ELECTRIC CAR INCENTIVES: STATE INVESTMENTS OR MISGUIDED FUNDS?

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Abstract

Government subsidies are influential economic tools that help states achieve their objectives, especially when combined with restrictive measures. However, the effectiveness of these incentives depends on whether they are well-directed and thoroughly considered. This paper explores state investments in promoting electric vehicles (EVs) to understand the effects of subsidies from ecological, economic, and technological perspectives. It addresses issues such as justification, timing, benefit distribution, infrastructural challenges, and potential dependency on subsidies. The research focuses on whether EVs are the best solution for climate change if government incentives are the fairest and most effective way to increase EV adoption, and the overall impact of these incentives on the EV sector. By creating specific null and alternative hypotheses, the authors provide a comprehensive analysis of EVs' ecological and economic benefits. The paper discusses both the advantages and disadvantages of government incentives for EVs, considering multiple fields. It concludes with recommendations for more effective strategies to reduce urban transportation pollution. The authors emphasize the importance of carefully planning and executing subsidies to ensure substantial benefits without unintended negative consequences.

Keywords: *Electric vehicles (EVs), Government incentives, CO_2 emissions, Sustainable development, Economic growth, Public health, Technological innovations, Infrastructure.*

1 INTRODUCTION

1.1 Significance of the Topic

The discussion on government investments in electric vehicle (EV) incentives is highly relevant, given the global push to reduce greenhouse gas emissions and foster sustainable development. These investments are crucial for transitioning the transportation sector into greener alternatives. EVs offer significant ecological advantages by reducing CO_2 emissions and harmful gases when powered by renewable energy sources. As the transportation sector is one of the biggest emissions contributors, promoting EVs through government incentives can significantly accelerate this transition.

Economically, EV incentives boost demand and stimulate production, create jobs, and foster innovation within the automotive industry. That reduces reliance on fossil fuels, enhancing energy security and improving trade balances, especially for countries lacking fossil fuel resources. Investing in EVs also

paves the way for new industries like battery manufacturing, charging infrastructure, and smart grids, contributing to overall economic growth.

Socially, EVs help reduce air pollution in urban areas, which consequently leads to better air quality and public health. Incentives, such as subsidies and tax breaks make EVs accessible, promoting sustainable living. Technologically, government support for EVs drives research and development in advanced batteries, autonomous driving, and smart grids, boosting the nation's technological capabilities and competitive edge in the global market.

However, while the benefits are compelling, there are notable challenges. The justification for substantial subsidies in the context of current technological limitations and unresolved issues in the EV industry is questioned. EVs represent a tiny fraction of the global vehicle fleet, raising questions about their immediate environmental impact. There's also a debate on whether it is prudent to invest heavily in EV production and sales, given that many countries' electrical grids still heavily rely on fossil fuels.

High costs are another concern, especially for developing countries, where funds might be more effectively utilized elsewhere. Additionally, incentives often benefit wealthier individuals more, potentially widening the socio-economic gap without substantial environmental gains. There's also the risk of market instability if subsidies are reduced or eliminated.

Infrastructure remains a significant challenge. Without sufficient charging stations, particularly in rural areas, and an electrical grid capable of handling increased demand, the effectiveness of EV incentives is limited. Moreover, the global context must be considered, as marginal improvements in air quality in certain regions might come at the cost of increased emissions elsewhere due to energy production dynamics.

In conclusion, while government investments in EV incentives offer numerous potential benefits, including reduced emissions, economic growth, and improved quality of life, their success depends on careful planning, addressing inherent challenges, and committing to long-term sustainable development goals.

1.2 Overview of the Article

Section 2 presents global trends in government incentives in electric vehicle manufacturing and selling. Section 3 discusses the main arguments that support the implementation of government incentives, while Section 4 addresses those who oppose state intervention and government incentives for EVs. The authors analyzed the issues from various perspectives, with particular emphasis on the role of public administration, the viewpoint of citizens, and the overall impact of EVs on the environment.

The following research questions guided this analysis:

A. Are electric vehicles the best option for addressing climate change and protecting the environment?
B. What is the impact of government incentives on the production and acquisition of electric vehicles?
C. Are government incentives the best and fairest solution for increasing the share of electric vehicles in the overall fleet of passenger cars?

