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Policy Coordination and Energy Efficiency[1]

Despina Alexiadou[2]

Michaël Aklin[3]

Abstract

Is the organisation of ministerial portfolios associated with governments' policy output? Political agendas and preferences alone cannot fully explain policy choices; the organisational design is also critical (Hall 1996). Governments cannot formulate coordinated strategies unless they facilitate such coordination through the organisation and design of ministerial portfolios. This 'political/policy game' should have direct effects in policy continuity and effectiveness. We investigate this problem in the context of energy efficiency policy. Do policies targeting energy efficiency in residential buildings vary depending on where the portfolios of Energy and Environment sit? Poorly insulated houses contribute significantly to countries' CO2 footprint and lead to higher levels of energy poverty in industrialized countries. Effective solutions exist in theory but often remain evasive in practice, at least in part because governments' policy strategies are often uncoordinated. Using unique new data on the structure of ministerial portfolios in fifteen European countries over thirty years, we test the hypothesis that when the departments of Energy and the Environment are major portfolios and have been in place for longer period of time (spanning government changes), they will be associated with a higher number of policy initiatives aiming at higher levels of energy efficiency. In contrast, when the department of Energy is a minor portfolio under Business or Economics, policies for improving energy efficiency are likely to be fewer and less ambitious.

Keywords: energy policy, energy efficiency, policy coordination, ministerial portfolios

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[2] University of Strathclyde, despina.alexiadou@strath.ac.uk.
[3] University of Pittsburgh, aklin@pitt.edu.

1. Introduction

March 2022 marks a turning point in European history as Russia attacked Ukraine and triggered a dramatic shock on energy markets. In light of rising energy prices and efforts to reduce the West's dependence on Russian gas and oil, it is also a turning point in the political saliency of homes' energy efficiency. Improving the energy efficiency of buildings reduces the consumption of natural gas, an important source of greenhouse gas. In the European Union, 24% of household energy consumption stems from gas used for heating.[4] With climbing gas prices, this also represents a drain on household finances and a source of energy poverty (Herrero 2017). In 2022, the average European household saw its expenses on gas and electricity go up by more than 50% compared to 2020.[5] Aside from its household budgetary effect, reducing dependence on gas and oil has also a climatic dimension. Overall, about 1 billion metric tonnes of CO2 equivalent (mtCO2e) are emitted for residential purposes (primarily heating), out of a total of about 4 billion mtCO2e emitted across the entire EU.[6]

Thus, by reducing demand for natural gas, improving the energy efficiency of buildings yields two benefits. First, energy efficiency contributes to climate policies that target "net zero" (i.e., zero greenhouse gas emissions once sinks are taken into account) (Tosun et al.

[4] Data for 2019. Source: Table 2, "Energy consumption in households by type of end-use," Eurostat, available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households#Energy_consumption_in_households_by_type_of_end-use (accessed on March 15, 2022).

[5] "Euro zone consumers in for a shock as power bills soar," *Reuters*, January 18, 2022 https://www.reuters.com/business/energy/euro-zone-consumers-shock-power-bills-soar-2022-01-18/

[6] Data for 2019. Source: Figure 1, "Greenhouse gas emissions from energy use in buildings in Europe," European Environment Agency, available at https://www.eea.europa.eu/data-and-maps/indicators/greenhouse-gas-emissions-from-energy/assessment (accessed on March 15, 2022). For total emissions, see "Greenhouse gas emissions," *OECD.stat*, available at https://stats.oecd.org/Index.aspx?DataSetCode=AIR_GHG (accessed on March 15, 2022).

2015). Second, energy efficiency measures reduce spending on energy, thus alleviating energy poverty. As such, energy efficiency has been a central policy goal of technocrats in the European Union. The first cohesive European legislative act on energy policy in buildings, the Energy Performance of Buildings Directive (EPBD), was introduced in 2002 – twenty years ago (Economidou et al. 2020). Yet, increasing home's energy efficiency has hardly featured in electoral campaigns. This might explain the fact that despite some gains in energy efficiency, current home renovation rates vary between 0.5% and 2.5% among EU member states and, on average, buildings' emissions account for 36% of the EU's CO2 (Economidou et al. 2020).

