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Abstract

We assess the revenue potential of states in the Passenger and Goods Tax (PGT) collection based on available information in the public domain. Taxes on Goods and Passengers (also known as PGT) is a tax on services provided by commercial vehicles for carrying goods and passengers on roads or inland waterways. This tax is not subsumed into the GST, except under Entry 52 of the State List (List II of the Seventh Schedule of the Indian Constitution) "Taxes on the entry of goods into a local area for consumption, use or sale therein" (also known as entry tax) has been subsumed into the GST, as per the Constitution One Hundred and First Amendment Act, 2016.

Many states do not exercise the taxation power of PGT, and there is scope for reforms in this tax handle in terms of revising the tax rate structure and expanding the tax base. With the increasing penetration of Electric Vehicles (EVs) both in passenger and goods transport fleets in India, it will be important to explore possibilities of shifting points of taxation from owning the vehicle (e.g., registration fee and associated taxes) and consumption of fuels (fossil) to uses (mobility) of the vehicle. Any tax on the mobility of the vehicles could be introduced using the provisions under the PGT Act of state governments.

Key Words: Revenue potential, State Finances, Taxes on passengers and goods, Externalities, Tax on Mobility, India.

JEL Codes: H20, H71, H23, I18.

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Contents

1. Introduction

The introduction of GST has revolutionised the tax policy for state governments. While the tax buoyancy in the total GST collection has improved, many states are yet to fully harness the benefits of GST in terms of a higher share of State GST in nominal GSDP vis-à-vis the revenue that is subsumed into the GST. It is a promising opportunity for states to explore the potential of generating additional revenues from other tax and non-tax revenue sources to sustain the overall revenue stream of state finances. A comprehensive study assessing states' potential in tax and non-tax revenue mobilisations promises a brighter financial future for Indian states.

Several state taxes are subsumed into the GST, which used to contribute, on average, 44.2 per cent of the Own Tax Revenue (OTR) of major states and 55.4 per cent of the OTR of minor states in 2015-16 (i.e., the base year of GST).[1] The revenue performance of states in the GST collection post-GST compensation period (i.e., beyond 30 June 2022) is yet to be assessed. So far, the performance assessment of states in the GST collections shows that without GST compensation, none of the major states could meet the average share of GST in the nominal GSDP during the post-GST period (2018-19 to 2021-22) as compared to the average share of the revenue from taxes those are subsumed into the GST during the pre-GST period (2013-14 to 2016-17) (Mukherjee 2023). The GST compensation (both from the GST compensation fund and GST back-to-back loans in lieu of shortfall in the GST compensation cess collection) helped states to sustain the average share of GST in GSDP. Given the design and structure of GST, individual states may not deviate from the harmonised rate structure of GST, but setting differential rates between the Union and states for goods and services may help states to mobilise additional revenue to cope with the revenue shortfall in the GST collection. At present for each GST rate, the share of the Union GST (i.e., CGST) and State GST (SGST) is equal (50:50). States may also look for additional revenue mobilisation from non-GST taxes.

In this study, we estimate the revenue potential of states in the Passenger and Goods Tax (PGT) collection based on available information in the public domain. Taxes on Goods and Passengers (also known as Passenger and Goods Tax or PGT) is a tax on goods and passengers carried on road or inland waterways.[2] This tax is not subsumed into the GST, except that under Entry 52 of the State List (List II of

[1] Minor states are Himalayan and North Eastern States (viz., Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, and Uttarakhand).

[2] As listed at Entry 56 of the State List: Taxes on goods and passengers carried by road or on inland waterways.

the Seventh Schedule of the Indian Constitution) *"Taxes on the entry of goods into a local area for consumption, use or sale therein"* has been subsumed into the GST, as per the Constitution One Hundred and First Amendment Act, 2016. The subsumed portion of the PGT (under the budget sub-head 0042-106) into the GST used to be known as 'entry tax' (Mukherjee and Rao 2019). Many states do not exercise the taxation power of the PGT and there is scope for reforms in this tax handle in terms of revising the tax rate structure, expanding the tax base and adopting a technology-backed tax administration system. With the increasing penetration of Electric Vehicles (EVs) both in passenger and goods transport fleets in India, it will be important to explore possibilities of shifting the point of taxation from owning the vehicle (e.g., registration fee and associated taxes) and consumption of fuels (fossil) to uses (mobility) of the vehicles. Any tax on the mobility of the vehicles could be introduced using the provisions under the PGT Act of state governments.

Since PGT is administered by the Transport Department of the respective state governments, it has a positive externality in terms of the cross-compliance with other taxes, e.g., GST (or equivalent taxes) and state excise. In general, the Transport Department passes on information about tax-avoided goods carried by PGT defaulters to other concerned departments. Therefore, it increases the vigilance of overall state tax administrations.

1.1 Passengers and Goods Tax

In the Indian Constitution, regulation and taxation of motor vehicles are treated as two distinct powers. While the regulation falls within the Concurrent List (List III, Seventh Schedule, Entry 35) and is a power exercised by both the Union and state governments, taxation of motor vehicles is clearly within the ambit of state legislative competence.[3] Entry 56 of the state list (List II) refers to taxes on goods and passengers carried by roads while Entry 57 speaks of taxes on vehicles suitable for use on roads subject to the provisions of Entry 35 of List III.[4] This means in effect that states have exclusive powers to levy passenger and goods tax but their power to tax motor vehicles is subject to the general regulatory provisions of the Union laws on the subject.

Before the Constitution (One Hundred and First Amendment) Act, 2016 (8 September 2016), some states used to collect "entry tax" under the Entry 52 of List II.[5] There are two forms of entry tax – (a) entry tax in lieu of octroi and (b) tax on entry of goods into the local area. The first type of entry tax was introduced after phasing out of octroi. Octroi used to be a tax on the entry of goods into the

[3] As listed at Entry 35 of List III – Concurrent List: Mechanically propelled vehicles including the principles on which taxes on such vehicles are to be levied.

[4] As listed at Entry 56 of List II: Taxes on goods and passengers carried by road or on inland waterways and Entry 57 of List II: Taxes on vehicles, whether mechanically propelled or not, suitable for use on roads, including tramcars subject to the provisions of entry 35 of List III.

[5] As listed at Entry 52 of List II: Taxes on the entry of goods into a local area for consumption, use or sale therein

administrative jurisdiction of urban local bodies/municipalities / cantonment boards and it used to be collected after the valuation of goods based on physical verification at the entry points. The second type of entry tax was more or less an equalisation levy imposed on the entry of goods by a state. The difference in the tax rate, where the tax rate in the destination state is higher than the origin state for a specific good, was the genesis for the imposition of an entry tax. All forms of entry taxes are subsumed into the GST since 1 July 2017. Inter-state supplies attract Integrated GST (IGST) where the tax is accrued to the destination state. For states, this tax used to be administered by the Commercial Taxes Department but used to be accounted under the major budget head *0042 (Taxes on Goods and Passengers)* and sub-head *106 (Tax on entry of goods into the local area).*

1.1.1 Registration of Motor Vehicles

Like other goods and services, motor vehicles attract GST in addition to registration fees. Registration fee for registering a vehicle with the Regional Transport Office (RTO) (or any other public authorities having the power to register motor vehicles) is a mandatory step for every vehicle owner to establish ownership of the vehicle as well as get the required permission to run the vehicle on the road. The RTO vehicle registration process involves various fees and charges (under the State Motor Vehicles Taxation Act and the Indian Motor Vehicles Taxation Act and rules thereunder). Road tax is a major component of vehicle registration fees, and it is a one-time tax for 15 years for personal vehicles. Road tax is calculated as a percentage of the vehicle's ex-showroom price and varies across states (e.g., in Delhi, it varies from 8 to 14% for passenger cars). Except for personal vehicles (e.g., two-wheelers, passenger cars), road tax is mostly collected in instalments (either annual/ half-yearly/ quarterly basis) from other vehicles. One-time recovery of road tax from the owner of a vehicle may be prohibitively costly to own certain vehicles (mostly commercial vehicles), and therefore, it is levied on an annual/ half-yearly/ quarterly basis. Different States use different bases for the computation of registration fees, road tax, goods tax and passenger tax, such as cost of vehicle, engine capacity, fuel used, unladen (unloaded) weight, seating capacity, etc. and use different rates with different periodicity of tax payments. If not properly designed, road tax cannot capture the actual pattern of vehicle use and, therefore, may not be an efficient tax to capture damages caused to roads by vehicles.

1.1.2 Rationale for PGT

Taking a cue from the Pigouvian tax approach, the rationale for levying Passengers and Goods Tax (PGT) is that it will help in *internalising the marginal social costs of usage of vehicles on roads* in terms of *marginal damages caused to roads by various vehicles* (e.g., passengers vs. goods vehicles, small vs. large vehicles), *marginal costs of pollution caused by vehicular exhaust emissions by different types of vehicles* (e.g., fossil fuels vs. renewable energy based vehicles, passengers vs. goods vehicles, small vs. large vehicles), and *marginal costs of congestions caused by different types of vehicles* (e.g., small vs. large vehicles, vehicles operating in cities vs. highways). Estimation of marginal social costs of externalities associated with

running a vehicle on roads may not be possible, and therefore, a single tax (say, PGT) may not capture all the externalities. However, designing a suitable PGT system based on the actual mobility of vehicles on roads may help to internalise some of the costs of externalities associated with running a vehicle on roads (e.g., dynamic parking fee based on vehicle density on roads, tax on mobility of vehicles based on RFID and GPRS technology).

We present the observations of earlier studies to support the rationale for PGT as follows:

> *"From the economist's viewpoint, the tax should promote efficiency, satisfy the canon of equity and be easy to comply with. There should be minimal unintended distortions of resource allocation attributable to the levy. Theoretically, this can be done through an appropriately defined economic user charge. Roads are public goods for which efficient pricing is not possible since user demand cannot be fully revealed through the market mechanism. But they are impure public goods to which neither the exclusion nor the rival consumption principle is fully applicable. From the public finance point of view, the objective would be to recover the long run marginal costs of road maintenance. Marginal social costs cover variable road maintenance and pollution costs as well as marginal congestion costs. The former depend on both road condition and the degree of damage caused by each vehicle category. However, use of motor vehicles tax mechanism to internalise the externalities of congestion and pollution has not yet become an explicit objective of fiscal policy in the economy."* (Government of Karnataka, Para 7.2, Page no. 225).
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> *"In practice, marginal costs are difficult to define and measure, there is a strong possibility of persistent deficits and the distribution of net benefits may be unacceptable., Nevertheless, it is generally agreed that, from the efficiency point of view, the motor vehicles tax, which is structured as an unrestricted license tax, probably has the least distorting effect on resource allocation compared with other levies on motor transport."* (Government of Karnataka, Para 7.3, Page no. 225).
>
> *"From the equity viewpoint, the tax can be structured in line with the ability to pay by introducing ad valorem rates and progressivity. But benefits received are difficult to estimate because of the subjectivity of individual valuations of both transport services and time. Finally, to achieve high levels of compliance and facility in administration, the structure of the tax and collection mechanisms must be kept simple and tax rates low."* (Government of Karnataka, Para 7.4, Page no. 225).

