

How are Developing Countries Addressing the Electric Vehicle Industry?

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Abstract

Governments of developing countries across the world are currently taking action to expand the development of electric vehicle industries. This paper aims to explain the current changes and their possible economic impacts on individual nations, as well as to address the question of whether or not it is too early for such nations to expand electric vehicle industries rather than spending government money on other aspects of economic development or infrastructure.

Introduction

In our ever-changing world, we can see now more than ever that environmental problems lie at the forefront of international fears. With increasing populations come subsequent increases in carbon emissions, a great portion of which are from transportation. Transportation in the current age takes up about a fifth of global carbon emissions¹ (Our World in Data). Of this, road travel accounts for three-fourths of those emissions, with a large portion (45.1%) of that sourced from passenger vehicles, such as cars or buses. Steadily, with the expansion of electric vehicle technology, we can see vehicles with lower lifetime emissions being introduced into the market. However, vehicles like these tend to be much more expensive than traditional fuel-powered vehicles, with prices of popular electric cars ranging between the equivalent of \$20,875 and \$181,450². Meanwhile, the prices of fuel-powered vehicles, especially used vehicles, tend to stay much lower, making used vehicles very popular in developing countries. Partially as a result of this, developing countries tend to have a very large share of their emissions being from transportation, with nations such as Nepal having a 39% share of their emissions from transportation³. Because of this, nations such as Nepal have sought to decrease their transportation-associated emissions through the ways of tax credits, acknowledging that in order to make electric vehicles more viable for their population, they must make them affordable.

Through a variety of tax credits, governments of developing countries are hoping to expand and improve the electric vehicle industry.

Tax Methods

These governments often do not use a single tax credit, but instead multiple to create widespread impacts. Taxes on such vehicles are broken up into multiple sections, which the governments set and target individually. This includes - but is not limited to - CDTs (Custom Duty Taxes), EDTs (Excise Duty Taxes), VATs (Value-Added Taxes), and RDTs (Road Development Taxes). All of these taxes are important in our analysis, for each government responds differently, lowering them in different ways to stimulate the EV industry. CDTs are taxes imposed on goods (in this case vehicles) that are transported across the international border. EDTs are taxes placed on the consumption of goods for “manufacturing, importing, selling, and storing excisable goods.”⁴ A Value-Added Tax is one place for each production level for the good, which indirectly affects the consumer. Lastly, RDTs are taxes placed upon the sales of goods that go towards developing roads for national infrastructure. Also important to note are vehicle property taxes (taxes placed on those who own vehicles), tariffs (which will be delved into in the next discussion), and the system of “tax holidays.” All of these various methods are important to note, as they function as methods through which governments can alter their economies towards a more sustainable future.

Representative Nations

In this discussion, we focus on three different countries: Costa Rica, Nepal, and Rwanda. When deciding which countries to focus on for the purpose of this article, these were notable because they are located in different regions sections of the world and use different methods to

amp up their responses to electric vehicles. All three nations are labeled “developing countries” by their score on a formula known as the “Human Development Index” which accounts for various aspects of life in the nation, such as fertility rates, wealth inequality, GDP per capita, and more. The Human Development Index is used to represent the level of economic and social development within a nation, and to distinguish between “developing” and “developed” nations. Costa Rica, Nepal, and Rwanda have scores of 0.81, 0.602, and 0.543, respectively, labeling them either on the edge between developing and developed or as developing nations⁴. Despite its score of 0.81, Costa Rica is still internationally considered a developing nation. As all three are labeled “developing nations” and represent separate areas of the world, they provide the opportunity to study the effects - or projected effects - of tax credits on a wide array of circumstances.

Individual Changes

To begin an analysis, first, this paper compares the responses from each country to electric vehicles in terms of their changes in Customs taxes and tariffs, as well as their Excise Duty taxes and VATs, as all affect the production and feasibility of bringing in electric vehicles to sell in each country. In the new budget that will take effect in 2023, the Costa Rican government set out new VATs and Customs Taxes. The Costa Rican government has set up a plan to have value-added taxes of 1% for electric vehicles in 2023. This is a massive deduction from the usual Added Value tax of 13%, and until 2035, the Added Value tax will increase by 1% yearly, before leveling out again at 13%⁵. In their Customs Taxes, Costa Rica has created a system in which from 2023 until the end of 2025, the customs taxes on electric vehicles will be fully exempted. This system will operate similarly to that of their VATs in that it will steadily return to normal

