SEQUENCES OF DEMOCRACY AND DEVELOPMENT

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SEQUENCES OF DEMOCRACY AND DEVELOPMENT

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Submitted to:

Brandy Witthoft, USAID COR

Submitted by:

Staffan Lindberg, Senior Level Evaluation Expert, University of Gothenburg
Valeriya Mechkova, Mid-Level Evaluation Expert, University of Gothenburg
Berker Kavasoglu, Junior Level Evaluation Expert, University of Gothenburg
Patrik Lindenfors, Senior Level Evaluation Expert, Stockholm University

Contractor:

NORC at the University of Chicago
Bethesda, MD 20814
Attention: Renée Hendley
Tel: 301- 634-9489; E-mail: Hendley-Renee@norc.org

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ABSTRACT

Scholars have long studied the correlation between democracy and development; yet, there is no consensus in the literature about what is the cause and what is the effect in this relationship. Engaging with this vast literature, we utilize novel sequencing methods and time series cross section analysis to examine the development trajectories of countries and the long-term dimensions of institution building. Drawing on previous research, we expect theoretically, and also find empirical support that historically several democracy indicators develop early on in the sequence, while most development indicators develop much later. Among the earliest movers are: introducing universal suffrage and establishing elections for the main office-holders; together with rule of law and civil liberties and freedom of association. The indicators which develop later in the sequence tend to be development outcomes, including higher ratings on the environmental performance index, greater trade and tax revenue as percentage of GDP, higher percentages of the population using the internet, as well as several key indicators of gender equality. The findings presented in this paper have substantive policy implications both for those who are interested in promoting democratic governance and for those who wish to improve development outcomes.

1. INTRODUCTION

Countries with developed democratic institutions also tend to perform well in terms of various other development indicators such as GDP per capita, health and education outcomes. Scholars have long studied this correlation between democracy and development; yet, there is no consensus in the literature about what is the cause and what is the effect in this relationship. Engaging with the vast literature on democratic development and governance, we utilize novel sequencing methods – specifically, domination analysis – to examine the development trajectories of countries and the long-term dimensions of institution building. Through this approach, we are able to map which traits from democratic institutions and development outcomes emerge early in countries' sequences and which emerge later.

As democracy and development are both multifaceted, complex institutions, we adopt a broad definition of both. Specifically, in our definition of democracy we go beyond the narrow definition of democracy focusing on elections to also consider non-electoral processes such as checks and balances between institutions, rule of law, the robustness of civil society, and the freedom of the media. In terms of development, we consider a wide range of outcomes: infant mortality, educational attainment, access to the Internet, environmental performance, and gender equality.

The goal of the analysis is to advance our understanding of the predominant trajectories of countries' development. Drawing on previous research, we expect that indicators capturing institutions of democratic governance, checks and balances, and civil liberties develop earlier and serve as drivers for positive change in development outcomes.[1]

Methodologically, we conduct this research using novel sequencing methods developed by Lindenfors et al. (2018, 2019). These methods have been used in studies such as those by Mechkova et al. (2018) to examine the steps required to reach high levels of government accountability and by Wang et al. (2017) to detail the role of women's rights in democratic transitions. We also employ more conventional linear regression techniques to get further clarity on which institutional characteristics are associated with development outcomes such as reducing poverty rates or improving access to and use of information and communication technology. In combination, the results help us to identify typical sequences. Specifically, the analysis sheds light on which institutions are first-movers, and thus, require few prerequisites, versus those that develop relatively late in the sequence.

In line with our expectations, we find that historically several democracy indicators develop early on in the sequence. The earliest movers are: introducing universal suffrage; establishing elections for the main office-holders; protection of the rule of law and civil liberties; freedom of association, and freedom of expression. The indicators which develop later in the sequence tend to be development outcomes, including higher ratings on the environmental performance index, greater trade and tax revenue as percentage of GDP, higher percentages of the population using the internet, as well as several key indicators of gender equality such as equal distribution of political power between men and women, equal opportunities for doing business, access to state jobs, and equal protection of civil liberties. We

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[1] We use the terms democracy, democratic institutions and democratic governance as synonymous throughout the paper.

find similar results both when using the sequence analysis techniques and in the time-series cross-sectional analysis.

The findings presented in this paper have important policy implications both for those who are interested in promoting democratic governance and for those who wish to improve development outcomes. We provide evidence that development in these two spheres are closely connected. Promoting democratic governance in the form of regular elections, guarantee of political and civil liberties, and checks and balances between institutions is robustly associated with a number of positive development outcomes, including greater gender equality and better economic outcomes. One concrete application of the findings from this paper could be related to the United States Agency for International Development's (USAID) framework "Journey to Self-Reliance" (JSR), which aims to ensure that its partner countries have the institutional capacity to meet their own development challenges. Similar to the analysis in the present paper, this framework maps the political and economic development of countries, divided in two categories: *commitment* that taps into choices and behavior, and *capacity* which captures achievements and outcomes (see USAID 2019 Methodology Guide).

The remainder of the paper is organized as follows. First, we briefly present the main insights of the existing literature. After that, we discuss the data, the chosen methodologies, and the results from the analysis. The final section concludes the paper by bringing the main results together and briefly discussing the implications of our study.

2. THEORETICAL FRAMEWORK AND PREVIOUS FINDINGS

This section presents first the theoretical framework of this paper. We present a brief overview of the larger literature on institutional development. The theoretical foundation for this paper is that social and political processes form a complex, series of sequentially related developments that contribute to the final outcome. We expect that inclusive institutions should lead to more widely available and higher quality services. However, there are also reasons to believe that the relationship arrow between those two variables could go the other way too, and there are some studies that support such a proposition. Further elaborated on below, we think of a sequence as one in which one factor usually develops before another factor, which in turn tends to become better before one or more third factors. In the next section we briefly outline a few key arguments that suggest that high levels of development are preconditions for democracy before turning to the strand of the literature this paper contributes to, namely, the literature suggesting that democracy contributes to improved development outcomes.

DEVELOPMENT OUTCOMES AS DRIVERS OF DEMOCRACY

One strand of the literature suggests that the correlation between democracy and development comes from economic development systematically influencing political institutions towards becoming more inclusive and less corrupt (see, e.g., Lipset, 1959; Inglehart and Welzel, 2005). The modernization theory posits that economically developed countries (measured most frequently with higher GDP per capita) are more likely to democratize (Dahlum 2018; Knutsen 2015). The explanation for this finding is that an efficient private sector is associated with a well-educated labor force, who are also able to defend democracy (Knutsen 2020). Further, the literature has shown that high GDP per capita helps to safeguard democracies from backsliding (Przeworski et al. 2000; Rød et al. 2019). Analyzing data from early 19th century, Boix (2011) finds that development stabilizes democracy but he also suggests that it

triggers democratic transition in certain historical periods, especially before World War II.[2] By contrast, some studies suggest that there is no convincing evidence that higher GDP per capita triggers democratization episodes (for review see Knutsen 2020). One explanation for this null finding is that good economic performance could also help autocrats to sustain their regimes either through co-optation or through repression (Kennedy 2010).

In connection to the modernization theory of democratization, Lipset also argued that education "broadens men's outlooks and increases their capacity to make rational electoral choices" (Lipset, 1959, p. 79). Therefore, citizens' level of education should influence the extent to which they can exercise their democratic right to vote. That is, more educated citizens should be better equipped to seek and understand information related to politicians, more able to critically evaluate their behavior, and also have greater knowledge of how to influence their future actions. Further, Glaeser et al (2007) argue that attending school increases human capital and equips citizens to efficiently participate in civil society and political organizations, which are crucial for democracy. More specifically, schooling teaches people how to interact with each other and facilitates different forms of civic involvement.

In his influential study, Barro (1999) argues that there are a number of social and economic determinants of democracy. He finds empirical support for this proposition using panel data of over 100 countries from 1965 to 1990, showing that increasing the standard of living in a country, measured by GDP per capita, higher primary school achievement, and a smaller gap between male and female primary schooling is associated with improved democracy scores, measured by electoral rights. The intuition for this finding is simple. We could expect that if an individual citizen is deprived of access to a basic resource such as drinking water, s/he will be spending more time on satisfying such a necessary need and will therefore be less likely to have time and capacity for garnering information on politicians' behavior and to participate in collective citizen actions that may affect the provision of public goods. When citizens have their basic needs met, they will have the time and capacity to push for democratization. With higher educational achievements, one would also expect such a citizens to gain greater capacity for such actions.

In terms of gender equality, the literature suggests that improving women's rights is essential for successful democratization (Wang et al 2017). Guaranteeing equality between men and women in terms of political and economic rights should help to establish and sustain democracy. More specifically, Wang et al (2017) argue that granting the full population (not just half of it) rights such as freedom of expression, movement, and association, makes it much more difficult for autocrats to continue oppression, and gives the opposition more resources to draw upon. Examples of how women's empowerment helps to transition to democracy comes from various settings, including Latin America in the 1970s, Middle East and North Africa in the 1990s, and sub-Saharan Africa in the 1990s (ibid).

