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Elasticity of Demand for Transport Services and Price Discrimination

Introduction

It should be noted that a monopolist charges:

- Same price for all units.
- Same price to all customers.

Changing one or both of these is called price discrimination. In which, a firm with monopoly power has some control over output price. It is able to increase profits by discriminating among consumers. A firm desires to sell additional output without lowering price on units it is currently selling by separating market into two or more segments. Price Discrimination has the following characteristics:

- It is a pricing strategy that charges customers different prices for the same product or service.
- If a firm is able to sell identical units of output at different prices.
- It is feasible depends on the inability of buyers to practice arbitrage.
- It becomes possible if resale is costly
- All the monopolist needs to know in this case is the price elasticity of demand for each market.
- the monopoly can separate its buyers into a few identifiable markets (Market Separation).
- It requires the monopolist to know the demand function for each potential buyer

Note

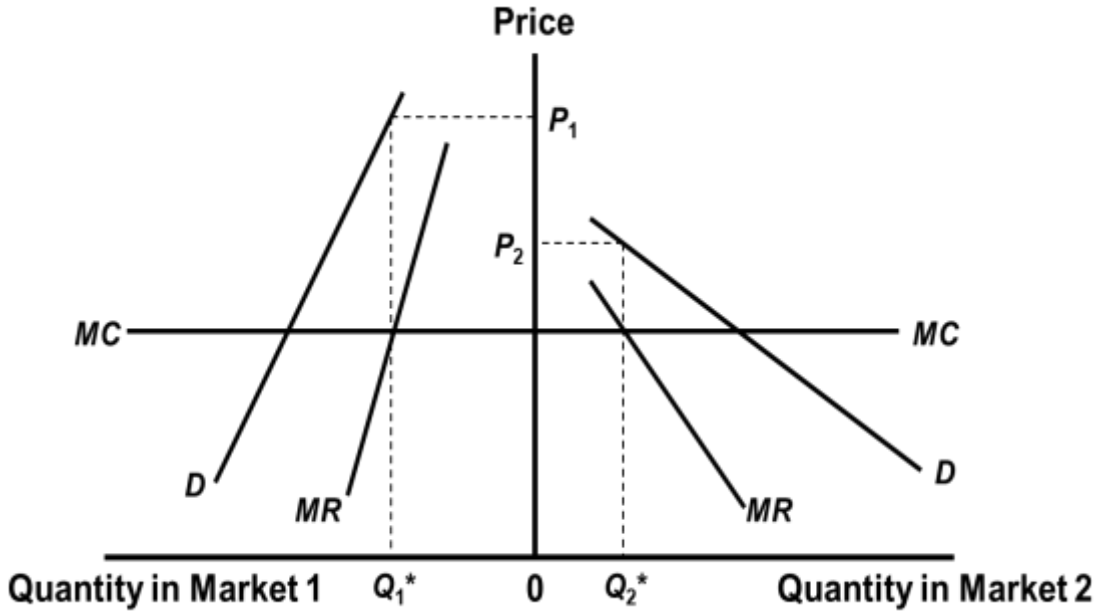
Transport analysts need to recognize that in markets where price discrimination is possible aggregate data will not allow for accurate predictions of demand responses in the relevant market segments.

Conditions for Price Discrimination:

- If elasticities associated with market segments are the same
- No incentive on part of a firm to price discriminate
- Two necessary conditions for price discrimination are
- Ability to segment market (no arbitrage)
- Existence of different demand elasticities

Consequences of Market Separation:

- If two markets are separate, a monopolist can maximize profits by selling its product at different prices in the two markets.
- If the marginal cost is the same in all markets, the profit-maximizing price will be higher in markets where demand is less elastic.



A firm may price discriminate across any category of consumers based on various criteria:

- Income level,
- Type of business,
- Quantity purchased,
- Geographic location,
- Time of day,
- Brand name,
- Age

Types of Price Discrimination

✓ <u>First-degree price discrimination:</u>
- Different prices for both consumers and units (both A and B are changed)
- It includes pricing strategies such as two-part tariffs[1]

✓ <u>Second-degree price discrimination:</u>
- Different prices for different units (A changed).
- It result in potential social benefits.

<u>Third-degree price discrimination:</u>

- Different prices to different consumers (B changed).
- It segments the market for instance, into a foreign and a domestic market

[1] In two-part tariffs, pricing decision is setting the entry fee (T) and the usage fee (P)

Characteristics of First-, Second-, and Third-Degree Price Discrimination

Characteristic	Degree		
	First	Second	Third
Output is sold for the maximum price each consumer is willing to pay (e.g., high-pressure sales, new-product pricing).	x		
Price differs across the commodity unit not a cross consumers (e.g., cell phone minutes and cereal packaging).		x	
Price differs across consumers not across commodity unit (e.g., happy hours, senior discounts, and campus parking).			x

Environmental Assessment Policy (The EAP): Environmental Screening and Transportation Projects

Introduction

Transportation projects involve both environmental and economic issues facing a community as it grows and changes. Considerations of sustainability and its three pillars[2] require tools that facilitate long-term impact analysis and easy communication among built-environment professionals. Environmental impact assessment (EIA) is instrumental for studying transportation project impacts on sustainability. Assuming that the Egyptian government wants to propose a developmental project belonging to the transportation services[3], in this case; it is important to consider the economic as well as environmental consequences of such project.

What is an EIA?

EIA is the process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of development proposals prior to major commitments being made. Through this process, information about environmental effects, including any harmful effects on humans and the biophysical environment, of a project are collected, assessed and taken into account.

EIA process generally begins with screening at the time of project identification. The screening process helps the study investigator determine if a project has a negative or positive significant environmental impact and the eligibility for applying the project. Thus,

[2] The three pillars of sustainability are economic, social, and environmental pillars. If any one pillar is weak then the system as a whole is unsustainable.

[3] Examples: Egypt Vehicle Scrapping and Recycling Program, Cairo Airport Development Project, and Railways Restructuring Project

it is important to decide if project requires an EIA with or without consultation with the Local Planning Authority.

What are objectives of EIA?

The role of EIA is to identify environmental limits and constraints on the project, not just its impacts on the environment; to ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process; to anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of development proposals; to protect the productivity and capacity of natural systems and the ecological processes which maintain their functions; to promote development that generates less destruction and optimizes resource use and management opportunities.

Classification of Projects

It is important to determine the level of EA for any given transport project. The transport project could be classified into one of three categories prior to issuance of the Project Concept Document[4]. The grading scheme is based on Environmental grading system, as follows:

Category	EA Requirements
Category A	A full EA is needed
Category B	EA is required (but its scope corresponds to the limited environmental impacts of the project)
Category C	No EA is required.

It should be noted that: category (A) and category (B) projects are those projects with high and medium potential environmental impacts. They are called black listed projects. The selection of the category should be based on: professional judgment and information available at the time of project identification.

Factors that influence the time required to plan and evaluate a transportation project that complies with national regulations.

Several factors influence the time required to plan and evaluate a transportation project that complies with the regulations. These factors can be internal to the transportation agency responsible for project development, or external to its control.

[4] In the Project Concept Document, it is important to present the problem of the transport project; describe the project objectives; describe all parties that will benefit from the project; discuss the project results, or what is expected to be accomplished throughout the project; describe the type of activities that are planned within the project; state the amount of funding requested from the grants programme.

Internal factors might include the following: Lack of adequate project leadership or available personnel, or both, to efficiently perform the necessary environmental and engineering studies; Staff turnover on long-term projects; Timing and availability of adequate funding, Timeliness of the agency's decision-making process, and Lines of communication.

