TRAGEDIES of Regional Conflicts & PROMISES of Peacebuilding
Responding to Disruptors and Enablers of MENA Development Pathway
ERF 30th Annual Conference

www.erf.org.eg

The Prospects of the Green Transition in the Arab Region:

State-Society Actors, Power Relations, Interests, and Coordination

Mohamed Ismail Sabry

ECONOMIC RESEARCH FORUM
30 years
منتدى البحوث الاقتصادية

2024

The Prospects of the Green Transition in the Arab Region: State-Society Actors, Power Relations, Interests, and Coordination

Mohamed Ismail Sabry
Postdoctoral Researcher
Erasmus University Rotterdam, International Institute of Social Studies (ISS)
The Hague, South Holland, 2518 AX, NL
The Netherlands

Lecturer
Bremen University of Applied Sciences
Bremen
Germany
Email: misabry@hotmail.com   Mobile: 00491741931

Abstract

This paper investigates how the comparative power of the various state and society collective actors and their utilities from the green transition- as reflected in their perceived losses or gains from the transition- affect the prospects of energy transition in the Arab region. The paper starts with a theoretical discussion in which a mapping of the important actors related to the green transition and their comparative power is conducted. These actors are identified as the state, labor, big business tycoons and small and medium enterprises' (SMEs) entrepreneurs. Then the various actors' utilities from the green transition are considered, where the sources of the different utilities are derived from the effect of industrial policies that impact on the green transition. The main focus here is placed on linkages-development, structural transformation, and energy subsidization policies. This discussion leads to the formulation of a theoretical mathematical model, from which several hypotheses are derived. The methodology section translates the theoretical model into a regression model. Then the paper discusses the results and how they compare to the hypotheses. A brief analysis of some case studies follows to have a better understanding of the results. The paper concludes that in countries with a more dominant state and weaker social actors, green transition is more likely to largely follow the interests of the state regardless of social actors' interests. In more balanced state-society relations, however, the higher the interests of the various social actors, the more likely the green transition will proceed. In these settings, tycoons and entrepreneurs would be encouraged to support the green transition by more linkages-development policies, labor by better structural transformation policies, and both tycoons and labor by lower fossil energy subsidies.

Keywords:

Green Transition, Energy Transition, State-Society Relations, Arab World, Industrial Policy, Innovation, Training, Energy Subsidy

JEL Classification:

O38, O14, O15, L52

I- Introduction

Located at a close distance from the tropic of cancer and by major oceans and seas, the Arab world is richly endowed with abundant solar and wind energy. The Green transition offers a chance for the diversification of energy production sources, creating linkages, establishing new industries and more jobs, reducing the burdensome oil imports of oil-poor Arab countries, providing more electricity coverage, and- for North African countries- there is the additional potential of energy exporting to Europe. At the same time, the growing concern on global warming and the call for a more international commitment to green transition encouraged many Arab countries to commit themselves towards more production of green energy.

International commitments as depicted in signing international agreements, however, have to be translated into suitable local regulations and legislations that would then have to be enacted and effectively implemented. Nevertheless, it is often the case that big gaps exist between the formulation, enactment, and implementation of policies, regulations, and legislations. The enactment of different regulations and legislations and their actual implementation are subject to the power dynamics of state-society relations (Sabry, 2023c). Accordingly, powerful actors and coalitions could foster or block the energy transition according to their perceived gains or losses. A big body of literature points to the need for having a supporting power coalition so that a major transformation could happen (Doner and Schneider, 2016; Hochstetler, 2020; Nem Singh and Camba, 2020).

This paper investigates how the comparative power of the various state and society collective actors and their utilities from the green transition- as reflected in their perceived losses or gains from the transition- affect the prospects of the transition in the Arab world. The research focuses on the industrial sector, and more specifically the manufacturing and energy production sectors. Accordingly, the main actors relevant to the green transition are identified as the state, big business tycoons, small and medium enterprises' entrepreneurs, and labor. It is acknowledged that these actors do not always have the same interests with regard to the transition. Rather, their interests are shaped by the existing policies. In this regard, three policy spheres relevant to the interests of the various actors are identified. These are: a)- policies that encourage the development of local suppliers- whether tycoons or entrepreneurs- of multinational firms investing in the renewable energy sector, b)- structural transformation policies such as professional training and active labor market policies (ALMPs), and c)- fossil energy subsidies. On the other hand, the actors' relative power vis a vis each other is shaped by the existing settings of state-society relations. Actors' relative power, interests, and their ability to coordinate among each other are what shape coalitions with and against the transition and hence the prospects of success or failure of the green transition.

Hypothesizing these dynamics with the help of a theoretical model and testing the presented hypotheses using regression and short case study analysis, this research reaches important conclusions. In state-society relations characterized by a more dominant state and weaker social actors, green transition is more likely to largely follow the interests of the state regardless of social actors' interests. In more balanced state-society relations, however, the higher the interests of the various social actors, the more likely the green transition will proceed. In these settings, tycoons and entrepreneurs would be encouraged to support the green transition by more innovation-fostering policies, labor by better structural transformation policies, and both tycoons and labor by lower energy subsidies.

The research done in this paper is novel given the focus placed on the different actors and the dynamics governing their interaction based on power, interests, and coordination. Such a research hardly exists in the literature on the Arab world or even globally.

The paper starts with a theoretical discussion leading to the formulation of a theoretical mathematical model that would ultimately provide several hypotheses. The methodology section translates the theoretical model into a regression model. Then the paper discusses the results and how they compare with the hypotheses. A brief analysis of some case studies follows to have a better understanding of the results. The paper ends with a conclusion that includes policy recommendations.

II- Theoretical Perspectives

Renewable Energy offers great chances for countries suffering from energy shortages and substantial burdens in the balance of payments because of oil imports. Remarkable is the ever falling costs of the renewable energy technology due to the improvement in the learning curve and the relative cheapness of generating electricity from renewables in many countries (Griffiths, 2017; Mathews, 2020). This makes it plausible for renewables to supersede oil as the main source of energy before the middle of the 21st of Century (Mathews, 2020). On the other hand, oil-exporting countries are faced by a major challenge that urges them to diversify their energy sources to minimize the consequences of the expected fall in revenues in the long-run as the global drive towards renewable sources of energy proceeds further.

In this context, many Arab countries committed themselves to move towards clean energy transition, remarkably some North African countries, and many West Asian countries other than the oil-rich Gulf states (Griffiths, 2017, p. 252). Yet, even in the Gulf area, there are some ambitious plans for investing in renewable energy (Olawuyi, 2021), with the United Arab Emirates being an important player (Hafner and Tagliapietra, 2020; Mills, 2020). Morocco remains a pioneer in the region, with renewables already becoming the first source of energy generation in the country in 2018 (Mills, 2020; El Ghazi, Sedra and Akdi, 2021) . Energy demand and consumption is rapidly increasing across the region accompanying its major demographic changes (Griffiths, 2017, p. 259; Krupa, Poudineh and Harvey, 2019; Olawuyi, 2021). Moreover, the oil and natural gas resources of the region- even for the oil rich countries- are expected to be totally depleted by 2064 with some estimates suggesting this to happen even in 2044 (Olawuyi, 2021). Another major concern is the environmental hazards that are already affecting the region because of its high consumption of fossil fuels (El Ghazi, Sedra and Akdi, 2021; Olawuyi, 2021). These and other factors should lead to a dramatic expansion of Arab countries' production and use of renewable energy and ultimate reduction of their reliance on fossil fuels.

Arab countries are richly endowed with renewable energy resources such as solar, wind, geothermal, hydro, and bio-based energy sources. The region, for instance, has high levels of Direct Normal Radiation (DNR), which makes it among the best in the world for concentrated solar applications (Griffiths, 2017, p. 255). For oil-rich Arab countries, the green transition offers a chance for diversification of energy production sources (Tagliapietra, 2019) and for creating linkages and establishing new industries. The gains are expected to be more substantial for oil-poor countries. The current and prospective renewable energy plans present great promises to reduce their oil imports that burden their trade balance and result in more electricity coverage and more jobs creation. For North African countries, there is the additional potential of energy exporting to Europe. The European Union (EU) ambitious objectives to reduce greenhouse emissions and dramatically increase renewable energy consumption, with Germany's *Energiewende* (energy change) being one of the most ambitious (Schiffer and Trüby, 2018), is a driving force behind creating such a potential. The EU has already set objectives for a lower carbon emissions-oriented "strategic energy partnership" with Arab countries (Olawuyi, 2021). With geopolitical tensions between Russia and the EU, escalating as a consequence of the War in Ukraine, neighboring North African countries are likely to play a major role meeting the expected accelerating EU economies' drive towards renewables in search for 'strategic autonomy' from other great powers.

Nevertheless, the presence of major opportunities is not enough for a successful and rapid structural change. As in other major transformations, the role of industrial policy is crucial. Industrial policy is generally any sort of state intervention or policy that tackles the restructuring of the economy towards higher growth activities or more societal welfare (Warwick, 2013). Yet, the state is not operating in a vacuum and the influence of major actors shape its decision, its policy formulation, enactment, and implementation, where gaps often exist between the three. This makes state-society relations crucial for industrial policy, with the main actors besides the state being the two who are involved in industrial relations, businesspeople and labor, reducing the focus into one on state-business-labor relations (SBLR) (Sabry, 2023c). Accordingly, the success of the energy transition could be supported or hindered by industrial policy, which itself is subject to state-society relations and more specifically SBLR. Understanding the dynamics of SBLR is important to understand how green industrial policy is formulated and implemented and the chances of its success.