To this end, the authors formulated null hypotheses as:

h_{A0}: Electric vehicles are the best option for addressing climate change and protecting the environment.
h_{B0}: Government incentives do not affect the production and acquisition of electric vehicles.
h_{C0}: Government incentives are the best and fairest solution for increasing the share of electric vehicles in the overall fleet of passenger cars.

In this context, alternative hypotheses can be:

h_{Aa}: Electric vehicles are not the best option for addressing climate change or protecting the environment.
h_{Ba}: Government incentives do affect the production and acquisition of electric vehicles.
h_{Ca}: Government incentives are neither the best nor the fairest solution for increasing the share of electric vehicles in the overall fleet of passenger cars.

Section 5 presents conclusions about the research questions and the hypotheses put forth. Section 6 shows some recommendations for effective pollution reduction from the city traffic.

2 GOVERNMENT INCENTIVES AND ELECTRIC VEHICLES: GLOBAL TRENDS

Investment in electric vehicles (EVs) is rapidly increasing worldwide. In the European Union (EU), governments and the private sector are actively promoting sustainable transportation. Government investments in electric vehicles are crucial for accelerating the transition to sustainable transport. The results have varied depending on specific policies, market conditions, and infrastructure capacities. Below, we will provide an overview of the results achieved globally.

The electric vehicle (EV) sector is advancing rapidly due to technological innovations, environmental consciousness, and government backing. Different regions show varied outcomes, but the trends are notable globally.

In 2022 and 2023, EV sales surged, with China, the U.S., and the EU leading the way. China remains the largest market for EVs. In 2022, EVs accounted for about 10% of new car sales globally[1]. Investments in battery technology have also soared. Companies like Tesla and CATL invest massively in R&D to reduce costs and enhance battery capacity and lifespan, with new technologies like solid-state batteries promising better safety and efficiency.

Charging infrastructure is expanding globally. Ambitious plans in the U.S. and EU aim to build hundreds of thousands of new charging stations. Political support is strong, with stricter emissions regulations and incentives for EV buyers.

The used EV market is growing, making EVs more accessible. Prices drop significantly within the first two years of use, benefiting buyers but potentially discouraging new EV purchases. Additionally, EVs are leading the way in integrating advanced technologies such as autonomous driving, enhancing their appeal.

The U.S. and Europe are investing in domestic production to boost competitiveness. Collaboration is key for further technological progress but is often limited. Successful cooperation is seen in creating and implementing standards, such as the Renault-Nissan-Dongfeng partnership. Government restrictions, like the U.S. imposing a 10% import duty on China[2], influence competitive dynamics.

These trends highlight that many have realized the growing importance of electric vehicles in the transition to sustainable transportation and that the battle for market dominance will intensify.

3 ARGUMENTS FOR STATE INVESTMENT IN EV INCENTIVES

State investments in EV incentives can offer numerous social, economic, and environmental benefits. They strategically advance a sustainable, green economy. Public administration plays a crucial role in this transition by implementing effective policies. Proponents highlight reasons such as:

- Reducing emissions and protecting the environment.
- Improving public health and lowering healthcare costs.
- Boosting economic growth and job creation.
- Promoting sustainable mobility through the development of infrastructure for charging electric vehicles.
- Encouraging innovation and technological progress.

Government investments in EV incentives are primarily motivated by reducing harmful gas emissions, improving air quality in cities, and combating climate change. The transportation sector is a significant source of CO_2 and pollutants, and EVs when powered by renewable energy, produce significantly fewer

[1] J. Liu, "Global EV market grew 55% in 2022 with 59% of EVs sold in Mainland China," 15.03.2023. [Online]. Available: https://canalys.com/static/press_release/2023/1766706937Worldwide-EV-Car-sales-2022.pdf.
[2] D. Roščić, "SAD: od danas važe carine za robu iz Kanade, Meksika i Kine," 01.02.2025. [Online]. Available: https://www.dw.com/sr/sad-od-danas-va%C5%BEe-carine-za-robu-iz-kanade-meksika-i-kine/a-71480121.

emissions[3]. Many countries are committed to emission reduction through agreements like the Paris Agreement[4], and EV incentives help meet these obligations.

