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Spillover Effects, Free Rider Problem and Pareto Optimality in Bangladesh: A Study

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Abstract

In the 21st century, efficiently allocating resources is the most important part of Economics because the vast global population and various disasters like climate change affect food and shelter rigorously. In Bangladesh, public goods and externalities problem monitoring, supervision, legal standard and practice are very poor. Market failure is a common problem in market mechanisms, especially in monopoly and oligopoly because of inefficient allocation of resources. Negative externalities cost a considerable amount of our output and impose medical expenses. Garments factories and tannery industries pollute Buriganga, Turag and other rivers beside capital city Dhaka and no one compensate the fishermen or riverside peoples or distressed citizens. External diseconomies arise because of corruption and mismanagement. In the case of public goods, every citizen enjoys a lot, but few of them pay taxes and most of them evasive taxes, which affect our growth and development and Pareto optimality are not found in practice. So, Private provision of public goods is required for some goods, and government intervention in externalities is required for regulation and greater welfare for the nation.

JEL Classification *B12 · B13 · B21 · B22 · D6*

Keywords *Spillovers Effects · Free-riding · Market Failure · External Diseconomies · Tax Evasion · Pareto Optimality · Government Intervention*

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1.1 Introduction

The age of our earth is approximately five billion years, and the journey of human beings on this planet is approximately three million years, but the basic need of food, clothing, shelter, education and health care are not improved proportionately. Every man on the planet does not get basic needs efficiently and equally. There are some fundamental problems in Economics such as, what to produce? How to produce? Whom to produce?

And most importantly, is resources used efficiently? In the 21st century, the last problem is a global and domestic challenge because of climatic changed natural disasters. Various pollutants like carbon dioxide damage the ozone layer, and direct sunlight heats our earth directly. As a result, ice melting fast in the northern and southern regions of the world, even in the Himalayas. Sea levels rising, and the number of homeless people also rises day by day. The major pollution emitting country like China (30%), the USA (15%) and the rest of the world (55%) do not provide and compensate enough for their pollution. In such a way, global inefficiency of resource allocation arises. Homeless and jobless people are also rising because of wars and racial discrimination. In a country internally, especially Bangladesh, no pollution emitting industries provide compensations to the deceased populations. Very few of them introduced environmental treatment plants (ETP). Even our tax structure is feeble. Tax evasion, money laundering, loan defaulting, fake currency notes, corrupted money market, mismanaged and ignored capital market, inefficient and corrupted revenue system, and so on are common problems in Bangladesh. Our tax-GDP ratio is abysmal (8.5%), where the average OECD ratio is 35%. Most of the people of our country are beyond the tax net, but all of the people of this country are beneficiaries of public goods and utilities. As a result, the free-rider problem arises. It is also the leading cause of inefficiency in resource allocation. In market mechanism spillover effects/externalities predominantly negative externalities and the free-rider problem of public goods make a market failure. Market failure never ensures Pareto optimality. That is why government intervention and government regulation in externalities problem and private provision of public goods are important to control market failure and ensure the efficiency of resource allocation and citizen satisfaction.

1.2 Objectives

The main objective of this study is to explain the spillover effects of externalities, and the free-rider problem in public goods causes inefficiency of resource allocation, which creates market failure. Because of market failure in the market

mechanism, we lose a considerable amount of our GDP, and Pareto optimality cannot be found in practice.

The specific objectives of this study are:

i) To explain the theoretical concepts regarding the study.
ii) To show the current status of external diseconomies, public goods, Tax-GDP ratio and tax evasion scenario in Bangladesh.
iii) To explain how the market mechanism fails to achieve an efficient allocation of resources.
iv) To identify the relationship between the spillover effect, the free-rider problem with economic growth and development.
v) To analyse the Coase theorem regarding the private-sector solution of negative externalities.
vi) To suggest the policy recommendations to control spillover effect, free-rider problem and encouraging Pareto optimality in Bangladesh.