The external factors might include Lack of cooperating and regulatory agency staffing resources; Sequential regulatory reviews; Amount of project detail required for regulatory review; Level of project controversy; Lack of comprehensive land-use planning; Organized opposition, including litigation; and Regulatory agency consent to the amount and methods of environmental mitigation.

Case study of EIA

- **Transport Project Title**:
  Egypt Vehicle Scrapping and Recycling Program
- **Background:**

The Government of Egypt has started a large program to replace old taxis. To prevent the conversion of these old taxis into private use, which is outside the jurisdiction of the law, the Ministry of Finance has formulated an incentive based program to provide flexible terms for taxi vehicle owners. This program will enable taxi drivers to purchase new low emitting vehicles in exchange for trading in their old vehicles for scrapping and recycling.

- **Project Goal and Objectives:**

The Egyptian mass transport fleet is aging. One of the objectives of the Egypt Vehicle Scrapping and Recycling Program is to reduce greenhouse gas (GHG) emissions and air pollution associated with the aging taxi fleet in the Greater Cairo Region (GCR). Thus, the purpose of the project is to scrap and recycle old vehicles in Egypt. This is because the average taxi in Egypt had until recently been on the road for 32 years. Aging fleets are prone to frequent breakdowns and high emissions because older vehicles are typically not equipped with modern catalytic converters. The Egypt Vehicle Scrapping and Recycling Program of Activities (PoA) is part of a national program whereby owners of taxis, buses, microbuses, and trailer trucks voluntarily surrender their vehicles for managed scrapping and recycling in exchange for financial incentives that may be used toward the purchase of new vehicles. The scrapping and recycling program is currently limited to taxi vehicles in the Greater Cairo Region, but may expand to other regions and vehicle types.

- **Assessment of current situation**

It is estimated that by the end of 2009, the Egyptian transportation sector will have been responsible for more than 40 million metric tons of global greenhouse gas emissions, most of which will have been emitted by road-based vehicles. About 40 percent of national transport emissions, or 14 million tons CO2e, may be attributed to the Greater Cairo Region (GCR) alone, where nearly half of all motorized vehicles in Egypt operate. The rapidly

growing population in the Greater Cairo Region (GCR) --16 million in 2006 to 27 million by 2027 – is expected to exacerbate conditions unless significant interventions are made in transport infrastructure and/or technology.

- **Type of Lending Instruments**

Specific Investment loan.

- **Compliance with Egypt CAS**

The program is fully consistent with the World Bank CAS objective of expanded supply and improved efficiency of infrastructure services (CAS Outcome 2.2).

- **Environmental Category and Assessment**

The equivalent of over 130,000 tons of carbon dioxide could be avoided. A total of 40,689 new taxi vehicles have replaced aging taxis in Cairo alone, some of which were over 50 years old. In addition, the new taxi fleet reduces emissions of other airborne pollutants (e.g., carbon monoxide, nitrogen oxides) and contributes to increased traffic safety across Egypt.

- **Summary of the project**

Status	Active
Approval Date	2010
Closing Date	2021
Financier	World Bank and non-bank sources including Global Environment Facility (Gef) and Japan Bank for International Cooperation (Jbic)
Lending Instrument	Specific Investment Loan
Grant Amount	8.32
Environmental Category	B
Total Project Cost	US$ 8.32 million
Borrower	GOVT. OF EGYPT
Implementing Agency	Ministry of Finance
Product Line	Developmental Project
IBRD Commitment	N/A
IDA Commitment	N/A

The Ownership of Transportation Networks

Introduction

To explain the patterns of public and private ownership of transportation networks, one would need to take a longer view of the development of transportation systems. Over time, economists have paid attention to the phenomenon of regulation, among the most important voices counting the founder of modern economics, Adam Smith. In his book "Wealth of Nations" he looked at the problems of regulation in terms of merchant privileges sought but with an emphasis on the factors of impoverishment of the public. Concepts such as market failure, government failure, deregulation, re-regulation, and privatization are often used when talking to the public service sector, in general, and transport sector, in particular. In practice, both market failure and government failure have influenced the nature of ownership arrangements in the provision of transportation.

Market Failure

Public ownership of transportation networks has been more prevalent in certain locations and at certain times during history. A common rationale in more modern times given in support of the public ownership of transportation facilities has been that of market failure. Though the formal concept of market failure is a relatively recent phenomenon, dating to developments in welfare economics during the early 20th century, earlier forms of it were used to justify public ownership of certain transportation facilities around the world.

By market failure, we mean any situation where the individual incentives for rational behavior do not lead to rational outcomes for the group. Thus, each individual makes the correct decision for him/herself, but those prove to be the wrong decisions for the group. Thus, private firms might undersupply a public good if there is not sufficient motivation (i.e. profit) for them to do so. In this situation, the allocation of goods and services is not efficient. That is, there exists another conceivable outcome where at least one individual may be made better-off without making someone else worse-off (no Pareto efficiency).

A secondary justification was that transportation facilities such as roads would facilitate trade and interstate commerce. This is a type of positive externality argument. While it might have been possible for some such roads to be financed and built privately, there was concern that the desired network would not develop quickly enough, with lower-priority roads linking parts of the rural hinterland to established urban centers significantly lagging the completion of other segments, and thus leaving rural areas with poor lines of communication.

Other types of market failure arguments may also apply, as some road and rail networks may exhibit economies of scale, leading to more efficient provision by fewer firms with high levels of output. In an extreme case, strong economies of scale may indicate the presence of a natural monopoly, where it becomes more efficient for a single provider to produce a good.

Transportation markets have many government failures. These include: First, poor service quality in government owned railway and port operations, and poor maintenance of road network; Second, ineffective regulation of privately managed trucks and buses, which includes: underpricing of truck and bus fares; low capacity (small) truck and buses– congestions and overloading congestions; poor logistic operations; Unable to control externalities: safety and pollution major problems; axle load control pollution major problems.

Government Failure

While the existence of market failures may provide a rationale for public ownership of transportation networks under certain circumstances, there is also a countervailing argument that cautions against public ownership as a response to instances of market failure.

The public-sector analogy to market failure is known as government failure, and refers to situations where government intervention causes a more inefficient allocation of resources than would occur in the absence of the intervention. There are many types of government failure, but the ones most relevant in the context of transportation policy tend to be legislative in nature. They include issues of logrolling, pork barrel spending and rent-seeking.

Logrolling

Logrolling is a term applied to political allocation processes to describe the act of vote-trading among members of a political body. Logrolling occurs when each of two people agree to vote for the other's project to ensure that both are passed. Logrolling may generate an inefficient allocation of resources.

An example is the maintenance of local roads by a group of rural farmers. The vote trading among the participants allows for agreements that ensure the maintenance of all roads. However, the cost of this bargaining is shown to be an aggregate overinvestment of resources, since each farmer must pay for the maintenance of all other local roads in order to ensure the maintenance of the road that serves his property.

Pork barrel spending

Pork barrel spending is one of common forms of government failure in both developed and developing countries in the context of transportation policy. The term refers to the process of elected officials securing spending on projects or programs for the primary benefit of members of their home district. It represents the intersection of money and politics.

In this practice, government appropriations are directed to specific projects, often without any form of evaluation to determine the project's social desirability, to bring more money to a specific representative's district. Thus, it can be considered as a wasteful government spending.

For example, pork barrel spending has influenced the design of federal highway and public transit programs in USA, both of which are structured to spread benefits as widely as possible across congressional districts in order to ensure local support.