Especially important is the comparative power of the different actors and the possible policy coalitions among these actors in support or resistance to the energy transition. Even with international commitment to energy transition as manifested in signing different international agreements, the enactment of different regulations and legislations and their actual implementation are subject to the power dynamics of SBLR. Powerful actors and coalitions could foster or block the enactment and implementation of energy transition policies according to their perceived gains or losses. A powerful coalition is one that is made up of comparatively powerful actors or whose collective power is high enough to overcome the power of opposing coalition(s). A big body of literature points to the need for having a supporting power coalition for a major transformation to happen (Doner and Schneider, 2016; Hochstetler, 2020; Nem Singh and Camba, 2020). Thus:

$$P(G) = \sum_{k,n} W_k U_n - \sum_{k,n} A_k U_n \qquad \ldots(1)$$

P(G) is the probability of the Green Transition, (W) is the power of the supporting (with) coalition, (A) is the power of the resisting (against) coalition, (U) is the utility of those actors from different policies, subscripts (k) and (n) refer to the actors forming up each coalition and policies, respectively.

The power of a policy coalition is not likely exactly equivalent to the summation of its constituting actors' power. As pointed out by Doner and Schneider (2016), social groups fragmentation in middle income countries prevent the creation of "strong upgrading coalitions". An increase in the scale of investment in a certain sector characterized by the fragmentation of business representation is likely to witness significant coordination failure, due to the increase in “particularistic demands and bargaining” (Di John, 2020, p. 334). Such conditions are not unfamiliar in the Arab world, with the upscaling of investment in renewable energy being a case worth studying. There is also the possibility of lack of trust among the different actors that prevents them from forming a powerful policy coalition (Sabry, 2023a).

Realizing this, a mapping of the important actors related to the green transition, their comparative power, utilities, and capability to coordinate should be done. Having identified the three major actors as the state, labor, and businesspeople, a subdivision of the latter into big business tycoons and small and medium enterprises’ (SMEs) entrepreneurs should be conducted. Sectoral sub-divisions among these collective social actors should also be considered based on their gains/losses from the transition, while divisions often exist inside the state between the executive, administration, and legislative. The power dynamics among these actors is largely country-specific and have to be investigated through variables such the level of government dominance vis a vis social actors and the ability of the social actors to independently organize and defend their interests vis a vis the state and one another. Generally speaking, social actors are more powerful whenever they have independent and less fragmented organizations representing their interests, business associations in the case of entrepreneurs and labor unions for labor. However, Tycoons have different sources of power, where they would benefit from their control over business associations or exercise their individual power relying on the economic and political resources under their disposal. The state, on the other hand, is more dominant vis a vis social actors whenever it is capable of preventing the independence of their organizations and whenever it is more cohesive with less friction among its constituents (Sabry, 2023c). Finally, the capability of the various actors to coordinate and build powerful policy coalitions depends on mutual trust and their ability to coordinate their actions.

To estimate actors’ utility as represented in their benefits and gains from the green transition, a better understanding of the multifaceted nature of the transition is needed. Starting with the state, the structural transformation accompanying the energy transition opens wide opportunities and poses major challenges. The MENA region, which is dominated by Arab countries, has currently about 48.3% and 38.4% of the world’s oil and natural gas reserves, respectively; yet, its potential for renewable energy generation is also strong (Mills, 2020). With the proceeding energy transition, new jobs would be created but others would be lost. A reason for optimism for the Arab state should be the more labor-intensive nature of green technologies (El-Katiri, 2016). Yet, substantial investment in infrastructure, training, and capacities is needed to accomplish this transformation. This represents a big financial burden and causes big social pressures. It might also diminish the substantial oil rents enjoyed by many Arab MENA countries for decades (Griffiths, 2017; Tagliapietra, 2019). Yet, given the capability of the state in the Arab world to sustain the rentier state despite of challenges (Beck and Richter, 2021), renewable energy industry could develop new rents for other Arab countries or change the source and nature of such rents for different countries of the region. Major opportunities also exist, such as reducing the energy import burden for many oil-poor MENA countries that would turn into energy producers, added to chances of exporting energy to EU countries.

Businesspeople, whether tycoons or entrepreneurs, have other different concerns that would shape their utilities from the green transition. Tycoons have the opportunity to invest in public-private partnerships that would handle renewable energy projects as a part of a consortium that might bring in multinational corporations (MNCs) and expose local tycoons to foreign technologies. Tycoons could also benefit from providing inputs to the renewable energy industry and again partnerships with MNCs could be possible in this market. Entrepreneurs are also likely to benefit from this opportunity, given that linkages between the renewable energy industry and the manufacturing sector could develop, given the industry's less capital-intensive technology characteristics (El-Katiri, 2016). Currently, renewable energy industry inputs, equipment, and technology are likely to be imported in many Arab countries. This includes inputs such as turbine controllers, electrical wires, and photovoltaic (PV) cells (Ben Rouine and Roche, 2022). Nevertheless, as many studies by the International Renewable Energy Agency (IRENA) have assessed, many Arab countries have high existing or potential capacities as local suppliers for the industry in its various value chain stages (European Investment Bank (EIB) and IRENA, 2015; IRENA and ESCWA, 2018). Opportunities for creating linkages and backward integration are thus present, for both entrepreneurs and tycoons. Moreover, in the oil and natural gas-rich Gulf countries, the potential of generating eco-friendly blue hydrogen which is generated from fossil fuels is being considered (Mills, 2020, pp. 130–132), opening further chances for local producers in cooperation with MNCs. These opportunities, however, should be weighed against generous energy subsidies that the state in many Arab countries provide for its industrial sector. This is more relevant for more energy-intensive industries such as heavy industries, in which tycoons and public enterprises are more likely to exist. Energy subsidies are considered among the factors that improve the competitiveness of some industrial sectors even in an Arab country that is comparatively not so rich with fossil resources such as Egypt (Adly, 2012).

As for labor, it is estimated that substantial job creation could result from backward integration with the local production of renewable energy equipment and inputs, especially in labor-abundant countries major. Yet, this is only one side of the expected structural transformation that the green transition entails in a largely fossil fuel-dependent region. Major job loss for labor in sectors connected to fossil fuel extraction and energy generation could not be quickly-enough compensated by green jobs. Moreover, it is often the case that public enterprises have monopolies or have big market shares in the sectors related to the extraction of and the production and distribution of energy from fossil fuels. Public sector employment still offers job security (and likely more welfare privileges) than jobs in the private sector especially with the increasing flexibility in the job market in many Arab countries (Cammett and Posusney, 2010). The green transition opens the way for major private sector investment and raises fears of privatization of the energy sector, as is the case in Tunisia where this prospect led to organized labor resistance to renewable energy projects by the major trade union organization in the country, the *Union Générale Tunisienne du Travail* (UGTT) (Ben Rouine and Roche, 2022). Another concern are energy subsidies that contribute to lowering the living expenses of poorer segments of society, with labor being among their significant beneficiaries.

Understanding these various interests, an assessment of how different industrial policies could shape the utilities of the different actors could be done. The potential gains of entrepreneurs and tycoons from creating linkages with the renewable energy industry would increase with policies fostering innovation and startups creation, including facilitating access to credit- especially venture and angel capital. These horizontal policies would enable domestic producers to provide less costly inputs matching the resources of the country. They would also encourage MNCs in the sector to enter into partnerships and alliances with local producers and increase the latter's financial resources and absorption of foreign technology. Other more vertical policies such as local content requirements have been used in developing countries (e.g.: India) seeking creating linkages between the renewable sector and the rest of the industrial sector (Mathews, 2020). Some Arab countries, such as Saudi Arabia and Morocco, have already started to implement this policy in the renewable energy sector (Mills, 2020). Another relevant vertical policy is the involvement of government investment promotion agencies (IPAs) in linking MNCs with local SMEs (World Bank Group, 2020). Such policies should increase the utility of businesspeople, whether tycoons or entrepreneurs, from the green transition. On the other hand, labor's utility from the transition would be boosted by the presence of active labor market policies (ALMP) that provide adequate unemployment compensation and retraining. The Scandinavian flexcurity model, for instance, has been widely promoted as one that entails policies facilitating structural transformation. These policies provide hiring and firing flexibility and balance it by providing generous welfare policies that compensate unemployed workers and by involving them in training programs that should quickly reintegrate them to the job market (van den Berg, 2009; Viebrock and Clasen, 2009; World Bank Group, 2020). However, fossil energy subsidies are expected to work on the different direction by disincentivizing tycoons, and especially managers and investors in energy-intensive sectors, as well as labor whose wages' purchasing power would diminish significantly with the abandonment of this policy.

This presents linkages-development, ALMP, and energy subsidization as fundamental policies that shape the utilities of the main actors in SBLR for the green transition. Government resources are used to finance these policies and, reasonably, spending to support these policies is subject to budget constraints. If maximizing the probability of the green transition as presented in Equation 1 is the objective function, spending on the three highlighted policies would be the constraint. Hence, the constrained objective function is given by:

$$Max\ P(G) = \sum_{k,n} W_k U_n - \sum_{k,n} A_k U_n$$

$$s.t.\ \ 1 \geq i + l + e \ \ ; where\ U = f(i, l, e)$$

…(2)

Where P(G), (W), (A), (U), (k) and (n) are as in Equation (1), while (i), (l), and (e) are the shares of government expenditure directed to linkages-development policies, ALMP, and energy subsidization respectively.

