

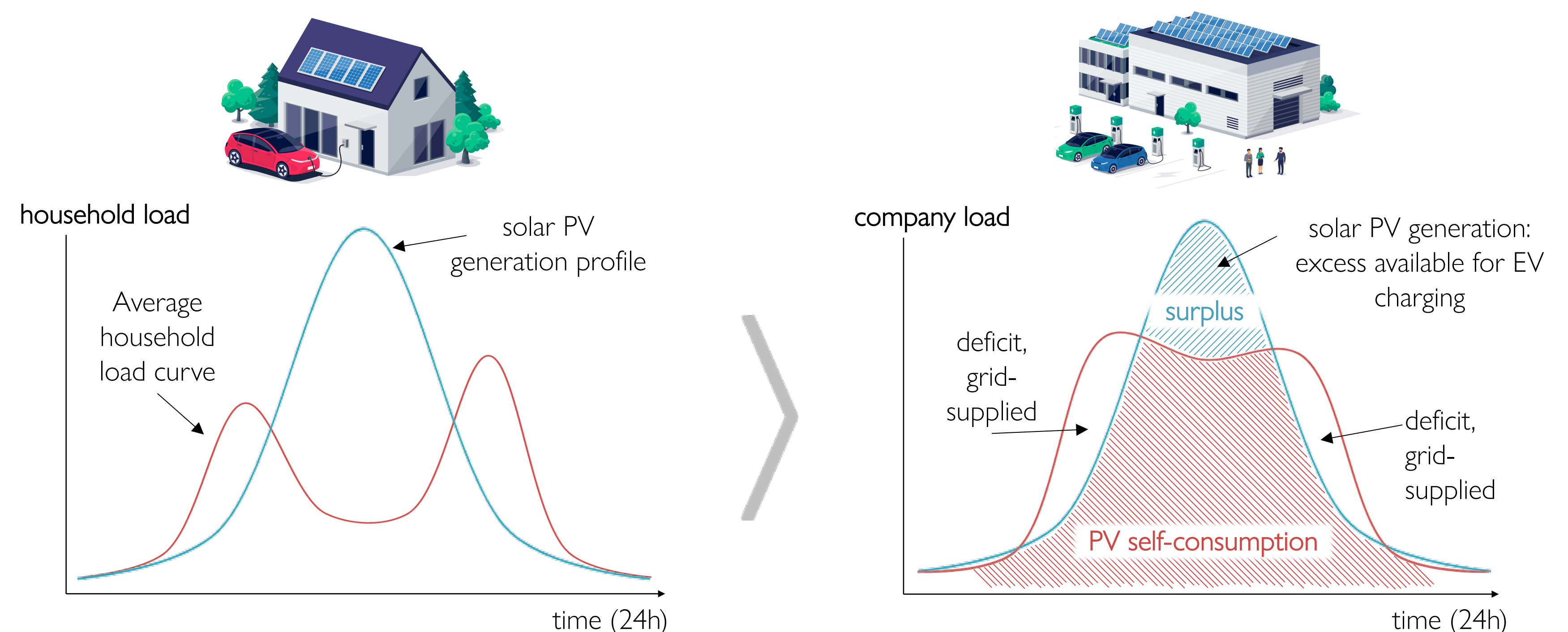
Co-creating grid integration of solar power and electric vehicles: A cross-country analysis of employee preferences for smart workplace charging

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Background

When EV drivers charge their EVs at home, they often add to early evening demand peaks. In parallel, high solar PV markets experience a duck curve, where electricity prices decrease at midday in the absence of flexibility to absorb the excess capacity.

Thereby, we present smart solar EV charging at work as a solution to the current temporal mismatch of solar power generation and residential EV charging patterns. Yet, the success of workplace charging hinges at the willingness of employees to co-create flexibility with their employers. Thus, we investigate the preferences of employees to participate in a smart solar EV charging program at their workplace.