Rent-seeking

Rent-seeking means the manipulation of the economic environment by private individuals or groups in order to extract economic rents. Rent seekers are individuals or organizations that have succeeded with existing business models and look to the government and regulators as their first line of defense against innovative competition.

Thus, Governments are considered a primary target of rent-seekers, since government officials may offer special privileges in the form of budget allocations or regulatory treatment, and are susceptible to interest group lobbying. Rent-seeking can hinder efficient allocation of resources in transport sector, since rent seekers spend money to increase their share of an existing market instead of creating new products or markets. The key idea is that rent seeking behavior creates nothing of value.

Examples of rent-seeking practices include bribery of government officials, corruption and regulatory capture, executing projects that have no value to the economy, and regulations that prevent innovation from reaching the consumer.

Deregulation

Deregulation is the process of removing or reducing state regulations, typically in the economic sphere. It became common in advanced industrial economies in the 1970s and 1980s, as a result of new trends in economic thinking about the inefficiencies of government regulation, and the risk that regulatory agencies would be controlled by the regulated industry to its benefit, and thereby hurt consumers and the wider economy.

The main pros for deregulation were: increasing competitiveness, a higher productivity, more efficiency and lower prices overall.

On the other hand, the main arguments against deregulation were: apprehension regarding environmental pollution, environmental quality standards and financial uncertainty or constraining monopolies.

Re-regulation

Re-regulation concerns with regulatory reforms that aims at improving the quality of government regulations that raise unnecessary obstacles to competition, innovation and growth, while ensuring that regulations efficiently serve important social objectives.

Case Study

Case study: Towards reforming the regulatory and policy environment of the microbus (shared-Taxi) system in the Greater Cairo Metropolitan Area

Over the last 2 decades the shared taxi, or microbus, has become the most important mode of transportation in the Greater Cairo, one of the world's most congested cities. In a city with a largely ineffective public transit system, microbuses have become the city's lifeline, meeting the demand for low cost, fast and timely transport. Incredibly, their

development and operation has been mostly unplanned, informal and illegal, causing many to question their place in future plans to revamp the city poor transport system. Since February 1999 no new microbus licenses have been issued. In 2006, there were 20,000 licensed microbuses in the Greater Cairo region but more than 80,000 were believed to be operating. while the importance of the microbus(shared-taxi) as the major mode of transport in a city with such enormous traffic problems cannot be doubtful, the government has mostly failed when it comes to applying any form of management or control over this mode. This is possibly due to the fact that microbuses are privately operated and informal. In addition, unlike private taxi cars, most microbus drivers do not have licenses. Microbuses require a route license but, since it does not have to be displayed, enforcement is almost impossible. According to UNDP report in 2010 on the situation of transport in Cairo cites the following as problems regarding the microbus issue:

- They operate in unorganized manner without a comprehensive view or plan;
- The shared-taxi network covers all of Greater Cairo, and competes with, formal bus services. They often run parallel to CTA buses and other public modes, thus taking away passengers from the formal public operator, rather than integrating with these modes;
- They often disrupt traffic by stopping short or slowing at curbs to collect/drop passengers thus causing congestion for other drivers;
- As an example, they commonly cut all the way of traffic stream from the leftmost side of the road to its rightmost side, which increases the potential (exposure) of accidents, to collect/drop passengers;
- Shared-taxi operations tend to be fiercely competitive, as there are few barriers to entry and single-bus ownership is prevalent. As a result of this competitive pressure, drivers often pay little regard to traffic conditions, safety or other vehicles in the competition for passengers.
- Some shared-taxis operate outside of the established regulatory framework and without proper vehicle or driver licensing;
- Their capacity to carry passengers is considerably lower the those of the bigger buses or, in particular, metro thereby contributing to congestion;
- In average, poor technical condition of the vehicles contributing significantly to air pollution and high-energy consumption.

Regulatory options

The government is planning to regulate shared-taxis in terms of vehicle stops, curbside behavior and disruptive driving behavior. The current action of licensing them based on routes without any regulations enforcement.

The most interesting option was the organization into feeder routes and making arrangements with operators based on enforcement of rules and standards, mainly

concerning areas of operations, curbside behavior, vehicle specifications, and labor practices.

A plan would be devised for the route including building new stops for microbuses on the route which would prevent them from using BRT routes and creating congestion at the stops.

Traffic demand options like signaling and proper intersection planning would also be revised for the route. Stops would be monitored regularly to ensure that the operators adhere to these regulations.

Finally, according to the MOT planning team, there are necessary reforms in terms of enforcement, particularly in the traffic authority and the municipalities. The enforcement is sometimes corrupt and the implementation of routes in terms of infrastructure and quality specifications is lacking. They believe that the current Cairo Traffic authority and the governorate and municipality transport authorities are incapable of performing and implementing the necessary traffic demand management on these routes. If the BRT routes are to succeed, or the microbuses are to be integrated willingly, the capacity of these government offices must be developed. Officials in the traffic authority and the municipalities have no training or education about enforcing the traffic laws and there is no accountability for bribes and coercion.

For infrastructural improvements, there should be a central authority planning transport in Cairo to plan and set standards and specifications in this regard.

Privatization

Privatization can be seen as taking state-owned service providers into the private sector. Until the 1990s, most forms of transport infrastructure were owned and operated by public monopolies or were closely supervised by central governments. A widespread shift in thinking about the appropriate role of the state in the marketplace took place in the 1990s. within the transport sector, the main force pushing governments to reduce its intervention was fiscal crisis, which enforced government to cut public expenditures and to turn to private sector for assistance in financing the investments needed to modernize transportation infrastructure and services.

The Regulation and Financing of Transportation Networks

What is regulation of transport services?

Regulation of transport services is broadly defined as imposition of rules by government, backed by the use of penalties that are intended specifically to modify the economic behavior of individuals, who demand for transport services, and private firms that provide transport services. Various regulatory instruments or targets exist, including: prices, output level, rate of return (in the form of profits, margins or commissions), disclosure of information, standards and ownership ceilings are among those frequently used.

Objectives that governments might pursue by way of intervention:

There are many different objectives that governments might pursue by way of intervention in private markets. These objectives fall under a few broad categories that characterize many of the efforts at government regulation. The following are some of the more commonly observed regulatory objectives.

- **Social welfare objectives:** among the most common set of objectives for government regulatory policy is the maximization of social welfare, which focuses on the optimal allocation of resources and how the allocation of these resources affects social prosperity. This can be done through the remediation of various types of market failures. For example, transport operators can gain market power through the creation of monopolies, or other forms of organization that limit the benefits from competitive markets. (For instance, when microbus and minibus drivers in Egypt agree to raise the fares. The previous action requires a government intervention through regulation. Road infrastructure, which implies natural monopoly because of the high fixed costs, requires a government intervention.)

Existence of any form of market failures means allocation does not achieve the best possible outcome, from society's point of view. Economists have identified the following possible cases of market failure:

- **Asymmetric information** (or Inaccurate information): this means one party to a transaction knows more than does the other, which causes inefficient trade transactions. Asymmetric information usually causes problems of adverse selection and moral hazard.
- **Adverse Selection and moral hazard**: adverse selection is a situation where sellers have information that buyers do not, or vice versa, about some aspect of product quality. For example: **(1)** when renting a vehicle, a buyer may know some defects in the vehicle, while consumer doesn't know. **(2)** when driver obtain coverage at lower premiums than the insurance company would charge if it were aware of the actual risk regarding the vehicles' drivers. Moral hazard is a situation in which one party gets involved in a risky activity knowing that it is protected against the risk and the other party will incur the cost. For example: a transport company get insurance

against accidents, it may involve in risky driving behavior. It should be noted that both adverse selection and moral hazard problems are special importance in transportation studies because insurance plays an important role in terms of insuring the following: **(1)** the value of cargo against damage, **(2)** drivers against damage caused by their vehicles, **(3)** and passengers against death in airplane crashes.