The utilities of the three considered players: tycoons (T), entrepreneurs (E), and labor (L), depend on the utilities that these actors get from the three policies. It is to be noted that each of these actors represents a set for which different subsets exist. For instance, tycoons could be subcategorized into: tycoons in sectors which are energy-intensive, tycoons who could invest in public-private partnerships, tycoons in the high-tech sector…etc. If (α_k), (γ_k), (θ_k) are the utilities obtained by actor (k) from linkages-development, training, and energy subsidies, respectively, then:

$$U_i = \alpha_k i;\ U_l = \gamma_k l;\ U_e = \theta_k e$$

$$where\ i, l, e, \alpha, \gamma, \theta\ \epsilon\ [0, 1]\ \ and\ k = \{T, E, L\}$$

Linkages-development and training policies should encourage renewable energy production and increase the utility from green transition, while higher fossil energy subsidies would do the opposite and increase the utility from resisting the transition. Thus, the constrained objective function becomes:

$$Max\ P(G) = \sum_{k} W_k(\alpha_k i + \gamma_k l) - \sum_{k} A_k(\theta_k e)$$

$$s.t.\ 1 \geq i + l + e$$

…(3)

The Lagrangian function would then be:

$$\mathcal{L} = \sum_k W_k(\alpha_k i + \gamma_k l) - \sum_k A_k(\theta_k e) - \lambda\,(i + l + e - 1)$$

Taking the first order conditions with respect to the three policies (i, l, e) will give us:

$$\frac{\partial \mathcal{L}}{\partial i} = \sum W_k \alpha_k - \lambda = 0$$

$$\frac{\partial \mathcal{L}}{\partial l} = \sum W_k \gamma_k - \lambda = 0$$

$$\frac{\partial \mathcal{L}}{\partial e} = -\sum A_k \theta_k - \lambda = 0$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = i + l + e - 1 = 0$$

Using these equations, we get:

$$\sum W_k \alpha_k = \sum W_k \gamma_k = -\sum A_k \theta_k = \lambda \ and\ \ i + l + e = 1$$

Thus:

$$\alpha_k = \gamma_k = -\frac{\sum A_k}{\sum W_k}\theta_k \qquad \text{…(4)}$$

Considering the concerns of each of the three main actors, substitution into the main objective function is done. For tycoons, linkages-development and energy subsidies matter, while training does not directly affect their utility from the green transition. Thus, maximizing the probability of green transition, P(G), would mean:

$$P(G) = \sum_k W_k(\alpha_k i + \alpha_k(1 - i - e) - \sum_k A_k(\theta_k e) = \alpha_k \sum_k W_k(1 - e) - \theta_k \sum_k A_k(e)$$

…(5)

The previous equation shows that an increase in the magnitude of tycoons' support for energy transition is caused by higher elasticity from linkage-development policies and lower energy subsidization and the elasticity from this subsidy. This support also increases with a higher capability of forming a strong with and lower capability of forming an against coalition.

As for labor, what matters are the utilities they would get from training and energy subsidies as a part of the general consumer public. Thus:

$$P(G) = \sum_k W_k(\gamma_k i + \alpha_k(1 - l - e) - \sum_k A_k(\theta_k e) = \gamma_k \sum_k W_k(1 - e) - \theta_k \sum_k A_k(e) \quad \ldots(6)$$

Thus, an increase in the magnitude of labor support for green transition is caused by a fall in energy subsidization and lower elasticity for labor from this subsidy. It also increases with a higher elasticity of training, a stronger capability to form a with coalition, and a lower capability to form an against coalition.

Entrepreneurs, on the other hand, are mainly concerned about linkage-development and comparatively less concerned about energy subsidization since entrepreneurs are less likely to have their enterprises in energy-intensive technologies or be as sensitive as labor to such subsidies as part of their consumption. Thus:

$$P(G) = \sum_k W_k(\alpha_k i + \alpha_k(1 - i - e) - \sum_k A_k\left(-\frac{\sum W_k}{\sum A_k}\alpha_k e\right) = \alpha_k \sum_k W_k \quad \ldots(7)$$

As the previous equation shows, an increase in the elasticity of entrepreneurs from linkage-development policies and their capability to form a supporting coalition (with) to energy transition would increase the strength of their support to green transition.

Finally, for the state, its constituent collective actors could be a part of either the with or against coalitions, depending on their perceived interests and regardless of the implemented policies. The earlier discussion suggested that in the Arab world, state actors are likely to have more gains from the transition. Thus, and due to exogenous factors independent from implemented policies, state actors are more likely to be in the coalition that supports the green transition. This is particularly true for the executive, which is more likely to benefit from developmental aid and from a reduction in the budget deficit because of a fall in energy imports. While the bureaucratic apparatus could be neutral, some parliamentarians could be against the transition based on the interests they are representing. Thus, a more dominant executive over the bureaucracy and the parliament will make the state lean more towards the green transition supporting coalition; and this condition of executive dominance is likely more common in the Arab world given the predominance of authoritarianism.

The next step is to analyze the policy coalitions with and against the green transition. The power of each coalition is a factor of the strength of its constituents. However, the power of the coalition is not simply the summation of its constituents' respective power. Coordination is crucial for creating a coalition, to the extent that lower levels of coordination and higher levels of rivalry or mistrust could diminish the power of the resultant coalition to levels that might fall below the power level of each single constituent. Conversely, higher coordination could magnify the power of the coalition beyond the mere summation of its constituent actors' power. Thus, if (Π) stands for power and (C) for coordination:

$$W_k = f(\Pi_k, C) = \sum_k \Pi_k(1 + C)\,; where\ \Pi_k \epsilon\ [0,1]\ and\ C\epsilon\ [-1,1]$$

…(8)

The presence of broad-based and strong business associations would enable the development of higher coordination and enable the evolvement of a powerful coalition among tycoons and entrepreneurs. Similarly, an effective public-private dialogue (PPD) that incorporates representatives of the four actors: the state, tycoons, entrepreneurs, and labor, would also produce a powerful coalition.

The model and previous discussion suggest the following hypotheses, concerning Arab countries:

H1: In Arab countries with high state dominance, the higher the benefits of the state from the green transition, the higher the production of renewable energy production, regardless of social actors' interests.

H2: In Arab countries with a comparatively more independent and less fragmented business associations, more linkage-development policies will lead to more renewable energy production.

H3: In Arab countries with a comparatively more independent and less fragmented labor unions, more structural transformation and training policies will lead to more renewable energy production.

H4: In Arab countries with a comparatively more powerful tycoons, higher energy subsidies will lead to less renewable energy production.

> H4a: In Arab countries with comparatively more powerful tycoons with an active presence in a more energy-intensive industrial sector, higher energy subsidies will lead to less renewable energy production.

H5: In Arab countries with comparatively more powerful labor organizations, higher energy subsidies will lead to less renewable energy production.

III- Methodology

In this section, the first step to be taken is to translate the mathematical theoretical model of the previous section into an equation that would enable conducting regression analysis. For this purpose, a fixed-effects regression equation is derived from the theoretical equation and would test the different presented hypotheses. The use of this model reduces the omitted variable bias. The use of the model is also justified given that the endogeneity concern is assumed here to be minimal. It is not likely that the level of renewable consumption affects the power of the different actors or policies, rather than the other way round. The general form of the conducted regressions is:

$$G_t = \beta_0 + \beta_1 \Pi_{it} + \beta_2 P_{jt} + \beta_3 (\Pi_{it} * P_{jt}) + \beta_4 (Control) + \beta_5 (Country\ Dummies) + \mu_t \quad \ldots(9)$$

The dependent variable (G) is the renewable energy produced by an Arab country, (Π) is the power of actor (i) at time (t), and (P) is policy (j) at time (t).

The various indicators are collected from different datasets, including the Varieties of Democracy (V-Dem) (University of Gothenburg, no date), World Development Indicators (World Bank, no date a), Worldwide Governance Indicators (WGI) (World Bank, no date b), the Global Competitiveness Indicators (GCI) (World Economic Forum, no date), the International Energy Agency (IEA) (International Energy Agency (IEA), no date), and Our World in Data (Our World in Data, no date). A full description of the used proxies is reported in the appendix. The collected dataset runs between the years 2000-2022, and the summary statistics of the different variables are listed in Table 1.

(Please insert Table 1 here)

Two indicators are used as dependent variables. The first is the sum of solar and wind energy consumption TWh per million inhabitants which is calculated from the solar and wind energy TWh indicators of the Our World in Data dataset adjusted by population levels from the WDI (see the Appendix). The second is the renewable energy consumption (% of total final energy consumption) obtained directly from the WDI. The first dependent variable is more relevant to the paper's analysis given the focus on solar and wind energy generation, while the second indicator includes other forms of renewable energy generation such as hydroelectrical energy generation, which is of less relevance.

For linkage-development policies, a focus is placed on innovation policy given its more horizontal intervention nature, while vertical policies such as the creation of IPAs and the effectiveness of these IPAs would be neglected given the difficulty of finding relevant proxies. For innovation policy, training, and fossil energy subsidization the proxies used respectively are GCI's innovation pillar, availability of training, and IEA's energy subsidies adjusted to measure the share of the subsidy per manufacturing value added (using WDI's indicator of manufacturing value added as percentage of GDP, calculation reported at the appendix).