1.3 Literature review

Carande-Kulis, Getzen and Thacker (2007) suggested that Efficiency measures are helpful at the programmatic level of public goods and externalities. However, lack of full employment and market failures, including public goods and the impact of consumers and producers' actions not reflected in the markets (externalities), compromise efficiency and generate health inequities. Merlo and Briales (2000) considered public goods and/or economic externalities (off-site and off-market effects) of Mediterranean forests, referred to as MEDFOREXs. It also reported possible market failures and/or distortions. Moreover, they valued market failures in monetary terms. Hummel (1990) analysed that the most sophisticated theoretical justification for State provision of this service is the public-goods argument. Economists have called public goods and then endlessly debated whether the label applies, but the national defence has remained the quintessential public good. Although rarely discussed in detail, it is universally invoked as the classic representative of the public-goods category. Arce and Sandler (2001) mentioned that Weaker-link and better-shot public goods are prevalent in examples of transnational collective action. Instances include dike building, atmospheric monitoring, cyberspace virus control, deforestation, disease control, and peacekeeping. They analysed the essential game-theoretic features of such public goods, allowing correlated strategies to provide Pareto-improving alternatives to the Nash equilibria. They also considered the consequences of diminishing returns on game forms and institutional prescriptions. Lee and Miller (1990) described that Collective wealth in the form of publicly owned mineral

reserves leads in some cases to enormous negative externalities, while in other cases, it is of little importance. No evaluation is attempted for collective environmental wealth, scale returns, or induced technological change.

2.1 Theoretical Concepts of the Study

Market Failure: Market failure indicates the inefficient allocation of goods and services in an economy. Market failure is defined by an inefficient distribution of goods and services in the free market. The primary reasons for market failure are:

A. Specific forms of market organisation: Examples include monopoly and oligopoly.
B. Spillover Effects or Externalities or neighbourhood Effects.
C. Existence of Public Goods.

Monopoly: The Monopoly is a market structure characterised by a single seller selling a unique product without a new firm's restriction entering the market. A monopoly is a form of market where a single seller sells a particular commodity for which there are no close substitutes.

Oligopoly: The Oligopoly Market is characterised by few sellers selling homogeneous or differentiated products. In other words, the Oligopoly market structure lies between the pure monopoly and monopolistic competition, where few sellers dominate the market and control the product's price.

Spillover Effects: Famous British economist Arthur Cecil Pigou (A.C. Pigou) systematically dealt with externalities in his famous book Wealth and Welfare (1912). Pigou argued that in the presence of externalities, we do not achieve a Pareto Optimum even if we have perfect competition. The behaviour of some individuals or firms affects (positively or negatively) the welfare of others. Externalities arise whenever the actions of one economic agent make another economic agent worse or better off, yet the first agent neither bears the costs nor receives the benefits of doing so: Externalities are one example of market failure. For example, a chemical firm dumping wastes in a river can increase production costs for fishers.

Classification of Externalities: The externalities could be positive externalities that involve external benefits and negative externalities which involve external costs.

Positive Externality in Production: When a firm's production increases its well-being, the firm is not compensated by those others. Positive production externalities lead to underproduction.

Example: Beehives of honey producers have a positive impact on pollination and agricultural output.

Positive Externality in Consumption: When an individual's consumption increases the well-being, the individual is not compensated by those others. Positive consumption externalities lead to underconsumption.

Example: Beautiful private garden that passers-by enjoy seeing.

Negative Externality in Production: When a firm's production reduces the well-being of others whom the firm does not compensate for, negative production externalities lead to overproduction.

For example, the steel plant pollutes a river, but the plant does not face any pollution regulation (and hence ignores pollution when deciding how much to produce).

Negative Externality in Consumption: When an individual's consumption reduces the well-being of others whom the individual does not compensate for, negative consumption externalities lead to overconsumption.

Example: Using a car and emitting carbon contributing to global warming.

When a negative externality is present, the private market will produce too much good, creating a deadweight loss. When a positive externality is present, the private market produces too little good, creating a deadweight loss.

The social benefit or cost is a combination of private and external benefits or costs. We will use the following notation to denote these costs and benefits:

MPC=Marginal Private Cost

MEC=Marginal External Cost

MSC=Marginal Social Cost. And MSC=MPC+MEC,

Also, MPB=Marginal Private Benefit

MEB=Marginal External Benefit

MSB=Marginal Social Benefit. And MSB=MPB+MEB

Overall economic efficiency requires that MSC=MSB for each product. The reason is apparent. As long as MSB>MSC, production should be expanded because additional benefit exceeds the additional cost. Similarly, if MSB<MSC, then production should be decreased. Consequently, in each pair of products, equality between the marginal social rate of transformation (MSRT) and the marginal social rate of substitution (MSRS). The word 'social' in both terms are added with standard marginal rates MRT and MRS. If only the marginal private costs are considered, the economy will not reach economic efficiency. For economic efficiency, consumers and producers must weigh the full social benefits of consumption or production. If externalities violate such equalities (MSRT=MSRS), regulations (taxes and subsidies) will be needed.