Country Selection & Methods

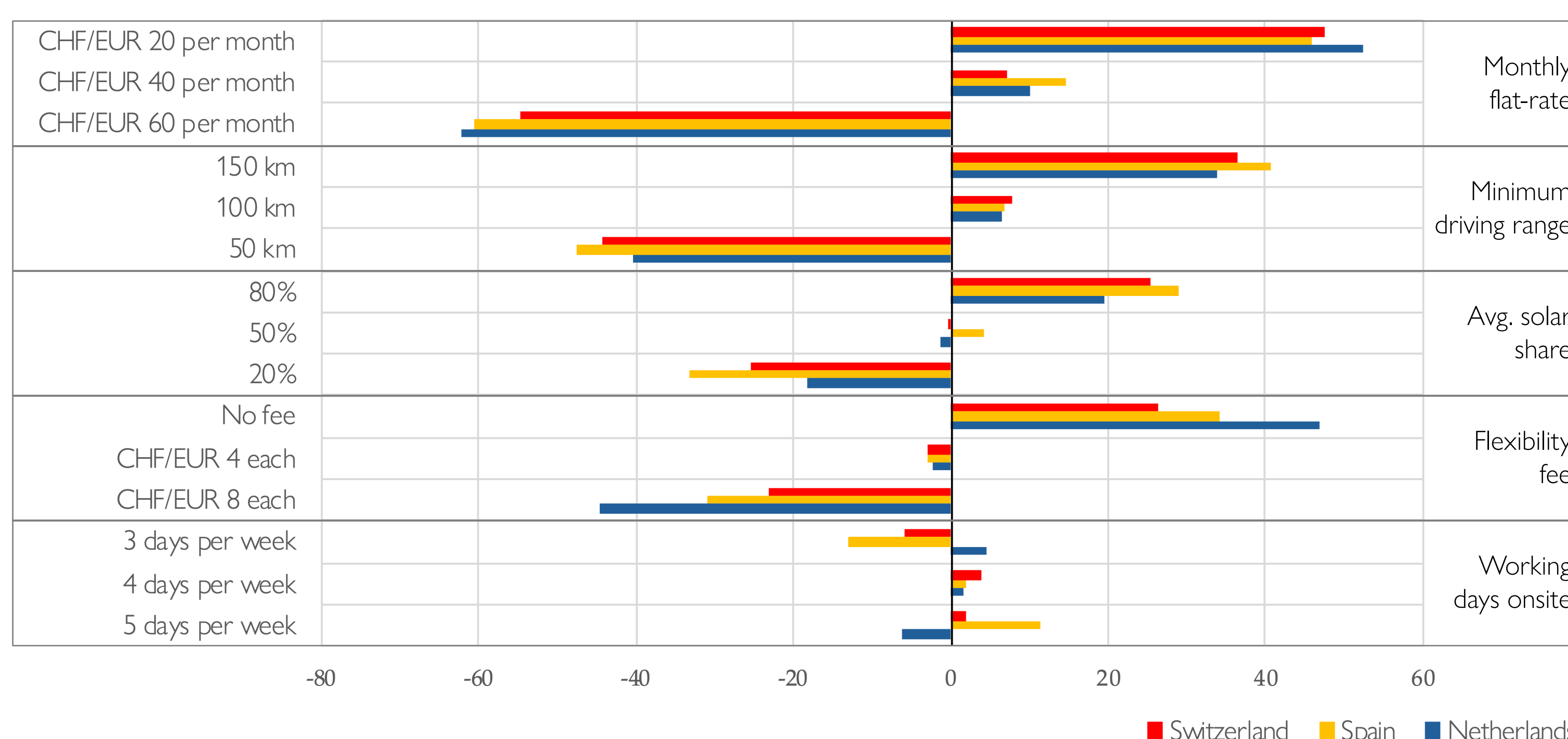
- RQ 1: To what extent are actual and potential EV adopters willing to participate in smart workplace charging?
- RQ 2: How do different features of smart workplace charging schemes shape employees' willingness to participate?
- RQ 3: How does the willingness to participate in workplace charging vary across countries with different levels of PV and EV adoption?

	EV adoption	PV adoption
	High	High; focus on residential-scale
	Medium	Medium; focus on commercial-scale
	Low	High; focus on utility-scale

