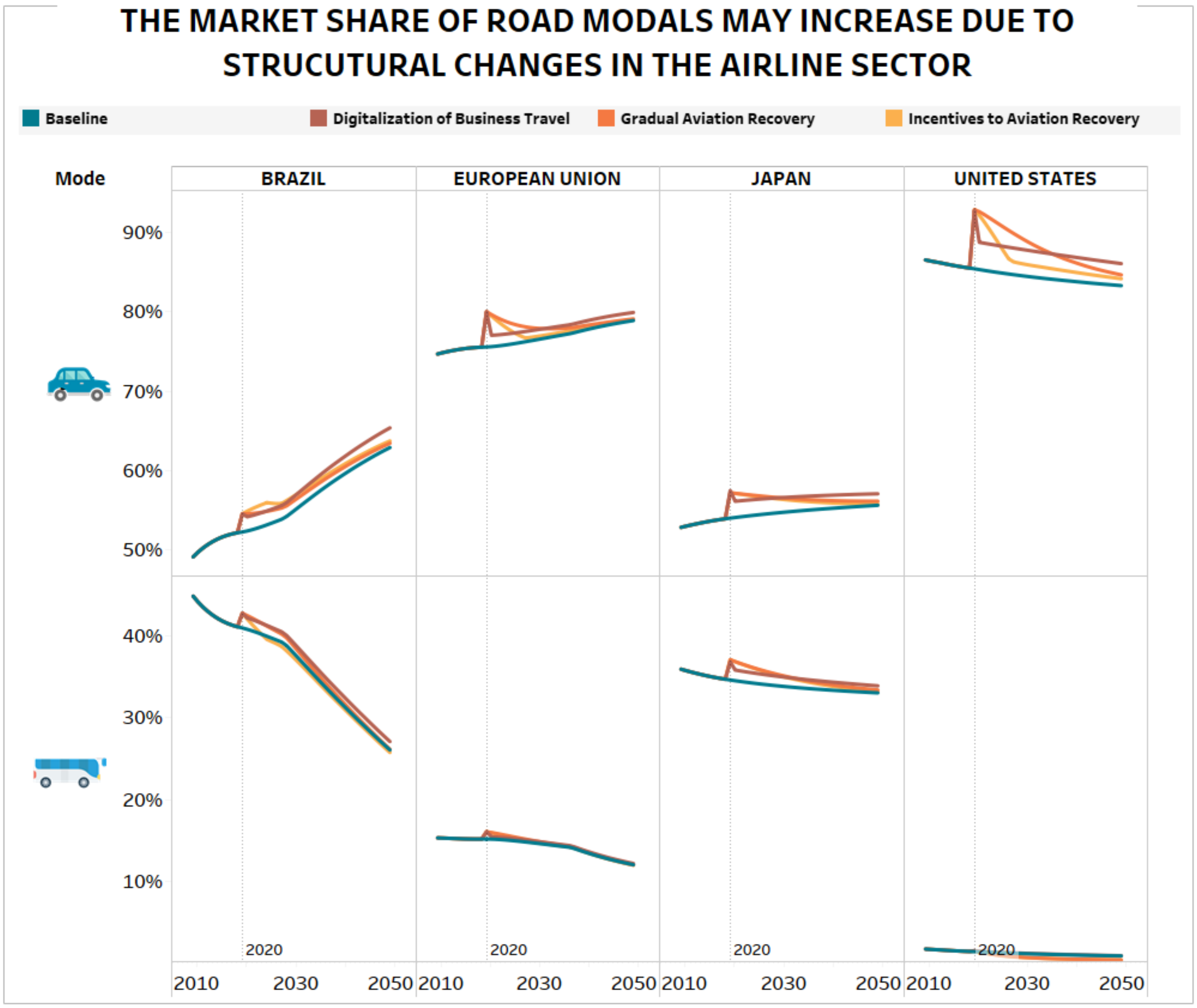


Figure 6-10: Domestic aviation in a post-pandemic world: modal competition
Source: Own elaboration

6.4 Discussion

The objective of Chapter 6 was to evaluate the behaviour of the HERMES version in different contexts of transport infrastructure. In this sense, pathways were developed for each mode, emphasizing how structural changes can impact transport demand and market competition.

In general, the assumptions assumed were based on secondary information, and, in this regard, future studies can provide more accurate information. For example, well-designed surveys allow segmentation of the value of reductions in travel time into meaningful components. Qualitative surveys are also helpful in obtaining a broader picture of how and under what conditions people make choices and better understand what factors travellers consider, and it would help determine willingness to pay (KOLAROVA et al., 2018). Despite the biases induced by the lack of information, the HERMES version provided valuable insights about the transportation sector.

Concerning the AV diffusion and the possible reduction in time value, the results obtained indicate an increase in the demand for private transport in most regions. That will have an impact on congestion, vehicle efficiency and the quality of life of consumers. Therefore, the evolution of technology must be accompanied by policies that encourage shared use, thus avoiding systemic inefficiency in the sector (COMPOSTELLA et al., 2020).

Regarding the public transport system, it was observed that relative improvements in speed could bring significant benefits to the system. Besides that, it should be highlighted that the quality of travel conditions affects willingness-to-pay, as travel undertaken in crowded and uncomfortable conditions creates greater disutility. Travel time can also be used for other activities when conditions are less busy and more comfortable. Even if trip time is not short, transportation improvements that improve passenger comfort during journeys can dramatically reduce travel disutility. As a result, transportation planners must consider a wide range of potential projects, including trade-offs between qualitative and quantitative benefits (ITF, 2019). Investing in longer commuter trains to alleviate overcrowding or providing free Wi-Fi to public transportation customers are two examples of such alternatives. This can justify investing in extra capacity and lowering the crowded value of time spent on the public service to its real or reference value.

Finally, the current COVID-19 outbreak may cast doubt on the viability of the previously proposed airline route. Aviation is especially sensitive to shifting consumer preferences, worsening economic conditions, and shrinking government resources. Certain operators, particularly in air transportation, may require direct or indirect state assistance to maintain a level playing field, and the demand is likely to take a long time to return to

2019 levels. From the experience of other crises, like SARS, we might expect a fast recovery (ICAO, 2021). However, the analysis of which COVID-19 scenario is more plausible is beyond the scope of this research.

The final remarks will be addressed in the following chapter.

Chapter 7

Conclusion

Passenger transportation has increased significantly in recent decades, resulting in several issues, including intense traffic congestion and pollution. Moreover, passenger transportation is expected to continue to expand in the future, accentuating the problems even further. Thus, methods and **analytical insights** that recognise alternative pathways will be required to comprehend these complex systems evolution. To enhance the understanding of this crucial sector, this thesis has developed approaches for characterizing and projecting transportation demand and its variance across regions and modes.

As such, the **final remarks** of this work are addressed in this chapter. Subsection 7.1 **summarises** the study's motivation, the methodological process, and the main findings. The **contributions** to research literature and modelling practice are presented in subsection 7.2. Subsection 7.3 discusses the research' **policy** implications. Last, subsection 7.4 explores the **limitations** of this study, along with recommendations for **future research** to continue and enhance the HERMES version created in this thesis.

7.1 Summary of the research and critical insights

Chapter 2 overviews current knowledge associated with consumer mobility preferences in tools that assess strategies and policies to meet climate targets. The primary goal of the literature review was to assess modal split models that could be used to predict travel behaviour for macro-regions. Our findings show that it is challenging to reproduce consumer decision behaviour in climate change models, which is a severe limitation given how important it is to accurately represent human behaviour in social-technical models. The most common method found in the literature that allows overcoming this barrier is the utility maximisation theory, which supposes consumers select the alternative possessing the highest utility. Furthermore, multinomial logit models were shown to be the most practicable modelling framework among all modal split models, even though they are founded on the IIA property, which asserts that all travelling modes in the option set are independent of one another.

Chapter 3 explored some of the recommended methodologies proposed to improve consumer mobility behaviour in IAMs. Accordingly, we improved an econometric model developed by Schäfer (2017) and applied it, for the first time, in two advanced economies, the European Union and Japan, and one emerging economy, Brazil. We named the resulting method by Historical tRends for Mobility assESsment (HERMES), which is a travel-economic simulation model designed to capture the transportation system at a macro-scale level for a user-defined analyses timeline. Current, HERMES allows users to examine the next 30-40 years of transportation demand evolution. The model provides long-term prospects for practical and applicable transportation policy solutions, especially for regions that aim to assess cost reductions, door-to-door speed, and willingness to pay to travel.

Chapter 4 described the analytical approach developed to compile the historical data for each analysed region and the method applied to estimate the model parameters. Uncertainty regarding the consumer's income level was examined due to the interrelationship between passenger demand, measured in passenger-kilometres, and income level variables in the model. In particular, it was investigated how the level of informality in the economy could influence the demand model specified. Results indicate that, for the HERMES version analyzed, the main effect of the shadow economy is the increase in the generalized cost coefficient, with no difference being found in the historical projection of the values. However, incorporating the shadow economy into the economic variables allows correcting the parameters, especially for regions with a high part of their economy in the shadow. Because of that, in this HERMES version, the total transportation demand and the mode share will be computed using the parameters from the "shadow GDP" model.

Chapter 5 presented the business as usual pathway, which is based primarily on the current structure and how the sector has evolved so far, making believe that in the future, the sector's situation will be the extrapolation of the history, in general terms. The outcomes are available from 1960 to 2050. Concerning the modals, the BAU pathway foresees for all regions a tendency inherent to the concentration on medium-speed modals at the expense of low-speed modals due to the increase in the population's purchasing power. This trend increases congestion in cities, adding pressure to consumer travel time budget and the vehicles energy performance. Accordingly, the HERMES version represented with minor errors the evolution of the transportation system in the regions analyzed, which indicates the approach is helpful as a first measure to assess the size of regional markets and their continuation into the future.

Chapter 6 evaluated the model's behaviour under alternative pathways and explored future total demand and mode share in the analysed regions. Three pathways were developed for each mode, emphasizing how structural changes can impact transport demand and market competition. Concerning the AV diffusion and the possible reduction in time value, the results obtained indicate an increase in the demand for private transport in most regions, with significant impacts on congestion, vehicle efficiency, and consumers' quality of life. Regarding the public transport system, it was observed that relative improvements in speed could bring significant benefits to the system, increasing its market share. Concerning the current COVID-19 outbreak on aviation, if a gradual recovery of consumer confidence travel takes place, the recovery of the aviation sector could take 12 to 18 years. From the experience of other crises, like SARS, we might expect a faster recovery. However, the analysis of which COVID-19 scenario is plausible is beyond the scope of this research.

7.2 Contributions to research and practice

This study built an **analysis tool** for the passenger transport sector, which assess demand focusing on consumer choice. Accordingly, the developed methodology can be implemented for other regions, contributing to building a **global mobility demand model**. Moreover, its **further link** with integrated assessment models could help to increase the tools' analytical power, improving the realism of results and derived policies.

In addition, the adoption of different values of travel time for different modes added to the sophistication and utility of the model. As a result, it was possible to assess the potential impacts of the **autonomous car** on mobility demand, a frontier of current knowledge. Also, the impact of the **pandemic** on the aviation sector can be evaluated under the light of consumers' willingness to travel by air, a substantial current uncertainty.

Also, this study shed light on uncertainties regarding the per capita GDP and wage rate level, exploring if the **shadow economy** can change the simulated model outputs. As such, we adjusted the methodological procedure to incorporate the shadow economy into the modelling framework. We added the shadow economy into the official GDP, and then we estimated the model parameters using the official GDP and the shadow GDP to assess the shadow economy influences on parameters estimation and model outputs. As far as the author is aware, **no study before** this one investigated changes in parameters and results of demand models caused by widespread informality.

Finally, the insights gained from this study will help regions and their stakeholders better design policies to manage demand. The **benefits** of storylines analysis using **HERMES** include: assess the per capita and total transportation trends; conducting scenario exercises to look at medium to longer-term alternative scenarios and their impact on achieving travel time budget goals; exploring policies and modal share trends in the transportation sector due to technology adoption or demand shocks.

7.3 Policy implications

Establishing a model capable of assessing consumer mobility choice benefits the scientific community, particularly the Brazilian institutes conducting climate change researches. Furthermore, the assessment methodology created in this study might be beneficial in **assisting policy** development. Policymaking is beyond the scope of this study, although some general implications will be highlighted.

The findings illustrated the wide range of transportation system stages and consumer preferences, indicating that each region must develop more appropriate measures for its reality. As a result, different regions may find different policy levers to be the most **successful** in tackling the effects of transportation demand. Transferring policy ideas from region to region **risks** leading regions to adopt measures that, while successful elsewhere, may have little impact on local consumer and their preferences.

For example, the high long-term elasticity parameters for Brazil imply that rising incomes would result in an even more significant increase in family transportation spending in the coming years, which, if left uncontrolled, may exacerbate existing severe concerns such as **congestion**, **pollution**, and **land usage**. On the other hand, because Japan presents a negative elasticity, which means local governments are more concerned with maintaining the **cost** of public transportation in the face of falling demand than with system **capacity expansion**. Thus, it is essential to respect and observe local historical characteristics.

In public transportation services, the tool can help experts and decision-makers learn more about alternative development strategies. It is possible, for example, to explore strategies to improve operational speed, cost and attractiveness of public transit and its impact on consumer choice and demand. Thus, future analyses can **assist** in achieving a regulatory framework for **attractive**, **efficient** and **sustainable** public transport services.

Other instance, autonomous cars hold enormous potential for significant advances in mobility and **safety**. On the other hand, they can substantially modify consumer behaviour by making driving easier and safer, with unforeseen effects on increased **energy**

consumption and **greenhouse gas emissions**. Policies to combat induced driving can apply, for example, a charge on miles driven, which could be simulated in the tool to assess the impact of such a solution.

7.4 Limitations and future work

The findings of this research are in accord with the most recent scientific literature. However, while analyzing the results, caution is recommended because this experiment comes with many **unknowns** and **constraints**. Thus, the primary limitations of the methodological technique utilized in this investigation and suggestions for future studies are addressed in this last subsection.

There are inherent constraints that must be addressed when analyzing the conclusions of any mathematical model. In this case, one of the significant problems of discrete choice models is that they are based on utility theory, which assumes that markets and consumers are **rational** decision-makers with plenty of time and a comprehensive understanding of the elements that influence their decisions. Adversely, consumer decision-making does not follow linear, methodical digestion of information en route to the best option. Numerous factors, many of which are **unrelated to the central issue** of transport, can significantly impact consumer choice and consumption. Even though most modellers are aware of this complicated reality, they frequently work from a linear and simplified perspective on the customer choice process. As such, future studies could explore innovative approaches to deal with the irrationality of consumers.

The model also assumes that the mobility growth is based on the fact that if people travel faster, they do not travel less time. Hence, travel times are constant, and people cover larger distances. Thus, the number of kilometres travelled every year rise due to the increasing availability of faster means of transport. The idea of time scarcity and territory maximization compose the **hypothesis of constant travel time**, which may be a **self-fulfilling prophecy**.

People had indeed begun to travel faster in recent decades. Nonetheless, the law of constant travel time is based on data considered “extremely scarce”. Thus such universal law may not be accurate. The discussion about the constancy of travel time remains an **open topic** in the literature. However, what is known is that there are **significant disparities** in travel time among the population, even for developed countries. When dealing with developing regions, to portray averages is even more challenging because the population is more likely to be described by a binomial Weibull with two distinct behaviour patterns than one single mean value. Thus, studies that assess the **heterogeneity of demand** is highly recommended in future appraisals. A knowledge frontier that can enhance the understanding of the mechanisms behind passenger mobility.

Another caution is related to the time series concept, in which the future is skewed towards the past. Essentially, the parameter estimations are calibrated based on system past behaviour, which then is used to simulate the future. Hence, **regression models** can only be assessed under the light of **non-structural breaks** in the transportation archetype. Thus it is essential to **update the data** to reflect the most current trends constantly. As such, future studies could update the historical data to reflect ongoing preferences and structural shocks.

Another significant source of limitations to the assessment done in this study is the **lack of data**. Regressions analyses are studies that rely on comprehensive historical data to report verified outcomes. As a result, it is fundamental to ensure that the data used is of the highest quality. If the data is inaccurate, the quality and accuracy of the model can be severely constrained. In this aspect, such long historical data might create specific difficulties, particularly when data cannot be accessed or even exists. Another factor is the translation issues when dealing with global models; may the data be available but originated in another language, making it tough to identify and interpret reports or official documents.

Even though surveys and official statistics can provide valuable information, researchers who rely solely on **traditional data** collection methods are likely to fail to give real-time and accurate responses to critical travel behaviour issues. In this regard, perhaps advancements in new techniques derived from **Information and Technology** science help scientists and transportation planners gather better and new insight about consumer mobility choice. For example, the speed values can be track and record in a more accessible fashion nowadays and can be used in future versions of HERMES.

Additionally, the **model specification** established for this study did not address qualitative qualities associated with the transport modes, such as **comfort, safety, and reliability**. These behaviours, often called latent variables or unmeasurable variables, can be added to the model to include the subjective factors' influence on transport mode choice. Previous studies on the theme (CHEN; LI, 2017; JOHANSSON; HELDT, 2004; TEMME; PAULSSEN; DANNEWALD, 2008) can provide the modelling approach and coefficients values to be assessed in the logistic regression equations, and their validity can be tested in future studies.

Besides that, further studies on the dynamics of **official and shadow economies** are recommended once a better understanding of the problem has important methodological implications. For example, the size of the shadow economy was held constant at the level of the 2010 level. However, informality is expected to grow due to the COVID-19 pandemic, increasing the official data and real economy gap. In this regard, further studies could investigate in profound this socio-economic dynamic, providing GDP scenarios to deal with this uncertainty.

Finally, future studies can derive from this work to assess transportation demand in **other regions** not covered herein or to assess its integration, via **soft-link or hard-link**, with multi-sector analysis tools, like the BLUES and COFFEE models.

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Appendix A: Materials for reproduction

Software and materials are available to enable the reproduction and extension of the work in this thesis. The material for reproduction is at Zenodo Repository, a general-purpose open-access repository developed under the European OpenAIRE program and operated by CERN. Zenodo archives are Digital Object Identifiers (DOIs), are citable, and refer to the HERMES version applied in this thesis.

Analysis and plotting can be accessed at Tableau Public, free software that allows creating interactive data visualizations for the web. If the hyperlinks provided in this Appendix A are not working anymore, please, access Tableau Public and search by the author Camila Ludovique Callegari, then click on the Chapter of interest.

A.1 Core models and analysis

The R codes can be found here. Short note on files:

- These scripts use R language to model consumer travel behaviour. The codes allow estimating passenger demand and share across modals;
- Each region has its script;
- For the pathway "Domestic aviation in a post-pandemic world", there are two scripts available. The main distinction is the rationality embedded in the variable 'VOT', as presented in Chapter 5.

Analysis and plotting are available at Tableau Public. Chapter 3 can be accessed here, Chapter 4 are available here, and Chapter 5 here.

A.2 Data and software

The input data for each region can be found here. Short note on files:

- The excel files present the data used in this thesis, as well the main assumptions, data source and inputs for further processing;
- The blue tabs contain the worksheets that should be used as input in the RStudio, and the grey tabs detail each variable used in the model.

HERMES version uses RStudio software to estimate the parameters and the results of the set of equations. RStudio is free and open-source software for data science; more information about installing and using it is available here.

A.3 Presentations

Two presentations can be found here. Short note:

- The file named "Lecture_2021" contains detailed information about the thesis issues, such as the basic concepts of transport, how to build a utility function, multinomial logit model, axioms, and main results;
- The file named "Thesis_presentation" summarizes this main text.

Appendix B: Supplementary information about VOT

The purpose of this appendix is to present, in a semi-structured way, the literary review on the value of time, pointing to the main definitions and studies related to the topic.

THE VALUE OF TIME IS NOT A THING. IT IS AN OPPORTUNITY COST.

What is it?

- When using a resource for a specific purpose, the opportunity to use it for another purpose or alternative is lost.
- For Beuren (1993), this statement presupposes the existence of two or more viable alternatives.
- In addition, the choice of an alternative implies abandonment or sacrifice of another not chosen.
- In this way, the opportunity cost of the chosen alternative is the cost of the abandoned alternative that would provide you with greater satisfaction.
- To exemplify this situation, Joaquim (2011) comments that for travel, the time spent in traffic is one of the most critical components of the "price" that users pay.
- This lost time could be dedicated to other activities, such as increasing your income or leisure activities. The value of these other activities represents the opportunity cost of travel time (JOAQUIM, 2011).

What are the main applications?

- The value attributed to travel time is an essential indicator in studies for transport planning.

- Among its main applications, the economic evaluation of projects and studies involving modal choice predictions stand out.
- This indicator is obtained through research, generally using the declared preference technique, and can be understood as the monetary value individuals are willing to pay to travel time savings for a given purpose and under given circumstances (ARRUDA, 1998).
- Studying this indicator is important because travel time savings are an essential benefit in transportation projects (ORTÚZAR and WILLUMSE, 2011).
- Mackie et al. (2003) and Brito and Strambi (2007) state that in some transport projects, the savings in travel time can represent 80% of the social benefits.
- A critical issue is attributing a value to the time wasted due to congestion or, conversely, to the time saved due to projects that improved the transportation system.
- Several studies have presented methods for measuring the value of travel time or saving time.

How did the concept evolve?

- Becker (1965) thought the time allocation model was the beginning of the attempt to measure what the value of time would be for people and how they used this time in activities.
- In Becker's model (1965), the value of time is equal to the amount paid per unit of time worked.
- DeSerpa (1971) inserted time into Becker's utility function and restrictions that relate the goods produced to the times of activities, resulting in three different concepts of time value:
    - value of time as a resource;

- amount of time allocated to an activity; and
- value of time gained in an activity.

- Two decades have passed in which few theoretical studies of time value have emerged. However, there has been a continuous and intense search to measure empirically what the theoretical models pointed out.
- The figure below illustrates this evolution of the concept in France (ITF, 2020)

	1961/62	1964	1970	1974	1980	1986	1995/1998	2004/2005	2014
Value of time	one value, for cars, no differentiation	one value, for cars, no differentiation	one value, for cars, no differentiation	one value, for cars, no differentiation	one value, for cars, no differentiation	one value, for cars, no differentiation	values per transport mode	highly differentiated	highly differentiated
Evolution		comfort motorways (distance)				collective VoT +50 %	new modes	Parisian region, train class	coaches, no train class
								trip purpose for urban	trip purpose for interurban
								distance	comfort for urban transit
								intermediate times (waiting, transfer...)	reliability

How can we measure it?

- The discrete choice models emerged in the 1960s. Since then, numerous works have been carried out that present more sophisticated choice structures.
- The application of these models has been widely disseminated in the literature to portray the reality of product (goods and services) markets in the transport sector.
- The results of these models provide econometric parameters to assess: values of willingness to pay for the product (willingness-to-pay) and elasticity of demand.
- Discrete choice models have as their central postulate the sentence (ORTÚZAR and WILLUMSEN, 1994): “the probability of an individual

choosing a given option is a function of his socioeconomic characteristics and the relative attractiveness of the option, formed through knowledge about the characteristics of this option".

- The function representing the degree of preference of an alternative for a certain individual must be defined according to the values of the attributes of the alternatives and the individual socioeconomic characteristics.
- It is a way of thinking about an empirical model, based on the rational consumer and incorporating the paradigm of random utility proposed in THURSTONE (1927) and LUCE (1959), concomitant with the utility proposed by LANCASTER (1966).

Data source

- Early applications of discrete choice analysis used revealed preference (RP) data.
- RP data describes actual behaviour to predict aggregate market behaviour based on objectively measured variables (see BEN-AKIVA and LERMAN, 1985).
- Stated preference (SP) data (i.e., data based on behavioural intentions and responses to hypothetical choice situations) can also be used in the discrete choice analysis.

Units

- The time cost of travel or value of travel time (VOT) is estimated in the transportation literature either in monetary terms ($/hour) (SHIRES and de JONG 2009; ABRANTES and WARDMAN 2011), or as a multiplier of wage rate (ZAMPARINI and REGGIANI, 2007).

- For the current project, we are interested in the latter representation for two reasons:
    - Inter-temporal income elasticity of travel costs:
    - A rise in income over the forecast period will lead to changes in travel costs within any region. This is consistent with studies estimating inter-temporal income elasticities (ABRANTES and WARDMAN 2011).
    - Cross-sectional income elasticity:
    - Travel costs are expected to differ across regions because of differences in income levels (SHIRES and DE JONG 2009). Nearly all studies on travel time costs are based on developed countries, and the estimated travel costs ($/hour) are unlikely to be applicable for developing countries where average incomes are substantially lower.

The VOT in our study

- Basically, we need: a national and general approach to estimate the willingness to pay to save a travel time unit.
- Also, we are interested in VOT per mode.
- Our analysis assumes three different types of mode:
    - Low-speed choices (composed mainly by public transportation option);
    - Medium-speed choices (mainly, LDV); and
    - High-speed choices (Aircraft and bullets trains).
- Evolution in time, what to expect of VOT in the long-term given the new technologies and consumer preferences?

Literatura review

The literature review aimed to assess information about VOT in developed and developing economies. Another topic of interest is the possible evolution of VOT in time due to technological disruption. The following Tables will present the principal studies and findings.

VOT in developed economies

We analyzed seven studies that treat the topic of the value of time in their research. The Table - Studies conducted in developed economies summarizes the results - pointing to the main features of the studies, which include the model specification, the data used, the transportation attributes assumed and the primary outcomes. What follows are some highlighted information, tables and figures that contribute to our research.

Studies	Model used	Data year	Sample size	Location	Association with wage levels	Distance [Urban / inter-urban]	Trip purpose	Day type	Modes			Trip attributes [waiting]
									Private	Public	Airplane	
Mishra et. Al, 2013	MNL	2007	Meta-analyses conducted by Zamparini and Reggiani 2007	Developed and developing economies	yes	no	no	no	yes	yes	yes	yes
VOT in the study - The inclusion of time value costs into the costs of the passenger modes tends to counteract the effect of income on future demand growth, and it also tends to shift the modal composition towards high-speed modes (e.g. air, high-speed rail) as incomes rise.				**Main findings** - To apply VOT as a multiplier of wage rate due to Inter-temporal income elasticity of travel costs and Cross-sectional income elasticity. - Methodology to estimate VOT for developed and developing countries; -Shortcomings: travel liking, trip purpose, variability of wage rate, spacial variability.								
Zamparini and Reggiani, 2007	Meta-analysis	from 1959 to 2003	- collected 195 VTTS observations - the last 8 years more than half the studies	Europe compared with North-America and Oceania (Australia)	yes	no	yes	no	yes	yes	yes	no

<table>
<tr><th rowspan="2">Studies</th><th rowspan="2">Model used</th><th rowspan="2">Data year</th><th rowspan="2">Sample size</th><th rowspan="2">Location</th><th rowspan="2">Association with wage levels</th><th rowspan="2">Distance [Urban / inter-urban]</th><th rowspan="2">Trip purpose</th><th rowspan="2">Day type</th><th colspan="3">Modes</th><th rowspan="2">Trip attributes [waiting]</th></tr>
<tr><th>Private</th><th>Public</th><th>Airplane</th></tr>
<tr><td colspan="4">VOT in the study
- Summarize the results of very heterogeneous studies on VTTS</td><td colspan="9">Main findings
- Wide array of papers with heterogeneous results that apparently do not permit general and consistent conclusions to be drawn.
- The heterogeneity is related to the quantitative determination of VTTS and effects of several exogenous variables on VTTS.
- Provide conclusions that emphasize the role of the explanatory variables.
- The average VTTS value for the 90 studies considered is 82.54% of the hourly wage rate with a standard deviation of 67.05.</td></tr>
<tr><td>Wardman, Chintakayala, Gerard, 2016</td><td>Meta-analysis</td><td>fom 1963 to 2011</td><td>- 3109 monetary valuations
- from 389 European studies conducted</td><td>Europe</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td></tr>
<tr><td colspan="4">VOT in the study
- Explain how valuations vary across studies, including over time and between countries</td><td colspan="9">Main findings
- These implied monetary values serve as very useful benchmarks against which new evidence can be assessed and provide parameters and values for countries and contexts where there is no other such evidence.
- VOT average - car trip (52%), Bus (95%), Air (289%).
- The non-business values across modes and for free flow time are in the region of 30% to 50%.
- Multipliers for urban journeys is 0.96, with a corresponding figure of 0.84 for inter-urban journeys.</td></tr>
<tr><td>Shires and Jong, 2009</td><td>Meta-analysis</td><td>- not available
- wide range</td><td>- 77 studies were collected, producing 1299 values of travel time savings</td><td>- Cover 30 countries around the world, mainly OECD countries, with some emphasis on European countries.
- US, Japan, Russia, Chile</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td></tr>
</table>

<table>
<tr><th rowspan="2">Studies</th><th rowspan="2">Model used</th><th rowspan="2">Data year</th><th rowspan="2">Sample size</th><th rowspan="2">Location</th><th rowspan="2">Association with wage levels</th><th rowspan="2">Distance [Urban / inter-urban]</th><th rowspan="2">Trip purpose</th><th rowspan="2">Day type</th><th colspan="3">Modes</th><th rowspan="2">Trip attributes [waiting]</th></tr>
<tr><th>Private</th><th>Public</th><th>Airplane</th></tr>
<tr><td colspan="4">VOT in the study
- Present the results of a meta-analysis of studies on the VTTS, focusing on national passenger VTTS studies across the world.</td><td colspan="9">Main findings
- A meta-regression can be applied to countries where such studies are lacking.
- Income elasticity of the VTTS of about 0.5 for business travel, 0.7 for commuting and 0.5 for other passenger transport.
- Long distances lead to higher VTTS for commuting and other purposes.
- SP and SP–RP studies give somewhat lower passenger VTTS than the cost savings approach.
- Significant effects for the purpose (business, commuting) and mode (especially for air; less so for bus relative to car and train).
- Higher values of travel time savings in Southern and Eastern European countries, all other things (including GDP/ capita) being equal.</td></tr>
<tr><td>Kato, Tanishita, Matsuzaki, 2010</td><td>Meta-analysis</td><td>from 1979 to 2003</td><td>- 68 refereed papers, covering 261 VTTS.</td><td>Japan</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td></tr>
<tr><td colspan="4">VOT in the study
- Estimate the VTTS of Japanese travellers mainly with the discrete choice models. Including urban inter-urban transportation, modal choice, route choice, parking choice, etc.</td><td colspan="9">Main findings
- VTTS estimated with stated preference data is lower than the VTTS estimated with revealed preference data.
- VTTS of business travel is higher than the VTTSs of home-to-school, private, and leisure travels.
- VTTSs of access/egress time, wait time, and transfer time are higher than the VTTS of in-vehicle time.
- VTTS on weekdays is not significantly different from that on weekend days.
- Provide VTTS in yen/minute, at 2000-year price.</td></tr>
<tr><td>Becker et.al, 2018</td><td>Questionary</td><td>2018</td><td>2500 participants</td><td>China, US, Japan, Germany and France</td><td>yes</td><td>no</td><td>no</td><td>no</td><td>yes</td><td>no</td><td>no</td><td>no</td></tr>
</table>

Studies	Model used	Data year	Sample size	Location	Association with wage levels	Distance [Urban / inter-urban]	Trip purpose	Day type	Modes			Trip attributes [waiting]
									Private	Public	Airplane	
VOT in the study - Attribute a monetary value for time. This is how much the people surveyed in each country were prepared to pay on average for an hour of free time during the day.				**Main findings** - Assumed as nominal values of 2018. - 18 US dollars (around 16 euros). - Germans value their time most, with an average of 20 US dollars (18 euros). - The Japanese would pay 17 US dollars (15 euros) for an extra hour of time. - Americans would give 16 US dollars (14 euros).								

VOT in developing economies

We analyzed ten studies that treat the topic of the value of time in their research. The Table - Studies conducted in developing economies summarizes the results - pointing to the main features of the studies, which include the model specification, the data used, the transportation attributes assumed and the primary outcomes. What follows are some highlighted information, tables and figures that contribute to our research.

Studies	Model used	Data year	Sample size	Location	Association with wage levels	Distance [Urban / inter-urban]	Trip purpose	Day type	Modes			Trip attributes [waiting]
									Private	Public	Airplane	
Anchante, 2017	Discrete choice econometric model. MNL and Nested logit. Revealed Preference	from 2007 to 2012	Microdata Origin Destination Surveys conducted by the Metro company	São Paulo, Brazil	yes	no	yes	yes	yes	yes	no	no
VOT in the study - How travel time and travel cost, as well as the commuter characteristics, are associated with the probability of choosing a specific mode of transport. - VOT is the ratio between the time and cost coefficients.					**Main findings** - VOT was low compared to some studies and high compared to others, in a somewhat middle ground. - VOT for commute ranges from R$0.04 to R$2.47 in Nested Logit. - Nominal VOT is R$1.78 for 2007 and R$2.47 for 2012 in Conditional logit.							

Studies	Model used	Data year	Sample size	Location	Association with wage levels	Distance [Urban / inter-urban]	Trip purpose	Day type	Modes			Trip attributes [waiting]
									Private	Public	Airplane	
Lucinda et al., 2013	Discrete choice models (Multinomial and Mixed Logit)	2007	Origin-Destination survey carried out by São Paulo's subway company	São Paulo, Brazil	yes	no	yes	yes	yes	yes	no	no
VOT in the study - VOT is not the focus of the paper. - VOT derives from the time and cost coefficient estimated in the study, aiming to estimate the welfare and traffic effect of a congestion charge.				**Main findings** - The coefficient signs are roughly the same regardless of trip motivation; Work related trips are much less price elastic than education-related trips. - Driving and Taxi are the alternatives most sensitive to income, and Bus has a negative sensitivity to income. With an increase in income, the respondents expected to shift their choices from Bus to Driving. - Driving mode is positive with smaller household sizes, male gender and older individuals. - Trip cost coefficient = .0378 - Trip time coefficient = 0.0063 - VOT = 0.16								
Barcellos, 2014.	Multinomial and Mixed Logit, separated by two reasons for travel: work and study	2007	Origin-Destination survey carried out by São Paulo's subway company	São Paulo, Brazil	yes	no	yes	yes	yes	yes	no	no
VOT in the study - VOT is not the focus. - Assess policy of decentralization of a tax imposed on gasoline, CIDE, to finance urban public transport. - Estimate impact on demand, separate trips into work and study.				**Main findings** - Cross-subsidy policy provides a low displacement in the flow of transport modes. - The welfare analysis of the policy shows that the most favored are low-income individuals. - MNL, Cost coefficient = 0.01640, Time coefficient = 0.0084, VOT = 0.51. - Mixed Logit, Cost coefficient = 0.4014, Time coefficient = 0.0068, VOT = 0.016.								
Tainá and Chagas, 2016.	Mixed logit	2007	Origin-Destination survey carried out by São Paulo's subway company	São Paulo, Brazil	yes	no	yes	yes	yes	yes	no	no

Studies	Model used	Data year	Sample size	Location	Association with wage levels	Distance [Urban / inter-urban]	Trip purpose	Day type	Modes			Trip attributes [waiting]
									Private	Public	Airplane	
VOT in the study - Estimate the demand for different modes of transport and understand the variation from the implantation of an urban toll in the expanded city center for automobiles.				**Main findings** - The ratio of time to cost provides an estimate of the value of time implied in the model. - Compare that value with the average income (R$3,904.44) divided by 160 hours month. - VOT = 8.04, work = 8.58, study = 6.52. - VOT (R$ per hour) = 24.40, work = 24.90, study = 22.11. - The literature suggests attributing a value between 10% and 50% of the hourly wage for working time to non-work time. - World Bank suggest 30% of wage rate, what it is line with the findings.								
DaSilva, 2012.	Discrete choice model, MNL	2010	1564 answers, Questionary.	Ceará, Brazil	yes	no	no	no	no	yes	no	no
VOT in the study - Aimed to assess the value of travel time for illegal and regular transport.				**Main findings** - VOT ranged between 0.1 cents and 0.17 reais for every 10 minutes, therefore, depending on the model adopted, the conclusion may be significantly different. - The study assumed the value of 0.016 reais per minute (travel time value for the McFadden model). - Present the VOT as a function of wage level, the VOT increases as income growth.								
Mobility, accessibility and productivity: note on the economic value of travel time in the metropolitan region of São Paulo, 2015. Eduardo Haddad and Renato Vieira.	- Relationship between travel time, mobility and productivity by 3 models. - CGE model. - Travel demand model. - Productivity model.	2007	Origin-Destination survey carried out by São Paulo's subway company	São Paulo, Brazil	yes	no	no	no	no	no	no	no
VOT in the study - Introduce into the debate about the valuation of urban workers' travel time an alternative view on the integration of some of their transmission channels to the economy.				**Main findings** - Results given for São Paulo city, Metropolitan area of São Paulo, São Paulo state and Brazil. multipliers of the travel time value in relation to the current hourly wage (Brazil): Short term = 0.07, middle-term = 1.19, long-term = 4.04. - at R$ 2010 / hour (Brazil): Short term = 0.88, middle-term = 15.04, long-term = 51.01. - Wage per hour (R$2010) = 12.60.								

