Wide Economic Impacts of Energy Storage: The Case of Argentina

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Abstract

Renewable energy technologies offer a pathway to decarbonize power systems but face challenges due to their intermittent nature. Energy storage can mitigate this issue by shifting supply across time, thereby stabilizing markets and enhancing system efficiency. This paper studies the economic and environmental impacts of deploying energy storage in Argentina, using a two-step approach: an optimal electricity dispatch model to estimate efficiency gains, and a recursive general equilibrium model to evaluate macroeconomic, sectoral, and distributional effects. We estimate that a storage capacity of 10 GW—equivalent to 22% of Argentina's installed power capacity—reduces average electricity costs by up to 3.6%. More conservative scenarios with 2–4 GW of storage still yield efficiency gains of 2%. In a low risk scenario, these gains translate into a GDP increases by 1.1 to 2.17 percentage points over a decade, while fiscal revenue rises, and welfare improves across all income groups, particularly among lower-income households. however, electrification effects associated with energy storage may moderate the increase in fiscal revenues and the decrease in unemployment. GHG emissions fall by 2.8–5.6 percentage points, though electrification partially offsets these gains due to the existing fossil-based electricity mix. Sectoral analysis reports that Construction, Machinery, and Non-Metallic Minerals benefit the most, while fossil fuel and primary sectors lose competitiveness. Risky environments preserves the qualitative results but presents lower magnitudes.

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1 Introduction

The electricity sector is one of the largest contributors to global greenhouse gas (GHG) emissions (Crippa et al., 2023). Decarbonizing this sector is therefore crucial to the energy transition. Renewable technologies has become a profitable alternative to produce low-cost energy and reduce GHG emissions from power generation. However, this alternatives are intermittent, that is, they are not available on demand but depends on favorable weather conditions (Soini, 2021; Ambec and Crampes, 2021). As a result, despite their advantages, they can introduce significant volatility into electricity markets.

One way to address intermittency is to increase regional integration, particularly by investing in transmission lines between different regions (Prol et al., 2023; Gonzales et al., 2023). The benefits of market integration can be understood through the traditional concept of gains from trade: it enables lower-cost power plants to export electricity and replace production from higher-cost plants, thereby improving allocative efficiency across regions. Another way to address this challenge is through energy storage (Andrés-Cerezo and Fabra, 2023; Domínguez et al., 2024). By storing electricity when renewable generation is high and releasing it when availability is low, storage eases the integration of renewables into electricity markets smoothing out production over time and flattening the price curve. Both energy storage and market integration are alternatives to address the problem of intermittency. The former works by linking electricity markets across time while the latter does it across regions. A third option involves demand management tools, such as real-time pricing, which encourage consumers to shift electricity use toward periods of high availability (Joskow and Wolfram, 2012). These tools create incentives to consume more when supply is plentiful and less when it is limited, further contributing to system stability.

In this article we focus on Energy storage. The objective of this article is to study the wide-economic and sectorial impacts of installing energy storage capacity for the case of Argentina. Particularly, we discuss the following research questions: (i) What is the efficiency gains in the average cost of electricity for different levels of energy storage capacity? (ii) Improved energy efficiency may change relative profitability between sectors: Who are the winners and losers? (iii) What is the impact on aggregate variables and welfare? (iv) Could small short run effects build up over time into larger structural changes?

To answer this questions, we develop a stylized dynamic model of the power market in Argentina. This model accounts for optimal dispatch of electricity to satisfy hourly demand. There are two ways to smooth the prices curve: Either by managing a given charging infrastructure or by managing water reservoirs for hydroelectric production. We use

hourly data on local supply and demand for Argentina 2021 provided by CAMMESA to estimate our model. The main objective of this model is to estimate how different level of storage infrastructure decreases the average cost of electricity. Also, we develop a recursive General Equilibrium model that we use to evaluate the previous efficiency gains in terms of aggregate and sectorial activity, fiscal variables, welfare, income distribution and emissions. To estimate this model we used an owned-developed Social Accounting Matrix (SAM) for Argentina 2021 with focus on energy activities.

We begin our analysis by estimating the efficiency gains enabled by energy storage, which depend on both installed capacity and the batteries' charging and discharging speed. We assess the impact of deploying between 1 GW and 10 GW of storage capacity under different speed scenarios. The largest gain —around 3.6%— occurs with 10 GW of storage, equivalent to 22% of Argentina's nominal installed capacity. More conservative, short-term scenarios suggest a 2% gain, achievable with 2–4 GW of storage (or 4.5–9.1% of the total installed capacity), depending on the charge/discharge speed.

Next, we use these estimated efficiency gains to evaluate the wide economic impacts of energy storage through our general equilibrium model. We analyze effects on economic activity, unemployment, the current account, fiscal revenue, welfare, income distribution, and emissions. For flow variables such as GDP, we report net present values using two discount rates: 2.5%, corresponding to the historical long-term U.S. bond rate (2015–2025), and 13.5%, which incorporates Argentina's 2024 risk premium of 11%. It is important to note that our analysis focuses exclusively on the benefits of energy storage. Thus, we estimate the shadow price of investing in this technology. However, capital costs which are highly dependent on each project's financial structure must also be considered to evaluate the social profitability of this projects.

In the low-risk scenario, a 2% efficiency gain leads to a 1.1 percentage point (p.p.) increase in GDP over ten years. A 3.6% gain raises it to 2.17 p.p. Unemployment declines, while improvements in the trade balance are modest but positive. However, higher efficiency levels produce an electrification effect that partially offsets employment gains. This occurs because the sectors that benefit most are less labor-intensive, resulting in some job displacement. Fiscal revenue and government welfare both increase, with gains of 1.38 p.p. and 0.68 p.p. over the decade in the 3.6% scenario. However, electrification reduces fossil fuel consumption (currently highly taxed) shifting demand to lower-taxed electricity reducing tax revenues. Welfare improves across all income groups, with lower-income households benefiting the most. As electricity represents a larger share of their consumption, these gains contribute to a more equitable income distribution. In terms of environmental variables, total emissions fall by 5.62 p.p. and 2.81 p.p. under the 3.6%

and 2% efficiency scenarios, respectively. However, the rebound effect of electrification (due to continued reliance on fossil-based electricity) partially offsets these gains. Still, the Kuznets Index shows a cleaner economy per unit of GDP. In a higher-risk environment, the qualitative results remain consistent, but the magnitudes shrink. For instance, under the 3.6% scenario, the GDP gain drops from 2.17 p.p. to 1.3 p.p. when a higher discount rate is applied.

Finally, we examine the sectoral impacts of the efficiency gains driven by energy storage. Beyond the electricity sector, the most positively affected industries include Construction, Non-Metallic Minerals, and Machinery—sectors that are both electricity-intensive and closely linked through input-output relationships. Gains in one sector generate positive spillovers in others. On the other hand, Fuels, Gas Distribution, and Primary sectors experience negative impacts. In the first two cases, energy storage reduces the demand for fossil-based energy, directly replacing their role. For Primary activities, low electricity intensity lowers their competitiveness, leading to a reallocation of capital and labor to other activities. An interesting case is Extraction activities. Despite losses in fuels and gas distribution, extractive industries benefit from energy storage. These sectors produce tradable goods, and when local demand declines, output shifts to international markets.

The remainder of the article is organized as follows. Section 2 highlights our contribution to the literature. Section 3 provides the international and domestic context for energy storage. Section 4 presents the two models used in this study, along with the data. Section 5 describes the counterfactual exercises, outlines the mechanisms at play, and reports the results. Section 6 concludes. Additional details are provided in the Appendices.

2 Related Literature

The academic literature on electricity policies and energy storage spans a range of interconnected themes, including sectoral impacts, welfare effects, and optimization strategies. However, a clear divide persists between two predominant analytical approaches: multisectoral economic models, often used to assess broader macroeconomic and distributional impacts, and energy system simulations, which tend to focus on technical feasibility, market efficiency, and system operations. The present study aims to contribute by bridging these two traditions, offering a more integrated perspective on the multisectoral socioeconomic and environmental effects of battery adoption in electricity storage.

First, a growing body of research explores the sectoral and market effects of electricity policies, focusing on how regulatory changes influence pricing dynamics, market

competitiveness, and deregulation processes (Choi et al. (2017); Li et al. (2017); Lin and Wu (2021); Zhang et al. (2021)). These studies also explore sector-specific electricity demand elasticities and rebound effects. For example, Nepal et al. (2021) analyze the New Zealand case and find partial rebound effects of 54% in the industrial sector and 23% in the commercial sector— indicating that energy efficiency improvements may lead to increased electricity consumption in these sectors. The residential sector showed no significant rebound effect. A notable contribution of these studies is the identification of potential winners and losers arising from the adoption of energy storage technologies.

Second, literature on the welfare and distributional impacts of electricity access and pricing examines how changes in electricity pricing and access affect household welfare and income distribution (Ito et al. (2023); Rodrigues and Linares (2015)). Beyond economic dimensions, these works also assess the broader microeconomic consequences of electricity access, including improvements in education, income generation, and health outcomes (Gashaye et al. (2025)). These studies contribute valuable insights into how energy policy can influence equity and social outcomes through indirect economic channels.