As for various actors' power, the degree of state dominance is calculated as the reciprocal of the WGI's voice and accountability (V&A) indicator. The V&A indicator measures how democratically officials are chosen and the freedom of association and the press. A state that does not provide sufficient levels of these political rights is one which is authoritarian but also largely autonomous from social actors' influence. That suggests the reciprocal of the V&A as a good indicator of state power vis a vis social actors (Sabry, 2023b). As a proxy for tycoons' power, the adjusted GCI's favoritism of government decisions (henceforth, favoritism) is used. Favoritism- after adjustment so that higher levels reflect higher favoritism- is a good indicator on how tycoons could have privileged access to government resources, hence their relative power vis a vis the other social actors. The V-Dem's "large encompassing organizations dominate" indicator is used as a proxy for entrepreneurs' power since they need broad-based business associations to represent their interests, as the literature presented in the theoretical section suggested. It is to be noted, however, that entrepreneurs might be overshadowed by tycoons- in terms of interest representation- even in broad-based business associations. However, these associations would still represent much of its constituent entrepreneurs' interests and as well might induce tycoons to use them in lobbying their interests instead of resorting to individual means of influence (Sabry, 2017, 2019). In other words, the used proxy could be used as an indicator for both the relative power of entrepreneurs and businesspeople general interest representation away from individualized tycoons' influence. Finally, the V-Dem's "engagement in independent trade unions" (henceforth, trade unions) is used as a proxy for the relative power of labor. Intuitively, labor power is better represented by the engagement in independent trade unions since independence from state manipulation is important for labor's organizational power.

On the other hand, V-Dem's CSO consultation is used as an indicator of coordination among the different actors. CSO consultation reflects how the different actors- state and social- interact and their ability to coordinate. Another variable is also considered, one that accounts for the energy intensity of the industrial sector. This is the energy intensity of the industrial sector indicator obtained from the Our World in Data dataset. This indicator is mainly used in order to test the effect of its interaction with energy subsidization, where supposedly higher energy intensity would augment the effect of energy subsidization on the industrial sector. As the case with other indicators of the regression model, the resultant interaction would be then used in a further interaction, once with favoritism and another with trade unions in order to test the effect of the combination between actors' power and interest on renewable energy production.

Given the low number of observations, imputations is used to estimate the values of some of the missing data. For every studied country, the average of the values in the years in which data is available is used to estimate the missing data. For only two variables, the favoritism and industrial energy intensity, another technique was used, where the relation between the used proxies and other related indicators was used in estimating missing values of the former. For favoritism, the strong relation between the proxy and the WGI's control of corruption indicator is used in estimating the missing values for the favoritism indicator between the years 2000-2006 (a very high correlation of 0.811 exists between the two indicators for the studied countries). As for the industrial energy intensity, the relation between this indicator and the "energy intensity level of primary energy (MJ/$2017 PPP GDP)" is used to estimate the missing values of the former for the years between 2013-2019. In both cases, the average ratio between the related variables in each country is used in estimating the missing values.

"Sequential elimination of variables" is run manually in the Gretl statistical program on the conducted regressions to dispose of insignificant independent variables where an F-test is run to check that the consistency of the conducted regressions was not altered (see the Appendix). The results of the conducted regressions are reported in Table 2.

To measure the overall effect on the dependent variable of the various independent indicators (given their involvement in interaction terms), the following equation is used in calculating the values reported in Table 3. Depending on Equation 1:

$$\frac{\partial G}{\partial P} = \beta_2 + \beta_3 \bar{\Pi}$$

$$\frac{\partial G}{\partial \Pi} = \beta_1 + \beta_3 \bar{P} \qquad \ldots(10)$$

Where $\bar{\Pi}$ *and* $\bar{P}$ are the mean values of the studied actor's power and policy, respectively.

(Please insert Tables 2 and 3 here)

IV- Results and Discussion

The following analysis depends on the results of both Tables 2 and 3. The analysis focuses only on statistically significant variables. Whenever the sign of the effect is the same in both conducted regressions, the obtained results are regarded as robust. Otherwise, the results of the first regression are considered more reliable since it tackles more specifically levels of solar and wind consumption, while for the second regression the dependent variable includes as well hydroelectrical power generation, which is less relevant to the dynamics of the theoretical model introduced in this paper. Thus, the results of the second regression are referred to as long as they do not have a contradictory sign with the results of the first regression.

Table 2 shows that only two variables are robust and have the same sign of effect on the dependent variables. These are CSO consultation and the interaction term between favoritism and innovation, where the effect is positive for the former and negative for the latter. For the latter, the interaction term between favoritism and innovation, a 1-unit (1% since both constituent variables use percentage scales) increase reduces solar and wind consumption by 0.0001 TWh per million inhabitant, suggesting that powerful tycoons are not motivated by higher levels of innovation policy (and backward integration) to support the emerging renewable energy sector. The first regression provides other results that are more consistent with the earlier introduced hypotheses. Providing evidence supporting H3, the interaction between trade union and training is positive, where a unit change in the interaction term (1% since both of the variable constituents are measured with a percentage scale) leads to an increase of solar and wind energy consumption of 0.0001 TWh per million inhabitant. This suggests that the presence of training services motivates labor to support green transition especially when they have strong labor unions. A change of one unit in the interaction term between energy subsidy per manufacturing value added and industrial energy intensity decreases the solar and wind consumption by 0.033 TWh per million inhabitants; and this is regardless of the power of either tycoons or labor unions. This provides evidence that partly supports H4 (especially H4a) and H5. Table 3 provides further supporting evidence to the mentioned hypotheses by showing the overall negative effect of favoritism, energy subsidy per manufacturing value added, and the interaction between the latter and industrial energy intensity, on one hand, and the positive effect on availability of training, on the other hand, on solar and wind consumption.

A result that is contradictory to the hypotheses is the negative effect of the interaction between CSO consultation and innovation. This result should be interpreted in the Arab context, suggesting that stronger consultation and policy coordination and innovation policy in Arab countries do not necessarily boost backward integration for the renewable sector and could surprisingly harm green transition. Table 3 further points out that the overall effect of both CSO consultation and innovation on solar and wind consumption is negative. This might suggest that green innovation is rather weak and innovation efforts focuses on other sectors and that consultation might actually be in favor of the maintenance of fossil fuel consumption.

The results of the second regression, having renewable energy consumption as a percentage of total energy consumption as the dependent variable, suggest the following. Higher levels of state dominance relative to social actors leads to a higher share of renewable energy consumption, where 1% increase in the former leads to an increase of 0.03% in the latter. This provides some evidence supporting H1. Table 3 reports overall negative effects for large CSOs and trade unions and a positive effect of CSO consultation (the latter would be disregarded since it contradicts with the results of the first regression) on renewable energy consumption share. This suggests a resistance to green transition of stronger unions and business associations whose representation are less fragmented, while a more dominant state is more likely to push things through the transition in the Arab world and especially if it engages in consultation with social actors, probably less powerful actors. Concerning policies, the overall effect of innovation is again negative as in the first regression and also the effect of availability of training is positive, suggesting their robustness. As for interaction terms, the interaction between trade union and energy subsidy per manufacturing has a negative effect on renewable energy consumption share (1% rise leads to 0.008% decrease in the share) while the interaction term between large CSOs and innovation leads to higher renewable energy consumption share (1% rise leads to an increase of 0.001% in the share). The last two results match the hypotheses derived from the theoretical model, H2 and H5, respectively. Contradictory to the hypotheses, however, is the negative effect of the interaction between CSO consultation and training (1% increase leading to a fall in renewable energy consumption share of 0.0004%).

Thus, overall, the results suggest that the state is likely the most supportive actor for green transition in the Arab world and that the higher its power the more likely for the green transition to take place (H1). The negative effect of the other major actors whenever they are powerful- through labor unions or business associations- suggests that the energy transition is yet not integrated into the interests of social actors. The presence of a good experience with structural transformation as represented in the presence of good training facilities enhances the chances for the success of green transition and motivates stronger labor unions to support the transition (H3). The strength of labor unions seems to be necessary for the realization of this outcome, given that the availability of these training facilities do not seem to induce support to green transition at higher levels of state-society consultation. Fostering innovation, however, could only motivate businesspeople- whether tycoons or entrepreneurs- to endorse the transition whenever innovation policies are matched by the presence of broad-based and less fragmented business associations (H2). Innovation policy will not motivate powerful tycoons to endorse green transition when their power rests on higher levels of favoritism, rather than on broad encompassing and less fragmented business associations. Neither would the innovation policy induce the green transition when state-CSO consultation is high, where again the power of business associations seems to be crucial. Finally, the presence of high levels of energy subsidization discourages the support of more powerful labor unions for transition (H5) and increases the resistance to the transition generally whenever the industrial sector is more energy intensive (partially, H4).