levels, as the reduction will be 75% between 2025 and 2027, then 50% between 2028 and 2030, a 25% reduction between 2031 and 2033, and returning to normal levels in 2034 (Outlier Legal Services). The Costa Rican government has also offered partial excise duty tax exemptions over the next five years, and has reduced vehicle property taxes in a similar manner to VATs, with the current system granting a full exemption from vehicle property taxes for electric vehicle owners in 2023. This will increase over time, falling to an 80% reduction in 2024, a 60% reduction in 2025, a 40% reduction in 2026, a 20% reduction in 2027, and no reduction starting in 2028. In addition, the Costa Rican government, starting in 2018, has provided other, unique incentives, such as the elimination of license plate restrictions, free parking (similar to the US system of handicap parking designation), and waiving payments for yearly road permits for owners of electric vehicles⁶. The free parking program, for example, helps consumers by making parking (which normally is incredibly cheap, with prices “ ¢200 and ¢500”⁷. This translates to about 85 cents on the high end, meaning that overall, this is not individually a large saving incentive for consumers. The effects of the programs introduced in 2018, alongside the budget set up in 2017 that introduced weaker incentives for electric vehicle purchasing and production, can already be seen, as in 2020 alone, the imports of electric vehicles grew by 23%. Through these programs, Costa Rica is expected to achieve 15,000 electric vehicles in circulation in 2023.

When discussing the potential impacts of these tax changes in Costa Rica, it is essential to note that each tax change can have differing effects on the industry and on consumers, some being more easily visible than others. VATs, for example, have comparably more notable effects than other taxes, leading them to be among the more controversial taxes. Presently, the US is “the only major country that does not have a value-added tax.”⁸ In many countries, this is a major source of tax revenue, making up above 20% of total tax revenue for nations such as the United

Kingdom, Sweden, Chile, Poland, Hungary, and more. A reduction in this tax can mean a large decline in tax revenue for the Costa Rican government, as the tax's ability to gather revenue for the government from every step of the industrial supply chain is a major boon, and can greatly increase government profits, providing money to be spent on other sectors of the economy. With the current VAT for most products in Costa Rica being 13% the fall to 1% is a major decline, major enough to greatly benefit the industry, but it also may significantly hurt Costa Rican government income. The system of yearly increases rising back to the standard 13% allows for the potential for the industry to greatly expand, as each step of the supply chain becomes cheaper, decreasing average costs for producers at all stages alongside consumers, and allowing for a continued buildup until the industry is hopefully large enough to support the standard 13% VAT.

On the other hand, Nepal responds differently to these taxes. Nepal has had a notably different history regarding electric vehicles, as its tax incentives passed in the 2016-2017 fiscal changed the customs tax to 10% and 1% for private and public electric vehicles, respectively, as well as a 13% VAT⁹. This system led to the existence of 45,000 electric vehicles in Nepal in 2018, and it is still increasing with new incentives in the 2022 budget. In the new budget, the Nepalese government has added a 50% reduction in excise duty taxes, reducing the cost of importing equipment and raw materials required for producing electric vehicles¹⁰. They have also lowered the CDT to 25% for four-wheeled and ambulance EV materials, as well as a 1% CDT for materials for EV scooters, motorcycles, and rickshaws. This is a notable change from the previous budget (Budget 2078/2079), which set EDTs to 0% and greatly lowered CDTs but did not affect RDTs or offer general tax breaks. In the new budget, the RDT rates have not been touched, however, which was a change from the previous budgets, which offered yearly

exemptions from RDTs to support the EV industry. Although this seems like a step back in expanding the industry, the changes in EDTs and CDTs may greatly outweigh this decline. In addition, Nepal has enacted a unique program in its Budget 2078/2079 that is continuing in the future, offering a 40% income tax break for employees of electric vehicle companies for six years after they begin operations, offering an incentive for individuals to seek jobs in the electric service industry in addition to the previous provisions that incentivized corporate expansion. The Nepal government also plans to expand charging stations across the nation, with a current plan to reach 50 charging stations across the nation, and 500 in the future. In addition, a tax only noted within Nepal among the nations studied in this article, is a change in the motor renewal taxes, as consumers who purchase an electric vehicle in Nepal will receive a six-year exemption from such taxes. Although comparably weaker than Costa Rica due to its lack of a large-scale reduction in the VAT, the Nepal budget has the capacity to greatly expand the EV industry through its reductions in customs taxes. The change in EDTs is described by J. Fred Giertz from the University of Illinois, “ In the short run, an excise tax increases the price of the product, albeit by less than the full amount of the tax, and the price burden is shared by both the producers and the consumers. The exact effect depends on the elasticities of demand and supply for the product.”¹⁰.

Rwanda has provided another plan for expanding the EV industry. With Rwanda’s current annual vehicle growth rate of 12%¹¹, the new budget is targeted towards shifting this growth more towards EVs. These incentives are targeted both at charging stations and at the materials for manufacturing the vehicles, with a significantly reduced tariff for the electricity used for charging stations (moved to the industrial level, at 94 Rwf/kilowatt hour). In addition, the Rwandan government has decreased the VAT, CDT, and EDT to 0% (from the usual standard for

vehicles of 25%) for “electric vehicles, spare parts, batteries, and charging station equipment”¹².

The Corporate Income Tax is also lowered by this new set of incentives to promote new growth in domestic companies involved in the EV industry, similar to Nepal’s reduction of the same.