Why have countries been so slow to improve their buildings' energy efficiency and what could explain the large variation in buildings' energy performance across European states? According to Economidou et al. (2020, p.10), *"[d]ifferent barriers persist towards Nearly Zero Emissions Buildings (NZEB). These are mainly technical, financial, social, political and institutional."* In this article we seek to better understand and quantify the political and institutional barriers to improving the energy efficiency of residential buildings. Specifically, we ask is the organisation of ministerial portfolios associated with improvements in energy efficiency? Does it reveal governments' policy priorities and could it affect policy outcomes?

During the last decade we witnessed the creation of new ministerial departments of the Energy and the Environment, an indication that governments bundle these two policies together to better coordinate across policy sectors to effectively address the challenges of climatic change. Such departments now can be found in Germany, France, Ireland, and so forth. Yet, in many other countries, the portfolio of energy sits under Business and Industry, such as in the UK, or is a stand-alone department as in Norway and Ireland. To this day we do not know if these bureaucratic configurations matter at all for policy coordination or the

final policy outcome. There are good reasons to suspect that it does. The allocation of portfolios and the setup of bureaucratic agencies is known to shape the design and effectiveness of policies (Alexiadou 2016; Huber 1998; König and Lin 2021; Olsen 2008; Wehner 2010).

Using a new dataset on the organisation of the portfolios of energy and the environment in fifteen West European countries since 1990, we aim to investigate the potential effect of bureaucratic organisation on governments' likelihood to achieve higher rates of energy efficiency in the residential sector. We show that (1) energy efficiency increases when Energy is jointly associated with Environment, compared to alternative organizational setups,[7] (2) that placing Energy as a subordinate in its ministry reduces policy productivity of the administration, and (3) changes in the portfolio allocation of Energy (i.e., Energy moving across various ministries over time) also reduces its ability to design and adopt energy efficiency policies.

Together, our results underscore the importance of bureaucratic and administrative design on both policy outputs and outcomes. Our case is one of high normative importance but low saliency (until recently, at least), which reduces the confounding effect of strong policy demand from the public. Oftentimes, such issues are assumed to lead to little policy activity (e.g., May 1991, Koski 2010, Guinaudeau and Brouard 2017). We show that effective administrative organization can help overcome and get meaningful results achieved.

[7] For readability, we sometimes drop "Ministry" and capitalize its domain instead (e.g., "Energy" for "Ministry of Energy").

2. Ministerial Portfolio Organisation and Energy Policy

Our focus lies on the way ministerial portfolio are organized, and how this organization affects policy outputs and outcomes (Moe 2013). In this section, we sketch a theory that connects three features of portfolio organization to energy policies. First, we start with *interests*: what are the preferences and priorities of the ministry to which Energy is attached. Second, we consider *hierarchy*: how senior and autonomous is Energy? Third, we consider the dynamic effects of portfolio *reallocation* from one ministry to another and how it affects both productivity and effectiveness of policies.

2.1. Interests

Certain policies, like tax or defence, are politically salient and are handled by a single ministerial department, such as Finance or Defence, respectively. Others, like energy, enter and exit political debates in a random manner. Such policies are often overseen by sub-portfolios in other major policy departments such as Economy or Industry, or are combined with other policy portfolios such as the Environment or Housing (Tosun 2018). One reason for this could be due to the multifaced nature of energy policy. Depending on governments' priorities energy policy might be treated as a primarily economic, security, environmental, or social policy issue.