A third and increasingly prominent line of inquiry centers on the economics and optimization of energy storage, especially given the growing penetration of renewable energy. Scholars have investigated the market structures and investment incentives required to support energy storage deployment (Andrés-Cerezo and Fabra (2023)). In addition, stochastic and simulation models are used to evaluate storage and transmission expansion strategies (Domínguez et al. (2024); Keck et al. (2019); Merrick et al. (2024)). Empirical research further highlights the stabilizing effects of grid-scale battery storage on electricity markets, highlighting that large-scale battery deployments enhance grid reliability by balancing intermittent renewable energy sources, providing reserve power, and reducing the need for costly grid upgrades (Rangarajan et al. (2023)). These contributions offer a comprehensive assessment of the economic viability, dispatch optimization, and efficiency improvements associated with energy storage.

It is important to highlight that the applied literature examining the multisectoral effects of electric battery deployment has largely concentrated on two specific areas: the promotion of electric vehicles and the integration of battery manufacturing into global value chains. Although some studies acknowledge the role of batteries in electricity storage, few provide a comprehensive assessment of their broader socioeconomic or cross-sectoral impacts.

Within the literature on electric mobility some studies use computable general equi-

librium (CGE) models to assess macroeconomic effects of vehicle electrification (Lin and Wu (2021); Li et al. (2017)), while others rely on other empirical methodologies (Su et al. (2023)). In contrast, the literature on energy storage systems tends to use simulation-based models to evaluate the role of lithium batteries in the electricity generation mix and associated system costs. For instance, Andrés-Cerezo and Fabra (2023) simulate the Spanish wholesale electricity market and show that battery adoption can shift the composition of renewable technologies used. Similarly, Keck et al. (2019), analyzing the Australian case, find that battery deployment is only profitable at high levels of renewable penetration—since fossil fuel technologies remain cost-competitive under lower renewable shares. Furthermore, Chen et al. (2020) emphasize the technical advantages of integrating lithium batteries into the electricity system, including load reduction and mitigation of intermittency in renewable generation.

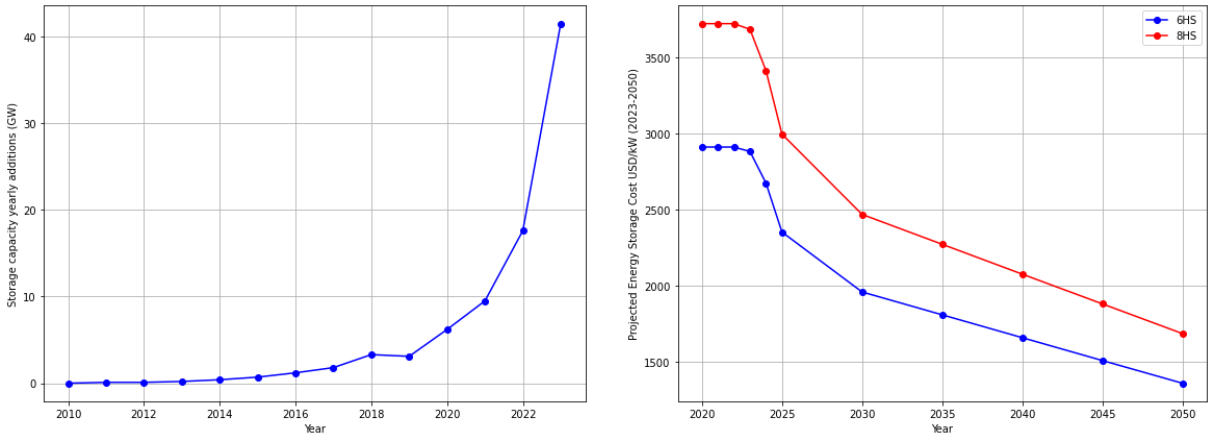
Across these studies, there remains a significant gap: few studies have examined the socioeconomic and environmental effects of large-scale battery adoption through a multisectoral modeling framework linked to an electricity market bottom-up model.

3 The Case of Argentina and the International Context

At COP28 in December 2023, nearly 200 countries adopted the UAE Consensus, committing to an ambitious global energy agenda. This agreement outlines a clear path toward net-zero emissions in the energy sector by 2050, with key efforts focused on phasing out fossil fuels, tripling renewable energy capacity, and doubling energy efficiency improvements by 2030. These targets have the potential to reshape the global energy landscape, accelerating the transition to a more affordable, secure, and sustainable energy system. According to the IEA (2024), the goal of tripling global renewable energy capacity by 2030 is within reach. However, unlocking its full potential requires modernizing electricity grids and scaling up energy storage infrastructure. In particular, the IEA (2024) estimates that 1,500 gigawatts (GW) of energy storage capacity will be needed by 2030, with 1,200 GW coming from battery storage—a 15-fold increase from today's levels.

Figure 1 reports the annual battery storage capacity additions per year and the projected cost of capital for 6-hours and 8-hours grid-scales batteries.

Figure 1 – Annual Global Battery Storage Capacity Additions (2010–2023) and Projected Capital Cost Evolution of 6-hour and 8-hour Grid-Scale Batteries to 2050.



(a) Annual Global Battery Storage Capacity Additions (2010–2023)

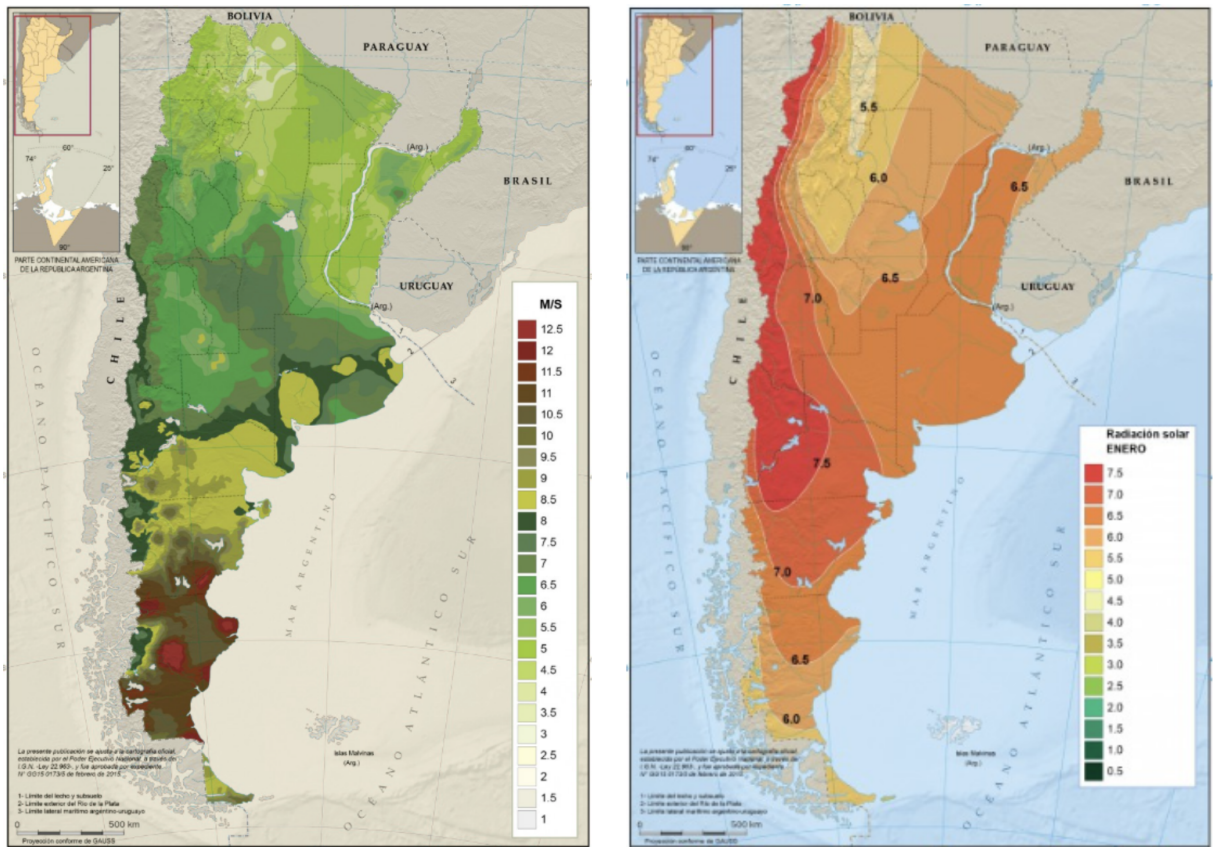
(b) Projected Capital Costs of 6-hour and 8-hour Grid-Scale Batteries (2025–2050)

Note: Panel (a) presents annual global additions in battery storage capacity from 2010 to 2023. Source: IEA. Accessed: 01/04/2025. [Link: IEA Data and Statistics]. Panel (b) shows the projected capital costs of 6-hour and 8-hour utility-scale battery storage systems from 2025 to 2050. Source: National Renewable Energy Laboratory (NREL). Accessed: 01/04/2025. [Link: NREL Annual Technology Baseline].

In 2023, China and the United States dominated global energy storage installed capacity, with 27.1 GW and 15.8 GW, respectively. Together, they accounted for over 79% of total installed capacity (Energy-Institute, 2024). The United Kingdom (3.6 GW), Australia (1.8 GW), and Germany (1.7 GW) also played significant roles in this market. This installed capacity is projected to increase as the capital costs of batteries decrease and and performance improves.