- **Property rights infringement:** by property rights, we mean the rights of people and companies to own and use land, capital, etc. and to receive a profit from it. On the other hand, property rights infringement is a market failure that is considered a result of the lack or absence of property rights, which leads to misuse or over-use of resources. Instance of market failures related to such problem is the existence of public goods or common property resources. For example, the misuse of roadways by microbus and minibus drivers that causes a traffic congestion in Egypt. This problem is a result of the fact that no nobody own public roads; and nobody is charged higher rates for using highly trafficked roads or offer discounts for traveling during nonpeak hours.
- **Existence of Natural monopolies:** it exists because the cost of producing the transport services is high if a competition exists. This means, the fixed cost is lower if there is just a single producer than if there are several competing producers. There are natural monopolies in infrastructure provision of transport services, which usually prevent rival firms to build a competitive infrastructure. This is often due to: high fixed costs, economies of scale, and economies of density. For example, natural monopoly in constructing railroads and pipelines; and the production of large aircraft and large container ship. It should be noted that there are strong incentives for natural monopolies to abuse their market position in order to increase profits and to enhance their power. This can be witnessed in a number of natural monopoly's practices: charging prices far above the cost of production; providing lower quality products; and suppressing new technologies. This usually results in pressure from consumers for government re-regulation.
- **Non-enforcement of contract obligations:** Efficient contract enforcement is essential to the development of transport sector, which cannot be achieved without respect for the rule of law and effective protection of rights. This requires a well-functioning judiciary that resolves cases in a reasonable time and is predictable and accessible to the public. Transport sector in economies with a more efficient judiciary, in which courts can effectively enforce contractual obligations, have more developed transport infrastructure and better access to finance required for the sector's growth. Overall, enhancing the efficiency of the judicial system can improve the transport business climate, foster transport innovation, and attract foreign direct investment in the transport sector.
- **Existence of externalities:** regulatory efforts toward externalities often focus on negative externalities. For example, many modes of transportation experience congestion where prices, as means of rationing capacity, are absent. The consumption of energy often leads to emission of pollutants which, when unpriced,

can lead to undesirable outcomes. However, positive types of externalities are also possible. For example, speeding up the growth of the transportation network, so that it serves a large number of users, can lead to increase social welfare.

- **Macro-economic objectives:** A second set of objectives that are pursued primarily by national governments revolve around macroeconomic performance. Macroeconomic objectives include efforts to control prices (fares) and revenues of transport services. For examples: **(1)** an introduction of a charging regime that defines on which type of infrastructure and for which mode the transport charges are introduced. **(2)** An introduction of a charging regime that impose congestion charges for roads in urban areas, charges on interurban roads, and charges for all modes that are oriented at levels that would cover the social marginal cost of each mode. **(3)** Some governments may seek to actively control a revenue allocation generated by the transport operators. Macroeconomic objectives also include efforts to counteract the effects of economic cycles on the growth of transport services. For example, policies oriented to mitigate negative impacts of recessions in the shipping or air lines during international crisis.
- **Socio-economic objectives:** Government may also intervene in order to promote a range of socio-economic objectives. Many of these objectives may be motivated by concerns over fairness, such as efforts to achieve a desired income distribution among transport operators or equal access to transport services; or a desire to provide a basic standard of transport service to all citizens. Other interventions may be designed to promote safety regarding moving people and delivering products. Other socio-economic objectives include industrial policy, where governments intervene to promote transport sector and its contribution in GDP, or even to promote individual mode of transportation or transport operators.

Case Study

Case Study: Government Provision and Regulation of Bus Service in Cairo
It is a common practice among many governments all over the world to regulate the urban transport system. The term regulation here does not refer to an exclusive control from the government over the sector or the impediment of market forces, but rather as an effort to organize the market and to make it work in favor of the citizens. The government of Egypt, driven by its commitment to provide affordable urban transport, plays the role of the service provider of transit bus as well as the market regulator. Through the publicly owned Cairo Transport Authority (CTA), the government attempts to enhance people's mobility. The government supports the CTA through a generous subsidy package that reached above one million Egyptian pounds in 2014. The CTA as an institution struggles to provide a quality service. However, it is heavily burdened by the common bureaucratic problems. From overstaffing problems to the inability to function on a commercial basis, the CTA cannot fulfill the government's promises to provide a quality service. The CTA is not empowered to determine the bus fares which falls within the Prime Minister's

domain of authority. Its staff are public servants who enjoy powerful position that make them immune from being laid off. Hiring new employees requires special complicated administrative procedures preventing the CTA from recruiting a highly qualified caliber who are strongly needed. All these reasons account for a poor quality bus service. A small fleet size and a shortage in drivers reduce the service frequency. A weak incentive system also reduces the drivers' motivation to work more efficiently or enthusiastically. Few buses work on each route increasing the out -off vehicle time and thereby increases passengers' dissatisfaction. In addition, buses are usually overcrowded making the trip a very uncomfortable experience and leading to discouraging potential passengers from using the bus.

With demographic changes and the changing commuting patterns, the supply of public bus service should be diversified in order to meet the growing and changing demand (European Commission) .The old one size fits all approach is no longer appropriate. Commuters' preferences varied considerably according to travel needs and aspirations, all of which are guided in principle by the passengers' willingness to pay.

The findings of this thesis suggest that passengers are willing and they actually pay more than the actual CTA bus fares when commute using other modes of transportation. Although price is important factor for modal choice, they seem to value travel time, reliability, comfort and accessibility more than money and hence they sometimes resort to other options than the CTA bus to arrive to work on time or to save themselves some time. Also, the CTA adopts a one size fits all approach by providing a uniform/standardized type of service that fails to respond to the diversified travel demands of wide range of commuters.

7.1 Policy recommendations

Reforming bus service should be pursued within a larger context of reforming urban transportation system. Urban transportation problem is a very wicked one, in such a way that fragmented actions can hardly bring solutions. It is not about to regulate or deregulate but rather to put a long term strategy developed upon evidence based research and accurate data. In addition, citizen participation and community engagement should be an integral part in any future policy.

1- Downsizing the CTA by reducing the number of employees to decrease the agency's expenditures on salaries and wages and to stabilize its financial balance. In addition to increasing the number of drivers, hiring inspectors to ride on board of buses to make sure that the drivers exert their fullest effort to arrive on time and do not stop randomly at any place is necessary.

2- Instead of subsidizing the CTA as an institution, the government should start thinking about subsidizing the passengers directly to prevent subsidies leakage. The large portion of CTA's expenditures funds its staff wages and salaries. In that scenario, fares should be set on a commercial basis. This will require having a market segmentation strategy to identify different types of current and prospected passengers. Those who are considered poor and cannot afford other modal options will receive subsidies while others will use the CTA bus by paying the actual commercial fare.

3- The CTA fleet should be renewed and upgraded by introducing more environmental friendly buses with lower pollutant emissions. In addition to buses with high comfort levels.

4- Since it is not always feasible nor economic efficient to designate special buses for people with disabilities it is better to make all buses *easy access* buses. There are some facilities that allow the elderly or people with disabilities to ride on board of all buses. These facilities include bus ramps or wheelchair lifts, priority seats in the front of the bus, bus stop announcement system, bus stop pushes, handrails and route number display.