<table>
<tr><th rowspan="2">Studies</th><th rowspan="2">Model used</th><th rowspan="2">Data year</th><th rowspan="2">Sample size</th><th rowspan="2">Location</th><th rowspan="2">Association with wage levels</th><th rowspan="2">Distance [Urban / inter-urban]</th><th rowspan="2">Trip purpose</th><th rowspan="2">Day type</th><th colspan="3">Modes</th><th rowspan="2">Trip attributes [waiting]</th></tr>
<tr><th>Private</th><th>Public</th><th>Airplane</th></tr>
<tr><td>Haddad and Vieira, 2018.</td><td>CGE</td><td>2008</td><td>Origin-Destination survey carried out by São Paulo's subway company</td><td>São Paulo, Brazil</td><td>yes</td><td>no</td><td>no</td><td>no</td><td>yes</td><td>yes</td><td>no</td><td>no</td></tr>
<tr><td colspan="4">VOT in the study
- Evaluates the impacts of transportation investments/policies using a spatial computable general equilibrium (SCGE) model integrated to a travel demand model.
- understand the impacts of improvements to intra-city connectivity on household income distribution.</td><td colspan="8">Main findings
- Commute time range from 49 to 53 minutes in the scenarios.</td></tr>
<tr><td>Dalbem et al., 2010.</td><td>Bibliographic and documentary research on economic evaluation of projects</td><td>2010</td><td>not specified</td><td>England, Europe, Brazil</td><td>yes</td><td>yes</td><td>yes</td><td>no</td><td>yes</td><td>yes</td><td>no</td><td>yes</td></tr>
<tr><td colspan="4">VOT in the study
- It presents the state of the art and the best international practices in this area, as well as the criteria currently adopted in Brazil</td><td colspan="8">Main findings
- Time distinctions: t working time - assessed by the salary involved; t non-working time - valuation of leisure time at 22-39% of the value of working time in the Netherlands.
- Not all 14 European countries give different treatment to “non-working time”, but most do, assigning values between 10% to 50% of the “working time” value (average = 20%).
- The World Bank recommends to value the hour of non-work spent on transportation at 30% of the gross family income / hour for adults and 15% for children.
- Gwilliam (1997) recommends considering the country's average income when calculating the value of time.
- t long trips (> 50 km), by car - time value is more than twice the value on short trips.
- t long journeys (> 50 km), in other modes - the time value is 20% higher than the value on short trips.
- t the greater the time savings versus the total travel time, the greater the unit value of the time saved.
- t waiting time - value 1.3 to 2.0 times the unit value attributed to the time already in transit.
- Surveys in Chile and Sweden indicated even higher figures. The World Bank recommends that waiting times be valued at 1.5 times the amount of time already in transit.
- The World Bank recommends correcting the value of time by varying GDP, unless there are more detailed studies regarding the marginal utility of time.</td></tr>
</table>

Studies	Model used	Data year	Sample size	Location	Association with wage levels	Distance [Urban / inter-urban]	Trip purpose	Day type	Modes			Trip attributes [waiting]
									Private	Public	Airplane	
Santos, 2012.	- Review	- Secondary data is used, mainly RP	10 studies analyzed	Brazil, mainly SP, RGS, Ceará e Bahia.	yes	yes	yes	no	yes	yes	no	no
VOT in the study - Analyzes the impacts of using the value of time in evaluating projects, using five calculation systems, in which the value of travel time is obtained using different formulas. - Performs analysis and comparison of the travel time values calculated in some Brazilian studies, updating these values to January 1, 2012.				**Main findings** - Mode R$2012/min - LDV general 0.14 - LDV work (average) 0.3 - LDV work (lowest) 0.11 - LDV work (highest) 0.41 - LDV leisure 0.12 - LDV others 0.34 - Long-distance 0.32 - Short distance 0.37 - PUB average 0.06 - PUB lowest 0.02 - PUB highest 0.15								
Souza and Schreiner, 2017	- Discrete choice, MNL	- 2 household surveys of origin and destination: Porto Alegre (2004) and São Paulo (2007).	- Two other data sources (Fortaleza and Salvador) were also initially considered in the analyzes, however, presents a low variability.	PA, SP and others	yes	no	no	no	yes	yes	no	no
VOT in the study - Discuss the use of revealed preference data obtained through traditional household surveys for the calibration of utility functions that make it possible to estimate the VT.				**Main findings** - SP (2007) - VT (R$ 2017/hour) = 5.92. - PA (2004) - VT (R$ 2017/hour) = 9.07. - Other cities: - PUB = 1.69 - 12.68 (R$ 2017/hour). - LDV = 9.30 - 11.83 (R$ 2017/hour) .								

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Appendix C: Tabulated outputs

C.1 BAU main outputs

Table C.1 – 1: BAU main outputs

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1970	BR															
1971	BR	381	1084	54	4E+10	1E+11	5E+09	0.98	1.05	1.33	0.0	0.1	0.0	0.25	0.71	0.04
1972	BR	464	1131	62	5E+10	1E+11	6E+09	0.98	1.05	1.33	0.0	0.1	0.0	0.28	0.68	0.04
1973	BR	568	1213	76	6E+10	1E+11	8E+09	0.98	1.05	1.33	0.0	0.2	0.0	0.31	0.65	0.04
1974	BR	674	1300	87	7E+10	1E+11	9E+09	0.98	1.05	1.33	0.1	0.2	0.0	0.33	0.63	0.04
1975	BR	776	1387	96	8E+10	1E+11	1E+10	0.98	1.05	1.33	0.1	0.2	0.0	0.34	0.61	0.04
1976	BR	889	1537	102	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.1	0.2	0.0	0.35	0.61	0.04
1977	BR	982	1691	104	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.1	0.2	0.0	0.35	0.61	0.04
1978	BR	1071	1850	111	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.1	0.2	0.0	0.35	0.61	0.04
1979	BR	1193	2009	124	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.36	0.60	0.04
1980	BR	1341	2215	130	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.36	0.60	0.04
1981	BR	1387	2292	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.36	0.60	0.04
1982	BR	1435	2364	143	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.36	0.60	0.04
1983	BR	1484	2376	135	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.37	0.59	0.03
1984	BR	1564	2431	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.38	0.59	0.03
1985	BR	1674	2535	150	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.38	0.58	0.03
1986	BR	1731	2567	185	2E+11	4E+11	3E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.39	0.57	0.04
1987	BR	1799	2696	179	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.38	0.58	0.04
1988	BR	1806	2794	186	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.1	0.3	0.0	0.38	0.58	0.04
1989	BR	1820	2885	212	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.37	0.59	0.04

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1990	BR	1805	2876	206	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.1	0.4	0.0	0.37	0.59	0.04
1991	BR	1764	2935	200	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.1	0.4	0.0	0.36	0.60	0.04
1992	BR	1706	2969	196	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.1	0.4	0.0	0.35	0.61	0.04
1993	BR	1729	3015	206	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.1	0.4	0.0	0.35	0.61	0.04
1994	BR	1812	3055	226	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.36	0.60	0.04
1995	BR	1918	3098	246	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.36	0.59	0.05
1996	BR	2017	3117	254	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.37	0.58	0.05
1997	BR	2146	3114	271	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.39	0.56	0.05
1998	BR	2234	3085	300	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.40	0.55	0.05
1999	BR	2297	3058	228	4E+11	5E+11	4E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.41	0.55	0.04
2000	BR	2358	3021	281	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.42	0.53	0.05
2001	BR	2420	2994	282	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.42	0.53	0.05
2002	BR	2515	3001	277	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.43	0.52	0.05
2003	BR	2599	3008	259	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.44	0.51	0.04
2004	BR	2724	3057	266	5E+11	6E+11	5E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.45	0.51	0.04
2005	BR	2825	3051	318	5E+11	6E+11	6E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.46	0.49	0.05
2006	BR	2974	3113	307	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.2	0.4	0.0	0.47	0.49	0.05
2007	BR	3167	3227	318	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.3	0.4	0.0	0.47	0.48	0.05
2008	BR	3380	3342	352	7E+11	6E+11	7E+10	0.98	1.05	1.33	0.3	0.4	0.0	0.48	0.47	0.05
2009	BR	3554	3376	389	7E+11	7E+11	8E+10	0.98	1.05	1.33	0.3	0.4	0.0	0.49	0.46	0.05
2010	BR	3843	3509	468	8E+11	7E+11	9E+10	0.98	1.05	1.33	0.3	0.4	0.0	0.49	0.45	0.06
2011	BR	4052	3598	498	8E+11	7E+11	1E+11	0.98	1.05	1.33	0.3	0.4	0.0	0.50	0.44	0.06
2012	BR	4238	3672	524	9E+11	7E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.50	0.44	0.06
2013	BR	4401	3733	547	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.51	0.43	0.06
2014	BR	4541	3782	568	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.51	0.43	0.06
2015	BR	4659	3820	586	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.51	0.42	0.06
2016	BR	4748	3842	600	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.52	0.42	0.07
2017	BR	4813	3854	612	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.52	0.42	0.07

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2018	BR	4857	3855	621	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.52	0.41	0.07
2019	BR	4881	3848	627	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.52	0.41	0.07
2020	BR	4888	3833	631	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.52	0.41	0.07
2021	BR	4970	3872	644	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.52	0.41	0.07
2022	BR	5080	3927	659	1E+12	9E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.53	0.41	0.07
2023	BR	5215	3996	676	1E+12	9E+11	1E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.53	0.40	0.07
2024	BR	5372	4078	695	1E+12	9E+11	2E+11	0.98	1.05	1.33	0.4	0.5	0.0	0.53	0.40	0.07
2025	BR	5550	4172	716	1E+12	9E+11	2E+11	0.98	1.05	1.33	0.5	0.5	0.0	0.53	0.40	0.07
2026	BR	5742	4272	739	1E+12	1E+12	2E+11	0.98	1.05	1.33	0.5	0.5	0.0	0.53	0.40	0.07
2027	BR	5950	4381	763	1E+12	1E+12	2E+11	0.98	1.05	1.33	0.5	0.5	0.0	0.54	0.39	0.07
2028	BR	6173	4498	788	1E+12	1E+12	2E+11	0.98	1.05	1.33	0.5	0.6	0.0	0.54	0.39	0.07
2029	BR	6332	4532	811	1E+12	1E+12	2E+11	1.05	1.13	1.43	0.5	0.6	0.0	0.54	0.39	0.07
2030	BR	6411	4476	833	1E+12	1E+12	2E+11	1.14	1.22	1.54	0.5	0.6	0.0	0.55	0.38	0.07
2031	BR	6494	4419	856	2E+12	1E+12	2E+11	1.16	1.24	1.57	0.5	0.6	0.0	0.55	0.38	0.07
2032	BR	6578	4360	880	2E+12	1E+12	2E+11	1.18	1.26	1.60	0.5	0.5	0.0	0.56	0.37	0.07
2033	BR	6662	4300	904	2E+12	1E+12	2E+11	1.20	1.29	1.63	0.6	0.5	0.0	0.56	0.36	0.08
2034	BR	6748	4242	929	2E+12	1E+12	2E+11	1.22	1.31	1.66	0.6	0.5	0.0	0.57	0.36	0.08
2035	BR	6833	4183	955	2E+12	1E+12	2E+11	1.24	1.33	1.69	0.6	0.5	0.0	0.57	0.35	0.08
2036	BR	6917	4123	981	2E+12	1E+12	2E+11	1.26	1.35	1.71	0.6	0.5	0.0	0.58	0.34	0.08
2037	BR	7003	4066	1008	2E+12	1E+12	2E+11	1.28	1.37	1.74	0.6	0.5	0.0	0.58	0.34	0.08
2038	BR	7085	4007	1035	2E+12	1E+12	2E+11	1.30	1.39	1.77	0.6	0.5	0.0	0.58	0.33	0.09
2039	BR	7168	3949	1063	2E+12	1E+12	3E+11	1.32	1.41	1.79	0.6	0.5	0.0	0.59	0.32	0.09
2040	BR	7248	3892	1090	2E+12	9E+11	3E+11	1.34	1.43	1.82	0.6	0.5	0.0	0.59	0.32	0.09
2041	BR	7331	3835	1120	2E+12	9E+11	3E+11	1.36	1.46	1.85	0.6	0.5	0.0	0.60	0.31	0.09
2042	BR	7413	3777	1149	2E+12	9E+11	3E+11	1.38	1.48	1.88	0.6	0.5	0.0	0.60	0.31	0.09
2043	BR	7495	3721	1180	2E+12	9E+11	3E+11	1.40	1.50	1.90	0.6	0.5	0.0	0.60	0.30	0.10
2044	BR	7574	3664	1211	2E+12	9E+11	3E+11	1.42	1.52	1.93	0.6	0.5	0.0	0.61	0.29	0.10
2045	BR	7653	3609	1242	2E+12	9E+11	3E+11	1.44	1.54	1.95	0.6	0.4	0.0	0.61	0.29	0.10

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2046	BR	7731	3551	1275	2E+12	9E+11	3E+11	1.46	1.57	1.99	0.6	0.4	0.0	0.62	0.28	0.10
2047	BR	7812	3496	1308	2E+12	9E+11	3E+11	1.48	1.59	2.01	0.6	0.4	0.0	0.62	0.28	0.10
2048	BR	7889	3440	1342	2E+12	9E+11	3E+11	1.50	1.61	2.04	0.7	0.4	0.0	0.62	0.27	0.11
2049	BR	7965	3385	1377	2E+12	8E+11	3E+11	1.52	1.63	2.07	0.7	0.4	0.0	0.63	0.27	0.11
2050	BR	8041	3331	1412	2E+12	8E+11	4E+11	1.54	1.65	2.09	0.7	0.4	0.0	0.63	0.26	0.11
1960	US															
1961	US	12997	680	276	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.8	0.1	0.0	0.93	0.05	0.02
1962	US	13387	679	297	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.8	0.1	0.0	0.93	0.05	0.02
1963	US	13772	648	332	3E+12	1E+11	6E+10	0.82	0.86	1.33	0.8	0.1	0.0	0.93	0.04	0.02
1964	US	14242	642	376	3E+12	1E+11	7E+10	0.82	0.86	1.33	0.8	0.1	0.0	0.93	0.04	0.02
1965	US	14698	633	439	3E+12	1E+11	8E+10	0.82	0.86	1.33	0.9	0.1	0.0	0.93	0.04	0.03
1966	US	15237	617	501	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.9	0.1	0.0	0.93	0.04	0.03
1967	US	15465	596	612	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.9	0.1	0.0	0.93	0.04	0.04
1968	US	15920	563	700	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.9	0.1	0.0	0.93	0.03	0.04
1969	US	16250	545	811	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.9	0.1	0.0	0.92	0.03	0.05
1970	US	16536	515	812	3E+12	1E+11	2E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.93	0.03	0.05
1971	US	17016	479	817	3E+12	1E+11	2E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.93	0.03	0.04
1972	US	17521	461	891	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.93	0.02	0.05
1973	US	17967	480	962	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.93	0.02	0.05
1974	US	17233	510	995	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.92	0.03	0.05
1975	US	17322	485	1001	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.92	0.03	0.05
1976	US	17613	482	1089	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.92	0.03	0.06
1977	US	17778	493	1164	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.91	0.03	0.06
1978	US	17920	494	1335	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.91	0.03	0.07
1979	US	17010	516	1502	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.89	0.03	0.08
1980	US	16761	517	1446	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.90	0.03	0.08
1981	US	16803	502	1426	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.90	0.03	0.08
1982	US	16712	479	1481	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.90	0.03	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1983	US	17057	474	1596	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.89	0.02	0.08
1984	US	17514	481	1712	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.89	0.02	0.09
1985	US	17702	474	1882	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.0	0.1	0.0	0.88	0.02	0.09
1986	US	17973	475	2083	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.1	0.1	0.0	0.88	0.02	0.10
1987	US	18187	461	2179	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.1	0.1	0.0	0.87	0.02	0.10
1988	US	18601	454	2154	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.1	0.1	0.0	0.88	0.02	0.10
1989	US	18916	462	2131	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.1	0.1	0.0	0.88	0.02	0.10
1990	US	19078	450	2179	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.1	0.1	0.0	0.88	0.02	0.10
1991	US	18827	443	2101	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.1	0.1	0.0	0.88	0.02	0.10
1992	US	19280	433	2185	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.1	0.1	0.0	0.88	0.02	0.10
1993	US	19641	440	2227	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.1	0.1	0.0	0.88	0.02	0.10
1994	US	19956	437	2361	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.2	0.1	0.0	0.88	0.02	0.10
1995	US	20108	440	2420	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.2	0.1	0.0	0.88	0.02	0.11
1996	US	20251	431	2565	5E+12	1E+11	7E+11	0.82	0.86	1.33	1.2	0.1	0.0	0.87	0.02	0.11
1997	US	20487	430	2618	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.2	0.1	0.0	0.87	0.02	0.11
1998	US	20813	438	2652	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.2	0.1	0.0	0.87	0.02	0.11
1999	US	21055	444	2769	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.2	0.1	0.0	0.87	0.02	0.11
2000	US	21196	451	2883	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.2	0.1	0.0	0.86	0.02	0.12
2001	US	21523	453	2709	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.2	0.1	0.0	0.87	0.02	0.11
2002	US	21895	438	2637	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.3	0.1	0.0	0.88	0.02	0.11
2003	US	21997	428	2782	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.3	0.1	0.0	0.87	0.02	0.11
2004	US	22095	420	3000	6E+12	1E+11	9E+11	0.82	0.86	1.33	1.3	0.1	0.0	0.87	0.02	0.12
2005	US	22132	416	3125	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.3	0.1	0.0	0.86	0.02	0.12
2006	US	22237	426	3146	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.3	0.1	0.0	0.86	0.02	0.12
2007	US	22274	441	3239	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.3	0.1	0.0	0.86	0.02	0.12
2008	US	21595	451	3080	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.3	0.1	0.0	0.86	0.02	0.12
2009	US	21946	446	2899	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.3	0.1	0.0	0.87	0.02	0.11
2010	US	21615	426	2943	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.3	0.1	0.0	0.87	0.02	0.12

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2011	US	22019	425	3045	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.3	0.1	0.0	0.86	0.02	0.12
2012	US	22366	424	3136	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.3	0.1	0.0	0.86	0.02	0.12
2013	US	22666	422	3218	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.3	0.1	0.0	0.86	0.02	0.12
2014	US	22788	414	3286	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.3	0.1	0.0	0.86	0.02	0.12
2015	US	22793	405	3334	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.3	0.1	0.0	0.86	0.02	0.13
2016	US	22792	397	3377	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.3	0.0	0.0	0.86	0.01	0.13
2017	US	22785	390	3417	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.3	0.0	0.0	0.86	0.01	0.13
2018	US	22774	383	3452	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.3	0.0	0.0	0.86	0.01	0.13
2019	US	22761	377	3485	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.3	0.0	0.0	0.85	0.01	0.13
2020	US	22840	373	3531	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.3	0.0	0.0	0.85	0.01	0.13
2021	US	22847	366	3571	8E+12	1E+11	1E+12	0.85	0.89	1.38	1.3	0.0	0.0	0.85	0.01	0.13
2022	US	22851	359	3610	8E+12	1E+11	1E+12	0.85	0.89	1.38	1.3	0.0	0.0	0.85	0.01	0.13
2023	US	22858	353	3649	8E+12	1E+11	1E+12	0.86	0.90	1.39	1.3	0.0	0.0	0.85	0.01	0.14
2024	US	22869	347	3686	8E+12	1E+11	1E+12	0.86	0.90	1.39	1.3	0.0	0.0	0.85	0.01	0.14
2025	US	22876	341	3722	8E+12	1E+11	1E+12	0.86	0.90	1.40	1.3	0.0	0.0	0.85	0.01	0.14
2026	US	22884	335	3757	8E+12	1E+11	1E+12	0.86	0.90	1.40	1.3	0.0	0.0	0.85	0.01	0.14
2027	US	22892	329	3791	8E+12	1E+11	1E+12	0.87	0.91	1.40	1.3	0.0	0.0	0.85	0.01	0.14
2028	US	22899	324	3825	8E+12	1E+11	1E+12	0.87	0.91	1.41	1.3	0.0	0.0	0.85	0.01	0.14
2029	US	22905	318	3857	8E+12	1E+11	1E+12	0.87	0.91	1.41	1.3	0.0	0.0	0.85	0.01	0.14
2030	US	22906	313	3888	8E+12	1E+11	1E+12	0.87	0.92	1.42	1.3	0.0	0.0	0.85	0.01	0.14
2031	US	22914	308	3919	8E+12	1E+11	1E+12	0.88	0.92	1.42	1.3	0.0	0.0	0.84	0.01	0.14
2032	US	22918	303	3949	8E+12	1E+11	1E+12	0.88	0.92	1.42	1.3	0.0	0.0	0.84	0.01	0.15
2033	US	22928	298	3978	8E+12	1E+11	1E+12	0.88	0.92	1.43	1.3	0.0	0.0	0.84	0.01	0.15
2034	US	22933	294	4007	8E+12	1E+11	1E+12	0.88	0.93	1.43	1.3	0.0	0.0	0.84	0.01	0.15
2035	US	22938	290	4034	9E+12	1E+11	2E+12	0.88	0.93	1.43	1.3	0.0	0.0	0.84	0.01	0.15
2036	US	22944	286	4060	9E+12	1E+11	2E+12	0.88	0.93	1.43	1.3	0.0	0.0	0.84	0.01	0.15
2037	US	22951	282	4085	9E+12	1E+11	2E+12	0.89	0.93	1.44	1.3	0.0	0.0	0.84	0.01	0.15
2038	US	22948	278	4109	9E+12	1E+11	2E+12	0.89	0.93	1.44	1.3	0.0	0.0	0.84	0.01	0.15

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2039	US	22956	274	4134	9E+12	1E+11	2E+12	0.89	0.93	1.44	1.3	0.0	0.0	0.84	0.01	0.15
2040	US	22963	270	4159	9E+12	1E+11	2E+12	0.89	0.94	1.45	1.3	0.0	0.0	0.84	0.01	0.15
2041	US	22963	267	4182	9E+12	1E+11	2E+12	0.90	0.94	1.45	1.3	0.0	0.0	0.84	0.01	0.15
2042	US	22965	263	4206	9E+12	1E+11	2E+12	0.90	0.94	1.46	1.3	0.0	0.0	0.84	0.01	0.15
2043	US	22968	260	4229	9E+12	1E+11	2E+12	0.90	0.94	1.46	1.3	0.0	0.0	0.84	0.01	0.15
2044	US	22972	257	4252	9E+12	1E+11	2E+12	0.90	0.94	1.46	1.3	0.0	0.0	0.84	0.01	0.15
2045	US	22976	253	4274	9E+12	1E+11	2E+12	0.90	0.95	1.46	1.3	0.0	0.0	0.84	0.01	0.16
2046	US	22977	250	4295	9E+12	1E+11	2E+12	0.90	0.95	1.47	1.3	0.0	0.0	0.83	0.01	0.16
2047	US	22986	248	4316	9E+12	1E+11	2E+12	0.90	0.95	1.47	1.3	0.0	0.0	0.83	0.01	0.16
2048	US	22990	245	4337	9E+12	1E+11	2E+12	0.91	0.95	1.47	1.3	0.0	0.0	0.83	0.01	0.16
2049	US	22992	242	4357	9E+12	1E+11	2E+12	0.91	0.95	1.47	1.3	0.0	0.0	0.83	0.01	0.16
2050	US	22995	239	4377	9E+12	1E+11	2E+12	0.91	0.95	1.48	1.3	0.0	0.0	0.83	0.01	0.16
1960	EU															
1961	EU	1266	864	61	5E+11	4E+11	3E+10	0.82	0.86	1.33	0.1	0.1	0.0	0.58	0.39	0.03
1962	EU	1375	917	82	6E+11	4E+11	3E+10	0.82	0.86	1.33	0.1	0.1	0.0	0.58	0.39	0.03
1963	EU	1531	950	85	6E+11	4E+11	4E+10	0.82	0.86	1.33	0.1	0.1	0.0	0.60	0.37	0.03
1964	EU	1737	944	88	7E+11	4E+11	4E+10	0.82	0.86	1.33	0.1	0.1	0.0	0.63	0.34	0.03
1965	EU	1981	905	93	8E+11	4E+11	4E+10	0.82	0.86	1.33	0.1	0.1	0.0	0.67	0.30	0.03
1966	EU	2111	959	123	9E+11	4E+11	5E+10	0.82	0.86	1.33	0.1	0.1	0.0	0.66	0.30	0.04
1967	EU	2415	890	118	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.1	0.1	0.0	0.71	0.26	0.03
1968	EU	2587	969	117	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.2	0.1	0.0	0.70	0.26	0.03
1969	EU	2784	1001	153	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.2	0.1	0.0	0.71	0.25	0.04
1970	EU	3074	967	164	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.2	0.1	0.0	0.73	0.23	0.04
1971	EU	3298	979	173	1E+12	4E+11	8E+10	0.82	0.86	1.33	0.2	0.1	0.0	0.74	0.22	0.04
1972	EU	3395	1076	239	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.2	0.1	0.0	0.72	0.23	0.05
1973	EU	3611	1062	269	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.2	0.1	0.0	0.73	0.21	0.05
1974	EU	3804	1112	258	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.2	0.1	0.0	0.74	0.21	0.05
1975	EU	3853	1178	293	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.2	0.1	0.0	0.72	0.22	0.06

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1976	EU	4020	1232	317	2E+12	6E+11	1E+11	0.82	0.86	1.33	0.2	0.1	0.0	0.72	0.22	0.06
1977	EU	4232	1221	354	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.3	0.1	0.0	0.73	0.21	0.06
1978	EU	4371	1230	371	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.3	0.1	0.0	0.73	0.21	0.06
1979	EU	4518	1266	430	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.3	0.1	0.0	0.73	0.20	0.07
1980	EU	4753	1258	420	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.3	0.1	0.0	0.74	0.20	0.07
1981	EU	4811	1428	446	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.3	0.2	0.0	0.72	0.21	0.07
1982	EU	4998	1480	431	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.3	0.2	0.0	0.72	0.21	0.06
1983	EU	5147	1519	451	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.3	0.2	0.0	0.72	0.21	0.06
1984	EU	5335	1536	457	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.3	0.2	0.0	0.73	0.21	0.06
1985	EU	5452	1694	498	3E+12	8E+11	2E+11	0.82	0.86	1.33	0.3	0.2	0.0	0.71	0.22	0.07
1986	EU	5757	1558	505	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.74	0.20	0.06
1987	EU	5929	1574	558	3E+12	7E+11	3E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.74	0.20	0.07
1988	EU	6025	1730	582	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.72	0.21	0.07
1989	EU	6256	1745	613	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.73	0.20	0.07
1990	EU	6432	1771	698	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.72	0.20	0.08
1991	EU	6679	1779	696	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.73	0.19	0.08
1992	EU	6879	1777	690	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.74	0.19	0.07
1993	EU	7050	1768	682	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.74	0.19	0.07
1994	EU	7263	1772	679	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.4	0.2	0.0	0.75	0.18	0.07
1995	EU	7490	1780	677	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.75	0.18	0.07
1996	EU	7543	1738	741	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.75	0.17	0.07
1997	EU	7673	1733	792	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.75	0.17	0.08
1998	EU	7854	1730	837	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.75	0.17	0.08
1999	EU	8053	1740	873	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.75	0.16	0.08
2000	EU	8187	1819	952	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.75	0.17	0.09
2001	EU	8418	1826	963	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.75	0.16	0.09
2002	EU	8651	1806	970	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.76	0.16	0.08
2003	EU	8795	1822	1018	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.76	0.16	0.09

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2004	EU	8959	1853	1082	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.5	0.2	0.0	0.75	0.16	0.09
2005	EU	9043	1896	1173	4E+12	9E+11	6E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.16	0.10
2006	EU	9217	1926	1240	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.74	0.16	0.10
2007	EU	9360	1972	1302	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.74	0.16	0.10
2008	EU	9413	2037	1290	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.74	0.16	0.10
2009	EU	9504	1949	1215	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.10
2010	EU	9648	1977	1294	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.10
2011	EU	9763	1994	1289	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.10
2012	EU	9871	2009	1286	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.10
2013	EU	9974	2023	1284	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.10
2014	EU	10072	2037	1283	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.10
2015	EU	10165	2050	1282	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.10
2016	EU	10207	2054	1278	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.09
2017	EU	10237	2057	1273	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.75	0.15	0.09
2018	EU	10257	2059	1269	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.76	0.15	0.09
2019	EU	10268	2061	1265	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.76	0.15	0.09
2020	EU	10271	2061	1261	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.76	0.15	0.09
2021	EU	10398	2084	1272	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.76	0.15	0.09
2022	EU	10537	2106	1283	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.6	0.2	0.0	0.76	0.15	0.09
2023	EU	10686	2129	1295	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.7	0.2	0.0	0.76	0.15	0.09
2024	EU	10845	2151	1307	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.7	0.2	0.0	0.76	0.15	0.09
2025	EU	11011	2174	1319	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.7	0.2	0.0	0.76	0.15	0.09
2026	EU	11182	2196	1332	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.7	0.2	0.0	0.76	0.15	0.09
2027	EU	11359	2218	1345	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.7	0.2	0.0	0.76	0.15	0.09
2028	EU	11541	2241	1358	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.7	0.2	0.0	0.76	0.15	0.09
2029	EU	11726	2263	1372	6E+12	1E+12	8E+11	0.82	0.86	1.33	0.7	0.2	0.0	0.76	0.15	0.09
2030	EU	11915	2285	1386	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.7	0.3	0.0	0.76	0.15	0.09
2031	EU	12114	2308	1400	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.7	0.3	0.0	0.77	0.15	0.09

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2032	EU	12317	2332	1415	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.7	0.3	0.0	0.77	0.15	0.09
2033	EU	12522	2355	1430	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.8	0.3	0.0	0.77	0.14	0.09
2034	EU	12728	2378	1445	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.8	0.3	0.0	0.77	0.14	0.09
2035	EU	12936	2401	1460	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.8	0.3	0.0	0.77	0.14	0.09
2036	EU	13144	2424	1475	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.8	0.3	0.0	0.77	0.14	0.09
2037	EU	13353	2447	1490	8E+12	1E+12	8E+11	0.82	0.86	1.33	0.8	0.3	0.0	0.77	0.14	0.09
2038	EU	13461	2433	1503	8E+12	1E+12	8E+11	0.85	0.90	1.38	0.8	0.3	0.0	0.77	0.14	0.09
2039	EU	13515	2402	1515	8E+12	1E+12	9E+11	0.87	0.92	1.42	0.8	0.3	0.0	0.78	0.14	0.09
2040	EU	13568	2372	1526	8E+12	1E+12	9E+11	0.88	0.92	1.42	0.8	0.3	0.0	0.78	0.14	0.09
2041	EU	13620	2343	1537	8E+12	1E+12	9E+11	0.88	0.93	1.43	0.8	0.3	0.0	0.78	0.13	0.09
2042	EU	13667	2315	1547	8E+12	1E+12	9E+11	0.89	0.93	1.44	0.8	0.3	0.0	0.78	0.13	0.09
2043	EU	13714	2288	1557	8E+12	1E+12	9E+11	0.89	0.93	1.45	0.8	0.3	0.0	0.78	0.13	0.09
2044	EU	13759	2263	1566	8E+12	1E+12	9E+11	0.90	0.94	1.45	0.8	0.2	0.0	0.78	0.13	0.09
2045	EU	13801	2238	1575	8E+12	1E+12	9E+11	0.90	0.94	1.46	0.8	0.2	0.0	0.78	0.13	0.09
2046	EU	13844	2215	1583	8E+12	1E+12	9E+11	0.90	0.95	1.46	0.8	0.2	0.0	0.78	0.13	0.09
2047	EU	13882	2193	1591	8E+12	1E+12	9E+11	0.91	0.95	1.47	0.8	0.2	0.0	0.79	0.12	0.09
2048	EU	13919	2171	1599	8E+12	1E+12	9E+11	0.91	0.95	1.48	0.8	0.2	0.0	0.79	0.12	0.09
2049	EU	13954	2151	1606	8E+12	1E+12	9E+11	0.91	0.96	1.48	0.8	0.2	0.0	0.79	0.12	0.09
2050	EU	13988	2131	1614	8E+12	1E+12	9E+11	0.92	0.96	1.49	0.9	0.2	0.0	0.79	0.12	0.09
1960	JP															
1961	JP	1854	3253	244	2E+11	3E+11	2E+10	0.7	0.77	1.11	0.1	0.4	0.0	0.35	0.61	0.05
1962	JP	1910	3284	268	2E+11	3E+11	3E+10	0.7	0.77	1.11	0.1	0.4	0.0	0.35	0.60	0.05
1963	JP	1966	3316	291	2E+11	3E+11	3E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.35	0.59	0.05
1964	JP	2026	3356	315	2E+11	3E+11	3E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.36	0.59	0.06
1965	JP	2071	3375	336	2E+11	3E+11	3E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.36	0.58	0.06
1966	JP	2128	3414	359	2E+11	3E+11	4E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.36	0.58	0.06
1967	JP	2185	3454	381	2E+11	3E+11	4E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.36	0.57	0.06
1968	JP	2241	3493	403	2E+11	4E+11	4E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.37	0.57	0.07

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1969	JP	2291	3523	423	2E+11	4E+11	4E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.37	0.56	0.07
1970	JP	2331	3540	442	2E+11	4E+11	5E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.37	0.56	0.07
1971	JP	2358	3538	457	2E+11	4E+11	5E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.37	0.56	0.07
1972	JP	2406	3569	477	3E+11	4E+11	5E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.37	0.55	0.07
1973	JP	2460	3610	497	3E+11	4E+11	5E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.37	0.55	0.08
1974	JP	2497	3627	514	3E+11	4E+11	6E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.38	0.55	0.08
1975	JP	2552	3670	534	3E+11	4E+11	6E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.38	0.54	0.08
1976	JP	2612	3722	555	3E+11	4E+11	6E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.38	0.54	0.08
1977	JP	2678	3782	578	3E+11	4E+11	7E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.38	0.54	0.08
1978	JP	2750	3849	602	3E+11	4E+11	7E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.38	0.53	0.08
1979	JP	2832	3931	628	3E+11	5E+11	7E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.38	0.53	0.08
1980	JP	2902	3997	651	3E+11	5E+11	8E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.38	0.53	0.09
1981	JP	3026	4008	682	4E+11	5E+11	8E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.39	0.52	0.09
1982	JP	3148	4015	713	4E+11	5E+11	8E+10	0.7	0.77	1.11	0.2	0.4	0.0	0.40	0.51	0.09
1983	JP	3265	4017	743	4E+11	5E+11	9E+10	0.7	0.77	1.11	0.3	0.4	0.0	0.41	0.50	0.09
1984	JP	3388	4023	774	4E+11	5E+11	9E+10	0.7	0.77	1.11	0.3	0.4	0.0	0.41	0.49	0.09
1985	JP	3518	4038	806	4E+11	5E+11	1E+11	0.7	0.77	1.11	0.3	0.4	0.0	0.42	0.48	0.10
1986	JP	3701	3973	834	4E+11	5E+11	1E+11	0.7	0.77	1.11	0.3	0.4	0.0	0.43	0.47	0.10
1987	JP	3881	3927	862	5E+11	5E+11	1E+11	0.7	0.77	1.11	0.3	0.4	0.0	0.45	0.45	0.10
1988	JP	4067	3902	893	5E+11	5E+11	1E+11	0.7	0.77	1.11	0.3	0.4	0.0	0.46	0.44	0.10
1989	JP	4234	3872	920	5E+11	5E+11	1E+11	0.7	0.77	1.11	0.3	0.4	0.0	0.47	0.43	0.10
1990	JP	4395	3848	946	5E+11	5E+11	1E+11	0.7	0.77	1.11	0.3	0.4	0.0	0.48	0.42	0.10
1991	JP	4519	3835	962	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.49	0.41	0.10
1992	JP	4629	3812	975	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.49	0.40	0.10
1993	JP	4736	3787	987	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.50	0.40	0.10
1994	JP	4845	3765	1000	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.50	0.39	0.10
1995	JP	4960	3749	1014	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.51	0.39	0.10
1996	JP	5085	3718	1039	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.52	0.38	0.11