Argentina constitues a case where renewable production has greater potential. Argentina is a vast large country where the north holds significant advanteges to produce solar energy while the south has adventeges to produce eolic energy. Figure 2 reports geografic data on solar and wind intensity for the case of Argentina.

Figure 2 – Solar and Wind Intensity for Argentina.



(a) Average Year Wind Intensity **(b)** Solar Intensity January

Note: Panel (a) presents argentine solar intensity. Source: YPF Fundation. Accessed: 01/04/2025. [Link: Wind Intensity Map]. Panel (b) shows solar intensity for Argentina. Source: YPF Fundation. Accessed: 01/04/2025. [Link: Solar Intensity Map].

In Argentina, the installation and operation of renewable energy capacity are regulated under Law No. 27.191 and managed by CAMMESA. Law No. 27.191 establishes a renewable energy promotion framework to meet capacity targets, while CAMMESA, an entity composed of 80% electricity market agents and 20% government representatives, oversees grid operations and capacity management. According to CAMMESA's monthly database[1], Argentina's renewable energy capacity expanded by approximately 77% between 2020 and 2024. As renewable installations continue to grow, developing energy storage infrastructure will be crucial to reducing market volatility and facilitating the integration of these technologies into the power system.

Argentina currently lacks both operational energy storage capacity and specific legislation to promote this technology. However, in February 2025, the government launched national and international tenders to install battery storage systems in the metropolitan area[2]. Additionally, authorities have urged other provinces to implement similar projects

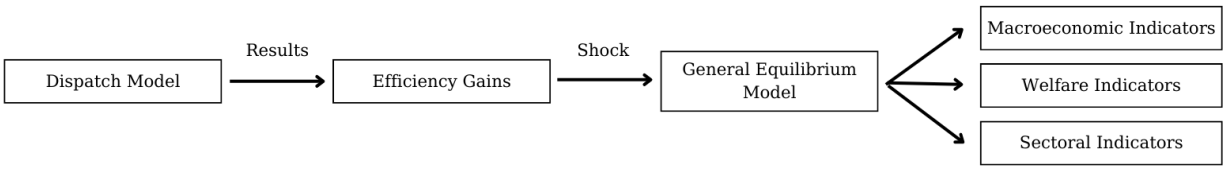
[1]Link: CAMMESA dataset
[2]Link: News About Energy Storage

in critical grid nodes, aiming to enhance grid stability and modernization.

4 Methodology and Data

This section presents the models and data used in this study. We develop two models: first, a dispatch model of the Argentine power market that captures hourly power generation and electricity costs; second, a general equilibrium model to assess both economy-wide and sectoral impacts of energy storage. The dispatch model estimates efficiency gains from installing and operating energy storage facilities, while the general equilibrium model evaluates the broader economic effects of these changes. Figure 3 illustrates the relationship between these models.

Figure 3 – Link between the dispatch model and the general equilibrium model



Note: Figure 3 presents a flowchart illustrating the connection between the dispatch model of the Argentine power system and the general equilibrium model. Efficiency gains from energy storage serve as the linking mechanism between these models.

The following subsections presents the optimal dispatch model and its estimation results. The second subsection presents the general equilibrium model and the data of the Social Accounting Matrix for Argentina.

4.1 The dispatch Model

There is a social planner that determines power dispatch, storage decisions, and the management of water reservoirs for hydroelectric production. We consider nine power generation technologies: Solar (SO), Wind (W), Bioenergy (B), Hydropower (H), Nuclear (N), Combined Cycles (CC), Diesel (D), Gas Turbine (GT), and Turbo Steam (TS). These technologies are indexed by $t \in \{SO, W, B, H, N, CC, D, GT, TS\}$. Each time unit corresponds to an hour, indexed by $h \in H = \{1, ..., \bar{H}\}$.

Hourly demand, denoted by d_h, is exogenous and inelastic for each hour. Total generation is represented by x_{ht}, while $\mathbb{I}_{ht}$ is a binary variable that indicates whether a technology is operating. Generation costs are technology-specific, represented by c_t, as are startup costs, denoted by sc_t. Each technology has an installed capacity K_t. However, availability may vary due to network constraints, maintenance, or repairs. Availability

is captured by $a_{ht} \in [0,1]$, which also accounts for the variability of renewable energy sources. All technologies are subject to ramping constraints, limiting adjustments in generation and charge/discharge between consecutive hours.

Hydroelectric production requires water reservoirs, denoted by R_h. The reservoir follows the law of motion:

$$R_h = R_{h-1} + \gamma - x_{H,h}, \tag{1}$$

where γ represents the average hourly replenishment of the reservoir, and $x_{H,h}$ denotes hydroelectric production in period h. Reservoirs are subject to capacity constraints, bounded by minimum ($\underline{R}$) and maximum ($\bar{R}$) levels.

Energy can also be stored in batteries. The stock of stored energy at time h is S_h, which evolves according to:

$$S_h = S_{h-1} + C_h, \tag{2}$$

where C_h represents the charge/discharge decision. Energy storage capacity is limited by ST. This model does not incorporate a nodal analysis of the electrical system, focusing instead on overall system costs.

The social planner's problem is represented by the following optimization model:

- **Objective:** Minimize total costs, including both generation and startup costs.

$$\min_{\{x_{ht}, C_h, \mathbb{I}_{ht}\}} TC = \sum_h \sum_t c_{ht} x_{ht} + \sum_h \sum_t sc_{ht} \mathbb{I}_{ht}$$

- **Energy Balance Constraint:** Supply must match demand.

$$\sum_t x_{ht} = d_h + C_h, \quad \forall h$$

- **Generation Capacity Constraints:** Generation is limited by available capacity.

$$x_{ht} \leq K_t a_{ht} \mathbb{I}_{ht}, \quad \forall t, h$$

$$x_{ht} \geq \epsilon \mathbb{I}_{ht}, \quad \forall t, h$$

  The second equation ensures that a power plant cannot be turned on without producing power.

- **Hydroelectric Generation Constraints:** Accounts for reservoir dynamics, and sets

initial and terminal conditions, and capacity bounds.

$$R_h = R_{h-1} + \gamma - x_{H,h}, \quad \forall h > 1$$
$$R_0 = R_{init} - x_{H,0}$$
$$R_{\bar{H}} = R_{fin}$$
$$R_h \in [\underline{R}, \bar{R}], \quad \forall h$$

- **Storage Constraints:** Accounts for energy storage dynamics, and sets initial conditions, and storage limits.

$$S_h = S_{h-1} + C_h, \quad \forall h > 1$$
$$S_0 = 0$$
$$S_h \in [0, ST], \quad \forall h$$

- **Ramping Constraints:** Limits generation adjustments (RL_t is the ramping limit of technology t, and RLS is the charging/discharging speed).

$$x_{t,h-1} - x_{t,h} \in [-RL_t, RL_t], \quad \forall h > 1, t$$
$$C_{h-1} - C_h \in [-RLS, RLS], \quad \forall h > 1$$

- **Positivity and Binary Constraints:** Ensures non-negativity and binary status of decision variables.

$$x_{ht} \geq 0, \quad \forall h, t$$
$$\mathbb{I}_{ht} \in \{0, 1\}, \quad \forall h, t$$

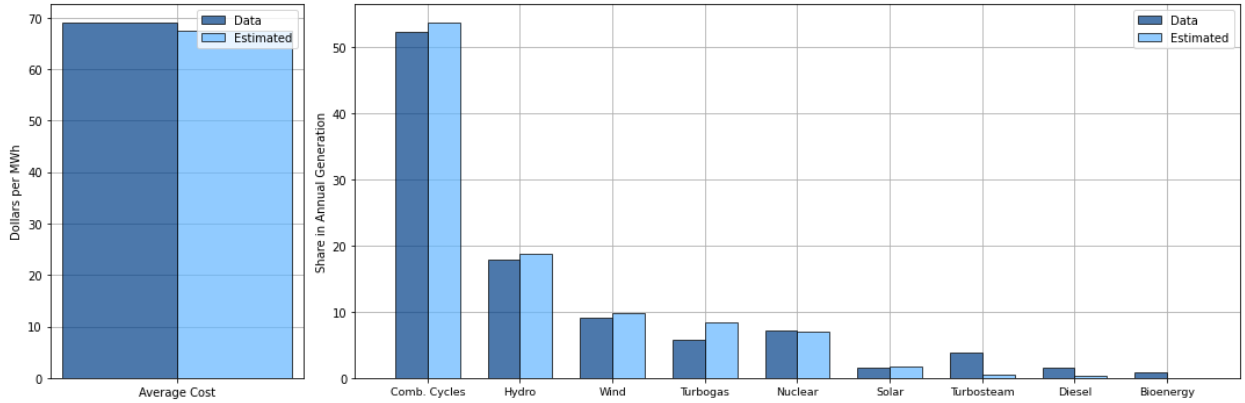
We estimate the model using hourly data on generation and demand, as well as cost data from CAMMESA. The model is estimated using a minimum distance estimator, selecting a vector of estimated parameters ($\hat{\theta}$) to minimize the distance between the observed data and the corresponding model-generated results. The minimum-distance estimator is defined as:

$$\hat{\theta}(W) \in \Theta : \hat{\theta}(W) = \arg\min_{\theta \in \Theta} e(\tilde{x}, x|\theta) W e(\tilde{x}, x|\theta)^T$$

The benchmarks used to estimate the model include the share of each technology in total annual generation and the average cost of electricity. The unknown parameters calibrated in this process are $\{\gamma; a_t \forall t\}$. Note that the estimation accounts for average availability over the entire year, meaning that a is not indexed by h.