1.2 Road Tax vs. PGT

Road tax is a compulsory tax to be paid at the time of registration of a vehicle or in instalments. Based on the various criteria of different state governments, the road tax payment is made either annually or as a one-time payment for the lifetime of

the vehicle, i.e., 15 years. Individuals purchasing a vehicle pay the road tax which is based on the ex-showroom price of the vehicle. The calculation of road tax depends on different physical features of the vehicles, such as seating capacity, engine capacity, age, weight, carrying capacity, fuel use, etc. For the majority of commercial vehicles (either passengers or goods), to reduce the burden of tax at the time of registration of the vehicle, it is made as an annual/ half-yearly/ quarterly levy.

The road tax is a state-level tax, and each state has different rules and regulations for charging it. Due to the varying percentages levied by different states, the amount of tax collected is also different.

To maintain the infrastructure of a vast network of roads and provide essential amenities such as street lighting and road signage, the government recuperates expenses through a tax imposed on vehicle proprietors within the country. Other than national highways, which are constructed and maintained by the Union Government, about 80 per cent of the roads in all the states of India are constructed by the respective state governments. Since each state bears the cost of construction of these roads, the road tax is essentially imposed by the respective state governments.

The funds accumulated are also channelled towards implementing safety measures and providing immediate medical aid in the event of on-road accidents that drivers and others might encounter. Moreover, these funds play a pivotal role in the expansion of the road network, along with the enhancement of highways and expressways, in response to the increasing number of vehicles utilising the roadways over time. Hence, under Section 39 of the Indian Motor Vehicle Taxation Act 1988, individuals purchasing new vehicles are obligated to remit a designated sum as road tax.

Though road tax has a feature to internalise the externality associated with the usage of vehicles in terms of damages caused to roads by different vehicles, it cannot address other externalities like costs of congestion and pollution. Moreover, road tax is not based on the actual mobility of vehicles but on ownership of the vehicle. Therefore, any attempt to raise road tax which is not based on the actual mobility of vehicles, may discourage ownership of vehicles and also it cannot internalise externalities associated with running vehicles on the road. Therefore, a well-designed PGT could subsume road taxes for the majority of on-road vehicles.

1.3 Tolls on Roads vs. PGT

Limitations of tolls on roads as an instrument to internalise externalities associated with vehicle uses are discussed here.

> *"The user charge concept may be best served by the use of tolls, as they can be imposed on every use of specific route by a vehicle. Tolls like cesses can be used for specific purposes. Tolls revenues have to be separately accounted for and utilised solely for the maintenance of the route on which they have been*

collected. The motor vehicles tax, on the other hand, is absorbed into general revenues, but government is expected to spend at least as much as it realises as tax on the upkeep of roads although there is no earmarking of receipts or separate accounting procedure." (Government of Karnataka 2001, Para 7.5, Page No. 225-226).

Tolls on Roads is a user charge specific to those vehicles plying on toll roads. It is mostly collected at a toll road's entry or exit point. Proceeds of tolls are used to recover the costs of construction and maintenance of the roads. Therefore, it is not a general-purpose tax and cannot be a substitute for PGT. Moreover, tolls on roads cannot internalise all externalities associated with running a vehicle on roads like congestion and pollution costs.

1.4 GST on Road Transport vs. PGT

As a service, some categories of passenger and goods transport by road attract GST. GST on road transport differs between passenger and goods transport and across levels of convenience (e.g., AC vs non-AC). GST rate structure on road transport is complex, and there are a plethora of exemptions. GST applies only to commercial transportation services and does not capture the social costs (externalities) of running a vehicle on roads. Therefore, PGT only supplements GST, and the Constitution of India has assigned a separate power to states to levy PGT (under Entry 56 of List II).

We present the taxability and rate structure of road transport under the GST regime separately for passenger and goods transport. Public transport of goods and passengers by roads is exempted from the GST (Chapter 99).

1.4.1 GST on Passengers Transport by Roads

Category	GST Rate
Transport of passengers by road on public transport	Nil
Transport by road of passengers by metered taxi/auto rickshaw/e-rickshaw	Nil
Transport by road of passengers by non-A/C contract carriage or stage carriage	Nil
Transport by road of passengers by A/C contract carriage or stage carriage (other than motor cab), and radio taxi* (no Input Tax Credit)	5%
Transport of passengers by any motor vehicle designed to carry passengers where the cost of fuel is included in the consideration charged from the service recipient (no Input Tax Credit).	5%
Rental services of road vehicles including cars, buses, and coaches (with or without operator)	18%
Services by way of giving on hire – (a) to a state transport undertaking, a motor vehicle meant to carry more than twelve passengers; or (aa) to a local authority, an Electrically operated vehicle meant to carry more than twelve passengers;** or (b) to a goods transport agency, a means of transportation of goods; (c) motor vehicle for transport of students, faculty and staff, to a person	Nil

Category	GST Rate
providing services of transportation of students, faculty and staff to an educational institution providing services by way of pre-school education and education up to higher secondary school or equivalent.	

Notes: *- "radio taxi" means a taxi including a radio cab, by whatever name called, which is in two-way radio communication with a central control office and is enabled for tracking using a Global Positioning System (GPS) or General Packet Radio Service (GPRS).
**- For this entry, "Electrically operated vehicle" means a vehicle falling under Chapter 87 in the First Schedule to the Customs Tariff Act, 1975 (51 of 1975) which is run solely on electrical energy derived from an external source or one or more electrical batteries fitted to such road vehicle.
Source: Compiled by authors

1.4.2 GST on Goods Transport by Roads

Transportation services of goods by road (except services of Goods Transport Agency or GTA)[6] are exempted under the GST regime. In so far as the services of GTA is concerned, if the services (of goods transportation) are provided (by the GTA) to specified classes of persons, the tax liability falls on such recipients under the reverse charge mechanism. In other words, mere transportation of goods by roads, unless a service is rendered by a goods transportation agency, is exempted from GST.

Category	GST Rate
Services of Goods Transport Agency (GTA) in relation to transportation of goods (including used household goods for personal use) supplied by a GTA where,-	
(a) GTA does not exercise the option to itself pay GST on the services supplied by it (no ITC)	5%
(b) GTA exercises the option to itself pay GST on services supplied by it (no ITC)	5%
(c) GTA exercises the option to itself pay GST on services supplied by it (with ITC)	12%
(d) Services provided by a goods transport agency, by way of transport in a goods carriage of - (a) agricultural produce; (d) milk, salt and food grains including flour, pulses and rice; (e) organic manure; (f) newspaper or magazines registered with the Registrar of Newspapers; (g) relief materials meant for victims of natural or man-made disasters, calamities, accidents or mishaps; or (h) defence or military equipments.	Nil
(e) Services provided by a goods transport agency to an unregistered person, including an unregistered casual taxable person, other than the following recipients, namely: - (a) any factory registered under or governed by the Factories Act, 1948(63 of 1948); or (b) any Society registered under the Societies Registration Act, 1860 (21	Nil

[6] "goods transport agency" means any person who provides service in relation to transport of goods by road and issues consignment note, by whatever name called; Under GST laws, the definition of Goods Transport Agency is provided in clause (ze) of notification no.12/2017-Central Tax (Rate) dated 28.06.2017.

Category	GST Rate
of 1860) or under any other law for the time being in force in any part of India; or (c) any Co-operative Society established by or under any law for the time being in force; or (d) any body corporate established, by or under any law for the time being in force; or (e) any partnership firm whether registered or not under any law including association of persons; (f) any casual taxable person registered under the Central Goods and Services Tax Act or the Integrated Goods and Services Tax Act or the State Goods and Services Tax Act or the Union Territory Goods and Services Tax Act.	
(f) Services provided by a goods transport agency, by way of transport of goods in a goods carriage, to, (a) a Department or Establishment of the Central Government or State Government or Union territory; or (b) local authority; or (c) Governmental agencies, which has taken registration under the Central Goods and Services Tax Act, 2017 (12 of 2017) only for the purpose of deducting tax under Section 51 and not for making a taxable supply of goods or services.	Nil

Source: Compiled by authors

1.5 Fossil Fuel Tax vs. PGT

Tax on fossil fuels is a major source of revenue for the Union as well as state governments. Together tax components (the Union excise duty and state sales tax/VAT) constitute a major share of retail prices of petrol (36.82%) and diesel (32.26%) (as on 1 October 2023 in Delhi). The rationale for high taxes on fossil fuels is that vehicle exhaust emissions are a major source of urban air pollution and impose health costs on society (morbidity and mortality associated with urban air pollution are high for Indian cities). Though fuel tax ideally could internalise the social costs of pollution, it cannot fully capture the other externalities like costs of congestion and road damages associated with vehicle usage. The bigger the vehicle larger the road space it occupies and causes congestion. Similarly, the bigger the vehicle, the larger the capacity to carry passengers and/or goods and therefore, causes higher damages to roads than small vehicles. However, all vehicles (across all sizes and weights) pay the same unit price for fuels in a state. It is true that the larger the vehicle lower the mileage they get from each unit of fuel (fuel efficiency), and therefore they need more fuel (pay more tax) to run a specific distance. It is to be noted that the combustion of more fuels into an internal combustion engine emits more pollutants. Therefore, emissions of pollutants from bigger vehicles (either in terms of per unit of fuel use or unit distance travelled) are higher than small vehicles. In addition, fuel tax cannot differentiate between fuel used in road transport vehicles or elsewhere, e.g., tractors/ tillers used in agriculture. Moreover, the environmental space available to assimilate pollution loads in rural areas is higher than in urban areas.

Therefore same tax on fuels across all uses may not help to achieve the 'canon of equity'. With the growing penetration of electric vehicles in the on-road vehicles fleet and lower tax (or no tax) on electricity supplied to EV charging stations, the revenue stream associated with fossil fuel taxes will dry out in the future. However, running all vehicles – either clean or fossil fuel-based – causes damage to the roads and congestion, therefore fossil fuels tax cannot be a substitute for the PGT. A suitably designed PGT could take into account pollution aspects of on-road vehicle use and therefore could subsume fuel taxes in the future.