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1997	JP	5201	3680	1062	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.52	0.37	0.11
1998	JP	5300	3631	1081	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.36	0.11
1999	JP	5416	3593	1104	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.54	0.36	0.11
2000	JP	5548	3566	1130	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.54	0.35	0.11
2001	JP	5581	3601	1153	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.54	0.35	0.11
2002	JP	5618	3637	1177	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.54	0.35	0.11
2003	JP	5656	3675	1201	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.54	0.35	0.11
2004	JP	5699	3716	1227	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.54	0.35	0.12
2005	JP	5730	3750	1250	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.35	0.12
2006	JP	5704	3762	1238	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.35	0.12
2007	JP	5680	3774	1226	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.35	0.11
2008	JP	5625	3766	1207	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.36	0.11
2009	JP	5564	3754	1187	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.36	0.11
2010	JP	5573	3789	1182	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.36	0.11
2011	JP	5638	3805	1195	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.36	0.11
2012	JP	5700	3818	1207	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.4	0.4	0.0	0.53	0.36	0.11
2013	JP	5757	3830	1218	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.53	0.35	0.11
2014	JP	5810	3840	1228	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.53	0.35	0.11
2015	JP	5860	3849	1238	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.35	0.11
2016	JP	5894	3849	1244	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.35	0.11
2017	JP	5925	3850	1249	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.35	0.11
2018	JP	5955	3850	1255	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.35	0.11
2019	JP	5983	3850	1260	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.35	0.11
2020	JP	6009	3851	1265	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.35	0.11
2021	JP	6046	3859	1272	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.35	0.11
2022	JP	6080	3866	1278	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.34	0.11
2023	JP	6111	3871	1284	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.34	0.11
2024	JP	6140	3875	1289	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.34	0.11

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2025	JP	6166	3878	1293	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.34	0.11
2026	JP	6189	3880	1297	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.54	0.34	0.11
2027	JP	6211	3881	1300	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2028	JP	6230	3881	1303	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2029	JP	6247	3880	1305	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2030	JP	6263	3879	1307	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2031	JP	6278	3877	1308	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2032	JP	6291	3875	1309	7E+11	4E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2033	JP	6302	3872	1310	7E+11	4E+11	2E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2034	JP	6313	3869	1311	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2035	JP	6321	3865	1311	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2036	JP	6328	3860	1311	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2037	JP	6334	3855	1311	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.34	0.11
2038	JP	6339	3849	1310	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2039	JP	6342	3843	1309	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2040	JP	6345	3837	1308	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2041	JP	6349	3832	1307	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2042	JP	6352	3826	1306	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2043	JP	6354	3820	1305	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2044	JP	6355	3813	1304	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2045	JP	6355	3806	1302	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2046	JP	6353	3799	1300	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.55	0.33	0.11
2047	JP	6351	3791	1298	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.56	0.33	0.11
2048	JP	6348	3783	1296	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.56	0.33	0.11
2049	JP	6345	3774	1293	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.56	0.33	0.11
2050	JP	6341	3766	1291	6E+11	4E+11	1E+11	0.7	0.77	1.11	0.5	0.4	0.0	0.56	0.33	0.11

C.2 Storyline "Autonomous vehicles take off" main outputs

Table C.2 – 1: Storyline "Autonomous vehicles take off" main outputs

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1960	US															
1961	US	12997	680	276	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.77	0.08	0.00	0.93	0.05	0.02
1962	US	13387	679	297	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.79	0.08	0.00	0.93	0.05	0.02
1963	US	13772	648	332	3E+12	1E+11	6E+10	0.82	0.86	1.33	0.81	0.08	0.00	0.93	0.04	0.02
1964	US	14242	642	376	3E+12	1E+11	7E+10	0.82	0.86	1.33	0.84	0.08	0.01	0.93	0.04	0.02
1965	US	14698	633	439	3E+12	1E+11	8E+10	0.82	0.86	1.33	0.86	0.07	0.01	0.93	0.04	0.03
1966	US	15237	617	501	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.89	0.07	0.01	0.93	0.04	0.03
1967	US	15465	596	612	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.90	0.07	0.01	0.93	0.04	0.04
1968	US	15920	563	700	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.93	0.07	0.01	0.93	0.03	0.04
1969	US	16250	545	811	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.94	0.07	0.01	0.92	0.03	0.05
1970	US	16536	515	812	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.96	0.06	0.01	0.93	0.03	0.05
1971	US	17016	479	817	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.93	0.03	0.04
1972	US	17521	461	891	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.01	0.05	0.01	0.93	0.02	0.05
1973	US	17967	480	962	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.04	0.06	0.01	0.93	0.02	0.05
1974	US	17233	510	995	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.00	0.06	0.01	0.92	0.03	0.05
1975	US	17322	485	1001	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.00	0.06	0.01	0.92	0.03	0.05
1976	US	17613	482	1089	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.02	0.06	0.01	0.92	0.03	0.06
1977	US	17778	493	1164	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.03	0.06	0.01	0.91	0.03	0.06
1978	US	17920	494	1335	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.04	0.06	0.01	0.91	0.03	0.07
1979	US	17010	516	1502	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.99	0.06	0.02	0.89	0.03	0.08
1980	US	16761	517	1446	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1981	US	16803	502	1426	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1982	US	16712	479	1481	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1983	US	17057	474	1596	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.00	0.06	0.02	0.89	0.02	0.08
1984	US	17514	481	1712	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.03	0.06	0.02	0.89	0.02	0.09

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1985	US	17702	474	1882	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.04	0.06	0.02	0.88	0.02	0.09
1986	US	17973	475	2083	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.05	0.06	0.02	0.88	0.02	0.10
1987	US	18187	461	2179	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.06	0.06	0.02	0.87	0.02	0.10
1988	US	18601	454	2154	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.08	0.06	0.02	0.88	0.02	0.10
1989	US	18916	462	2131	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.10	0.06	0.02	0.88	0.02	0.10
1990	US	19078	450	2179	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.11	0.06	0.02	0.88	0.02	0.10
1991	US	18827	443	2101	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.09	0.05	0.02	0.88	0.02	0.10
1992	US	19280	433	2185	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.12	0.05	0.02	0.88	0.02	0.10
1993	US	19641	440	2227	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.14	0.05	0.02	0.88	0.02	0.10
1994	US	19956	437	2361	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.16	0.05	0.02	0.88	0.02	0.10
1995	US	20108	440	2420	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.17	0.05	0.02	0.88	0.02	0.11
1996	US	20251	431	2565	5E+12	1E+11	7E+11	0.82	0.86	1.33	1.18	0.05	0.02	0.87	0.02	0.11
1997	US	20487	430	2618	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.19	0.05	0.02	0.87	0.02	0.11
1998	US	20813	438	2652	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.20	0.05	0.03	0.87	0.02	0.11
1999	US	21055	444	2769	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.22	0.05	0.03	0.87	0.02	0.11
2000	US	21196	451	2883	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.23	0.05	0.03	0.86	0.02	0.12
2001	US	21523	453	2709	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.24	0.06	0.03	0.87	0.02	0.11
2002	US	21895	438	2637	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.26	0.05	0.02	0.88	0.02	0.11
2003	US	21997	428	2782	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.27	0.05	0.03	0.87	0.02	0.11
2004	US	22095	420	3000	6E+12	1E+11	9E+11	0.82	0.86	1.33	1.27	0.05	0.03	0.87	0.02	0.12
2005	US	22132	416	3125	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.28	0.05	0.03	0.86	0.02	0.12
2006	US	22237	426	3146	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.28	0.05	0.03	0.86	0.02	0.12
2007	US	22274	441	3239	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.29	0.06	0.03	0.86	0.02	0.12
2008	US	21595	451	3080	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.25	0.06	0.03	0.86	0.02	0.12
2009	US	21946	446	2899	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.27	0.06	0.03	0.87	0.02	0.11
2010	US	21615	426	2943	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.25	0.05	0.03	0.87	0.02	0.12
2011	US	22019	425	3045	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.27	0.05	0.03	0.86	0.02	0.12
2012	US	22366	424	3136	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.29	0.05	0.03	0.86	0.02	0.12

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2013	US	22666	422	3218	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.31	0.05	0.03	0.86	0.02	0.12
2014	US	22788	414	3286	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.02	0.12
2015	US	22793	405	3334	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.02	0.13
2016	US	22792	397	3377	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2017	US	22785	390	3417	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2018	US	22774	383	3452	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2019	US	22761	377	3485	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.85	0.01	0.13
2020	US	22840	373	3531	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.85	0.01	0.13
2021	US	22847	366	3571	8E+12	1E+11	1E+12	0.85	0.89	1.38	1.32	0.05	0.03	0.85	0.01	0.13
2022	US	22851	359	3610	8E+12	1E+11	1E+12	0.85	0.89	1.38	1.32	0.04	0.03	0.85	0.01	0.13
2023	US	22858	353	3649	8E+12	1E+11	1E+12	0.86	0.90	1.39	1.32	0.04	0.03	0.85	0.01	0.14
2024	US	22869	347	3686	8E+12	1E+11	1E+12	0.86	0.90	1.39	1.32	0.04	0.03	0.85	0.01	0.14
2025	US	22876	341	3722	8E+12	1E+11	1E+12	0.86	0.90	1.40	1.32	0.04	0.03	0.85	0.01	0.14
2026	US	22884	335	3757	8E+12	1E+11	1E+12	0.86	0.90	1.40	1.32	0.04	0.03	0.85	0.01	0.14
2027	US	22892	329	3791	8E+12	1E+11	1E+12	0.87	0.91	1.40	1.32	0.04	0.03	0.85	0.01	0.14
2028	US	22899	324	3825	8E+12	1E+11	1E+12	0.87	0.91	1.41	1.32	0.04	0.03	0.85	0.01	0.14
2029	US	22905	318	3857	8E+12	1E+11	1E+12	0.87	0.91	1.41	1.33	0.04	0.03	0.85	0.01	0.14
2030	US	22906	313	3888	8E+12	1E+11	1E+12	0.87	0.92	1.42	1.33	0.04	0.04	0.85	0.01	0.14
2031	US	22914	308	3919	8E+12	1E+11	1E+12	0.88	0.92	1.42	1.33	0.04	0.04	0.84	0.01	0.14
2032	US	22918	303	3949	8E+12	1E+11	1E+12	0.88	0.92	1.42	1.33	0.04	0.04	0.84	0.01	0.15
2033	US	22928	298	3978	8E+12	1E+11	1E+12	0.88	0.92	1.43	1.33	0.04	0.04	0.84	0.01	0.15
2034	US	22933	294	4007	8E+12	1E+11	1E+12	0.88	0.93	1.43	1.33	0.04	0.04	0.84	0.01	0.15
2035	US	22938	290	4034	9E+12	1E+11	2E+12	0.88	0.93	1.43	1.33	0.04	0.04	0.84	0.01	0.15
2036	US	22951	283	4056	9E+12	1E+11	2E+12	0.88	0.94	1.45	1.33	0.04	0.04	0.84	0.01	0.15
2037	US	22969	274	4073	9E+12	1E+11	2E+12	0.89	0.96	1.48	1.33	0.03	0.04	0.84	0.01	0.15
2038	US	22991	263	4084	9E+12	1E+11	2E+12	0.89	0.97	1.50	1.33	0.03	0.04	0.84	0.01	0.15
2039	US	23017	250	4092	9E+12	1E+11	2E+12	0.89	0.99	1.53	1.33	0.03	0.04	0.84	0.01	0.15
2040	US	23050	235	4093	9E+12	9E+10	2E+12	0.89	1.01	1.56	1.33	0.03	0.04	0.84	0.01	0.15

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2041	US	23087	218	4089	9E+12	8E+10	2E+12	0.89	1.03	1.59	1.34	0.03	0.04	0.84	0.01	0.15
2042	US	23125	201	4081	9E+12	8E+10	2E+12	0.89	1.05	1.63	1.34	0.03	0.04	0.84	0.01	0.15
2043	US	23165	184	4068	9E+12	7E+10	2E+12	0.89	1.07	1.66	1.34	0.02	0.04	0.84	0.01	0.15
2044	US	23205	166	4050	9E+12	7E+10	2E+12	0.89	1.10	1.70	1.34	0.02	0.04	0.85	0.01	0.15
2045	US	23244	150	4030	9E+12	6E+10	2E+12	0.90	1.11	1.72	1.34	0.02	0.04	0.85	0.01	0.15
2046	US	23282	134	4005	9E+12	5E+10	2E+12	0.90	1.13	1.75	1.35	0.02	0.04	0.85	0.00	0.15
2047	US	23319	119	3977	9E+12	5E+10	2E+12	0.90	1.16	1.79	1.35	0.01	0.04	0.85	0.00	0.15
2048	US	23355	105	3944	9E+12	4E+10	2E+12	0.90	1.18	1.83	1.35	0.01	0.04	0.85	0.00	0.14
2049	US	23390	91	3907	9E+12	4E+10	2E+12	0.90	1.21	1.87	1.35	0.01	0.04	0.85	0.00	0.14
2050	US	23424	79	3865	9E+12	3E+10	2E+12	0.90	1.24	1.92	1.36	0.01	0.04	0.86	0.00	0.14
1960	EU															
1961	EU	1266	864	61	5E+11	4E+11	3E+10	0.82	0.86	1.33	0.08	0.09	0.00	0.58	0.39	0.03
1962	EU	1375	917	82	6E+11	4E+11	3E+10	0.82	0.86	1.33	0.08	0.10	0.00	0.58	0.39	0.03
1963	EU	1531	950	85	6E+11	4E+11	4E+10	0.82	0.86	1.33	0.09	0.10	0.00	0.60	0.37	0.03
1964	EU	1737	944	88	7E+11	4E+11	4E+10	0.82	0.86	1.33	0.11	0.10	0.00	0.63	0.34	0.03
1965	EU	1981	905	93	8E+11	4E+11	4E+10	0.82	0.86	1.33	0.12	0.10	0.00	0.67	0.30	0.03
1966	EU	2111	959	123	9E+11	4E+11	5E+10	0.82	0.86	1.33	0.13	0.11	0.00	0.66	0.30	0.04
1967	EU	2415	890	118	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.15	0.10	0.00	0.71	0.26	0.03
1968	EU	2587	969	117	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.16	0.11	0.00	0.70	0.26	0.03
1969	EU	2784	1001	153	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.17	0.11	0.00	0.71	0.25	0.04
1970	EU	3074	967	164	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.19	0.11	0.00	0.73	0.23	0.04
1971	EU	3298	979	173	1E+12	4E+11	8E+10	0.82	0.86	1.33	0.20	0.11	0.00	0.74	0.22	0.04
1972	EU	3395	1076	239	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.21	0.12	0.00	0.72	0.23	0.05
1973	EU	3611	1062	269	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.22	0.12	0.00	0.73	0.21	0.05
1974	EU	3804	1112	258	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.23	0.12	0.00	0.74	0.21	0.05
1975	EU	3853	1178	293	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.23	0.13	0.00	0.72	0.22	0.06
1976	EU	4020	1232	317	2E+12	6E+11	1E+11	0.82	0.86	1.33	0.24	0.14	0.00	0.72	0.22	0.06
1977	EU	4232	1221	354	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.26	0.13	0.00	0.73	0.21	0.06

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1978	EU	4371	1230	371	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.27	0.13	0.00	0.73	0.21	0.06
1979	EU	4518	1266	430	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.28	0.14	0.00	0.73	0.20	0.07
1980	EU	4753	1258	420	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.29	0.14	0.00	0.74	0.20	0.07
1981	EU	4811	1428	446	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.29	0.16	0.00	0.72	0.21	0.07
1982	EU	4998	1480	431	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.30	0.16	0.00	0.72	0.21	0.06
1983	EU	5147	1519	451	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.31	0.17	0.00	0.72	0.21	0.06
1984	EU	5335	1536	457	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.32	0.17	0.00	0.73	0.21	0.06
1985	EU	5452	1694	498	3E+12	8E+11	2E+11	0.82	0.86	1.33	0.33	0.19	0.00	0.71	0.22	0.07
1986	EU	5757	1558	505	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.35	0.17	0.00	0.74	0.20	0.06
1987	EU	5929	1574	558	3E+12	7E+11	3E+11	0.82	0.86	1.33	0.36	0.17	0.01	0.74	0.20	0.07
1988	EU	6025	1730	582	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.37	0.19	0.01	0.72	0.21	0.07
1989	EU	6256	1745	613	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.38	0.19	0.01	0.73	0.20	0.07
1990	EU	6432	1771	698	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.39	0.19	0.01	0.72	0.20	0.08
1991	EU	6679	1779	696	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.41	0.19	0.01	0.73	0.19	0.08
1992	EU	6879	1777	690	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.42	0.19	0.01	0.74	0.19	0.07
1993	EU	7050	1768	682	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.43	0.19	0.01	0.74	0.19	0.07
1994	EU	7263	1772	679	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.44	0.19	0.01	0.75	0.18	0.07
1995	EU	7490	1780	677	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.46	0.20	0.01	0.75	0.18	0.07
1996	EU	7543	1738	741	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.46	0.19	0.01	0.75	0.17	0.07
1997	EU	7673	1733	792	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.47	0.19	0.01	0.75	0.17	0.08
1998	EU	7854	1730	837	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.48	0.19	0.01	0.75	0.17	0.08
1999	EU	8053	1740	873	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.49	0.19	0.01	0.75	0.16	0.08
2000	EU	8187	1819	952	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.50	0.20	0.01	0.75	0.17	0.09
2001	EU	8418	1826	963	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.51	0.20	0.01	0.75	0.16	0.09
2002	EU	8651	1806	970	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.53	0.20	0.01	0.76	0.16	0.08
2003	EU	8795	1822	1018	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.54	0.20	0.01	0.76	0.16	0.09
2004	EU	8959	1853	1082	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.55	0.20	0.01	0.75	0.16	0.09
2005	EU	9043	1896	1173	4E+12	9E+11	6E+11	0.82	0.86	1.33	0.55	0.21	0.01	0.75	0.16	0.10

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2006	EU	9217	1926	1240	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.56	0.21	0.01	0.74	0.16	0.10
2007	EU	9360	1972	1302	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.57	0.22	0.01	0.74	0.16	0.10
2008	EU	9413	2037	1290	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.57	0.22	0.01	0.74	0.16	0.10
2009	EU	9504	1949	1215	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.58	0.21	0.01	0.75	0.15	0.10
2010	EU	9648	1977	1294	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.59	0.22	0.01	0.75	0.15	0.10
2011	EU	9763	1994	1289	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.59	0.22	0.01	0.75	0.15	0.10
2012	EU	9872	2009	1286	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.60	0.22	0.01	0.75	0.15	0.10
2013	EU	9975	2024	1284	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.61	0.22	0.01	0.75	0.15	0.10
2014	EU	10072	2037	1283	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.61	0.22	0.01	0.75	0.15	0.10
2015	EU	10166	2050	1282	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.22	0.01	0.75	0.15	0.10
2016	EU	10208	2054	1278	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.75	0.15	0.09
2017	EU	10238	2057	1273	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.75	0.15	0.09
2018	EU	10259	2060	1269	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.76	0.15	0.09
2019	EU	10270	2061	1265	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.63	0.23	0.01	0.76	0.15	0.09
2020	EU	10273	2062	1262	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.63	0.23	0.01	0.76	0.15	0.09
2021	EU	10402	2085	1272	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.63	0.23	0.01	0.76	0.15	0.09
2022	EU	10544	2107	1284	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.64	0.23	0.01	0.76	0.15	0.09
2023	EU	10696	2130	1296	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.65	0.23	0.01	0.76	0.15	0.09
2024	EU	10857	2153	1308	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.66	0.24	0.01	0.76	0.15	0.09
2025	EU	11026	2176	1321	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.67	0.24	0.01	0.76	0.15	0.09
2026	EU	11201	2199	1334	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.68	0.24	0.01	0.76	0.15	0.09
2027	EU	11382	2221	1347	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.69	0.24	0.01	0.76	0.15	0.09
2028	EU	11567	2244	1361	6E+12	1E+12	7E+11	0.82	0.86	1.33	0.70	0.25	0.01	0.76	0.15	0.09
2029	EU	11756	2267	1374	6E+12	1E+12	8E+11	0.82	0.86	1.33	0.72	0.25	0.01	0.76	0.15	0.09
2030	EU	11948	2289	1388	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.73	0.25	0.01	0.76	0.15	0.09
2031	EU	12151	2313	1403	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.74	0.25	0.01	0.77	0.15	0.09
2032	EU	12358	2337	1418	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.75	0.26	0.01	0.77	0.15	0.09
2033	EU	12567	2361	1434	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.77	0.26	0.01	0.77	0.14	0.09

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2034	EU	12777	2384	1449	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.78	0.26	0.01	0.77	0.14	0.09
2035	EU	12989	2408	1464	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.79	0.26	0.01	0.77	0.14	0.09
2036	EU	13201	2431	1479	7E+12	1E+12	8E+11	0.82	0.86	1.33	0.80	0.27	0.01	0.77	0.14	0.09
2037	EU	13414	2454	1494	8E+12	1E+12	8E+11	0.82	0.86	1.33	0.82	0.27	0.01	0.77	0.14	0.09
2038	EU	13613	2350	1501	8E+12	1E+12	8E+11	0.83	0.98	1.51	0.83	0.26	0.01	0.78	0.13	0.09
2039	EU	13807	2242	1506	8E+12	1E+12	9E+11	0.83	1.00	1.55	0.84	0.25	0.01	0.79	0.13	0.09
2040	EU	13995	2137	1510	8E+12	1E+12	9E+11	0.83	1.02	1.58	0.85	0.23	0.01	0.79	0.12	0.09
2041	EU	14179	2035	1514	8E+12	1E+12	9E+11	0.83	1.04	1.61	0.86	0.22	0.01	0.80	0.11	0.09
2042	EU	14357	1935	1517	8E+12	1E+12	9E+11	0.83	1.06	1.64	0.87	0.21	0.01	0.81	0.11	0.09
2043	EU	14531	1839	1519	8E+12	1E+12	9E+11	0.83	1.08	1.67	0.88	0.20	0.01	0.81	0.10	0.08
2044	EU	14700	1745	1520	8E+12	1E+12	9E+11	0.84	1.10	1.70	0.90	0.19	0.01	0.82	0.10	0.08
2045	EU	14865	1653	1521	9E+12	9E+11	9E+11	0.84	1.12	1.73	0.91	0.18	0.01	0.82	0.09	0.08
2046	EU	15020	1567	1521	9E+12	9E+11	9E+11	0.84	1.14	1.76	0.91	0.17	0.01	0.83	0.09	0.08
2047	EU	15170	1484	1521	9E+12	9E+11	9E+11	0.84	1.16	1.79	0.92	0.16	0.01	0.83	0.08	0.08
2048	EU	15316	1402	1520	9E+12	8E+11	9E+11	0.84	1.18	1.82	0.93	0.15	0.01	0.84	0.08	0.08
2049	EU	15458	1324	1518	9E+12	8E+11	9E+11	0.84	1.20	1.86	0.94	0.15	0.01	0.84	0.07	0.08
2050	EU	15596	1247	1516	9E+12	7E+11	9E+11	0.84	1.22	1.89	0.95	0.14	0.01	0.85	0.07	0.08
1970	BR															
1971	BR	381	1084	54	4E+10	1E+11	5E+09	0.98	1.05	1.33	0.03	0.14	0.00	0.25	0.71	0.04
1972	BR	464	1131	62	5E+10	1E+11	6E+09	0.98	1.05	1.33	0.04	0.14	0.00	0.28	0.68	0.04
1973	BR	568	1213	76	6E+10	1E+11	8E+09	0.98	1.05	1.33	0.05	0.15	0.00	0.31	0.65	0.04
1974	BR	674	1300	87	7E+10	1E+11	9E+09	0.98	1.05	1.33	0.06	0.16	0.00	0.33	0.63	0.04
1975	BR	776	1387	96	8E+10	1E+11	1E+10	0.98	1.05	1.33	0.06	0.17	0.00	0.34	0.61	0.04
1976	BR	889	1537	102	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.07	0.19	0.00	0.35	0.61	0.04
1977	BR	982	1691	104	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.08	0.21	0.00	0.35	0.61	0.04
1978	BR	1071	1850	111	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.09	0.23	0.00	0.35	0.61	0.04
1979	BR	1193	2009	124	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.10	0.25	0.00	0.36	0.60	0.04
1980	BR	1341	2215	130	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.11	0.28	0.00	0.36	0.60	0.04

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1981	BR	1387	2292	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.29	0.00	0.36	0.60	0.04
1982	BR	1435	2364	143	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.29	0.00	0.36	0.60	0.04
1983	BR	1484	2376	135	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.30	0.00	0.37	0.59	0.03
1984	BR	1564	2431	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.13	0.30	0.00	0.38	0.59	0.03
1985	BR	1674	2535	150	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.14	0.32	0.00	0.38	0.58	0.03
1986	BR	1731	2567	185	2E+11	4E+11	3E+10	0.98	1.05	1.33	0.14	0.32	0.00	0.39	0.57	0.04
1987	BR	1799	2696	179	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.34	0.00	0.38	0.58	0.04
1988	BR	1806	2794	186	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.35	0.00	0.38	0.58	0.04
1989	BR	1820	2885	212	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.36	0.00	0.37	0.59	0.04
1990	BR	1805	2876	206	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.36	0.00	0.37	0.59	0.04
1991	BR	1764	2935	200	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.37	0.00	0.36	0.60	0.04
1992	BR	1706	2969	196	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.14	0.37	0.00	0.35	0.61	0.04
1993	BR	1729	3015	206	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.14	0.38	0.00	0.35	0.61	0.04
1994	BR	1812	3055	226	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.15	0.38	0.00	0.36	0.60	0.04
1995	BR	1918	3098	246	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.16	0.39	0.00	0.36	0.59	0.05
1996	BR	2017	3117	254	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.17	0.39	0.00	0.37	0.58	0.05
1997	BR	2146	3114	271	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.18	0.39	0.00	0.39	0.56	0.05
1998	BR	2234	3085	300	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.19	0.38	0.00	0.40	0.55	0.05
1999	BR	2297	3058	228	4E+11	5E+11	4E+10	0.98	1.05	1.33	0.19	0.38	0.00	0.41	0.55	0.04
2000	BR	2358	3021	281	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.20	0.38	0.00	0.42	0.53	0.05
2001	BR	2420	2994	282	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.20	0.37	0.00	0.42	0.53	0.05
2002	BR	2515	3001	277	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.21	0.37	0.00	0.43	0.52	0.05
2003	BR	2599	3008	259	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.22	0.37	0.00	0.44	0.51	0.04
2004	BR	2724	3057	266	5E+11	6E+11	5E+10	0.98	1.05	1.33	0.23	0.38	0.00	0.45	0.51	0.04
2005	BR	2825	3051	318	5E+11	6E+11	6E+10	0.98	1.05	1.33	0.23	0.38	0.00	0.46	0.49	0.05
2006	BR	2974	3113	307	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.25	0.39	0.00	0.47	0.49	0.05
2007	BR	3167	3227	318	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.26	0.40	0.00	0.47	0.48	0.05
2008	BR	3380	3342	352	7E+11	6E+11	7E+10	0.98	1.05	1.33	0.28	0.42	0.00	0.48	0.47	0.05

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2009	BR	3554	3376	389	7E+11	7E+11	8E+10	0.98	1.05	1.33	0.30	0.42	0.00	0.49	0.46	0.05
2010	BR	3843	3509	468	8E+11	7E+11	9E+10	0.98	1.05	1.33	0.32	0.44	0.01	0.49	0.45	0.06
2011	BR	4052	3598	498	8E+11	7E+11	1E+11	0.98	1.05	1.33	0.34	0.45	0.01	0.50	0.44	0.06
2012	BR	4238	3672	524	9E+11	7E+11	1E+11	0.98	1.05	1.33	0.35	0.46	0.01	0.50	0.44	0.06
2013	BR	4401	3733	547	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.37	0.46	0.01	0.51	0.43	0.06
2014	BR	4541	3782	568	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.38	0.47	0.01	0.51	0.43	0.06
2015	BR	4659	3820	586	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.39	0.48	0.01	0.51	0.42	0.06
2016	BR	4748	3842	600	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.39	0.48	0.01	0.52	0.42	0.07
2017	BR	4813	3854	612	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.40	0.48	0.01	0.52	0.42	0.07
2018	BR	4857	3855	621	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.40	0.48	0.01	0.52	0.41	0.07
2019	BR	4881	3848	627	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.41	0.48	0.01	0.52	0.41	0.07
2020	BR	4888	3833	631	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.41	0.48	0.01	0.52	0.41	0.07
2021	BR	4970	3872	644	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.41	0.48	0.01	0.52	0.41	0.07
2022	BR	5080	3927	659	1E+12	9E+11	1E+11	0.98	1.05	1.33	0.42	0.49	0.01	0.53	0.41	0.07
2023	BR	5215	3996	676	1E+12	9E+11	1E+11	0.98	1.05	1.33	0.43	0.50	0.01	0.53	0.40	0.07
2024	BR	5372	4078	695	1E+12	9E+11	2E+11	0.98	1.05	1.33	0.45	0.51	0.01	0.53	0.40	0.07
2025	BR	5550	4172	716	1E+12	9E+11	2E+11	0.98	1.05	1.33	0.46	0.52	0.01	0.53	0.40	0.07
2026	BR	5742	4272	739	1E+12	1E+12	2E+11	0.98	1.05	1.33	0.48	0.53	0.01	0.53	0.40	0.07
2027	BR	5950	4381	763	1E+12	1E+12	2E+11	0.98	1.05	1.33	0.49	0.55	0.01	0.54	0.39	0.07
2028	BR	6173	4498	788	1E+12	1E+12	2E+11	0.98	1.05	1.33	0.51	0.56	0.01	0.54	0.39	0.07
2029	BR	6332	4532	811	1E+12	1E+12	2E+11	1.05	1.13	1.43	0.53	0.56	0.01	0.54	0.39	0.07
2030	BR	6411	4476	833	1E+12	1E+12	2E+11	1.14	1.22	1.54	0.53	0.56	0.01	0.55	0.38	0.07
2031	BR	6494	4419	856	2E+12	1E+12	2E+11	1.16	1.24	1.57	0.54	0.55	0.01	0.55	0.38	0.07
2032	BR	6578	4360	880	2E+12	1E+12	2E+11	1.18	1.26	1.60	0.55	0.54	0.01	0.56	0.37	0.07
2033	BR	6662	4300	904	2E+12	1E+12	2E+11	1.20	1.29	1.63	0.55	0.54	0.01	0.56	0.36	0.08
2034	BR	6748	4242	929	2E+12	1E+12	2E+11	1.22	1.31	1.66	0.56	0.53	0.01	0.57	0.36	0.08
2035	BR	6854	4169	954	2E+12	1E+12	2E+11	1.22	1.35	1.70	0.57	0.52	0.01	0.57	0.35	0.08
2036	BR	6980	4083	980	2E+12	1E+12	2E+11	1.23	1.38	1.75	0.58	0.51	0.01	0.58	0.34	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2037	BR	7122	3987	1006	2E+12	1E+12	2E+11	1.23	1.42	1.80	0.59	0.50	0.01	0.59	0.33	0.08
2038	BR	7278	3879	1032	2E+12	9E+11	2E+11	1.23	1.46	1.85	0.60	0.48	0.01	0.60	0.32	0.08
2039	BR	7448	3763	1058	2E+12	9E+11	3E+11	1.23	1.50	1.90	0.62	0.47	0.01	0.61	0.31	0.09
2040	BR	7630	3640	1083	2E+12	9E+11	3E+11	1.24	1.54	1.95	0.63	0.45	0.01	0.62	0.29	0.09
2041	BR	7832	3501	1110	2E+12	9E+11	3E+11	1.24	1.59	2.02	0.65	0.44	0.01	0.63	0.28	0.09
2042	BR	8049	3356	1136	2E+12	8E+11	3E+11	1.24	1.64	2.08	0.67	0.42	0.01	0.64	0.27	0.09
2043	BR	8277	3201	1162	2E+12	8E+11	3E+11	1.25	1.70	2.15	0.69	0.40	0.01	0.65	0.25	0.09
2044	BR	8517	3037	1188	2E+12	7E+11	3E+11	1.25	1.75	2.22	0.71	0.38	0.01	0.67	0.24	0.09
2045	BR	8767	2868	1214	2E+12	7E+11	3E+11	1.25	1.81	2.30	0.73	0.36	0.01	0.68	0.22	0.09
2046	BR	9037	2686	1240	2E+12	7E+11	3E+11	1.26	1.89	2.40	0.75	0.33	0.02	0.70	0.21	0.10
2047	BR	9319	2495	1265	2E+12	6E+11	3E+11	1.26	1.97	2.50	0.77	0.31	0.02	0.71	0.19	0.10
2048	BR	9612	2299	1289	2E+12	6E+11	3E+11	1.26	2.06	2.60	0.80	0.29	0.02	0.73	0.17	0.10
2049	BR	9914	2096	1311	2E+12	5E+11	3E+11	1.27	2.15	2.73	0.82	0.26	0.02	0.74	0.16	0.10
2050	BR	10223	1887	1331	3E+12	5E+11	3E+11	1.27	2.26	2.86	0.85	0.24	0.02	0.76	0.14	0.10
1960	JP															
1961	JP	1854	3253	244	2E+11	3E+11	2E+10	0.7	0.77	1.11	0.15	0.36	0.00	0.35	0.61	0.05
1962	JP	1910	3284	268	2E+11	3E+11	3E+10	0.7	0.77	1.11	0.15	0.36	0.00	0.35	0.60	0.05
1963	JP	1966	3316	291	2E+11	3E+11	3E+10	0.7	0.77	1.11	0.15	0.36	0.00	0.35	0.59	0.05
1964	JP	2026	3356	315	2E+11	3E+11	3E+10	0.7	0.77	1.11	0.16	0.37	0.00	0.36	0.59	0.06
1965	JP	2071	3375	336	2E+11	3E+11	3E+10	0.7	0.77	1.11	0.16	0.37	0.00	0.36	0.58	0.06
1966	JP	2128	3414	359	2E+11	3E+11	4E+10	0.7	0.77	1.11	0.17	0.37	0.00	0.36	0.58	0.06
1967	JP	2185	3454	381	2E+11	3E+11	4E+10	0.7	0.77	1.11	0.17	0.38	0.00	0.36	0.57	0.06
1968	JP	2241	3493	403	2E+11	4E+11	4E+10	0.7	0.77	1.11	0.18	0.38	0.00	0.37	0.57	0.07
1969	JP	2291	3523	423	2E+11	4E+11	4E+10	0.7	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1970	JP	2331	3540	442	2E+11	4E+11	5E+10	0.7	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1971	JP	2358	3538	457	2E+11	4E+11	5E+10	0.7	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1972	JP	2406	3569	477	3E+11	4E+11	5E+10	0.7	0.77	1.11	0.19	0.39	0.00	0.37	0.55	0.07
1973	JP	2460	3610	497	3E+11	4E+11	5E+10	0.7	0.77	1.11	0.19	0.40	0.01	0.37	0.55	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1974	JP	2497	3627	514	3E+11	4E+11	6E+10	0.7	0.77	1.11	0.20	0.40	0.01	0.38	0.55	0.08
1975	JP	2552	3670	534	3E+11	4E+11	6E+10	0.7	0.77	1.11	0.20	0.40	0.01	0.38	0.54	0.08
1976	JP	2612	3722	555	3E+11	4E+11	6E+10	0.7	0.77	1.11	0.20	0.41	0.01	0.38	0.54	0.08
1977	JP	2678	3782	578	3E+11	4E+11	7E+10	0.7	0.77	1.11	0.21	0.41	0.01	0.38	0.54	0.08
1978	JP	2750	3849	602	3E+11	4E+11	7E+10	0.7	0.77	1.11	0.22	0.42	0.01	0.38	0.53	0.08
1979	JP	2832	3931	628	3E+11	5E+11	7E+10	0.7	0.77	1.11	0.22	0.43	0.01	0.38	0.53	0.08
1980	JP	2902	3997	651	3E+11	5E+11	8E+10	0.7	0.77	1.11	0.23	0.44	0.01	0.38	0.53	0.09
1981	JP	3026	4008	682	4E+11	5E+11	8E+10	0.7	0.77	1.11	0.24	0.44	0.01	0.39	0.52	0.09
1982	JP	3148	4015	713	4E+11	5E+11	8E+10	0.7	0.77	1.11	0.25	0.44	0.01	0.40	0.51	0.09
1983	JP	3265	4017	743	4E+11	5E+11	9E+10	0.7	0.77	1.11	0.26	0.44	0.01	0.41	0.50	0.09
1984	JP	3388	4023	774	4E+11	5E+11	9E+10	0.7	0.77	1.11	0.27	0.44	0.01	0.41	0.49	0.09
1985	JP	3518	4038	806	4E+11	5E+11	1E+11	0.7	0.77	1.11	0.28	0.44	0.01	0.42	0.48	0.10
1986	JP	3701	3973	834	4E+11	5E+11	1E+11	0.7	0.77	1.11	0.29	0.44	0.01	0.43	0.47	0.10
1987	JP	3881	3927	862	5E+11	5E+11	1E+11	0.7	0.77	1.11	0.30	0.43	0.01	0.45	0.45	0.10
1988	JP	4067	3902	893	5E+11	5E+11	1E+11	0.7	0.77	1.11	0.32	0.43	0.01	0.46	0.44	0.10
1989	JP	4234	3872	920	5E+11	5E+11	1E+11	0.7	0.77	1.11	0.33	0.42	0.01	0.47	0.43	0.10
1990	JP	4395	3848	946	5E+11	5E+11	1E+11	0.7	0.77	1.11	0.34	0.42	0.01	0.48	0.42	0.10
1991	JP	4519	3835	962	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.35	0.42	0.01	0.49	0.41	0.10
1992	JP	4629	3812	975	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.36	0.42	0.01	0.49	0.40	0.10
1993	JP	4736	3787	987	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.37	0.42	0.01	0.50	0.40	0.10
1994	JP	4845	3765	1000	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.38	0.41	0.01	0.50	0.39	0.10
1995	JP	4960	3749	1014	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.39	0.41	0.01	0.51	0.39	0.10
1996	JP	5085	3718	1039	6E+11	5E+11	1E+11	0.7	0.77	1.11	0.40	0.41	0.01	0.52	0.38	0.11
1997	JP	5201	3680	1062	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.41	0.40	0.01	0.52	0.37	0.11
1998	JP	5300	3631	1081	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.41	0.40	0.01	0.53	0.36	0.11
1999	JP	5416	3593	1104	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.42	0.39	0.01	0.54	0.36	0.11
2000	JP	5548	3566	1130	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.43	0.39	0.01	0.54	0.35	0.11
2001	JP	5581	3601	1153	7E+11	5E+11	1E+11	0.7	0.77	1.11	0.44	0.39	0.01	0.54	0.35	0.11