The bureaucratic organisation of the portfolio of Energy could have an impact on how a number of energy related policies, namely energy efficiency, are drafted and implemented, for two reasons connected to interests (Hammond 1993). First, governments may strategically use the allocation of Energy to a specific ministry to signal their preferences. Governments dissolve and create a new ministries as their policy priorities change (Mortensen and Green-Pedersen 2014) and in line with changes in governments'

partisan composition and ideology (Sieberer et al. 2019). Putting energy and environment together sends a strong signal that energy is seen as a primarily environmental issue and is reflective of the government's policy priorities and policy agenda (Mortensen and Green-Pedersen 2014). If, on the other hand, the government seeks to undermine energy policies as merely financial and economic, then it is more likely to place it as a sub-portfolio under the ministry of economics or business (Mortensen and Green-Pedersen 2014). Subsequently, where and how the energy portfolio sits within the broader bureaucratic organisation of ministries, provides significant information on the government's policy priorities.

Second, bureaucrats from various ministries will differ in their ideological and policy preferences, thereby facilitating or stimying the progress of energy efficiency measures(Peters 1981). The importance of the preferences of bureaucrats has been recognized in a range of settings. In the United States, for instance, bureaucrats have been found to provide more contracts toward likeminded legislators (Arnold 1979; Bertelli and Grose 2009). As a result, even in the absence of a strategic motivation behind the allocation of Energy to another portfolio, we may expect that ministries whose task is to promote economic growth or help industries will slow down the adoption of ambitious energy efficiency policies.

Regardless of the exact mechanism – governmental or bureaucratic preferences – we expect that the allocation of Energy to a ministry will thus affect policy output.

> *When Energy is together with the portfolio of the Environment, governments should adopt more ambitious energy efficiency targets and should achieve higher levels of energy efficiency. In contrast when Energy is with Economics or Industry,*

governments should adopt less ambitious energy efficiency targets and are expected to achieve lower levels of energy efficiency in the residential sector. (H1)

2.2. Hierarchy

Improving a building's energy efficiency, through retrofits, new window and door installations or other renovations, might appear like a straightforward social or local government policy intervention. It is technically not too complex and it requires a modest level of financing per household to achieve the policy goal. Yet, its financing and implementation need not be as straightforward as it requires action across different ministerial departments and levels of government. In the absence of a global energy crisis, increasing buildings' energy efficiency is not a politically salient issue and is mostly understood as a means for addressing environmental or social problems (i.e., energy poverty). This means that governments might fail to draft comprehensive policy plans for addressing energy efficiency problems when energy policy sits under predominantly economic portfolios. Thus, creating a Ministry of Energy is an indication that energy is a salient policy and should increase the government's focus on energy policies.

However, increased policy attention to energy need not suffice for adopting more ambitious policy initiatives. Policy coordination and bureaucratic hierarchy are also crucial in policy implementation (Hammond 1993; Peters 2019; Trein and Maggetti 2020). Energy policy is a complex issue in that it spans across economic, security and environmental policy jurisdictions. According to Trein and Maggetti (2020) complex issues are best addressed through policy integration and administrative coordination. Policy integration is achieved through the "*bundling of policy goals and instruments across policy sectors"* (p.199) while

departmental coordination refers to the reorganisation of the public sector in light of improving policy coordination.

> *Therefore, one would expect that when energy is a sub-portfolio, multiple ministerial departments will be responsible for different aspects of energy policy, making it less likely that they will have the capacity and coordination to draft effective energy efficiency policies. An immediate observable implication of this is that when Energy is a sub-portfolio, we should see fewer policy initiatives to increase energy efficiency in the residential sector (H2)*

2.3. Reallocation

So far, our theoretical framework was static. In practice, portfolios are regularly reallocated. The design of ministerial portfolios need not follow the logic of policy integration and administrative coordination. Instead, questions of partisan ideology, political saliency, and coalition governance could prevail. Governments constantly reorganise their ministerial portfolios for partisan and political reasons (Sieberer et al. 2019). Other times portfolios are split between two departments so that coalition partners can monitor each other's policy agenda (Fernandes, Meinfelder, and Moury 2016).

When departmental/jurisdictional changes happen for political instead of policy-driven reasons, the policy effectiveness of the bureaucracy is diminished as the ministry's administrative capacity is diffused across multiple departments (Klüser 2022). Doing so entails considerable short-term transaction costs in terms of efficiency and ability to maintain the work done under the previous administrative system (Grofman 1989). It

creates delays, losses of previously acquired information, and the need to reconstruct consensus among different stakeholders within and outside the state.