5- Adding real time information about arrival and departure time so as to give the passengers the necessary information for making their decisions as a passenger may be willing to make a quick purchase or s/he may decide to change mode if he is in a hurry. This should also be coupled with a responsive complaints system to reporting excessive bus delays.

6- Since on time arrivals, though very crucial for a commuter decision to take a bus, cannot be guaranteed given the high congestion, the CTA in close consultation with other urban transport stakeholders should give more attention to transferability by connecting modes of urban transportation and establishing more transit centers where a passenger can transfer from one bus to another or from one mode to another (Iseki, Taylor, & Miller, 2006).

7- Since the CTA covers a large geographical area that includes three governorates, a multiple fare system should be introduced rather than the single fare system. The greater Cairo region may be divided into zones with a ticket for each zone.

8- Opening a communication channel with bus riders by introducing riders satisfaction scorecards, questionnaires and surveys. It sends a strong message to the people that the government needs to listen and thereby increases citizens' satisfaction and also it enables the CTA to understand more about the passengers' preferences and needs. So planning the service will be based on what the people actually needs.

9- Using automatic passenger counting system to have accurate figures about the number of passengers getting on and alighting at every stop. Using such data is essential in policy making regarding where to locate bus stops, service frequency, and to take any future decision about route termination or continuation.

The Role of the Public and Private Sector in Transport Infrastructure: PPP Options

Introduction: The Economics of Transport Infrastructure

All over the world, transport investment receives important financial resources. As, modern, efficient, and sound transport networks are considered essential for international competitiveness, as they allow countries to integrate to the global economy. In addition, transport infrastructure development reduces the costs of doing business over distance and improves the capacity of firms to compete in global markets. Transport has a great impact

on poverty alleviation and MDGs. Transport infrastructure investments are characterized by:

- They are "lumpy", this is because they involve significant sunk costs[5] and create assets that are long-lived and location-specific.
- Creation of transport infrastructure has economics both of scale[6] and scope[7]. This implies existence of minimum size of facilities, inelastic adjustment of capacity to demand, and long-term project completion.
- Transport supply systems contain elements of natural monopoly.
- Demand is wide spread and thus difficult to target.
- Revenues are usually in local currency. This probably causing a currency mismatch in case of foreign debt financing.
- Services have an essentiality component that raise legitimate public policy concerns of affordability. This is because transport services have strong characteristics as a public good and creates major positive externalities.
- Transport services face finance constraints. That is, the capital required for infrastructure investments is voluminous and raising it domestically without affecting investments in other key sectors remains a challenge.

The Role of the Private Sector and the Service Delivery Gap

Many governments across the world encounter 'infrastructure financing gaps' due to increasing investment demand for infrastructure with shrinking public finance. Increasing financial liability over time has posed a great challenge on already in-debt governments. filling the public financing gap mainly through borrowing; however, it is not a sustainable choice.

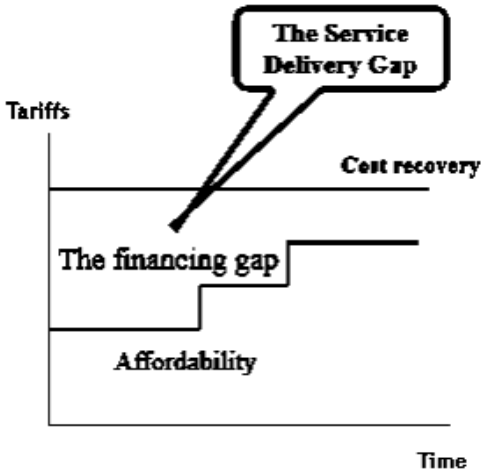
Thus, there is limited affordability in the provision of most of the transport services, particularly when including the costs of the required infrastructure facilities, especially for low income end-users. This can be shown in the following figure:

[5] Sunk costs are fixed costs incurred in the past which cannot be recovered. Expenditures such as planning for a project that is never built or research and development activities are sunk costs, resources spent on them cannot be recovered in the future. This is different from other recoverable fixed costs, such as equipment, buildings and land, as they can be sold, and their value can be partly recovered.

[6] Economies of scale implies that as the size of the transport company gets larger, the average or unit cost gets smaller.

[7] Economies of scope implies that the average total cost of production decreases as a result of increasing the number of different goods produced. For example, (1) the transport operator can be expanded its service line to transport goods and mails; (2) a transport company can provide food during traveling. (3) An obvious example of economies of scope can be seen in railroad transportation. A single train can carry both passengers and freight more cheaply than having separate trains, one for passengers and another for freight.

From a social point of view, the financing gap is a function of the gap between **cost recovery and affordability**.



On the other hand, from a financial point of view, the "financing gap" measures the need of external funds for investment in and operation of transport sector. The financing gap is the amount of money needed to fund the ongoing operations or future development of transport investments that is not currently covered by cash, equity or debt. Financing gaps can be covered by investment from venture capital, equity sales, or through borrowing.

The clue for filling the financing gap is on how to seize constrained national budgets, and attract additional private investment in financing transport infrastructure of high added value. That is, it is important to allow for private sector participation. In this context, it is important to identify the important roles of both public and private sector.

The Role of Public Sector

The public sector is driven by the optimization of **public welfare.** It has an important role in the following:

- Role in the **design**, **development** and **enforcement** of transport sector **policies**. In particular in the definition of cost recovery and affordability issues in the context of financial sustainability of the sector.
- Role in the establishment of **smart regulation** regarding provision of public services)

- Role in the provision of transport services where **externalities** and sector **constraints** do not provide **adequate incentives** for full private sector engagement, e.g., political, regulatory, financial, bureaucratic, technological, as following:

1	• **Political** • Related to actions of governments and political conditions
2	• **Regulatory** • Restrictions regarding safety and quality standards
3	• **Financial** • Credit constraints
4	• **bureaucratic** • Excessively complicated administrative procedure
5	• **Technological** • Barriers to the implementation of recent technologies

Case Study

Case Study: Egypt's Railways
The railways sector in Egypt is managed and operated by Egyptian National Railways (ENR). ENR is an integrated railways company, subordinated to the Minister of Transport. It is responsible for managing the railway infrastructure and operates railway transport services on the entire network.1 The network, 5,085 kilometers long, serves the main activity and population centers in Egypt: about 60 percent is in the Nile Delta (Alexandria, Cairo, Port Saïd, Ismaïlia, and Suez) and along the Nile Valley (up to El Sad Ali, beyond Aswan). In the north-south direction it spans from the Mediterranean Sea to Sadd el Ali, where it connects with the river steamers of Sudan Railways. In the east-west direction it runs from Salûm, at the Libyan border, to Beer Al-Abd on the Sinai peninsula. There is another east-west link from the Red Sea port of Safaga to Abu Tartour. Other lines in the desert provide connections to iron ore and phosphate mines. Overall, the network adequately serves the Egyptian economy: main cities are linked by rail, as are ports and industrial and mining centers.2 No major development of the railway network seems necessary over the medium term. A few short-distance new lines may be required to connect the railway network to the "new suburban towns" (for suburban passenger transport) or to new industrial or port areas (for freight traffic). The 225 kilometer-long new line under construction between El Ferdan and Rafa (at the Gaza strip border) is essentially strategic and likely to generate only limited traffic. ENR operations are significant, with a strong focus on passenger services. Total combined passenger and freight traffic in FY 2004 reached 57 billion traffic units; this exceeds the combined traffic of the railways in Turkey, Iran, Morocco, Algeria, and Tunisia; it amounts to 46 percent of the traffic of French railways and almost equals the

traffic of British railways. ENR is predominantly a passenger railway with passenger traffic constituting more than 90 percent of the traffic volume (against 30 to 42 percent in the above-mentioned countries, 68 percent in Britain, and 59 percent in France); the remaining 10 percent is freight traffic. Such high dependence on passenger traffic is seen elsewhere only in Japan.