How do these results explain the real conditions in the Arab world? Identifying three case studies, Table 4 addresses this question. The three countries are, the UAE, Morocco, and Egypt, which are the leading in terms of solar and wind production per million inhabitants among the studied Arab countries for which data for this indicator is available. Comparing figures from the first half of the last decade (2010-2014) to those of the present decade (2020-2022) and the performance of the three countries, it is clear that the UAE is both leading with an average of 1.71 TWh per million inhabitant -with a wide margin- and that the country's production has witnessed an impressive growth of 5600% between the two periods. This is although the UAE in the first half of the 2010 had significantly lower levels than either Morocco or Egypt. In the same period, Morocco's production grew by 487.5%, while Egypt's with 380%. Egypt in 2020-2022 has both the lowest levels and the lowest growth rate. A different perspective is presented when looking at the renewable energy consumption (as a percentage of total final energy consumption) indicator. Here, Morocco is leading with 10.92% (which fell in comparison to the 2010-2014 figure), Egypt is second (6.51%), and UAE comes last with only 0.92%, reflecting a still very high reliance of the Gulf state on fossil fuels. Nevertheless, the UAE had an incomparable impressive increase in renewables' share by 736.4% between 2010-2014 and 2020-2022. Worth noting again is that the variable reflects other forms of renewable energy, including hydroelectric energy generation which Egypt has a long history with given the significant contribution of the Aswan High Dam. Generally, the performance in both indicators reflect a relative success in energy transition, especially solar and wind energy, in the UAE followed by Morocco and less as such for Egypt.

(Please insert Table 4 here)

Looking at the indicators of actors' power, interests, and coordination provides a clue for understanding the witnessed outcomes. The remarkable feature of state-society relations in Egypt in the 2010s, as confirmed by the figures of Table 4, is the dominance of the state (74.25% in 2015-2019) and the weakness of all social actors, with the exception of tycoons' power as reflected in a relatively high favoritism even if it fell between 2010-2014 and 205-2019 from 69.55% to 53.68%. Agreeing with the weakness of social actors' organization power is the very low level of the large encompassing organizations dominate indicator that drastically fell by 58.7% between 2010-2014 and 2020-2022 to 12.70%, indicating the fragmentation of civil society representation including business associations. Engagement in independent trade unions is in a middle position between the UAE and Morocco. CSO consultation is the lowest (19.95% in 2020-2022) among the three countries and significantly fell between 2010-2014 and 2020-2022. The medium level of engagement in independent trade unions, relative to the other two Arab countries, is matched by the lowest levels among the three countries of availability of training services which also fell between 2010-2014 and 2015-2019 by 68.4% reaching 32.4%. Similarly, the medium level of favoritism is matched with the lowest level of innovation (among the three countries), 29.55% in 2015-2019 (also lower than the previous period). This suggests the presence of negative incentives for both labor and tycoons against the green transition and a possible failure to rally their power in support to the transition. The only positive development is the significant fall of energy subsidy per manufacturing value added by 50.2% between 2010-2014 and 2020-2022 reaching 8.72% (about half the corresponding figure of the UAE) and the medium level of industrial energy intensity of the country. Generally, it could be said that Egypt's green transition is likely more dependent on the state which largely dominates state-society relations and that less policy incentives exist for social actors, even the ones with some power, such as tycoons and labor. This might explain why Egypt's pace of energy transition is slower than the other two countries.

The UAE has comparable state-society relations to that of Egypt. The UAE has the second highest dominant state level (71.73% in 2015-2019) and not far from Egypt's level but with a relatively wide margin from Morocco (62.71%). Moreover, the country has the lowest levels of engagement in independent trade unions and favoritism, but a medium level of CSO consultation and large encompassing organizations dominate. The most remarkable is the level of engagement in independent trade unions, where the country has a very low level of only 13.93%. Remarkable also is that the UAE has, and by a wide margin, the lowest level of favoritism among the three countries and the level of the indicator significantly fell between 2010-2014 and 2015-2019, reaching 25.69%. Contrary to Egypt, the UAE has the highest levels of innovation (58.68%) among the three countries which has also grown between 2010-2014 and 2015-2019 by about 16.36%. Energy subsidies per manufacturing value added, although much higher than Egypt, has sharply fallen by 65.49% in a country that has the highest level of industrial energy intensity (4.26 MJ/$2011 PPP) among the three countries and with a wide margin from the other two. The UAE also has the highest levels among the three countries of availability of training services (72.57% in 2015-2019) and with wide margins from the other two countries. This all suggests the presence of stronger incentives for the various social actors to support the green transition, despite their relative weakness and the great dominance of the state. The presence of encouraging policies distinguishes the case of the UAE from Egypt's. Also noticeable is the remarkable growth of CSO consultation between 2010-2014 and 2020-2022 by about 46.98%. Even if the level of the indicator reached only 25.59% in the latter period, it surpassed the level of Egypt which significantly fell (19.39%) between the same two periods (although it improved in 2020-2022 in comparison to 2015-2019). The difference in the pace of the green transition between the UAE and Egypt to the advantage of the former could be thus attributed to better policy incentives that the UAE provides for the various social actors.

Morocco represents a significantly different case in terms of state-society relations. The state is still dominant (62.71% in 2015-2019) but the level of dominance is the lowest with a significant margin from the other two countries. More remarkable is social actors' higher power as reflected in the highest level among the three countries of favoritism (59.11% in 2015-2019), large encompassing organizations dominate (50% in 2020-2022), and engagement in independent trade unions (68.71% in 2020-2022), the levels of the last two indicators are higher by great margins from the corresponding levels in the other two countries. CSO consultation is also the highest (50.75% in 2020-2022), also with a large margin. The level of policies are medium in comparison to the two other countries for the availability of training services and innovation (in 2015-2019, 51.02% and 35.35% respectively). Given the more balanced state-society relations in Morocco in comparison to both Egypt and the UAE, policy incentives are expected to be more important in encouraging the green transition, since the transition in Morocco seems to depend more on social actors' support. Thus, the medium level of these policies seems to correspond well with and explain the medium level of solar and wind production in the country.

(Please insert Table 5 here)

Based on data from the International Renewable Energy Agency (IRENA) (European Investment Bank (EIB) and IRENA, 2015; IRENA and ESCWA, 2018), Table 5 presents some data that helps further in identifying the interest of the different actors in the three countries. The assessment is based on the local capabilities of the three countries in the value chain of solar PV cells, concentrating solar power (CSP), and wind energy generation industries, focusing on only high and very high capabilities (as assessed by IRENA). With regard to solar PV cells, the three countries have comparable capabilities that are mainly concentrated in electronics and cables, steel support structure, and construction. The slight variations between the three countries include Morocco’s future potential for raw materials but deficiency in active local enterprises and/or suppliers in steel support structure and Egypt’s deficiency in R&D and/or industry innovation in electronics and cables. The availability of skilled labor varies among the three countries which share high capabilities in electronics and cables; but while Egypt and the UAE have high skilled labor capabilities in construction, Morocco has them in steel support structure. Things are different though with regard to CSP. The information in the table suggests that Egypt has comparatively the best existing and potential capacities in CSP among the three countries. Morocco’s potential is comparable to the UAE, but its more unique potential compared to both the UAE and Egypt is the raw material sector. Egypt is also comparatively the best in terms of the presence of local enterprises and/or suppliers and R&D and/or industry innovation while the UAE high capacity in terms of availability of skilled labor covers more sectors than the other two countries. Finally, in the wind generation industry value chain, both Egypt and Morocco has comparable present and potential capacities which are relatively superior to the UAE. The same is true in terms of the presence of active local enterprises and/or suppliers. Yet, in terms of R&D and/or industry innovation, Morocco has higher capacities in more sectors than the other two countries. For availability of skilled labor, comparable but different capacity profiles exist for the three countries.

In summary, it could be said that Egypt seems to have relatively the highest capacities than Morocco and the UAE, especially with regard to CSP and wind energy. In other words, the utility of the different actors from the energy transition should be higher in Egypt than the other two Arab countries. Nevertheless, the earlier discussion on the weakness of the various social actors in Egypt seems to deny the materialization of this high utility into a strong supportive force for the transition. This again suggests that the relatively lower level of renewable energy production might be attributed to social actors’ weakness, despite the presence of a relatively strong local capacity. On the other hand, Morocco’s highest capacity in R&D and/or industry innovation especially in wind energy added to the presence of relatively more powerful social actors could explain the country’s higher production of renewable energy and its higher pace of green transition. It is to be noted that the dataset used for calculating the solar and wind consumption per million inhabitants (Our World in Data, no date) reveals that wind energy consumption was responsible for about 75.87% of the total solar and wind consumption in Morocco in the 2020-2022 time period. This provides additional evidence for H2.

V- Conclusion

In this paper, it was argued and supported by empirical evidence that the green transition in Arab countries depends on maximizing the interest of important state and society actors, especially more powerful ones. Focusing on policies, the interest of state actors are likely to be exogenous, while social actors’ interests are shaped by policies such as linkage-development, ALMP, and energy subsidization. The relative power of these actors are shaped, on the other hand, by the prevailing state-society relations in each country. Given the great opportunities offered by the green transition, Arab state actors are likely to have a big interest in the transition and, aided by their dominant position vis a vis social actors in most of the Arab world, they are likely a big force for accomplishing the transition. Nevertheless, a quicker pace of the transformation could be realized whenever right policies that grow the interests of various social actors are implemented and even more when those actors are powerful thanks to their organizational power and are additionally able to coordinate among themselves and with the state.