Figure 4 presents the model fit for the estimated parameters $\hat{\theta}$.

Figure 4 – Model Fitting: comparison between the estimated moments of the model and the data.



Note: Figure 3 reports the results of the model using the estimated $\hat{\theta}$ compared to the data to evaluate the fitting of the estimated model. There are two types of values that we are using to evaluate the mode: The yearly average cost of electricity and the share of each technology in annual power generation.

As it can be observed in Figure 4, the estimated model reproduces both the average costs of electricity and the share of each technology in total annual generation.

4.2 The General Equilibrium Model

The Computable General Equilibrium (CGE) model employed in this study follows a standard multi-sector structure, where each sector produces a single good using a combination of value-added inputs and intermediate consumption. Value-added is composed of labor, gross mixed income (GMI), and capital, aggregated through a Cobb-Douglas production function.

Intermediate consumption, categorized into energy and non-energy goods, are combined with value-added under a Leontief structure, reflecting strict complementarity. The model developed for this study features five representative household types, differentiated by income quintiles, and fifty productive sectors. The model also captures interactions with the rest of the world.

On the demand side, the output from each sector can be directed to four potential destinations: intermediate use by other firms, final consumption by households and government, investment demands, or exports to the rest of the world. Markets for goods and services clear simultaneously, ensuring that supply equals demand for each commodity.

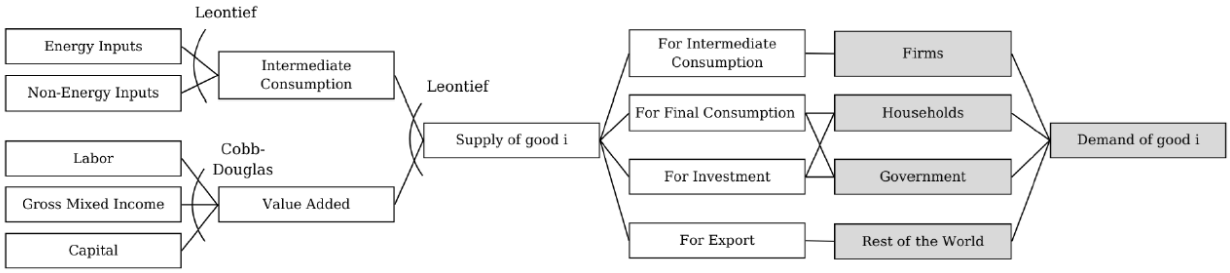
Households, as was mentioned before, are differentiated by income levels and modeled with nested Cobb-Douglas utility functions, where the top-level utility function ag-

gregates across composite consumption bundles (energy and non-energy goods), subject to budget constraints. Their demand system is derived from cost minimization, ensuring consistent treatment of substitution patterns among domestic and imported goods.

The government is represented as an agent that participates in markets for investments, consumes and makes transfers to households and has a Cobb-Douglas utility function; its main source of income is tax collection (though it also makes financial transactions through the bonds account). The external sector buys domestic exports and sells imports in each region, and collects dividends from investments, and also makes transactions of bonds.

Figure 5 shows the general CGE structure used in the model.

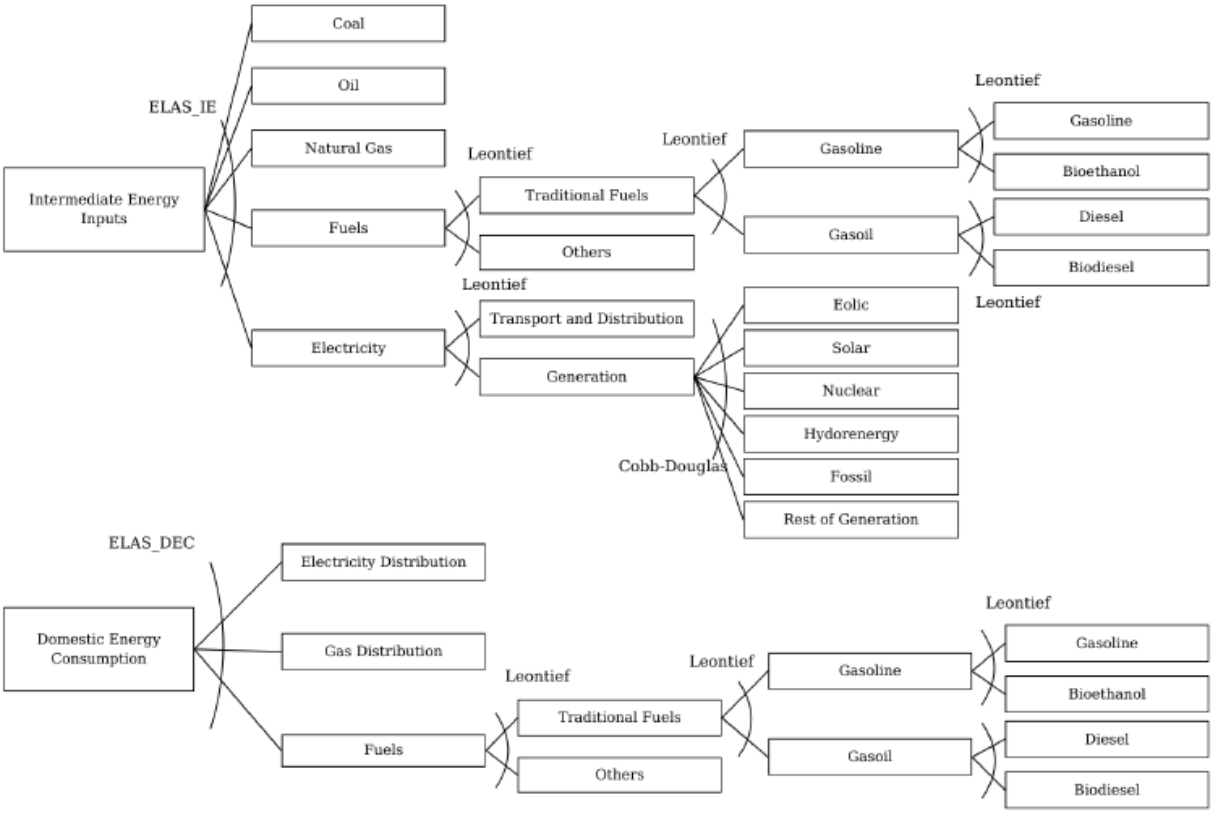
Figure 5 – CGE: general structure.



The model provides detailed treatment of energy inputs. Firms demand primary energy resources, including coal, oil, natural gas, fuels, and electricity. These energy goods are combined in a nested Leontief structure, distinguishing between traditional fuels, electricity, and other energy sources. Electricity supply, in turn, is decomposed into generation technologies (e.g., hydro, nuclear, fossil, and renewables) and transportation and distribution services, aggregated using a Cobb-Douglas function. Households demand energy products through a separate nest, which distinguishes between electricity, gas, and fuels.

The degree of substitutability among different energy types is governed by elasticity parameters: $ELAS_{IE}$ for intermediate energy inputs and $ELAS_{DEC}$ for domestic energy consumption. These parameters measure how easily firms and households can substitute between different energy goods within each branch of the nesting structure. This structure is shown in the following figure.

Figure 6 – CGE: energy bundles.



Overall, this CGE model provides a flexible framework to capture the interactions between sectors, agents, and regions in the economy, incorporating both the complexity of energy markets and the broader economic linkages critical for policy evaluation.

5 Counterfactual Exercises

This section explores the impacts of energy efficiency improvements enabled by storage technologies. Energy efficiency gains, particularly those stemming from the use of storage solutions, can significantly influence economic performance, energy consumption patterns, and environmental outcomes. The following subsections describes the scenarios simulated and their transmission mechanism and analyze the Efficiency Effect and Electrification Effect. This framework provides insights into how these efficiency improvements manifest across different economic dimensions and contribute to structural changes within the economy.

We also present the results of the simulations and identify the winners and losers under the various efficiency gain scenarios. By analyzing the effects on macroeconomic aggregates, sectoral outputs, environmental variables and energy consumption patterns,

we assess which sectors and agents benefit from these changes and which face challenges. Understanding these dynamics is crucial for policymakers aiming to design strategies that maximize the benefits of energy efficiency improvements while mitigating any negative impacts on vulnerable sectors.

5.1 Counterfactual Exercises and Mechanisms

To evaluate the macroeconomic impacts of energy efficiency improvements associated with storage technologies, we use the CGE model to simulate three efficiency gain scenarios corresponding to 2%, 3.6%, and 6% improvements, which are the results obtained from the simulated dispatch model. The analysis decomposes the total effect of these efficiency gains into two components: (i) the Efficiency Effect and (ii) the Electrification Effect.