ENR's physical productivity is excellent and its technical efficiency good. ENR scores very well in terms of physical productivity (figure 1): infrastructure is very densely used, and locomotive and passenger coach productivity is high. The only exception is the low productivity of freight wagons, a symptom of the inefficient management of freight activity. Technical functions are adequately handled. Track on main lines is generally in good condition, and telecommunication and signaling systems work properly. The situation is more mixed for rolling stock. Passenger coaches are generally in good condition. Freight wagons are also in good condition, with a favorable availability factor (90 to 96 percent). Availability of locomotives, though, is below standard (about 70–73 percent against a target of 85 percent).

Some of ENR's assets need to be modernized over the medium term. Although assets are generally in good condition, some need to be renewed or modernized in years to come. The motive power and rolling stock fleet is aging. In a fleet of 688 locomotives, only 146 are less than 20 years old. Similarly, part of the passenger coach fleet has reached the end of its economic life. Some rolling stock maintenance facilities are old and lack adequate equipment. Only 180–200 kilometers of track is renewed annually, an amount that might be insufficient on a heavily used network. About 4,500 kilometers of lines are still equipped with old mechanical signaling systems, which should be replaced by color-light Central Traffic Control on busy lines and radio-based Direct Train Control on less busy single-track lines. The entire network is covered by a modern, fully digital microwave system that is satisfactory for operational purposes but not suited to the data transmission used in modern management.

Partnership of the private sector (PPP)

The private sector is driven by economic incentives. Although transport investments are often regarded by governments as essential to economic welfare، private sector participation is integral to achieve government objectives. The introduction of private capital will surely reduce the financial burden on developing the transport services. For example, **(1)** the participation of private investments in highways, ports and waterway construction, maintenance, operation and management, as well as projects like integrated transport hubs, logistics parks and transportation stations can enhance economic growth and welfare. **(2)** Encouragement of private capital to fund the research and promotion of new transport technologies, processes, materials and the development of transportation logistics public information platforms, public transportation information service systems, highway electronic toll collection system, and urban traffic intelligent systems can help in improving services' quality.

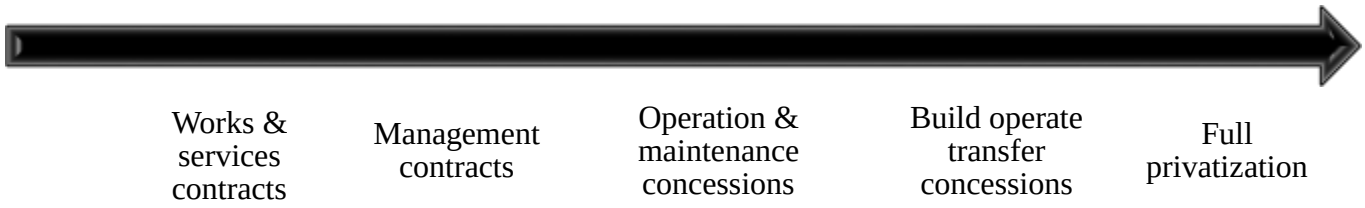
Private sector can contribute to the development of transport sector by providing:

- **Capital Financing** (i.e., equity and debt)
- **Construction** of Transport Facilities
- **Operations** of Transport Services

Thus, the private sector partnership can be defined as following: PPPs are **contractual arrangements** between the public sector and a private sector party for the **private delivery** of public infrastructure services or other basic services. PPPs are characterized by:

- PPPs are **complex structures**, involving different parties, long and demanding negotiations and relatively high transaction costs.
- PPPs are a **procurement tool** where the focus is payment for delivery of services rendered (outputs – outcomes). This implies **a transfer of the performance risk**.
- **Project-related risks** (i.e., technical, performance, market and financial risks are transferred to a great extent **to the private entity**. This implies a risk-sharing between public and private sectors.
- **PPPs' contracts** involve long-term relationship between public and private sectors.
- **PPPs' contracts** extend from: works & services contracts to full privatization contracts, as follows:

Extent of Private Sector Participation



Effective partnership of the private sector with public sector helps in filling the **following needs**:

- The need to **reconcile** transport infrastructure **development goals** with criteria for **fiscal prudence** (i.e., public sector resources available for infrastructure investments will be limited).
- The need to **mobilize additional private capital** to match the financing gap if infrastructure development is to keep its pace sustaining economic growth.
- The need to **develop** a **procurement tool** for better and efficient allocation of scarce public-sector resources.
- The need to **provide better risk assessment**/management.

- The need to **provide incentives** to improve operational and commercial performance of transport services.
- The need to assure **greater innovation** in design and financing structures.
- The need to optimize the use of capital & maintenance spends over project life.

Case Study

Case Study: Roads and Highways in Egypt

Introduction:

The transport sector in Egypt is characterized by strong public intervention in the design, building and operation of networks and services. Additionally, being a strategic sector, it is marked by significant political interference, aiming to either absorb excess workers or to maintain a low pricing policy. Such policies led to a considerable deficit and shortage of resources in this sector. It is no surprise, therefore, that financing new projects and improving efficiency headed a list of problematic issues on the government agenda. In order to solve these problems many reforms need to be implemented.

Traditionally, the provision of means of transport was the monopoly of governments either in providing transport services or building adequate infrastructure including airports, ports, railways and roads. These transport projects have always put financial pressures on governments to maintain service quality and monitor safety to protect users. Such intervention resulted in financial deficits, which eventually forced governments to consider private financing. The 1990s witnessed a major change in terms of restructuring transport policies and increasing the role of private operators and investors in transport infrastructure. Thus, it is important to find ways to develop performance and eliminate obstacles facing private sector participation in rehabilitation and maintenance of infrastructure in order to reduce the cost burden on the public sector.

Unlike in other countries, the Egyptian transport network could benefit from the strategic location of Egypt, where it could play a role in expansion of trade, and also in bringing together production zones and distribution points. Thus, modernization of the transport sector will not only allow trade and business to flourish but also will strengthen the country's presence internationally and increase its competitiveness. This implies a rising annual share of budgetary resources directed to different modes of transport (air, maritime and land).

The significant need to expand projects and maintain existing ones resulted in a continued burden on Egypt’s public finances. To remedy this situation, the government has started investing more in the roads and highways sector and restructuring the railway and maritime sectors. It has also allowed the private sector to participate through several BOT and BOOT projects in both maritime and road sectors[8]. The road

[8] BOT stands for build, operate and transfer, while BOOT stands for build, own, operate and transfer.

sector is considered the backbone of an economy and the most important mode for carrying both goods and passengers. Nevertheless, the road network has become a major problem affecting trade, industry, tourism and population in general due to the financial, structural and institutional obstacles facing the sector. When studying the road sector, the following main questions are considered:

i) What is the current status of the sector?
ii) What are the constraints confronting the sector, and what needs to be done to enhance the sector's performance?
iii) What lessons can be learned from international experience to face these problems? iv) What actions and policies are required to enhance the efficiency of the road sector?