The paper, thus, suggests fostering innovation, linkage-development policies, and professional training of structural transformational nature especially in Arab countries where business associations and labor unions are relatively independent, less fragmented, and more representative of their respective actors. Fossil fuel subsidization should be minimized or even replaced with a carbon tax, while subsidization should target instead energy produced from renewable sources. On the other hand, empowering social actors and having a more balanced and collaborative state-society relations would augment the positive effects of the suggested policies. It is still important to provide Arab states with various incentives through development aid aiming at capacity building, increasing green finance credit, and facilitating the flow of foreign direct investment (FDI) in the renewable energy sector. However, a more accelerated and sustainable green transition could be accomplished when the interests of more empowered and powerful social actors are being addressed.

VI- Bibliography

Adly, A. I. (2012) *State reform and development in the middle East: Turkey and Egypt in the post-liberalization era*, *State Reform and Development in the Middle East: Turkey and Egypt in the Post-Liberalization Era*. doi: 10.4324/9780203100172.

Beck, M. and Richter, T. (2021) *Oil and the political economy in the Middle East: Post-2014 adjustment policies of the Arab Gulf and beyond*. Manchester, England: Manchester University Press. doi: 10.7765/9781526149107.

van den Berg, A. (2009) 'Flexicurity: What Can We Learn from the Scandinavian Experience?', *European Journal of Social Security*, 11(3), pp. 245–269. doi: 10.1177/138826270901100301.

Cammett, M. and Posusney, M. P. (2010) 'Labor standards and labor market flexibility in the middle east: Free trade and freer unions?', *Studies in Comparative International Development*, 45(2). doi: 10.1007/s12116-010-9062-z.

Doner, R. F. and Schneider, B. R. (2016) 'The Middle-Income Trap: More Politics than Economics', *World Politics*, 68(4).

El-Katiri, L. (2016) *A Roadmap for Renewable Energy in the Middle East and North Africa*. Publisher's version. Oxford Institute for Energy Studies.

European Investment Bank (EIB) and IRENA (2015) *Evaluating Renewable Energy Manufacturing Potential in the Mediterranean Partner Countries: Final Report*. Abu Dhabi.

El Ghazi, F., Sedra, B. and Akdi, M. (2021) 'International Journal of Energy Economics and Policy Energy Transition from Fossil to Renewable Sources in North Africa: Focus on the Renewable Electricity Generation in Morocco', *International Journal of Energy Economics and Policy*, 11(3), pp. 236–242. doi: 10.32479/ijeep.11036.

Griffiths, S. (2017) 'A review and assessment of energy policy in the Middle East and North Africa region', *Energy Policy*, 102, pp. 249–269. doi: 10.1016/J.ENPOL.2016.12.023.

Hafner, M. and Tagliapietra, S. (2020) ‘The Global Energy Transition: A Review of the Existing Literature’, in Hafner Manfredand Tagliapietra, S. (ed.) *The Geopolitics of the Global Energy Transition*. Cham: Springer International Publishing, pp. 1–24. doi: 10.1007/978-3-030-39066-2_1.

Hochstetler, K. (2020) ‘Political Economies of Energy Transition in Brazil and South Africa’, in *Political Economies of Energy Transition*. doi: 10.1017/9781108920353.001.

International Energy Agency (IEA) (no date) *Data and Statistics*. Available at: https://www.iea.org/data-and-statistics/data-sets (Accessed: 8 September 2023).

IRENA (2021) *Renewable Readiness Assessment: The Republic of Tunisia*. Abu Dhabi.

IRENA and ESCWA (2018) *Evaluating Renewable Energy: Manufacturing Potential in the Arab Region: Jordan, Lebanon, United Arab Emirates*. Abu Dhabi.

Di John, J. (2020) ‘The Political Economy of Industrial Policy in Venezuela’, in *Venezuela Before Chávez*. doi: 10.5325/j.ctv14gp2r6.15.

Krupa, J., Poudineh, R. and Harvey, L. D. D. (2019) ‘Renewable electricity finance in the resource-rich countries of the Middle East and North Africa: A case study on the Gulf Cooperation Council’, *Energy*, 166, pp. 1047–1062. doi: 10.1016/J.ENERGY.2018.10.106.

Mathews, J. A. (2020) ‘Greening Industrial Policy’, in Oqubay, A. et al. (eds) *The Oxford Handbook of Industrial Policy*. Oxford: Oxford University Press. doi: 10.1093/oxfordhb/9780198862420.013.10.

Mills, R. (2020) ‘A Fine Balance: The Geopolitics of the Global Energy Transition in MENA’, in Hafner Manfredand Tagliapietra, S. (ed.) *The Geopolitics of the Global Energy Transition*. Cham: Springer International Publishing, pp. 115–150. doi: 10.1007/978-3-030-39066-2_6.

Nem Singh, J. and Camba, A. (2020) ‘The role of domestic policy coalitions in extractive industries’ governance: Disentangling the politics of “responsible mining” in the Philippines’, *Environmental Policy and Governance*, 30(5). doi: 10.1002/eet.1905.

Olawuyi, D. S. (2021) ‘Can MENA extractive industries support the global energy transition? Current opportunities and future directions’, *The Extractive Industries and Society*, 8(2), p. 100685. doi: 10.1016/J.EXIS.2020.02.003.

Our World in Data (no date) *Our World in Data, Energy and Environment*. Available at: https://ourworldindata.org/ (Accessed: 25 September 2023).

Ben Rouine, C. and Roche, F. (2022) *Longreads, ‘Renewable’ energy in Tunisia: an unjust transition*. Available at: https://longreads.tni.org/renewable-energy-in-tunisia (Accessed: 24 April 2022).

Sabry, M. I. (2017) ‘Taming cronyism!: The role of Public Private Dialogues’, *International Journal of Social Economics*, 44(12). doi: 10.1108/IJSE-01-2016-0030.

Sabry, M. I. (2019) ‘Cronyism as an outcome of institutional settings: the case of pre-2011 Egypt’, *International Journal of Sociology and Social Policy*, 40(1–2). doi: 10.1108/IJSSP-08-2019-0153.

Sabry, M. I. (2023a) ‘State-Society Relations and Industrial Sustainable Growth: The Case of Post-Revolution Tunisia’, *Sustainable Development*.

Sabry, M. I. (2023b) ‘State–Business Relations, Public Policy, and Industrial Cluster Development in the Arab World’, in El Ebrashi, R. et al. (eds) *Industry Clusters and Innovation in the Arab World*. Emerald Publishing Limited, pp. 99–127. doi: 10.1108/978-1-80262-871-520231006.

Sabry, M. I. (2023c) *The Growth Paths of State-Society Relations: Power Dynamics, Industrial Policy, and the Pursuit of Inclusive and Sustainable Growth*. Bingley: Emerald Publishing.

Schiffer, H.-W. and Trüby, J. (2018) 'A review of the German energy transition: taking stock, looking ahead, and drawing conclusions for the Middle East and North Africa', *Energy Transitions 2018 2:1*, 2(1), pp. 1–14. doi: 10.1007/S41825-018-0010-2.

Tagliapietra, S. (2019) 'The impact of the global energy transition on MENA oil and gas producers', *Energy Strategy Reviews*, 26, p. 100397. doi: 10.1016/J.ESR.2019.100397.

University of Gothenburg (no date) *The V-Dem Dataset, The Varieties of Democracy Dataset*. Available at: https://v-dem.net/vdemds.html (Accessed: 22 July 2022).

Viebrock, E. and Clasen, J. (2009) 'Flexicurity and welfare reform: a review', *Socio-Economic Review*, 7(2), pp. 305–331. doi: 10.1093/ser/mwp001.

Warwick, K. (2013) 'Beyond Industrial Policy: Emerging Issues and New Trends', *OECD Science, Technology and Industry Policy Papers*, (2).

World Bank (no date a) *World Development Indicators (WDI)*. Available at: https://datatopics.worldbank.org/world-development-indicators/ (Accessed: 24 September 2021).

World Bank (no date b) *Worldwide Governance Indicators (WGI)*. Available at: http://info.worldbank.org/governance/wgi/ (Accessed: 24 September 2021).

World Bank Group (2020) *Trading for development in the age of global value chains*, *World Development Report 2020*. Available at: https://www.worldbank.org/en/publication/wdr2020 (Accessed: 12 October 2021).

World Economic Forum (no date) *Global Competitiveness Indicators (GCI) Dataset 2007-2017*. Available at: https://view.officeapps.live.com/op/view.aspx?src=http%3A%2F%2Fwww3.weforum.org%2Fdocs%2FGCR2017-2018%2FGCI_Dataset_2007-2017.xlsx&wdOrigin=BROWSELINK (Accessed: 24 September 2021).