DEMOCRATIC INSTITUTIONS AS DRIVERS OF DEVELOPMENT OUTCOMES

Scholars have long argued that political choices, shaped by political institutions, determine political outcomes (Acemoglu and Robinson 2012). Thus, a large body of literature argues that democratic

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[2] However, Boix argues that there are conditional effects to the development-democracy relationship. First, growth has declining marginal effect on democracy, and second, the effect depends on the current international system and balance of powers.

regimes perform comparatively better than non-democratic countries in terms of providing welfare for their population. These arguments come in several different forms. Historically, there has been no large-scale famine in a full-fledged democracy (Dreze and Sen, 1989). Other studies have demonstrated that democratic governance has positive effects on public goods provision such as more extensive public infrastructure, better water provision, and higher levels of education (Antonis et al., 2011; Biser & Edwards, 2012; Deacon & Saha, 2009). Furthermore, a series of contributions provide evidence that democracy is associated with improvements on various indicators of human development and health, such as life expectancy, maternal mortality, and infant mortality (Bollyky, 2019; Gerring, 2012; Franco, Álvarez-Dardet & Ruiz, 2004; Klomp & de Haan, 2009; Wigley & Akkoyunlu-Wigley, 2011; Wang et al 2019).

While the literature mostly agrees on the association between democratic institutions and levels and social and economic development, there is debate as to which features of democracy are most important in this regard. In the next two sections we review the arguments from the literature about electoral and non-electoral institutional determinants of democracy.

ELECTIONS AND DEVELOPMENT

A prominent explanation for these positive effects of democracy is that democratic institutions provide an opportunity for and implicit threat of holding governments accountable, which provides an incentive for governments to provide better development outcomes (Adam et al., 2011; Biser et al., 2012; Harding et al., 2010; Gerring et al., 2012). Specifically, placing accountability demands on public officials from both state and non-state actors should create strong motivations to design and implement policies that are important for the citizenry and societal growth. A large body of literature has found that while regularly held competitive elections are in no way perfect in their function to steer decision-making, they do seem to pressure politicians to perform as a means to gain votes and stay in office (for a recent review of the literature see Dewan and Shepsle, 2011). Voters on average can be expected to value human welfare and have that high on their list of priorities. Therefore, elections should be a mechanism through which voters reward politicians who they perceive as having successfully implemented human development policies, while punishing those who fail to do so (Wang 2019).

Research has looked specifically at competitive elections and found that even if they are not completely free and fair, they have a positive causal effect on a wide range of human development outcomes, including infant mortality and literacy (Miller, 2015). The explanation for the positive effect is that competition leads to greater elite responsiveness to, at a minimum, a plurality of the electorate (Gerring et al., 2012), as opposed to authoritarian leaders who face a much smaller selectorate (Bueno de Mesquita et al., 2003). Improving human development should be expected to be a high priority among the general population (it should be one of their primary interests), and this prioritization should therefore lead to a higher weight given to effective public policies (Adam et al., 2011) that improve human welfare.

INSTITUTIONAL DETERMINANTS OF DEVELOPMENT OUTSIDE ELECTIONS

Biser et al. (2012) rather point to civil liberties as the driving mechanism in democracies that put pressure on politicians to deliver public goods. Increased civil liberties empower the people to express their concerns, through protest if necessary, and this enhances voice and provides avenues for accountability between and beyond elections. In their empirical analysis, Biser et al. (2012) find that

greater respect for civil liberties is associated with a larger percentage of the population with access to water in rural areas, while Gerring et al. (2012) give evidence that protecting civil liberties is also associated with lower infant mortality rates.

Among the institutions of democracy, horizontal accountability is another mechanism that could play an important role in furthering human health and development. Checks and balances between institutions should ensure that institutions serve citizens by ensuring that the legal and political consequences of public officials' activity are enforced (O'Donnell, 1998). Therefore, with more extensive, better functioning of checks and balances de facto, potential abuse of power in the of welfare policies should be investigated by institutions such as the prosecutor general, the judiciary, or members of parliament. The mere existence of a well-functioning system of checks and balances therefore should work as an incentive for less misuse of public office that would undermine the provision of public goods such as health and development investments.

Another possible mechanism by which democracies hold governments accountable put forward by the literature is that democracies allow for greater freedom of expression, which includes unconstrained investigative reporting by the media (Miller, 2015). Thus, both citizens and bureaucracies, as well as politicians in democracies, are expected to be better informed about some of the shortcomings in public goods provision as opposed to autocracies where the flow of information is often subjugated to the interests of various stakeholders in the political hierarchy. In support of this line of reasoning, Wolf (2007) finds a positive, empirical relationship between how free the press is and access to water.

Thus, citizens and the media can also serve an important "fire alarm" accountability function by monitoring and reporting observed irregularities through their daily lives and professional activities (Grimes, 2013, p. 382). During the periods between elections, citizens can seek to influence public policies through a wide variety of intermediaries: interest associations, social movements, and locality groupings (Schmitter and Karl, 1991, p. 78). Civil society organizations are also instrumental in exercising pressure on politicians between and during elections, and offer a focal point for coordination of efforts (Putnam et al., 1993). Both types of activities can be picked up by the media, and journalists in democracies are also free to do their own investigative reporting.

Further, Acemoglu and Robison (2012) highlight that the extent to which institutions are inclusive matters for economic outcomes. Inclusive societies are based on large coalition of stakeholders with which those exercising power need to reconcile (ibid). More specifically, as result of specific set of informal institutions and norms, citizens pressure elites to introduce inclusive institutions, as result of which state capacity also increases (Acemoglu and Robinson 2016).

Finally, we also consider specifically how democracy relates to outcomes related to gender equality. The existing literature suggests that women's rights such as freedom of domestic movement, right to private property, freedom from forced labor, and access to justice are better protected in democracies (Lindberg, 2004). Similarly, democracies provide for the opportunity for women to better defend their economic rights. One illustrative example is the study of South African women who, through unions and coalition-building, managed to defend in the legislature their economic rights after the apartheid (Fish, 2006).

In sum, various mechanisms for holding governments accountable for their actions to both state and non-state actors lead us to expect that a higher degree of democracy leads to better development

outcomes. A common way to study this relationship is through time-series cross sectional analysis by utilizing instrumental variables (Wang, 2019; Miller 2015), stock variables (Gerring, 2012), and lagged outcome variables, country and year fixed effects to account for country-specific effects and global trends (Ross, 2006). While these methods address endogeneity concerns, they cannot resolve the direction of causality. Drawing on sequencing methods, this paper employs a domination analysis to fill that gap and address the following open questions: Are the processes of accountability-building and human development recursive? In other words, is a certain level of human development needed to develop high levels of democracy?

Finally, it seems improbable that the development of either democratic institutions or better development outcomes are necessarily linear. To account for both the possibility of endogeneity and recursive relationships, as well as non-linear processes, we focus on identifying the sequential patterns between indicators of democratic institutions and development outcomes over long time series using methodologies that allow for complex interactions. Thus, the research goal of this paper is to understand how the emergence of democratic institutions are sequentially related to improved development outcomes such as improved child health and increased levels of education. Is there a typical or common sequence of development? If so, what is it? When a country succeeds in building democratic institutions, which are the human development prerequisites that are typically in place?

Answering the aforementioned questions would allow us to give insight into relevant policy issues. If we are to improve a specific development outcome, how should we focus our support: empowering the media, strengthening the autonomy of the judiciary, building political parties, or strengthening elections? Relatedly, is a certain level of education or economic growth needed in order to build open, inclusive democratic institutions?

3. METHODOLOGY

We opt to utilize a recently developed approach to identifying sequences in ordinal time-series data: domination analysis. This approach is particularly valuable for exploring temporal relationships between ordinal variables (Lindenfors et al. 2018; 2019 used in Wang et al. 2017, Mechkova et al. 2019). For a given dataset of variables, the first step is to select pairs of variables and generate frequency tables presenting the number of observations associated with every combination of values for each variable. This process is iterated across all pairs of variables in the dataset. Frequency tables show how variables covary in magnitude and can give us an idea of more frequent and rarer combinations.

Further, by combining all frequency tables for all pairs of variables, we are able to determine which variables tend to increase before others. Specifically, we are able to identify variables that "dominate" others by assessing which variables consistently display higher values than others. If, for example, Variable A and Variable B are both increasing over time, and Variable A consistently has a higher value than Variable B, then it can be concluded that Variable A "dominates" Variable B. By repeating this algorithm for all pairs of variables, a sequence of dominants is constructed and potential causal pathways are identified (see Lindenfors 2018; 2019 for further details).

As an example of how a relationship between two variables may look in this method, consider the relationship between the Freedom of Association Index (FAI – indicating to what extent parties are allowed to form and to participate in elections, and civil society organizations able to form and to

operate freely, a higher score equals more democratic) and the Environmental Performance Index (EPI – ranks countries on environmental health and ecosystem vitality, higher rank indicates greater health and vitality). In the data, the rank of countries on the FAI is higher than their rank on the EPI in 60% of observed cases, at an equivalent level in 26% of observed cases, and lower in 14% of observed cases. This indicates that the FAI generally ranks above EPI in the dataset, under the assumption that the rank of countries on the indices is comparable.

We complement the domination analysis with time-series cross-sectional regressions with models including country and year fixed effects. Country fixed effects account for unobserved country-specific characteristics and factors that remain constant or change little across time. This ensures that the results are driven by variation in key metrics within countries rather than between them. We also estimate models with year fixed effects to ensure that the observed relationships between metrics are not driven by world trends that are common to all countries such as global economic crises or international war.

4. DATA

The complete dataset covers 180 democratic and autocratic countries around the world from 1974 to 2018. Each metric has different country and temporal coverage, subject to data availability. Table 2 presents an overview of data sources.