2. Variations in the Taxation Structure of PGT across States

Considering the taxes on passengers and goods, the adoption of lifetime tax (LTT) on vehicles is prevalent across most states, except for a select few like Odisha, certain Northeastern States (Manipur, Mizoram, Sikkim, Tripura), and specific Union Territories (Andaman & Nicobar, Dadra & Nagar Haveli, Daman & Diu, Puducherry), especially in the context of two-wheelers. For light passenger vehicles, different states apply varying taxation methods, e.g., some states consider factors like engine capacity (Himachal Pradesh, Jammu & Kashmir, Rajasthan, West Bengal), while others base their tax structure on unladen weight (Assam, Madhya Pradesh, Meghalaya, Odisha). Moreover, certain states rely solely on the value or cost of the vehicle for taxation purposes (Andhra Pradesh, Bihar, Chandigarh, Chhattisgarh, Delhi, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Tamil Nadu, and Uttar Pradesh).

Likewise, in the case of cars, the taxation methods differ across states. Some states take into account the engine capacity (Jammu & Kashmir, Sikkim, West Bengal), whereas others, such as Kerala, Madhya Pradesh, Puducherry, and Daman & Diu, use unladen weight as a basis. Himachal Pradesh adopts a combined approach, incorporating both engine capacity and a percentage of the vehicle's cost for Motor Vehicle Tax (MVT). The state of Jharkhand bases its taxation on seating capacity. However, many states have now shifted towards the lifetime tax model, considering the value or cost of the vehicle as the primary criterion.

Regarding passenger transport vehicles like stage or contract carriage buses, the taxation criterion typically revolves around seating capacity. Taxation methods for passenger buses often involve an upper seating capacity limit per seat per quarter/annum, distinct from the taxation of motor cars and jeeps. Some states differentiate tax treatment based on service types (Ordinary/Luxury/Express), while a few incorporate the permitted distance that a vehicle can travel as an additional factor in determining tax rates. Certain states categorise routes based on regions or areas, each carrying distinct tax rates.

In the realm of goods vehicles, taxation generally hinges on registered laden weight (RLW), gross vehicle weight (GVW), or unladen weight (ULW). Most states opt for RLW/GVW-based taxation, employing specific tax rates calculated based on ULW, GVW, RLW, or payload, contributing to varied taxation methods across regions.

The frequency of tax payment obligations also differs across states. Even within a state, it differs across vehicles.

3. State-wise PGT Collection

Tax collections from Taxes on Goods and Passengers (or PGT) constitute 9 sub-heads under the major budget head 0042 (Table 1). Out of these components, tolls on roads is a specific tax collected from vehicles entering into a toll road and/or a state (from other States). Therefore, the tax base of tolls on roads is not necessarily the stock of vehicles of a state. Since the objective of the study is to estimate the revenue potential in the PGT across states, we exclude tolls on roads from our analysis. Tax on entry of goods into the local area or entry tax has been rolled back in the GST regime. Therefore, we excluded these two components (0042-102 and 0042-106) from our analysis and named them as net-PGT.

Table 1: Sub-components of PGT

Entries under Taxes on Goods and Passengers (0042)	
Budget Head /Sub-head	**Description**
0042	**Taxes on Goods and Passengers**
101	Tax Collections
102	**Tolls on Roads**
103	Passenger Tax
104	Goods Tax
106	**Tax on Entry of Goods into Local Areas (Entry Tax)**
501	Services and Service Fees (only applicable for Maharashtra)
800	**Other Receipts**
900	Deduct Refunds

Source: The CAG's State Finance Accounts

We compile state-wise PGT collection from State Finance Accounts of the Comptroller and Auditor General of India (CAG) for the period 2011-12 to 2021-22. Since the objective of this exercise is to know how many states exercise PGT over the years, we have also excluded 'other receipts' along with tolls on roads and entry tax from the total PGT collection and get a revenue stream associated with PGT (net of tolls on road, entry tax and other receipts).

$$\boldsymbol{PGT\ (PGT\ Net\ of\ Tolls\ on\ Roads, Entry\ Tax\ and\ Other\ Receipts)} = Total\ PGT - Tolls\ on\ Roads - Entry\ Tax - Other\ Receipts \quad (1)$$

$$\boldsymbol{PGT\ (PGT\ Net\ of\ Tolls\ on\ Roads\ and\ Entry\ Tax)} = Total\ PGT - Tolls\ on\ Roads - Entry\ Tax \quad (2)$$

We present state-wise PGT collections (net of Tolls on Roads, Entry Tax, and Other Receipts) from 2011-12 to 2021-22 in Table 2. Out of 28 states, only 11 states

(highlighted with blue shading in Table 2) are consistently collecting PGT throughout our analysis. States like Chhattisgarh, Madhya Pradesh, Maharashtra and Punjab collect PGT intermittently. Except for three states (Meghalaya, Mizoram, and Odisha) average PGT collection from 2017-18 to 2021-22 has fallen as compared to the average PGT collection from 2011-12 to 2016-17 for the other 11 states (Table 3). Among 11 states, volatility in the PGT collection is the highest in Assam (Coefficient of Variation or CV is 2.18),[7] followed by Uttar Pradesh (CV: 2.08), Odisha (CV: 1.85) and Gujarat (CV: 1.12). The lowest volatility in the revenue stream was observed for Himachal Pradesh (0.09). Total PGT collection across all states exhibits a volatility of 0.67 (CV).

Table 2: Annual Average PGT Collection (Net) across Selected States (Rs. Lakh)

State	Average of 2011-12 to 2016-17	Average of 2017-18 to 2021-22
Assam	365.84	22.35
Goa	2,001.39	1,995.06
Gujarat	29,906.95	8,232.35
Haryana	45,219.67	1,377.57
Himachal Pradesh	10,473.95	9,728.13
Manipur	118.27	96.13
Meghalaya	**490.62**	**971.52**
Mizoram	**285.02**	**520.10**
Nagaland	3.62	12.60
Odisha	**27.25**	**146.92**
Uttar Pradesh	120.95	0.72

Source: Computed

[7] Coefficient of Variation (CV) = Standard Deviation/Mean

Table 3: State-wise PGT Collections (Net of Tolls on Roads, Entry Tax and Other Receipts) (Rs. lakh)

State	2011-12	2012-13	2013-14	2014-15	2015 - 16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Andhra Pradesh	-	-	-	-	-	-	-	-	-	0.23	-
Arunachal Pradesh	-	-	-	-	-	-	-	-	-	-	-
Assam	707.67	478.34	247.97	246.03	203.03	311.98	254.83	-1,035.23	625.21	244.23	22.73
Bihar	-	-	-	-	-	-	-	-	-	-	-
Chhattisgarh	14.54	27.57	-	-	8,302.51	700.22	236.26	-	-	-	0.02
Goa	1,275.61	1,881.01	1,997.93	2,207.17	2,281.58	2,365.05	2,608.87	2,539.55	2,502.67	1,003.58	1,320.62
Gujarat	20,833.90	21,057.71	83,355.86	21,035.11	26,519.06	6,640.04	13,127.98	11,673.44	4,834.38	10,381.90	1,144.06
Haryana	39,601.00	43,929.87	48,019.56	45,137.08	37,642.68	56,987.85	3,033.59	1,814.31	1,275.65	185.61	578.67
Himachal Pradesh	9,314.06	9,993.24	10,293.24	10,718.65	11,195.98	11,328.54	10,328.32	10,313.53	10,211.47	8,135.70	9,651.61
Jharkhand	-	-	-	-	-	-	-	-	-	-	-
Karnataka	-	-	-	-	-	-	-	-	-	-	-
Kerala	-	-	-	0.01	-	-	-	-	0.02	-	-
Madhya Pradesh	-	-	14.27	-	-	7,547.44	-	-	-	-	6.14
Maharashtra	2.05	-	-	246.92	91.24	34.58	100.71	5.93	86.09	-	0.08
Manipur	140.35	142.62	110.97	115.38	102.16	98.13	112.88	118.37	160.35	41.77	47.28
Meghalaya	437.80	468.31	484.19	529.91	491.63	531.85	783.35	834.50	913.54	1,071.71	1,254.50
Mizoram	205.02	365.51	261.53	255.31	268.09	354.68	383.23	449.47	743.78	485.11	538.90
Nagaland	2.29	1.12	3.10	3.45	4.95	6.78	8.95	12.22	13.26	15.17	13.41
Odisha	9.03	44.23	-177.72	82.90	105.86	99.22	113.59	133.98	455.94	24.30	6.78
Punjab	-	-	-	-	0.42	2.66	-	0.01	-	269.21	-
Rajasthan	-	-	-	-	-	-	-	-	-	-	-
Sikkim	-	-	-	-	-	-	-	-	-	-	-
Tamil Nadu	-	-	-	-	-	-	-	-	-	-	-
Telangana	-	-	-	-	-	-	-	-	-	-	-
Tripura	-	-	-	-	-	-	-	-	-	-	-
Uttar Pradesh	471.44	84.21	58.31	52.74	56.83	2.19	0.65	1.32	0.35	1.27	0.02
Uttarakhand	-	6.39	-	0.02	-	0.11	0.58	0.21	-	-	-
West Bengal	-160.53	-22.19	67.92	13.80	-	-	-	-	-	-	-
Total	**72,854.23**	**78,457.94**	**1,44,737.13**	**80,644.48**	**87,266.02**	**87,011.32**	**31,093.79**	**26,861.61**	**21,822.71**	**21,859.79**	**14,584.82**

Source: Compiled from the CAG's State Finance Accounts

In Table 4, we present state-wise PGT collections (Net of Tolls on Roads and Entry Tax) from 2011-12 to 2021-22. Excluding 'other receipts' may not reflect the true revenue potential of states in the PGT, as 'other receipts' could be incidental to PGT collection, e.g., fees, fines and penalties. Except for 12 states (highlighted with yellow shading in Table 5), the PGT (net) revenue stream is not consistent for other states. For many states, the revenue stream of the PGT has been drying up since 2017-18. The CAG has not flagged this in State audit reports for any state.

Among 12 states, except in Maharashtra, Meghalaya, Mizoram, Nagaland, and Odisha, the average annual PGT (net) collection has gone down from 2017-18 to 2021-22 as compared to 2011-12 to 2016-17 (Table 5). PGT (net) revenue is less volatile in Himachal Pradesh (CV: 0.10) among 12 states. The largest volatility in the revenue stream is observed for Assam (CV: 2.40) followed by UP (CV: 2.08), Odisha (CV: 1.26), Gujarat (CV: 1.12) and Haryana (0.92).