Public Goods: Paul Anthony Samuelson (1915-2009), the first American to win the Nobel Memorial Prize in Economic Sciences, known by some economists

as the Father of Modern Economics, is credited as the first economist to develop the theory of public goods. In his 1954 paper – The Pure Theory of Public Expenditure – he defined public goods, which he referred to in the paper as 'collective consumption goods', as a pure public good that provides no excludability and nontrivial benefits to all people in a given society. A public good is a product that one individual can consume without reducing its availability to another individual and from which no one is excluded. Economists refer to public goods as "nonrivalrous" and "no excludable. No excludability means it is technically impossible or extremely costly to exclude any individual from the benefits of a good (degree of exclusion=0). Nonrivalry means that there is no rivalry among the consumers because the enjoyment of the good by any one person does not reduce its availability for others (degree of jointness=1)

A classic example is that of a lighthouse. When the light is on, it is difficult to prevent any nearby ship from seeing it and taking advantage of it (Nonexcludability), and one ship's use does not affect other ship's ability to use it (Nonrivalry). Example: Public goods include flood control systems, street lighting, the judiciary and emergency services, clean air, national defence, sewer systems and public parks. Most basic societal goods are probably included in the list.

Free-Rider problem: This problem arises because a rational person will not contribute to providing a public good since he or she does not need to contribute to benefit. For example: if a person does not pay his taxes, he still benefits from the government's provision of national defence by free-riding on the tax payments of his fellow citizens.

Pareto Optimality: Pareto Optimality, named after the Italian economist and political scientist Vilfredo Pareto (1848-1923), is a major pillar of welfare economics. Pareto efficiency or optimality is an economic state where resources cannot be reallocated to make one individual better off without making at least one individual worse off. Pareto efficiency implies that resources are allocated in the most economically efficient manner but does not imply equality or fairness.

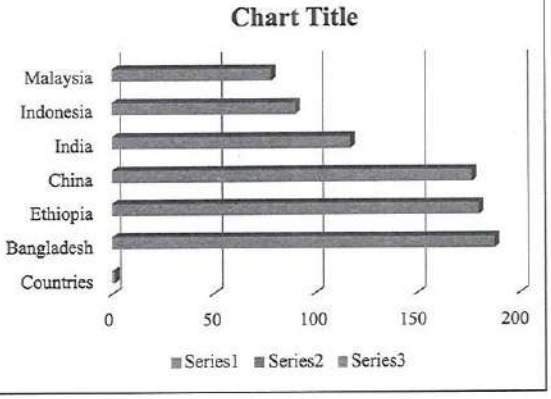
2.2 Existing Status of External Diseconomies, Public Goods, Tax-GDP ratio and Tax Evasion Scenario in Bangladesh

Negative externalities or external diseconomies, the existence of public goods, the especially free-rider problem of public goods, adverse tax-GDP ratio and tax evasion, causes inefficiency of resource allocation among the citizen of a nation which causes market failure. Now we will show these scenarios:

Garments and textile, cement and tannery industries, diesel and petrol run vehicles, overpopulation and unplanned brick manufacturing around the capital city Dhaka made it the second unfit city to live in the world. Moreover, Bangladesh is at high risk of climatic change for global warming. We are suffering from both internal and external negative externalities. Dhaka has ranked 2nd from bottom in the Economist Intelligence Unit's survey of 140 cities under the Global Livability Index for three years in a row. According to The Spectator Index, the scores are based on five major criteria -- health care, culture, environment, education, and infrastructure though we recorded the highest economic growth among a list of 26 countries in the last ten years.