Table 1. List of Democratic Institutions and Development Outcomes Used in the Analyses

VARIABLE	DATA SOURCE	TEMPORAL COVERAGE
DEMOCRATIC INSTITUTIONS		
Equality before the law and individual liberty index	V-Dem	1974-2018
Freedom of association index	V-Dem	1974-2018
Freedom of expression index	V-Dem	1974-2018
Elected officials index	V-Dem	1974-2018
Suffrage	V-Dem	1974-2018
Clean elections index	V-Dem	1974-2018
Engaged society	V-Dem	1974-2018
CSO participatory environment	V-Dem	1974-2018
Judicial constraints on the executive index	V-Dem	1974-2018
Legislative constraints on the executive index	V-Dem	1974-2018

VARIABLE	DATA SOURCE	TEMPORAL COVERAGE
Public sector corruption index	V-Dem	1974-2018
Legislature corrupt activities	V-Dem	1974-2018
Judicial corruption decision	V-Dem	1974-2018
Executive corruption index	V-Dem	1974-2018
DEVELOPMENT OUTCOMES		
State ownership of economy	V-Dem	1974-2018
Access to state jobs by gender	V-Dem	1974-2018
Power distributed by gender	V-Dem	1974-2018
Access to state business opportunities by gender	V-Dem	1974-2018
Exclusion by gender index	V-Dem	1974-2018
GDP Per Capita	Maddison Project (Bolt et al., 2018).	1974-2018
Export Diversification Index.	United Nations Conference on Trade and Development	1974 - 2010
Exports per capita	World Development Indicators	1974 - 2014
Imports per capita	World Development Indicators	1974 - 2014
Trade (% of GDP)	World Development Indicators	1974 - 2017
Tax revenue (% of GDP)	World Development Indicators	1974 – 2016
Environmental performance index	Yale Center for Environmental Law & Policy	2007 - 2015
Mobile cellular subscriptions (per 100 people)	World Development Indicators	1975 - 2017
Individuals using the Internet (% of population)	World Development Indicators	1990 - 2016
Average years of education among citizens older than 15	Clio Infra (2018)	1974 - 2018
Infant mortality rate	Gapminder	1974 - 2018

We use several measures from Varieties of Democracy Project (V-Dem) (Coppedge et al., 2019) that capture the nature of democratic institutions. These measures include equality before the law and individual liberties index, freedom of association index, freedom of expression index, suffrage, judicial constraints index, legislative constraints index, and public sector corruption index. We focus on indices that are sub-components of higher-level indices such as liberal democracy or specific indicators that

have been used to build indices such as social group inequality. This allows for drawing more specific conclusions about the relationships between democratic institutions and development outcomes.

In terms of development outcomes, we employ measures such as economic development measured as GDP per capita, infant mortality, education, percentage of population using the internet, trade income as share of GDP, trade revenue as share of GDP, and environmental performance, among many others.

5. FIRST PART: DOMINATION ANALYSIS

As discussed above, we first combine the frequency tables for all pairs of variables and conduct a domination analysis. The results are reported in Table 3. The name of each variable appears in the "Variable" column. The "Dominates" column provides the number of comparisons in which that variable dominated others, meaning that it consistently displayed higher values than those other variables and thus tended to increase before these. The "Dominated" column provides the number of comparisons in which that variable was dominated by others, meaning that it consistently displayed lower values than those other variables and thus tended to increase after these. The "Balance" column presents the difference between "Dominates" and "Dominated," where positive numbers indicate that the variable was more likely to lead sequences of development, and negative numbers indicate the variable was more likely to lag behind. The indicators appearing at the top of the table are measuring those traits that typically develop before others, while the ones that usually require many other properties to develop first are found at the bottom.

All five indicators at the top are democratic institutions: extension of suffrage to the entire adult population ("Suffrage") and institutionalization so that powers at the national level are vested in officials elected in regular elections ("Elected officials") in particular, but also creating a stronger rule of law based on individual liberties ("Equality before the law and individual liberties index") as well as protecting freedom of association ("Freedom of association index") and expression ("Freedom of expression index").

At the bottom – those features that typically develop only after other indicators have improved – we find mainly development outcomes: environmental performance, ability to collect a higher share of GDP in taxes, development of more extensive trade networks resulting in a greater share of trade as percentage of GDP, and decreasing exclusion by gender.

The only democratic institution indicator we find in this lower rung is the clean elections index. It is hard to say why clean elections are the only democratic institution (or set of institutions) that appear to develop later. However, it is important to note that the clean elections index we are using is constructed from eight lower-level indicators, including traits that are typically difficult to make more democratic before other democratic institutions are in place. For example, it seems logical that a freer media with ability to monitor and report issues surrounding elections must develop before one can start getting rid of phenomena that thrive in "darkness," such as vote buying and election irregularities. None of the development outcomes are found early in the sequence. This is a substantially important finding. The only development outcome that comes close to being early is infant mortality but there is no dominant relationship to any of the other variables. The most we can say from this analysis is that infant mortality does not tend to occur before any of the political development variables.

Table 2. Domination Analysis Results

VARIABLE	DOMINATES	DOMINATED	BALANCE
Suffrage	30	0	30
Elected officials index	27	0	27
Equality before the law and individual liberty index	9	1	8
Freedom of association index	6	1	5
Freedom of expression index	5	1	4
Engaged society	2	2	0
Imports per capita	2	2	0
Infant mortality	0	0	0
Legislature corrupt activities	0	0	0
Access to public services distributed by gender	1	2	-1
Export diversification	2	3	-1
Exports per capita	1	2	-1
Judicial constraints on the executive index	1	2	-1
Legislative constraints on the executive index	1	2	-1
Public sector corruption index	1	2	-1
State ownership of economy	1	2	-1
Access to state jobs by gender	0	2	-2
Average years of education among citizens older than 15	0	2	-2
CSO participatory environment	0	2	-2
Executive corruption index	1	3	-2
Gender equality in respect for civil liberties	0	2	-2
Judicial corruption decision	0	2	-2
Logged GDP per capita	0	2	-2
Mobile cellular subscriptions (per 100 people)	2	4	-2
Power distributed by gender	0	2	-2

VARIABLE	DOMINATES	DOMINATED	BALANCE
Access to state business opportunities by gender	0	3	-3
Exclusion by gender index	1	5	-4
Individuals using the Internet (% of population)	1	6	-5
Trade (% of GDP)	0	5	-5
Clean elections index	1	7	-6
Tax revenue (% of GDP)	4	12	-8
Environmental performance index	1	10	-9

Note: Reported values are the number of other components the given component is larger than (dominates) or smaller than (dominated) in at least 50% of the observed states. Balance reflects the difference between dominates and dominated by. Higher balance values suggest that the component develops earlier, while lower values indicate that the component develops later.

Collectively, these findings suggest that making progress in improving development outcomes such as mortality rates comes after the core institutions of democracy such as having elections for those in power, instituting fundamental individual liberties, and freedom of association and expression, but develops before more "difficult to achieve" democratic institutions that make up horizontal accountability. The latter is found both in direct measures such as legislative and judicial constraints on the executive, but even clearer in the effects such as lowering corruption in the executive as well as in the judiciary. But it is also clear that a series of indicators are found in the "messy middle" without clear patterns of domination. This simply means that they tend not to have any particular relationship in terms of sequence when countries develop.

The domination analysis is not designed to infer causality in the standard understanding of the term where an average effect is estimated across a sample. At the same time, detailing in this way what actually happened over the entire world in this long period, and finding clear patterns like the ones described above suggest at the minimum something close to necessary conditions. Empirically, it is rare for countries to improve development outcomes before certain democratic institutions. A much more common pattern is that a series of democracy institutions strengthen first, while those associated with achieving greater degrees of horizontal accountability comes later, and most of the development outcomes follow last. The policy guidance that emerges out of the domination analysis is that focusing on support to develop democratic institutions such as rule of law and elected government, as well as ensuring freedoms of association and expression, are vital. The analysis also suggests that key development outcomes like increasing trade tax revenue and protecting the environment are unlikely to move forward unless the democratic institutions are in place.

This general pattern is fairly consistent across several regions of the world (see Appendix I for each region's domination analysis table). The patterns for Latin America & The Caribbean, Asia & The Pacific, and Western Europe & North America are highly similar. In the analysis of Eastern Europe & Central Asia, the early movers among democratic institutions are mixed up with development outcomes that have to do with gender. This probably reflects a post-communist legacy of greater gender parity during

the Soviet era. In sub-Saharan Africa, on the other hand, the sequence where democratic institutions develop first is mixed with another set of development outcomes (infant mortality reductions) and corruption in particular. The MENA region is even more unique. Beyond extension of suffrage and combating corruption, a series of improvements of economic indicators as indicated by higher GDP per capita, greater exports and imports, and diversification have been early steps in development, instead of seeing the earliest improvements in democratic institutions. Better gender equality and democratic institutions such as improving the participatory environment for CSOs and greater freedom of associations in general, emerges as properties developing late in this region. Overall, the disaggregated regional analysis indicates that there are region-specific patterns for development trajectories.

6. SECOND PART: TIME-SERIES CROSS-SECTIONAL ANALYSIS

Based on the results from the sequence analyses, we further investigate the relationships between the key institutions that clearly develop earlier and outcomes that develop later in the sequence. Among those that develop later in the sequence, we consider indicators of development outcomes such as exclusion by gender, environmental performance, tax revenue as a share of gross domestic product (GDP), share of trade income in countries' GDP, and share of population using the internet. In terms of democratic institution indicators that may drive these outcomes given their status as early movers in the sequence, we consider equality before the law and individual liberties index, freedom of association index, elected officials index, suffrage, judicial constraints on the executive index, legislative constraints on the executive index, and public sector corruption index.