> *We expect that the more regularly portfolios are re-assigned and restructured the less policy continuity there is and the lower policy effectiveness. In relation to energy efficiency, the more often the portfolio of energy is restructured, the less likely it is that countries will make significant improvements in energy efficiency, all else equal. (H3a)*

On the other hand, changes in the structure of ministries could increase the government's policy productivity as new ministers seek to take ownership of the policy issue and have more ambitious plans. Regular changes could also indicative that government's respond to external or internal demands for swifter policy action. Governments may, for instance, implement a campaign pledge to reshuffle a bureaucracy deemed inefficient (Bertelli and Sinclair 2018). Or departmental changes simply reflect an ideological change by the ruling coalition (Fleischer et al. 2022).

> *We expect that the more regularly portfolios are re-assigned and restructured the more often new policies are produced, all else equal. The effect of reallocation on policy effectiveness is uncertain. (H3b)*

3. Data & Empirical Strategy

We test our three hypotheses against newly collected data from thirteen West European countries. We focus on a single region to reduce the heterogeneity of cases and increase our trust in our observational analysis.

Outcome variable. We use three different dependent variables to test the three hypotheses. To test Hypothesis 1, we use the unit consumption of energy per square meters, adjusted by the EU climate. These data are provided by the Odyssee Database.[8] Although this dependent variable is a policy *outcome*, which depends on a number of factors above and beyond government policy, it is used here to test whether the organisation of the ministerial departments is associated with concrete policy *outputs*.

The second and third hypotheses are tested using a qualitative indicator we constructed from the same database. This variable is a binary 0-1 variable that codes as 1 every year a country passed a policy targeting increased household energy efficiency. We concentrated on two types of policies: regulatory policies, which require new legislation, and financial policies. We did not include any initiatives that involve informational campaigns or other measures such as the use of smart meters. For example, we coded as one when a government passed a new law on the minimum energy efficiency requirement for new builds or when they provided financial assistance for retrofits. If a country passed two policies in the same year, we still coded this as one. Some of the initiatives are EU directives that are approved by national parliaments, but the majority of initiatives are national.

[8] Odyssee Database, available at https://www.indicators.odyssee-mure.eu/energy-efficiency-database.html (accessed on March 15, 2022).