Tables and Figures

Table 1: Summary Statistics

Variable	Mean	Median	Min	Max	Std. Dev.	Skew	Ex. kurtosis
Solar-Wind Consump. (TWh per million)	0.074	0.004	0	1.921	0.24	5.485	33.45
Renewable energy consumption	16.473	2.950	0	95.520	25.999	1.796	2.109
Dominant State	71.166	69.982	43.936	93.935	9.847	0.225	-0.542
Favoritism	61.553	60.572	21.447	100.000	19.905	0.155	-0.698
CSO consultation	35.872	36.424	0	96.622	16.065	0.065	0.605
Large CSO (Large encompassing organizations dominate)	25.525	25.000	0	75.000	15.883	0.540	0.275
Trade Unions	47.640	57.917	4.116	83.773	20.874	-0.693	-0.748
Availability of Training	47.978	48.297	20.408	75.154	12.819	-0.044	-0.647
Innovation	34.392	33.730	11.270	64.613	10.672	0.365	0.624
Total Energy Subsidy per million inhabitants	14048	7566.200	0	79021	18012	2.226	4.495
Industrial Energy Intensity	2.873	2.646	0.625	9.647	1.736	1.515	2.898
Large CSO*Innovation	846.73	745.620	0	2836.000	612.240	0.757	0.508
Trade Union * Training	2181.8	1942.900	170.45	4865.800	1262.300	0.191	-1.167
Favoritism*Innovation	1940	1958.700	973.07	3311.500	476.900	0.109	-0.022
Energy Subsidy per Manuf. VA	0.458	0.252	0	4.608	0.640	3.710	17.169
Trade Union*Energy Subsidy Per Manuf. VA	16.790	6.254	0	194.360	28.037	3.566	15.629
CSO Consult*Innovation	1115.1	1042.8	0	3816.200	634.720	0.646	1.356
CSO consult*Training	1619.5	1449.9	0	5529.900	1028.700	0.859	1.333
Energy Subsidy per Manuf. VA*Industrial Energy Intensity	0.865	0.763	0	5.444	0.755	1.983	8.077
Favoritism*Energy Subsidy per Manuf. VA	19.424	13.542	0	90.167	19.000	1.334	1.32
Favoritism*Energy Subsidy per Manuf. VA*Industrial Energy Intensity	43.505	33.542	0	148.550	36.970	1.012	0.377

Table 2: Regressions using the Fixed-Effects Panel Model

Dependent variable:	Solar & Wind Consumption		Renewable Energy Consumption	
const	-0.136	**	-0.324	
	(0.062)		(0.632)	
Dominant State			0.029	***
			(0.007)	
Favoritism	0.002			
	(0.001)			
Large CSO			-0.024	***
			(0.007)	
Trade Unions			-0.035	***
			(0.006)	
CSO consultation	0.004	**	0.038	***
	(0.002)		(0.006)	
Innovation	0.007	***	-0.019	***
	(0.002)		(0.007)	
Availability of Training	-0.002	***	0.016	***
	(0.001)		(0.004)	
Favoritism*Innovation	-0.0001	**	-0.0002	***
	(0.000)		(0.000)	
Large CSO*Innovation			0.001	***
			(0.000)	
CSO consultation*Innovation	-0.0001	**		
	(0.000)			
Trade Union*Training	0.0001	***		
	(0.000)			
CSO consultation*Training			-0.0004	***
			(0.000)	
Trade Union*Energy Subsidy per Manufacturing			-0.008	*
			(0.004)	
Favoritism*Energy Subsidy per Manufacturing	-0.001			
	(0.001)			
Energy Substitution per Manufacturing*Indust. Energy Intensity	-0.033	***		
	(0.011)			
Favoritism*Energy Subsidy per Manufacturing*Indust. Energy Intensity			0.004	***
			(0.001)	
n	75		94	
LSDV R-squared	0.770		0.998	
Within R-squared	0.636		0.623	
LSDV F-test	F(15, 59)= 13.133		F(19, 74)= 1609.8	
Durbin-Watson	0.778		1.448	

Table 3: The Overall Effect of Various Variables Based on Regression Results

	Solar & Wind Consumption	Renewable Energy Consumption
Dominant State	..	0.0292
Favoritism	-0.0022	-0.0041
(Large CSO) Large encompassing organizations dominate	..	-0.0003
Trade Unions	..	-0.0390
CSO consultation	-0.0002	0.0189
Innovation	-0.0010	-0.0143
Availability of Training	0.0009	0.0163
Energy subsidy per Manufacturing	-0.0940	0.2733
Energy subsidy per Manufacturing*Indust. Energy Intensity	-0.0327	0.2436

Table 4: SBLR Actors' Power, Interests, and Policies Related to Energy Transition

Country	Egypt			Morocco			UAE		
Time	2010-2014	2015-2019	2020-2022	2010-2014	2015-2019	2020-2022	2010-2014	2015-2019	2020-2022
Solar-Wind Consump. (TWh per million)	0.05	0.09	0.24	0.08	0.30	0.47	0.03	0.36	1.71
Renewable energy consumption (% of total final energy cons.)	5.35	5.31	6.51	11.89	10.84	10.92	0.11	0.29	0.92
Dominant State	71.30	74.25	..	63.60	62.71	..	69.53	71.73	..
Favoritism	69.55	53.68	..	59.80	59.11	..	35.93	25.69	..
CSO consultation	24.75	14.74	19.95	55.30	52.35	50.75	17.41	17.41	25.59
Large encompassing organizations dominate	30.76	22.22	12.70	16.28	38.90	50.00	25.00	25.00	25.00
Engagement in independent trade unions	37.28	36.98	36.98	68.28	68.71	68.71	13.93	13.93	13.93
Availability of Training Services	47.37	32.40	..	53.00	51.02	..	68.51	72.57	..
R&D (%GDP)	0.55	0.68	0.68	0.71	..	..	0.59	0.88	0.85
Innovation	31.57	29.55	..	32.55	35.35	..	50.43	58.68	..
Energy Subsidies per Manufacturing VA %	17.50	12.85	8.72	..	..	..	47.32	15.17	16.33
Industrial Energy Intensity (MJ/$2011 PPP)	2.87	..	..	2.45	..	..	4.26	..	..

Table 5: Fields of High and Very High Local Capabilities in the Renewable Industry Value Chain

Country	Present Capabilities	Future Possibilities	Presence of Active Local Enterprises and/or Suppliers	R&D and/or Industry Innovation	Availability of Skilled Labor
Solar PV					
Egypt	Electronics and cable, steel support structure, construction	Electronics and cable, steel support structure, construction	Electronics and cable, steel support structure, construction	Steel support structure, construction	Electronics and cable, construction
Morocco	Electronics and cable, steel support structure , construction	Raw material, Electronics and cable, steel support structure, construction	Electronics and cables, construction	Electronics and cable, steel support structure, construction	Electronics and cable, steel support structure
UAE	Electronics and cable, steel support structure, construction	Electronics and cable, steel support structure, construction	Electronics and cables, steel support structure, construction	Electronics and cable, steel support structure, construction	Electronics and cable, construction
Solar CSP					
Egypt	Mirrors, mounting structure, balance of plant pipping electronics, gird connection, construction	Mounting structure, balance of plant piping electronics, storage system, grid connection, construction	Mirrors, mounting structure, balance of plant pipping electronics, grid connection, construction	Mounting structure, balance of plant pipping electronics, storage system, grid connection, construction	Mirrors, balance of plant pipping electronics, grid connection, and construction
Morocco	Mounting structure, grid connection, construction	Raw material, mirrors, mounting structure, construction	Raw material, storage system, grid connection, construction	Mounting structure, storage system, grid connection, construction	Mounting structure, grid connection
UAE	Mounting structure, balance of plant piping electronics, storage system, grid connection, construction	Mounting structure, balance of plant piping electronics, grid connection, construction	Mounting structure, balance of plant piping electronics, grid connection, construction	Balance of plant piping electronics, grid connection, construction	Mounting structure, balance of plant piping electronics, storage systems, grid connection, construction
Wind					
Egypt	Wind tower, wind turbine blade, electronics and cable, construction	Wind tower, wind turbine blade, electronics and cable, construction	Wind tower, wind turbine blade, electronics and cable, construction	Wind turbine blade, construction	Wind tower, wind turbine blade, electronics and cable, construction

Morocco	Wind tower, wind turbine blade, electronics and cable, construction	Raw material, wind tower, electronics and cable, construction	Wind tower, wind turbine blade, electronics and cable, construction	Raw material, wind tower, wind turbine blade, electronics and cable, construction	Wind tower, wind turbine blade, electronics and cable, construction
UAE	Electronics and cables, construction	Raw material, electronics and cable, construction	Raw material, electronics and cable, construction	Raw material, construction	Raw materials, wind towers, electronics and cable, construction

Source: Self-summarized and organized based on data from IRENA reports (European Investment Bank (EIB) and IRENA, 2015; IRENA and ESCWA, 2018)

(IRENA, 2021)

Appendix

Table A.1: List of the used proxies and their definition in their original datasets

Variable	Definition & Calculation	Original Source
Solar Wind Consumption TWh per million inhabitants	Solar consumption TWh + Wind Consumption TWh	Our World in Data
Renewable energy consumption	Renewable energy consumption (% of total final energy cons.)	World Development Indicators (WDI)
Dominant State	100- (Percentage adjusted Voice and Accountability indicator), where Voice and Accountability measures: “Perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.”	Worldwide Governance Indicators (WGI)
Favoritism	“To what extent do government officials show favoritism to well-connected firms and individuals when deciding upon policies and contracts?”	Global Competitiveness Indicators (GCI)
CSO consultation	"Are major civil society organizations (CSOs) routinely consulted by policymakers on policies relevant to their members?"	Varieties of Democracy (V-Dem)
Large CSO	“Large Encompassing Organizations dominate”: "characterize the relative influence of large mass constituency civil society organizations (CSOs) versus smaller, more local, or narrowly construed CSOs. The government and CSOs are linked formally through a corporatist system of interest intermediation; or, due to historical circumstances, particular large CSOs are highly influential. The voice of such organizations is recognized by the government and is accorded special weight by policymakers."	Varieties of Democracy (V-Dem)
Trade Unions	"What share of the population is regularly active in independent trade unions?"	Varieties of Democracy (V-Dem)
Availability of Training	Local availability of specialized training services “In your country, how available are high-quality, professional training services”	Global Competitiveness Indicators (GCI)
Innovation	A composite of the following indicators: capacity for innovation, quality of scientific research institutions, company spending on R&D, university-industry collaboration in R&D, government procurement of advanced technology, availability of scientists and engineers, and PCT patents.	Global Competitiveness Indicators (GCI)
Industrial Energy Intensity	Energy intensity of industrial sector (MJ/2011 USD PPP)	Our World in Data
Energy Subsidy per Manuf. VA	[Total Energy Subsidies ($ million Real 2021)/GDP constant 2010 USD)]/Manufacturing Value Added % GDP	* Total Energy Subsidies ($ million Real 2021): the International Energy Agency (IEA) * GDP and Manufacturing VA: World Development Indicators (WDI)