Table 5: Average Annual PGT (net) Collection across Selected States (Rs. Lakh)

	Average of 2011-12 to 2016-17	Average of 2017-18 to 2021-22
Assam	1227.12	28.86
Goa	2001.39	1995.06
Gujarat	29906.95	8232.35
Haryana	46670.27	1405.48
Himachal Pradesh	10789.93	10056.83
Maharashtra	**372.20**	**487.57**
Manipur	118.32	96.13
Meghalaya	**492.13**	**973.58**
Mizoram	**287.64**	**520.99**
Nagaland	**878.62**	**1802.64**
Odisha	**71.58**	**187.00**
Uttar Pradesh	121.53	0.81

Source: Compiled from the CAG's State Finance Accounts

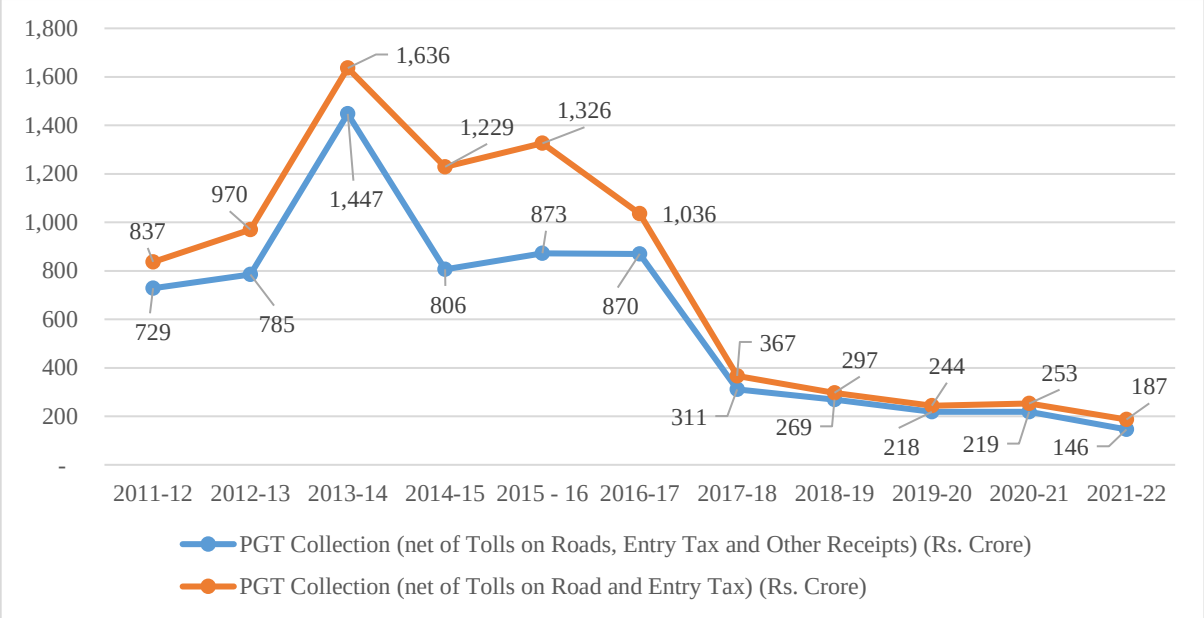
Table 4: State-wise PGT Collections (Net of Tolls on Roads & Entry Tax) (Rs. lakh)

State	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Andhra Pradesh	-	-	-	-	-	-	-	-	-	0.23	-
Arunachal Pradesh	4,515.66	8,464.70	12,275.06	17,945.06	10,661.19	-	-	-	-	-	-
Assam	742.56	485.05	248.00	249.18	214.05	5,423.87	275.22	**-1029.59**	630.82	245.1	22.73
Bihar	18.62	-	-	-	0.6	174.72	-	-	-	-	3.27
Chhattisgarh	26.21	27.57	-	21,344.58	29,583.87	4,400.61	2,882.11	143.24	51.99	1278.82	1,119.25
Goa	1,275.61	1,881.01	1,997.93	2,207.17	2,281.58	2,365.05	2,608.87	2,539.55	2,502.67	1003.58	1,320.62
Gujarat	20,833.90	21,057.71	83,355.86	21,035.11	26,519.06	6,640.04	13,127.98	11,673.44	4,834.38	10381.9	1,144.06
Haryana	39,601.36	43,929.87	48,122.40	46,142.49	44,969.02	57,256.48	3,098.81	1,841.19	1,295.00	198.3	594.12
Himachal Pradesh	9,436.14	10,138.96	10,494.70	11,004.90	11,527.59	12,137.30	11,169.49	10,438.05	10,403.43	**8354.96**	9,918.21
Jharkhand	-	-	-	-	-	-	-	-	-	-	-
Karnataka	-	-	-	-	-	-	-	-	-	-	-
Kerala	-	-	-	0.01	1.16	0.85	0.4	0.15	0.08	0.02	0.04
Madhya Pradesh	5,655.90	9,092.68	5,125.38	404.01	3,666.74	11,670.14	-	-	-	-	15.45
Maharashtra	10.66	0.20	2.03	506.42	840.51	873.38	557.47	508.53	508.75	346.14	516.97
Manipur	140.35	142.62	111.28	115.38	102.16	98.13	112.88	118.37	160.35	41.77	47.28
Meghalaya	438.59	468.31	492.48	529.91	491.63	531.85	783.35	844.79	913.54	**1071.71**	1,254.50
Mizoram	205.02	377.37	261.53	255.53	270.73	355.65	387.7	449.47	743.78	485.11	538.90
Nagaland	485.00	671.32	1,079.08	973.04	587.50	1,475.77	1502.76	2,010.50	1,806.91	1559.52	2,133.52
Odisha	9.91	131.17	-76.24	109.85	128.76	126.04	151.92	166.33	539.61	25.73	51.41
Punjab	-	-	-	-	665.24	59.04	-	0.01	-	270.73	-
Rajasthan	-	-	-	-	-	-	-	-	-	-	-
Sikkim	-	-	-	-	-	-	-	-	-	-	-
Tamil Nadu	-	-	-	-	-	-	-	-	-	-	-
Telangana	-	-	-	-	-	-	-	-	-	-	-
Tripura	-	-	-	-	-	-	-	-	-	-	-
Uttar Pradesh	474.84	84.25	58.31	52.74	56.83	2.19	1.11	1.32	0.35	1.27	0.02
Uttarakhand	-	10.32	-	0.02	-	0.11	0.58	0.21	-	-	-
West Bengal	-160.53	20.06	73.75	13.95	0.03	0.01	-	-	0.16	-	-
Total	**83,709.80**	**96,983.17**	**1,63,621.55**	**1,22,889.35**	**1,32,568.25**	**1,03,591.23**	**36,660.65**	**29,705.56**	**24,391.82**	**25,264.89**	**18,680.35**

Source: Compiled from the CAG's State Finance Accounts

Two revenue streams associated with the PGT collection are presented in Figure 1. It shows that PGT collection has fallen significantly after 2016-17. The highest PGT collection was achieved in 2013-14; thereafter, it shows a falling trend. Removal of border check posts after the implementation of GST could be one reason for a fall in the PGT collections.[8] State border check posts are used to scrutinise goods and location-based tax compliance. In the absence of check posts, the tax administration's capacity to enforce/ verify tax compliance in the PGT has reduced, which may have resulted in the fall of the PGT collection.

Figure 1: PGT (Net) Collection during 2011-12 to 2021-22 (Rs. Crore)



Source: Compiled from the CAG's State Finance Accounts

4. Sources of Data and Limitations

We have compiled the state-wise number of registered vehicles from the *Road Transport Yearbook* of the Ministry of Road Transport and Highways for the period 31 March 1996 to 31 March 2020. It is to be noted that beyond 31 March 2020, state-wise data on cumulative registration of vehicles is not available yet. Vehicle data is categorised into two broad categories, viz., transport and non-transport. Within each category there are sub-categories. However, for certain years only consolidated figures of two sub-categories are reported. For example, in some years, data on trailers and tractors are reported together. To overcome this, we have consolidated these categories in our database. To estimate the approximate number of vehicles operational on the roads for each sub-category, i.e., 15 years of stock of registered vehicles in a state, data from 15 years before the concerned

[8] https://www.livemint.com/Politics/zMetC01w8N8Jtt4691K0oM/GST-22-states-abolish-border-check-posts-after-1-July-rollo.html (last accessed on 30 January 2024).

year is subtracted. Table 6 summarises the process of estimating the stock of on-road vehicles for each financial year from 2011-12 to 2019-20.

Table 6: Estimation of Stock of On-road Vehicles

Financial Year	Stock of On-Road Vehicles
2011-12	Cumulative Registered Vehicles as of 31 March 2012 - Cumulative Registered Vehicles as of 31 March 1997
2012-13	Cumulative Registered Vehicles as of 31 March 2013 - Cumulative Registered Vehicles as of 31 March 1998
2013-14	Cumulative Registered Vehicles as of 31 March 2014 - Cumulative Registered Vehicles as of 31 March 1999
2014-15	Cumulative Registered Vehicles as of 31 March 2015 - Cumulative Registered Vehicles as of 31 March 2000
2015-16	Cumulative Registered Vehicles as of 31 March 2016 - Cumulative Registered Vehicles as of 31 March 2001
2016-17	Cumulative Registered Vehicles as of 31 March 2017 - Cumulative Registered Vehicles as of 31 March 2002
2017-18	Cumulative Registered Vehicles as of 31 March 2018 - Cumulative Registered Vehicles as of 31 March 2003
2018-19	Cumulative Registered Vehicles as of 31 March 2019 - Cumulative Registered Vehicles as of 31 March 2004
2019-20	Cumulative Registered Vehicles as of 31 March 2020 - Cumulative Registered Vehicles as of 31 March 2005

Source: Authors

Three states were formed during 2001-02, viz., Chhattisgarh, Jharkhand, and Uttarakhand; we do not have data for them before 2001-02. Similarly, we do not have data for Telangana before 2014-15. Consequently, we merge these states with their parent states—Jharkhand with Bihar, Uttarakhand with Uttar Pradesh, Chhattisgarh with Madhya Pradesh, and Telangana with Andhra Pradesh. The data is subsequently aggregated.

It is to be highlighted that a one-time tax or lifetime tax is imposed for two-wheelers, cars and jeeps. Therefore, for two-wheelers, cars and jeeps, net registration in a given year is estimated by the following method:

$$\text{Net Registration}_{it} = Cummulative\ Registration_{it} - Cummulative\ Registration_{it-1} \quad (3)$$

Where 'i' represents the state and 't' represents the year.

During the estimation of the stock of different categories of vehicles, three significant data limitations we have faced for some states and some categories of vehicles. Firstly, the presence of negative values in the stock of vehicles, secondly, instances of sudden increase or decrease in the stock of vehicles, and finally, the occurrence of zero values.

4.1 Negative Values in the Stock of Vehicles

A significant data constraint that we have faced is the occurrence of negative values in the stock of vehicles. For example, in Table 7 we present the vehicle stocks across categories for Assam. Notably, there are negative values (highlighted by yellow shading) for light motor vehicles (passengers) for the period 2016-17 to 2018-19 and also multi-axled articulated vehicles for the year 2012-13.