Internal combustion vehicles emit harmful gases and particulates, causing health issues and noise pollution. EVs do not produce exhaust emissions and are quieter. They improve air quality and quality of life in urban areas. The automotive industry faces pressure from tightening regulations. The EV incentives, by stimulating demand and innovation, foster economic growth and job creation.

Countries investing in EV technology remain competitive globally. Nations dependent on imported oil benefit from EVs powered by locally produced electricity, enhancing energy independence[5]. Charging infrastructure, essential for EV adoption, often requires government investment to develop adequately[6].

Initial EV costs deter consumers, but government incentives make EVs more accessible. Incentives often include awareness campaigns and fostering acceptance of sustainable transportation. Successful policies involve financial incentives, regulations, and infrastructure, engaging manufacturers and communities.

In summary, government investments in EV incentives reduce emissions, improve health, stimulate economic growth, and enhance energy independence. These investments are crucial for a sustainable transportation system, achieving long-term climate goals, and benefiting the environment and society.

4 ARGUMENTS AGAINST STATE INVESTMENT IN EV INCENTIVES

Numerous counterarguments related to social, economic, and environmental benefits follow Government investments in incentives for electric vehicles.

Each advantage also presents challenges:

- Validity of EVs' environmental impact.
- Accuracy of claims about automotive engines and air pollution.
- Legitimacy of economic growth and job creation claims.
- Financial burden on taxpayers.
- Risks of economic downturns due to poor investment execution.
- Reliance on government subsidies.
- Technical challenges and battery safety issues.

Although electric vehicles are considered environmentally friendly, their production, use, and recycling carry numerous environmental risks.

For instance, the average electric vehicle contains approximately 83 kg of copper, whereas a gasoline vehicle contains about 23 kilograms[7].

The Renault Zoe battery contains approximately 8 kg of lithium[8], while the equivalent Renault Clio does not contain any lithium.

If the entire vehicle fleet were to be electric vehicles, the energy systems of many countries would be unable to sustain this demand, especially with only renewable energy sources.

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[3] D. Andrić, *Veliki plan: Dolaze subvencije za električne automobile na razini cijele Europske unije?!*, “HAK Revija”, 22.01.2025.

[4] UNFCCC, "Paris Agreement," 2015. [Online]. Available: https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

[5] Automobili, "Potez očajnika: Europa dijeli poticaje za električna vozila u svim zemljama EU?". 31.01.2025. [Online]. Available: https://www.automobili.ba/potez-ocajnika-europa-dijeli-poticaje-za-elektricna-vozila-u-svim-zemljama-eu/.

[6] BESEN, "8 razloga za investiranje u stanice za punjenje električnih vozila". 26.12.2024. [Online]. Available: https://www.besen-group.com/bs/8-reasons-to-invest-in-ev-charging-stations/.

[7] C. Bennett, "Driving the green revolution: The use of copper in EVs". 25.07.2022. [Online]. Available: https://www.innovationnewsnetwork.com/green-revolution-use-of-copper-in-evs/22503/.

[8] P. Lima, "New generation Renault ZOE battery details". 14.05.2020. [Online]. Available: https://pushevs.com/2020/05/14/new-generation-renault-zoe-battery-details/.

Lithium-ion (Li-ion) batteries now account for about 95% of all electric vehicle batteries, with demand increasing by 55% in 2022[9]. Batteries production requires significant energy and raw materials, while recycling is complex and costly.

According to T&E[10], the production of a small vehicle like the Renault Zoe emits 6.85 tons of CO_2, compared to 4.49 tons emitted during the production of the gasoline-powered Clio.

According to available data, the CO_2 emissions from these two vehicles become comparable after approximately 17,000 kilometers of driving. They reach the milestone during the third year of operation.[11]

Literature compares the health impacts of emissions from internal combustion engines, fossil fuel power plants, steel mills, and cement factories. Several studies have demonstrated that emissions from industrial sources, particularly power plants and steel mills, are key contributors to air pollution that can lead to respiratory and cardiovascular diseases[12]. Urban heating plants predominantly use fossil fuels and contribute significantly to this issue. Research indicates that approximately 72% of buildings in Europe utilize fossil fuels for heating[13].