We estimate a series of ordinary least squares (OLS) regressions. To ensure that the results are not driven by unobserved time-invariant regional and country specific characteristics, our models include region and country fixed effects. We also include five-year period fixed effects to account for global temporal trends that are likely to influence observed patterns in the variables across all countries. In all models, we further control for regime type, which is a dummy variable that indicates whether a country is democracy as defined by V-Dem, and economic development, measured as GDP per capita. We control for these two variables because they are likely to be systematically associated with the independent and dependent variables of interest. Full results from regression analyses, which also include pooled OLS estimates in addition to OLS with country fixed effects, are presented in the appendix.

In this section, we discuss and visualize statistically significant associations between democratic institution indicators and development outcomes based on OLS regression estimates with country, region, and five-year period fixed effects. To facilitate the interpretation, we present a series of coefficient plots in which the x-axes represent the coefficient values. Figure 1 summarizes estimated relationships between key democratic institution indicators and exclusion by gender index. Exclusion by gender index captures the extent to which individuals are denied access to public services or participation in public spaces based on their gender. Higher values on this index indicates more exclusion based on gender. **Figure 1** demonstrates that greater equality of individuals before the law and respect for individual liberties are associated with lower levels of exclusion by gender.

Figure 1 also demonstrates that greater freedom of association is associated with lower levels of exclusion based on gender. [3]What this suggests is that as individuals enjoy greater freedoms to participate in politics through political parties and civil society organizations, gender exclusion tends to decrease. Relatedly, increasing suffrage is also associated with lower levels of exclusion by gender. As suffrage is extended to the extent that all individuals, irrespective of their gender, have the right to vote, gender exclusion becomes lower. The results also suggest that increasing freedom of expression is associated with lower exclusion by gender.

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[3] Freedom of association is not included in the measure exclusion based on gender.

Figure 1. Predictors of exclusion by gender. Estimates with 95 % confidence intervals
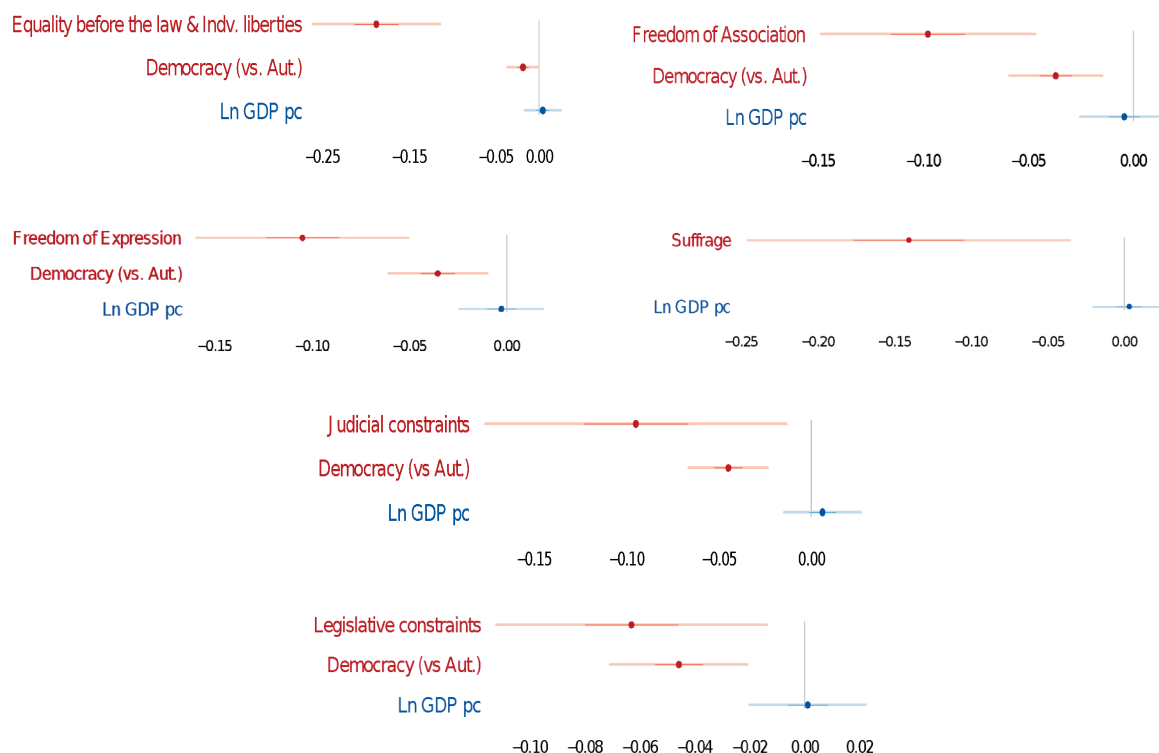
Note: Full results are presented in the appendix. Statistically significant estimates are highlighted in red. X-axis presents coefficient values, which represent average predicted changes in the dependent variable given a unit increase in the independent variable.

Figure 1 further indicates that increasing constraints on the executive by judiciary and legislature is associated with lower exclusion by gender. One possible interpretation of this finding is that increasing constraints on the executive branch prevent governments from taking measures that can hinder individuals' access to public services based on their gender.

Overall, although democracies tend to have lower levels of exclusion based on gender than autocracies, the association between the selected institutional features and exclusion based on gender holds irrespective of regime type. Importantly, we find no evidence that economic development, measured as logged GDP per capita, is significantly associated with the extent of exclusion based on gender.

As **Figure 2** displays, our analyses also indicate that greater values in equality before the law and the protection of individual liberties index are associated with increasing trade income as a share of GDP.

Figure 2. Predictor of trade income as share of GDP. Estimates with 95 % confidence intervals

Note: Full results are presented in the appendix. Statistically significant estimates are highlighted in red. X-axis presents coefficient values, which represent average predicted changes in the dependent variable given a unit increase in the independent variable.

Specifically, rigorously enforced transparent laws, bureaucratic impartiality, access to justice, protection of property rights, freedom from forced labor, freedom of movement, protection of physical integrity rights and freedom of religion create conditions propitious for trade. The association is substantial even after controlling for regime type and GDP per capita: an increase in the index is associated with around 2.8 percent increase in trade income as a share of countries' GDP.

Figure 3. Predictors of the share of population using the internet. Estimates with 95 % confidence intervals
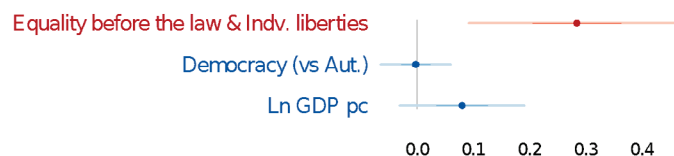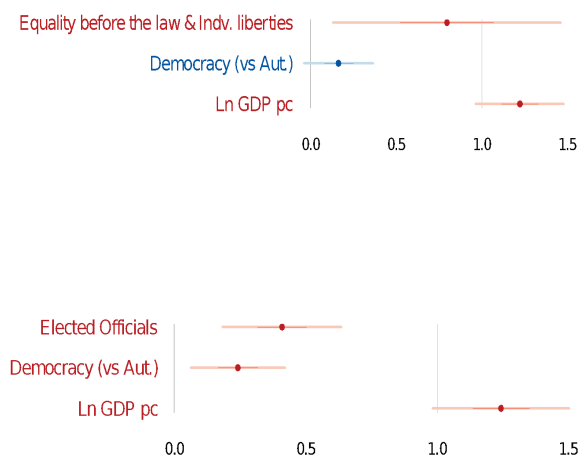

Note: Full results are presented in the appendix. Statistically significant estimates are highlighted in red. X-axis presents coefficient values, which represent average predicted changes in the dependent variable given a unit increase in the independent variable.

Moving on to the use of the internet among the population, we find that equality before the law and elected officials indices, which indicates whether the chief executive and legislature are directly elected (for a detailed description see Coppedge et al., 2019), are significantly associated with higher shares of individuals using the internet, illustrated by **Figure 3.** These findings are in line with the literature suggesting that in countries where the rule of law and protection of individual liberties are the norm,

and where citizens can hold public officials accountable through elections, governments are likely to have incentives to ensure provision of public goods such as the internet. Moreover, economic development (GDP per capita) consistently emerges as a strong predictor of internet use among the citizens.

Looking at institutional factors that are significantly associated with tax revenue, we find that public sector corruption is associated with a lower share of tax revenue in a country's GDP. Although the relationship is only significant at $p < 0.10$ level, the negative association between increasing corruption in the public sector and tax revenue is substantial. As illustrated in **Figure 4**, an increase in public sector corruption index is associated with around a 5 percent decrease in tax revenue. Hence, public sector corruption may be a significant impediment to governments' capacity to extract taxes and generate resources crucial to their progress towards sustainable development.

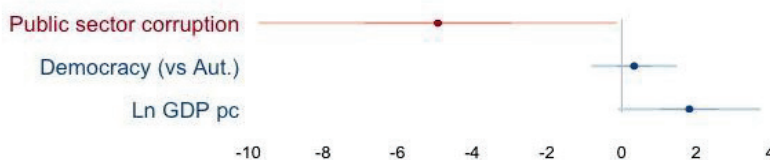**Figure 4. Predictors of Tax Revenue as share of GDP. Coefficient estimates with 90 % confidence intervals**

Note: Full results are presented in Appendix. Statistically significant estimates are highlighted in red. X-axis presents coefficient values, which represent average predicted changes in the dependent variable given a unit increase in the independent variable.