Figure 1: GDP growth comparison in 2019

The Spectator Index		
Total GDP growth in ten years in %		
Countries	GDP Growth	
Bangladeh	188	
Ethiopia	180	
China	177	
India	117	
Indonesia	90	
Malaysia	78	

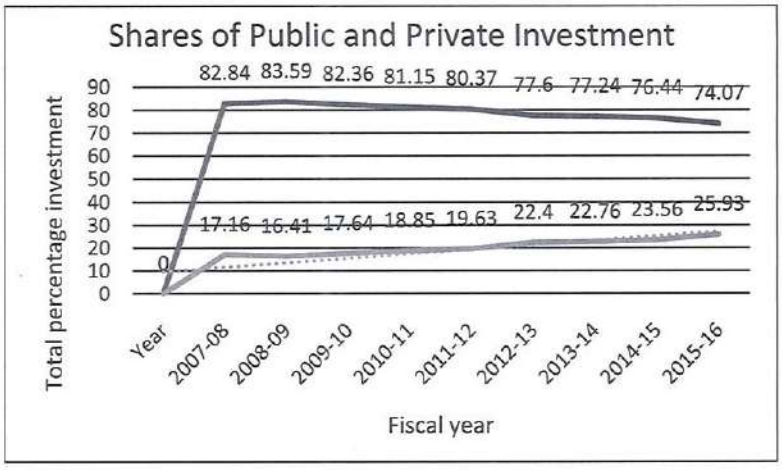


The net worth of public enterprises is approximately US$ 3.6 billion (approximately 14 per cent of GDP). In 1996-97, the annual losses of the public sector approached US$ 250 million, which is equivalent to 30 per cent of the country's annual project disbursement aid and nearly 1 per cent of its Gross Domestic Product. Ninety per cent of the public enterprises have borrowed highly from the nationalised commercial banks. Such borrowing from commercial banking creates enormous pressure on the banking sector because individual and corporate finance also borrow from this sector. As a result, the crowding-out effect appears in the economy by raising interest rates. That is, inefficiency appears, which reduce growth and development. Figure 2 shows that Public investment is growing fast compared to private investment, and it will cause inefficiency because of corruption, which causes market failure and violates Pareto optimality.

Table: Since 2009, the country's gross domestic product (GDP) has expanded 188 per cent at the current prices, which is the highest globally.

Percent(%) of total investment				
Shares of Public and Private Investment				
		Base Year 2005-06 prices		
Year	Private	Public		
2007-08	82.84	17.16		
2008-09	83.59	16.41		
2009-10	82.36	17.64		
2010-11	81.15	18.85		
2011-12	80.37	19.63		
2012-13	77.6	22.4		
2013-14	77.24	22.76		
2014-15	76.44	23.56		
2015-16	74.07	25.93		

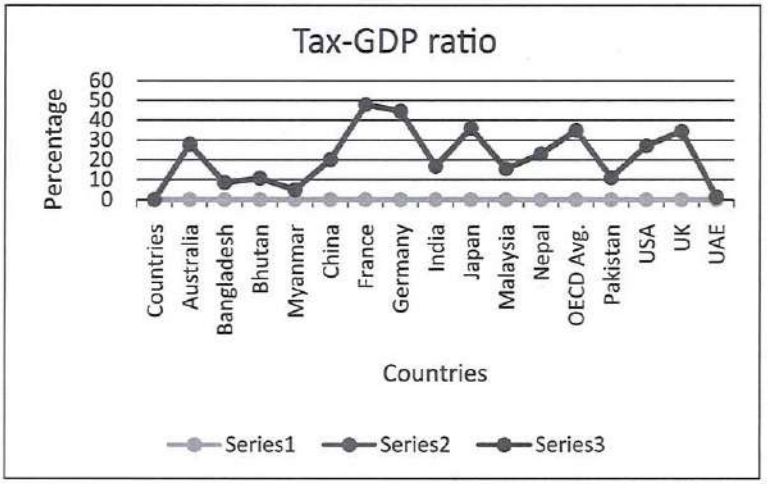
Figure 2: Shares of Public and Private Investment



Upper Line for Private Investment
Lower Line for Public Investment
Source: National accounts statistics, BBS

Free-rider problem and Tax-GDP ratio relationship in Bangladesh and global context

The tax-to-GDP ratio is a ratio of a nation's tax revenue relative to its gross domestic product (GDP) or the market value of goods and services a country produces. Some countries aim to increase the tax-to-GDP ratio to address deficiencies in their budgets.