According to Oberschelp, Pfister, & Hellweg[14], exhaust emissions from vehicles are directly linked to urban pollution and have an immediate impact on public health, particularly in cities with high traffic levels. That raises the question of whether new electric vehicles will automatically improve street conditions. The most likely answer is no. Therefore, a prudent choice for public administration would be to remove older vehicles from the streets through buyback and recycling programs at market prices that are certainly lower than subsidies for purchasing electric cars. Such an approach would promptly and effectively eliminate polluters.

However, if we consider CO_2 emission more broadly, we must also include the impact of wildfires. The most recent wildfire in California, which occurred in January 2025, emitted approximately 4.4 megatons of carbon dioxide (CO_2)[15]. That corresponds to the emissions associated with the production of about one million Clio cars, or an annual emission of around 4.9 million vehicles (assuming an emission of 120 g/km CO_2 and an annual mileage of 7,500 km). Additionally, this wildfire was smaller in scale compared to the annual fires in Chile and Canada.

The validity of claims regarding economic growth and the creation of new jobs raises a significant dilemma concerning the transition to electric vehicles: Will economic growth and job creation offset the losses in traditional sectors related to internal combustion engines (ICE)?

Several key reasons suggest that EVs may not significantly increase job numbers or could even lead to a net loss of jobs:

- Reduced Jobs in Manufacturing: EVs have fewer parts and more automation than ICE vehicles, leading to fewer manufacturing jobs.
- Job Losses in Traditional Sectors: Decline in ICE components and maintenance leads to job losses in these sectors.

[9] IEA, "Global EV Outlook - Trends in batteries". 2023. [Online]. Available: https://www.iea.org/reports/global-ev-outlook-2023.

[10] T&E, "How clean are electric cars?". 30.05.2022. [Online]. Available: https://www.transportenvironment.org/articles/how-clean-are-electric-cars.

[11] Z. Cekerevac, *Ecological and Economic Risks of Using Gasoline, Electric, Hybrid, and Hydrogen-Powered Vehicles*. "MEST Journal" , 2025, vol. 13, no. 2.

[12] C. Oberschelp, S. Pfister and S. Hellweg, *Global site-specifc health impacts of fossil energy, steel mills, oil refineries and cement plants*. "Scientific Reports", 22.08.2023, p. 13708.

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[14] C. Oberschelp, S. Pfister and S. Hellweg, *Global site-specifc health impacts of fossil energy, steel mills, oil refineries and cement plants*, *"Scientific Reports",* 22.08.2023, p. 13708.

[15] K. S. Petersen, "No, LA wildfires haven't emitted more CO2 than all US cars | Fact check," 31.01.2025. [Online]. Available: https://www.usatoday.com/story/news/factcheck/2025/01/31/la-fires-co2-car-use-fact-check/78006031007/.

- Concentration of Battery Production: Battery manufacturing is limited to a few countries and is highly automated, creating fewer jobs[16].
- Uneven Distribution of Benefits: EV industry requires highly skilled workers, potentially causing economic inequalities.
- Limited Growth in New Sectors: New jobs in charging stations and battery recycling may not offset losses in traditional sectors[17].
- Economic Risks: Dependence on subsidies, market instability, and rapid tech advancements may jeopardize jobs. Active policies are needed to support worker training, promote new sectors, and encourage regional development to mitigate adverse effects. Without such measures, the shift to electric vehicles could result in overall job losses and a rise in economic inequalities. Vehicle depreciation also impacts owners[18,19].