Table 7: Category-wise Stock of Vehicles in Assam

Year	Bus	Light Vehicle Motor (Passengers)	Light Vehicle Motor (Goods)	Multi-Axled Articulated Vehicles	Tractors and Trailers	Taxi	Two-wheeler	Cars	Jeeps
2011-12	5494	57714	47296	83797	20936	27174	142330	42312	107
2012-13	12013	56836	61991	-61218	25588	35662	129630	71812	0
2013-14	10770	69362	88096	70247	40680	44919	64037	88544	0
2014-15	11430	75900	102164	67908	41093	48033	225328	35862	0
2015-16	13280	79583	104890	66556	94742	47414	224283	1340	65
2016-17	12403	-12212	120507	63391	51145	50953	230247	110722	0
2017-18	13148	-5634	137173	69142	57965	55901	298899	63936	0
2018-19	13812	-844	160245	72204	76125	62161	360295	66095	0
2019-20	12830	104803	190468	69481	82001	67237	247455	20302	0

Source: Computed based on the Road Statistics Yearbook of the MoRTH

We resolve this problem by substituting the negative values with the corresponding value from the immediately previous year. Here, we assume that at least the stock of vehicles of the respective category will remain unchanged as observed in the immediately previous year. For example, in Table 8 we present the case of LMV (passenger) vehicles for Assam.

Table 8: Revised Stock of Light Motor Vehicles in Assam

Year	Light Motor Vehicle (Passengers)	Light Motor Vehicle (Passengers) (after Corrections)
2011-12	57714	57714
2012-13	56836	56836
2013-14	69362	69362
2014-15	75900	75900
2015-16	79583	79583
2016-17	-12212	79583
2017-18	-5634	79583
2018-19	-844	79583
2019-20	104803	104803

Source: Computed based on the Road Statistics Yearbook of the MoRTH

4.2 Sudden Increase or Decrease in the Stock of Vehicles

In Table 7, we can see a sudden increase in the stock of Tractors and Trailers in the year 2015-16, a sudden fall in the stock of two-wheelers in the year 2013-14 and volatility in the stock of cars from 2014-15 to 2016-17 (highlighted by green shading). It is important to highlight that we have not made many corrections in

the dataset to resolve the issue of sudden increase or decrease in the stock of vehicles data in our analysis. This is to avoid falling into the trap of potential major data manipulation. So, we have maintained the integrity of the original dataset.

4.3 Zero Values in the Stock of Vehicles

In Table 7, we observe zero values against the stock of jeeps in Assam for all years except 2011-12, 2015-16. We have not made any corrections in the data set to overcome this data constraint. The decision is made to maintain the originality of the dataset as we have compiled from the Road Statistics Yearbooks.

5. Selection of the Benchmark State

As we have seen, 11 states consistently exercise the power of the PGT throughout the period of our analysis, i.e., 2011-12 to 2021-22. We present the average PGT collection per lakh vehicles for 11 states in Table 9. It shows that the average PGT collection is the highest in Himachal Pradesh (Rs. 6,677 per lakh vehicle). The average PGT collection in Goa is the second highest, with Rs. 3,745, and it is followed by Haryana (Rs. 3,590). Since this exercise aims to understand the revenue potential of states from the PGT, given the scale and composition of the stock of vehicles, we consider Himachal Pradesh as a benchmark state for our analysis. Therefore, a discussion on PGT structure and rates across categories of vehicles in Himachal Pradesh could help other states comprehend the design of PGT.

Table 9: Average PGT Collection (Net of Entry Tax and Tolls on Road) (Rs. per lakh vehicle)

State	Average of 2011-12 to 2019-20
Assam	300.96
Goa	3,745.25
Gujarat	1,353.69
Haryana	3,589.60
Himachal Pradesh	6,676.59
Maharashtra	17.64
Manipur	380.24
Meghalaya	815.22
Mizoram	1,449.08
Nagaland	942.04
Odisha	18.88

Source: Estimated

5.1 Structure of PGT in Himachal Pradesh

Himachal Pradesh holds significance in the context of PGT, primarily attributable to two principal factors in the design and structure of PGT. Firstly, the adoption of a relatively simple annual taxation system for the majority of vehicles (except two-wheelers, cars and jeeps), and secondly, the highest average PGT collection per lakh of vehicle across states. As delineated in Table 10, the taxation structure in

Himachal Pradesh is characterised by the application of a simplified annual tax structure, distinguishing it from other states where vehicles are subject to monthly or quarterly taxes as well as tax methods vary across categories of vehicles too (see Appendix A for details). This distinction assumes a pivotal role in fostering operational efficiency within the realm of potential PGT collection. The tax structure of Himachal Pradesh has remained stable over the years, except for a hike in the annual tax rate on trailers in 2019-20.

Table 10 summarises the category-wise tax (PGT) rate in Himachal Pradesh from 2012-13 to 2019-20.

Table 10: PGT Rate Structure in Himachal Pradesh

Year	Bus[1]	Light Vehicle Motor (Passenger)[1]	Light Vehicle Motor (Goods)[2]	Multi-axled Articulated Vehicle[2]	Tractor[2]	Trailer[2]	Tractor and Trailer (Average)[2]	Taxi[1]	Jeep[3]	Car (% of Price) [3]*	Two-wheeler (% of Price) [3]*
2012-13	500	200	1500	1500	1500	1500	1500	350	1500	2.5	3
2013-14	500	200	1500	1500	1500	1500	1500	350	1500	2.5	3
2014-15	500	200	1500	1500	1500	1500	1500	350	1500	2.5	3
2015-16	500	200	1500	1500	1500	1500	1500	350	1500	2.5	3
2016-17	500	200	1500	1500	1500	1500	1500	350	1500	2.5	3
2017-18	500	200	1500	1500	1500	1500	1500	350	1500	2.5	3
2018-19	500	200	1500	1500	1500	1500	1500	350	1500	2.5	3
2019-20	500	200	1500	1500	1500	**2500**	2000	350	1500	2.5	3

Note: *-ex-showroom price of the vehicle. [1]-Per Seat Per Annum (PSPA), [2]-Per Vehicle Per Annum, [3]-Life Time Tax (or One Time Tax) at the time of vehicle registration.
Source: Compiled from Road Statistics Yearbook (various years) of the MoRTH.

5.2 Category-wise Stock of Vehicles in Himachal Pradesh

All issues related to data limitations (negative values, sudden increase/ decrease, zero values in the stock of vehicles) apply to Himachal Pradesh also. For instance, the increase in the stock of LMV (passenger) in 2019-20 is substantial compared to the immediate previous year. Similarly, the stock of buses fell in 2019-20 as compared to 2018-19. This shows that data on vehicles available in the public domain needs scrutiny.

Table 11: Category-wise Stock of Vehicles in Himachal Pradesh (Nos.)

Year	Bus	LMV (Passenger)	LMV (Goods)	Multi Axle Articulated Vehicle	Tractors and Trailers	Taxi	Two-wheeler (New Registration)	Four Wheeler (New Registration)	Jeep (New Registration)
2012-13	7,714	3,408	52,084	51,019	18,679	23,794	49,058	16,352	1,307
2013-14	7,711	3,604	57,796	54,050	20,018	24,763	50,445	**27,812**	1,815
2014-15	8,562	3,758	62,268	55,826	18,827	25,547	60,817	29,560	1,786
2015-16	**10,814**	**1,717**	**60,016**	52,832	18,206	24,988	61,333	32,990	2091
2016-17	**1,920**	1,554	75,321	51,261	**-5,770**	25,027	72,433	40,148	2,708
2017-18	7,149	2,296	87,977	41,739	**-5,671**	21,884	79,658	46,955	**0**
2018-19	7,703	2,318	93,087	40,211	**3,960**	23,274	76,162	48,912	**0**
2019-20	**3,597**	**56,018**	**50,520**	63,567	22,338	24,241	71,740	97,434	**0**

5.3 Estimation of Revenue from PGT for Himachal Pradesh

To estimate the revenue potential of PGT for Himachal Pradesh based on tax rate and stock of vehicles across categories by the following method:

$$Potential\ PGT_{it} = 500 \times Bus_{it} + 200 \times LVM\ (Passenger)_{it} + 1500 \times LVM\ (Goods)_{it} + 1500 \times Multi - axle\ and\ articulated\ vehicle_{it} + 1500 \times Tractor\ and\ Trailer_{it} + 1500 \times Bus_{it} + 350 \times Taxi_{it} + 0.03 \times Two\ Wheeler_{it} \times Average\ Price\ of\ Two\ Wheeler + 0.02 \times Cars_{it} \times Average\ Price\ of\ Cars + 1500 \times Jeep_{it} \quad (4)$$

Where i stands for the state (say Himachal Pradesh) and t stands for the year (say 2012-13).

Here our assumptions are as follows:

Bus: The average Number of Seat is 50

LMV (Passenger): The average Number of Seat is 3

Taxi: Average Number of Seat is 3

2 Wheeler: The average price of Two Wheeler in 2019-20 is Rs. 70,000 and LTT is 3% of Value of the Vehicle

4 Wheeler: The average price of Four Wheeler in 2019-20 is Rs. 750,000 and LTT is 2% of the Value of the Vehicle

We assume that the average price for two-wheelers and four-wheelers in 2019-2020 is Rs. 70,000 and Rs. 750,000, respectively. For other years, we have estimated the prices of two-wheelers and four-wheelers by using the *Wholesale Price Index (WPI) of the Manufacture of Motor Vehicles* (Base 2011-12=100). The estimation process is presented as follows:

$$\text{WPI Deflector}_t = \frac{\text{WPI}_t}{\text{WPI}_{2019-2020}}$$

Where,

't' is the year, 2011-12, 2012-13…

By using the WPI deflector, prices of two-wheelers and four-wheelers are estimated as follows:

$$Two\ Wheeler\ Price_t = 70{,}000 \times WPI\ Deflector_t$$

$$Four\ Wheeler\ Price_t = 750{,}000 \times WPI\ Deflector_t$$

Apart from tax base (here stock of vehicles) and tax rate (here PGT rate structure), tax collection also depends on tax compliance and tax efficiency. Tax compliance

is also a function of tax efficiency apart from several other factors like tax morale, and ease of tax compliance (e.g., certainty and stability in the tax structure, ease of tax payment). The rationale for this exercise is to see if our estimated PGT lies within a reasonable range of proximity to the actual PGT collection in Himachal Pradesh. If the deviation between the two (actual vs. estimated) is very high, it will imply that there could be problems in capturing the tax base correctly, tax efficiency and tax compliance are not up to the mark, and there could be problems in our assumptions (as presented above). We present the estimated PGT collection along with the actual PGT collection of HP for the period 2012-13 to 2019-20 in Table 12. For the period 2013-14 to 2016-17, the error of our estimation varies between 1 to 7% of either side (Column F in Table 12) which is within a reasonable range of acceptance (<10%), given the data constraints (as presented in Table 11).