Taxes and GDP are generally related. The higher the GDP, the more a nation collects taxes. Conversely, countries with lower taxes produce a lower GDP. Analysts, economists, and government leaders can use this ratio to see the rate at which taxes fuel a nation's economy.

Higher Tax-GDP ratio indicates that the maximum number of citizens of a nation pays their taxes to the government, and the free-rider problem is minimum there. On the contrary, a lower Tax-GDP ratio indicates that minimum citizens of a nation pay their taxes to the government and that the free-rider problem is maximum there. Inefficiency in resource distribution, market failure and absence of Pareto optimality is found in practice.

Tax evasion in Bangladesh and global context: Sams Uddin Ahmed, commissioner of taxes, mentioned in his article in 2018 that, In the US, 17 per cent of income taxes are unpaid each year. (Fisman and Wei, 1994). In Europe, $1.3 trillion is lost every year due to tax evasion (Plogander, 2013). In Australia, there is tax evasion. Schneider finds that the average value of the underground economy in Australia, Canada, Japan, New Zealand and the US in 2010 was 9.7 per cent, and, in 2013, was 8.6 per cent (Schneider, 2013). While all countries experience tax evasion, the problem is more severe in developing countries, such as Bangladesh. Systematic large-scale tax evasion is omnipresent in many developing countries (Flatters and McLeod, 1995). Buehn and Schneider estimate that the average size of the shadow economy in developing countries in 2007 comprised 37.4 per cent of the GDP (Buehn and Schneider, 2012). Government estimation in Bangladesh reveals that the black economy comprised 80 per cent

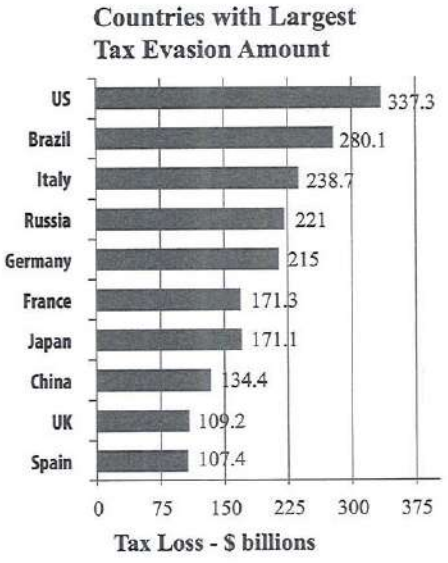


Fig: Tax evasion scenario globally in 2018(Source: Wikipedia)

Fig: Tax evasion scenario globally in 2018 (Source: Wikipedia)

of the GDP—some $110 billion (The Economist, 2011). Hasan (2009) finds the size of the shadow economy in Bangladesh to be 38.1 per cent.

These are weaknesses in resource distribution that cause inefficiency and encourage the free-rider problem to be worst.

2.3 Market mechanism is failed to achieve an efficient allocation of resources

Pigou argued that in the presence of externalities, we do not achieve a Pareto Optimum even if we have perfect competition. The market mechanism, especially oligopoly and monopoly, creates some abnormal behaviour in the market. A monopoly is a price setter in the market and enjoys complete freedom because of the absence of competitors. In an oligopoly market, few sellers make cartels that turn into syndicates automatically and control the market abnormally. They produce as much on their wishes and if external diseconomies appear no matter of concern for them. As a result, unjust, deprivation and discrimination appears in society. In the case of public goods, the government collects tax revenue from citizens and establishes public goods like flood control systems, street lighting, the judiciary and emergency services, clean air, national defense, sewer systems, public parks.

However, how many people pay their taxes accurately? Rather tax evasion, money laundering, loan defaulting is a common scenario. In Bangladesh, the tax-GDP ratio is abysmal. It means many people do not pay their taxes but enjoy the benefits equally. This is a free-rider problem. Such efficiency in resource distribution and Pareto optimality do not appear in practice; instead, market failure appears in the economy. Many economists argue that the mere existence of externalities and public goods does not by itself justify government intervention in markets. They argue that the private market exists for 'internalising' the externalities and private provision of public goods (privatisation of public goods). However, who will determine the degree of internalisation (mitigate social cost with compensation provided by responsible authorities by establishing an environmental treatment plant) and the appropriate ability of privatisation? The government will determine, and the role of government is vital for ensuring social safety, security, equality and optimality.