The Efficiency Effect captures the direct impact of lower energy costs, while the Electrification Effect isolates the additional gains resulting from the substitution of traditional fossil energy sources with electricity from the pure efficiency improvement. To isolate these two effects, two sets of simulations are conducted for each efficiency gain scenario. First, we allow for substitution between energy goods by setting the substitution elasticities $ELAS_{IE}$ and $ELAS_{DEC}$ to 1, thereby enabling electrification. Second, the same shock is simulated while constraining electrification by setting $ELAS_{IE}$ and $ELAS_{DEC}$ to 0. The difference between the two simulations quantifies the Electrification Effect.

The transmission mechanisms through which these shocks propagate in the economy are several. First, household energy savings play a key role. Lower energy costs ease budget constraints for households, leading to increased consumption of other goods and, in turn, higher levels of investment. Additionally, reduced domestic production costs generate network benefits through the input-output structure of the economy, driving efficiency across various sectors.

Another important mechanism is resource reallocation, where the economy reallocates resources toward sectors with improved relative profitability. Finally, electrification plays a crucial role as both households and firms substitute fossil fuel consumption with electricity, further contributing to efficiency and structural transformation within the economy.

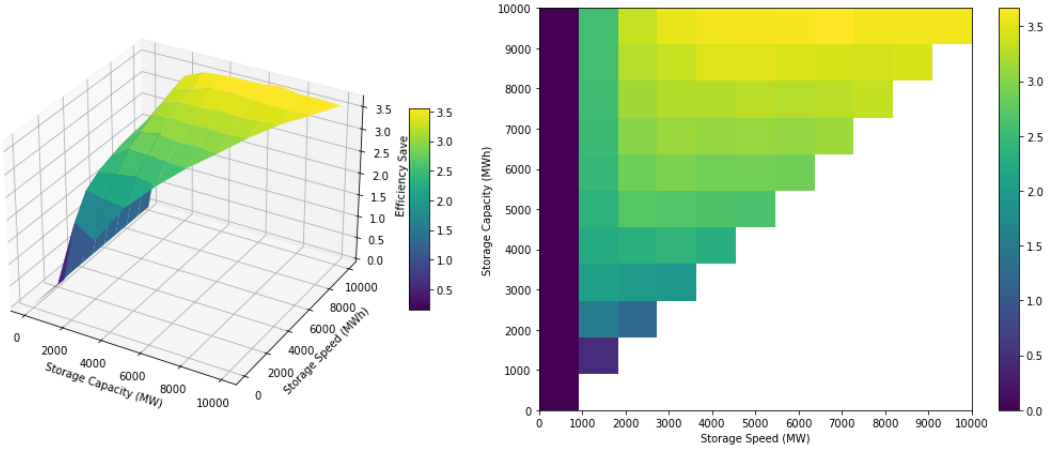
These simulations provide a dynamic characterization of how storage-induced energy efficiency improvements affect macroeconomic aggregates, sectoral outputs, environmental variables and energy use patterns under different efficiency gains scenarios

and the assumptions regarding the flexibility of energy substitution.

5.2 Results

Figure 7 shows the efficiency gains in average electricity costs from adding energy storage. These gains depend on both the installed storage capacity and the batteries' charging/discharging speed. The largest gain—about 3.6%—occurs with 10 GW of storage (yellow squares), which represents 22% of Argentina's nominal installed capacity. More conservative and short-term scenarios suggest a 2% gain (dark green squares), achievable with 2–4 GW of storage, or 4.5–9.1% of total installed capacity in Argentina's power market.

Figure 7 – Counterfactual Impact of Energy Storage: Cumulated Sectoral GDP Gains. 10 years simulation.



Note: This figure illustrates the cumulative gains in sectoral GDP, computed as the net present value (NPV) of yearly gains relative to the baseline scenario. Results are expressed in percentage points.

In Table 1 and Figure 8, we use the results in Figure 7 to calculate the wide economic and sectorial impacts of increasing energy storage capacity. We simulate three scenarios: 2% (short-term, realistic), 3.6% (long-term, ambitious), and 6% (sensitivity case). For each, we report key macroeconomic, fiscal, welfare, distributional, and environmental indicators.

Table 1 reports the results for aggregated variables and presents them under two discount rates. The first rate, 2.5%, corresponds to the historical long-term US bond rate for the period 2015–2025. The second rate, 13.5%, incorporates the 2024 Argentine risk premium, which was 11%. The first scenario reflects a low-risk context, while the second captures conditions typical of a riskier country, as is the case for some emerging economies.

Table 1 – Counterfactual Impact of Energy Storage: Efficiency Gains in Electricity Costs. 10 years simulation.

	Unit	Efficiency Gains 2%			Efficiency Gains 3.6%			Efficiency Gains 6%		
		Efficiency Gains	Electri-fication	Total	Efficiency Gains	Electri-fication	Total	Efficiency Gains	Electri-fication	Total
Low Risk (Interest rate = 2.5%)										
Activity										
GDP	P.P.	1.048	0.053	1.101	2.111	0.067	2.178	2.951	0.089	3.040
Unemployment Rate	Avg. P.P.	- 0.139	- 0.001	- 0.140	- 0.284	0.016	- 0.269	- 0.410	0.026	- 0.383
Trade Balance	P.P.	0.009	0.000	0.010	0.018	0.001	0.019	0.025	0.002	0.027
Fiscal Variables										
Fiscal Revenue	P.P.	0.758	- 0.044	0.715	1.549	- 0.167	1.382	2.201	- 0.254	1.946
Government welfare	P.P.	0.351	- 0.002	0.349	0.747	- 0.060	0.687	1.058	- 0.105	0.953
Welfare and Income Distribution										
Quintile 1	P.P.	1.248	0.065	1.313	2.523	0.078	2.600	3.528	0.105	3.633
Quintile 5	P.P.	0.691	0.068	0.759	1.320	0.188	1.508	1.820	0.294	2.114
Gini Index	Avg. P.P.	- 0.003	0.001	- 0.002	- 0.007	0.004	- 0.003	- 0.011	0.007	- 0.004
Environment										
Emission index	P.P.	- 3.720	0.904	- 2.816	- 8.035	2.414	- 5.620	- 12.004	3.694	- 8.309
Kuznets Index	P.P.	- 4.635	0.805	- 3.830	- 9.752	2.198	- 7.554	- 14.412	3.360	- 11.052
High Risk (Interest rate = 13.5%)										
Activity										
GDP	P.P.	0.659	0.020	0.679	1.285	0.023	1.308	1.838	0.036	1.873
Unemployment Rate	Avg. P.P.	- 0.139	- 0.001	- 0.140	- 0.284	0.016	- 0.269	- 0.410	0.026	- 0.383
Trade Balance	P.P.	0.006	0.000	0.006	0.011	0.001	0.012	0.015	0.001	0.017
Fiscal Variables										
Fiscal Revenue	P.P.	0.484	- 0.048	0.436	0.949	- 0.129	0.820	1.374	- 0.189	1.185
Government welfare	P.P.	0.232	- 0.018	0.214	0.470	- 0.061	0.409	0.676	- 0.094	0.582
Welfare and Income Distribution										
Quintile 1	P.P.	0.785	0.025	0.809	1.534	0.027	1.561	2.194	0.044	2.238
Quintile 5	P.P.	0.426	0.043	0.470	0.799	0.111	0.909	1.131	0.177	1.308
Gini Index	Avg. P.P.	- 0.003	0.001	- 0.002	- 0.007	0.004	- 0.003	- 0.011	0.007	- 0.004
Environment										
Emission index	P.P.	- 3.720	0.904	- 2.816	- 8.035	2.414	- 5.620	- 12.004	3.694	- 8.309
Kuznets Index	P.P.	- 4.635	0.805	- 3.830	- 9.752	2.198	- 7.554	- 14.412	3.360	- 11.052

Note: This table presents the estimated impact of improving energy efficiency on key aggregated variables. Efficiency gains represent the impact of improved electricity cost, while the electrification effect captures the impact of increased electricity consumption replacing fossil fuels.