Table 12: Revenue Potential of Himachal Pradesh in PGT Collection (Rs. Lakh)

Year	PGT (Per Annum) (A)#	PGT (OTT - from two-wheeler, four-wheeler and jeep) (B)	Estimated PGT (C=A+B)	Actual PGT (D)	Difference between Actual PGT and Estimated PGT (E=D-C)	Error in Estimation (%) (F=E/D*100)	Average Price of a Two Wheeler (Rs.)	Average Price of a Four Wheeler (Rs.)	WPI_t	WPI deflector*
2012-13	4,109	3,697	7,806	10,139	2,333	23	62,847	673,362	103	0.90
2013-14	4,274	5,912	10,186	10,495	308	3	65,659	703,493	107	0.94
2014-15	4,575	6,567	11,141	11,005	-136	-1	67,127	719,214	110	0.96
2015-16	5,029	7,257	12,286	11,528	-759	-7	67,677	725,109	111	0.97
2016-17	3,012	8,765	11,777	12,137	360	3	67,493	723,144	110	0.96
2017-18	4,326	10,399	14,725	11,170	-3,555	-32	67,677	725,109	111	0.97
2018-19	4,324	10,873	15,197	10,438	-4,759	-46	68,961	738,865	113	0.99
2019-20	3,733	20,027	23,759	10,403	-13,356	-128	**70,000**	**750,000**	115	1.00

Note: #-Sum of PGT on Buses, LMV (Passenger & Goods), Multi-Axled Articulated Vehicles, Tractors and Trailers. *-WPI Deflator = $WPI_t/WPI_{2019\text{-}20}$, t stands for year.

To estimate revenue potential from the PGT for other states, we consider 2013-14 a benchmark year. So, we apply the average prices of two-wheelers and four-wheelers of 2013-14, along with the PGT structure of Himachal Pradesh, to the category-wise stock of vehicles for other states.

5.4 State-wise Projections of Stock of Vehicles for 2020-21 and 2021-22

For each state, we project cumulative registration of each category of vehicles for 2020-21 and 2021-22 by using the following specification in the regression (OLS) model:

$$V_{ik} = \alpha_0 + \beta_1 Year_i + \sum_{i=1}^{n-1} \beta_k \times S_i + \mu_i$$

Where,

V_{ik} is the cumulative registration of the kth category vehicle in the ith state

β_1 is the coefficient of the trend (as measured by years)
S_i is a state dummy, where one state (among all states) we have selected as a base state
n is the total number of states
β_k is the coefficient of the state dummy

Firstly, state-specific prediction of cumulative registration of each category of vehicles is carried out for 2020-21 and 2021-22 based on category-wise existing vehicle registration data across states for the period 2011-12 to 2019-20. Secondly, we deduct the cumulative registration of each category of vehicles for 2005-06 and 2006-07 from the predicted registration of vehicles for 2020-21 and 2021-22 for each state and each category of vehicles to get a cumulative stock of vehicles for 2020-21 and 2021-22. In this analysis, we assume that the average growth rate for each category of vehicles will remain the same across states.

For two-wheelers, cars and jeeps, immediately previous year's cumulative registration figures are subtracted from the current cumulative registration figures to get newly registered vehicles of the current year. It is to be noted that two-wheelers, cars and jeeps attract one-time PGT at the time of registration.

6. Estimation of Revenue Potential from the PGT

We apply the PGT rate structure of Himachal Pradesh (along with associated assumptions, as presented above) as it was prevailing in 2013-14 across states (for whom we have data of category-wise stock of vehicles over the years) to estimate revenue potential from the PGT for 2013-14 and 2021-22. In Table 13, we present state-wise potential PGT collection along with actual PGT collection. Given the stock of vehicles across categories, revenue potential in PGT differs across states. Notable disparities between actual and potential revenues are evident, with Andhra Pradesh, Bihar, Karnataka, Kerala, and Madhya Pradesh having significant revenue potential from the PGT. Aggregate revenue potential from the PGT in 2013-14 is estimated to be Rs. 1,361,294 lakh, whereas the actual PGT collection was Rs. 163,622 lakh in 2013-14. Therefore, there was a gap of Rs. 11,97,672 lakh (or Rs. 11,976.72 crore) in the PGT collection for the year. The gap in the PGT collection has widened in 2021-22, as the estimated revenue potential is Rs. 29,46,071 lakh whereas the actual collection was Rs. 18,680 lakh. Therefore, in 2021-22 states could have generated additional Rs. 29,27,391 lakh (Rs. 29,273.91 crore) in the PGT collection. This analysis shows that, if states implement the PGT by adopting the rate structure of Himachal Pradesh, there will be additional revenue generation from the PGT.

Table 13: State-wise Potential and Actual PGT (in Rs lakhs)

State	2013-14		2021-22	
	Actual PGT (Rs. lakh)	Potential PGT (Rs. lakh)	Actual PGT (Rs. lakh)	Potential PGT (Rs. lakh)
Andhra Pradesh*	-	2,55,810	-	1,01,136
Arunachal Pradesh	-	3,609	-	13,660
Assam	248.00	23,558	22.73	16,157
Bihar**	-	30,130	3.27	2,58,040
Goa	1,997.93	6,285	1,320.62	14,018
Gujarat	83,355.86	78,325	1,144.06	2,14,806
Haryana	48,122.40	55,214	594.12	45,706
Himachal Pradesh	10,494.70	10,186	9,918.21	50,576
Karnataka	-	77,416	-	7,60,284
Kerala	-	1,46,289	0.04	85,092
Madhya Pradesh#	5,125.38	72,508	1,134.70	6,06,085
Maharashtra	2.03	1,14,419	516.97	1,26,544
Manipur	111.28	2,723	47.28	13,924
Meghalaya	492.48	2,723	1,254.5	15,843
Mizoram	261.53	929	538.9	14,944
Nagaland	1,079.08	2,389	2,133.52	33,986
Odisha	-76.24	22,876	51.41	39,960
Punjab	-	1,48,008	-	37,857
Rajasthan	-	58,644	-	69,406
Sikkim	-	350	-	12,622
Tamil Nadu	-	1,06,237	-	81,267
Tripura	-	2,638	-	13,442
Uttar Pradesh##	58.31	1,04,563	0.02	1,53,035
West Bengal	73.75	35,465	-	1,67,682
Total	**1,63,621.55**	**13,61,294**	**18,680.35**	**29,46,071**

Notes: *-includes Telangana, **-includes Jharkhand, #-includes Chhattisgarh, ##-includes Uttarakhand.

6.1 Costs of Tax Collection from Motor Vehicles

We analyse the *costs of tax collection* vis-à-vis *actual tax collection* for four states (viz., Goa, Gujarat, Haryana, and Himachal Pradesh) in Table 14. The Department of Transports administers the PGT and the Motor Vehicles Tax (MVT) in many states. Therefore, data on tax collection costs may not be available separately for the PGT for some states. To overcome this data constraint, we have compiled the costs of tax collection of the MVT along with the PGT (if available separately); otherwise, we have taken the Costs of Tax Collection on MVT. We present the total costs of tax collection in vehicle taxes (i.e., MVT and PGT) as a percentage of total tax collection (i.e., combined revenue from the MVT and the PGT) in Table 14. It shows that the cost of tax collection is the highest in HP (10.3% in 2021-22), followed by Gujarat (4.2% in 2021-22). If we consider HP as a benchmark, the tax collection costs would be at most 10% of the collected taxes.

Table 14: Costs of Tax Collection from Motor Vehicles

State	Budget description (Budget code)	Cost of Tax Collection (Rs. Lakh)				Tax Collection (Rs. Lakh)*	
		2013-14	% of Tax Collection	2021-22	% of Tax Collection	2013-14	2021-22
Goa	Taxes on Vehicles (2041)	387		510		15,391	26,110
	Collection Charges Goods and Passengers (2045-104)	67		87		38,641	2,231
	Total	**454**	**0.8**	**597**	**2.1**	**54,032**	**28,341**
Gujarat	Taxes on Vehicles (2041)	13,853		16,541		2,28,281	3,88,862
	Collection Charges Goods and Passengers (2045-104)	-		-		83,356	1,144
	Total	**13,853**	**4.4**	**16,541**	**4.2**	**3,11,637**	**3,90,006**
Haryana	Taxes on Vehicles (2041)	1,872		7,181		1,09,486	3,26,461
	Collection Charges Goods and Passengers (2045-104)	242		192		49,745	594
	Total	**2,114**	**1.3**	**7,372**	**2.3**	**1,59,231**	**3,27,056**
Himachal Pradesh	Taxes on Vehicles (2041)	641		1,264		20,781	51,003
	Collection Charges Goods and Passengers (2045-104)	3,430		5,016		10,495	9,918
	Total	**4,071**	**13.0**	**6,279**	**10.3**	**31,275**	**60,922**

Note: *-Total tax collection against Taxes on Vehicles (0041) and Taxes on Goods and Passengers (0042)
Source: Compiled from the CAG's State Finance Account (various years).

7. Whether PGT Collection influence GST collection across States?

In this section, we assess GST (or equivalent revenue that is subsumed into GST) capacity and efficiency during the pre-GST period (2012-13 to 2016-17) as well as the post-GST period (2018-19 to 2021-22). Since the data of revenue that is subsumed into GST is available for only 2015-16 for Arunachal Pradesh, Gujarat, and Haryana, we exclude them from our analysis for the pre-GST period. For the post-GST period, we consider all 28 states (18 major states and 10 minor states) in our analysis. We consider state-wise revenue subsumed into GST (as available from the GST portal) for the pre-GST analysis. For the post-GST analysis we consider State GST collection (including IGST settlement on SGST account) as available from State Finance Accounts for the period 2018-19 to 2021-22. For all public finance-related data we rely on State Finance Accounts of the CAG. We compile state-wise nominal Gross State Value Added (GSVA) at basic prices (2011-12 series) from the Ministry of Statistics and Programme Implementation (MOSPI) website. We exclude 2017-18 from our analysis, as being the transition year there was a settlement of transitional credits on the state as well the Union accounts of GST collection and therefore may not reflect the actual potential of the GST collection across states. The data on total forest area and geographical area are

compiled from *India State of Forest Reports* (FSI 2021, 2019, 2017, 2015, 2013). We use average values for years between two successive surveys.

7.1 Methodology and Sources of Data

The study aims to assess the GST capacity and efficiency of Indian states from the fiscal year 2012-13 to 2021-22, employing a time-variant truncated panel Stochastic Frontier Approach (SFA). The analysis utilises a maximum likelihood (ML) random-effects time-varying inefficiency effects model, a methodology developed by Battese and Coelli (1995). The *sfpanel* command in Stata (version 17), as refined by Belotti et al. (2012), is used for estimation. Battese and Coelli's approach simultaneously estimates parameters of the stochastic frontier and the inefficiency model and mitigates potential bias. This technique incorporates time-varying inefficiency, capturing observable heterogeneity through maximum likelihood estimation. The study's detailed methodology and the SFA model framework are expounded by Mukherjee (2020).