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2002	JP	5618	3637	1177	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.44	0.40	0.01	0.54	0.35	0.11
2003	JP	5656	3675	1201	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.44	0.40	0.01	0.54	0.35	0.11
2004	JP	5699	3716	1227	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.45	0.41	0.01	0.54	0.35	0.12
2005	JP	5730	3750	1250	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.45	0.41	0.01	0.53	0.35	0.12
2006	JP	5704	3762	1238	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.45	0.41	0.01	0.53	0.35	0.12
2007	JP	5680	3774	1226	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.44	0.41	0.01	0.53	0.35	0.11
2008	JP	5625	3766	1207	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.44	0.41	0.01	0.53	0.36	0.11
2009	JP	5564	3754	1187	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.44	0.41	0.01	0.53	0.36	0.11
2010	JP	5573	3789	1182	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.44	0.42	0.01	0.53	0.36	0.11
2011	JP	5638	3805	1195	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.44	0.42	0.01	0.53	0.36	0.11
2012	JP	5700	3818	1207	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.45	0.42	0.01	0.53	0.36	0.11
2013	JP	5757	3830	1218	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.45	0.42	0.01	0.53	0.35	0.11
2014	JP	5810	3840	1228	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.45	0.42	0.01	0.53	0.35	0.11
2015	JP	5860	3849	1238	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2016	JP	5894	3849	1244	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2017	JP	5925	3850	1249	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2018	JP	5955	3850	1255	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2019	JP	5983	3850	1260	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2020	JP	6009	3851	1265	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2021	JP	6046	3859	1272	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2022	JP	6080	3866	1278	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.48	0.42	0.01	0.54	0.34	0.11
2023	JP	6111	3871	1284	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.48	0.42	0.01	0.54	0.34	0.11
2024	JP	6140	3875	1289	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.48	0.42	0.01	0.54	0.34	0.11
2025	JP	6166	3878	1293	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.48	0.43	0.01	0.54	0.34	0.11
2026	JP	6189	3880	1297	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.48	0.43	0.01	0.54	0.34	0.11
2027	JP	6211	3881	1300	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.49	0.43	0.01	0.55	0.34	0.11
2028	JP	6230	3881	1303	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.49	0.43	0.01	0.55	0.34	0.11
2029	JP	6247	3880	1305	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.49	0.43	0.01	0.55	0.34	0.11

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2030	JP	6263	3879	1307	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.49	0.43	0.01	0.55	0.34	0.11
2031	JP	6278	3877	1308	7E+11	5E+11	2E+11	0.7	0.77	1.11	0.49	0.42	0.01	0.55	0.34	0.11
2032	JP	6291	3875	1309	7E+11	4E+11	2E+11	0.7	0.77	1.11	0.49	0.42	0.01	0.55	0.34	0.11
2033	JP	6302	3872	1310	7E+11	4E+11	2E+11	0.7	0.77	1.11	0.49	0.42	0.01	0.55	0.34	0.11
2034	JP	6313	3869	1311	7E+11	4E+11	1E+11	0.7	0.77	1.11	0.49	0.42	0.01	0.55	0.34	0.11
2035	JP	6404	3882	1317	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.50	0.43	0.01	0.55	0.33	0.11
2036	JP	6488	3893	1322	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.51	0.43	0.01	0.55	0.33	0.11
2037	JP	6567	3902	1327	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.51	0.43	0.01	0.56	0.33	0.11
2038	JP	6641	3910	1331	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.52	0.43	0.01	0.56	0.33	0.11
2039	JP	6709	3917	1334	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.53	0.43	0.01	0.56	0.33	0.11
2040	JP	6773	3922	1337	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.53	0.43	0.01	0.56	0.33	0.11
2041	JP	6834	3927	1340	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.53	0.43	0.01	0.56	0.32	0.11
2042	JP	6890	3931	1342	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.54	0.43	0.01	0.57	0.32	0.11
2043	JP	6941	3934	1344	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.54	0.43	0.01	0.57	0.32	0.11
2044	JP	6988	3935	1345	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.55	0.43	0.01	0.57	0.32	0.11
2045	JP	7032	3936	1346	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.55	0.43	0.01	0.57	0.32	0.11
2046	JP	7070	3935	1347	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.55	0.43	0.01	0.57	0.32	0.11
2047	JP	7105	3933	1347	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.56	0.43	0.01	0.57	0.32	0.11
2048	JP	7137	3931	1346	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.56	0.43	0.01	0.57	0.32	0.11
2049	JP	7166	3927	1346	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.56	0.43	0.01	0.58	0.32	0.11
2050	JP	7192	3924	1345	7E+11	4E+11	1E+11	0.5	0.77	1.11	0.56	0.43	0.01	0.58	0.31	0.11

C.3 Storyline “Digital transformation of public transportation” main outputs

Table C.3 – 1: Storyline “Digital transformation of public transportation” main outputs

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1960	JP															
1961	JP	1854	3253	244	2E+11	3E+11	2E+10	0.7	0.8	1.1	0.15	0.36	0.00	0.35	0.61	0.05
1962	JP	1910	3284	268	2E+11	3E+11	3E+10	0.7	0.8	1.1	0.15	0.36	0.00	0.35	0.60	0.05
1963	JP	1966	3316	291	2E+11	3E+11	3E+10	0.7	0.8	1.1	0.15	0.36	0.00	0.35	0.59	0.05
1964	JP	2026	3356	315	2E+11	3E+11	3E+10	0.7	0.8	1.1	0.16	0.37	0.00	0.36	0.59	0.06
1965	JP	2071	3375	336	2E+11	3E+11	3E+10	0.7	0.8	1.1	0.16	0.37	0.00	0.36	0.58	0.06
1966	JP	2128	3414	359	2E+11	3E+11	4E+10	0.7	0.8	1.1	0.17	0.37	0.00	0.36	0.58	0.06
1967	JP	2185	3454	381	2E+11	3E+11	4E+10	0.7	0.8	1.1	0.17	0.38	0.00	0.36	0.57	0.06
1968	JP	2241	3493	403	2E+11	4E+11	4E+10	0.7	0.8	1.1	0.18	0.38	0.00	0.37	0.57	0.07
1969	JP	2291	3523	423	2E+11	4E+11	4E+10	0.7	0.8	1.1	0.18	0.39	0.00	0.37	0.56	0.07
1970	JP	2331	3540	442	2E+11	4E+11	5E+10	0.7	0.8	1.1	0.18	0.39	0.00	0.37	0.56	0.07
1971	JP	2358	3538	457	2E+11	4E+11	5E+10	0.7	0.8	1.1	0.18	0.39	0.00	0.37	0.56	0.07
1972	JP	2406	3569	477	3E+11	4E+11	5E+10	0.7	0.8	1.1	0.19	0.39	0.00	0.37	0.55	0.07
1973	JP	2460	3610	497	3E+11	4E+11	5E+10	0.7	0.8	1.1	0.19	0.40	0.01	0.37	0.55	0.08
1974	JP	2497	3627	514	3E+11	4E+11	6E+10	0.7	0.8	1.1	0.20	0.40	0.01	0.38	0.55	0.08
1975	JP	2552	3670	534	3E+11	4E+11	6E+10	0.7	0.8	1.1	0.20	0.40	0.01	0.38	0.54	0.08
1976	JP	2612	3722	555	3E+11	4E+11	6E+10	0.7	0.8	1.1	0.20	0.41	0.01	0.38	0.54	0.08
1977	JP	2678	3782	578	3E+11	4E+11	7E+10	0.7	0.8	1.1	0.21	0.41	0.01	0.38	0.54	0.08
1978	JP	2750	3849	602	3E+11	4E+11	7E+10	0.7	0.8	1.1	0.22	0.42	0.01	0.38	0.53	0.08
1979	JP	2832	3931	628	3E+11	5E+11	7E+10	0.7	0.8	1.1	0.22	0.43	0.01	0.38	0.53	0.08
1980	JP	2902	3997	651	3E+11	5E+11	8E+10	0.7	0.8	1.1	0.23	0.44	0.01	0.38	0.53	0.09
1981	JP	3026	4008	682	4E+11	5E+11	8E+10	0.7	0.8	1.1	0.24	0.44	0.01	0.39	0.52	0.09
1982	JP	3148	4015	713	4E+11	5E+11	8E+10	0.7	0.8	1.1	0.25	0.44	0.01	0.40	0.51	0.09
1983	JP	3265	4017	743	4E+11	5E+11	9E+10	0.7	0.8	1.1	0.26	0.44	0.01	0.41	0.50	0.09
1984	JP	3388	4023	774	4E+11	5E+11	9E+10	0.7	0.8	1.1	0.27	0.44	0.01	0.41	0.49	0.09

1985	JP	3518	4038	806	4E+11	5E+11	1E+11	0.7	0.8	1.1	0.28	0.44	0.01	0.42	0.48	0.10
1986	JP	3701	3973	834	4E+11	5E+11	1E+11	0.7	0.8	1.1	0.29	0.44	0.01	0.43	0.47	0.10
1987	JP	3881	3927	862	5E+11	5E+11	1E+11	0.7	0.8	1.1	0.30	0.43	0.01	0.45	0.45	0.10
1988	JP	4067	3902	893	5E+11	5E+11	1E+11	0.7	0.8	1.1	0.32	0.43	0.01	0.46	0.44	0.10
1989	JP	4234	3872	920	5E+11	5E+11	1E+11	0.7	0.8	1.1	0.33	0.42	0.01	0.47	0.43	0.10
1990	JP	4395	3848	946	5E+11	5E+11	1E+11	0.7	0.8	1.1	0.34	0.42	0.01	0.48	0.42	0.10
1991	JP	4519	3835	962	6E+11	5E+11	1E+11	0.7	0.8	1.1	0.35	0.42	0.01	0.49	0.41	0.10
1992	JP	4629	3812	975	6E+11	5E+11	1E+11	0.7	0.8	1.1	0.36	0.42	0.01	0.49	0.40	0.10
1993	JP	4736	3787	987	6E+11	5E+11	1E+11	0.7	0.8	1.1	0.37	0.42	0.01	0.50	0.40	0.10
1994	JP	4845	3765	1000	6E+11	5E+11	1E+11	0.7	0.8	1.1	0.38	0.41	0.01	0.50	0.39	0.10
1995	JP	4960	3749	1014	6E+11	5E+11	1E+11	0.7	0.8	1.1	0.39	0.41	0.01	0.51	0.39	0.10
1996	JP	5085	3718	1039	6E+11	5E+11	1E+11	0.7	0.8	1.1	0.40	0.41	0.01	0.52	0.38	0.11
1997	JP	5201	3680	1062	7E+11	5E+11	1E+11	0.7	0.8	1.1	0.41	0.40	0.01	0.52	0.37	0.11
1998	JP	5300	3631	1081	7E+11	5E+11	1E+11	0.7	0.8	1.1	0.41	0.40	0.01	0.53	0.36	0.11
1999	JP	5416	3593	1104	7E+11	5E+11	1E+11	0.7	0.8	1.1	0.42	0.39	0.01	0.54	0.36	0.11
2000	JP	5548	3566	1130	7E+11	5E+11	1E+11	0.7	0.8	1.1	0.43	0.39	0.01	0.54	0.35	0.11
2001	JP	5581	3601	1153	7E+11	5E+11	1E+11	0.7	0.8	1.1	0.44	0.39	0.01	0.54	0.35	0.11
2002	JP	5618	3637	1177	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.44	0.40	0.01	0.54	0.35	0.11
2003	JP	5656	3675	1201	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.44	0.40	0.01	0.54	0.35	0.11
2004	JP	5699	3716	1227	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.45	0.41	0.01	0.54	0.35	0.12
2005	JP	5730	3750	1250	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.45	0.41	0.01	0.53	0.35	0.12
2006	JP	5704	3762	1238	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.45	0.41	0.01	0.53	0.35	0.12
2007	JP	5680	3774	1226	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.44	0.41	0.01	0.53	0.35	0.11
2008	JP	5625	3766	1207	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.44	0.41	0.01	0.53	0.36	0.11
2009	JP	5564	3754	1187	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.44	0.41	0.01	0.53	0.36	0.11
2010	JP	5573	3789	1182	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.44	0.42	0.01	0.53	0.36	0.11
2011	JP	5638	3805	1195	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.44	0.42	0.01	0.53	0.36	0.11
2012	JP	5700	3818	1207	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.45	0.42	0.01	0.53	0.36	0.11
2013	JP	5757	3830	1218	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.45	0.42	0.01	0.53	0.35	0.11
2014	JP	5810	3840	1228	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.45	0.42	0.01	0.53	0.35	0.11

2015	JP	5860	3849	1238	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.46	0.42	0.01	0.54	0.35	0.11
2016	JP	5894	3849	1244	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.46	0.42	0.01	0.54	0.35	0.11
2017	JP	5925	3850	1249	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.46	0.42	0.01	0.54	0.35	0.11
2018	JP	5955	3850	1255	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.47	0.42	0.01	0.54	0.35	0.11
2019	JP	5983	3850	1260	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.47	0.42	0.01	0.54	0.35	0.11
2020	JP	6009	3851	1265	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.47	0.42	0.01	0.54	0.35	0.11
2021	JP	6046	3859	1272	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.47	0.42	0.01	0.54	0.35	0.11
2022	JP	6080	3866	1278	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.48	0.42	0.01	0.54	0.34	0.11
2023	JP	6111	3871	1284	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.48	0.42	0.01	0.54	0.34	0.11
2024	JP	6140	3875	1289	7E+11	5E+11	2E+11	0.7	0.8	1.1	0.48	0.42	0.01	0.54	0.34	0.11
2025	JP	6193	3947	1299	7E+11	5E+11	2E+11	0.7	0.6	1.1	0.48	0.43	0.01	0.54	0.35	0.11
2026	JP	6242	4015	1308	8E+11	5E+11	2E+11	0.7	0.6	1.1	0.49	0.44	0.01	0.54	0.35	0.11
2027	JP	6288	4081	1316	8E+11	5E+11	2E+11	0.7	0.6	1.1	0.49	0.44	0.01	0.54	0.35	0.11
2028	JP	6331	4145	1324	8E+11	5E+11	2E+11	0.7	0.6	1.1	0.50	0.44	0.01	0.54	0.35	0.11
2029	JP	6371	4206	1331	8E+11	5E+11	2E+11	0.7	0.6	1.1	0.50	0.44	0.01	0.54	0.35	0.11
2030	JP	6409	4265	1337	8E+11	5E+11	2E+11	0.7	0.6	1.1	0.50	0.45	0.01	0.53	0.36	0.11
2031	JP	6444	4322	1343	8E+11	5E+11	2E+11	0.7	0.6	1.1	0.50	0.45	0.01	0.53	0.36	0.11
2032	JP	6478	4376	1348	8E+11	5E+11	2E+11	0.7	0.6	1.1	0.51	0.45	0.01	0.53	0.36	0.11
2033	JP	6508	4429	1353	7E+11	5E+11	2E+11	0.7	0.6	1.1	0.51	0.45	0.01	0.53	0.36	0.11
2034	JP	6537	4479	1357	7E+11	5E+11	2E+11	0.7	0.6	1.1	0.51	0.45	0.01	0.53	0.36	0.11
2035	JP	6563	4527	1361	7E+11	5E+11	2E+11	0.7	0.6	1.1	0.51	0.45	0.01	0.53	0.36	0.11
2036	JP	6587	4573	1365	7E+11	5E+11	2E+11	0.7	0.6	1.1	0.52	0.45	0.01	0.53	0.37	0.11
2037	JP	6609	4617	1368	7E+11	5E+11	2E+11	0.7	0.6	1.1	0.52	0.45	0.01	0.52	0.37	0.11
2038	JP	6630	4660	1370	7E+11	5E+11	2E+11	0.7	0.6	1.1	0.52	0.45	0.01	0.52	0.37	0.11
2039	JP	6649	4700	1372	7E+11	5E+11	2E+11	0.7	0.6	1.1	0.52	0.45	0.01	0.52	0.37	0.11
2040	JP	6666	4739	1374	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.52	0.45	0.01	0.52	0.37	0.11
2041	JP	6684	4778	1376	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.52	0.45	0.01	0.52	0.37	0.11
2042	JP	6700	4816	1378	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.52	0.45	0.01	0.52	0.37	0.11
2043	JP	6715	4851	1379	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.53	0.45	0.01	0.52	0.37	0.11
2044	JP	6728	4885	1380	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.53	0.45	0.01	0.52	0.38	0.11

2045	JP	6740	4917	1381	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.53	0.45	0.01	0.52	0.38	0.11
2046	JP	6749	4947	1381	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.53	0.45	0.01	0.52	0.38	0.11
2047	JP	6758	4976	1381	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.53	0.45	0.01	0.52	0.38	0.11
2048	JP	6766	5004	1381	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.53	0.45	0.01	0.51	0.38	0.11
2049	JP	6772	5031	1381	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.53	0.44	0.01	0.51	0.38	0.10
2050	JP	6778	5056	1380	7E+11	5E+11	1E+11	0.7	0.6	1.1	0.53	0.44	0.01	0.51	0.38	0.10
1960	US															
1961	US	12997	680	276	2E+12	1E+11	5E+10	0.8	0.9	1.3	0.77	0.08	0.00	0.93	0.05	0.02
1962	US	13387	679	297	2E+12	1E+11	5E+10	0.8	0.9	1.3	0.79	0.08	0.00	0.93	0.05	0.02
1963	US	13772	648	332	3E+12	1E+11	6E+10	0.8	0.9	1.3	0.81	0.08	0.00	0.93	0.04	0.02
1964	US	14242	642	376	3E+12	1E+11	7E+10	0.8	0.9	1.3	0.84	0.08	0.01	0.93	0.04	0.02
1965	US	14698	633	439	3E+12	1E+11	8E+10	0.8	0.9	1.3	0.86	0.07	0.01	0.93	0.04	0.03
1966	US	15237	617	501	3E+12	1E+11	1E+11	0.8	0.9	1.3	0.89	0.07	0.01	0.93	0.04	0.03
1967	US	15465	596	612	3E+12	1E+11	1E+11	0.8	0.9	1.3	0.90	0.07	0.01	0.93	0.04	0.04
1968	US	15920	563	700	3E+12	1E+11	1E+11	0.8	0.9	1.3	0.93	0.07	0.01	0.93	0.03	0.04
1969	US	16250	545	811	3E+12	1E+11	2E+11	0.8	0.9	1.3	0.94	0.07	0.01	0.92	0.03	0.05
1970	US	16536	515	812	3E+12	1E+11	2E+11	0.8	0.9	1.3	0.96	0.06	0.01	0.93	0.03	0.05
1971	US	17016	479	817	3E+12	1E+11	2E+11	0.8	0.9	1.3	0.98	0.06	0.01	0.93	0.03	0.04
1972	US	17521	461	891	4E+12	1E+11	2E+11	0.8	0.9	1.3	1.01	0.05	0.01	0.93	0.02	0.05
1973	US	17967	480	962	4E+12	1E+11	2E+11	0.8	0.9	1.3	1.04	0.06	0.01	0.93	0.02	0.05
1974	US	17233	510	995	4E+12	1E+11	2E+11	0.8	0.9	1.3	1.00	0.06	0.01	0.92	0.03	0.05
1975	US	17322	485	1001	4E+12	1E+11	2E+11	0.8	0.9	1.3	1.00	0.06	0.01	0.92	0.03	0.05
1976	US	17613	482	1089	4E+12	1E+11	2E+11	0.8	0.9	1.3	1.02	0.06	0.01	0.92	0.03	0.06
1977	US	17778	493	1164	4E+12	1E+11	3E+11	0.8	0.9	1.3	1.03	0.06	0.01	0.91	0.03	0.06
1978	US	17920	494	1335	4E+12	1E+11	3E+11	0.8	0.9	1.3	1.04	0.06	0.01	0.91	0.03	0.07
1979	US	17010	516	1502	4E+12	1E+11	3E+11	0.8	0.9	1.3	0.99	0.06	0.02	0.89	0.03	0.08
1980	US	16761	517	1446	4E+12	1E+11	3E+11	0.8	0.9	1.3	0.98	0.06	0.01	0.90	0.03	0.08
1981	US	16803	502	1426	4E+12	1E+11	3E+11	0.8	0.9	1.3	0.98	0.06	0.01	0.90	0.03	0.08
1982	US	16712	479	1481	4E+12	1E+11	3E+11	0.8	0.9	1.3	0.98	0.06	0.01	0.90	0.03	0.08
1983	US	17057	474	1596	4E+12	1E+11	4E+11	0.8	0.9	1.3	1.00	0.06	0.02	0.89	0.02	0.08

1984	US	17514	481	1712	4E+12	1E+11	4E+11	0.8	0.9	1.3	1.03	0.06	0.02	0.89	0.02	0.09
1985	US	17702	474	1882	4E+12	1E+11	4E+11	0.8	0.9	1.3	1.04	0.06	0.02	0.88	0.02	0.09
1986	US	17973	475	2083	4E+12	1E+11	5E+11	0.8	0.9	1.3	1.05	0.06	0.02	0.88	0.02	0.10
1987	US	18187	461	2179	4E+12	1E+11	5E+11	0.8	0.9	1.3	1.06	0.06	0.02	0.87	0.02	0.10
1988	US	18601	454	2154	5E+12	1E+11	5E+11	0.8	0.9	1.3	1.08	0.06	0.02	0.88	0.02	0.10
1989	US	18916	462	2131	5E+12	1E+11	5E+11	0.8	0.9	1.3	1.10	0.06	0.02	0.88	0.02	0.10
1990	US	19078	450	2179	5E+12	1E+11	5E+11	0.8	0.9	1.3	1.11	0.06	0.02	0.88	0.02	0.10
1991	US	18827	443	2101	5E+12	1E+11	5E+11	0.8	0.9	1.3	1.09	0.05	0.02	0.88	0.02	0.10
1992	US	19280	433	2185	5E+12	1E+11	6E+11	0.8	0.9	1.3	1.12	0.05	0.02	0.88	0.02	0.10
1993	US	19641	440	2227	5E+12	1E+11	6E+11	0.8	0.9	1.3	1.14	0.05	0.02	0.88	0.02	0.10
1994	US	19956	437	2361	5E+12	1E+11	6E+11	0.8	0.9	1.3	1.16	0.05	0.02	0.88	0.02	0.10
1995	US	20108	440	2420	5E+12	1E+11	6E+11	0.8	0.9	1.3	1.17	0.05	0.02	0.88	0.02	0.11
1996	US	20251	431	2565	5E+12	1E+11	7E+11	0.8	0.9	1.3	1.18	0.05	0.02	0.87	0.02	0.11
1997	US	20487	430	2618	6E+12	1E+11	7E+11	0.8	0.9	1.3	1.19	0.05	0.02	0.87	0.02	0.11
1998	US	20813	438	2652	6E+12	1E+11	7E+11	0.8	0.9	1.3	1.20	0.05	0.03	0.87	0.02	0.11
1999	US	21055	444	2769	6E+12	1E+11	8E+11	0.8	0.9	1.3	1.22	0.05	0.03	0.87	0.02	0.11
2000	US	21196	451	2883	6E+12	1E+11	8E+11	0.8	0.9	1.3	1.23	0.05	0.03	0.86	0.02	0.12
2001	US	21523	453	2709	6E+12	1E+11	8E+11	0.8	0.9	1.3	1.24	0.06	0.03	0.87	0.02	0.11
2002	US	21895	438	2637	6E+12	1E+11	8E+11	0.8	0.9	1.3	1.26	0.05	0.02	0.88	0.02	0.11
2003	US	21997	428	2782	6E+12	1E+11	8E+11	0.8	0.9	1.3	1.27	0.05	0.03	0.87	0.02	0.11
2004	US	22095	420	3000	6E+12	1E+11	9E+11	0.8	0.9	1.3	1.27	0.05	0.03	0.87	0.02	0.12
2005	US	22132	416	3125	7E+12	1E+11	9E+11	0.8	0.9	1.3	1.28	0.05	0.03	0.86	0.02	0.12
2006	US	22237	426	3146	7E+12	1E+11	9E+11	0.8	0.9	1.3	1.28	0.05	0.03	0.86	0.02	0.12
2007	US	22274	441	3239	7E+12	1E+11	1E+12	0.8	0.9	1.3	1.29	0.06	0.03	0.86	0.02	0.12
2008	US	21595	451	3080	7E+12	1E+11	9E+11	0.8	0.9	1.3	1.25	0.06	0.03	0.86	0.02	0.12
2009	US	21946	446	2899	7E+12	1E+11	9E+11	0.8	0.9	1.3	1.27	0.06	0.03	0.87	0.02	0.11
2010	US	21615	426	2943	7E+12	1E+11	9E+11	0.8	0.9	1.3	1.25	0.05	0.03	0.87	0.02	0.12
2011	US	22019	425	3045	7E+12	1E+11	1E+12	0.8	0.9	1.3	1.27	0.05	0.03	0.86	0.02	0.12
2012	US	22366	424	3136	7E+12	1E+11	1E+12	0.8	0.9	1.3	1.29	0.05	0.03	0.86	0.02	0.12
2013	US	22666	422	3218	7E+12	1E+11	1E+12	0.8	0.9	1.3	1.31	0.05	0.03	0.86	0.02	0.12

2014	US	22788	414	3286	7E+12	1E+11	1E+12	0.8	0.9	1.4	1.32	0.05	0.03	0.86	0.02	0.12
2015	US	22793	405	3334	7E+12	1E+11	1E+12	0.8	0.9	1.4	1.32	0.05	0.03	0.86	0.02	0.13
2016	US	22792	397	3377	7E+12	1E+11	1E+12	0.8	0.9	1.4	1.32	0.05	0.03	0.86	0.01	0.13
2017	US	22785	390	3417	7E+12	1E+11	1E+12	0.8	0.9	1.4	1.32	0.05	0.03	0.86	0.01	0.13
2018	US	22774	383	3452	8E+12	1E+11	1E+12	0.8	0.9	1.4	1.32	0.05	0.03	0.86	0.01	0.13
2019	US	22761	377	3485	8E+12	1E+11	1E+12	0.8	0.9	1.4	1.32	0.05	0.03	0.85	0.01	0.13
2020	US	22840	373	3531	8E+12	1E+11	1E+12	0.8	0.9	1.4	1.32	0.05	0.03	0.85	0.01	0.13
2021	US	22847	366	3571	8E+12	1E+11	1E+12	0.8	0.9	1.4	1.32	0.05	0.03	0.85	0.01	0.13
2022	US	22851	359	3610	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.03	0.85	0.01	0.13
2023	US	22858	353	3649	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.03	0.85	0.01	0.14
2024	US	22869	347	3686	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.03	0.85	0.01	0.14
2025	US	22876	341	3722	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.03	0.85	0.01	0.14
2026	US	22885	340	3757	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.03	0.85	0.01	0.14
2027	US	22885	341	3791	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.03	0.85	0.01	0.14
2028	US	22885	344	3824	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.03	0.85	0.01	0.14
2029	US	22876	348	3856	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.03	0.84	0.01	0.14
2030	US	22866	354	3886	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.04	0.84	0.01	0.14
2031	US	22855	362	3916	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.04	0.84	0.01	0.14
2032	US	22834	371	3945	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.04	0.84	0.01	0.15
2033	US	22814	381	3973	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.04	0.84	0.01	0.15
2034	US	22794	392	4000	8E+12	1E+11	1E+12	0.9	0.9	1.4	1.32	0.04	0.04	0.84	0.01	0.15
2035	US	22770	405	4026	8E+12	2E+11	2E+12	0.9	0.9	1.4	1.32	0.05	0.04	0.84	0.01	0.15
2036	US	22751	420	4051	9E+12	2E+11	2E+12	0.9	0.9	1.4	1.32	0.05	0.04	0.84	0.02	0.15
2037	US	22726	436	4076	9E+12	2E+11	2E+12	0.9	0.9	1.4	1.31	0.05	0.04	0.83	0.02	0.15
2038	US	22698	453	4099	9E+12	2E+11	2E+12	0.9	0.9	1.5	1.31	0.05	0.04	0.83	0.02	0.15
2039	US	22665	471	4122	9E+12	2E+11	2E+12	0.9	0.9	1.5	1.31	0.05	0.04	0.83	0.02	0.15
2040	US	22628	490	4145	9E+12	2E+11	2E+12	0.9	0.9	1.5	1.31	0.05	0.04	0.83	0.02	0.15
2041	US	22599	511	4169	9E+12	2E+11	2E+12	0.9	0.9	1.5	1.31	0.05	0.04	0.83	0.02	0.15
2042	US	22558	534	4191	9E+12	2E+11	2E+12	0.9	0.9	1.5	1.31	0.06	0.04	0.83	0.02	0.15
2043	US	22515	557	4213	9E+12	2E+11	2E+12	0.9	0.9	1.5	1.30	0.06	0.04	0.83	0.02	0.15

2044	US	22481	582	4235	9E+12	2E+11	2E+12	0.9	0.9	1.5	1.30	0.06	0.04	0.82	0.02	0.16
2045	US	22441	609	4255	9E+12	2E+11	2E+12	0.9	0.9	1.5	1.30	0.06	0.04	0.82	0.02	0.16
2046	US	22396	637	4275	9E+12	3E+11	2E+12	0.9	0.9	1.5	1.30	0.07	0.04	0.82	0.02	0.16
2047	US	22346	666	4294	9E+12	3E+11	2E+12	0.9	0.9	1.5	1.29	0.07	0.04	0.82	0.02	0.16
2048	US	22301	698	4313	9E+12	3E+11	2E+12	0.9	0.9	1.5	1.29	0.07	0.04	0.82	0.03	0.16
2049	US	22250	730	4331	9E+12	3E+11	2E+12	0.9	1.0	1.5	1.29	0.07	0.04	0.81	0.03	0.16
2050	US	22200	764	4350	9E+12	3E+11	2E+12	0.9	1.0	1.5	1.28	0.08	0.04	0.81	0.03	0.16
1960	EU															
1961	EU	1266	864	61	5E+11	4E+11	3E+10	0.8	0.9	1.3	0.08	0.09	0.00	0.58	0.39	0.03
1962	EU	1375	917	82	6E+11	4E+11	3E+10	0.8	0.9	1.3	0.08	0.10	0.00	0.58	0.39	0.03
1963	EU	1531	950	85	6E+11	4E+11	4E+10	0.8	0.9	1.3	0.09	0.10	0.00	0.60	0.37	0.03
1964	EU	1737	944	88	7E+11	4E+11	4E+10	0.8	0.9	1.3	0.11	0.10	0.00	0.63	0.34	0.03
1965	EU	1981	905	93	8E+11	4E+11	4E+10	0.8	0.9	1.3	0.12	0.10	0.00	0.67	0.30	0.03
1966	EU	2111	959	123	9E+11	4E+11	5E+10	0.8	0.9	1.3	0.13	0.11	0.00	0.66	0.30	0.04
1967	EU	2415	890	118	1E+12	4E+11	5E+10	0.8	0.9	1.3	0.15	0.10	0.00	0.71	0.26	0.03
1968	EU	2587	969	117	1E+12	4E+11	5E+10	0.8	0.9	1.3	0.16	0.11	0.00	0.70	0.26	0.03
1969	EU	2784	1001	153	1E+12	4E+11	7E+10	0.8	0.9	1.3	0.17	0.11	0.00	0.71	0.25	0.04
1970	EU	3074	967	164	1E+12	4E+11	7E+10	0.8	0.9	1.3	0.19	0.11	0.00	0.73	0.23	0.04
1971	EU	3298	979	173	1E+12	4E+11	8E+10	0.8	0.9	1.3	0.20	0.11	0.00	0.74	0.22	0.04
1972	EU	3384	1072	238	2E+12	5E+11	1E+11	0.8	0.9	1.3	0.21	0.12	0.00	0.72	0.23	0.05
1973	EU	3600	1058	268	2E+12	5E+11	1E+11	0.8	0.9	1.3	0.22	0.12	0.00	0.73	0.21	0.05
1974	EU	3806	1113	258	2E+12	5E+11	1E+11	0.8	0.9	1.3	0.23	0.12	0.00	0.74	0.21	0.05
1975	EU	3855	1178	293	2E+12	5E+11	1E+11	0.8	0.9	1.3	0.23	0.13	0.00	0.72	0.22	0.06
1976	EU	4022	1233	317	2E+12	6E+11	1E+11	0.8	0.9	1.3	0.24	0.14	0.00	0.72	0.22	0.06
1977	EU	4234	1222	354	2E+12	6E+11	2E+11	0.8	0.9	1.3	0.26	0.13	0.00	0.73	0.21	0.06
1978	EU	4373	1231	371	2E+12	6E+11	2E+11	0.8	0.9	1.3	0.27	0.13	0.00	0.73	0.21	0.06
1979	EU	4534	1271	432	2E+12	6E+11	2E+11	0.8	0.9	1.3	0.28	0.14	0.00	0.73	0.20	0.07
1980	EU	4768	1262	422	2E+12	6E+11	2E+11	0.8	0.9	1.3	0.29	0.14	0.00	0.74	0.20	0.07
1981	EU	4810	1427	446	2E+12	7E+11	2E+11	0.8	0.9	1.3	0.29	0.16	0.00	0.72	0.21	0.07
1982	EU	4997	1480	431	2E+12	7E+11	2E+11	0.8	0.9	1.3	0.30	0.16	0.00	0.72	0.21	0.06