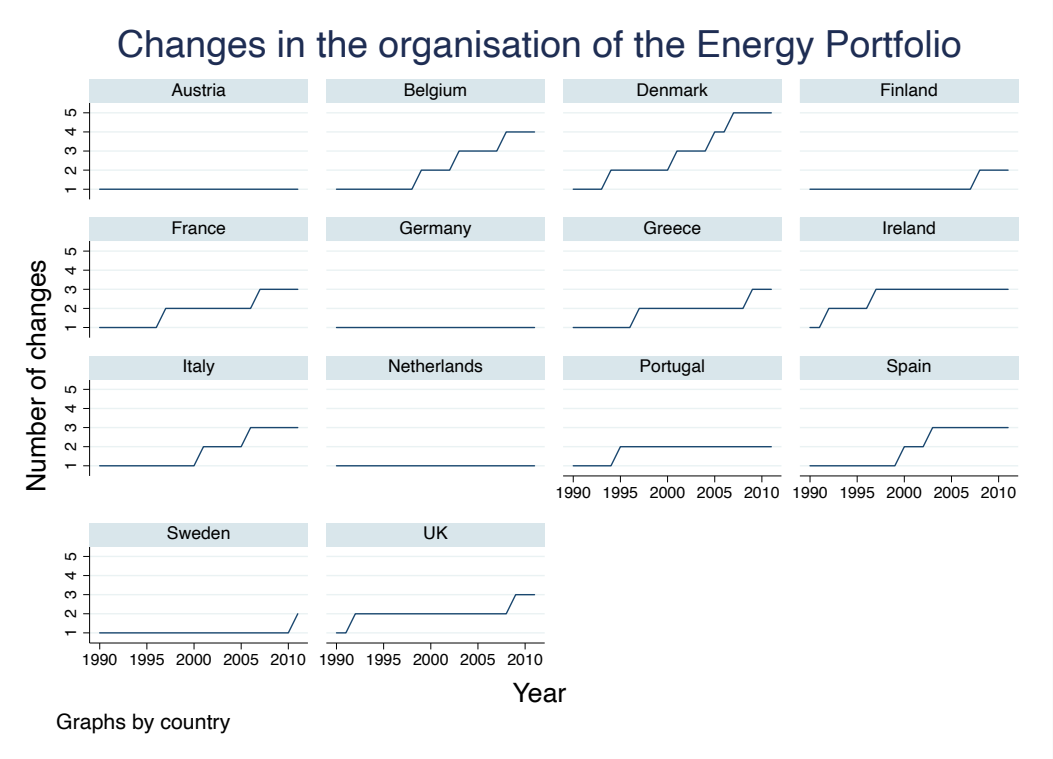
Main ministerial variables. We coded the institutional setup of energy policymaking across the European Union. For each country-year, we assessed the location of the energy portfolio in the administrative constellation of the state. We identified the following cases: (1) energy can be its own separate ministry; (2) energy is a ministry jointly with the climate (or environment) portfolio; (3) energy is joined to the economics portfolio, (4) energy is tied to the portfolio of industry or business; (5) energy is linked to housing; finally, a small number of cases fit in none of these categories and are coded as 'other.' In practice, we find that energy is most commonly tied to the economics portfolio (almost 40%), followed by industry (almost 30%) (Table 1).[9] It is important to note that while there is important cross-country variation, there is also significant within country variation over time, as we see in Table 1 and Figure 1.

[9] In a few cases, such as in Denmark and Finland for a few years, Economics, Industry and Energy would be under one portfolio. We coded these as Economics and Energy. There is only one instance, in the Netherlands since 2017, where the ministry of Economics is together with Climate and Energy.

Table 1: Cross-country variation in the organisation of the portfolio of Energy

COUNTRY	ENERGY ALONE	WITH CLIMATE	WITH ECONOMICS	WITH INDUSTRY	WITH OTHER
Austria	0.00	0.13	0.87	0.00	0.00
Belgium	0.00	0.35	0.45	0.00	0.19
Denmark	0.13	0.68	0.13	0.00	0.06
Finland	0.00	0.06	0.35	0.58	0.00
France	0.00	0.45	0.32	0.23	0.00
Germany	0.00	0.00	1.00	0.00	0.00
Greece	0.00	0.39	0.39	0.23	0.00
Ireland	0.68	0.00	0.16	0.00	0.16
Italy	0.00	0.00	0.48	0.35	0.16
Netherlands	0.00	0.00	1.00	0.13	0.00
Norway	0.87	0.00	0.00	0.13	0.00
Portugal	0.00	0.26	0.58	0.16	0.00
Spain	0.00	0.10	0.10	0.74	0.06
Sweden	0.00	0.23	0.00	0.68	0.10
UK	0.06	0.23	0.00	0.71	0.00
Total	0.12	0.19	0.39	0.26	0.05

Figure 1: Number of portfolio organisation changes by country (cumulative changes). See text for data and coding.



To test Hypothesis 2, we coded the level at which the energy portfolio is located in the bureaucratic hierarchy. We created an indicator that takes value 1 if the energy portfolio is a sub-department instead of a primary department within the ministry. We find this to be the case in 65% of the country-years included in the data. Finally, to test Hypothesis 3, which looks at whether regular portfolio changes undermine policy initiatives, we constructed two variables: a binary variable which takes the value one every year the energy portfolio is re-allocated as well as the following binary variables: two changes, three changes, four changes, five changes and over.

Utilising the information of the different configurations of the energy portfolio we are also able to count the number of changes that the energy portfolio has undergone during the period 1990 to 2020. Figure 1 provides an overview of the number of times governments have reformed the portfolio of energy in terms of which other portfolios it is combined with[10]. Figure 1 is quite revealing. There is a large variation among countries in the times they have reorganised the portfolio of energy, with countries such as Austria and Finland having none or very small changes, while other countries such as Belgium or Denmark having up to 5 changes.