2.4 Explanation of the Relationship among Spillovers Effect, Free Rider Problem with Economic Growth and Development

Negative externalities or external diseconomies created from commercial and industrial productions especially and without such activities, no economy cannot run. Every industrial production like garments, tannery, cement, bricks, tobacco, transportation, even computers, mobile phones pollutes our water, soil, air and sound, which cause climatic change and substantial medical costs. Climate change imposes enormous economic costs for hundreds of years. These costs hamper our economic growth and development. However, without these activities economy cannot run and compete with global economies. So the government can introduce effective principles, imposing health and climate-friendly latest technologies to the responsible authorities. The free-rider problem is also a significant cause of declining economic growth and development. Bangladesh's tax-GDP ratio is one of the lowest globally, and less than one per cent of the population pays income tax. As many as two-thirds of the eligible taxpayers evade taxes, Corruption and inefficiency of the national board of revenue, tax evasion, money laundering, and loan defaulting costs our desired economic growth and development.

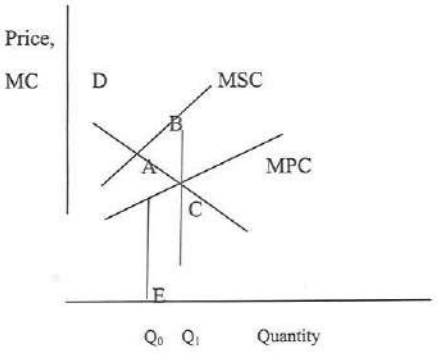
2.5 Coase theorem regarding private sector solution to externalities

With a free market, quantity and price are such that PMB =PMC, Social optimum is such that SMB = SMC. Private market leads to an inefficient outcome like as follows:

Negative production externalities lead to overproduction
Positive production externalities lead to underproduction
Negative consumption externalities lead to overconsumption
Positive consumption externalities lead to underconsumption.
Ronald Coase introduced the following theorem because of such externalities and provided an optimal solution of private-sector bargaining:

A Market or private sector Solution: The Coase Theorem-private sector solution to negative externality- Coase (1960) pleaded for a private-sector solution instead of government intervention by collective bargaining. According to this theorem, the polluter will compensate the ruinous as per property rights. The compensation is an internalisation of the externality through a process of bargaining. With well-defined property rights and costless bargaining, negotiations between the parties will bring about a socially efficient level. Thus, the role of government intervention may be minimal—that of simply enforcing property rights.

Possibility of private deals under externalities



Coase argued, in addition, that there is a possibility of private deals that would achieve the same result as government taxes and subsidies. Consider the case of the paper mill dumping waste in a river and, thus, hurting the fishing. In the figure, Q0 is the socially optimal output but the competitive market producesQ1. If the paper mill reduces the amount from Q1 to Q0, the net loss in the producer's and consumer's surplus is ACE, but the gain to the fisheries is ABCE(the excess of MSC over MPC for the output rangeQ0 to Q1). SinceABCE is larger than ACE, the fisheries' gain is more significant than the loss to the consumers and producers. It should be possible for the fishers to bribe the producers and consumers to cut production to Q0. Thus, the socially optimal level of output could be achieved without the government taxing and subsidising. Of

course, if the number of people involved is large, the bargaining costs could be very high.

Problems with Coasian Solutions: Coase theorem is fit for a small number of parties but not for a large number. There are several problems with the Coase Theorem

i. The assignment problem (how do we compute costs and attribute blame?)
ii. The holdout problem (what if two parties are given the property rights?)
iii. The free-rider problem (the last fisherman will not benefit from bribing)
iv. Transaction costs and negotiating problems.

Public sector solution to externalities:

Coasian solutions are insufficient to deal with large scale externalities. Public policy makes use of two types of remedies to address negative externalities.

1) Price policy: corrective tax or subsidy equal to marginal damage per unit. Arthur Cecil Pigou (1912) suggested that in the presence of externalities, the government should intervene by levying taxes on those imposing external costs and subsidising those who contribute external benefits as follows:

2) Quantity regulation: The government can impose quantity regulation to produce socially optimal output rather than relying on price.