1983	EU	5145	1519	451	2E+12	7E+11	2E+11	0.8	0.9	1.3	0.31	0.17	0.00	0.72	0.21	0.06
1984	EU	5334	1535	456	3E+12	7E+11	2E+11	0.8	0.9	1.3	0.32	0.17	0.00	0.73	0.21	0.06
1985	EU	5433	1688	496	3E+12	8E+11	2E+11	0.8	0.9	1.3	0.33	0.19	0.00	0.71	0.22	0.07
1986	EU	5739	1553	504	3E+12	7E+11	2E+11	0.8	0.9	1.3	0.35	0.17	0.00	0.74	0.20	0.06
1987	EU	5912	1569	556	3E+12	7E+11	3E+11	0.8	0.9	1.3	0.36	0.17	0.01	0.74	0.20	0.07
1988	EU	6010	1725	580	3E+12	8E+11	3E+11	0.8	0.9	1.3	0.37	0.19	0.01	0.72	0.21	0.07
1989	EU	6242	1741	611	3E+12	8E+11	3E+11	0.8	0.9	1.3	0.38	0.19	0.01	0.73	0.20	0.07
1990	EU	6419	1768	697	3E+12	8E+11	3E+11	0.8	0.9	1.3	0.39	0.19	0.01	0.72	0.20	0.08
1991	EU	6667	1776	695	3E+12	9E+11	3E+11	0.8	0.9	1.3	0.41	0.19	0.01	0.73	0.19	0.08
1992	EU	6868	1774	689	3E+12	9E+11	3E+11	0.8	0.9	1.3	0.42	0.19	0.01	0.74	0.19	0.07
1993	EU	7039	1765	681	3E+12	9E+11	3E+11	0.8	0.9	1.3	0.43	0.19	0.01	0.74	0.19	0.07
1994	EU	7253	1769	678	4E+12	9E+11	3E+11	0.8	0.9	1.3	0.44	0.19	0.01	0.75	0.18	0.07
1995	EU	7481	1778	676	4E+12	9E+11	3E+11	0.8	0.9	1.3	0.46	0.19	0.01	0.75	0.18	0.07
1996	EU	7535	1737	740	4E+12	8E+11	4E+11	0.8	0.9	1.3	0.46	0.19	0.01	0.75	0.17	0.07
1997	EU	7666	1731	791	4E+12	8E+11	4E+11	0.8	0.9	1.3	0.47	0.19	0.01	0.75	0.17	0.08
1998	EU	7847	1728	836	4E+12	8E+11	4E+11	0.8	0.9	1.3	0.48	0.19	0.01	0.75	0.17	0.08
1999	EU	8046	1738	873	4E+12	8E+11	4E+11	0.8	0.9	1.3	0.49	0.19	0.01	0.75	0.16	0.08
2000	EU	8181	1818	952	4E+12	9E+11	5E+11	0.8	0.9	1.3	0.50	0.20	0.01	0.75	0.17	0.09
2001	EU	8413	1825	962	4E+12	9E+11	5E+11	0.8	0.9	1.3	0.51	0.20	0.01	0.75	0.16	0.09
2002	EU	8646	1805	969	4E+12	9E+11	5E+11	0.8	0.9	1.3	0.53	0.20	0.01	0.76	0.16	0.08
2003	EU	8791	1821	1018	4E+12	9E+11	5E+11	0.8	0.9	1.3	0.54	0.20	0.01	0.76	0.16	0.09
2004	EU	8955	1852	1081	4E+12	9E+11	5E+11	0.8	0.9	1.3	0.55	0.20	0.01	0.75	0.16	0.09
2005	EU	9039	1895	1173	4E+12	9E+11	6E+11	0.8	0.9	1.3	0.55	0.21	0.01	0.75	0.16	0.10
2006	EU	9214	1925	1240	5E+12	1E+12	6E+11	0.8	0.9	1.3	0.56	0.21	0.01	0.74	0.16	0.10
2007	EU	9357	1972	1301	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.57	0.22	0.01	0.74	0.16	0.10
2008	EU	9440	2043	1293	5E+12	1E+12	6E+11	0.8	0.9	1.3	0.57	0.22	0.01	0.74	0.16	0.10
2009	EU	9498	1948	1214	5E+12	1E+12	6E+11	0.8	0.9	1.3	0.58	0.21	0.01	0.75	0.15	0.10
2010	EU	9643	1976	1293	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.59	0.22	0.01	0.75	0.15	0.10
2011	EU	9758	1993	1289	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.59	0.22	0.01	0.75	0.15	0.10
2012	EU	9867	2008	1285	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.60	0.22	0.01	0.75	0.15	0.10

2013	EU	9971	2023	1283	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.61	0.22	0.01	0.75	0.15	0.10
2014	EU	10069	2036	1282	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.61	0.22	0.01	0.75	0.15	0.10
2015	EU	10163	2050	1282	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.62	0.22	0.01	0.75	0.15	0.10
2016	EU	10205	2054	1277	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.62	0.23	0.01	0.75	0.15	0.09
2017	EU	10236	2057	1273	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.62	0.23	0.01	0.75	0.15	0.09
2018	EU	10256	2059	1269	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.62	0.23	0.01	0.76	0.15	0.09
2019	EU	10268	2060	1265	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.63	0.23	0.01	0.76	0.15	0.09
2020	EU	10271	2061	1261	5E+12	1E+12	7E+11	0.8	0.9	1.3	0.63	0.23	0.01	0.76	0.15	0.09
2021	EU	10401	2084	1272	6E+12	1E+12	7E+11	0.8	0.9	1.3	0.63	0.23	0.01	0.76	0.15	0.09
2022	EU	10542	2107	1283	6E+12	1E+12	7E+11	0.8	0.9	1.3	0.64	0.23	0.01	0.76	0.15	0.09
2023	EU	10695	2130	1295	6E+12	1E+12	7E+11	0.8	0.9	1.3	0.65	0.23	0.01	0.76	0.15	0.09
2024	EU	10856	2153	1308	6E+12	1E+12	7E+11	0.8	0.9	1.3	0.66	0.24	0.01	0.76	0.15	0.09
2025	EU	11025	2176	1321	6E+12	1E+12	7E+11	0.8	0.9	1.3	0.67	0.24	0.01	0.76	0.15	0.09
2026	EU	11200	2207	1334	6E+12	1E+12	7E+11	0.8	0.9	1.3	0.68	0.24	0.01	0.76	0.15	0.09
2027	EU	11379	2245	1347	6E+12	1E+12	7E+11	0.8	0.9	1.3	0.69	0.24	0.01	0.76	0.15	0.09
2028	EU	11564	2291	1360	6E+12	1E+12	7E+11	0.8	0.9	1.3	0.70	0.24	0.01	0.76	0.15	0.09
2029	EU	11752	2342	1374	6E+12	1E+12	8E+11	0.8	0.9	1.3	0.72	0.25	0.01	0.76	0.15	0.09
2030	EU	11943	2398	1388	7E+12	1E+12	8E+11	0.8	0.9	1.3	0.73	0.25	0.01	0.76	0.15	0.09
2031	EU	12146	2461	1403	7E+12	1E+12	8E+11	0.8	0.9	1.3	0.74	0.25	0.01	0.76	0.15	0.09
2032	EU	12352	2529	1418	7E+12	1E+12	8E+11	0.8	0.9	1.3	0.75	0.26	0.01	0.76	0.16	0.09
2033	EU	12560	2601	1433	7E+12	1E+12	8E+11	0.8	0.9	1.3	0.76	0.26	0.01	0.76	0.16	0.09
2034	EU	12771	2676	1448	7E+12	1E+12	8E+11	0.8	0.9	1.3	0.78	0.27	0.01	0.76	0.16	0.09
2035	EU	12983	2756	1463	7E+12	2E+12	8E+11	0.8	0.9	1.3	0.79	0.27	0.01	0.75	0.16	0.09
2036	EU	13196	2839	1479	7E+12	2E+12	8E+11	0.8	0.9	1.3	0.80	0.28	0.01	0.75	0.16	0.08
2037	EU	13225	2873	1491	7E+12	2E+12	8E+11	0.9	0.9	1.4	0.81	0.28	0.01	0.75	0.16	0.08
2038	EU	13222	2901	1502	7E+12	2E+12	8E+11	0.9	0.9	1.5	0.81	0.28	0.01	0.75	0.16	0.09
2039	EU	13214	2931	1512	7E+12	2E+12	9E+11	0.9	0.9	1.5	0.80	0.28	0.01	0.75	0.17	0.09
2040	EU	13204	2961	1522	8E+12	2E+12	9E+11	0.9	0.9	1.5	0.80	0.28	0.01	0.75	0.17	0.09
2041	EU	13190	2994	1531	8E+12	2E+12	9E+11	0.9	0.9	1.5	0.80	0.28	0.01	0.74	0.17	0.09
2042	EU	13177	3028	1540	8E+12	2E+12	9E+11	0.9	0.9	1.5	0.80	0.28	0.01	0.74	0.17	0.09

2043	EU	13163	3063	1548	8E+12	2E+12	9E+11	0.9	0.9	1.5	0.80	0.28	0.01	0.74	0.17	0.09
2044	EU	13145	3099	1555	8E+12	2E+12	9E+11	0.9	1.0	1.5	0.80	0.29	0.01	0.74	0.17	0.09
2045	EU	13128	3137	1563	8E+12	2E+12	9E+11	0.9	1.0	1.5	0.80	0.29	0.01	0.74	0.18	0.09
2046	EU	13107	3176	1569	8E+12	2E+12	9E+11	1.0	1.0	1.5	0.80	0.29	0.01	0.73	0.18	0.09
2047	EU	13085	3216	1575	8E+12	2E+12	9E+11	1.0	1.0	1.6	0.80	0.29	0.01	0.73	0.18	0.09
2048	EU	13064	3257	1581	8E+12	2E+12	9E+11	1.0	1.0	1.6	0.80	0.29	0.01	0.73	0.18	0.09
2049	EU	13042	3299	1587	8E+12	2E+12	9E+11	1.0	1.0	1.6	0.79	0.29	0.01	0.73	0.18	0.09
2050	EU	13016	3342	1593	8E+12	2E+12	9E+11	1.0	1.0	1.6	0.79	0.29	0.01	0.73	0.19	0.09
1970	BR															
1971	BR	381	1084	54	4E+10	1E+11	5E+09	1.0	1.1	1.3	0.03	0.14	0.00	0.25	0.71	0.04
1972	BR	464	1131	62	5E+10	1E+11	6E+09	1.0	1.1	1.3	0.04	0.14	0.00	0.28	0.68	0.04
1973	BR	568	1213	76	6E+10	1E+11	8E+09	1.0	1.1	1.3	0.05	0.15	0.00	0.31	0.65	0.04
1974	BR	674	1300	87	7E+10	1E+11	9E+09	1.0	1.1	1.3	0.06	0.16	0.00	0.33	0.63	0.04
1975	BR	776	1387	96	8E+10	1E+11	1E+10	1.0	1.1	1.3	0.06	0.17	0.00	0.34	0.61	0.04
1976	BR	889	1537	102	1E+11	2E+11	1E+10	1.0	1.1	1.3	0.07	0.19	0.00	0.35	0.61	0.04
1977	BR	982	1691	104	1E+11	2E+11	1E+10	1.0	1.1	1.3	0.08	0.21	0.00	0.35	0.61	0.04
1978	BR	1071	1850	111	1E+11	2E+11	1E+10	1.0	1.1	1.3	0.09	0.23	0.00	0.35	0.61	0.04
1979	BR	1193	2009	124	1E+11	2E+11	1E+10	1.0	1.1	1.3	0.10	0.25	0.00	0.36	0.60	0.04
1980	BR	1341	2215	130	2E+11	3E+11	2E+10	1.0	1.1	1.3	0.11	0.28	0.00	0.36	0.60	0.04
1981	BR	1387	2292	136	2E+11	3E+11	2E+10	1.0	1.1	1.3	0.12	0.29	0.00	0.36	0.60	0.04
1982	BR	1435	2364	143	2E+11	3E+11	2E+10	1.0	1.1	1.3	0.12	0.29	0.00	0.36	0.60	0.04
1983	BR	1484	2376	135	2E+11	3E+11	2E+10	1.0	1.1	1.3	0.12	0.30	0.00	0.37	0.59	0.03
1984	BR	1564	2431	136	2E+11	3E+11	2E+10	1.0	1.1	1.3	0.13	0.30	0.00	0.38	0.59	0.03
1985	BR	1674	2535	150	2E+11	3E+11	2E+10	1.0	1.1	1.3	0.14	0.32	0.00	0.38	0.58	0.03
1986	BR	1731	2567	185	2E+11	4E+11	3E+10	1.0	1.1	1.3	0.14	0.32	0.00	0.39	0.57	0.04
1987	BR	1799	2696	179	3E+11	4E+11	3E+10	1.0	1.1	1.3	0.15	0.34	0.00	0.38	0.58	0.04
1988	BR	1806	2794	186	3E+11	4E+11	3E+10	1.0	1.1	1.3	0.15	0.35	0.00	0.38	0.58	0.04
1989	BR	1820	2885	212	3E+11	4E+11	3E+10	1.0	1.1	1.3	0.15	0.36	0.00	0.37	0.59	0.04
1990	BR	1805	2876	206	3E+11	4E+11	3E+10	1.0	1.1	1.3	0.15	0.36	0.00	0.37	0.59	0.04
1991	BR	1764	2935	200	3E+11	4E+11	3E+10	1.0	1.1	1.3	0.15	0.37	0.00	0.36	0.60	0.04

1992	BR	1706	2969	196	3E+11	5E+11	3E+10	1.0	1.1	1.3	0.14	0.37	0.00	0.35	0.61	0.04
1993	BR	1729	3015	206	3E+11	5E+11	3E+10	1.0	1.1	1.3	0.14	0.38	0.00	0.35	0.61	0.04
1994	BR	1812	3055	226	3E+11	5E+11	4E+10	1.0	1.1	1.3	0.15	0.38	0.00	0.36	0.60	0.04
1995	BR	1918	3098	246	3E+11	5E+11	4E+10	1.0	1.1	1.3	0.16	0.39	0.00	0.36	0.59	0.05
1996	BR	2017	3117	254	3E+11	5E+11	4E+10	1.0	1.1	1.3	0.17	0.39	0.00	0.37	0.58	0.05
1997	BR	2146	3114	271	4E+11	5E+11	5E+10	1.0	1.1	1.3	0.18	0.39	0.00	0.39	0.56	0.05
1998	BR	2234	3085	300	4E+11	5E+11	5E+10	1.0	1.1	1.3	0.19	0.38	0.00	0.40	0.55	0.05
1999	BR	2297	3058	228	4E+11	5E+11	4E+10	1.0	1.1	1.3	0.19	0.38	0.00	0.41	0.55	0.04
2000	BR	2358	3021	281	4E+11	5E+11	5E+10	1.0	1.1	1.3	0.20	0.38	0.00	0.42	0.53	0.05
2001	BR	2420	2994	282	4E+11	5E+11	5E+10	1.0	1.1	1.3	0.20	0.37	0.00	0.42	0.53	0.05
2002	BR	2515	3001	277	5E+11	5E+11	5E+10	1.0	1.1	1.3	0.21	0.37	0.00	0.43	0.52	0.05
2003	BR	2599	3008	259	5E+11	5E+11	5E+10	1.0	1.1	1.3	0.22	0.37	0.00	0.44	0.51	0.04
2004	BR	2724	3057	266	5E+11	6E+11	5E+10	1.0	1.1	1.3	0.23	0.38	0.00	0.45	0.51	0.04
2005	BR	2825	3051	318	5E+11	6E+11	6E+10	1.0	1.1	1.3	0.23	0.38	0.00	0.46	0.49	0.05
2006	BR	2974	3113	307	6E+11	6E+11	6E+10	1.0	1.1	1.3	0.25	0.39	0.00	0.47	0.49	0.05
2007	BR	3167	3227	318	6E+11	6E+11	6E+10	1.0	1.1	1.3	0.26	0.40	0.00	0.47	0.48	0.05
2008	BR	3380	3342	352	7E+11	6E+11	7E+10	1.0	1.1	1.3	0.28	0.42	0.00	0.48	0.47	0.05
2009	BR	3554	3376	389	7E+11	7E+11	8E+10	1.0	1.1	1.3	0.30	0.42	0.00	0.49	0.46	0.05
2010	BR	3843	3509	468	8E+11	7E+11	9E+10	1.0	1.1	1.3	0.32	0.44	0.01	0.49	0.45	0.06
2011	BR	4052	3598	498	8E+11	7E+11	1E+11	1.0	1.1	1.3	0.34	0.45	0.01	0.50	0.44	0.06
2012	BR	4238	3672	524	9E+11	7E+11	1E+11	1.0	1.1	1.3	0.35	0.46	0.01	0.50	0.44	0.06
2013	BR	4401	3733	547	9E+11	8E+11	1E+11	1.0	1.1	1.3	0.37	0.46	0.01	0.51	0.43	0.06
2014	BR	4541	3782	568	9E+11	8E+11	1E+11	1.0	1.1	1.3	0.38	0.47	0.01	0.51	0.43	0.06
2015	BR	4659	3820	586	1E+12	8E+11	1E+11	1.0	1.1	1.3	0.39	0.48	0.01	0.51	0.42	0.06
2016	BR	4748	3843	600	1E+12	8E+11	1E+11	1.0	1.1	1.3	0.39	0.48	0.01	0.52	0.42	0.07
2017	BR	4814	3854	612	1E+12	8E+11	1E+11	1.0	1.1	1.3	0.40	0.48	0.01	0.52	0.42	0.07
2018	BR	4858	3855	621	1E+12	8E+11	1E+11	1.0	1.1	1.3	0.40	0.48	0.01	0.52	0.41	0.07
2019	BR	4882	3848	627	1E+12	8E+11	1E+11	1.0	1.1	1.3	0.41	0.48	0.01	0.52	0.41	0.07
2020	BR	4889	3833	631	1E+12	8E+11	1E+11	1.0	1.1	1.3	0.41	0.48	0.01	0.52	0.41	0.07
2021	BR	4972	3872	644	1E+12	8E+11	1E+11	1.0	1.1	1.3	0.41	0.48	0.01	0.52	0.41	0.07

2022	BR	5083	3927	659	1E+12	9E+11	1E+11	1.0	1.1	1.3	0.42	0.49	0.01	0.53	0.41	0.07
2023	BR	5218	3997	676	1E+12	9E+11	1E+11	1.0	1.1	1.3	0.43	0.50	0.01	0.53	0.40	0.07
2024	BR	5376	4079	696	1E+12	9E+11	2E+11	1.0	1.1	1.3	0.45	0.51	0.01	0.53	0.40	0.07
2025	BR	5556	4173	717	1E+12	9E+11	2E+11	1.0	1.1	1.3	0.46	0.52	0.01	0.53	0.40	0.07
2026	BR	5749	4285	739	1E+12	1E+12	2E+11	1.0	1.1	1.3	0.48	0.53	0.01	0.53	0.40	0.07
2027	BR	5959	4415	763	1E+12	1E+12	2E+11	1.0	1.1	1.3	0.49	0.54	0.01	0.54	0.40	0.07
2028	BR	6184	4563	788	1E+12	1E+12	2E+11	1.0	1.1	1.3	0.51	0.55	0.01	0.54	0.40	0.07
2029	BR	6373	4685	813	1E+12	1E+12	2E+11	1.0	1.1	1.4	0.53	0.56	0.01	0.54	0.39	0.07
2030	BR	6417	4695	834	1E+12	1E+12	2E+11	1.2	1.2	1.6	0.53	0.56	0.01	0.54	0.39	0.07
2031	BR	6459	4709	856	2E+12	1E+12	2E+11	1.2	1.2	1.6	0.54	0.55	0.01	0.54	0.39	0.07
2032	BR	6494	4725	879	2E+12	1E+12	2E+11	1.2	1.2	1.7	0.54	0.55	0.01	0.54	0.39	0.07
2033	BR	6526	4746	902	2E+12	1E+12	2E+11	1.3	1.3	1.7	0.54	0.55	0.01	0.54	0.39	0.07
2034	BR	6551	4767	926	2E+12	1E+12	2E+11	1.3	1.3	1.8	0.54	0.54	0.01	0.54	0.39	0.08
2035	BR	6574	4793	950	2E+12	1E+12	2E+11	1.3	1.3	1.8	0.55	0.54	0.01	0.53	0.39	0.08
2036	BR	6590	4820	975	2E+12	1E+12	2E+11	1.4	1.3	1.8	0.55	0.54	0.01	0.53	0.39	0.08
2037	BR	6603	4851	1000	2E+12	1E+12	2E+11	1.4	1.4	1.9	0.55	0.54	0.01	0.53	0.39	0.08
2038	BR	6611	4885	1025	2E+12	1E+12	2E+11	1.4	1.4	1.9	0.55	0.54	0.01	0.53	0.39	0.08
2039	BR	6618	4923	1050	2E+12	1E+12	3E+11	1.4	1.4	2.0	0.55	0.54	0.01	0.53	0.39	0.08
2040	BR	6619	4962	1076	2E+12	1E+12	3E+11	1.5	1.4	2.0	0.55	0.54	0.01	0.52	0.39	0.09
2041	BR	6617	5003	1103	2E+12	1E+12	3E+11	1.5	1.5	2.0	0.55	0.54	0.01	0.52	0.39	0.09
2042	BR	6612	5048	1130	2E+12	1E+12	3E+11	1.5	1.5	2.1	0.55	0.54	0.01	0.52	0.39	0.09
2043	BR	6603	5094	1157	2E+12	1E+12	3E+11	1.6	1.5	2.1	0.55	0.54	0.01	0.51	0.40	0.09
2044	BR	6592	5143	1185	2E+12	1E+12	3E+11	1.6	1.5	2.2	0.55	0.54	0.01	0.51	0.40	0.09
2045	BR	6577	5194	1213	2E+12	1E+12	3E+11	1.6	1.5	2.2	0.55	0.54	0.01	0.51	0.40	0.09
2046	BR	6559	5247	1242	2E+12	1E+12	3E+11	1.7	1.6	2.3	0.54	0.54	0.02	0.50	0.40	0.10
2047	BR	6540	5304	1272	2E+12	1E+12	3E+11	1.7	1.6	2.3	0.54	0.54	0.02	0.50	0.40	0.10
2048	BR	6517	5362	1302	2E+12	1E+12	3E+11	1.7	1.6	2.3	0.54	0.54	0.02	0.49	0.41	0.10
2049	BR	6493	5423	1333	2E+12	1E+12	3E+11	1.8	1.6	2.4	0.54	0.54	0.02	0.49	0.41	0.10
2050	BR	6463	5485	1363	2E+12	1E+12	3E+11	1.8	1.7	2.4	0.54	0.55	0.02	0.49	0.41	0.10

C.4 Storyline "Domestic aviation in a post-pandemic world: digitalization of business travel" main outputs

Table C.4 – 1: Storyline "Domestic aviation in a post-pandemic world: digitalization of business travel" main outputs

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1960	US															
1961	US	12997	680	276	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.77	0.08	0.00	0.93	0.05	0.02
1962	US	13387	679	297	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.79	0.08	0.00	0.93	0.05	0.02
1963	US	13772	648	332	3E+12	1E+11	6E+10	0.82	0.86	1.33	0.81	0.08	0.00	0.93	0.04	0.02
1964	US	14242	642	376	3E+12	1E+11	7E+10	0.82	0.86	1.33	0.84	0.08	0.01	0.93	0.04	0.02
1965	US	14698	633	439	3E+12	1E+11	8E+10	0.82	0.86	1.33	0.86	0.07	0.01	0.93	0.04	0.03
1966	US	15237	617	501	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.89	0.07	0.01	0.93	0.04	0.03
1967	US	15465	596	612	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.90	0.07	0.01	0.93	0.04	0.04
1968	US	15920	563	700	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.93	0.07	0.01	0.93	0.03	0.04
1969	US	16250	545	811	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.94	0.07	0.01	0.92	0.03	0.05
1970	US	16536	515	812	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.96	0.06	0.01	0.93	0.03	0.05
1971	US	17016	479	817	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.93	0.03	0.04
1972	US	17521	461	891	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.01	0.05	0.01	0.93	0.02	0.05
1973	US	17967	480	962	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.04	0.06	0.01	0.93	0.02	0.05
1974	US	17233	510	995	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.00	0.06	0.01	0.92	0.03	0.05
1975	US	17322	485	1001	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.00	0.06	0.01	0.92	0.03	0.05
1976	US	17613	482	1089	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.02	0.06	0.01	0.92	0.03	0.06
1977	US	17778	493	1164	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.03	0.06	0.01	0.91	0.03	0.06
1978	US	17920	494	1335	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.04	0.06	0.01	0.91	0.03	0.07
1979	US	17010	516	1502	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.99	0.06	0.02	0.89	0.03	0.08
1980	US	16761	517	1446	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1981	US	16803	502	1426	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1982	US	16712	479	1481	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1983	US	17057	474	1596	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.00	0.06	0.02	0.89	0.02	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1984	US	17514	481	1712	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.03	0.06	0.02	0.89	0.02	0.09
1985	US	17702	474	1882	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.04	0.06	0.02	0.88	0.02	0.09
1986	US	17973	475	2083	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.05	0.06	0.02	0.88	0.02	0.10
1987	US	18187	461	2179	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.06	0.06	0.02	0.87	0.02	0.10
1988	US	18601	454	2154	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.08	0.06	0.02	0.88	0.02	0.10
1989	US	18916	462	2131	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.10	0.06	0.02	0.88	0.02	0.10
1990	US	19078	450	2179	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.11	0.06	0.02	0.88	0.02	0.10
1991	US	18827	443	2101	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.09	0.05	0.02	0.88	0.02	0.10
1992	US	19280	433	2185	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.12	0.05	0.02	0.88	0.02	0.10
1993	US	19641	440	2227	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.14	0.05	0.02	0.88	0.02	0.10
1994	US	19956	437	2361	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.16	0.05	0.02	0.88	0.02	0.10
1995	US	20108	440	2420	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.17	0.05	0.02	0.88	0.02	0.11
1996	US	20251	431	2565	5E+12	1E+11	7E+11	0.82	0.86	1.33	1.18	0.05	0.02	0.87	0.02	0.11
1997	US	20487	430	2618	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.19	0.05	0.02	0.87	0.02	0.11
1998	US	20813	438	2652	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.20	0.05	0.03	0.87	0.02	0.11
1999	US	21055	444	2769	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.22	0.05	0.03	0.87	0.02	0.11
2000	US	21196	451	2883	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.23	0.05	0.03	0.86	0.02	0.12
2001	US	21523	453	2709	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.24	0.06	0.03	0.87	0.02	0.11
2002	US	21895	438	2637	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.26	0.05	0.02	0.88	0.02	0.11
2003	US	21997	428	2782	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.27	0.05	0.03	0.87	0.02	0.11
2004	US	22095	420	3000	6E+12	1E+11	9E+11	0.82	0.86	1.33	1.27	0.05	0.03	0.87	0.02	0.12
2005	US	22132	416	3125	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.28	0.05	0.03	0.86	0.02	0.12
2006	US	22237	426	3146	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.28	0.05	0.03	0.86	0.02	0.12
2007	US	22274	441	3239	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.29	0.06	0.03	0.86	0.02	0.12
2008	US	21595	451	3080	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.25	0.06	0.03	0.86	0.02	0.12
2009	US	21946	446	2899	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.27	0.06	0.03	0.87	0.02	0.11
2010	US	21615	426	2943	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.25	0.05	0.03	0.87	0.02	0.12
2011	US	22019	425	3045	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.27	0.05	0.03	0.86	0.02	0.12

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2012	US	22366	424	3136	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.29	0.05	0.03	0.86	0.02	0.12
2013	US	22666	422	3218	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.31	0.05	0.03	0.86	0.02	0.12
2014	US	22788	414	3286	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.02	0.12
2015	US	22793	405	3334	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.02	0.13
2016	US	22792	397	3377	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2017	US	22785	390	3417	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2018	US	22774	383	3452	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2019	US	22761	377	3485	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.85	0.01	0.13
2020	US	22840	373	1412	8E+12	1E+11	5E+11	0.84	0.88	1.36	1.32	0.05	0.03	0.93	0.02	0.06
2021	US	22847	366	2536	8E+12	1E+11	9E+11	0.85	0.89	1.38	1.32	0.05	0.03	0.89	0.01	0.10
2022	US	22851	359	2574	8E+12	1E+11	9E+11	0.85	0.89	1.38	1.32	0.04	0.03	0.89	0.01	0.10
2023	US	22858	353	2612	8E+12	1E+11	9E+11	0.86	0.90	1.39	1.32	0.04	0.03	0.89	0.01	0.10
2024	US	22869	347	2650	8E+12	1E+11	9E+11	0.86	0.90	1.39	1.32	0.04	0.03	0.88	0.01	0.10
2025	US	22876	341	2687	8E+12	1E+11	9E+11	0.86	0.90	1.40	1.32	0.04	0.03	0.88	0.01	0.10
2026	US	22884	335	2724	8E+12	1E+11	1E+12	0.86	0.90	1.40	1.32	0.04	0.03	0.88	0.01	0.10
2027	US	22892	329	2760	8E+12	1E+11	1E+12	0.87	0.91	1.40	1.32	0.04	0.03	0.88	0.01	0.11
2028	US	22899	324	2796	8E+12	1E+11	1E+12	0.87	0.91	1.41	1.32	0.04	0.03	0.88	0.01	0.11
2029	US	22905	318	2831	8E+12	1E+11	1E+12	0.87	0.91	1.41	1.33	0.04	0.03	0.88	0.01	0.11
2030	US	22906	313	2865	8E+12	1E+11	1E+12	0.87	0.92	1.42	1.33	0.04	0.04	0.88	0.01	0.11
2031	US	22914	308	2900	8E+12	1E+11	1E+12	0.88	0.92	1.42	1.33	0.04	0.04	0.88	0.01	0.11
2032	US	22918	303	2934	8E+12	1E+11	1E+12	0.88	0.92	1.42	1.33	0.04	0.04	0.88	0.01	0.11
2033	US	22928	298	2968	8E+12	1E+11	1E+12	0.88	0.92	1.43	1.33	0.04	0.04	0.88	0.01	0.11
2034	US	22933	294	3001	8E+12	1E+11	1E+12	0.88	0.93	1.43	1.33	0.04	0.04	0.87	0.01	0.11
2035	US	22938	290	3033	9E+12	1E+11	1E+12	0.88	0.93	1.43	1.33	0.04	0.04	0.87	0.01	0.12
2036	US	22944	286	3065	9E+12	1E+11	1E+12	0.88	0.93	1.43	1.33	0.04	0.04	0.87	0.01	0.12
2037	US	22951	282	3097	9E+12	1E+11	1E+12	0.89	0.93	1.44	1.33	0.04	0.04	0.87	0.01	0.12
2038	US	22948	278	3127	9E+12	1E+11	1E+12	0.89	0.93	1.44	1.33	0.03	0.04	0.87	0.01	0.12
2039	US	22956	274	3158	9E+12	1E+11	1E+12	0.89	0.93	1.44	1.33	0.03	0.04	0.87	0.01	0.12

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2040	US	22963	270	3190	9E+12	1E+11	1E+12	0.89	0.94	1.45	1.33	0.03	0.04	0.87	0.01	0.12
2041	US	22963	267	3220	9E+12	1E+11	1E+12	0.90	0.94	1.45	1.33	0.03	0.04	0.87	0.01	0.12
2042	US	22965	263	3251	9E+12	1E+11	1E+12	0.90	0.94	1.46	1.33	0.03	0.04	0.87	0.01	0.12
2043	US	22968	260	3282	9E+12	1E+11	1E+12	0.90	0.94	1.46	1.33	0.03	0.04	0.87	0.01	0.12
2044	US	22972	257	3313	9E+12	1E+11	1E+12	0.90	0.94	1.46	1.33	0.03	0.04	0.87	0.01	0.12
2045	US	22976	253	3342	9E+12	1E+11	1E+12	0.90	0.95	1.46	1.33	0.03	0.04	0.86	0.01	0.13
2046	US	22977	250	3372	9E+12	1E+11	1E+12	0.90	0.95	1.47	1.33	0.03	0.04	0.86	0.01	0.13
2047	US	22986	248	3401	9E+12	1E+11	1E+12	0.90	0.95	1.47	1.33	0.03	0.04	0.86	0.01	0.13
2048	US	22990	245	3430	9E+12	1E+11	1E+12	0.91	0.95	1.47	1.33	0.03	0.04	0.86	0.01	0.13
2049	US	22992	242	3459	9E+12	1E+11	1E+12	0.91	0.95	1.47	1.33	0.03	0.04	0.86	0.01	0.13
2050	US	22995	239	3488	9E+12	1E+11	1E+12	0.91	0.95	1.48	1.33	0.03	0.04	0.86	0.01	0.13
1970	BR															
1971	BR	381	1084	54	4E+10	1E+11	5E+09	0.98	1.05	1.33	0.03	0.14	0.00	0.25	0.71	0.04
1972	BR	464	1131	62	5E+10	1E+11	6E+09	0.98	1.05	1.33	0.04	0.14	0.00	0.28	0.68	0.04
1973	BR	568	1213	76	6E+10	1E+11	8E+09	0.98	1.05	1.33	0.05	0.15	0.00	0.31	0.65	0.04
1974	BR	674	1300	87	7E+10	1E+11	9E+09	0.98	1.05	1.33	0.06	0.16	0.00	0.33	0.63	0.04
1975	BR	776	1387	96	8E+10	1E+11	1E+10	0.98	1.05	1.33	0.06	0.17	0.00	0.34	0.61	0.04
1976	BR	889	1537	102	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.07	0.19	0.00	0.35	0.61	0.04
1977	BR	982	1691	104	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.08	0.21	0.00	0.35	0.61	0.04
1978	BR	1071	1850	111	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.09	0.23	0.00	0.35	0.61	0.04
1979	BR	1193	2009	124	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.10	0.25	0.00	0.36	0.60	0.04
1980	BR	1341	2215	130	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.11	0.28	0.00	0.36	0.60	0.04
1981	BR	1387	2292	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.29	0.00	0.36	0.60	0.04
1982	BR	1435	2364	143	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.29	0.00	0.36	0.60	0.04
1983	BR	1484	2376	135	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.30	0.00	0.37	0.59	0.03
1984	BR	1564	2431	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.13	0.30	0.00	0.38	0.59	0.03
1985	BR	1674	2535	150	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.14	0.32	0.00	0.38	0.58	0.03
1986	BR	1731	2567	185	2E+11	4E+11	3E+10	0.98	1.05	1.33	0.14	0.32	0.00	0.39	0.57	0.04

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1987	BR	1799	2696	179	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.34	0.00	0.38	0.58	0.04
1988	BR	1806	2794	186	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.35	0.00	0.38	0.58	0.04
1989	BR	1820	2885	212	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.36	0.00	0.37	0.59	0.04
1990	BR	1805	2876	206	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.36	0.00	0.37	0.59	0.04
1991	BR	1764	2935	200	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.37	0.00	0.36	0.60	0.04
1992	BR	1706	2969	196	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.14	0.37	0.00	0.35	0.61	0.04
1993	BR	1729	3015	206	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.14	0.38	0.00	0.35	0.61	0.04
1994	BR	1812	3055	226	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.15	0.38	0.00	0.36	0.60	0.04
1995	BR	1918	3098	246	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.16	0.39	0.00	0.36	0.59	0.05
1996	BR	2017	3117	254	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.17	0.39	0.00	0.37	0.58	0.05
1997	BR	2146	3114	271	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.18	0.39	0.00	0.39	0.56	0.05
1998	BR	2234	3085	300	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.19	0.38	0.00	0.40	0.55	0.05
1999	BR	2297	3058	228	4E+11	5E+11	4E+10	0.98	1.05	1.33	0.19	0.38	0.00	0.41	0.55	0.04
2000	BR	2358	3021	281	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.20	0.38	0.00	0.42	0.53	0.05
2001	BR	2420	2994	282	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.20	0.37	0.00	0.42	0.53	0.05
2002	BR	2515	3001	277	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.21	0.37	0.00	0.43	0.52	0.05
2003	BR	2599	3008	259	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.22	0.37	0.00	0.44	0.51	0.04
2004	BR	2724	3057	266	5E+11	6E+11	5E+10	0.98	1.05	1.33	0.23	0.38	0.00	0.45	0.51	0.04
2005	BR	2825	3051	318	5E+11	6E+11	6E+10	0.98	1.05	1.33	0.23	0.38	0.00	0.46	0.49	0.05
2006	BR	2974	3113	307	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.25	0.39	0.00	0.47	0.49	0.05
2007	BR	3167	3227	318	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.26	0.40	0.00	0.47	0.48	0.05
2008	BR	3380	3342	352	7E+11	6E+11	7E+10	0.98	1.05	1.33	0.28	0.42	0.00	0.48	0.47	0.05
2009	BR	3554	3376	389	7E+11	7E+11	8E+10	0.98	1.05	1.33	0.30	0.42	0.00	0.49	0.46	0.05
2010	BR	3843	3509	468	8E+11	7E+11	9E+10	0.98	1.05	1.33	0.32	0.44	0.01	0.49	0.45	0.06
2011	BR	4052	3598	498	8E+11	7E+11	1E+11	0.98	1.05	1.33	0.34	0.45	0.01	0.50	0.44	0.06
2012	BR	4238	3672	524	9E+11	7E+11	1E+11	0.98	1.05	1.33	0.35	0.46	0.01	0.50	0.44	0.06
2013	BR	4401	3733	547	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.37	0.46	0.01	0.51	0.43	0.06
2014	BR	4541	3782	568	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.38	0.47	0.01	0.51	0.43	0.06