Regression analyses suggest no statistically significant association between the selected democratic institution indicators and environmental performance. It should be emphasized that the environmental performance index has very short time coverage and it is not available for all countries, which limits the possibility of uncovering meaningful patterns in the data. Nevertheless, our analyses demonstrate a robust relationship between environmental performance index and GDP per capita. Simply put, economically developed countries seem to be more capable of protecting the environment than their economically less developed counterparts. Material and social capacities that come with economic development seem to encourage protection of the environment.

In sum, results from regression analyses highlight the importance of legal and institutional frameworks in successful development. Specifically, the extent of exclusion based on gender is significantly associated with the institutional context. Moreover, equality before the law and protection of individual liberties together with popular elections for key public offices may create conditions propitious for the widespread use of the internet among the population, and likely other public service provision.

Finally, we find association between public sector corruption and government's tax revenue. Countries where public institutions are plagued with corrupt practices are strikingly unsuccessful in generating tax revenues.[4]

7. CONCLUSION

Supporting countries in their development trajectories is a long-term goal of USAID. This paper provides insights about typical trajectories for this journey based on the most extensive dataset available. We consider the long-term development of countries by analyzing the history of 180 countries around the world from 1974 to 2018. We include 14 indicators measuring different democratic institutions such as elections, rule of law, and civil liberties. Based on previous research from political science and economics, we hypothesize that these democratic institutions should develop before, and stimulate the improvement of countries' development outcomes. The analyses also include a series of 15 measures of development outcomes, including infant mortality, education, and gender equality.

Using novel sequencing methods – specifically, a domination analysis – this paper provides evidence that institutions related to democracy tend to develop before development outcomes. In particular, early movers in a country's development trajectories are institutions such as extensive suffrage, vesting power in elected officials, and expanding freedom of expression and association – all of which also belong to the core of democracy even if they alone are not sufficient (Dahl 1971). Consistent with previous findings (Mechkova et al 2019), institutions that are sharp tools for constraining government's use of executive power, such as checks and balances between institutions, typically develop later than the first movers in the sequence. Finally, we find clear evidence that indicators such as equal opportunities for business for both men and women, better environmental performance, and increasing trade and tax revenues (as percentages of GDP per capita) develop much later than democratic institutions in most regions.

We also probe these findings using more conventional time-series cross-sectional (TSCS) models to test whether the improvements in democratic institutions are associated with improvements in specific development outcomes. The results from these TSCS-analyses corroborate the findings from the domination analysis, especially when considering the advancement of gender equality. Further, rule of law and protection of civil liberties are significant predictors of higher trade income and the proportion of the population using the Internet. The latter indicator could also be viewed as a measure of state capacity. Finally, reducing corruption is associated with higher levels of tax revenue.

The primary policy implication of these findings is that supporting basic democratic institutions not only has an intrinsic value, but the development of these institutions is also beneficial as a prerequisite for later improvement of institutions that are associated with a higher level of economic development.

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[4] In Appendix III we relax the assumption of linearity and explore potential non-linear relationships between institutions and development outcomes using generalized additive models.

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APPENDIX B, REGIONAL SEQUENCE ANALYSES

Table 3. Eastern Europe & Central Asia

VARIABLE	DOMINATES	DOMINATED	BALANCE
Suffrage	29	0	29
Elected officials index	28	0	28
Average years of education among citizens older than 15	23	0	23
Gender equality in respect for civil liberties	19	1	18
Access to public services distributed by gender	19	2	17
Access to state business opportunities by gender	17	2	15
Equality before the law and individual liberty index	15	2	13
Access to state jobs by gender	14	2	12
Mobile cellular subscriptions (per 100 people)	10	3	7
Trade (% of GDP)	9	3	6
Environmental performance index	8	3	5
Freedom of association index	7	3	4
Freedom of expression index	7	3	4
Imports per capita	10	6	4
Exports per capita	8	6	2
Power distributed by gender	6	5	1
Clean elections index	6	7	-1
Individuals using the Internet (% of population)	7	8	-1
Logged GDP per capita	6	7	-1
Judicial constraints on the executive index	5	8	-3
Legislative constraints on the executive index	5	8	-3
Executive corruption index	5	9	-4

VARIABLE	DOMINATES	DOMINATED	BALANCE
State ownership of economy	5	9	-4
Engaged society	5	11	-6
Public sector corruption index	4	10	-6
Judicial corruption decision	3	16	-13
Tax revenue (% of GDP)	4	23	-19
CSO participatory environment	1	21	-20
Ledislature corrupt activities	3	25	-22
Export diversification	0	28	-28
Infant mortality	0	28	-28
Exclusion by gender index	0	29	-29

Domination analysis

Table 4. Latin America & the Caribbean

VARIABLE	DOMINATES	DOMINATED	BALANCE
Suffrage	29	0	29
Elected officials index	27	0	27
Freedom of association index	24	0	24
Freedom of expression index	22	1	21
Equality before the law and individual liberty index	21	1	20
State ownership of economy	19	2	17
Clean elections index	11	2	9
CSO participatory environment	10	3	7
Judicial constraints on the executive index	8	2	6
Legislative constraints on the executive index	8	3	5
Engaged society	8	4	4
Exports per capita	6	5	1
Power distributed by gender	5	5	0
Imports per capita	5	6	-1
Logged GDP per capita	5	6	-1
Average years of education among citizens older than 15	3	6	-3
Export diversification	4	7	-3
Public sector corruption index	5	8	-3
Executive corruption index	4	8	-4
Mobile cellular subscriptions (per 100 people)	3	8	-5
Access to state business opportunities by gender	1	7	-6
Environmental performance index	9	16	-7
Gender equality in respect for civil liberties	0	7	-7

VARIABLE	DOMINATES	DOMINATED	BALANCE
Access to public services distributed by gender	1	9	-8
Exclusion by gender index	2	10	-8
Individuals using the Internet (% of population)	4	14	-10
Infant mortality	0	12	-12
Judicial corruption decision	0	14	-14
Access to state jobs by gender	0	18	-18
Trade (% of GDP)	0	18	-18
Ledislature corrupt activities	0	19	-19
Tax revenue (% of GDP)	0	23	-23

Domination analysis

Table 5. Middle East & North Africa (MENA)

VARIABLE	DOMINATES	DOMINATED	BALANCE
Suffrage	29	0	29
Exclusion by gender index	26	1	25
Export diversification	24	0	24
Logged GDP per capita	24	1	23
Exports per capita	22	1	21
Imports per capita	22	1	21
Executive corruption index	20	2	18
Public sector corruption index	17	3	14
Trade (% of GDP)	13	4	9
Individuals using the Internet (% of population)	13	7	6
Mobile cellular subscriptions (per 100 people)	13	7	6
Judicial corruption decision	10	6	4
Infant mortality	11	10	1
Equality before the law and individual liberty index	7	7	0
Tax revenue (% of GDP)	2	4	-2
Average years of education among citizens older than 15	6	10	-4
Elected officials index	2	6	-4
Engaged society	2	8	-6
Ledislature corrupt activities	3	9	-6
Environmental performance index	4	13	-9
Freedom of expression index	0	10	-10
Legislative constraints on the executive index	1	11	-10
Access to public services distributed by gender	2	13	-11
Judicial constraints on the executive index	1	13	-12
Access to state business opportunities by gender	0	14	-14

VARIABLE	DOMINATES	DOMINATED	BALANCE
Access to state jobs by gender	0	14	-14
CSO participatory environment	0	14	-14
Freedom of association index	0	14	-14
Clean elections index	0	15	-15
State ownership of economy	0	16	-16
Gender equality in respect for civil liberties	0	18	-18
Power distributed by gender	0	22	-22

Domination analysis

Table 6. Sub-Saharan Africa

VARIABLE	DOMINATES	DOMINATED	BALANCE
Suffrage	29	0	29
Elected officials index	28	0	28
Infant mortality	26	0	26
Export diversification	25	1	24
Executive corruption index	25	2	23
Public sector corruption index	25	2	23
Exclusion by gender index	24	3	21
Equality before the law and individual liberty index	14	7	7
Freedom of expression index	13	7	6
CSO participatory environment	10	7	3
State ownership of economy	10	7	3
Freedom of association index	9	7	2
Trade (% of GDP)	8	7	1
Gender equality in respect for civil liberties	6	7	-1
Judicial constraints on the executive index	6	7	-1
Power distributed by gender	6	7	-1
Engaged society	5	7	-2
Access to state jobs by gender	4	7	-3
Legislative constraints on the executive index	4	8	-4
Ledislature corrupt activities	4	10	-6
Tax revenue (% of GDP)	6	12	-6
Mobile cellular subscriptions (per 100 people)	2	9	-7
Access to state business opportunities by gender	1	9	-8
Clean elections index	1	13	-12

VARIABLE	DOMINATES	DOMINATED	BALANCE
Imports per capita	1	14	-13
Judicial corruption decision	1	14	-13
Exports per capita	1	15	-14
Access to public services distributed by gender	1	16	-15
Individuals using the Internet (% of population)	1	20	-19
Average years of education among citizens older than 15	0	21	-21
Logged GDP per capita	0	21	-21
Environmental performance index	0	29	-29