The entire timeframe from 2012-13 to 2021-22 is segmented into two distinct sub-periods: the pre-GST period spanning 2012-13 to 2016-17 and the post-GST period covering 2018-19 to 2021-22. This division allows for a nuanced examination of tax efficiency and capacity functions during these two distinct phases. The research employs this framework to delve into the complex dynamics of GST performance, providing insights into how states have managed tax capacity and efficiency before and after the introduction of the Goods and Services Tax in India:

Pre-GST model Specification 1

GST Capacity Estimation

$$\text{lnsgst} = \beta_0 + \beta_1\, lngsva + \beta_2 lngsva^2 + \beta_3 mfg\_agri + \beta_4 service\_agri + \beta_5 tfa + \beta_6 minor\_state*lngsva + V_{it} + U_{it}$$

GST inefficiency estimation

$$U_{it} = \delta_0 + \delta_1\,(\text{lnpcgsva}) + \delta_2\,(\text{lnpcgsva}^2) + \delta_3\,(\text{sgst\_otr}) + \delta_4\,(\text{dumpgt}) + W_{it}$$

Post-GST model Specification 2

GST Capacity Estimation

$$\text{lnsgst} = \beta_0 + \beta_1\, lngsva + \beta_2 mfg\_agri + \beta_3\, service\_agri + \beta_4 tfa + \beta_5 capex + \beta_6 lnpop + \beta_7 covid + V_{it} + U_{it}$$

GST inefficiency estimation

$$U_{it} = \delta_0 + \delta_1\,(\text{lnpcgsva}) + \delta_2\,(\text{sgst\_otr}) + \delta_3\,(\text{gstcall\_sgst}) + \delta_4(\text{grants\_revex*minor\_states}) + W_{it}$$

We present descriptions of variables in Table 15.

Table 15: Descriptions of Variables

Variable Name	Variable Description
lnsgst	log(state's goods and service tax collection in Rs. lakh)
lngsva	log(gross state value added in Rs. lakh, at basic prices, current price 2011-12 series)
lngsva²	Square of lngsva
mfg_agri	The ratio of the percentage share of the *manufacturing sector* in GSVA and the percentage share of *agriculture, fishing and forestry* in GSVA.
service_agri	The ratio of percentage share of *tertiary sector* in GSVA and percentage share of *agriculture, fishing and forestry sector* in GSVA.
lnpop	Natural logarithm of population (in hundred) of the state
tfa	Percentage share of total forest area in total geographical area of a state
capex	Percentage share of public capital expenditure in GSVA.
minor_state	The dummy variable takes value 1 if the states are Assam, Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, and Uttarakhand, and 0 otherwise.
*minor_state*lngsva*	Interaction Dummy of minor_state and lngsva
covid	Dummy variable taking value 1 if the year is 2020-21 and 0 otherwise
grants_revex	Share of grants-in-aid from the Union government in total revenue expenditure of a state (%)
*grants_revex*minor_state*	Interaction dummy of minor_states and grants_revex
lnpcgsva	Natural logarithm of per capita gross state value added (basic prices, current prices 2011-12 series)
lnpcgsva2	Square of lnpcgsva
dum_pgt	The dummy variable takes value 1 if there is positive revenue collection in a state from the PGT (net of entry tax) and 0 otherwise
sgst_otr	Share of State GST (including IGST settlement) in Own Tax Revenue (OTR, %)
gstcall_sgst	GST compensation receipts (from GST compensation fund as well as GST back-to-back loans in lieu of shortfall in the GST compensation cess collection) as a percentage of State GST collection (SGST, including IGST settlement) (%)

Source: Authors

7.2 Results and Discussions

The estimated results of tax capacity and tax efficiency are presented in Table 16. The results of the analysis show that the scale of the economic activity of states as measured by *lngsva* and the structural composition of the economy (as measured by the share of manufacturing and services sector vis-à-vis agriculture sector in

GSVA) are major factors determining GST capacity (Table 16) for the pre-and post-GST periods. We find a non-linear relationship between lngsva and GST collection for the pre-GST period. This suggests that with increasing *lngsva*, the GST capacity first increases and thereafter GST capacity decreases with further increase in the *lngsva*.

States where the shares of manufacturing and services sectors in GSVA are higher than that of the agriculture sector have higher GST capacity. States having a higher share of total forest area as in the total geographical area of the state have lower GST capacity. A larger share of forest cover reduces opportunities to expand economic activities in a state. In other words, having higher coverage of forests restricts activities which constrain the expansion of a state's economy. For the post-GST period, states with higher public capital expenditure (as a percentage of GSVA) have higher GST capacity. This indicates that public capital expenditures help a state to improve GST capacity. We also introduce a dummy for the COVID-19 pandemic (1 for 2020-21, 0 otherwise) to control for the impact of the COVID-19 pandemic on GST capacity and GST efficiency for the post-GST period. We see that the GST capacity during the Covid-19 pandemic was lower vis-à-vis other years. However, there was no impact of the Covid-19 pandemic on the tax (GST) efficiency.

The estimated results for the tax inefficiency function show that per capita GSVA (*lnpcgsva*) influences the GST efficiency. For the pre-GST period, there is a non-linear relationship between them *lnpcgsva* and GST efficiency. GST efficiency improves with increasing per capita GSVA (*lnpcgsva*) and after a point, it decreases with a further increase in the per capita GSVA. The analysis shows that states having higher dependence on the SGST in their Own Tax Revenue (OTR) have higher tax efficiency. This shows that the state's effort in collecting SGST is conditional on the dependence of that revenue in the overall own tax revenue mobilisation of the state. Furthermore, there is a positive relationship between GST compensation receipts (from all sources) as a percentage of SGST collection and tax efficiency. This implies that GST compensation did not make states complacent, rather they put larger tax efforts with increasing GST compensation receipts vis-à-vis their own GST collection (SGST along with IGST settlement on SGST account). Grants-in-aid from the Union government finance a large part of revenue expenditure (*grants_revex*) for minor states (*minor_states*) vis-à-vis major states. We find that there is a positive and significant relationship between the interaction dummy of *grants_revex* and *minor_states* (viz., *grants_revex*minor_states*) with tax inefficiency. This implies that with increasing grants-in-aid as percentage of total revenue expenditure, the GST efficiency of minor states declines.

For the pre-GST regime period, we found that states with operational PGT had higher GST efficiency. Before the introduction of the GST, the enforcement wing of the Department of Transport used to scrutinise goods carried by vehicles and location-based tax compliance at check posts and state border check posts.

Compliance enforcement in the PGT used to play a very important role in catching defaulters of VAT and State excise.

For the post-GST period, however, we have not found any impact of PGT on GST efficiency. After the GST introduction, PGT collection has declined. Removal of border check posts may have an impact on PGT collection. On the other hand, since there is a substantial fall in the PGT collection, the state transport department has put little effort into catching the tax defaulters, and therefore, cross-compliance of GST collection may not have any role. In the absence of check posts, tax administration's capacity to enforce/ verify tax compliance in the PGT has reduced, which may have resulted in the fall of PGT collection.

Table 16: Estimated Results of GST Capacity and Efficiency of States

	Pre-GST SFA model (2012-13 to 2016-17)			***Post-GST SFA model (2018-19 to 2021-22)***		
lnsgst	**Coeff**		**Std. err.**	**Coeff**		**Std. err.**
Stochastic Frontier						
lngsva	3.515	***	0.324	0.899	***	0.031
lngsva2	-0.076	***	0.010			
mfg_agri	0.052	**	0.024	0.022	*	0.013
service_agri	0.065	**	0.022	0.090	***	0.009
tfa	-0.004	**	0.002	-0.004	***	0.001
capex				0.024	***	0.003
minor_state*lngsva	-0.021	***	0.004			
lnpop				0.054	**	0.023
covid				-0.059	***	0.020
constant	-23.758	***	2.645	-2.913	**	0.327
Inefficiency function						
lnpcgsva	-3.697	**	1.463	0.620	***	0.160
lnpcgsva^2	0.162	**	0.065			
sgst_otr	-0.014	***	0.002	-0.022	***	0.008
dum_pgt	-0.087	**	0.038			
gstccall_sgst				-0.003	*	0.002
grants_revex*minor_states				0.014	***	0.004
constant	22.364	**	8.233	-6.714	***	1.880
Specification of inefficiency variance function (Usigma)						
constant	-4.063	***	0.618	-3.733	***	0.462
Specification of idiosyncratic error variance function (Vsigma)						
constant	-4.352	***	0.802	-5.757	***	0.473
Diagnostic Stat						
sigma_u	0.131	**	0.041	0.155	***	0.036
sigma_v	0.113	**	0.046	0.056	***	0.013
lambda	1.156	***	0.085	2.752	***	0.044
gamma	0.572			0.887		
Basic Information						
Number of Observations	122.000			112.000		
Number of Groups	25			28		
Wald chi2	10542.890	***		17825.490	***	
Prob>chi	0.000			0.000		
Log-Likelihood	41.449			114.602		
Mean Efficiency	0.605			0.904		

Note: ***, ** and * imply estimated z-statistic is significant at 0.01, 0.05 and 0.10 level respectively.
Source: Computed

With the increasing penetration of Electric Vehicles (EVs) in passenger and goods transport fleets in India, it will be important to explore possibilities of shifting the point of taxation from owning the vehicle (e.g., registration fee and associated taxes) and consumption of fuels (fossil) to using the vehicles (mobility). Any tax on the mobility of the vehicles could be introduced using the provisions under the PGT Act of state governments.

8. Vehicle Mileage Travelled (VMT) Tax

The vehicle mileage travelled (VMT) tax proposes taxing vehicles based on their miles traveled instead of their fuel consumption. This innovative approach collects mileage data and allocates tax liabilities accordingly.

The rationale for the VMT tax lies in the principle of fairness and sustainability in financing road networks. Unlike traditional fuel taxes, which are becoming increasingly inequitable due to the rise in vehicle fuel efficiency and increasing penetration of electric vehicles (including hybrid vehicles),[9] the VMT tax could ensure that all vehicle users contribute appropriately to the costs of road damages and congestion they cause. It is to be noted that electricity used in charging EV batteries is not taxed as much as fossil fuels.

The tax base of VMT tax is the vehicle miles travelled and it closely aligns with the concept of "user fees" on roads. Those who utilise the road more often will pay more VMT tax as compared to those who use less. A suitable design of VMT tax may satisfy all canons of taxation (viz., equity, certainty, convenience, and economy). This approach ensures that the burden of funding transportation infrastructure is distributed more equitably across all vehicle users, regardless of their choice of fuel/ energy.