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2015	BR	4659	3820	586	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.39	0.48	0.01	0.51	0.42	0.06
2016	BR	4748	3842	600	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.39	0.48	0.01	0.52	0.42	0.07
2017	BR	4813	3854	612	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.40	0.48	0.01	0.52	0.42	0.07
2018	BR	4857	3855	621	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.40	0.48	0.01	0.52	0.41	0.07
2019	BR	4881	3848	627	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.41	0.48	0.01	0.52	0.41	0.07
2020	BR	4888	3833	240	1E+12	8E+11	5E+10	0.98	1.05	1.33	0.41	0.48	0.01	0.55	0.43	0.03
2021	BR	4970	3872	331	1E+12	8E+11	7E+10	0.98	1.05	1.33	0.41	0.48	0.01	0.54	0.42	0.04
2022	BR	5080	3927	342	1E+12	9E+11	8E+10	0.98	1.05	1.33	0.42	0.49	0.01	0.54	0.42	0.04
2023	BR	5215	3996	355	1E+12	9E+11	8E+10	0.98	1.05	1.33	0.43	0.50	0.01	0.55	0.42	0.04
2024	BR	5372	4078	368	1E+12	9E+11	8E+10	0.98	1.05	1.33	0.45	0.51	0.01	0.55	0.42	0.04
2025	BR	5550	4172	383	1E+12	9E+11	9E+10	0.98	1.05	1.33	0.46	0.52	0.01	0.55	0.41	0.04
2026	BR	5742	4272	399	1E+12	1E+12	9E+10	0.98	1.05	1.33	0.48	0.53	0.01	0.55	0.41	0.04
2027	BR	5950	4381	415	1E+12	1E+12	9E+10	0.98	1.05	1.33	0.49	0.55	0.01	0.55	0.41	0.04
2028	BR	6173	4498	433	1E+12	1E+12	1E+11	0.98	1.05	1.33	0.51	0.56	0.01	0.56	0.41	0.04
2029	BR	6332	4532	450	1E+12	1E+12	1E+11	1.05	1.13	1.43	0.53	0.56	0.01	0.56	0.40	0.04
2030	BR	6411	4476	466	1E+12	1E+12	1E+11	1.14	1.22	1.54	0.53	0.56	0.01	0.56	0.39	0.04
2031	BR	6494	4419	483	2E+12	1E+12	1E+11	1.16	1.24	1.57	0.54	0.55	0.01	0.57	0.39	0.04
2032	BR	6578	4360	500	2E+12	1E+12	1E+11	1.18	1.26	1.60	0.55	0.54	0.01	0.58	0.38	0.04
2033	BR	6662	4300	519	2E+12	1E+12	1E+11	1.20	1.29	1.63	0.55	0.54	0.01	0.58	0.37	0.05
2034	BR	6748	4242	538	2E+12	1E+12	1E+11	1.22	1.31	1.66	0.56	0.53	0.01	0.59	0.37	0.05
2035	BR	6833	4183	557	2E+12	1E+12	1E+11	1.24	1.33	1.69	0.57	0.52	0.01	0.59	0.36	0.05
2036	BR	6917	4123	577	2E+12	1E+12	1E+11	1.26	1.35	1.71	0.57	0.51	0.01	0.60	0.35	0.05
2037	BR	7003	4066	598	2E+12	1E+12	1E+11	1.28	1.37	1.74	0.58	0.51	0.01	0.60	0.35	0.05
2038	BR	7085	4007	619	2E+12	1E+12	1E+11	1.30	1.39	1.77	0.59	0.50	0.01	0.60	0.34	0.05
2039	BR	7168	3949	641	2E+12	1E+12	2E+11	1.32	1.41	1.79	0.60	0.49	0.01	0.61	0.34	0.05
2040	BR	7248	3892	663	2E+12	9E+11	2E+11	1.34	1.43	1.82	0.60	0.48	0.01	0.61	0.33	0.06
2041	BR	7331	3835	686	2E+12	9E+11	2E+11	1.36	1.46	1.85	0.61	0.48	0.01	0.62	0.32	0.06
2042	BR	7413	3777	710	2E+12	9E+11	2E+11	1.38	1.48	1.88	0.62	0.47	0.01	0.62	0.32	0.06

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2043	BR	7495	3721	735	2E+12	9E+11	2E+11	1.40	1.50	1.90	0.62	0.46	0.01	0.63	0.31	0.06
2044	BR	7574	3664	760	2E+12	9E+11	2E+11	1.42	1.52	1.93	0.63	0.46	0.01	0.63	0.31	0.06
2045	BR	7653	3609	786	2E+12	9E+11	2E+11	1.44	1.54	1.95	0.64	0.45	0.02	0.64	0.30	0.07
2046	BR	7731	3551	812	2E+12	9E+11	2E+11	1.46	1.57	1.99	0.64	0.44	0.02	0.64	0.29	0.07
2047	BR	7812	3496	840	2E+12	9E+11	2E+11	1.48	1.59	2.01	0.65	0.44	0.02	0.64	0.29	0.07
2048	BR	7889	3440	869	2E+12	9E+11	2E+11	1.50	1.61	2.04	0.65	0.43	0.02	0.65	0.28	0.07
2049	BR	7965	3385	898	2E+12	8E+11	2E+11	1.52	1.63	2.07	0.66	0.42	0.02	0.65	0.28	0.07
2050	BR	8041	3331	927	2E+12	8E+11	2E+11	1.54	1.65	2.09	0.67	0.41	0.02	0.65	0.27	0.08
1960	JP															
1961	JP	1854	3253	244	2E+11	3E+11	2E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.61	0.05
1962	JP	1910	3284	268	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.60	0.05
1963	JP	1966	3316	291	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.59	0.05
1964	JP	2026	3356	315	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.16	0.37	0.00	0.36	0.59	0.06
1965	JP	2071	3375	336	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.16	0.37	0.00	0.36	0.58	0.06
1966	JP	2128	3414	359	2E+11	3E+11	4E+10	0.70	0.77	1.11	0.17	0.37	0.00	0.36	0.58	0.06
1967	JP	2185	3454	381	2E+11	3E+11	4E+10	0.70	0.77	1.11	0.17	0.38	0.00	0.36	0.57	0.06
1968	JP	2241	3493	403	2E+11	4E+11	4E+10	0.70	0.77	1.11	0.18	0.38	0.00	0.37	0.57	0.07
1969	JP	2291	3523	423	2E+11	4E+11	4E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1970	JP	2331	3540	442	2E+11	4E+11	5E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1971	JP	2358	3538	457	2E+11	4E+11	5E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1972	JP	2406	3569	477	3E+11	4E+11	5E+10	0.70	0.77	1.11	0.19	0.39	0.00	0.37	0.55	0.07
1973	JP	2460	3610	497	3E+11	4E+11	5E+10	0.70	0.77	1.11	0.19	0.40	0.01	0.37	0.55	0.08
1974	JP	2497	3627	514	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.40	0.01	0.38	0.55	0.08
1975	JP	2552	3670	534	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.40	0.01	0.38	0.54	0.08
1976	JP	2612	3722	555	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.41	0.01	0.38	0.54	0.08
1977	JP	2678	3782	578	3E+11	4E+11	7E+10	0.70	0.77	1.11	0.21	0.41	0.01	0.38	0.54	0.08
1978	JP	2750	3849	602	3E+11	4E+11	7E+10	0.70	0.77	1.11	0.22	0.42	0.01	0.38	0.53	0.08
1979	JP	2832	3931	628	3E+11	5E+11	7E+10	0.70	0.77	1.11	0.22	0.43	0.01	0.38	0.53	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1980	JP	2902	3997	651	3E+11	5E+11	8E+10	0.70	0.77	1.11	0.23	0.44	0.01	0.38	0.53	0.09
1981	JP	3026	4008	682	4E+11	5E+11	8E+10	0.70	0.77	1.11	0.24	0.44	0.01	0.39	0.52	0.09
1982	JP	3148	4015	713	4E+11	5E+11	8E+10	0.70	0.77	1.11	0.25	0.44	0.01	0.40	0.51	0.09
1983	JP	3265	4017	743	4E+11	5E+11	9E+10	0.70	0.77	1.11	0.26	0.44	0.01	0.41	0.50	0.09
1984	JP	3388	4023	774	4E+11	5E+11	9E+10	0.70	0.77	1.11	0.27	0.44	0.01	0.41	0.49	0.09
1985	JP	3518	4038	806	4E+11	5E+11	1E+11	0.70	0.77	1.11	0.28	0.44	0.01	0.42	0.48	0.10
1986	JP	3701	3973	834	4E+11	5E+11	1E+11	0.70	0.77	1.11	0.29	0.44	0.01	0.43	0.47	0.10
1987	JP	3881	3927	862	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.30	0.43	0.01	0.45	0.45	0.10
1988	JP	4067	3902	893	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.32	0.43	0.01	0.46	0.44	0.10
1989	JP	4234	3872	920	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.33	0.42	0.01	0.47	0.43	0.10
1990	JP	4395	3848	946	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.34	0.42	0.01	0.48	0.42	0.10
1991	JP	4519	3835	962	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.35	0.42	0.01	0.49	0.41	0.10
1992	JP	4629	3812	975	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.36	0.42	0.01	0.49	0.40	0.10
1993	JP	4736	3787	987	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.37	0.42	0.01	0.50	0.40	0.10
1994	JP	4845	3765	1000	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.38	0.41	0.01	0.50	0.39	0.10
1995	JP	4960	3749	1014	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.39	0.41	0.01	0.51	0.39	0.10
1996	JP	5085	3718	1039	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.40	0.41	0.01	0.52	0.38	0.11
1997	JP	5201	3680	1062	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.41	0.40	0.01	0.52	0.37	0.11
1998	JP	5300	3631	1081	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.41	0.40	0.01	0.53	0.36	0.11
1999	JP	5416	3593	1104	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.42	0.39	0.01	0.54	0.36	0.11
2000	JP	5548	3566	1130	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.43	0.39	0.01	0.54	0.35	0.11
2001	JP	5581	3601	1153	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.44	0.39	0.01	0.54	0.35	0.11
2002	JP	5618	3637	1177	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.40	0.01	0.54	0.35	0.11
2003	JP	5656	3675	1201	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.40	0.01	0.54	0.35	0.11
2004	JP	5699	3716	1227	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.54	0.35	0.12
2005	JP	5730	3750	1250	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.53	0.35	0.12
2006	JP	5704	3762	1238	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.53	0.35	0.12
2007	JP	5680	3774	1226	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.35	0.11

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2008	JP	5625	3766	1207	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.36	0.11
2009	JP	5564	3754	1187	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.36	0.11
2010	JP	5573	3789	1182	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.42	0.01	0.53	0.36	0.11
2011	JP	5638	3805	1195	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.42	0.01	0.53	0.36	0.11
2012	JP	5700	3818	1207	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.36	0.11
2013	JP	5757	3830	1218	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.35	0.11
2014	JP	5810	3840	1228	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.35	0.11
2015	JP	5860	3849	1238	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2016	JP	5894	3849	1244	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2017	JP	5925	3850	1249	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2018	JP	5955	3850	1255	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2019	JP	5983	3850	1260	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2020	JP	6009	3851	595	7E+11	5E+11	7E+10	0.70	0.77	1.11	0.47	0.42	0.01	0.57	0.37	0.06
2021	JP	6046	3859	865	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.47	0.42	0.01	0.56	0.36	0.08
2022	JP	6080	3866	873	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.48	0.42	0.01	0.56	0.36	0.08
2023	JP	6111	3871	881	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.48	0.42	0.01	0.56	0.36	0.08
2024	JP	6140	3875	889	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.48	0.42	0.01	0.56	0.36	0.08
2025	JP	6166	3878	896	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.48	0.43	0.01	0.56	0.35	0.08
2026	JP	6189	3880	903	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.48	0.43	0.01	0.56	0.35	0.08
2027	JP	6211	3881	910	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.49	0.43	0.01	0.56	0.35	0.08
2028	JP	6230	3881	916	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.49	0.43	0.01	0.56	0.35	0.08
2029	JP	6247	3880	922	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.49	0.43	0.01	0.57	0.35	0.08
2030	JP	6263	3879	927	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.49	0.43	0.01	0.57	0.35	0.08
2031	JP	6278	3877	933	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.57	0.35	0.08
2032	JP	6291	3875	938	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.57	0.35	0.08
2033	JP	6302	3872	943	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.57	0.35	0.08
2034	JP	6313	3869	948	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.57	0.35	0.09
2035	JP	6321	3865	952	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.57	0.35	0.09

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2036	JP	6328	3860	957	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.35	0.09
2037	JP	6334	3855	961	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.35	0.09
2038	JP	6339	3849	964	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.35	0.09
2039	JP	6342	3843	968	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2040	JP	6345	3837	972	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2041	JP	6349	3832	976	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2042	JP	6352	3826	979	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2043	JP	6354	3820	982	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2044	JP	6355	3813	986	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2045	JP	6355	3806	989	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2046	JP	6353	3799	992	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2047	JP	6351	3791	994	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.57	0.34	0.09
2048	JP	6348	3783	997	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.41	0.01	0.57	0.34	0.09
2049	JP	6345	3774	999	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.41	0.01	0.57	0.34	0.09
2050	JP	6341	3766	1002	6E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.41	0.01	0.57	0.34	0.09
1960	EU															
1961	EU	1266	864	61	5E+11	4E+11	3E+10	0.82	0.86	1.33	0.08	0.09	0.00	0.58	0.39	0.03
1962	EU	1375	917	82	6E+11	4E+11	3E+10	0.82	0.86	1.33	0.08	0.10	0.00	0.58	0.39	0.03
1963	EU	1531	950	85	6E+11	4E+11	4E+10	0.82	0.86	1.33	0.09	0.10	0.00	0.60	0.37	0.03
1964	EU	1737	944	88	7E+11	4E+11	4E+10	0.82	0.86	1.33	0.11	0.10	0.00	0.63	0.34	0.03
1965	EU	1981	905	93	8E+11	4E+11	4E+10	0.82	0.86	1.33	0.12	0.10	0.00	0.67	0.30	0.03
1966	EU	2111	959	123	9E+11	4E+11	5E+10	0.82	0.86	1.33	0.13	0.11	0.00	0.66	0.30	0.04
1967	EU	2415	890	118	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.15	0.10	0.00	0.71	0.26	0.03
1968	EU	2587	969	117	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.16	0.11	0.00	0.70	0.26	0.03
1969	EU	2784	1001	153	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.17	0.11	0.00	0.71	0.25	0.04
1970	EU	3074	967	164	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.19	0.11	0.00	0.73	0.23	0.04
1971	EU	3298	979	173	1E+12	4E+11	8E+10	0.82	0.86	1.33	0.20	0.11	0.00	0.74	0.22	0.04
1972	EU	3395	1076	239	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.21	0.12	0.00	0.72	0.23	0.05

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1973	EU	3611	1062	269	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.22	0.12	0.00	0.73	0.21	0.05
1974	EU	3804	1112	258	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.23	0.12	0.00	0.74	0.21	0.05
1975	EU	3853	1178	293	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.23	0.13	0.00	0.72	0.22	0.06
1976	EU	4020	1232	317	2E+12	6E+11	1E+11	0.82	0.86	1.33	0.24	0.14	0.00	0.72	0.22	0.06
1977	EU	4232	1221	354	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.26	0.13	0.00	0.73	0.21	0.06
1978	EU	4371	1230	371	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.27	0.13	0.00	0.73	0.21	0.06
1979	EU	4518	1266	430	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.28	0.14	0.00	0.73	0.20	0.07
1980	EU	4753	1258	420	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.29	0.14	0.00	0.74	0.20	0.07
1981	EU	4811	1428	446	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.29	0.16	0.00	0.72	0.21	0.07
1982	EU	4998	1480	431	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.30	0.16	0.00	0.72	0.21	0.06
1983	EU	5147	1519	451	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.31	0.17	0.00	0.72	0.21	0.06
1984	EU	5335	1536	457	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.32	0.17	0.00	0.73	0.21	0.06
1985	EU	5452	1694	498	3E+12	8E+11	2E+11	0.82	0.86	1.33	0.33	0.19	0.00	0.71	0.22	0.07
1986	EU	5757	1558	505	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.35	0.17	0.00	0.74	0.20	0.06
1987	EU	5929	1574	558	3E+12	7E+11	3E+11	0.82	0.86	1.33	0.36	0.17	0.01	0.74	0.20	0.07
1988	EU	6025	1730	582	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.37	0.19	0.01	0.72	0.21	0.07
1989	EU	6256	1745	613	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.38	0.19	0.01	0.73	0.20	0.07
1990	EU	6432	1771	698	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.39	0.19	0.01	0.72	0.20	0.08
1991	EU	6679	1779	696	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.41	0.19	0.01	0.73	0.19	0.08
1992	EU	6879	1777	690	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.42	0.19	0.01	0.74	0.19	0.07
1993	EU	7050	1768	682	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.43	0.19	0.01	0.74	0.19	0.07
1994	EU	7263	1772	679	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.44	0.19	0.01	0.75	0.18	0.07
1995	EU	7490	1780	677	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.46	0.20	0.01	0.75	0.18	0.07
1996	EU	7543	1738	741	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.46	0.19	0.01	0.75	0.17	0.07
1997	EU	7673	1733	792	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.47	0.19	0.01	0.75	0.17	0.08
1998	EU	7854	1730	837	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.48	0.19	0.01	0.75	0.17	0.08
1999	EU	8053	1740	873	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.49	0.19	0.01	0.75	0.16	0.08
2000	EU	8187	1819	952	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.50	0.20	0.01	0.75	0.17	0.09

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2001	EU	8418	1826	963	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.51	0.20	0.01	0.75	0.16	0.09
2002	EU	8651	1806	970	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.53	0.20	0.01	0.76	0.16	0.08
2003	EU	8795	1822	1018	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.54	0.20	0.01	0.76	0.16	0.09
2004	EU	8959	1853	1082	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.55	0.20	0.01	0.75	0.16	0.09
2005	EU	9043	1896	1173	4E+12	9E+11	6E+11	0.82	0.86	1.33	0.55	0.21	0.01	0.75	0.16	0.10
2006	EU	9217	1926	1240	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.56	0.21	0.01	0.74	0.16	0.10
2007	EU	9360	1972	1302	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.57	0.22	0.01	0.74	0.16	0.10
2008	EU	9413	2037	1290	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.57	0.22	0.01	0.74	0.16	0.10
2009	EU	9504	1949	1215	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.58	0.21	0.01	0.75	0.15	0.10
2010	EU	9648	1977	1294	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.59	0.22	0.01	0.75	0.15	0.10
2011	EU	9763	1994	1289	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.59	0.22	0.01	0.75	0.15	0.10
2012	EU	9871	2009	1286	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.60	0.22	0.01	0.75	0.15	0.10
2013	EU	9974	2023	1284	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.61	0.22	0.01	0.75	0.15	0.10
2014	EU	10072	2037	1283	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.61	0.22	0.01	0.75	0.15	0.10
2015	EU	10165	2050	1282	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.22	0.01	0.75	0.15	0.10
2016	EU	10207	2054	1278	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.75	0.15	0.09
2017	EU	10237	2057	1273	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.75	0.15	0.09
2018	EU	10257	2059	1269	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.76	0.15	0.09
2019	EU	10268	2061	1265	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.63	0.23	0.01	0.76	0.15	0.09
2020	EU	10271	2061	505	5E+12	1E+12	3E+11	0.82	0.86	1.33	0.63	0.23	0.01	0.80	0.16	0.04
2021	EU	10398	2084	1018	6E+12	1E+12	5E+11	0.82	0.86	1.33	0.63	0.23	0.01	0.77	0.15	0.08
2022	EU	10537	2106	1029	6E+12	1E+12	6E+11	0.82	0.86	1.33	0.64	0.23	0.01	0.77	0.15	0.08
2023	EU	10686	2129	1041	6E+12	1E+12	6E+11	0.82	0.86	1.33	0.65	0.23	0.01	0.77	0.15	0.08
2024	EU	10845	2151	1054	6E+12	1E+12	6E+11	0.82	0.86	1.33	0.66	0.24	0.01	0.77	0.15	0.07
2025	EU	11011	2174	1066	6E+12	1E+12	6E+11	0.82	0.86	1.33	0.67	0.24	0.01	0.77	0.15	0.07
2026	EU	11182	2196	1079	6E+12	1E+12	6E+11	0.82	0.86	1.33	0.68	0.24	0.01	0.77	0.15	0.07
2027	EU	11359	2218	1093	6E+12	1E+12	6E+11	0.82	0.86	1.33	0.69	0.24	0.01	0.77	0.15	0.07
2028	EU	11541	2241	1106	6E+12	1E+12	6E+11	0.82	0.86	1.33	0.70	0.25	0.01	0.78	0.15	0.07

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2029	EU	11726	2263	1120	6E+12	1E+12	6E+11	0.82	0.86	1.33	0.71	0.25	0.01	0.78	0.15	0.07
2030	EU	11915	2285	1134	7E+12	1E+12	6E+11	0.82	0.86	1.33	0.73	0.25	0.01	0.78	0.15	0.07
2031	EU	12114	2308	1149	7E+12	1E+12	6E+11	0.82	0.86	1.33	0.74	0.25	0.01	0.78	0.15	0.07
2032	EU	12317	2332	1164	7E+12	1E+12	6E+11	0.82	0.86	1.33	0.75	0.26	0.01	0.78	0.15	0.07
2033	EU	12522	2355	1179	7E+12	1E+12	7E+11	0.82	0.86	1.33	0.76	0.26	0.01	0.78	0.15	0.07
2034	EU	12728	2378	1195	7E+12	1E+12	7E+11	0.82	0.86	1.33	0.77	0.26	0.01	0.78	0.15	0.07
2035	EU	12936	2401	1210	7E+12	1E+12	7E+11	0.82	0.86	1.33	0.79	0.26	0.01	0.78	0.15	0.07
2036	EU	13144	2424	1226	7E+12	1E+12	7E+11	0.82	0.86	1.33	0.80	0.27	0.01	0.78	0.14	0.07
2037	EU	13353	2447	1241	8E+12	1E+12	7E+11	0.82	0.86	1.33	0.81	0.27	0.01	0.78	0.14	0.07
2038	EU	13461	2433	1255	8E+12	1E+12	7E+11	0.85	0.90	1.38	0.82	0.27	0.01	0.78	0.14	0.07
2039	EU	13515	2402	1268	8E+12	1E+12	7E+11	0.87	0.92	1.42	0.82	0.26	0.01	0.79	0.14	0.07
2040	EU	13568	2372	1281	8E+12	1E+12	7E+11	0.88	0.92	1.42	0.83	0.26	0.01	0.79	0.14	0.07
2041	EU	13620	2343	1293	8E+12	1E+12	7E+11	0.88	0.93	1.43	0.83	0.26	0.01	0.79	0.14	0.07
2042	EU	13667	2315	1305	8E+12	1E+12	7E+11	0.89	0.93	1.44	0.83	0.25	0.01	0.79	0.13	0.08
2043	EU	13714	2288	1316	8E+12	1E+12	8E+11	0.89	0.93	1.45	0.83	0.25	0.01	0.79	0.13	0.08
2044	EU	13759	2263	1327	8E+12	1E+12	8E+11	0.90	0.94	1.45	0.84	0.25	0.01	0.79	0.13	0.08
2045	EU	13801	2238	1338	8E+12	1E+12	8E+11	0.90	0.94	1.46	0.84	0.25	0.01	0.79	0.13	0.08
2046	EU	13844	2215	1349	8E+12	1E+12	8E+11	0.90	0.95	1.46	0.84	0.24	0.01	0.80	0.13	0.08
2047	EU	13882	2193	1359	8E+12	1E+12	8E+11	0.91	0.95	1.47	0.85	0.24	0.01	0.80	0.13	0.08
2048	EU	13919	2171	1368	8E+12	1E+12	8E+11	0.91	0.95	1.48	0.85	0.24	0.01	0.80	0.12	0.08
2049	EU	13954	2151	1378	8E+12	1E+12	8E+11	0.91	0.96	1.48	0.85	0.24	0.01	0.80	0.12	0.08
2050	EU	13988	2131	1388	8E+12	1E+12	8E+11	0.92	0.96	1.49	0.85	0.23	0.01	0.80	0.12	0.08

C.5 Storyline "Domestic aviation in a post-pandemic world: gradual recovery" main outputs

Table C.5 – 1: Storyline "Domestic aviation in a post-pandemic world: gradual recovery l" main outputs

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1960	EU															
1961	EU	1266	864	61	5E+11	4E+11	3E+10	0.82	0.86	1.33	0.08	0.09	0.00	0.58	0.39	0.03
1962	EU	1375	917	82	6E+11	4E+11	3E+10	0.82	0.86	1.33	0.08	0.10	0.00	0.58	0.39	0.03
1963	EU	1531	950	85	6E+11	4E+11	4E+10	0.82	0.86	1.33	0.09	0.10	0.00	0.60	0.37	0.03
1964	EU	1737	944	88	7E+11	4E+11	4E+10	0.82	0.86	1.33	0.11	0.10	0.00	0.63	0.34	0.03
1965	EU	1981	905	93	8E+11	4E+11	4E+10	0.82	0.86	1.33	0.12	0.10	0.00	0.67	0.30	0.03
1966	EU	2111	959	123	9E+11	4E+11	5E+10	0.82	0.86	1.33	0.13	0.11	0.00	0.66	0.30	0.04
1967	EU	2415	890	118	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.15	0.10	0.00	0.71	0.26	0.03
1968	EU	2587	969	117	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.16	0.11	0.00	0.70	0.26	0.03
1969	EU	2784	1001	153	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.17	0.11	0.00	0.71	0.25	0.04
1970	EU	3074	967	164	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.19	0.11	0.00	0.73	0.23	0.04
1971	EU	3298	979	173	1E+12	4E+11	8E+10	0.82	0.86	1.33	0.20	0.11	0.00	0.74	0.22	0.04
1972	EU	3395	1076	239	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.21	0.12	0.00	0.72	0.23	0.05
1973	EU	3611	1062	269	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.22	0.12	0.00	0.73	0.21	0.05
1974	EU	3804	1112	258	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.23	0.12	0.00	0.74	0.21	0.05
1975	EU	3853	1178	293	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.23	0.13	0.00	0.72	0.22	0.06
1976	EU	4020	1232	317	2E+12	6E+11	1E+11	0.82	0.86	1.33	0.24	0.14	0.00	0.72	0.22	0.06
1977	EU	4232	1221	354	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.26	0.13	0.00	0.73	0.21	0.06
1978	EU	4371	1230	371	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.27	0.13	0.00	0.73	0.21	0.06
1979	EU	4518	1266	430	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.28	0.14	0.00	0.73	0.20	0.07
1980	EU	4753	1258	420	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.29	0.14	0.00	0.74	0.20	0.07
1981	EU	4811	1428	446	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.29	0.16	0.00	0.72	0.21	0.07
1982	EU	4998	1480	431	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.30	0.16	0.00	0.72	0.21	0.06
1983	EU	5147	1519	451	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.31	0.17	0.00	0.72	0.21	0.06
1984	EU	5335	1536	457	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.32	0.17	0.00	0.73	0.21	0.06

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1985	EU	5452	1694	498	3E+12	8E+11	2E+11	0.82	0.86	1.33	0.33	0.19	0.00	0.71	0.22	0.07
1986	EU	5757	1558	505	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.35	0.17	0.00	0.74	0.20	0.06
1987	EU	5929	1574	558	3E+12	7E+11	3E+11	0.82	0.86	1.33	0.36	0.17	0.01	0.74	0.20	0.07
1988	EU	6025	1730	582	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.37	0.19	0.01	0.72	0.21	0.07
1989	EU	6256	1745	613	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.38	0.19	0.01	0.73	0.20	0.07
1990	EU	6432	1771	698	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.39	0.19	0.01	0.72	0.20	0.08
1991	EU	6679	1779	696	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.41	0.19	0.01	0.73	0.19	0.08
1992	EU	6879	1777	690	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.42	0.19	0.01	0.74	0.19	0.07
1993	EU	7050	1768	682	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.43	0.19	0.01	0.74	0.19	0.07
1994	EU	7263	1772	679	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.44	0.19	0.01	0.75	0.18	0.07
1995	EU	7490	1780	677	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.46	0.20	0.01	0.75	0.18	0.07
1996	EU	7543	1738	741	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.46	0.19	0.01	0.75	0.17	0.07
1997	EU	7673	1733	792	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.47	0.19	0.01	0.75	0.17	0.08
1998	EU	7854	1730	837	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.48	0.19	0.01	0.75	0.17	0.08
1999	EU	8053	1740	873	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.49	0.19	0.01	0.75	0.16	0.08
2000	EU	8187	1819	952	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.50	0.20	0.01	0.75	0.17	0.09
2001	EU	8418	1826	963	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.51	0.20	0.01	0.75	0.16	0.09
2002	EU	8651	1806	970	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.53	0.20	0.01	0.76	0.16	0.08
2003	EU	8795	1822	1018	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.54	0.20	0.01	0.76	0.16	0.09
2004	EU	8959	1853	1082	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.55	0.20	0.01	0.75	0.16	0.09
2005	EU	9043	1896	1173	4E+12	9E+11	6E+11	0.82	0.86	1.33	0.55	0.21	0.01	0.75	0.16	0.10
2006	EU	9217	1926	1240	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.56	0.21	0.01	0.74	0.16	0.10
2007	EU	9360	1972	1302	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.57	0.22	0.01	0.74	0.16	0.10
2008	EU	9413	2037	1290	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.57	0.22	0.01	0.74	0.16	0.10
2009	EU	9504	1949	1215	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.58	0.21	0.01	0.75	0.15	0.10
2010	EU	9648	1977	1294	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.59	0.22	0.01	0.75	0.15	0.10
2011	EU	9763	1994	1289	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.59	0.22	0.01	0.75	0.15	0.10
2012	EU	9872	2009	1286	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.60	0.22	0.01	0.75	0.15	0.10

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2013	EU	9975	2024	1284	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.61	0.22	0.01	0.75	0.15	0.10
2014	EU	10072	2037	1283	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.61	0.22	0.01	0.75	0.15	0.10
2015	EU	10166	2050	1282	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.22	0.01	0.75	0.15	0.10
2016	EU	10208	2054	1278	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.75	0.15	0.09
2017	EU	10238	2057	1273	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.75	0.15	0.09
2018	EU	10259	2060	1269	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.76	0.15	0.09
2019	EU	10270	2061	1265	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.63	0.23	0.01	0.76	0.15	0.09
2020	EU	10222	2051	503	5E+12	1E+12	3E+11	0.82	0.86	25.71	0.62	0.22	0.00	0.80	0.16	0.04
2021	EU	10335	2071	572	6E+12	1E+12	3E+11	0.82	0.86	1.48	0.63	0.23	0.01	0.80	0.16	0.04
2022	EU	10464	2091	640	6E+12	1E+12	3E+11	0.82	0.86	1.48	0.64	0.23	0.01	0.79	0.16	0.05
2023	EU	10606	2112	705	6E+12	1E+12	4E+11	0.82	0.86	1.48	0.65	0.23	0.01	0.79	0.16	0.05
2024	EU	10759	2134	769	6E+12	1E+12	4E+11	0.82	0.86	1.48	0.66	0.23	0.01	0.79	0.16	0.06
2025	EU	10922	2155	830	6E+12	1E+12	4E+11	0.82	0.86	1.48	0.66	0.24	0.01	0.79	0.15	0.06
2026	EU	11093	2177	887	6E+12	1E+12	5E+11	0.82	0.86	1.48	0.68	0.24	0.01	0.78	0.15	0.06
2027	EU	11271	2200	941	6E+12	1E+12	5E+11	0.82	0.86	1.48	0.69	0.24	0.01	0.78	0.15	0.07
2028	EU	11455	2222	992	6E+12	1E+12	5E+11	0.82	0.86	1.48	0.70	0.24	0.01	0.78	0.15	0.07
2029	EU	11644	2245	1040	6E+12	1E+12	6E+11	0.82	0.86	1.48	0.71	0.25	0.01	0.78	0.15	0.07
2030	EU	11837	2268	1084	7E+12	1E+12	6E+11	0.82	0.86	1.48	0.72	0.25	0.01	0.78	0.15	0.07
2031	EU	12042	2292	1127	7E+12	1E+12	6E+11	0.82	0.86	1.48	0.73	0.25	0.01	0.78	0.15	0.07
2032	EU	12251	2317	1166	7E+12	1E+12	6E+11	0.82	0.86	1.48	0.75	0.25	0.01	0.78	0.15	0.07
2033	EU	12462	2341	1203	7E+12	1E+12	7E+11	0.82	0.86	1.48	0.76	0.26	0.01	0.78	0.15	0.08
2034	EU	12676	2365	1238	7E+12	1E+12	7E+11	0.82	0.86	1.48	0.77	0.26	0.01	0.78	0.15	0.08
2035	EU	12891	2390	1270	7E+12	1E+12	7E+11	0.82	0.86	1.48	0.78	0.26	0.01	0.78	0.14	0.08
2036	EU	13107	2414	1301	7E+12	1E+12	7E+11	0.82	0.86	1.48	0.80	0.26	0.01	0.78	0.14	0.08
2037	EU	13324	2438	1329	8E+12	1E+12	7E+11	0.82	0.86	1.48	0.81	0.27	0.01	0.78	0.14	0.08
2038	EU	13476	2438	1355	8E+12	1E+12	8E+11	0.84	0.88	1.52	0.82	0.27	0.01	0.78	0.14	0.08
2039	EU	13532	2405	1379	8E+12	1E+12	8E+11	0.87	0.92	1.55	0.82	0.26	0.01	0.78	0.14	0.08
2040	EU	13584	2373	1404	8E+12	1E+12	8E+11	0.88	0.92	1.49	0.83	0.26	0.01	0.78	0.14	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2041	EU	13636	2343	1428	8E+12	1E+12	8E+11	0.88	0.93	1.49	0.83	0.26	0.01	0.78	0.13	0.08
2042	EU	13686	2314	1449	8E+12	1E+12	8E+11	0.89	0.93	1.49	0.83	0.25	0.01	0.78	0.13	0.08
2043	EU	13731	2286	1470	8E+12	1E+12	8E+11	0.89	0.94	1.49	0.84	0.25	0.01	0.79	0.13	0.08
2044	EU	13776	2260	1489	8E+12	1E+12	9E+11	0.90	0.94	1.49	0.84	0.25	0.01	0.79	0.13	0.08
2045	EU	13820	2234	1507	8E+12	1E+12	9E+11	0.90	0.95	1.49	0.84	0.24	0.01	0.79	0.13	0.09
2046	EU	13860	2210	1523	8E+12	1E+12	9E+11	0.90	0.95	1.49	0.84	0.24	0.01	0.79	0.13	0.09
2047	EU	13900	2187	1538	8E+12	1E+12	9E+11	0.91	0.95	1.50	0.85	0.24	0.01	0.79	0.12	0.09
2048	EU	13936	2165	1553	8E+12	1E+12	9E+11	0.91	0.96	1.49	0.85	0.24	0.01	0.79	0.12	0.09
2049	EU	13973	2144	1566	8E+12	1E+12	9E+11	0.92	0.96	1.49	0.85	0.23	0.01	0.79	0.12	0.09
2050	EU	14006	2123	1579	8E+12	1E+12	9E+11	0.92	0.96	1.49	0.85	0.23	0.01	0.79	0.12	0.09
1960	US															
1961	US	12997	680	276	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.77	0.08	0.00	0.93	0.05	0.02
1962	US	13387	679	297	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.79	0.08	0.00	0.93	0.05	0.02
1963	US	13772	648	332	3E+12	1E+11	6E+10	0.82	0.86	1.33	0.81	0.08	0.00	0.93	0.04	0.02
1964	US	14242	642	376	3E+12	1E+11	7E+10	0.82	0.86	1.33	0.84	0.08	0.01	0.93	0.04	0.02
1965	US	14698	633	439	3E+12	1E+11	8E+10	0.82	0.86	1.33	0.86	0.07	0.01	0.93	0.04	0.03
1966	US	15237	617	501	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.89	0.07	0.01	0.93	0.04	0.03
1967	US	15465	596	612	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.90	0.07	0.01	0.93	0.04	0.04
1968	US	15920	563	700	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.93	0.07	0.01	0.93	0.03	0.04
1969	US	16250	545	811	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.94	0.07	0.01	0.92	0.03	0.05
1970	US	16536	515	812	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.96	0.06	0.01	0.93	0.03	0.05
1971	US	17016	479	817	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.93	0.03	0.04
1972	US	17521	461	891	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.01	0.05	0.01	0.93	0.02	0.05
1973	US	17967	480	962	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.04	0.06	0.01	0.93	0.02	0.05
1974	US	17233	510	995	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.00	0.06	0.01	0.92	0.03	0.05
1975	US	17322	485	1001	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.00	0.06	0.01	0.92	0.03	0.05
1976	US	17613	482	1089	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.02	0.06	0.01	0.92	0.03	0.06
1977	US	17778	493	1164	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.03	0.06	0.01	0.91	0.03	0.06