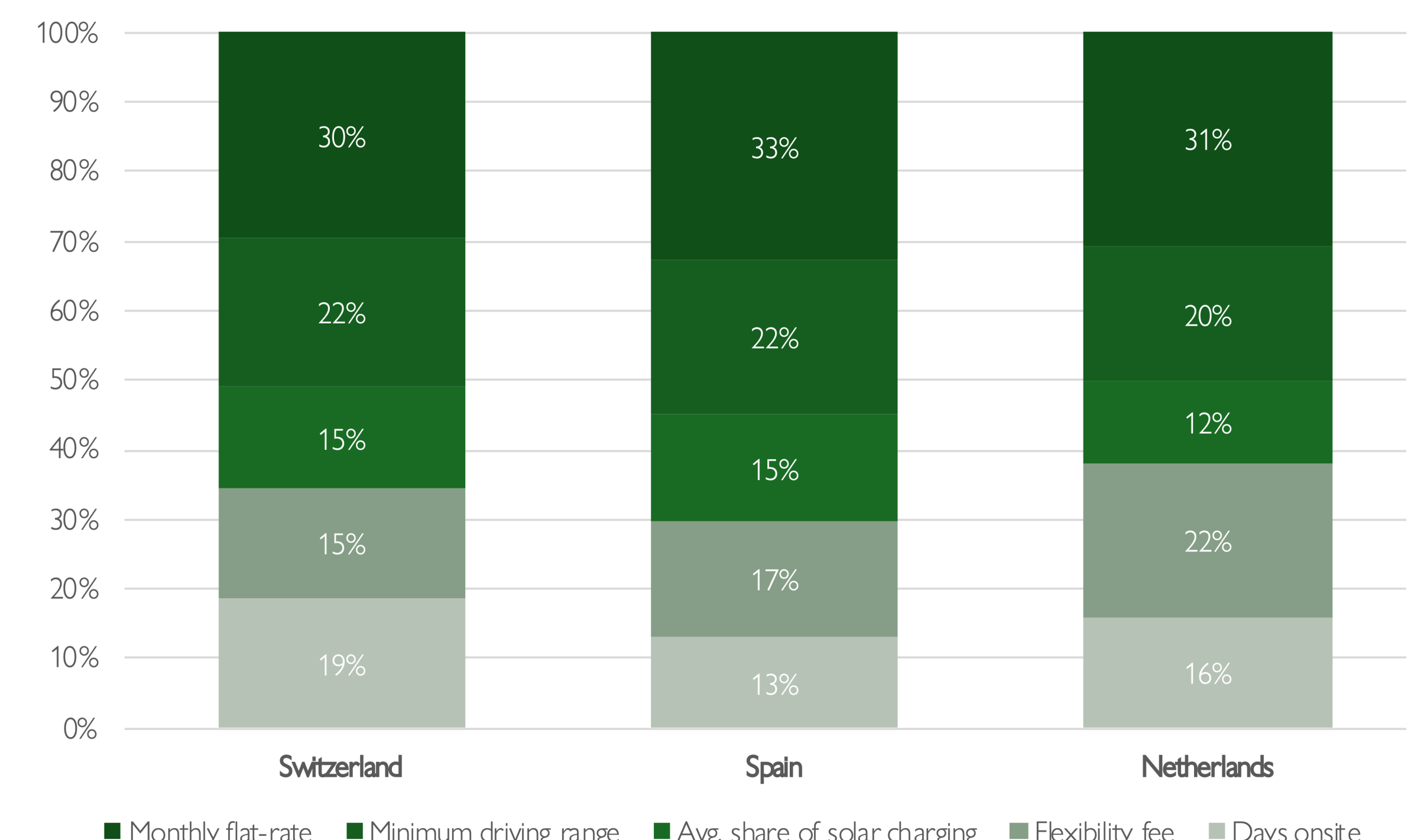
- Choice experiment questioning 3,149 labour force members of the Netherlands, Switzerland and Spain on their preferences for smart solar EV charging at the workplace
- Respondents are shown 3 different workplace charging programs by their employer 10 times, where program features vary along 5 attributes. We incorporate attributes unique to a workplace context, evaluating the need for flexibility and home office, while considering commuting patterns

Results

Average part-worth utilities



Attribute importance scores



- 77%, 83% and 74% employees were either “somewhat likely”, “likely” or “highly likely” to participate in smart solar workplace charging programs in Switzerland, Spain and the Netherlands respectively – particularly in Spain workplace charging reduces the perceived need for homeplace charging and encourages the transition to EVs
- Monthly costs are consistently the most important attribute. This is followed by guaranteed minimum driving range in Switzerland and Spain, consistent with their higher levels of perceived range anxiety when available battery power is low, compared to the more EV-experienced Dutch respondents
- Spanish respondents indicated their preference to come to the office 5 days per week when offered workplace charging. Although 82% of respondents are currently onsite 1-2 days per week, this indicates a higher propensity to sacrifice flexibility in exchange for workplace charging opportunities.
- In comparison, Dutch respondents preferred maintaining existing commuting patterns and exhibited a significantly negative part-worth utility for paying flexibility fees in exchange for interrupting charging sessions before the end of the workday

Conclusion & Policy Recommendations

- Thus far, policymakers and researchers have focused on residential or public charging and largely in isolation of solar PV
- Yet, smart solar charging at the workplace has significant potential to contribute to energy-system resilience by providing flexible electrical demand that can shift EV charging away from periods of peak grid demand, facilitate the integration of variable renewable energy, and support demand management during system disturbances
- Workplace charging experiences high acceptance across countries with varying PV and EV adoption levels
- We encourage policymakers to increase funding for workplace charging infrastructure and e.g., offer financial support only when installing commercial PV systems jointly with EV charging infrastructure. Progressive subsidies can ensure the employees' requirements for minimum driving range and flexibility are met
- By shifting funding from utility to commercial & industrial scale, solar PV self-consumption can be increased, which reduces pressure on increasingly congested grids
- We prompt policymakers to consider the implications on taxation, when offering workplace charging as a fringe benefit to employees