We estimate a range of models to test our hypotheses. A reduced error correction model is used for the models that test the hypotheses on energy consumption per square meter. Concretely, we estimate versions of:

$$\Delta\text{Efficiency}_{it} = \alpha_i + \lambda\text{Efficiency}_{i,t-1} + \sum\beta\text{Portfolio}_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{it}$$

[10] These numbers could be underestimated as we did not include the 'other' category in our data. As a result Norway, which has Energy under the Ministry of Petroleum and Energy.

Where we compare the parameters on portfolio allocation of Energy. This model is estimated with least squares and standard errors are heteroskedastic-robust.

For H2, we use a logit model to test the hypotheses on governments' policies that target to increase energy efficiency in houses. We estimate the following model with maximum likelihood:

$$\Pr(\text{Energy efficiency policy})_{it} = f(\alpha + \beta \text{Sub-portfolio}_{i,t} + \gamma X_{i,t})$$

Finally, for H3, we augment the previous model by including indicators for the number of times the portfolio changes.

Across all models, in order to account for the observational nature of the data, we adjust our estimates for several potential confounders, including GDP growth, energy inflation and the share of Green seats in the legislature. To reduce the risk of omitted variable bias, we include country and year fixed effects.

4. Results

Our results regarding H1 are reported in Table 3. The baseline category is 'Climate or Environment'. We find that joining Energy to Climate (environment) is associated with higher energy efficiency in residential buildings. Specifically, when the departments of Energy and Climate are combined we observe a reduction in energy consumption in residential buildings by about 0.3 to 0.6 units compared to putting Energy and Economics together (the standard deviation of the change in energy efficiency is 0.7 units, which implies that the change represents about 30-70% of the outcome's typical variation). Given that we have a partial error correction model (including a lagged dependent variable), the long-term effect is a decline of about 7 units of energy consumption, which is almost twice

the standard deviation of energy efficiency (in levels). Thus, the effect is substantially large. It is also significant at conventional levels across all specifications.

In Equations 4 and 5 of Table 3 we test Hypothesis 3b. We find that the number of changes in the organisation of the Energy portfolio has no positive effect, and in some instances, could have a negative effect on the actual energy efficiency of residential buildings. In Equation 5, which does not include country fixed effects but includes year effects, three and five changes in the organisation of the Energy portfolio, are associated with higher levels of consumption compared to lower changes. Relying mostly on the cross-country variation, the model informs us that countries that have had multiple changes in the organisation of their ministry have higher consumption. Of course, these results do not provide a causal explanation as we cannot know which way the causal mechanism goes. Poorer consumption performance could be due to too many organisational changes as we hypothesize but it is also possible that governments reallocate the portfolio of Energy frequently as they are trying alternative configuration due to high consumption.

Table 3: Change in energy unit consumption per square meter adjusted to climate conditions, EU 15. All models have robust standard errors & regressors are lagged by one year. DV in changes.

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	Energy consumption in residential buildings per m2, climate adjusted				
Lagged consumption	-0.0264**	-0.0542***	-0.0587***	-0.0319***	-0.118***
	(0.0108)	(0.0170)	(0.0182)	(0.00999)	(0.0222)
Dept_Energy	0.0881	0.406*	0.450*	-0.0533	0.562**
	(0.168)	(0.232)	(0.234)	(0.168)	(0.249)
Dept_Energy_Other	0.376*	0.577**	0.618**	0.435*	0.926***
	(0.218)	(0.241)	(0.243)	(0.249)	(0.309)
Dept_Energy_Economics	0.227	0.323*	0.340*	0.276*	0.541***
	(0.149)	(0.175)	(0.176)	(0.167)	(0.199)
Dept_Energy_Industry	0.303**	0.426**	0.420**	0.229	0.280
	(0.144)	(0.166)	(0.166)	(0.167)	(0.207)
Energy_sub	-0.0818	-0.0573	-0.0877	-0.0495	0.0429
	(0.0985)	(0.110)	(0.112)	(0.0966)	(0.116)
Left PM			0.138		
			(0.0867)		
Multiparty cabinet			0.0342		
			(0.109)		
Three changes				0.181	0.316**
				(0.134)	(0.156)
Four changes				0.0171	-0.0190
				(0.539)	(0.565)
Five changes				0.181	0.647*
				(0.297)	(0.344)
Country Effects	**No**	**Yes**	**Yes**	**No**	**Yes**
Year Effects	No	No	No	Yes	Yes
_cons	0.104	0.441	0.451	0.0421	1.417***
	(0.206)	(0.277)	(0.282)	(0.319)	(0.487)
N_g	14	14	14	14	14
N	341	341	341	341	341