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1978	US	17920	494	1335	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.04	0.06	0.01	0.91	0.03	0.07
1979	US	17010	516	1502	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.99	0.06	0.02	0.89	0.03	0.08
1980	US	16761	517	1446	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1981	US	16803	502	1426	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1982	US	16712	479	1481	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1983	US	17057	474	1596	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.00	0.06	0.02	0.89	0.02	0.08
1984	US	17514	481	1712	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.03	0.06	0.02	0.89	0.02	0.09
1985	US	17702	474	1882	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.04	0.06	0.02	0.88	0.02	0.09
1986	US	17973	475	2083	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.05	0.06	0.02	0.88	0.02	0.10
1987	US	18187	461	2179	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.06	0.06	0.02	0.87	0.02	0.10
1988	US	18601	454	2154	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.08	0.06	0.02	0.88	0.02	0.10
1989	US	18916	462	2131	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.10	0.06	0.02	0.88	0.02	0.10
1990	US	19078	450	2179	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.11	0.06	0.02	0.88	0.02	0.10
1991	US	18827	443	2101	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.09	0.05	0.02	0.88	0.02	0.10
1992	US	19280	433	2185	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.12	0.05	0.02	0.88	0.02	0.10
1993	US	19641	440	2227	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.14	0.05	0.02	0.88	0.02	0.10
1994	US	19956	437	2361	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.16	0.05	0.02	0.88	0.02	0.10
1995	US	20108	440	2420	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.17	0.05	0.02	0.88	0.02	0.11
1996	US	20251	431	2565	5E+12	1E+11	7E+11	0.82	0.86	1.33	1.18	0.05	0.02	0.87	0.02	0.11
1997	US	20487	430	2618	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.19	0.05	0.02	0.87	0.02	0.11
1998	US	20813	438	2652	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.20	0.05	0.03	0.87	0.02	0.11
1999	US	21055	444	2769	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.22	0.05	0.03	0.87	0.02	0.11
2000	US	21196	451	2883	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.23	0.05	0.03	0.86	0.02	0.12
2001	US	21523	453	2709	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.24	0.06	0.03	0.87	0.02	0.11
2002	US	21895	438	2637	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.26	0.05	0.02	0.88	0.02	0.11
2003	US	21997	428	2782	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.27	0.05	0.03	0.87	0.02	0.11
2004	US	22095	420	3000	6E+12	1E+11	9E+11	0.82	0.86	1.33	1.27	0.05	0.03	0.87	0.02	0.12
2005	US	22132	416	3125	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.28	0.05	0.03	0.86	0.02	0.12

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2006	US	22237	426	3146	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.28	0.05	0.03	0.86	0.02	0.12
2007	US	22274	441	3239	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.29	0.06	0.03	0.86	0.02	0.12
2008	US	21595	451	3080	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.25	0.06	0.03	0.86	0.02	0.12
2009	US	21946	446	2899	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.27	0.06	0.03	0.87	0.02	0.11
2010	US	21615	426	2943	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.25	0.05	0.03	0.87	0.02	0.12
2011	US	22019	425	3045	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.27	0.05	0.03	0.86	0.02	0.12
2012	US	22366	424	3136	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.29	0.05	0.03	0.86	0.02	0.12
2013	US	22666	422	3218	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.31	0.05	0.03	0.86	0.02	0.12
2014	US	22788	414	3286	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.02	0.12
2015	US	22793	405	3334	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.02	0.13
2016	US	22792	397	3377	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2017	US	22785	390	3417	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2018	US	22774	383	3452	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2019	US	22761	377	3485	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.85	0.01	0.13
2020	US	22658	363	1382	8E+12	1E+11	5E+11	0.74	0.86	17.32	1.31	0.05	0.01	0.93	0.01	0.06
2021	US	23213	344	1515	8E+12	1E+11	5E+11	0.82	0.95	1.62	1.34	0.04	0.01	0.93	0.01	0.06
2022	US	23257	314	1645	8E+12	1E+11	6E+11	0.86	1.00	1.54	1.35	0.04	0.01	0.92	0.01	0.07
2023	US	23292	289	1783	8E+12	1E+11	6E+11	0.87	1.01	1.47	1.35	0.04	0.02	0.92	0.01	0.07
2024	US	23315	266	1918	8E+12	9E+10	7E+11	0.87	1.01	1.48	1.35	0.03	0.02	0.91	0.01	0.08
2025	US	23341	248	2053	8E+12	9E+10	7E+11	0.87	1.01	1.46	1.35	0.03	0.02	0.91	0.01	0.08
2026	US	23354	231	2185	8E+12	8E+10	8E+11	0.87	1.01	1.47	1.35	0.03	0.02	0.91	0.01	0.08
2027	US	23364	217	2313	8E+12	8E+10	8E+11	0.87	1.02	1.47	1.35	0.03	0.02	0.90	0.01	0.09
2028	US	23371	204	2437	8E+12	7E+10	9E+11	0.88	1.02	1.47	1.35	0.03	0.02	0.90	0.01	0.09
2029	US	23376	193	2556	8E+12	7E+10	9E+11	0.88	1.02	1.48	1.35	0.02	0.02	0.89	0.01	0.10
2030	US	23377	183	2673	8E+12	7E+10	1E+12	0.88	1.02	1.46	1.35	0.02	0.02	0.89	0.01	0.10
2031	US	23384	175	2786	9E+12	6E+10	1E+12	0.88	1.02	1.47	1.35	0.02	0.03	0.89	0.01	0.11
2032	US	23378	167	2892	9E+12	6E+10	1E+12	0.88	1.03	1.47	1.35	0.02	0.03	0.88	0.01	0.11
2033	US	23380	160	2994	9E+12	6E+10	1E+12	0.88	1.03	1.47	1.35	0.02	0.03	0.88	0.01	0.11

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2034	US	23379	154	3091	9E+12	6E+10	1E+12	0.89	1.03	1.47	1.35	0.02	0.03	0.88	0.01	0.12
2035	US	23373	148	3182	9E+12	6E+10	1E+12	0.89	1.03	1.48	1.35	0.02	0.03	0.88	0.01	0.12
2036	US	23372	143	3271	9E+12	5E+10	1E+12	0.89	1.03	1.46	1.35	0.02	0.03	0.87	0.01	0.12
2037	US	23374	139	3356	9E+12	5E+10	1E+12	0.89	1.03	1.46	1.35	0.02	0.03	0.87	0.01	0.12
2038	US	23371	134	3435	9E+12	5E+10	1E+12	0.89	1.03	1.47	1.35	0.02	0.03	0.87	0.00	0.13
2039	US	23362	131	3509	9E+12	5E+10	1E+12	0.89	1.04	1.47	1.35	0.02	0.03	0.87	0.00	0.13
2040	US	23360	127	3581	9E+12	5E+10	1E+12	0.89	1.04	1.47	1.35	0.02	0.03	0.86	0.00	0.13
2041	US	23355	124	3648	9E+12	5E+10	1E+12	0.90	1.04	1.48	1.35	0.02	0.03	0.86	0.00	0.13
2042	US	23349	121	3715	9E+12	5E+10	1E+12	0.90	1.04	1.46	1.35	0.02	0.03	0.86	0.00	0.14
2043	US	23351	118	3778	9E+12	5E+10	1E+12	0.90	1.04	1.47	1.35	0.01	0.03	0.86	0.00	0.14
2044	US	23349	115	3838	9E+12	5E+10	2E+12	0.90	1.05	1.47	1.35	0.01	0.03	0.86	0.00	0.14
2045	US	23344	113	3893	9E+12	4E+10	2E+12	0.90	1.05	1.47	1.35	0.01	0.04	0.85	0.00	0.14
2046	US	23334	111	3944	9E+12	4E+10	2E+12	0.90	1.05	1.47	1.35	0.01	0.04	0.85	0.00	0.14
2047	US	23330	109	3993	9E+12	4E+10	2E+12	0.90	1.05	1.47	1.35	0.01	0.04	0.85	0.00	0.15
2048	US	23331	107	4040	9E+12	4E+10	2E+12	0.90	1.05	1.48	1.35	0.01	0.04	0.85	0.00	0.15
2049	US	23327	105	4087	9E+12	4E+10	2E+12	0.91	1.05	1.46	1.35	0.01	0.04	0.85	0.00	0.15
2050	US	23324	103	4132	9E+12	4E+10	2E+12	0.91	1.06	1.47	1.35	0.01	0.04	0.85	0.00	0.15
1970	BR															
1971	BR	381	1084	54	4E+10	1E+11	5E+09	0.98	1.05	1.33	0.03	0.14	0.00	0.25	0.71	0.04
1972	BR	464	1131	62	5E+10	1E+11	6E+09	0.98	1.05	1.33	0.04	0.14	0.00	0.28	0.68	0.04
1973	BR	568	1213	76	6E+10	1E+11	8E+09	0.98	1.05	1.33	0.05	0.15	0.00	0.31	0.65	0.04
1974	BR	674	1300	87	7E+10	1E+11	9E+09	0.98	1.05	1.33	0.06	0.16	0.00	0.33	0.63	0.04
1975	BR	776	1387	96	8E+10	1E+11	1E+10	0.98	1.05	1.33	0.06	0.17	0.00	0.34	0.61	0.04
1976	BR	889	1537	102	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.07	0.19	0.00	0.35	0.61	0.04
1977	BR	982	1691	104	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.08	0.21	0.00	0.35	0.61	0.04
1978	BR	1071	1850	111	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.09	0.23	0.00	0.35	0.61	0.04
1979	BR	1193	2009	124	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.10	0.25	0.00	0.36	0.60	0.04
1980	BR	1341	2215	130	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.11	0.28	0.00	0.36	0.60	0.04

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1981	BR	1387	2292	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.29	0.00	0.36	0.60	0.04
1982	BR	1435	2364	143	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.29	0.00	0.36	0.60	0.04
1983	BR	1484	2376	135	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.30	0.00	0.37	0.59	0.03
1984	BR	1564	2431	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.13	0.30	0.00	0.38	0.59	0.03
1985	BR	1674	2535	150	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.14	0.32	0.00	0.38	0.58	0.03
1986	BR	1731	2567	185	2E+11	4E+11	3E+10	0.98	1.05	1.33	0.14	0.32	0.00	0.39	0.57	0.04
1987	BR	1799	2696	179	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.34	0.00	0.38	0.58	0.04
1988	BR	1806	2794	186	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.35	0.00	0.38	0.58	0.04
1989	BR	1820	2885	212	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.36	0.00	0.37	0.59	0.04
1990	BR	1805	2876	206	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.36	0.00	0.37	0.59	0.04
1991	BR	1764	2935	200	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.37	0.00	0.36	0.60	0.04
1992	BR	1706	2969	196	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.14	0.37	0.00	0.35	0.61	0.04
1993	BR	1729	3015	206	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.14	0.38	0.00	0.35	0.61	0.04
1994	BR	1812	3055	226	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.15	0.38	0.00	0.36	0.60	0.04
1995	BR	1918	3098	246	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.16	0.39	0.00	0.36	0.59	0.05
1996	BR	2017	3117	254	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.17	0.39	0.00	0.37	0.58	0.05
1997	BR	2146	3114	271	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.18	0.39	0.00	0.39	0.56	0.05
1998	BR	2234	3085	300	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.19	0.38	0.00	0.40	0.55	0.05
1999	BR	2297	3058	228	4E+11	5E+11	4E+10	0.98	1.05	1.33	0.19	0.38	0.00	0.41	0.55	0.04
2000	BR	2358	3021	281	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.20	0.38	0.00	0.42	0.53	0.05
2001	BR	2420	2994	282	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.20	0.37	0.00	0.42	0.53	0.05
2002	BR	2515	3001	277	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.21	0.37	0.00	0.43	0.52	0.05
2003	BR	2599	3008	259	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.22	0.37	0.00	0.44	0.51	0.04
2004	BR	2724	3057	266	5E+11	6E+11	5E+10	0.98	1.05	1.33	0.23	0.38	0.00	0.45	0.51	0.04
2005	BR	2825	3051	318	5E+11	6E+11	6E+10	0.98	1.05	1.33	0.23	0.38	0.00	0.46	0.49	0.05
2006	BR	2974	3113	307	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.25	0.39	0.00	0.47	0.49	0.05
2007	BR	3167	3227	318	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.26	0.40	0.00	0.47	0.48	0.05
2008	BR	3380	3342	352	7E+11	6E+11	7E+10	0.98	1.05	1.33	0.28	0.42	0.00	0.48	0.47	0.05

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2009	BR	3554	3376	389	7E+11	7E+11	8E+10	0.98	1.05	1.33	0.30	0.42	0.00	0.49	0.46	0.05
2010	BR	3843	3509	468	8E+11	7E+11	9E+10	0.98	1.05	1.33	0.32	0.44	0.01	0.49	0.45	0.06
2011	BR	4052	3598	498	8E+11	7E+11	1E+11	0.98	1.05	1.33	0.34	0.45	0.01	0.50	0.44	0.06
2012	BR	4238	3672	524	9E+11	7E+11	1E+11	0.98	1.05	1.33	0.35	0.46	0.01	0.50	0.44	0.06
2013	BR	4401	3733	547	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.37	0.46	0.01	0.51	0.43	0.06
2014	BR	4541	3782	568	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.38	0.47	0.01	0.51	0.43	0.06
2015	BR	4659	3820	586	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.39	0.48	0.01	0.51	0.42	0.06
2016	BR	4748	3843	600	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.39	0.48	0.01	0.52	0.42	0.07
2017	BR	4814	3854	612	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.40	0.48	0.01	0.52	0.42	0.07
2018	BR	4858	3855	621	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.40	0.48	0.01	0.52	0.41	0.07
2019	BR	4882	3848	627	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.41	0.48	0.01	0.52	0.41	0.07
2020	BR	4852	3804	236	1E+12	8E+11	5E+10	0.98	1.05	42.16	0.40	0.47	0.00	0.55	0.43	0.03
2021	BR	4940	3847	266	1E+12	8E+11	6E+10	0.98	1.05	2.09	0.41	0.48	0.00	0.55	0.42	0.03
2022	BR	5054	3905	296	1E+12	9E+11	7E+10	0.98	1.05	2.09	0.42	0.49	0.00	0.55	0.42	0.03
2023	BR	5194	3978	328	1E+12	9E+11	7E+10	0.98	1.05	2.09	0.43	0.50	0.00	0.55	0.42	0.03
2024	BR	5355	4063	361	1E+12	9E+11	8E+10	0.98	1.05	2.09	0.44	0.51	0.00	0.55	0.42	0.04
2025	BR	5537	4159	395	1E+12	9E+11	9E+10	0.98	1.05	2.09	0.46	0.52	0.00	0.55	0.41	0.04
2026	BR	5734	4262	430	1E+12	1E+12	1E+11	0.98	1.05	2.09	0.48	0.53	0.01	0.55	0.41	0.04
2027	BR	5946	4373	464	1E+12	1E+12	1E+11	0.98	1.05	2.09	0.49	0.54	0.01	0.55	0.41	0.04
2028	BR	6172	4492	500	1E+12	1E+12	1E+11	0.98	1.05	2.09	0.51	0.56	0.01	0.55	0.40	0.04
2029	BR	6351	4546	533	1E+12	1E+12	1E+11	1.04	1.11	2.21	0.53	0.57	0.01	0.56	0.40	0.05
2030	BR	6432	4489	565	1E+12	1E+12	1E+11	1.13	1.21	2.28	0.53	0.56	0.01	0.56	0.39	0.05
2031	BR	6515	4430	600	2E+12	1E+12	1E+11	1.16	1.24	2.12	0.54	0.55	0.01	0.56	0.38	0.05
2032	BR	6600	4370	636	2E+12	1E+12	1E+11	1.18	1.26	2.12	0.55	0.54	0.01	0.57	0.38	0.05
2033	BR	6684	4309	671	2E+12	1E+12	2E+11	1.20	1.29	2.12	0.55	0.54	0.01	0.57	0.37	0.06
2034	BR	6769	4249	706	2E+12	1E+12	2E+11	1.22	1.31	2.13	0.56	0.53	0.01	0.58	0.36	0.06
2035	BR	6855	4189	742	2E+12	1E+12	2E+11	1.24	1.33	2.12	0.57	0.52	0.01	0.58	0.36	0.06
2036	BR	6939	4128	778	2E+12	1E+12	2E+11	1.26	1.35	2.12	0.58	0.51	0.01	0.59	0.35	0.07

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2037	BR	7024	4069	814	2E+12	1E+12	2E+11	1.28	1.37	2.13	0.58	0.51	0.01	0.59	0.34	0.07
2038	BR	7108	4010	850	2E+12	1E+12	2E+11	1.30	1.39	2.11	0.59	0.50	0.01	0.59	0.34	0.07
2039	BR	7190	3950	887	2E+12	1E+12	2E+11	1.32	1.42	2.13	0.60	0.49	0.01	0.60	0.33	0.07
2040	BR	7272	3893	923	2E+12	9E+11	2E+11	1.34	1.43	2.11	0.60	0.48	0.01	0.60	0.32	0.08
2041	BR	7354	3834	960	2E+12	9E+11	2E+11	1.36	1.46	2.13	0.61	0.48	0.01	0.61	0.32	0.08
2042	BR	7436	3776	998	2E+12	9E+11	2E+11	1.38	1.48	2.12	0.62	0.47	0.01	0.61	0.31	0.08
2043	BR	7517	3718	1037	2E+12	9E+11	3E+11	1.40	1.50	2.12	0.62	0.46	0.01	0.61	0.30	0.08
2044	BR	7597	3661	1076	2E+12	9E+11	3E+11	1.42	1.52	2.11	0.63	0.46	0.01	0.62	0.30	0.09
2045	BR	7676	3604	1115	2E+12	9E+11	3E+11	1.44	1.54	2.12	0.64	0.45	0.01	0.62	0.29	0.09
2046	BR	7755	3547	1155	2E+12	9E+11	3E+11	1.47	1.57	2.13	0.64	0.44	0.01	0.62	0.28	0.09
2047	BR	7836	3491	1197	2E+12	9E+11	3E+11	1.49	1.59	2.12	0.65	0.43	0.01	0.63	0.28	0.10
2048	BR	7912	3434	1238	2E+12	9E+11	3E+11	1.51	1.62	2.13	0.66	0.43	0.02	0.63	0.27	0.10
2049	BR	7990	3379	1282	2E+12	8E+11	3E+11	1.53	1.63	2.11	0.66	0.42	0.02	0.63	0.27	0.10
2050	BR	8065	3323	1325	2E+12	8E+11	3E+11	1.55	1.66	2.12	0.67	0.41	0.02	0.63	0.26	0.10
1960	JP															
1961	JP	1854	3253	244	2E+11	3E+11	2E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.61	0.05
1962	JP	1910	3284	268	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.60	0.05
1963	JP	1966	3316	291	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.59	0.05
1964	JP	2026	3356	315	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.16	0.37	0.00	0.36	0.59	0.06
1965	JP	2071	3375	336	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.16	0.37	0.00	0.36	0.58	0.06
1966	JP	2128	3414	359	2E+11	3E+11	4E+10	0.70	0.77	1.11	0.17	0.37	0.00	0.36	0.58	0.06
1967	JP	2185	3454	381	2E+11	3E+11	4E+10	0.70	0.77	1.11	0.17	0.38	0.00	0.36	0.57	0.06
1968	JP	2241	3493	403	2E+11	4E+11	4E+10	0.70	0.77	1.11	0.18	0.38	0.00	0.37	0.57	0.07
1969	JP	2291	3523	423	2E+11	4E+11	4E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1970	JP	2331	3540	442	2E+11	4E+11	5E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1971	JP	2358	3538	457	2E+11	4E+11	5E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1972	JP	2406	3569	477	3E+11	4E+11	5E+10	0.70	0.77	1.11	0.19	0.39	0.00	0.37	0.55	0.07
1973	JP	2460	3610	497	3E+11	4E+11	5E+10	0.70	0.77	1.11	0.19	0.40	0.01	0.37	0.55	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1974	JP	2497	3627	514	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.40	0.01	0.38	0.55	0.08
1975	JP	2552	3670	534	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.40	0.01	0.38	0.54	0.08
1976	JP	2612	3722	555	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.41	0.01	0.38	0.54	0.08
1977	JP	2678	3782	578	3E+11	4E+11	7E+10	0.70	0.77	1.11	0.21	0.41	0.01	0.38	0.54	0.08
1978	JP	2750	3849	602	3E+11	4E+11	7E+10	0.70	0.77	1.11	0.22	0.42	0.01	0.38	0.53	0.08
1979	JP	2832	3931	628	3E+11	5E+11	7E+10	0.70	0.77	1.11	0.22	0.43	0.01	0.38	0.53	0.08
1980	JP	2902	3997	651	3E+11	5E+11	8E+10	0.70	0.77	1.11	0.23	0.44	0.01	0.38	0.53	0.09
1981	JP	3026	4008	682	4E+11	5E+11	8E+10	0.70	0.77	1.11	0.24	0.44	0.01	0.39	0.52	0.09
1982	JP	3148	4015	713	4E+11	5E+11	8E+10	0.70	0.77	1.11	0.25	0.44	0.01	0.40	0.51	0.09
1983	JP	3265	4017	743	4E+11	5E+11	9E+10	0.70	0.77	1.11	0.26	0.44	0.01	0.41	0.50	0.09
1984	JP	3388	4023	774	4E+11	5E+11	9E+10	0.70	0.77	1.11	0.27	0.44	0.01	0.41	0.49	0.09
1985	JP	3518	4038	806	4E+11	5E+11	1E+11	0.70	0.77	1.11	0.28	0.44	0.01	0.42	0.48	0.10
1986	JP	3701	3973	834	4E+11	5E+11	1E+11	0.70	0.77	1.11	0.29	0.44	0.01	0.43	0.47	0.10
1987	JP	3881	3927	862	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.30	0.43	0.01	0.45	0.45	0.10
1988	JP	4067	3902	893	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.32	0.43	0.01	0.46	0.44	0.10
1989	JP	4234	3872	920	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.33	0.42	0.01	0.47	0.43	0.10
1990	JP	4395	3848	946	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.34	0.42	0.01	0.48	0.42	0.10
1991	JP	4519	3835	962	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.35	0.42	0.01	0.49	0.41	0.10
1992	JP	4629	3812	975	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.36	0.42	0.01	0.49	0.40	0.10
1993	JP	4736	3787	987	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.37	0.42	0.01	0.50	0.40	0.10
1994	JP	4845	3765	1000	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.38	0.41	0.01	0.50	0.39	0.10
1995	JP	4960	3749	1014	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.39	0.41	0.01	0.51	0.39	0.10
1996	JP	5085	3718	1039	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.40	0.41	0.01	0.52	0.38	0.11
1997	JP	5201	3680	1062	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.41	0.40	0.01	0.52	0.37	0.11
1998	JP	5300	3631	1081	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.41	0.40	0.01	0.53	0.36	0.11
1999	JP	5416	3593	1104	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.42	0.39	0.01	0.54	0.36	0.11
2000	JP	5548	3566	1130	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.43	0.39	0.01	0.54	0.35	0.11
2001	JP	5581	3601	1153	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.44	0.39	0.01	0.54	0.35	0.11

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2002	JP	5618	3637	1177	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.40	0.01	0.54	0.35	0.11
2003	JP	5656	3675	1201	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.40	0.01	0.54	0.35	0.11
2004	JP	5699	3716	1227	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.54	0.35	0.12
2005	JP	5730	3750	1250	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.53	0.35	0.12
2006	JP	5704	3762	1238	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.53	0.35	0.12
2007	JP	5680	3774	1226	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.35	0.11
2008	JP	5625	3766	1207	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.36	0.11
2009	JP	5564	3754	1187	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.36	0.11
2010	JP	5573	3789	1182	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.42	0.01	0.53	0.36	0.11
2011	JP	5638	3805	1195	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.42	0.01	0.53	0.36	0.11
2012	JP	5700	3818	1207	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.36	0.11
2013	JP	5757	3830	1218	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.35	0.11
2014	JP	5810	3840	1228	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.35	0.11
2015	JP	5860	3849	1238	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2016	JP	5894	3849	1244	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2017	JP	5925	3850	1249	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2018	JP	5955	3850	1255	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2019	JP	5983	3850	1260	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2020	JP	5971	3871	596	7E+11	5E+11	7E+10	0.10	0.17	129.54	0.47	0.42	0.01	0.57	0.37	0.06
2021	JP	6005	3874	630	7E+11	5E+11	8E+10	0.70	0.77	1.11	0.47	0.42	0.01	0.57	0.37	0.06
2022	JP	6037	3877	663	7E+11	5E+11	8E+10	0.70	0.77	1.11	0.47	0.42	0.01	0.57	0.37	0.06
2023	JP	6067	3879	696	7E+11	5E+11	8E+10	0.70	0.77	1.11	0.47	0.43	0.01	0.57	0.36	0.07
2024	JP	6095	3881	728	7E+11	5E+11	9E+10	0.70	0.77	1.11	0.48	0.43	0.01	0.57	0.36	0.07
2025	JP	6121	3881	759	7E+11	5E+11	9E+10	0.70	0.77	1.11	0.48	0.43	0.01	0.57	0.36	0.07
2026	JP	6145	3882	789	7E+11	5E+11	9E+10	0.70	0.77	1.11	0.48	0.43	0.01	0.57	0.36	0.07
2027	JP	6167	3881	818	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.48	0.43	0.01	0.57	0.36	0.08
2028	JP	6188	3880	846	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.48	0.43	0.01	0.57	0.36	0.08
2029	JP	6207	3879	873	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.49	0.43	0.01	0.57	0.35	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2030	JP	6224	3877	898	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.57	0.35	0.08
2031	JP	6241	3875	922	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.57	0.35	0.08
2032	JP	6256	3873	946	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.56	0.35	0.09
2033	JP	6269	3870	967	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.56	0.35	0.09
2034	JP	6282	3866	988	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.56	0.35	0.09
2035	JP	6292	3862	1007	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.56	0.35	0.09
2036	JP	6301	3858	1026	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.56	0.34	0.09
2037	JP	6309	3853	1043	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.56	0.34	0.09
2038	JP	6315	3847	1058	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.56	0.34	0.09
2039	JP	6321	3842	1073	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.49	0.42	0.01	0.56	0.34	0.10
2040	JP	6325	3836	1087	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.56	0.34	0.10
2041	JP	6331	3831	1100	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.56	0.34	0.10
2042	JP	6336	3825	1113	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.56	0.34	0.10
2043	JP	6339	3819	1124	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.56	0.34	0.10
2044	JP	6341	3813	1134	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.56	0.34	0.10
2045	JP	6342	3806	1144	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.56	0.34	0.10
2046	JP	6342	3799	1152	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.56	0.34	0.10
2047	JP	6341	3791	1160	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.42	0.01	0.56	0.34	0.10
2048	JP	6339	3783	1167	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.41	0.01	0.56	0.34	0.10
2049	JP	6336	3775	1173	7E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.41	0.01	0.56	0.33	0.10
2050	JP	6333	3767	1179	6E+11	4E+11	1E+11	0.70	0.77	1.11	0.50	0.41	0.01	0.56	0.33	0.10

C.6 Storyline “Domestic aviation in a post-pandemic world: incentive to recovery” main outputs

Table C.6 – 1: Storyline “Domestic aviation in a post-pandemic world: incentive to recovery l” main outputs

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1960	EU															
1961	EU	1266	864	61	5E+11	4E+11	3E+10	0.82	0.86	1.33	0.08	0.09	0.00	0.58	0.39	0.03
1962	EU	1375	917	82	6E+11	4E+11	3E+10	0.82	0.86	1.33	0.08	0.10	0.00	0.58	0.39	0.03
1963	EU	1531	950	85	6E+11	4E+11	4E+10	0.82	0.86	1.33	0.09	0.10	0.00	0.60	0.37	0.03
1964	EU	1737	944	88	7E+11	4E+11	4E+10	0.82	0.86	1.33	0.11	0.10	0.00	0.63	0.34	0.03
1965	EU	1981	905	93	8E+11	4E+11	4E+10	0.82	0.86	1.33	0.12	0.10	0.00	0.67	0.30	0.03
1966	EU	2111	959	123	9E+11	4E+11	5E+10	0.82	0.86	1.33	0.13	0.11	0.00	0.66	0.30	0.04
1967	EU	2415	890	118	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.15	0.10	0.00	0.71	0.26	0.03
1968	EU	2587	969	117	1E+12	4E+11	5E+10	0.82	0.86	1.33	0.16	0.11	0.00	0.70	0.26	0.03
1969	EU	2784	1001	153	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.17	0.11	0.00	0.71	0.25	0.04
1970	EU	3074	967	164	1E+12	4E+11	7E+10	0.82	0.86	1.33	0.19	0.11	0.00	0.73	0.23	0.04
1971	EU	3298	979	173	1E+12	4E+11	8E+10	0.82	0.86	1.33	0.20	0.11	0.00	0.74	0.22	0.04
1972	EU	3395	1076	239	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.21	0.12	0.00	0.72	0.23	0.05
1973	EU	3611	1062	269	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.22	0.12	0.00	0.73	0.21	0.05
1974	EU	3804	1112	258	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.23	0.12	0.00	0.74	0.21	0.05
1975	EU	3853	1178	293	2E+12	5E+11	1E+11	0.82	0.86	1.33	0.23	0.13	0.00	0.72	0.22	0.06
1976	EU	4020	1232	317	2E+12	6E+11	1E+11	0.82	0.86	1.33	0.24	0.14	0.00	0.72	0.22	0.06
1977	EU	4232	1221	354	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.26	0.13	0.00	0.73	0.21	0.06
1978	EU	4371	1230	371	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.27	0.13	0.00	0.73	0.21	0.06
1979	EU	4518	1266	430	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.28	0.14	0.00	0.73	0.20	0.07
1980	EU	4753	1258	420	2E+12	6E+11	2E+11	0.82	0.86	1.33	0.29	0.14	0.00	0.74	0.20	0.07
1981	EU	4811	1428	446	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.29	0.16	0.00	0.72	0.21	0.07
1982	EU	4998	1480	431	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.30	0.16	0.00	0.72	0.21	0.06
1983	EU	5147	1519	451	2E+12	7E+11	2E+11	0.82	0.86	1.33	0.31	0.17	0.00	0.72	0.21	0.06
1984	EU	5335	1536	457	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.32	0.17	0.00	0.73	0.21	0.06

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1985	EU	5452	1694	498	3E+12	8E+11	2E+11	0.82	0.86	1.33	0.33	0.19	0.00	0.71	0.22	0.07
1986	EU	5757	1558	505	3E+12	7E+11	2E+11	0.82	0.86	1.33	0.35	0.17	0.00	0.74	0.20	0.06
1987	EU	5929	1574	558	3E+12	7E+11	3E+11	0.82	0.86	1.33	0.36	0.17	0.01	0.74	0.20	0.07
1988	EU	6025	1730	582	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.37	0.19	0.01	0.72	0.21	0.07
1989	EU	6256	1745	613	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.38	0.19	0.01	0.73	0.20	0.07
1990	EU	6432	1771	698	3E+12	8E+11	3E+11	0.82	0.86	1.33	0.39	0.19	0.01	0.72	0.20	0.08
1991	EU	6679	1779	696	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.41	0.19	0.01	0.73	0.19	0.08
1992	EU	6879	1777	690	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.42	0.19	0.01	0.74	0.19	0.07
1993	EU	7050	1768	682	3E+12	9E+11	3E+11	0.82	0.86	1.33	0.43	0.19	0.01	0.74	0.19	0.07
1994	EU	7263	1772	679	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.44	0.19	0.01	0.75	0.18	0.07
1995	EU	7490	1780	677	4E+12	9E+11	3E+11	0.82	0.86	1.33	0.46	0.20	0.01	0.75	0.18	0.07
1996	EU	7543	1738	741	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.46	0.19	0.01	0.75	0.17	0.07
1997	EU	7673	1733	792	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.47	0.19	0.01	0.75	0.17	0.08
1998	EU	7854	1730	837	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.48	0.19	0.01	0.75	0.17	0.08
1999	EU	8053	1740	873	4E+12	8E+11	4E+11	0.82	0.86	1.33	0.49	0.19	0.01	0.75	0.16	0.08
2000	EU	8187	1819	952	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.50	0.20	0.01	0.75	0.17	0.09
2001	EU	8418	1826	963	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.51	0.20	0.01	0.75	0.16	0.09
2002	EU	8651	1806	970	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.53	0.20	0.01	0.76	0.16	0.08
2003	EU	8795	1822	1018	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.54	0.20	0.01	0.76	0.16	0.09
2004	EU	8959	1853	1082	4E+12	9E+11	5E+11	0.82	0.86	1.33	0.55	0.20	0.01	0.75	0.16	0.09
2005	EU	9043	1896	1173	4E+12	9E+11	6E+11	0.82	0.86	1.33	0.55	0.21	0.01	0.75	0.16	0.10
2006	EU	9217	1926	1240	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.56	0.21	0.01	0.74	0.16	0.10
2007	EU	9360	1972	1302	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.57	0.22	0.01	0.74	0.16	0.10
2008	EU	9413	2037	1290	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.57	0.22	0.01	0.74	0.16	0.10
2009	EU	9504	1949	1215	5E+12	1E+12	6E+11	0.82	0.86	1.33	0.58	0.21	0.01	0.75	0.15	0.10
2010	EU	9648	1977	1294	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.59	0.22	0.01	0.75	0.15	0.10
2011	EU	9763	1994	1289	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.59	0.22	0.01	0.75	0.15	0.10
2012	EU	9872	2009	1286	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.60	0.22	0.01	0.75	0.15	0.10