With these three nations’ diverse situations, they adopt different strategies to promote sustainable growth, with all having some overlap, but different possible effects. Rwanda’s massive-scale drop in VATs, CDTs, and EDTs provides what is arguably the largest potential for growth in the EV industry, as import prices are significantly decreased as well as domestic production prices, decreasing prices of importing vehicles by an incredible margin, but also decreasing prices on every step of the production process, promoting the growth of domestic firms. However, this great decline removes a massive amount of government income, as a full VAT exemption with no policy for its regrowth over time (resembling Costa Rica’s policy) causes the government to lose the ability to gather some of the most important revenue-gathering taxes available. The Rwandan policies, due to their extremity, display the potential for the greatest economic impact of the three discussed.

Elasticity Impacts

Although not all of these new budgets have been implemented yet, we can predict the effects of these different policies through traditional economic analysis techniques. See Table 1. In Table I, we can see the world price with a tariff, as well as traditional supply and demand curves. With the decrease in VATs, EDTs, and other producer cost-reducing changes such as the corporate income taxes, notice the supply line moving outward to the right, as firms are encouraged to produce more, as costs of importing materials are lower. On the other hand, the demand curve also will move out to the right, with declines in CDTs and the implementation of

non-tax-related consumer incentives, such as Costa

Rica's use of designated free parking spots for EV drivers.

In addition, the price of importing full vehicles will be lower with the decreased tariffs, increasing demand by making it easier for consumers

to buy EVs. This increase in

demand, combined with the increase in quantity supplied, will cause a massive increase in the market, promoting a brighter future for these nations' EV industries. On the other hand, the

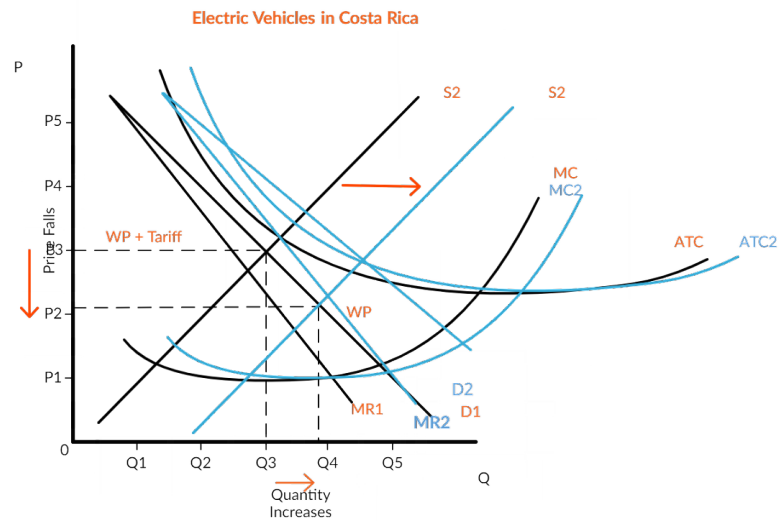
question must be posed: is EV investment the best idea for these developing nations? Is it too

early? When assessing this question, it is important to note the elasticities of demand and supply

for electric vehicles in such nations. How much will the quantities of electric vehicles and

associated materials be affected by a deduction in the taxes that raise the prices of such goods?

To calculate the elasticity of demand, this paper refers to traditional economics formulas.



$$\text{Price elasticity of supply} = \% \text{ change in price} / \% \text{ change in quantity supplied}$$

$$\text{Price elasticity of demand} = \% \text{ change in price} / \% \text{ change in quantity demanded}$$

The price elasticities of supply and demand are crucial because they indicate how much the new budgets and incentives can help the nations to expand their EV industries. With the current tax

incentives, governments can lower prices, greatly increasing demand. With the current economic situation, electric vehicles are listed as price-elastic, with elasticity statistics in nations such as Norway reaching levels such as -1.27 for battery-powered electric vehicles and -1.72 for hybrid electric vehicles¹³. In developing nations, this statistic may only reach higher, as high quantities of available used fuel-powered vehicles provide a cheaper alternative to electric vehicles, and by closing the gap between the prices of electric and fuel-powered vehicles, the government can greatly expand the demand for such products. This means that with declines in price, a very significant change in demand can be expected - for Norway, a price change in battery-powered electric vehicles of 10% would create a change in demand of 12.7%. In Costa Rica, Nepal, and Rwanda, this will likely create much stronger rippling effects, meaning that declines in price open up the path to great expansions in consumer demand. With tax reductions such as VATs that reduce costs on every step of the producer-consumer chain, a massive increase in EV demand can be expected. With these high elasticities, it can be argued that it is very worthwhile for the governments of these nations to decrease taxes affecting the EV industry.

Conclusion

How do these nations play a role in the grand scheme of expanding electric vehicle use and bringing sustainable technology to developing countries across the world? Presently, they are working to close the gap between their electric vehicle industries and those of more developed nations - which greatly expands the possibility for growth in sustainable practices in these nations. From an analysis of representative developing nations, it can be concluded that tax deductions affecting the electric vehicle industries can greatly stimulate the growth of such industry, making the effort worthwhile for the government.

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