Our results regarding H2 and H3a are reported in Table 4. We find systematically that the likelihood of adopting a new energy efficiency policy is lower when Energy is a sub-ministerial unit. Very roughly, the point estimates imply that the odds of implementing a policy are about half when Energy is a sub-unit compared to when it is a primary unit. This suggests that its subordinate status slows down its ability to pass policies, further emphasizing the importance of organizational design for effective policymaking. Interestingly, the actual configuration of the portfolios has no direct effect on the number of initiatives.

Lastly, we find that the number of changes in portfolio allocation has no impact on the odds of implementing energy efficiency policies with the exception of three changes. The baseline category here is cases with no or less than two changes. The odds ratio suggest that more than three changes has no positive or negative effect on government initiatives. However, three changes increase the odds of initiating an energy efficiency policy by a factor of 15 compared to the baseline. Disrupting the administrative process, then, could increase bureaucratic productivity, against our expectation, but only at moderate levels of disruption.

Table 4: Introduction of new energy efficiency policies for the residential sector. 15 West European Countries, 1990-2020 Logistic regression. All models include year effects.

	(1)	**(2)**	**(3)**	**(4)**
	Energy Efficiency Policy Initiatives			
Dept_Energy	0.390	0.329	0.0498	-0.773
	(0.635)	(0.641)	(0.664)	(1.119)
Dept_Energy_Economics	0.180	0.133	0.591	0.729
	(0.509)	(0.514)	(0.611)	(0.703)
Dept_Energy_Industry	-0.472	-0.544	-0.145	0.262
	(0.585)	(0.596)	(0.653)	(0.774)
Energy_sub	-0.665*	-0.670*	-0.667	-0.958**
	(0.395)	(0.395)	(0.414)	(0.439)
Dept_Energy_Other	-0.444	-0.390	0.179	0.503
	(0.771)	(0.775)	(0.869)	(0.986)
New_ministry		-0.404		
		(0.610)		
Three changes			1.127**	1.484**
			(0.505)	(0.622)
Four changes			0.566	0.618
			(0.942)	(1.078)
Five_changes			-0.534	0.0581
			(1.048)	(1.323)
_cons	-0.714	-0.246	-0.853	
	(0.787)	(1.056)	(0.813)	
Country Effects	No	No	No	Yes
N_g	15	15	15	15
N	360	360	360	450

5. Conclusion

Energy efficiency seldom makes it in the headlines. Yet it a major problem at the intersection of climate mitigation (residential energy use is a major source of greenhouse gas emissions) and social policy (energy poverty has become an important source of disutility in Europe. Our paper contributes by showing the critical role played by the design of ministerial organizations. We identify the important of attaching Energy to the "right" ministry, and of making it a senior partner rather than a lower-ranked department.

Beyond this, our paper contributes to the general literature on bureaucratic design. The problem of policy coordination is one that has received considerable interest in recent years (Bolleyer 2011; Peters 2018), though it is a topic that has regularly come up in the study of administrative organizations (e.g., Lindblom 1965; Simon 1991). Our analysis emphasizes how both the vertical and horizontal location of an administrative unit may shape its ability to respond to public needs as they arise. Furthermore, we show that reorganization itself affects policy productivity.

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