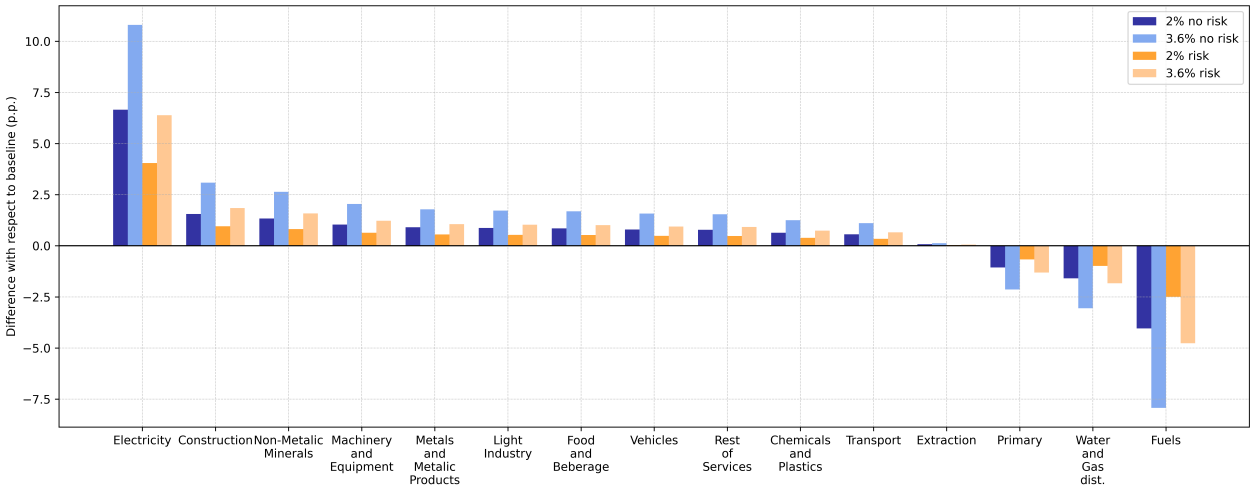
First, consider the low risk case. With a 2% gain in efficiency, GDP increases by 1.1 percentage points (p.p.) over 10 years. A 3.6% gain raises it to 2.17 p.p.. Unemployment falls on average by 0.14 p.p. and 0.269 p.p. in the respective scenarios. While trade balance improvements are small, they remain positive. The electrification effect slightly offsets employment gains at higher efficiency levels. This occurs because the shock benefits sectors that are less labor-intensive, causing some job displacement. Fiscal revenue and government welfare both increase, with gains of 1.38 p.p. and 0.68 p.p. over the decade in the 3.6% scenario. However, electrification reduces fossil fuel consumption—currently highly taxed—shifting demand to lower-taxed electricity and potentially straining public finances. Welfare improves across all income levels. The poorest quintile gains 2.6 p.p., while the richest quintile gains 1.5 p.p. when efficiency gains equal 3.6%. Since electricity accounts for a larger share of poorer households' consumption, these gains contribute to a more equitable income distribution. The Gini index drops slightly, indicating improved

equity. On the environmental side, total emissions fall by 5.62 p.p. and 2.81 p.p. with a 3.6% and 2% efficiency gain respectively. However, electrification increases electricity demand, part of which is still met by fossil fuels. This rebound effect partly offsets the benefits of improved efficiency. Still, the Kuznets Index confirms a cleaner economy per unit of GDP.

When considering a riskier context, the results and interpretation of the indicators remain the same, but their magnitudes differ. High levels of risk significantly reduce the benefits of energy storage when measured in present value terms. For example, under the 3.6% discount rate scenario, we find an improvement in GDP of 2.178 p.p., while in a riskier environment, the same shock results in only 1.3 p.p.. Economic flows such as GDP and fiscal revenue are the only variables affected by the increase in the discount rate.

Figure 8 reports the winners and losers in terms of sectors. It reports, for each activity, the impact in terms of cumulated GDP.

Figure 8 – Counterfactual Impact of Energy Storage: Simulated impact of different levels of energy storage and storage speed in the average cost of electricity.



Note: This figure reports the decrease in the average cost of electricity (efficiency gain) for different levels of storage capacity and storage speed.

Beyond the electricity sector, the most positively impacted are Construction, Non-Metallic Minerals, and Machinery. These sectors are highly electricity-intensive and closely linked through input-output relationships. Gains in one sector create positive spillovers in others. On the losing side, Fuels, Gas Distribution, and Primary sectors experience negative impacts. In the first two cases, energy storage substitutes their role, reducing demand for fossil-based energy. For Primary activities, the low electricity intensity makes them less competitive, pushing capital and labor toward more dynamic sectors. A particularly interesting case is Extraction activities. Despite losses in fuels and

gas distribution, extractive industries benefit from energy storage These sectors produce tradable goods, and when local demand declines, output shifts to international markets.

6 Conclusions

This study has examined the macroeconomic and sectorial impacts of energy storage deployment in Argentina, focusing on the efficiency gains enabled by increased storage capacity. By simulating various storage scenarios, we have demonstrated that significant efficiency gains—ranging from 2% to 3.6%—are achievable through strategic investments in storage technology, with corresponding benefits to economic performance, welfare, and environmental outcomes.

Our results highlight the positive effects of energy storage on economic growth, fiscal revenue, and welfare, particularly for lower-income households who stand to benefit most from lower electricity costs. Additionally, energy storage contributes to a cleaner economy by reducing emissions, despite some offsetting effects from the electrification process. The findings underscore that, while energy storage technologies can help address intermittency and volatility in renewable energy supply, they also drive sectoral shifts, benefiting energy-intensive industries while posing challenges to fossil fuel-based sectors.

While energy storage brings substantial long-term benefits, the short-term effects are more modest, and the overall impact depends on factors such as the speed of battery discharge and the scale of storage infrastructure deployed. Policymakers must take these dynamics into account when designing energy transition strategies, ensuring that the gains from energy efficiency improvements are maximized while minimizing potential negative impacts on vulnerable sectors.

Ultimately, this paper contributes valuable insights into the role of energy storage in decarbonizing the energy sector and advancing the transition to a more efficient, sustainable, and equitable energy system. The findings provide a robust framework for evaluating the wider economic implications of energy storage and inform decision-making processes that can guide Argentina and similar economies in navigating the complexities of the energy transition.

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8 Appendix A

In Table 1.A, we list the indicators used for the simulations. When reporting the results, we display the differences in Table 3 relative to the baseline. Appendix E provides the model's estimated baseline values.

Table 2 – Estimated Indicators in the CGE Model.

Indicator	Measure	Formula
GDP Index	Percentage	$\left(\frac{GDP_t}{GDP_{base}} - 1\right) \times 100$
Unemployment Rate	Percentage	$\frac{UL_t}{TL_t} \times 100$
Current Account	Ratio	$\frac{X_t}{M_t} \times 100$
Fiscal Revenue Index	Percentage	$\left(\frac{TS_t}{TS_{base}} - 1\right) \times 100$
Household Welfare or Gov. Index	Equivalent Variation (%)	$\left(\frac{EV_t^h}{EV_{base}^h} - 1\right) \times 100$
Gini Index	[0-100]	$\frac{1}{n}\left(n + 1 - 2\frac{\sum_{i=1}^{n}(n+1-i)y_i}{\sum_{i=1}^{n} y_i}\right) \times 100$
GEI Emission Index	Percentage	$\left(\frac{GEI_t}{GEI_{base}} - 1\right) \times 100$
Kuznets Index	Percentage	$\left(\frac{1+\Delta\%GEI}{1+\Delta\%GDP} - 1\right) \times 100$
GDP Index for Activity j	Percentage	$\left(\frac{GDP_t^j}{GDP_{base}^j} - 1\right) \times 100$

Note: GDP: Gross Domestic Product; EV: Equivalent Variation; UL_t: Unemployed Labor; TL_t: Total Labor; n: Number of households; y_i: Household income of i; GEI: GHG emissions; TS: Taxes net of subsidies.

We use the GDP index to measure the impact on the overall level of activity and on sectoral activity. We include the unemployment rate and current account as additional indicators of economic activity. This article assesses the impact of the simulated scenario on household welfare using equivalent variation, which represents the income change that yields the same effect on household utility as the simulated scenario (Guerra and Sancho, 2018). We capture fiscal performance with the Fiscal Revenue indicator, which records all public income, and with a government welfare index that reflects the benefits of public goods provision. To evaluate income distribution, we use the Gini Index. We construct an emissions index from the GHG emissions generated by the model, and we estimate a Kuznets Index to determine whether each unit of GDP becomes cleaner over time.

9 Appendix B

Appendix B presents the main results derived from the 2021 Argentine Social Accounting Matrix (SAM), along with data from the national electricity market, sourced from CAMMESA. First, we provide information from the SAM at both the aggregate and sectoral levels. This is followed by an analysis of seasonal patterns in electricity demand and supply-side characteristics of the electricity market.

Table 3 displays the composition of total supply and demand for Argentina.

Table 4 presents the household accounts included in the SAM, disaggregated by income quintile. The matrix distinguishes five household groups, each corresponding to a different quintile. It reports the primary sources of income and main expenditure com-

Table 3 – Argentina 2021. Global Supply and Demand.

	Millions ARS
Total Supply	**53,132,422.5**
GDPmp	46,219,083.5
Imports	6,913,339.0
Total Demand	**53,132,422.5**
Private Consumption	29,090,837.6
Public Consumption	7,356,145.2
Investment	8,354,695.2
Exports	8,330,744.5

Note: *GDP*: Gross Domestic Product; *mp*: Market Prices; ARS: Argentine Local Currency Unit.

ponents for each group.

Table 4 – Argentina 2021. Households Incomes and Expenses by Income Group.

	H1	**H2**	**H3**	**H4**	**H5**
Total Expenses	**3,963,190.4**	**4,996,567.5**	**5,631,495.0**	**6,723,535.5**	**16,376,113.1**
Consumption	97.5%	97.0%	96.2%	91.3%	53.9%
Investment	0.6%	0.5%	1.4%	5.7%	44.1%
Direct Taxes	1.9%	2.5%	2.5%	3.1%	2.0%
Total Income	**1,728,432.3**	**2,961,059.7**	**3,631,350.8**	**6,168,037.6**	**27,830,328.7**
Labour	68.6%	66.5%	60.1%	52.0%	18.6%
Gross Mixed Income	7.6%	8.3%	12.6%	14.5%	12.6%
Capital	3.1%	1.8%	5.0%	14.8%	61.8%
Transfers	20.7%	23.4%	22.3%	18.8%	6.9%
Result	**-2,234,758.1**	**-2,035,507.8**	**-2,000,144.2**	**-555,498.0**	**11,454,215.6**

Note: H*i*: Quintile *i*. Note: $ represents argentine local currency unit.