2.6 Policy recommendations to control spillover effect, free-rider problem and encouraging Pareto optimality in Bangladesh

In 21stcentury, global warming and climatic change are the critical concern for this planet. Environmental pollutions causes these. Though the USA and Western Europe cause maximum pollution of the world and benefit from climatic change by rising temperatures by improving their agricultural productions, the country's situation like Bangladesh will be worst of this change by sinking its majority of its land area. This study recommends some suggestions to control environmental pollution, minimise the free-rider problem, reduce market failure and ensure Pareto optimality in Bangladesh which are as follows:

Taxes and Subsidies in the Presence of Externalities		
Condition	**Tax or Subsidy**	**Amount of Tax or Subsidy**
MSC>MPC	Tax to Producers	MSC-MPC
MSC<MPC	**Subsidize Producers**	**MPC-MSC**
MSB<MPB	Tax Consumers	MPB-MSB
MSB>MPB	**Subsidize Cosumers**	**MSB-MPB**

To control spillover effect

i. Private sectors do not create anything for environmental freshness. Even a perfectly competitive market cannot ensure this for making their abnormal profit and capitalistic expansion. Government must intervene here to control by fixing pollution standards, pollution taxes and pollution licenses.
ii. Collecting progressive tax, detecting harmed people and distributing collected tax as compensation to the harmed people.
iii. Govt. will set motor vehicle pollution control act and implement environmental treatment plant (ETP) in each firm.
iv. Chemical and tannery industries should be removed from the city area, decentralise garments industries around the country, and follow the rules of ACCORD and ALLIANCE for fire safety.
v. Govt. should import high tech waste dumping technologies and strictly prohibit them in open places smoking.
vi. Should implement delta plan of water management and tree plantation around the country.
vii. Govt. will do the above work keeping itself beyond political considerations and honesty, ensuring good governance.

To control the free-rider problem

Every individual wants to get a free ride and does not want to pay for the provision of the good because it is possible to get it free once someone else pays for its provision. That is why the equal distribution of wealth, efficiency and optimality cannot find in practice and also create market failure. Suggestions to control it are as follows:

i. Tax-GDP ratio in Bangladesh is meagre. There are six reasons, including high tax evasion behind Bangladesh's low tax to GDP ratio. Zahid Hussain, the lead economist of the World Bank's Dhaka office, said, "High tax rates, multiple tax rates, the complexity of tax laws, corruption among tax collectors and inefficient tax authorities are the main causes of tax evasion". The government should take corrective actions to reduce tax evasion and improve the Tax-GDP ratio to ensure efficient resource allocation.
ii. Private production of public goods: Because of bureaucracy and interference, govt. Investments are costly and lengthy. According to 'club theory', the government can shift the majority of public goods to the private sector and invest in these sectors together.

iii. Public production of public goods: Government will focus on sectors that cannot compete with private sectors, and people's welfare is not found because of monopoly and oligopoly.
iv. Make robust surveillance and monitor tax net and ensure equal opportunity of benefits from public goods.
v. Because of political identities country like Bangladesh has a prominent free-rider problem. Opposition voters are permanently deprived of most of the government benefits. This attitude should be removed.
vi. Connectivity should be improved so that every citizen gets public benefits easily, quickly and comfortably.

2.7 Conclusion

In Bangladesh, public goods and externality problem monitoring, supervision, legal standard and practice are inferior. External diseconomies are more significant than external economies because of corruption and mismanagement. Because of external diseconomies, we lose a considerable amount of foreign currencies behind treatment abroad, agricultural production loss, river basin degradation, and climate change finally, and no one compensates for these one-sided sufferings. As a result, misdistribution of wealth and benefits arises, and Pareto optimality is a rare case in practice in Bangladesh. Because of high tax rates, multiple tax rates, the complexity of tax laws, corruption among tax collectors, inefficient tax authorities and lack of good governance free-rider problem arises. Some people get benefits by paying various kinds of taxes, and some get freely. It causes another type of misdistribution of wealth and benefit, which cause Pareto inefficiency. Monopoly and oligopoly cannot ensure efficiency in wealth distribution. Even a perfectly competitive market cannot solve this misdistribution. So that, government intervention and good governance are required to ensure proper distribution of wealth and ensure Pareto optimality.

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