The Economic Importance of the Roads and Highways Sector in Egypt

We should note that an adequate road network is divided into freeways, urban streets and related civil engineering work (bridges and tunnels). The other modes of transport, including the 3,500 km of inland waterways (i.e., Nile River, Lake Nasser, Alexandria-Cairo Waterway, and smaller canals in the Delta), carry very little freight traffic; Egypt’s railway network, comprising about 5,000 km of standard gauge (rail gauge), carries around 45 percent of passenger transport with less than 3 percent of freight traffic.

As a major contributor to trade and an essential means of transport, Egypt's road sector is responsible for 97 percent of freight movements, most of which are private, and for more than 55 percent of domestic passenger movements (4.1 million vehicles in 2006/07 with 60 million passengers/daily).

In 2007/08, transportation and warehousing contributed to the economy by only 4.1 percent of GDP on average, and represented 12.9 percent on average of total production services during the same period (transportation and warehousing, telecommunications, Suez Canal, trade, financial services, insurance and tourism) (MOF 2009). Evidence shows that the transport sector in Egypt still needs to expand the network, improve its adequacy, reduce costs and increase its capacity in order to achieve better performance. Recently published figures show that the share of the roads and highways sector in GDP was around 0.3 percent in 2004, with new construction expenditure contributing the major part (0.25 percent) and maintenance no more than 0.05 percent.

Road network

The road network in Egypt consists of more than 62,000 kilometers of paved and unpaved roads, with the Ministry of Transport (MOT) portfolio covering around the third. The network is also divided into three main types: arterial and primary roads comprising freeways and fast roads, which are under the jurisdiction of GARBLT;

secondary and regional roads fall under the jurisdiction of municipalities; and urban roads under the new communities (Table 1).

Table 1. Classification of Roads in 2007/08

Road category	Length (km)	Paved (%)	Administration
Arterial roads	22,000	100	MOT (GARBLT)
Secondary roads	37,600	64	Governorates
Urban roads	2,400	100	New communities
Total	62,000	78	--

Source: The General Authority of Roads, Bridges, and Land Transport (GARBLT), 2008

Among the approximately mentioned 22,000 kilometers of paved roadways under GARBLT supervision, 4,277 km are dual carriageway with at least two lanes in each direction but with no application of freeway standards; the remainder of the network is single carriageway. Most of the dual carriageways are characterized by: no surface intersections;4 shoulders on both sides of the road; allow U-turn maneuvers with complete access control to and out of the road that are used by cars, pedestrians and animals from nearby towns and villages; and no emergency lanes. The only available freeways with motorway standard specifications include the 110 km road linking Cairo to Ain Sukhna; the 28 km bypass close to Tanta along the “Agricultural” road; and several kilometers close to Alexandria along the North Coast road. The remaining 37,600 km of paved and unpaved roads fall under the responsibility of the governorates, where investments should be allocated to improving road sections with high traffic accident rates, rehabilitation and maintenance to improve accessibility.

Maritime and Air Transport

Introduction: Maritime Transport

Shipping has been an important human activity throughout history, particularly where prosperity depended primarily on international and interregional trade. Maritime transportation has been called one of the four cornerstones of globalization, along with communications, international standardization, and trade liberalization. Many countries have seen astonishing economic growth in the recent past decades due to their willingness to open their borders and markets to foreign investment and trade. There exists a symbiotic relationship between globalization and maritime shipping. As, from one side, globalization has increased the demands for maritime shipping; and maritime shipping (as an integrated component in a larger goods movement system) has more fully enabled globalization, from the other side.

Maritime Shipping and Goods Movement

Global goods movement is a critical element in the global freight transportation system that includes ocean and coastal routes, inland waterways, railways, roads, and air freight. The freight transportation network connects locations by multiple modal routes, (functioning as modal substitutes). Maritime transport is divided into six cargo groups:

1. **The liquid bulk cargo:** for the transport of crude oil its products and other liquids, E.g., petroleum products, chemicals, liquid gas and fruit juice concentrate.
2. **The solid bulk cargo:** for the transport of minerals, wheat and other grains, E.g., ores, coal, grain; Bulk carriers for large-volume unit loads such as motor vehicles and iron.
3. **The general cargo:** for the transport of manufactured products.
4. **Container ships:** which are increasingly taking on the tasks of general cargo ships on long-haul routes.
5. **Refrigerated vessels (reefers):** for fruit from the Southern Hemisphere.
6. **Ferries:** for shipping trucks and general cargo vessels on short-haul routes.

Modern ships characteristics

Marine innovations have helped to fuel the growth of maritime freight traffic. Modern ships are characterized by large, fast and highly specialized structures. These characteristics include:

Size: The average size of ships has increased substantially. Larger vessels reduce the shipping costs per load unit for crew, fuel, demurrage, insurance, servicing and ship maintenance. Port authorities must respond to increasing vessel sizes by expanding port infrastructure, e.g., transport connections inland and improving port access e.g. by

deepening fairways. Therefore they too face increasing costs. This can bring the owners – usually the State or local authorities – into financial difficulty: the capital investment is usually funded from the public purse

Speed: The average speed of a merchant ship is about 15 knots (1 knot = 1 nautical mile per hour = 1853 metres per hour), or 28 kilometres per hour, the equivalent of about 670 kilometres a day. Newer ships are capable of 25 to 30 knots (45 to 55 kilometres per hour). Marine propulsion has improved considerably since the invention of the screw propeller, particularly the double propeller. This development reached its peak in the 1970s. Achieving even higher speeds is a challenge and is likely to prove extremely expensive. Experts are therefore predicting only limited increases to average commercial shipping speeds.

Design: Ship design has changed radically – from timber to steel to vessels built mainly of aluminum and composite materials. Design innovations were aimed at dramatically reducing fuel consumption and construction costs while increasing safety at the same time.

Specialization: Specialization in the shipbuilding industry has brought massive changes to ocean shipping. By speeding up cargo handling, specialization has been responsible for reducing the costs per transported unit. Where special ships can be utilized to capacity, therefore, economies of scale have been achieved. Special ships have increasingly been constructed for different and specific types of freight: tankers for crude oil, bulk carriers for bulk goods, refrigerated vessels, general cargo ships, container ships, and ferries.

Automation: Various automation technologies have been introduced to shipbuilding and ship operations, including self-loading/unloading systems, computerized navigation, and the global positioning system (GPS). Automation has markedly reduced the number of crew needed and at the same time substantially improved safety standards. According to data service provider "IHS Fairplay", total vessel losses (due to accidents or sinking) have declined from more than 200 a year in the mid- 1990s to about 150 now – a remarkable improvement in safety when measured against the sharp rise in fleet numbers. Maritime freight traffic was booming for many years. The amount of cargo transported by sea exceeded the 8 billion tonne mark for the first time in 2007. Global shipping had therefore doubled since 1990 (an average annual increase of over 4 per cent). Transport capacity, too, virtually doubled in the same period to almost 33 trillion tonne-miles.

Case Study (1): Review of Maritime Transport

Case Study: Review of Maritime Transport 2016
Seaborne trade In 2015, world gross domestic product expanded by 2.5 per cent, the same rate as in 2014. Diverging individual country performances unfolded against the background of lower oil and commodity price levels, weak global demand and a slowdown in China. In

tandem, global merchandise trade by volume weakened, increasing by only 1.4 per cent, down from 2.3 per cent in 2014.

In addition in 2015, estimated world seaborne trade volumes surpassed 10 billion tons – the first time in the records of UNCTAD. Shipments expanded by 2.1 per cent, a pace notably slower than the historical average. The tanker trade segment recorded its best performance since 2008, while growth in the dry cargo sector, including bulk commodities and containerized trade in commodities, fell short of expectations. UNCTAD expects world gross domestic product to further decelerate to 2.3 per cent in 2016, while, according to estimates by the World Trade Organization, merchandise trade volumes are expected to remain steady and grow at the same rate as in 2015. Growth in world seaborne trade shipments is expected to pick up marginally in 2016, with the estimated pace remaining relatively slow on a historical basis.