Table 5 presents the aggregate results from the account that captures the relationship between the national economy and the rest of the world. It reports both inflows and outflows, along with the resulting net balance.

Table 6 presents the results for the government account. It includes both revenue and expenditure, as well as the overall fiscal balance for the year 2021.

Table 7 presents the sectoral disaggregation of the SAM, which includes 50 productive activities grouped into 15 categories. While the general equilibrium model is calibrated using the full 50-sector detail, the results presented in the paper are aggregated by group to maintain clarity and a manageable scale. Table 8 reports the main indicators per productive activity. To conclude with the presentation of the SAM, Table 9 reports an aggregated version of the SAM.

Table 5 – Argentina 2021. Local result with respect the rest of the world.

	Millions ARS	Share GDP
Income	**8,330,744.50**	**0.18**
Exports	8,330,744.50	0.18
Expenses	**7,773,165.85**	**0.17**
Imports	6,913,338.96	0.15
Factor Flows	859,826.89	0.02
Result	**557,578.65**	**0.01**

Note: $ represents argentine local currency unit.

Table 6 – Argentina 2021. Government Incomes and Expenses.

	Millions ARS	Share GDP
Income	**12,739,560.5**	**0.276**
Taxes on Products	9,160,562.5	0.198
Taxes on Factors	2,699,026.8	0.058
Direct taxes	879,971.1	0.019
Expense	**16,810,289.4**	**0.364**
Public Expenditure	7,356,145.2	0.159
Public Capital Expenditure	634,602.3	0.014
Economic Subsidies	1,592,085.4	0.034
Transfers	4,944,484.1	0.107
Net other Incomes and expenses	2,282,972.4	0.049
Result	**- 4,070,728.9**	**- 0.088**

Note: $ represents argentine local currency unit.

Table 7 – Argentina 2021. Sectoral Opening and Grouping of the National Social Accounting Matrix.

Sector	Group
Agriculture	Primary
Cattle Rising	Primary
Silviculture	Primary
Fishing	Primary
Coal	Extraction
Oil	Extraction
Gas	Extraction
Oil and Gas Related Acts.	Extraction
Minery	Extraction
Food and Beverage	Light Industry
Textil	Light Industry
Shoes	Light Industry
Wood and Wood Prods.	Light Industry
Paper	Light Industry
Edition and Printing	Light Industry
Gasoil	Fuels
Gasoline	Fuels
Fuel Oil	Fuels
Rest. Fuels	Fuels
Biodiesel	Fuels
Bioethanol	Fuels
Chemicals	Chemicals and Plastics
Plastics and Rubber	Chemicals and Plastics
Non-Metallic Minerals	Non-Metallic Minerals
Metallic Products	Metals
Machinery and Equipment	Machinery and Equipment
Vehicles	Vehicles
Other Transport Equipent	Vehicles
Rest of Industry	Light Industry
Electricity - Termic Generation	Gen. Transp. And Dist of electricity
Electricity - Hydroelectric Generation	Gen. Transp. And Dist of electricity
Electricity - Nuclear Generation	Gen. Transp. And Dist of electricity
Electricity - Eólic Generation	Gen. Transp. And Dist of electricity
Electricity - Solar Generation	Gen. Transp. And Dist of electricity
Electricity - Rest Generation	Gen. Transp. And Dist of electricity
Transport and Dist. Of Electricity	Gen. Transp. And Dist of electricity
Transport and Dist. Of Gas	Transport and Distribution of Gas
Transport and Dist. Of Water	Transport and Distribution of Water
Construction	Construction
Commerce	Rest of Services
Hotels and Restaurants	Rest of Services
Rail Transports	Transportation and Telecomunications
Road Transport	Transportation and Telecomunications
Rest of Transport and Comunications	Transportation and Telecomunications
Financial Servives	Rest of Services
Bussiness and Real State Activities	Rest of Services
Public Administration	Rest of Services
Education	Rest of Services
Health	Rest of Services
Rest of Servicies	Rest of Services

Table 8 – Argentina 2021. Sectoral Indicators.

Sector	VA Intensity	Share VA	Share of Imported Supply	Share of Private Cons. In Final Demand	Share of Exports In Final Demand
Agriculture	54.22	5.78	5.86	22.70	62.92
Cattle Rising	52.22	2.11	0.22	80.02	8.74
Silviculture	67.94	0.10	10.84	91.27	8.90
Fishing	68.05	0.35	2.81	29.29	70.23
Coal	53.54	0.01	82.82	-	100.00
Oil	48.40	1.35	10.42	7.90	41.66
Gas	42.54	0.38	12.53	-	15.91
Oil and Gas Related Acts.	60.16	0.62	0.69	-	-
Minery	68.12	0.93	15.08	10.42	88.97
Food and Beverage	40.67	9.02	1.60	70.47	29.38
Textil	48.71	1.02	11.57	85.19	12.73
Shoes	58.80	0.18	21.55	99.00	0.43
Wood and Wood Prods.	51.80	0.39	4.98	30.39	51.67
Paper	44.60	0.60	12.08	88.80	11.29
Edition and Printing	52.48	0.64	4.09	92.28	6.05
Gasoil	29.55	0.48	10.66	99.95	0.05
Gasoline	41.29	0.68	9.69	99.79	0.21
Fuel Oil	9.56	0.02	5.70	-	100.00
Rest. Fuels	23.60	0.25	20.16	71.50	26.31
Biodiesel	22.95	0.01	26.20	-	100.00
Bioethanol	37.56	0.01	15.78	-	100.00
Chemicals	46.00	2.51	29.85	73.12	17.22
Plastics and Rubber	35.81	1.39	24.30	29.84	48.38
Non-Metallic Minerals	49.92	0.90	7.46	51.85	21.75
Metallic Products	41.70	2.10	21.78	15.16	35.78
Machinery and Equipment	39.54	1.79	39.19	37.27	4.57
Vehicles	34.95	1.52	25.66	34.84	31.55
Other Transport Equipent	54.35	0.16	39.19	89.77	3.98
Rest of Industry	56.24	0.65	14.49	66.25	8.38
Electricity - Termic Generation	20.57	0.26	1.38	-	-
Electricity - Hydroelectric Generation	79.62	0.06	1.89	-	100.00
Electricity - Nuclear Generation	57.12	0.04	1.47	-	-
Electricity - Eólic Generation	79.13	0.01	1.39	-	-
Electricity - Solar Generation	90.16	0.00	1.65	-	-
Electricity - Rest Generation	55.58	0.00	1.31	-	-
Transport and Dist. Of Electricity	30.44	0.43	3.03	100.00	-
Transport and Dist. Of Gas	36.51	0.27	0.21	74.44	25.41
Transport and Dist. Of Water	62.95	0.19	-	100.00	-
Construction	48.10	4.30	0.10	-	0.05
Commerce	71.15	16.93	1.20	65.14	22.11
Hotels and Restaurants	43.38	1.71	4.84	98.45	1.54
Rail Transports	57.23	0.04	-	100.00	-
Road Transport	32.48	1.66	-	90.09	9.91
Resto of Transport and Comunications	46.84	3.79	2.40	90.84	9.16
Financial Servives	72.27	5.83	0.78	95.15	0.94
Bussiness and Real State Activities	69.34	9.99	6.43	75.77	17.20
Public Administration	69.52	6.29	0.09	10.47	0.04
Education	83.98	4.73	0.00	32.22	0.00
Health	61.10	4.65	0.03	51.25	0.02
Rest of Servicies	61.89	2.88	3.61	96.49	2.63

Note: values are measured as percentage.

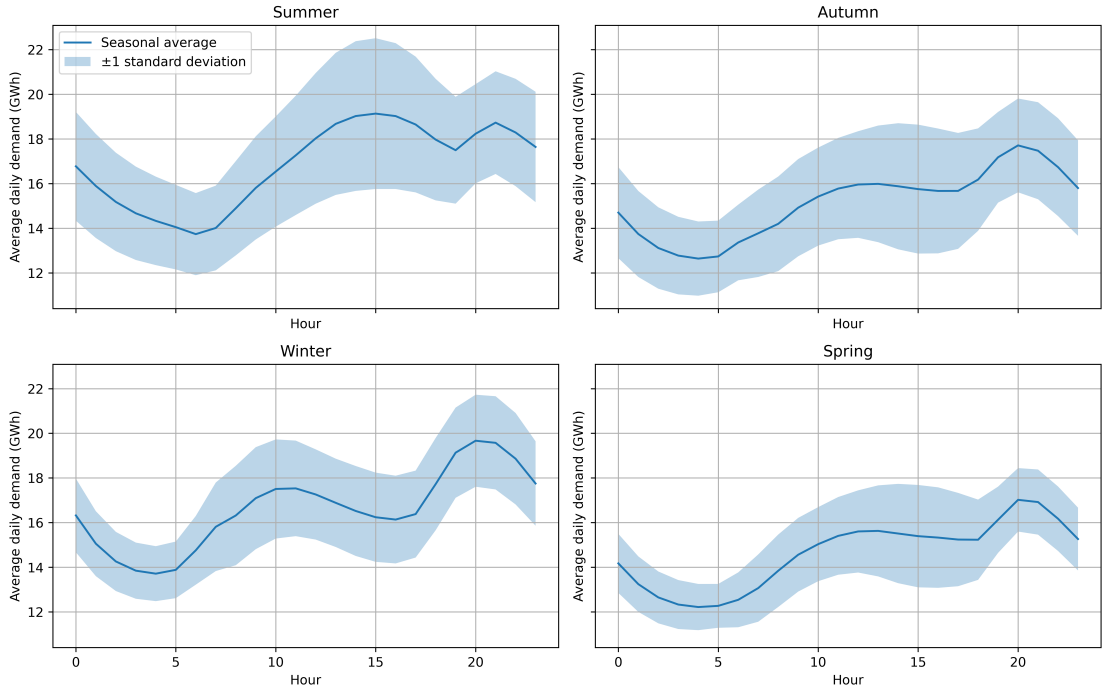
Table 9 – Argentina 2021. Social Accounting Matrix. Millions of Local Currency Units.