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2013	EU	9975	2024	1284	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.61	0.22	0.01	0.75	0.15	0.10
2014	EU	10072	2037	1283	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.61	0.22	0.01	0.75	0.15	0.10
2015	EU	10166	2050	1282	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.22	0.01	0.75	0.15	0.10
2016	EU	10208	2054	1278	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.75	0.15	0.09
2017	EU	10238	2057	1273	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.75	0.15	0.09
2018	EU	10259	2060	1269	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.62	0.23	0.01	0.76	0.15	0.09
2019	EU	10270	2061	1265	5E+12	1E+12	7E+11	0.82	0.86	1.33	0.63	0.23	0.01	0.76	0.15	0.09
2020	EU	10222	2051	503	5E+12	1E+12	3E+11	0.82	0.86	25.71	0.62	0.22	0.00	0.80	0.16	0.04
2021	EU	10334	2071	601	6E+12	1E+12	3E+11	0.82	0.86	0.30	0.63	0.23	0.01	0.79	0.16	0.05
2022	EU	10462	2091	701	6E+12	1E+12	4E+11	0.82	0.86	0.30	0.64	0.23	0.01	0.79	0.16	0.05
2023	EU	10604	2112	802	6E+12	1E+12	4E+11	0.82	0.86	0.30	0.65	0.23	0.01	0.78	0.16	0.06
2024	EU	10758	2133	902	6E+12	1E+12	5E+11	0.82	0.86	0.30	0.65	0.23	0.01	0.78	0.15	0.07
2025	EU	10922	2155	1000	6E+12	1E+12	5E+11	0.82	0.86	0.30	0.66	0.24	0.01	0.78	0.15	0.07
2026	EU	11094	2178	1094	6E+12	1E+12	6E+11	0.82	0.86	0.30	0.68	0.24	0.01	0.77	0.15	0.08
2027	EU	11274	2200	1180	6E+12	1E+12	6E+11	0.82	0.86	0.30	0.69	0.24	0.01	0.77	0.15	0.08
2028	EU	11460	2223	1261	6E+12	1E+12	7E+11	0.82	0.86	0.30	0.70	0.24	0.01	0.77	0.15	0.08
2029	EU	11657	2247	1280	6E+12	1E+12	7E+11	0.82	0.86	1.49	0.71	0.25	0.01	0.77	0.15	0.08
2030	EU	11856	2271	1298	7E+12	1E+12	7E+11	0.82	0.86	1.49	0.72	0.25	0.01	0.77	0.15	0.08
2031	EU	12065	2297	1316	7E+12	1E+12	7E+11	0.82	0.86	1.49	0.73	0.25	0.01	0.77	0.15	0.08
2032	EU	12277	2322	1334	7E+12	1E+12	7E+11	0.82	0.86	1.49	0.75	0.25	0.01	0.77	0.15	0.08
2033	EU	12491	2346	1352	7E+12	1E+12	8E+11	0.82	0.86	1.49	0.76	0.26	0.01	0.77	0.14	0.08
2034	EU	12707	2371	1369	7E+12	1E+12	8E+11	0.82	0.86	1.49	0.77	0.26	0.01	0.77	0.14	0.08
2035	EU	12923	2396	1387	7E+12	1E+12	8E+11	0.82	0.86	1.49	0.79	0.26	0.01	0.77	0.14	0.08
2036	EU	13140	2420	1403	7E+12	1E+12	8E+11	0.82	0.86	1.49	0.80	0.27	0.01	0.77	0.14	0.08
2037	EU	13356	2444	1420	8E+12	1E+12	8E+11	0.82	0.86	1.49	0.81	0.27	0.01	0.78	0.14	0.08
2038	EU	13475	2432	1434	8E+12	1E+12	8E+11	0.85	0.89	1.55	0.82	0.27	0.01	0.78	0.14	0.08
2039	EU	13530	2399	1450	8E+12	1E+12	8E+11	0.88	0.92	1.53	0.82	0.26	0.01	0.78	0.14	0.08
2040	EU	13584	2369	1467	8E+12	1E+12	8E+11	0.88	0.92	1.50	0.83	0.26	0.01	0.78	0.14	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2041	EU	13635	2338	1483	8E+12	1E+12	8E+11	0.88	0.93	1.50	0.83	0.26	0.01	0.78	0.13	0.08
2042	EU	13683	2310	1498	8E+12	1E+12	9E+11	0.89	0.93	1.50	0.83	0.25	0.01	0.78	0.13	0.09
2043	EU	13732	2283	1512	8E+12	1E+12	9E+11	0.89	0.94	1.50	0.84	0.25	0.01	0.78	0.13	0.09
2044	EU	13776	2256	1526	8E+12	1E+12	9E+11	0.90	0.94	1.50	0.84	0.25	0.01	0.78	0.13	0.09
2045	EU	13821	2232	1540	8E+12	1E+12	9E+11	0.90	0.95	1.50	0.84	0.24	0.01	0.79	0.13	0.09
2046	EU	13859	2207	1552	8E+12	1E+12	9E+11	0.91	0.95	1.50	0.84	0.24	0.01	0.79	0.13	0.09
2047	EU	13900	2185	1564	8E+12	1E+12	9E+11	0.91	0.95	1.50	0.85	0.24	0.01	0.79	0.12	0.09
2048	EU	13936	2163	1576	8E+12	1E+12	9E+11	0.91	0.96	1.50	0.85	0.24	0.01	0.79	0.12	0.09
2049	EU	13974	2142	1587	8E+12	1E+12	9E+11	0.92	0.96	1.50	0.85	0.23	0.01	0.79	0.12	0.09
2050	EU	14008	2122	1597	8E+12	1E+12	9E+11	0.92	0.96	1.50	0.85	0.23	0.01	0.79	0.12	0.09
1960	US															
1961	US	12997	680	276	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.77	0.08	0.00	0.93	0.05	0.02
1962	US	13387	679	297	2E+12	1E+11	5E+10	0.82	0.86	1.33	0.79	0.08	0.00	0.93	0.05	0.02
1963	US	13772	648	332	3E+12	1E+11	6E+10	0.82	0.86	1.33	0.81	0.08	0.00	0.93	0.04	0.02
1964	US	14242	642	376	3E+12	1E+11	7E+10	0.82	0.86	1.33	0.84	0.08	0.01	0.93	0.04	0.02
1965	US	14698	633	439	3E+12	1E+11	8E+10	0.82	0.86	1.33	0.86	0.07	0.01	0.93	0.04	0.03
1966	US	15237	617	501	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.89	0.07	0.01	0.93	0.04	0.03
1967	US	15465	596	612	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.90	0.07	0.01	0.93	0.04	0.04
1968	US	15920	563	700	3E+12	1E+11	1E+11	0.82	0.86	1.33	0.93	0.07	0.01	0.93	0.03	0.04
1969	US	16250	545	811	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.94	0.07	0.01	0.92	0.03	0.05
1970	US	16536	515	812	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.96	0.06	0.01	0.93	0.03	0.05
1971	US	17016	479	817	3E+12	1E+11	2E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.93	0.03	0.04
1972	US	17521	461	891	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.01	0.05	0.01	0.93	0.02	0.05
1973	US	17967	480	962	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.04	0.06	0.01	0.93	0.02	0.05
1974	US	17233	510	995	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.00	0.06	0.01	0.92	0.03	0.05
1975	US	17322	485	1001	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.00	0.06	0.01	0.92	0.03	0.05
1976	US	17613	482	1089	4E+12	1E+11	2E+11	0.82	0.86	1.33	1.02	0.06	0.01	0.92	0.03	0.06
1977	US	17778	493	1164	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.03	0.06	0.01	0.91	0.03	0.06

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1978	US	17920	494	1335	4E+12	1E+11	3E+11	0.82	0.86	1.33	1.04	0.06	0.01	0.91	0.03	0.07
1979	US	17010	516	1502	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.99	0.06	0.02	0.89	0.03	0.08
1980	US	16761	517	1446	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1981	US	16803	502	1426	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1982	US	16712	479	1481	4E+12	1E+11	3E+11	0.82	0.86	1.33	0.98	0.06	0.01	0.90	0.03	0.08
1983	US	17057	474	1596	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.00	0.06	0.02	0.89	0.02	0.08
1984	US	17514	481	1712	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.03	0.06	0.02	0.89	0.02	0.09
1985	US	17702	474	1882	4E+12	1E+11	4E+11	0.82	0.86	1.33	1.04	0.06	0.02	0.88	0.02	0.09
1986	US	17973	475	2083	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.05	0.06	0.02	0.88	0.02	0.10
1987	US	18187	461	2179	4E+12	1E+11	5E+11	0.82	0.86	1.33	1.06	0.06	0.02	0.87	0.02	0.10
1988	US	18601	454	2154	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.08	0.06	0.02	0.88	0.02	0.10
1989	US	18916	462	2131	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.10	0.06	0.02	0.88	0.02	0.10
1990	US	19078	450	2179	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.11	0.06	0.02	0.88	0.02	0.10
1991	US	18827	443	2101	5E+12	1E+11	5E+11	0.82	0.86	1.33	1.09	0.05	0.02	0.88	0.02	0.10
1992	US	19280	433	2185	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.12	0.05	0.02	0.88	0.02	0.10
1993	US	19641	440	2227	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.14	0.05	0.02	0.88	0.02	0.10
1994	US	19956	437	2361	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.16	0.05	0.02	0.88	0.02	0.10
1995	US	20108	440	2420	5E+12	1E+11	6E+11	0.82	0.86	1.33	1.17	0.05	0.02	0.88	0.02	0.11
1996	US	20251	431	2565	5E+12	1E+11	7E+11	0.82	0.86	1.33	1.18	0.05	0.02	0.87	0.02	0.11
1997	US	20487	430	2618	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.19	0.05	0.02	0.87	0.02	0.11
1998	US	20813	438	2652	6E+12	1E+11	7E+11	0.82	0.86	1.33	1.20	0.05	0.03	0.87	0.02	0.11
1999	US	21055	444	2769	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.22	0.05	0.03	0.87	0.02	0.11
2000	US	21196	451	2883	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.23	0.05	0.03	0.86	0.02	0.12
2001	US	21523	453	2709	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.24	0.06	0.03	0.87	0.02	0.11
2002	US	21895	438	2637	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.26	0.05	0.02	0.88	0.02	0.11
2003	US	21997	428	2782	6E+12	1E+11	8E+11	0.82	0.86	1.33	1.27	0.05	0.03	0.87	0.02	0.11
2004	US	22095	420	3000	6E+12	1E+11	9E+11	0.82	0.86	1.33	1.27	0.05	0.03	0.87	0.02	0.12
2005	US	22132	416	3125	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.28	0.05	0.03	0.86	0.02	0.12

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2006	US	22237	426	3146	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.28	0.05	0.03	0.86	0.02	0.12
2007	US	22274	441	3239	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.29	0.06	0.03	0.86	0.02	0.12
2008	US	21595	451	3080	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.25	0.06	0.03	0.86	0.02	0.12
2009	US	21946	446	2899	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.27	0.06	0.03	0.87	0.02	0.11
2010	US	21615	426	2943	7E+12	1E+11	9E+11	0.82	0.86	1.33	1.25	0.05	0.03	0.87	0.02	0.12
2011	US	22019	425	3045	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.27	0.05	0.03	0.86	0.02	0.12
2012	US	22366	424	3136	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.29	0.05	0.03	0.86	0.02	0.12
2013	US	22666	422	3218	7E+12	1E+11	1E+12	0.82	0.86	1.33	1.31	0.05	0.03	0.86	0.02	0.12
2014	US	22788	414	3286	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.02	0.12
2015	US	22793	405	3334	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.02	0.13
2016	US	22792	397	3377	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2017	US	22785	390	3417	7E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2018	US	22774	383	3452	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.86	0.01	0.13
2019	US	22761	377	3485	8E+12	1E+11	1E+12	0.84	0.88	1.36	1.32	0.05	0.03	0.85	0.01	0.13
2020	US	22658	363	1382	8E+12	1E+11	5E+11	0.74	0.86	17.32	1.31	0.05	0.01	0.93	0.01	0.06
2021	US	23195	343	1634	8E+12	1E+11	6E+11	0.82	0.96	0.33	1.34	0.04	0.01	0.92	0.01	0.06
2022	US	23218	313	1896	8E+12	1E+11	6E+11	0.87	1.01	0.31	1.34	0.04	0.02	0.91	0.01	0.07
2023	US	23231	286	2175	8E+12	1E+11	7E+11	0.87	1.01	0.30	1.34	0.04	0.02	0.90	0.01	0.08
2024	US	23240	264	2465	8E+12	9E+10	9E+11	0.87	1.01	0.30	1.34	0.03	0.02	0.89	0.01	0.09
2025	US	23237	245	2762	8E+12	9E+10	1E+12	0.87	1.01	0.30	1.34	0.03	0.03	0.89	0.01	0.11
2026	US	23218	228	3064	8E+12	8E+10	1E+12	0.87	1.02	0.30	1.34	0.03	0.03	0.88	0.01	0.12
2027	US	23199	214	3359	8E+12	8E+10	1E+12	0.87	1.02	0.30	1.34	0.03	0.03	0.87	0.01	0.13
2028	US	23161	202	3485	8E+12	7E+10	1E+12	0.87	1.02	1.12	1.34	0.03	0.03	0.86	0.01	0.13
2029	US	23134	191	3533	8E+12	7E+10	1E+12	0.87	1.02	1.48	1.34	0.02	0.03	0.86	0.01	0.13
2030	US	23134	182	3582	8E+12	7E+10	1E+12	0.87	1.02	1.48	1.34	0.02	0.03	0.86	0.01	0.13
2031	US	23157	174	3629	8E+12	6E+10	1E+12	0.87	1.02	1.48	1.34	0.02	0.03	0.86	0.01	0.13
2032	US	23197	167	3675	8E+12	6E+10	1E+12	0.87	1.02	1.48	1.34	0.02	0.03	0.86	0.01	0.14
2033	US	23252	162	3720	9E+12	6E+10	1E+12	0.87	1.02	1.48	1.35	0.02	0.03	0.86	0.01	0.14

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2034	US	23273	156	3760	9E+12	6E+10	1E+12	0.88	1.02	1.48	1.35	0.02	0.03	0.86	0.01	0.14
2035	US	23273	151	3798	9E+12	6E+10	1E+12	0.88	1.02	1.48	1.35	0.02	0.03	0.85	0.01	0.14
2036	US	23283	146	3836	9E+12	5E+10	1E+12	0.88	1.02	1.48	1.35	0.02	0.03	0.85	0.01	0.14
2037	US	23283	141	3871	9E+12	5E+10	1E+12	0.88	1.03	1.48	1.35	0.02	0.04	0.85	0.01	0.14
2038	US	23283	137	3906	9E+12	5E+10	1E+12	0.89	1.03	1.48	1.35	0.02	0.04	0.85	0.01	0.14
2039	US	23292	133	3941	9E+12	5E+10	2E+12	0.89	1.03	1.48	1.35	0.02	0.04	0.85	0.00	0.14
2040	US	23290	130	3975	9E+12	5E+10	2E+12	0.89	1.03	1.48	1.35	0.02	0.04	0.85	0.00	0.15
2041	US	23291	126	4009	9E+12	5E+10	2E+12	0.89	1.04	1.48	1.35	0.02	0.04	0.85	0.00	0.15
2042	US	23292	123	4043	9E+12	5E+10	2E+12	0.89	1.04	1.48	1.35	0.02	0.04	0.85	0.00	0.15
2043	US	23295	120	4076	9E+12	5E+10	2E+12	0.90	1.04	1.48	1.35	0.02	0.04	0.85	0.00	0.15
2044	US	23298	118	4108	9E+12	5E+10	2E+12	0.90	1.04	1.48	1.35	0.01	0.04	0.85	0.00	0.15
2045	US	23299	115	4139	9E+12	5E+10	2E+12	0.90	1.04	1.48	1.35	0.01	0.04	0.85	0.00	0.15
2046	US	23298	113	4169	9E+12	4E+10	2E+12	0.90	1.05	1.48	1.35	0.01	0.04	0.84	0.00	0.15
2047	US	23294	111	4198	9E+12	4E+10	2E+12	0.90	1.05	1.48	1.35	0.01	0.04	0.84	0.00	0.15
2048	US	23298	109	4227	9E+12	4E+10	2E+12	0.90	1.05	1.48	1.35	0.01	0.04	0.84	0.00	0.15
2049	US	23298	107	4255	9E+12	4E+10	2E+12	0.90	1.05	1.48	1.35	0.01	0.04	0.84	0.00	0.15
2050	US	23299	105	4284	9E+12	4E+10	2E+12	0.91	1.05	1.48	1.35	0.01	0.04	0.84	0.00	0.15
1970	BR															
1971	BR	381	1084	54	4E+10	1E+11	5E+09	0.98	1.05	1.33	0.03	0.14	0.00	0.25	0.71	0.04
1972	BR	464	1131	62	5E+10	1E+11	6E+09	0.98	1.05	1.33	0.04	0.14	0.00	0.28	0.68	0.04
1973	BR	568	1213	76	6E+10	1E+11	8E+09	0.98	1.05	1.33	0.05	0.15	0.00	0.31	0.65	0.04
1974	BR	674	1300	87	7E+10	1E+11	9E+09	0.98	1.05	1.33	0.06	0.16	0.00	0.33	0.63	0.04
1975	BR	776	1387	96	8E+10	1E+11	1E+10	0.98	1.05	1.33	0.06	0.17	0.00	0.34	0.61	0.04
1976	BR	889	1537	102	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.07	0.19	0.00	0.35	0.61	0.04
1977	BR	982	1691	104	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.08	0.21	0.00	0.35	0.61	0.04
1978	BR	1071	1850	111	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.09	0.23	0.00	0.35	0.61	0.04
1979	BR	1193	2009	124	1E+11	2E+11	1E+10	0.98	1.05	1.33	0.10	0.25	0.00	0.36	0.60	0.04
1980	BR	1341	2215	130	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.11	0.28	0.00	0.36	0.60	0.04

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1981	BR	1387	2292	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.29	0.00	0.36	0.60	0.04
1982	BR	1435	2364	143	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.29	0.00	0.36	0.60	0.04
1983	BR	1484	2376	135	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.12	0.30	0.00	0.37	0.59	0.03
1984	BR	1564	2431	136	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.13	0.30	0.00	0.38	0.59	0.03
1985	BR	1674	2535	150	2E+11	3E+11	2E+10	0.98	1.05	1.33	0.14	0.32	0.00	0.38	0.58	0.03
1986	BR	1731	2567	185	2E+11	4E+11	3E+10	0.98	1.05	1.33	0.14	0.32	0.00	0.39	0.57	0.04
1987	BR	1799	2696	179	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.34	0.00	0.38	0.58	0.04
1988	BR	1806	2794	186	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.35	0.00	0.38	0.58	0.04
1989	BR	1820	2885	212	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.36	0.00	0.37	0.59	0.04
1990	BR	1805	2876	206	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.36	0.00	0.37	0.59	0.04
1991	BR	1764	2935	200	3E+11	4E+11	3E+10	0.98	1.05	1.33	0.15	0.37	0.00	0.36	0.60	0.04
1992	BR	1706	2969	196	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.14	0.37	0.00	0.35	0.61	0.04
1993	BR	1729	3015	206	3E+11	5E+11	3E+10	0.98	1.05	1.33	0.14	0.38	0.00	0.35	0.61	0.04
1994	BR	1812	3055	226	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.15	0.38	0.00	0.36	0.60	0.04
1995	BR	1918	3098	246	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.16	0.39	0.00	0.36	0.59	0.05
1996	BR	2017	3117	254	3E+11	5E+11	4E+10	0.98	1.05	1.33	0.17	0.39	0.00	0.37	0.58	0.05
1997	BR	2146	3114	271	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.18	0.39	0.00	0.39	0.56	0.05
1998	BR	2234	3085	300	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.19	0.38	0.00	0.40	0.55	0.05
1999	BR	2297	3058	228	4E+11	5E+11	4E+10	0.98	1.05	1.33	0.19	0.38	0.00	0.41	0.55	0.04
2000	BR	2358	3021	281	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.20	0.38	0.00	0.42	0.53	0.05
2001	BR	2420	2994	282	4E+11	5E+11	5E+10	0.98	1.05	1.33	0.20	0.37	0.00	0.42	0.53	0.05
2002	BR	2515	3001	277	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.21	0.37	0.00	0.43	0.52	0.05
2003	BR	2599	3008	259	5E+11	5E+11	5E+10	0.98	1.05	1.33	0.22	0.37	0.00	0.44	0.51	0.04
2004	BR	2724	3057	266	5E+11	6E+11	5E+10	0.98	1.05	1.33	0.23	0.38	0.00	0.45	0.51	0.04
2005	BR	2825	3051	318	5E+11	6E+11	6E+10	0.98	1.05	1.33	0.23	0.38	0.00	0.46	0.49	0.05
2006	BR	2974	3113	307	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.25	0.39	0.00	0.47	0.49	0.05
2007	BR	3167	3227	318	6E+11	6E+11	6E+10	0.98	1.05	1.33	0.26	0.40	0.00	0.47	0.48	0.05
2008	BR	3380	3342	352	7E+11	6E+11	7E+10	0.98	1.05	1.33	0.28	0.42	0.00	0.48	0.47	0.05

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2009	BR	3554	3376	389	7E+11	7E+11	8E+10	0.98	1.05	1.33	0.30	0.42	0.00	0.49	0.46	0.05
2010	BR	3843	3509	468	8E+11	7E+11	9E+10	0.98	1.05	1.33	0.32	0.44	0.01	0.49	0.45	0.06
2011	BR	4052	3598	498	8E+11	7E+11	1E+11	0.98	1.05	1.33	0.34	0.45	0.01	0.50	0.44	0.06
2012	BR	4238	3672	524	9E+11	7E+11	1E+11	0.98	1.05	1.33	0.35	0.46	0.01	0.50	0.44	0.06
2013	BR	4401	3733	547	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.37	0.46	0.01	0.51	0.43	0.06
2014	BR	4541	3782	568	9E+11	8E+11	1E+11	0.98	1.05	1.33	0.38	0.47	0.01	0.51	0.43	0.06
2015	BR	4659	3820	586	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.39	0.48	0.01	0.51	0.42	0.06
2016	BR	4748	3843	600	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.39	0.48	0.01	0.52	0.42	0.07
2017	BR	4814	3854	612	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.40	0.48	0.01	0.52	0.42	0.07
2018	BR	4858	3855	621	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.40	0.48	0.01	0.52	0.41	0.07
2019	BR	4882	3848	627	1E+12	8E+11	1E+11	0.98	1.05	1.33	0.41	0.48	0.01	0.52	0.41	0.07
2020	BR	4852	3804	236	1E+12	8E+11	5E+10	0.98	1.05	42.16	0.40	0.47	0.00	0.55	0.43	0.03
2021	BR	5022	3849	277	1E+12	8E+11	6E+10	0.98	1.05	0.30	0.42	0.48	0.00	0.55	0.42	0.03
2022	BR	5211	3908	322	1E+12	9E+11	7E+10	0.98	1.05	0.30	0.43	0.49	0.00	0.55	0.41	0.03
2023	BR	5418	3981	368	1E+12	9E+11	8E+10	0.98	1.05	0.30	0.45	0.50	0.00	0.55	0.41	0.04
2024	BR	5643	4066	417	1E+12	9E+11	9E+10	0.98	1.05	0.30	0.47	0.51	0.01	0.56	0.40	0.04
2025	BR	5884	4161	468	1E+12	9E+11	1E+11	0.98	1.05	0.30	0.49	0.52	0.01	0.56	0.40	0.04
2026	BR	6061	4263	521	1E+12	1E+12	1E+11	0.98	1.05	0.30	0.50	0.53	0.01	0.56	0.39	0.05
2027	BR	6256	4374	574	1E+12	1E+12	1E+11	0.98	1.05	0.30	0.52	0.54	0.01	0.56	0.39	0.05
2028	BR	6450	4471	627	1E+12	1E+12	1E+11	1.00	1.07	0.42	0.54	0.56	0.01	0.56	0.39	0.05
2029	BR	6516	4424	648	2E+12	1E+12	1E+11	1.12	1.20	2.36	0.54	0.55	0.01	0.56	0.38	0.06
2030	BR	6585	4375	674	2E+12	1E+12	2E+11	1.14	1.22	2.14	0.55	0.54	0.01	0.57	0.38	0.06
2031	BR	6659	4324	700	2E+12	1E+12	2E+11	1.16	1.25	2.14	0.55	0.54	0.01	0.57	0.37	0.06
2032	BR	6735	4272	728	2E+12	1E+12	2E+11	1.19	1.27	2.14	0.56	0.53	0.01	0.57	0.36	0.06
2033	BR	6811	4217	756	2E+12	1E+12	2E+11	1.21	1.29	2.14	0.57	0.53	0.01	0.58	0.36	0.06
2034	BR	6890	4163	784	2E+12	1E+12	2E+11	1.23	1.31	2.13	0.57	0.52	0.01	0.58	0.35	0.07
2035	BR	6968	4108	814	2E+12	1E+12	2E+11	1.25	1.34	2.13	0.58	0.51	0.01	0.59	0.35	0.07
2036	BR	7045	4051	844	2E+12	1E+12	2E+11	1.27	1.36	2.13	0.58	0.50	0.01	0.59	0.34	0.07

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2037	BR	7126	3996	874	2E+12	1E+12	2E+11	1.29	1.38	2.13	0.59	0.50	0.01	0.59	0.33	0.07
2038	BR	7203	3940	905	2E+12	1E+12	2E+11	1.31	1.40	2.13	0.60	0.49	0.01	0.60	0.33	0.08
2039	BR	7283	3886	937	2E+12	9E+11	2E+11	1.33	1.42	2.13	0.60	0.48	0.01	0.60	0.32	0.08
2040	BR	7359	3830	969	2E+12	9E+11	2E+11	1.35	1.44	2.13	0.61	0.48	0.01	0.61	0.32	0.08
2041	BR	7437	3774	1002	2E+12	9E+11	2E+11	1.37	1.47	2.13	0.62	0.47	0.01	0.61	0.31	0.08
2042	BR	7517	3720	1036	2E+12	9E+11	3E+11	1.39	1.49	2.13	0.62	0.46	0.01	0.61	0.30	0.08
2043	BR	7595	3664	1071	2E+12	9E+11	3E+11	1.41	1.51	2.13	0.63	0.46	0.01	0.62	0.30	0.09
2044	BR	7671	3609	1106	2E+12	9E+11	3E+11	1.43	1.53	2.13	0.64	0.45	0.01	0.62	0.29	0.09
2045	BR	7746	3554	1143	2E+12	9E+11	3E+11	1.45	1.55	2.13	0.64	0.44	0.01	0.62	0.29	0.09
2046	BR	7824	3499	1181	2E+12	9E+11	3E+11	1.47	1.58	2.13	0.65	0.44	0.01	0.63	0.28	0.09
2047	BR	7901	3444	1220	2E+12	9E+11	3E+11	1.49	1.60	2.13	0.66	0.43	0.01	0.63	0.27	0.10
2048	BR	7976	3389	1259	2E+12	8E+11	3E+11	1.51	1.62	2.13	0.66	0.42	0.02	0.63	0.27	0.10
2049	BR	8052	3336	1300	2E+12	8E+11	3E+11	1.53	1.64	2.12	0.67	0.42	0.02	0.63	0.26	0.10
2050	BR	8126	3283	1342	2E+12	8E+11	3E+11	1.55	1.66	2.13	0.67	0.41	0.02	0.64	0.26	0.11
1960	JP															
1961	JP	1854	3253	244	2E+11	3E+11	2E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.61	0.05
1962	JP	1910	3284	268	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.60	0.05
1963	JP	1966	3316	291	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.15	0.36	0.00	0.35	0.59	0.05
1964	JP	2026	3356	315	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.16	0.37	0.00	0.36	0.59	0.06
1965	JP	2071	3375	336	2E+11	3E+11	3E+10	0.70	0.77	1.11	0.16	0.37	0.00	0.36	0.58	0.06
1966	JP	2128	3414	359	2E+11	3E+11	4E+10	0.70	0.77	1.11	0.17	0.37	0.00	0.36	0.58	0.06
1967	JP	2185	3454	381	2E+11	3E+11	4E+10	0.70	0.77	1.11	0.17	0.38	0.00	0.36	0.57	0.06
1968	JP	2241	3493	403	2E+11	4E+11	4E+10	0.70	0.77	1.11	0.18	0.38	0.00	0.37	0.57	0.07
1969	JP	2291	3523	423	2E+11	4E+11	4E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1970	JP	2331	3540	442	2E+11	4E+11	5E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1971	JP	2358	3538	457	2E+11	4E+11	5E+10	0.70	0.77	1.11	0.18	0.39	0.00	0.37	0.56	0.07
1972	JP	2406	3569	477	3E+11	4E+11	5E+10	0.70	0.77	1.11	0.19	0.39	0.00	0.37	0.55	0.07
1973	JP	2460	3610	497	3E+11	4E+11	5E+10	0.70	0.77	1.11	0.19	0.40	0.01	0.37	0.55	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
1974	JP	2497	3627	514	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.40	0.01	0.38	0.55	0.08
1975	JP	2552	3670	534	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.40	0.01	0.38	0.54	0.08
1976	JP	2612	3722	555	3E+11	4E+11	6E+10	0.70	0.77	1.11	0.20	0.41	0.01	0.38	0.54	0.08
1977	JP	2678	3782	578	3E+11	4E+11	7E+10	0.70	0.77	1.11	0.21	0.41	0.01	0.38	0.54	0.08
1978	JP	2750	3849	602	3E+11	4E+11	7E+10	0.70	0.77	1.11	0.22	0.42	0.01	0.38	0.53	0.08
1979	JP	2832	3931	628	3E+11	5E+11	7E+10	0.70	0.77	1.11	0.22	0.43	0.01	0.38	0.53	0.08
1980	JP	2902	3997	651	3E+11	5E+11	8E+10	0.70	0.77	1.11	0.23	0.44	0.01	0.38	0.53	0.09
1981	JP	3026	4008	682	4E+11	5E+11	8E+10	0.70	0.77	1.11	0.24	0.44	0.01	0.39	0.52	0.09
1982	JP	3148	4015	713	4E+11	5E+11	8E+10	0.70	0.77	1.11	0.25	0.44	0.01	0.40	0.51	0.09
1983	JP	3265	4017	743	4E+11	5E+11	9E+10	0.70	0.77	1.11	0.26	0.44	0.01	0.41	0.50	0.09
1984	JP	3388	4023	774	4E+11	5E+11	9E+10	0.70	0.77	1.11	0.27	0.44	0.01	0.41	0.49	0.09
1985	JP	3518	4038	806	4E+11	5E+11	1E+11	0.70	0.77	1.11	0.28	0.44	0.01	0.42	0.48	0.10
1986	JP	3701	3973	834	4E+11	5E+11	1E+11	0.70	0.77	1.11	0.29	0.44	0.01	0.43	0.47	0.10
1987	JP	3881	3927	862	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.30	0.43	0.01	0.45	0.45	0.10
1988	JP	4067	3902	893	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.32	0.43	0.01	0.46	0.44	0.10
1989	JP	4234	3872	920	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.33	0.42	0.01	0.47	0.43	0.10
1990	JP	4395	3848	946	5E+11	5E+11	1E+11	0.70	0.77	1.11	0.34	0.42	0.01	0.48	0.42	0.10
1991	JP	4519	3835	962	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.35	0.42	0.01	0.49	0.41	0.10
1992	JP	4629	3812	975	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.36	0.42	0.01	0.49	0.40	0.10
1993	JP	4736	3787	987	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.37	0.42	0.01	0.50	0.40	0.10
1994	JP	4845	3765	1000	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.38	0.41	0.01	0.50	0.39	0.10
1995	JP	4960	3749	1014	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.39	0.41	0.01	0.51	0.39	0.10
1996	JP	5085	3718	1039	6E+11	5E+11	1E+11	0.70	0.77	1.11	0.40	0.41	0.01	0.52	0.38	0.11
1997	JP	5201	3680	1062	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.41	0.40	0.01	0.52	0.37	0.11
1998	JP	5300	3631	1081	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.41	0.40	0.01	0.53	0.36	0.11
1999	JP	5416	3593	1104	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.42	0.39	0.01	0.54	0.36	0.11
2000	JP	5548	3566	1130	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.43	0.39	0.01	0.54	0.35	0.11
2001	JP	5581	3601	1153	7E+11	5E+11	1E+11	0.70	0.77	1.11	0.44	0.39	0.01	0.54	0.35	0.11

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2002	JP	5618	3637	1177	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.40	0.01	0.54	0.35	0.11
2003	JP	5656	3675	1201	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.40	0.01	0.54	0.35	0.11
2004	JP	5699	3716	1227	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.54	0.35	0.12
2005	JP	5730	3750	1250	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.53	0.35	0.12
2006	JP	5704	3762	1238	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.41	0.01	0.53	0.35	0.12
2007	JP	5680	3774	1226	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.35	0.11
2008	JP	5625	3766	1207	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.36	0.11
2009	JP	5564	3754	1187	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.41	0.01	0.53	0.36	0.11
2010	JP	5573	3789	1182	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.42	0.01	0.53	0.36	0.11
2011	JP	5638	3805	1195	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.44	0.42	0.01	0.53	0.36	0.11
2012	JP	5700	3818	1207	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.36	0.11
2013	JP	5757	3830	1218	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.35	0.11
2014	JP	5810	3840	1228	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.45	0.42	0.01	0.53	0.35	0.11
2015	JP	5860	3849	1238	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2016	JP	5894	3849	1244	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2017	JP	5925	3850	1249	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.46	0.42	0.01	0.54	0.35	0.11
2018	JP	5955	3850	1255	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2019	JP	5983	3850	1260	7E+11	5E+11	2E+11	0.70	0.77	1.11	0.47	0.42	0.01	0.54	0.35	0.11
2020	JP	5971	3871	596	7E+11	5E+11	7E+10	0.10	0.17	129.54	0.47	0.42	0.01	0.57	0.37	0.06
2021	JP	6007	3876	633	7E+11	5E+11	8E+10	0.70	0.77	0.30	0.47	0.42	0.01	0.57	0.37	0.06
2022	JP	6041	3879	671	7E+11	5E+11	8E+10	0.70	0.77	0.30	0.47	0.43	0.01	0.57	0.37	0.06
2023	JP	6073	3883	707	7E+11	5E+11	9E+10	0.70	0.77	0.30	0.48	0.43	0.01	0.57	0.36	0.07
2024	JP	6103	3886	743	7E+11	5E+11	9E+10	0.70	0.77	0.30	0.48	0.43	0.01	0.57	0.36	0.07
2025	JP	6131	3888	778	7E+11	5E+11	9E+10	0.70	0.77	0.30	0.48	0.43	0.01	0.57	0.36	0.07
2026	JP	6157	3889	812	7E+11	5E+11	1E+11	0.70	0.77	0.30	0.48	0.43	0.01	0.57	0.36	0.07
2027	JP	6181	3890	845	7E+11	5E+11	1E+11	0.70	0.77	0.30	0.48	0.43	0.01	0.57	0.36	0.08
2028	JP	6203	3890	876	7E+11	5E+11	1E+11	0.70	0.77	0.30	0.49	0.43	0.01	0.57	0.35	0.08
2029	JP	6223	3889	906	7E+11	5E+11	1E+11	0.70	0.77	0.30	0.49	0.43	0.01	0.56	0.35	0.08

year	Region	pc pkt LDV	pc pkt PUB	pc pkt AIR	PKT LDV	PKT PUB	PKT AIR	VOT LDV	VOT PUB	VOT AIR	TT LDV	TT PUB	TT AIR	Share LDV	Share PUB	Share AIR
2030	JP	6242	3888	934	7E+11	5E+11	1E+11	0.70	0.77	0.30	0.49	0.43	0.01	0.56	0.35	0.08
2031	JP	6260	3887	962	7E+11	5E+11	1E+11	0.70	0.77	0.30	0.49	0.43	0.01	0.56	0.35	0.09
2032	JP	6277	3886	988	7E+11	5E+11	1E+11	0.70	0.77	0.30	0.49	0.43	0.01	0.56	0.35	0.09
2033	JP	6292	3883	1013	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.49	0.43	0.01	0.56	0.35	0.09
2034	JP	6305	3881	1037	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.49	0.43	0.01	0.56	0.35	0.09
2035	JP	6317	3877	1059	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.49	0.42	0.01	0.56	0.34	0.09
2036	JP	6327	3873	1080	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.10
2037	JP	6335	3869	1099	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.10
2038	JP	6343	3864	1118	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.10
2039	JP	6349	3859	1135	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.10
2040	JP	6355	3854	1151	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.10
2041	JP	6361	3849	1166	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.10
2042	JP	6366	3844	1180	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.10
2043	JP	6370	3838	1194	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.10
2044	JP	6373	3832	1206	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.11
2045	JP	6375	3826	1217	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.34	0.11
2046	JP	6375	3819	1227	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.33	0.11
2047	JP	6374	3811	1236	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.33	0.11
2048	JP	6373	3803	1244	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.33	0.11
2049	JP	6371	3796	1252	7E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.33	0.11
2050	JP	6368	3787	1259	6E+11	4E+11	1E+11	0.70	0.77	0.30	0.50	0.42	0.01	0.56	0.33	0.11