While a slowdown in China is bad news for shipping, other countries have the potential to drive further growth. South–South trade is gaining momentum, and planned initiatives such as the One Belt, One Road Initiative and the Partnership for Quality Infrastructure, as well as the expanded Panama Canal and Suez Canal, all have the potential to affect seaborne trade, reshape world shipping networks and generate business opportunities. In parallel, trends such as the fourth industrial revolution, big data and electronic commerce are unfolding, and entail both challenges and opportunities for countries and maritime transport.

Maritime businesses

The world fleet grew by 3.5 per cent in the 12 months to 1 January 2016 (in terms of dead-weight tons (dwt)). This is the lowest growth rate since 2003, yet still higher than the 2.1 per cent growth in demand, leading to a continued situation of global overcapacity. The position of countries within global container shipping networks is reflected in the UNCTAD liner shipping connectivity index. In May 2016, the best connected countries were Morocco, Egypt and South Africa in Africa; China and the Republic of Korea in Eastern Asia; Panama and Colombia in Latin America and the Caribbean; Sri Lanka and India in South Asia; and Singapore and Malaysia in South-East Asia. Different countries participate in different sectors of the shipping business, seizing opportunities to generate income and employment. As at January 2016, the top five ship owning economies were Greece, Japan, China, Germany and Singapore, while the top five economies by flag of registration were Panama, Liberia, the Marshall Islands, Hong Kong (China) and Singapore.

The largest shipbuilding countries are China, Japan and the Republic of Korea, accounting for 91.4 per cent of gross tonnage constructed in 2015. Most demolitions take place in Asia; four countries – Bangladesh, India, Pakistan and China – accounted for 95 per cent of ship scrapping gross tonnage in 2015. The largest suppliers of seafarers are China, Indonesia and the Philippines. As countries specialize in different maritime

subsectors, a process of concentration of the industry occurs. As each maritime business locates in a smaller number of countries, most countries host a decreasing number of maritime businesses, albeit with growing market shares in the subsectors.

Policymakers are advised to identify and invest in maritime sectors in which their countries may have a comparative advantage. Supporting the maritime sector is no longer a policy choice. Rather, the challenge is to identify and support selected maritime businesses. Policymakers need to carefully assess the competitive environment for each maritime subsector they wish to develop, and to consider the value added of a sector for the State economy, including possible synergies and spillover effects into other sectors – maritime and beyond.

Policymakers should also take into account the fact that the port and shipping business is a key enabler of a country's foreign trade. Apart from possibly generating income and employment in the maritime sector, it is generally even more important to ensure that a country's traders have access to fast, reliable and cost-effective port and shipping services, no matter who is the provider.

Freight rates and maritime transport costs

In 2015, most shipping segments, except for tankers, suffered historic low levels of freight rates and weak earnings, triggered by weak demand and oversupply of new tonnage. The tanker market remained strong, mainly because of the continuing and exceptional fall in oil prices. In the container segment, freight rates declined steadily, reaching record low prices as the market continued to struggle with weakening demand and the presence of ever-larger container vessels that had entered the market throughout the year. In an effort to deal with low freight rate levels and reduce losses, carriers continued to consider measures to improve efficiency and optimize operations, as in previous years.

Key measures included cascading, idling, slow steaming, and wider consolidation and integration, as well as the restructuring of new alliances. The same was true of the dry bulk freight market, which was affected by the substantial slowdown in seaborne dry bulk trade and the influx of excess tonnage. Rates fluctuated around or below vessels' operating costs across all segments. As in container shipping, measures were taken to mitigate losses and alliances were reinforced, as illustrated by the formation in February 2015 of the largest alliance of dry bulk carriers, Capsize Chartering. Market conditions in the tanker market, however, were favorable. The crude oil and oil product tanker markets enjoyed strong freight rates throughout 2015, mainly triggered by a surge in seaborne oil trade and supported by a low supply of crude tanker fleet capacity.

Case Study (2): Maritime Transport and Environment

Case Study: Energy and Environmental Impacts of Maritime Shipping
The expansion of goods movement to meet the needs of a globalized world does not come free. In particular, there are a number of energy and environmental impacts

associated with the movement of goods. For example, the energy use and emissions associated with transporting freight can be significant. According to the U.S. EPA, heavy duty truck, rail, and water transport together account for more than 25% of U.S. CO2 emissions, about 50% of NOx emissions, and nearly 40% of PM emissions from all mobile sources. In Europe, these modes generate more than 30% of the transportation sector's CO2 emissions.

That said, shipping is not only among the least costly modes of transportation, but also the most energy efficient (with some exceptions generally proportional with high vessel speed and low service capacity). Because fuel costs can represent between 20% and 60% of shipping costs, operators have strong economic motivation to operate ships efficiently and to employ propulsion technologies that reduce fuel consumption per cargo ton-km. For example, the use of high-temperature, high-pressure (HTHP) engines that can combust low-cost residual fuels (a byproduct of petroleum refining) stems directly from the desire to reduce fuel expenditures. Nevertheless, a consequence of marine engine technologies is increased air pollution. These HTHP engines oxidize nitrogen effectively (thereby increasing NOx emissions), and emit many of the impurities of residual fuel (including sulfur, toxics, and heavy metals) out the ship stack. Among freight modes, waterborne transportation has been shown to cause significant air pollution locally in port communities, add to long-range pollution transport in coastal regions of heavy trade, and contribute to climate change on a global scale. Oceangoing shipping is also the least regulated freight mode, at least for air pollution. These issues are discussed in more detail in the following sections.

Air transportation

Introduction: Air Transportation

Air transportation is one of the most important components of the world's transportation system. Not only does it provide the major means of long-distance travel in the world, but its economic impacts on global and national economies is substantial. In addition, because of the unique nature of aviation infrastructure (for example, airports) and the current technology for flight (for example, jet engines that consume fuel and emit air pollutants), air transportation plays an important role in efforts to improve environmental quality and promote sustainable development.

Major Components of the Air Transportation System

The major components of the air transportation system include airports, air traffic control systems, aircraft, and airlines. Changes in each of these components will have important consequences for the future of the aviation industry. For example, significant airside congestion is occurring at some of the world's largest airports. How can additional capacity be provided in an environment where major infrastructure investment is constrained? Technological advances are preparing for a major shift in air traffic control away from ground-based aircraft guidance to satellite navigation systems that allow aircraft to fly their own routes.

Major Trends in Air Transportation

One of the major trends in air transportation over the past 80 years has been ever increasing aircraft size and weight. If aircraft continue to get bigger, what will this do to airport capacity and environmental impacts? And finally, in a deregulated market environment, the airline industry is extremely volatile, with market conditions significantly affecting the viability of air service and the profitability of some airlines around the world.

Reasons for the Growth in Air Cargo

Reasons for the growth in air cargo include: (1) deregulation and liberalization of the air cargo industry; (2) global interdependence helped by world trade agreements; (3) the vast development of high value and limited time consumable commodities; (4) Unlike ocean shipping, there is considerable mixing between passenger transport and cargo transport; (5) Air transport is characterized by: quicker and smoother than land or sea travel, less transport-related stresses, less packaging is needed (save expense), and less insurance expense; and (6) Airplane manufacturing is one of the most concentrated industries in the world. Only two major companies for large planes: Boeing, Airbus.

The End