From a taxpayer's perspective, several key risks and issues follow government incentives for electric vehicles (EVs). These incentives, funded by tax revenues, raise concerns such as:

- High Costs to Taxpayers: EV incentives burden the state budget, potentially leading to higher taxes or reduced funding for public services (healthcare, education, infrastructure)[20].
- Unequal Distribution of Benefits: Incentives often benefit wealthier individuals, while low-income taxpayers may end up at a disadvantage. Incentives are usually concentrated in urban areas with better infrastructure[21].
- Investment Efficiency: If incentives do not significantly increase EV numbers and reduce emissions, they may waste public funds. Allocating resources to other environmental projects (e.g., renewable energy, public transportation) might be more effective.
- Dependency on Subsidies: EV demand, relying solely on subsidies could destabilize the market if incentives are reduced or eliminated, resulting in taxpayer losses.
- Environmental and Social Risks: Battery production for EVs requires significant energy and critical materials, potentially causing adverse environmental and social impacts. Unresolved battery recycling issues may lead to environmental remediation costs.
- Transparency and Accountability: Taxpayers need a transparent system to monitor the use of funds from EV incentives and evaluate the program's effectiveness[22].
- Long-Term Economic Effects: Transitioning to EVs may cause job losses in traditional sectors. New jobs in the EV sector may not fully compensate for these losses. Volkswagen, for instance, plans to eliminate over 35,000 jobs in Germany by 2030[23]. Audi's factory closure in Brussels will result in nearly 3,000 job losses[24].

Taxpayers demand responsible and efficient use of public funds, with minimal risks and maximum societal benefits. Improper implementation of EV incentives can lead to negative economic consequences, affecting taxpayers and the broader community. If EV usage and CO_2 reduction targets

[16] Automobili, "Potez očajnika: Europa dijeli poticaje za električna vozila u svim zemljama EU?". 31.01.2025. [Online]. Available: https://www.automobili.ba/potez-ocajnika-europa-dijeli-poticaje-za-elektricna-vozila-u-svim-zemljama-eu/.

[17] BESEN, "8 razloga za investiranje u stanice za punjenje električnih vozila", 26.12.2024. [Online]. Available: https://www.besen-group.com/bs/8-reasons-to-invest-in-ev-charging-stations/.

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[21] BESEN, "8 razloga za investiranje u stanice za punjenje električnih vozila," 26.12.2024. [Na mreži]. Available: https://www.besen-group.com/bs/8-reasons-to-invest-in-ev-charging-stations/.

[22] Z. Cekerevac, *Ecological and Economic Risks of Using Gasoline, Electric, Hybrid, and Hydrogen-Powered Vehicles.* "MEST Journal", 2025, vol. 13, no. 2.

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[24] A. Huseinagić, "NIO želi kupiti najstariju Volkswagenovu fabriku," 20.09.2024. [Online]. Available: https://proauto.ba/nio-zeli-kupiti-najstariju-volkswagenovu-fabriku/.

are not met, funds may be considered wasted, indicating potential corruption and misuse of resources. Poor incentive management can erode trust in government institutions.

Proper planning, execution, evaluation, transparency, and accountability are crucial to mitigating these risks. Technical challenges and battery safety remain significant concerns. While electric motor drives are well understood, battery technology is still evolving. Lithium-ion batteries, the dominant technology in EVs, offer advantages but also present unresolved challenges.

Key issues with EV batteries include:

- Safety concerns: The risks of spontaneous ignition or explosions, though EVs are generally safer than ICE vehicles regarding fire risks[25]. However, to understand the extent of the risks associated with batteries, the following example can be considered. Numerous newspaper headlines have reported on the Jaguar I-Pace, which went from winning the "World Car of the Year" title in 2019 to having a tarnished reputation: "one riddled with countless recalls, reliability issues, and even fires"[26]. Jaguar has sold more than 60,000 units of this electric crossover but has gradually recalled thousands of cars in various countries and sent them for recycling[27]. The economic and environmental damage involved here is beyond comment. The cars were recalled due to fires caused by LG batteries, which also left a negative impression on buyers. This car is priced at around EUR 60,000. Battery Management Systems (BMS) in some cases can help mitigate overheating risks.
- Submerging: Water exposure can cause short circuits and fires, especially in seawater, with long-term damage even after the vehicle dries[28,29,30].
- Durability and Degradation: Batteries degrade over time, reducing vehicle range. Proper management can alleviate degradation[31].
- Environmental Issues: Battery production has significant environmental and social impacts, with low recycling rates (5-10%)[32].
- Extreme Conditions: Low temperatures reduce battery capacity and performance, while high temperatures accelerate degradation. Temperature management is improving.
- Technological Uncertainties: Alternatives like solid-state and lithium-sulfur batteries are promising but not yet commercially available[33].
- Economic Challenges: Batteries are the most expensive EV component, though prices are declining[34]. Market instability and fluctuating material costs are concerns.
- Charging Infrastructure: Fast charging degrades batteries, and limited charging stations restrict EV use, particularly in rural areas.