8.1 Drivers for VMT Tax

> *"Electric vehicles (EVs) and sustainable transportation modes are all the rage. In many ways, that's a good thing. Still, this shift to environmentally sound travel solutions has diminished the returns of most pre-existing taxation systems and sent shockwaves through federal and state-level governments in the United States. While the motor fuel tax has served its purpose by prioritizing alternative fuels over petroleum and mitigating the negative impacts of pollution and traffic congestion, its relevance dwindles as fuel consumption declines. …*
>
> *As fuel tax revenues decline due to EVs and improved fuel efficiency, exploring alternative funding mechanisms like VMT fees becomes imperative for sustainable transportation funding. The timeline of VMT tax initiatives, political acceptance from diverse stakeholders, privacy considerations, and*

[9] As fuel tax paid per unit of distance travelled is falling.

the demonstrated benefits all contribute to the growing viability of this approach." (Team Cardata, 2023)[10]

Therefore, erosion of the motor fuel tax base—due to increasing penetration of Electric Vehicles (EVs) and increasing fuel efficiency of the on–road vehicle fleet—is the major driver for going for VMT.

8.2 Rationale for VMT Tax

Externalities: The VMT tax addresses the externalities associated with driving a vehicle, such as damages caused to roads, congestion, and air pollution. By charging a vehicle based on the distance it travels, this tax incentivises more efficient use of roadways and encourages alternatives like public transport, thereby reducing negative externalities.

Congestion Management: With urbanisation and population growth, congestion of road space in cities and towns in India has become a pressing issue in many states. VMT tax could provide a mechanism to manage congestion by charging higher rates during peak hours or in congested areas. This dynamic pricing may discourage unnecessary trips and incentivise carpooling or using alternative modes of transport (e.g., public transport), parking of vehicles outside the congested zones, etc.

Urbanisation: As urbanisation expands, the strain on transportation infrastructure increases. Traditional funding sources like fuel taxes and taxes on vehicles (e.g., road tax/PGT) struggle to keep pace with the increasing demand for financing transport infrastructure. The VMT tax may be efficient in generating more revenue than the present taxes on either fuels or vehicles.

Road Repair and Maintenance: Roads degrade over time due to usage, weather conditions, and other factors. VMT tax could provide a reliable revenue stream for road repair and maintenance, ensuring that those who contribute more wear and tear to the infrastructure bear a fairer share of the costs.

8.3 Administrative Challenges of Implementing a VMT Tax

Considering the number of vehicles on the roads, the administration of VMT tax may face challenges such as collecting mileage recordings, considering privacy, raising tax demands/invoices, and collecting due taxes.

Mileage Recording

Recording the distance that a vehicle travels on roads is a fundamental requirement for implementing the VMT tax. Several options exist, and each of them has its own set of complexities and costs:

Odometer Readings: This method involves manual reporting of readings either through self-reporting at regular intervals or third-party reporting (e.g., reporting by fuel stations, EV charging stations, emissions inspection centres, or

[10] https://cardata.co/blog/vehicle-mileage-taxes-vmt/ (last accessed on 27 January 2024).

any other certified authorities). Though this is relatively simple, ensuring accurate reporting of readings may not be free from 'mileage fraud' by tampering with the odometer reading.

Automatic Vehicle Identification (AVI): AVI devices, such as RFID tags, provide estimates of mileage based on interactions with roadside or fuelling station infrastructure. While less intrusive than GPS-based systems, they still require widespread infrastructure deployment.

On-Board Units (OBUs): OBUs are sophisticated devices that plug into a vehicle's on-board diagnostic port, enabling real-time mileage tracking. While offering high accuracy and potential for variable tax rates, they require significant upfront investment and may not be compatible with older vehicles.

Privacy Considerations

Studies examining VMT tax schemes have consistently highlighted privacy as a key consideration, with participants expressing apprehension about the government's potential invasion of their privacy rights.

Addressing privacy concerns is paramount for the successful implementation of VMT tax systems. One potential solution could be the involvement of private firms in data collection rather than relying solely on the government authorities. By entrusting data collection to private entities, there may be a perceived increase in the protection of individual privacy rights, potentially alleviating some of the apprehension surrounding VMT taxation.

Invoicing and Tax Collection

Once mileage is recorded, invoicing and collecting taxes may pose challenges, especially for numerous vehicle owners in India. Depending on the mileage recording system, invoices can be issued annually, monthly, or even per trip basis. Integrating VMT taxes into the existing electronic toll collection system like ***FASTag bills*** may be efficient as well as convenient for vehicle owners. Effective enforcement mechanisms must be in place to deter tax evasion and ensure tax integrity.

We present the problems and possible prospects (solutions) as follows:

Problems	Prospects
Political acceptance from diverse stakeholders *a) Such a tax could burden the trucking industry and clear the way for increased pricing on consumer goods.* *b) It would be challenging to levy taxes on individuals who travel across state lines, as they would cause damage to the roads of multiple states but only pay taxes in the state of their residence.* *c) A complex approach risks becoming excessively convoluted for states and taxpayers,*	• Drying up of revenue stream from the existing taxes on vehicles may force the political parties or alliances in the governments to cut public expenditures, and therefore may reduce their prospects to get re-elected. • Though VMT has not yet been approved in Texas, an unexpected collaboration between Republicans and Democrats has put the prospect of a mileage tax in a positive light.

Problems	Prospects
reducing transparency and hindering effective tax collection.	
Environmental Issues *Environmental groups worry that the vehicle mileage tax might discourage fuel-efficient and electric vehicles, potentially favouring petroleum-powered cars.*	• Support is growing for mileage-based fees, special rates for low-income drivers, and rates linked to vehicle pollution levels. Policies should align with efforts to reduce carbon emissions and combat climate change.
Privacy considerations: *Data security concerns become particularly significant if GPS tracking is incorporated into the system. Understandably, individuals may be reluctant to agree to constant vehicle location monitoring by the government. However, these concerns can be addressed.*	• The OReGo pilot program in Oregon deletes collected data after 30 days. • Limiting data collection to essential information could mitigate privacy and security risks. • A private company could act as an intermediary, collecting GPS data and controlling the information transferred to the government.
Demonstrated benefits	• The rationale behind this approach is simple—the heavier the car, the more damage it causes to the roads, while wear and tear decrease with increased axles.
Higher expenses *a) Implementing the new tax would incur higher costs than the motor fuel tax. States would need to distribute specific hardware to vehicle owners for mileage tracking over millions of vehicles.* *b) Implementing the vehicle mileage tax is complex and requires significant staffing and financial resources for the tax departments.*	• Returns from investments in tax administrations are always found much higher.
Mileage fraud *There is a potential for individuals to resort to mileage fraud as a means of reducing their tax burden, primarily if the government relies on data collected directly from vehicles. Verifying the accuracy of mileage data would be challenging, and tools for altering vehicle mileage are readily available. Odometer fraud is already a prevalent issue, and implementing the pay-per-mile tax system could exacerbate the problem.*	• A more layered approach involves detailed ***GPS tracking***. Although this method would require additional resources, it offers greater efficiency. • ***FASTag Bills****, which is an electronic toll collection system operated by the National Highways Authority of India, uses radio frequency identification (**RFID**) technology for making toll payments. Adoption of technology-backed infrastructure could easily identify routes, distance travelled and the speed of movement of vehicles along the route. Hence, in principle, the ecosystem could help to implement PGT based on the actual movement of vehicles on roads in future. This will also facilitate automatic tax collection based on the FATag system.*

8.3 Examples of VMT taxation

Oregon: Oregon's ***OreGo pay-per-mile*** system has been lauded as a way to maintain road and bridge funding while gas-based taxation diminishes. The program, which aims to reduce greenhouse gas emissions, is still fully recouping fees to offset the reduction in gasoline taxes.

Utah: In 2020, Utah launched a voluntary program that allows EV drivers to pay per mile instead of a flat fee during annual registration.

Virginia: Virginia's Department of Motor Vehicles introduced the ***Highway Use Fee*** to compensate for reduced fuel taxes from fuel-efficient and electric vehicles.

Hawaii: Hawaii enacted mileage-based road usage legislation on July 1st, 2023. The state's Senate Bill 1534 abolishes the $50 annual registration surcharge for electric vehicles (EVs). It introduces the option for owners to pay a registration surcharge or a per-mile road usage fee until June 2028. Those selecting the per-mile cost must provide odometer readings to the state.

Texas: A Texas House panel has proposed a truck tax pilot program that would impose tariffs on commercial trucks. The revenue generated would specifically benefit road repairs.

9. Conclusions

We find that out of 28 Indian states, only 11 states consistently collected Passenger and Goods Tax (PGT) during the period 2011-12 to 2021-22. There is scope for reforms in this tax handle in terms of revising the tax rate structure, expanding the tax base and adopting technology-driven tax administration. In this study, we estimate state-wise revenue potential from the PGT in 2021-22 and found that together, states could generate additional revenue of Rs. 29,274 crore if they adopt the PGT design and structure of Himachal Pradesh. Given the stock and composition of the vehicle fleet, revenue potential will vary across states.

Implementation of the PGT has a positive externality in terms of increasing efficiency in other taxes like GST and State excise. For example, we found that tax efficiency was higher for the revenue that is subsumed into the GST for states where the PGT was prevalent consistently. After the introduction of GST in 2017-18, PGT collections have fallen across all states. Removal of border check posts could be one reason behind this fall.

With the increasing penetration of Electric Vehicles (EVs) in passenger and goods transport fleets in India, it will be important to explore possibilities of shifting the point of taxation from owning the vehicle (e.g., registration fee and associated taxes) and consumption of fuels (fossil) to using the vehicle (mobility). Any tax on the mobility of the vehicles (like Vehicle Mileage Travelled Tax) could be introduced using the provisions under the PGT Act of state governments.

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Appendix A

Himachal Pradesh collects the highest per-vehicle PGT across states. Table A.1 summarises the tax structure of PGT for Himachal Pradesh.

Table A.1: Tax structure for Himachal Pradesh (as on 31 March 2019)

Buses	Trucks	Tractors and Trailers	Two wheelers	Cars and Jeeps	Taxi	Auto Rickshaws/Three Wheelers
Stage Carriage: Rs 500 PSPA Contract carriage: Rs 1000 PSPA	LGV: Rs 1500 PA MGV: Rs 2000 PA HGV: Rs 2500 PA	Rs 1500 PA	LTT for a period of 15 years Engine Capacity up to 50: 3% of price Engine Capacity > 50: 4% of price	LTT for a period of 15 years Engine Capacity up to 1000: 2.5% of Vehicle Cost Engine Capacity > 1000: 3% of Vehicle Cost Commercial pick-up jeeps: Rs 1500 PA	Rs 350 PSPA	Passengers: Rs 200 PSPA Goods: Rs 1500 Rs

Notes: LGV: Light Goods Vehicles, MGV: Medium Goods Vehicles, HGV: Heavy Goods Vehicles. PSPA: Per Seat per Annum, PA: Per Annum, LTT: Life-Time Tax

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