Domination analysis

Table 7. Western Europe & North America

VARIABLE	DOMINATES	DOMINATED	BALANCE
Elected officials index	9	0	9
Equality before the law and individual liberty index	9	0	9
Freedom of association index	9	0	9
Freedom of expression index	9	0	9
Judicial constraints on the executive index	9	0	9
Suffrage	9	0	9
Access to public services distributed by gender	8	0	8
Clean elections index	8	0	8
Exports per capita	8	0	8
Imports per capita	8	0	8
Legislative constraints on the executive index	8	0	8
Logged GDP per capita	8	0	8
Access to state business opportunities by gender	7	0	7
Access to state jobs by gender	7	0	7
Average years of education among citizens older than 15	7	0	7
CSO participatory environment	7	0	7
Engaged society	7	0	7
Gender equality in respect for civil liberties	7	0	7
Judicial corruption decision	7	0	7
Ledislature corrupt activities	7	0	7
Power distributed by gender	7	0	7
Environmental performance index	6	0	6
Individuals using the Internet (% of population)	6	2	4
State ownership of economy	7	6	1
Tax revenue (% of GDP)	6	10	-4

VARIABLE	DOMINATES	DOMINATED	BALANCE
Mobile cellular subscriptions (per 100 people)	5	22	-17
Trade (% of GDP)	5	25	-20
Exclusion by gender index	0	27	-27
Executive corruption index	0	27	-27
Export diversification	0	27	-27
Infant mortality	0	27	-27
Public sector corruption index	0	27	-27

Domination analysis

Table 8. Asia and the Pacific

VARIABLE	DOMINATES	DOMINATED	BALANCE
Suffrage	30	0	30
Elected officials index	26	0	26
Executive corruption index	15	2	13
Infant mortality	13	2	11
Public sector corruption index	11	2	9
Exclusion by gender index	10	2	8
Freedom of expression index	8	1	7
Freedom of association index	7	1	6
Equality before the law and individual liberty index	6	1	5
Judicial constraints on the executive index	6	2	4
Power distributed by gender	5	2	3
Trade (% of GDP)	3	2	1
Access to state jobs by gender	4	4	0
CSO participatory environment	2	2	0
Engaged society	3	3	0
Access to state business opportunities by gender	2	3	-1
Export diversification	5	6	-1
Judicial corruption decision	1	2	-1
Legislative constraints on the executive index	2	3	-1
State ownership of economy	3	4	-1
Average years of education among citizens older than 15	2	5	-3
Exports per capita	3	7	-4
Logged GDP per capita	2	6	-4
Mobile cellular subscriptions (per 100 people)	3	8	-5
Access to public services distributed by gender	2	8	-6

VARIABLE	DOMINATES	DOMINATED	BALANCE
Clean elections index	2	8	-6
Ledislature corrupt activities	0	6	-6
Imports per capita	2	10	-8
Gender equality in respect for civil liberties	2	11	-9
Individuals using the Internet (% of population)	2	17	-15
Environmental performance index	0	26	-26
Tax revenue (% of GDP)	0	26	-26

Domination analysis

APPENDIX C, REGRESSION TABLES

Table 9. Correlates of exclusion by gender

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Equality before the Law and Individual Liberties Index	-0.37***	-0.19***														
	(0.04)	(0.04)														
Freedom of Association Index			-0.18**	-0.10***												
			(0.06)	(0.03)												
Freedom of Expression Index					-0.17**	-0.10***										
					(0.06)	(0.03)										
Elected Officials Index							-0.01	-0.02								
							(0.03)	(0.01)								
Suffrage									-0.26***	-0.14**						
									(0.06)	(0.05)						
Judicial Constraints Index											-0.25***	-0.10*				
											(0.05)	(0.04)				
Legislative Constraints Index													-0.17**	-0.06*		
													(0.06)	(0.03)		
Public sector corruption Index															0.22***	0.07
															(0.05)	(0.04)
Democracy (vs. Autocracy)	-0.04***	-0.02*	-0.09***	-0.04***	-0.10***	-0.04**	-0.17***	-0.07***			-0.07**	-0.05***	-0.10**	-0.05***	-0.12***	-0.06***
	(0.01)	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)			(0.03)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)
Ln GDP per capita	-0.03*	0.00	-0.06***	-0.01	-0.06***	-0.01	-0.06***	-0.00	-0.08***	0.00	-0.04**	0.00	-0.05**	0.00	-0.03*	0.00
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)
Region fixed effects	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Five-year period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R²	0.67	0.94	0.63	0.94	0.63	0.94	0.61	0.94	0.64	0.94	0.64	0.94	0.63	0.94	0.64	0.94
N (Countries)	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156
N (Country-year)	6206	6206	6206	6206	6206	6206	6206	6206	6206	6206	6178	6178	5730	5730	6206	6206

Dependent variable is exclusion by gender (higher values mean more exclusion). All variables are lagged by one year. Robust standard errors clustered by country. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

Table 10. Correlates of environmental performance

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Equality before the law and individual liberties index	5.10	-1.61														
	(3.31)	(1.35)														
Freedom of association index			6.15	0.62												
			(3.29)	(1.58)												
Freedom of expression index					2.99	-0.49										
					(3.48)	(1.31)										
Elected officials index							4.08	0.31								
							(2.15)	(0.42)								
Suffrage									4.63	-0.07						
									(3.27)	(0.24)						
Judicial constraints index											4.83	0.90				
											(2.56)	(1.12)				
Legislative constraints index													5.73	1.36		
													(2.90)	(0.84)		
Public corruption index															-4.90	-2.02
															(2.81)	(1.47)
Democracy (vs. Autocracy)	-0.24	0.19	-0.94	0.05	0.19	0.14	0.60	0.06			-0.63	0.02	-1.14	-0.09	0.05	0.03
	(1.57)	(0.29)	(1.58)	(0.32)	(1.73)	(0.30)	(1.24)	(0.30)			(1.62)	(0.30)	(1.80)	(0.33)	(1.28)	(0.30)
Ln GDP per capita	7.36***	3.66***	7.84***	3.64***	7.73***	3.61***	7.80***	3.60***	7.73***	3.62***	7.38***	3.62***	7.57***	3.78***	6.97***	3.56***
	(0.75)	(0.68)	(0.72)	(0.65)	(0.76)	(0.69)	(0.75)	(0.68)	(0.78)	(0.68)	(0.74)	(0.67)	(0.76)	(0.64)	(0.80)	(0.68)
Region fixed effects	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Adj. R²	0.81	0.99	0.81	0.99	0.81	0.99	0.81	0.99	0.81	0.99	0.81	0.99	0.81	0.99	0.81	0.99
N (Countries)	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159
N (Country-year)	1395	1395	1395	1395	1395	1395	1395	1395	1395	1395	1395	1395	1395	1395	1395	1395

Dependent variable is environmental performance index (higher values mean better performance). All variables are lagged by one year. Robust standard errors clustered by country. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 11. Correlates of Tax Revenue (GDP %)

Equality before the law and individual liberties index	5.71*	2.89														
	(2.65)	(2.46)														
Freedom of association index			3.67	-4.71												
			(3.15)	(3.16)												
Freedom of expression index					-3.82	-2.42										
					(3.74)	(2.69)										
Elected officials index							3.86*	0.09								
							(1.76)	(0.95)								
Suffrage									11.37*	-1.46						
									(4.91)	(2.60)						
Judicial constraints index											1.96	-0.39				
											(2.76)	(1.81)				
Legislative constraints index													-3.62	-1.16		
													(3.11)	(2.38)		
Public sector corruption index															-1.62	-4.94
															(2.27)	(2.78)
Democracy (vs. Autocracy)	1.22	-0.16	1.57	2.20**	4.58*	1.70*	2.01	0.62			2.22	0.74	4.37**	1.34*	2.65*	0.15
	(1.41)	(0.64)	(1.27)	(0.75)	(1.91)	(0.70)	(1.20)	(0.77)			(1.70)	(0.65)	(1.67)	(0.56)	(1.22)	(0.71)
Ln GDP per capita	0.31	1.98	0.76	1.79	0.74	1.95	0.74	2.33*	1.36*	1.97	0.64	2.41*	0.71	2.09	0.48	2.17
	(0.73)	(1.16)	(0.72)	(1.09)	(0.72)	(1.14)	(0.72)	(1.18)	(0.68)	(1.16)	(0.71)	(1.17)	(0.71)	(1.23)	(0.83)	(1.15)
Region fixed effects	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Five-year period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R²	0.22	0.77	0.21	0.77	0.21	0.77	0.22	0.77	0.23	0.77	0.21	0.77	0.20	0.76	0.21	0.77
N (Countries)	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
N (Country-year)	3297	3297	3297	3297	3297	3297	3297	3297	3297	3297	3285	3285	3173	3173	3297	3297

Ordinary least squares regression estimates. Dependent variable is share of tax revenue to GDP (higher values mean more tax revenue). All variables are lagged by one year. Robust standard errors clustered by country in parentheses. ***p < 0.001, **p < 0.01, *p < 0.05.