	S1	S2	S3	S4	VA	T	H1	H2	G	I	X
S1	1,403,185.6	3,816,714.0	656,827.5	225,904.6	0.0	0.0	639,189.3	279,271.0	0.0	686,020.5	2,150,547.9
S2	771,438.2	5,362,639.5	4,436,796.8	158,266.8	0.0	0.0	5,350,630.6	5,178,531.5	179,635.4	1,715,944.0	3,937,714.1
S3	2,035,442.1	2,920,933.9	10,783,611.3	108,965.3	0.0	0.0	7,484,351.5	8,891,770.9	7,176,509.8	4,531,014.7	2,213,692.3
S4	65,449.7	222,677.1	370,576.3	373,155.2	0.0	0.0	147,613.0	104,073.5	0.0	-6.4	28,790.2
M	237,587.8	3,601,683.3	823,219.2	74,518.4	0.0	0.0	417,048.0	416,461.4	0.0	1,342,820.7	-6,913,339.0
VA	4,616,407.6	6,607,176.0	24,451,153.9	276,842.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TF	327,796.1	583,781.8	1,768,018.7	19,430.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TP	400,353.2	3,975,991.4	2,856,088.1	75,245.9	0.0	0.0	88,617.2	93,279.5	0.0	78,901.8	0.0
TD	0.0	0.0	0.0	0.0	0.0	0.0	342,175.3	537,795.8	0.0	0.0	0.0
G	0.0	0.0	0.0	0.0	-2,282,972.4	11,147,475.1	0.0	0.0	0.0	0.0	0.0
I	0.0	0.0	0.0	0.0	0.0	0.0	121,628.0	7,598,464.9	634,602.3	0.0	0.0
H1	0.0	0.0	0.0	0.0	6,459,775.8	0.0	0.0	0.0	1,861,067.1	0.0	0.0
H2	0.0	0.0	0.0	0.0	30,914,949.3	0.0	0.0	0.0	3,083,417.0	0.0	0.0
RM	0.0	0.0	0.0	0.0	859,826.9	0.0	0.0	0.0	0.0	0.0	0.0
Result	0.0	0.0	0.0	0.0	0.0	0.0	-6,270,410.1	10,898,717.6	-4,070,728.9	0.0	-557,578.7

Note: This table presents a simplified version of the 2021 Argentine Social Accounting Matrix. The values of the transactions between accounts are measured in millions of local currency units (ARS) for the year 2021. The original matrix includes 50 productive sectors, 5 households, one government, and the rest of the world. That version is available with the submission of the thesis.

We now present some stylized facts about the electricity market in Argentina, based primarily on data from CAMMESA, the national electricity system operator. Figure 7 illustrates the average hourly electricity demand for a representative day in each season.

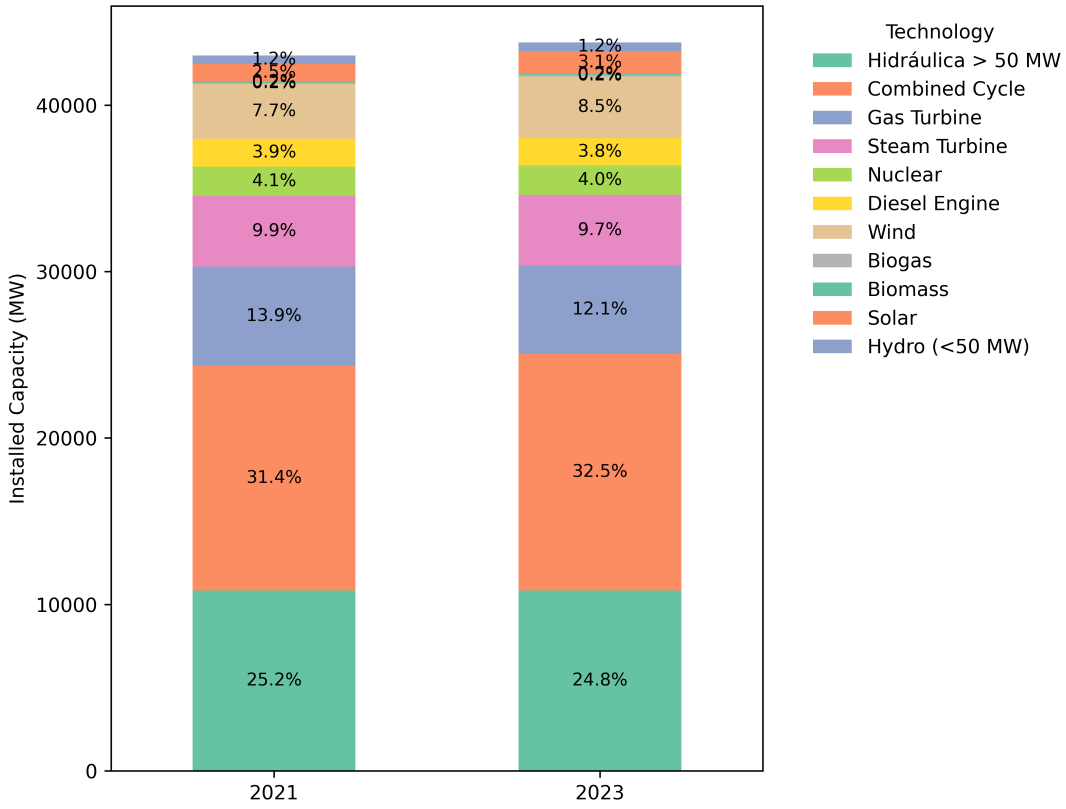
Figure 9 – Argentina 2021. Average Hourly Demand for a Representative Day by Season.



Source: CAMMESA.

Table 8 presents the evolution of electricity generation capacity from 2021 to 2023. The data include all generation technologies classified by CAMMESA in its official database.

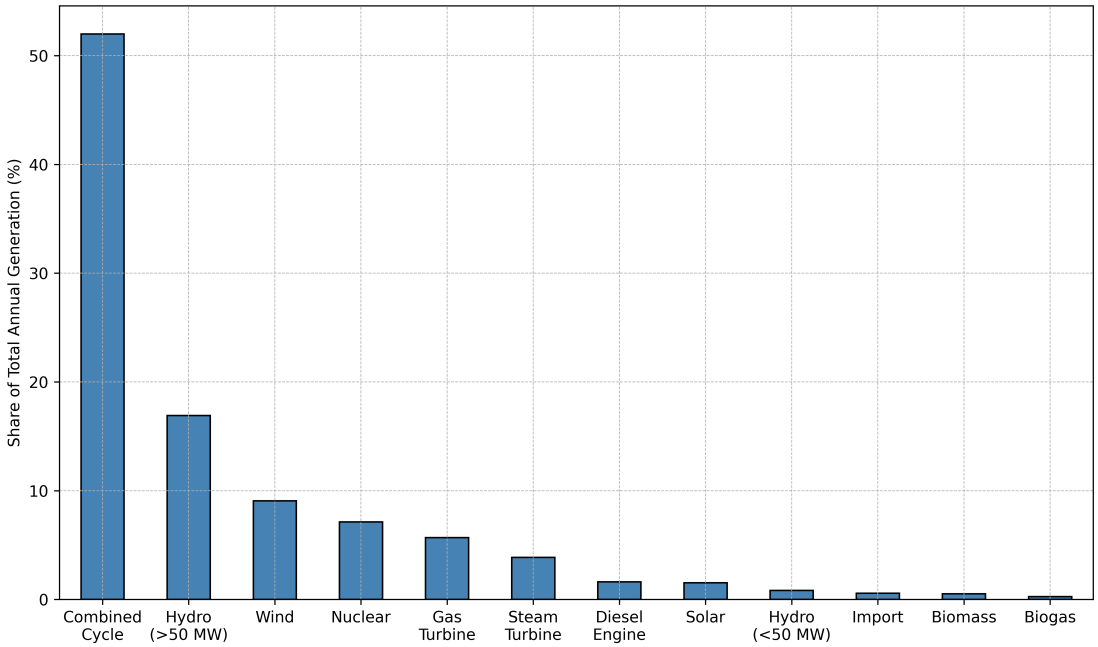
Figure 10 – Argentina 2021 and 2023. Installed Capacity Composition by Technology.



Source: CAMMESA.

Figure 9 presents the technological composition of total electricity generation in Argentina for the year 2021.

Figure 11 – Argentina 2021. Share of each technology in total annual power generation.



Source: CAMMESA.