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5 CONCLUSION

Government subsidies for electric vehicles (EVs) aim to stimulate economic growth, environmental initiatives, and social policies. However, analysis indicates that these incentives were premature and directed toward immature products. Lithium-ion batteries pose significant problems, requiring substantial energy for production and causing environmental degradation. They are expensive, and recycling remains underdeveloped and uneconomical. EV manufacturing costs are significantly higher than those for gasoline-powered vehicles, posing risks for manufacturers and consumers.

Governments have attracted buyers through subsidies and restrictions on internal combustion engine (ICE) vehicles. Buyers, often lacking complete information, have spent more on EVs, forming a small fleet with substantial electricity demands. In 2023 Germans bought approximately 396,000 electric cars out of 2.845 million new vehicles (about 14%). Norway, which is considered a leader in EV adoption, had an electric car share of below 14% among all registered vehicles.

From a vehicle owner's perspective, factors discouraging EV purchases include:

- Significant Initial Cost Difference: EVs are more expensive than conventional vehicles, and reduced operational costs often do not justify the initial expense.
- Battery Replacement Costs: Replacing the battery can be very costly, increasing the total cost of ownership.
- Limited Tax Incentives: Tax incentives and subsidies are often temporary, and their withdrawal diminishes the economic rationale.
- Reduction in Government Revenue: The transition to EVs may decrease government revenue from fuel taxes, necessitating tax policy changes.

Environmentally, the impact of 1-2% of EVs is negligible. It takes at least two years for CO_2 emissions from EV production to offset those from gasoline engines. Governments could have used taxpayer money more effectively by organizing the buyback and recycling of old vehicles. That would have a more significant and prompt impact on pollution reduction.

Most electricity is generated from fossil fuels, diminishing the effects of EVs. Issues like industrial pollution, wildfires, and wars also affect the environment. Subsidies have supported wealthier individuals in purchasing expensive vehicles, with funds taken from all taxpayers. The poorer population effectively subsidizes the affluent demographic.

Based on the research results, there is sufficient evidence to reject the adopted null hypotheses in favor of the alternative hypotheses:

h_{Aa}: Electric vehicles are not the best option for addressing climate change or protecting the environment.

h_{Ba}: Government incentives influence the production and procurement of electric vehicles.

h_{Ca}: Government incentives are neither the best nor the most equitable solution for increasing the share of electric vehicles in the overall passenger car fleet.

In conclusion, we think governments implemented EV subsidies prematurely and inappropriately. A substantial amount of money has been invested but the effects are negligible, and EVs have presented numerous unnecessary challenges.

6 RECOMMENDATIONS

The authors of this paper fully support the recommendations from papers of Čekerevac[35] and Čekerevac, Dvořák and Prigoda[36]. Modernizing automotive powertrains alone is insufficient for genuine environmental preservation. Systemic changes in urban transportation and vehicle ownership perceptions are essential.

A public bus, occupying the same road space as three small cars, can transport up to 35 times more passengers while consuming the equivalent of the electric energy used by 11 electric cars. Implementing car-sharing could reduce the number of cars by tenfold, and using buses exclusively could decrease vehicles by an additional twentyfold. That would reduce vehicle and battery production, lower pollution, improve street accessibility, resolve parking issues, and eliminate traffic congestion.

Reorganizing transportation is crucial for significant environmental protection.

Notes

* This article is modeled on the article by Čekerevac, Z. (still unpublished) *Should the State Invest in Electric Car Incentives, and Why Not*?

** For more information on the ecological and economic risks associated with various powertrains in vehicles, please refer to:
Cekerevac, Z. (2025). *Ecological and Economic Risks of Using Gasoline, Electric, Hybrid, and Hydrogen-Powered Vehicles*. “MEST Journal”.
https://mest.meste.org/MEST_Najava/XXVI_Cekerevac_2.pdf

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