Table 12. Correlates of Trade (GDP %)

Equality before the law and individual liberties index	0.45 (0.26)	0.32* (0.13)														
Freedom of association index			0.16 (0.17)	0.24 (0.14)												
Freedom of expression index					-0.13 (0.19)	0.20 (0.15)										
Elected officials index							0.09 (0.11)	0.07 (0.06)								
Suffrage									-0.09 (0.17)	-0.23 (0.12)						
Judicial constraints index											0.05 (0.18)	0.21 (0.14)				
Legislative constraints index													-0.26 (0.17)	0.16 (0.12)		
Public sector corruption index															-16.44 (24.84)	-0.12 (0.11)
Democracy (vs. Autocracy)	-0.21 (0.12)	-0.01 (0.04)	-0.12 (0.10)	0.00 (0.04)	-0.00 (0.07)	0.01 (0.05)	-0.08 (0.08)	0.06 (0.03)			-0.07 (0.09)	0.02 (0.04)	0.01 (0.10)	0.01 (0.03)	-15.46 (11.93)	0.06* (0.03)
Ln GDP per capita	0.18** (0.06)	0.11 (0.07)	0.21*** (0.06)	0.13 (0.08)	0.21*** (0.06)	0.13 (0.08)	0.21*** (0.06)	0.12 (0.08)	0.21** (0.07)	0.12 (0.07)	0.21*** (0.06)	0.11 (0.07)	0.21*** (0.06)	0.09 (0.07)	17.84** (5.60)	0.11 (0.08)
Region fixed effects	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Five-year period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R²	0.18	0.75	0.17	0.75	0.17	0.75	0.17	0.74	0.16	0.75	0.17	0.74	0.18	0.76	0.16	0.74
N (Countries)	157	157	157	157	157	157	157	157	157	157	157	157	157	157	157	157
N (Country-year)	5542	5542	5542	5542	5542	5542	5542	5542	5542	5542	5520	5520	5122	5122	5542	5542

Ordinary least squares regression estimates. Dependent variable is share of trade to GDP (higher values mean more trade). Dependent variable is logged. All variables are lagged by one year. Robust standard errors clustered by country in parentheses. ***p < 0.001, **p < 0.01, *p < 0.05.

Table 13. Individual using the Internet (% of population)

Equality before the law and individual liberties index	1.71*** (0.31)	0.46 (0.40)														
Freedom of association index			0.90*** (0.27)	0.26 (0.36)												
Freedom of expression index					0.79** (0.29)	0.19 (0.41)										
Elected officials index							0.28 (0.16)	0.40** (0.14)								
Suffrage									0.50* (0.23)	-0.43 (0.26)						
Judicial constraints index											1.05*** (0.25)	0.05 (0.36)				
Legislative constraints index													0.92*** (0.20)	0.15 (0.28)		
Public corruption index															-1.24*** (0.21)	-0.34 (0.39)
Democracy (vs. Autocracy)	-0.01 (0.11)	0.21 (0.12)	0.17 (0.11)	0.24* (0.12)	0.22 (0.12)	0.25* (0.12)	0.45*** (0.12)	0.23* (0.11)			0.10 (0.12)	0.27* (0.12)	0.13 (0.10)	0.25* (0.12)	0.21* (0.09)	0.25* (0.11)
Ln GDP per capita	0.88*** (0.07)	1.28*** (0.17)	1.00*** (0.07)	1.30*** (0.18)	1.00*** (0.07)	1.30*** (0.17)	1.00*** (0.08)	1.29*** (0.17)	1.00*** (0.08)	1.30*** (0.17)	0.92*** (0.07)	1.29*** (0.17)	0.95*** (0.07)	1.24*** (0.18)	0.82*** (0.08)	1.27*** (0.17)
Region fixed effects	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Five-year period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R²	0.88	0.90	0.87	0.90	0.87	0.90	0.87	0.90	0.87	0.90	0.88	0.90	0.87	0.90	0.88	0.90
N (Countries)	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159
N (Country-year)	3679	3679	3679	3679	3679	3679	3679	3679	3679	3679	3671	3671	3562	3562	3679	3679

Ordinary least squares regression estimates. Dependent variable is share of population using internet (higher values mean more users). Dependent variable is logged. All variables are lagged by one year. Robust standard errors clustered by country in parentheses. ***p < 0.001, **p < 0.01, *p < 0.05

APPENDIX D, ESTIMATING NON-LINEARITIES WITH GENERALIZED ADDITIVE MODELS

In this section, we run a series of generalized additive models (GAM) to estimate potential non-linear relationships between the key democratic institutions and development outcomes. All models include country and regional fixed effects as well as a regime type dummy (democracy vs autocracy). To facilitate the interpretation, we present partial residuals plots with smoothed regression lines generated by iterative smoothing of partial residuals. The degree of smoothness is estimated by generalized cross validation. Shaded areas in plots represent 95% confidence intervals.

We begin by re-fitting the linear models that predict exclusion by gender index in Table 1 through GAM. Figure 5 visualizes the relationship between exclusion by gender and equality before the law and individual liberties. Similar to the results based on linear regressions, we observe a consistent negative association between the two variables. Yet, the observed negative association is especially strong in contexts where equality before the law and individual liberties are highly respected.

Both freedom of expression and freedom of association are negatively associated with exclusion by gender, but there are no remarkable non-linearities. The observed negative association is stronger in contexts where judicial constraints on the executive is already low. Judicial constraints are important for reducing exclusion by gender. In other words, potential gains from increasing judicial constraints on the executive with respect to gender equality decreases in countries that have already developed judicial institutions that can impose relatively higher constraints on the executive.

In line with our findings from linear regression analyses, we find a weak overall relationship between public sector corruption and exclusion by gender. Yet, it is clear that increasing public sector corruption is likely to have a stronger negative association with gender equality in countries that have very low levels of public sector corruption. Hence, an initial worsening in the quality of public institutions demonstrates a clear positive association with increasing gender inequality but the relationship tends to weaken in countries that already have corrupt public institutions. Another potential interpretation is that public sector corruption might be important to decrease exclusion by gender, but the positive association becomes only noticeable once countries develop high quality public institutions. Our analysis suggests no remarkable non-linear association between legislative constraints on the executive and exclusion by gender.

Finally, we present the results for the association between GDP per capita and exclusion by gender from the final equation that includes public sector corruption (together with country and regional fixed effects). The observed association is substantively the same in the above mentioned models that predict exclusion by gender. Overall, there is no noticeable non-linear relationship between GDP per capita and exclusion by gender. The association is negative, which means that economic development is likely to reduce exclusion by gender. The flattening of the regression line at highest or lowest levels of economic development is mainly due to the fact that there are few observations with such extreme values of GDP per capita.

In terms of environmental performance, the results from non-linear analyses are similar to those from linear analyses. There are no substantive associations between democratic institutions and environmental performance. Nevertheless, an increase in freedom of association is strongly associated

with better environmental performance in countries that impose significant restrictions on citizens' right to form and participate in political parties and civil society organizations. Similar patterns are observed with respect to freedom of expression.

Figure 5. Predictors of exclusion by gender (Non-linear estimates)
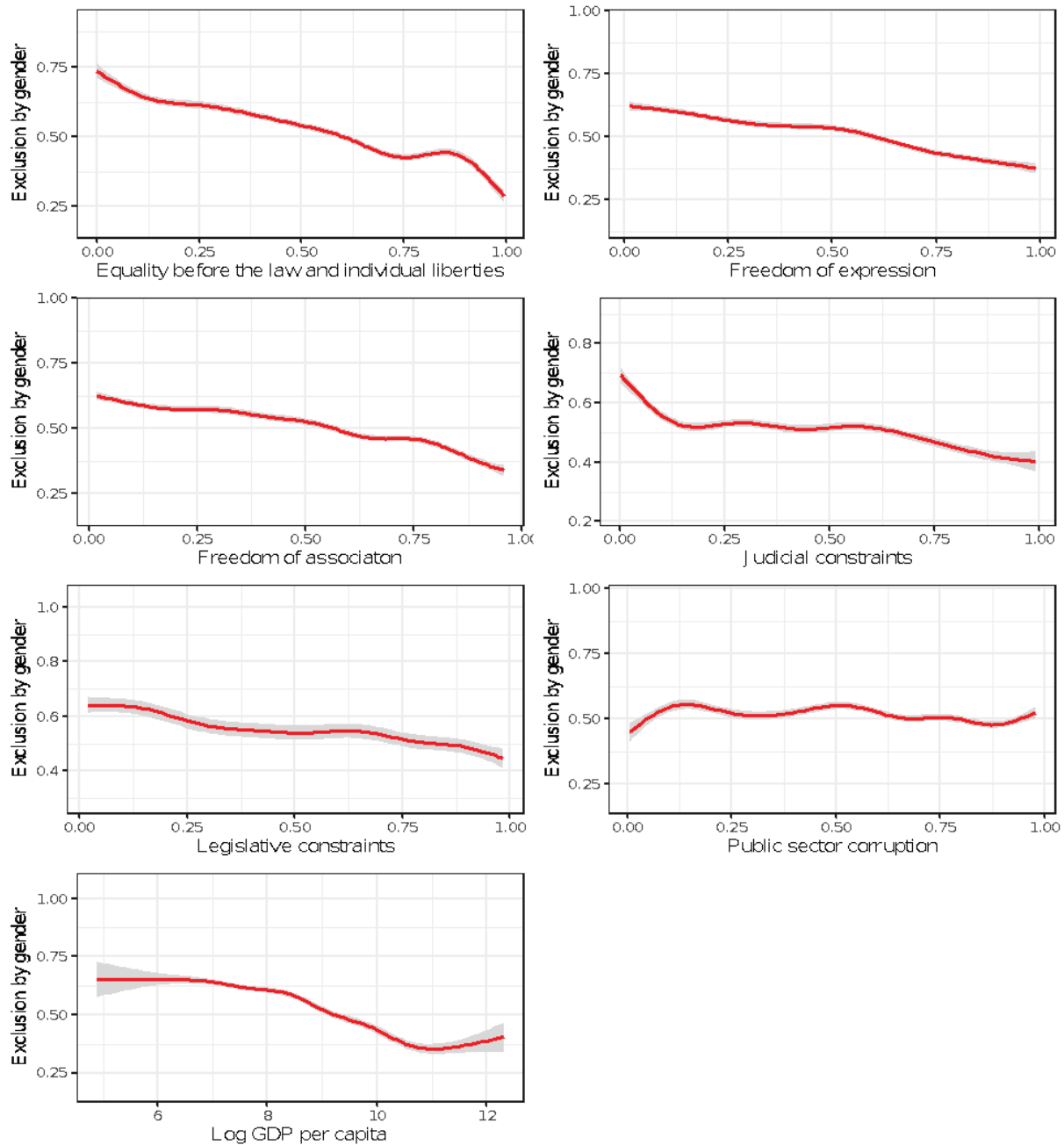
In addition, increasing public sector corruption in countries with relatively high-quality public institutions is substantively negatively associated with environmental performance. To put it another way, impartial and transparent public institutions are associated with better environmental performance, but the association becomes only noticeable at very low levels of public sector corruption.