Table A.2: The Sequential Elimination Process on the Conducted Regressions

Regression	Eliminated Variables	F-Test
Reg. 1	Dominant State, Large CSO, Trade Unions, Large CSO*Innovation, Trade Unions*Energy Subsidy Per Manufacturing VA, Industrial Energy Intensity	F(6, 50) = 0.083, p-value 0.998
	Energy Subsidy Per Manufacturing VA, CSO Consult*Training, Favoritism*Energy Subsidy Manufacturing*Industrial Energy Intensity	F(3, 56) = 0.834, p-value 0.481
Reg. 2	Favoritism, Energy Subsidy Per Manufacturing VA, CSO Consult*Innovation, Trade Unions*Training, Favoritism*Energy Subsidy per Manufacturing VA, Industrial Energy Intensity, Energy Subsidy per Manufacturing VA*Industrial Energy Intensity	F(7, 67) = 0.67, p-value 0.697

Table A.3: SBLR Power Relations and Renewable Energy Production in the Arab World

Country	Time	Solar-Wind Consump. (TWh per million)	Renewable energy consumpti on (%)	Dominant State	Favoritism	CSO consultation	Large CSOs	Independent trade unions
Algeria	2005-2009	0.00	0.40	68.54	55.48	27.38	35.30	58.70
	2015-2019	0.03	0.13	67.26	65.62	30.17	60.62	58.70
Bahrain	2005-2009	..	0.00	66.65	55.56	40.30	50.00	65.80
	2015-2019	..	0.00	77.15	46.55	22.05	13.34	62.16
Comoros	2005-2009	..	68.78	57.48	..	49.10	35.00	59.66
	2015-2019	..	57.67	55.59	..	51.65	14.06	61.49
Djibouti	2005-2009	..	33.23	73.33	..	53.22	20.00	41.85
	2015-2019	..	26.18	77.94	..	52.86	24.06	47.82
Egypt	2005-2009	0.03	6.06	72.81	61.67	23.67	34.98	30.47
	2015-2019	0.09	5.31	74.25	53.68	14.74	22.22	36.98
Iraq	2005-2009	0.00	1.87	73.35	..	50.57	39.42	42.18
	2015-2019	0.01	0.77	71.29	..	42.59	38.82	42.51
Jordan	2005-2009	..	2.36	63.72	55.13	42.94	12.00	67.77
	2015-2019	..	5.75	64.70	53.71	50.25	13.52	67.77
Kuwait	2005-2009	0.00	0.00	60.55	65.57	48.61	20.00	57.92
	2015-2019	0.03	0.03	62.66	68.54	46.67	26.30	57.92
Lebanon	2005-2009	..	6.33	57.65	83.20	48.33	14.64	67.70
	2015-2019	..	4.40	60.40	83.40	48.25	24.88	67.70
Libya	2005-2009	..	2.73	88.58	68.46	6.09	10.00	21.27
	2015-2019	..	2.97	78.09	77.85	41.83	35.72	35.75
Mauritania	2005-2009	..	36.55	67.19	62.21	36.97	29.00	59.85
	2015-2019	..	27.31	66.42	67.98	45.01	10.00	59.85

Morocco	2005-2009	0.02	16.71	64.44	58.67	48.81	17.14	66.57
	2015-2019	0.30	10.84	62.71	59.11	52.35	38.90	68.71
Oman	2005-2009	0.00	0.00	71.15	36.71	33.99	13.30	37.40
	2015-2019	0.01	0.01	71.18	49.91	37.04	13.52	37.40
Qatar	2005-2009	0.00	0.08	67.78	36.53	26.64	33.30	4.12
	2015-2019	0.01	0.06	73.16	25.52	25.16	24.90	4.12
Saudi Arabia	2005-2009	0.00	0.01	84.30	47.14	28.23	15.02	11.28
	2015-2019	0.01	0.01	84.98	43.99	36.23	10.36	11.28
Somalia	2005-2009	..	93.36	87.21	..	30.56	14.00	16.27
	2015-2019	..	94.83	87.94	..	43.17	19.72	30.65
Sudan	2005-2009	..	66.75	83.74	..	36.50	14.30	64.72
	2015-2019	..	59.90	86.20	..	37.40	26.66	73.21
Syria	2005-2009	..	1.52	83.86	67.04	3.80	33.30	46.70
	2015-2019	..	0.97	89.18	69.70	0.00	36.52	41.16
Tunisia	2005-2009	..	14.70	75.34	36.81	31.01	40.00	68.82
	2015-2019	..	12.16	45.17	61.44	82.10	40.60	75.85
UAE	2005-2009	0.00	0.11	67.46	43.76	17.41	25.00	10.15
	2015-2019	0.36	0.29	71.73	25.69	17.41	25.00	13.93
West Bank & Gaza	2005-2009	..	19.60	64.33	..	53.98	15.54	59.68
	2015-2019	..	12.08	70.75	..	53.54	26.66	56.74
Yemen	2005-2009	..	0.74	73.37	88.41	29.89	38.50	65.02
	2015-2019	..	2.69	82.71	81.34	13.44	11.10	61.17

Table A.4: Policies Relevant to Energy Transition in the Arab World

Country	Time	Availability of Training	ALMP	R&D (%GDP)	Innovation	Technology Readiness	Energy Subsidies per Manufacturing VA %	Industrial Energy Intensity (MJ/$2011 PPP)
Algeria	2005-2009	35.24	..	0.07	31.59	23.38	7.27	1.84
	2015-2019	39.09	..	0.53	30.39	33.49	9.71	..
Bahrain	2005-2009	40.56	..	..	28.37	49.63	35.50	4.43
	2015-2019	63.41	..	..	41.82	70.76	9.53	..
Comoros	2005-2009	..	9.21	..	..	..	..	..
	2015-2019	..	9.21	..	..	..	..	..
Djibouti	2005-2009	..	..	..	..	..	..	1.92
	2015-2019	..	..	..	..	..	..	..
Egypt	2005-2009	43.51	..	0.29	34.63	30.20	22.06	3.52
	2015-2019	32.40	..	0.68	29.55	38.49	12.85	..
Iraq	2005-2009	..	5.50	0.04	..	..	313.26	0.87
	2015-2019	..	..	0.04	..	..	84.19	..
Jordan	2005-2009	50.08	..	0.43	38.37	36.04	..	3.63

	2015-2019	58.71	..	0.33	44.22	49.48	..	..
Kuwait	2005-2009	50.35	..	0.09	33.91	41.56	74.87	..
	2015-2019	42.93	..	0.09	32.18	51.63	43.49	..
Lebanon	2005-2009	..	..	..	27.53	37.34	..	2.87
	2015-2019	58.26	..	..	36.40	49.22	..	..
Libya	2005-2009	34.05	..	..	28.03	22.55	55.35	0.77
	2015-2019	25.72	..	..	16.32	25.96	63.09	..
Mauritania	2005-2009	24.96	..	..	25.70	27.46	..	1.00
	2015-2019	30.01	..	..	21.88	23.68	..	..
Morocco	2005-2009	48.24	..	0.61	35.00	32.47	..	2.32
	2015-2019	51.02	..	..	35.35	44.87	..	..
Oman	2005-2009	48.79	..	..	43.76	35.50	0.26	4.19
	2015-2019	43.31	..	0.24	37.85	56.42	1.02	..
Qatar	2005-2009	49.55	..	..	40.53	48.45	30.26	4.23
	2015-2019	73.18	..	0.51	63.52	71.81	9.47	..
Saudi Arabia	2005-2009	52.54	..	0.05	41.42	41.49	66.70	1.37
	2015-2019	52.67	..	..	45.64	63.83	21.61	..
Somalia	2005-2009	..	..	..	..	..	..	8.25
	2015-2019	..	..	..	..	..	..	..
Sudan	2005-2009	..	..	0.30	..	..	..	1.62
	2015-2019	..	..	..	..	..	..	..
Syria	2005-2009	39.59	..	..	31.66	25.43	..	4.26
	2015-2019	..	..	0.01	25.81	34.76	..	..
Tunisia	2005-2009	61.34	..	0.68	48.19	38.65	..	3.19
	2015-2019	45.34	..	0.62	33.98	43.52	..	..
UAE	2005-2009	52.60	..	..	39.19	53.45	46.89	2.93
	2015-2019	72.57	..	0.88	58.68	78.37	15.17	..
West Bank & Gaza	2005-2009	..	..	0.26	..	..	..	..
	2015-2019	..	..	..	..	..	..	..
Yemen	2005-2009	..	..	..	11.27	23.52	..	1.53
	2015-2019	30.11	..	..	20.45	20.28	..	..