The most remarkable relationship is observed between economic development and environmental performance. High levels of economic development are strongly associated with better environmental performance. The relationship becomes weaker and slightly negative in countries with very high levels of economic development. However, the extent to which countries protect the environment seems to depend on the level of economic development - proxied as GDP per capita - rather than democratic institutions.

Figure 6. Predictors of Environmental Performance (Non-linear estimates)
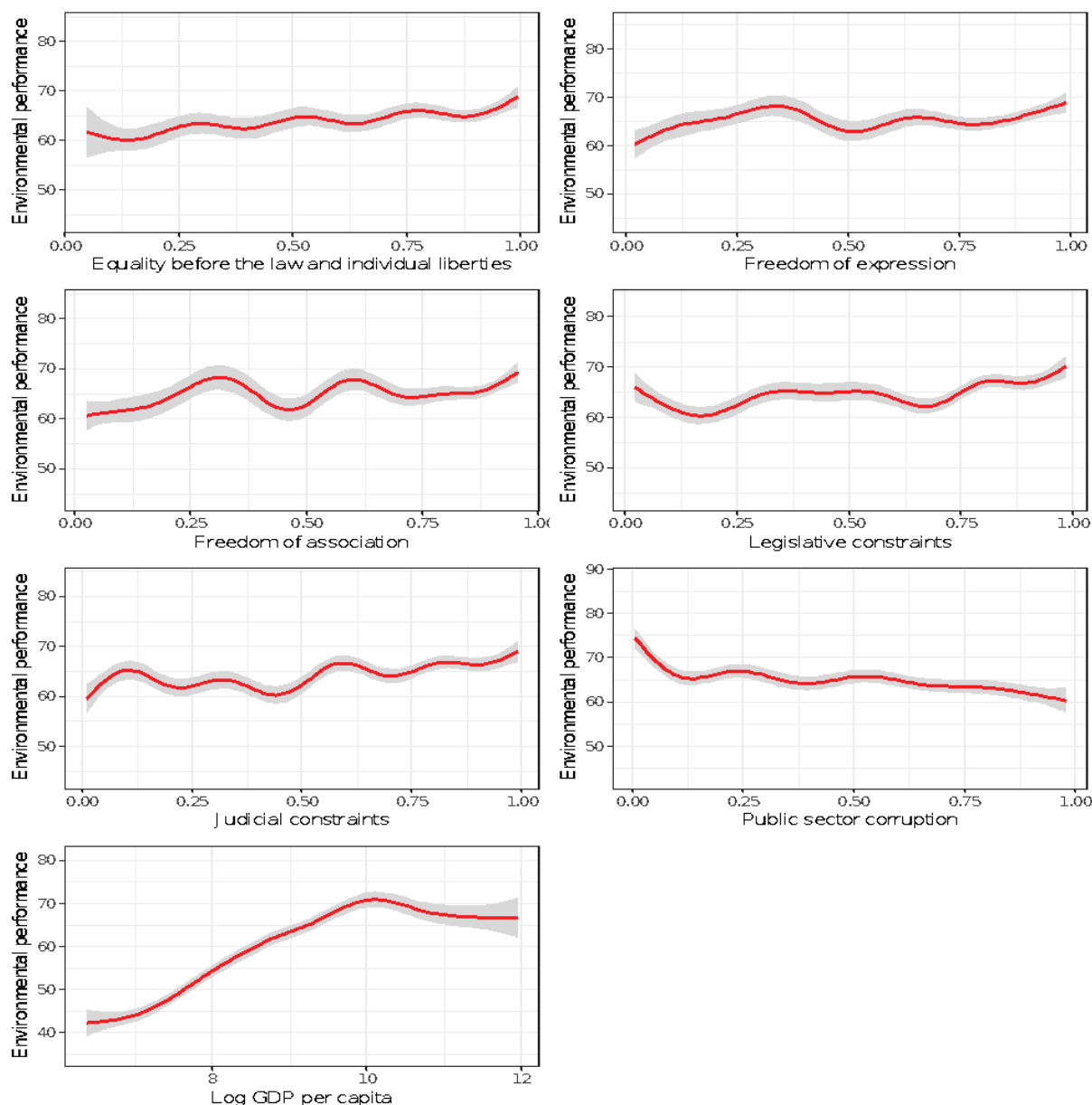
As demonstrated in figure 7, our analyses show no noticeable association between democratic institutions and tax revenue. Nevertheless, economic development seems to be positively associated with higher levels of tax revenue. Our analyses also suggest no remarkable non-linear relationship between democratic institutions and trade income, though improvements in democratic qualities seems

to be positively associated with trade income. However, there seems to be an especially strong relationship between judicial constraints and trade income at very low levels of the former.

Figure 7. Predictors of Tax Revenue (% GDP) (Non-linear estimates)
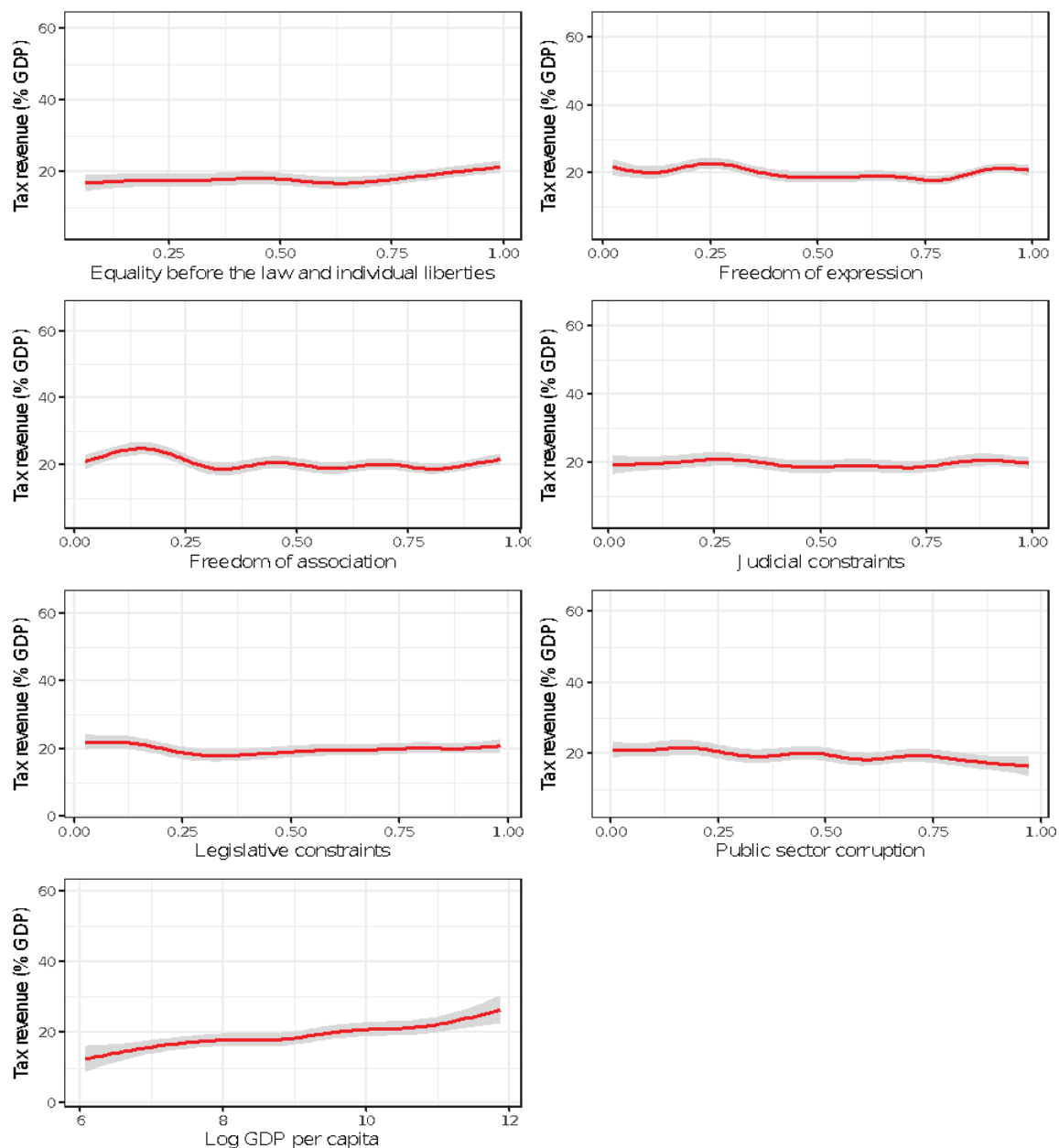
Figure 8. Predictors of Trade Income (% GDP) (Non-linear estimates)
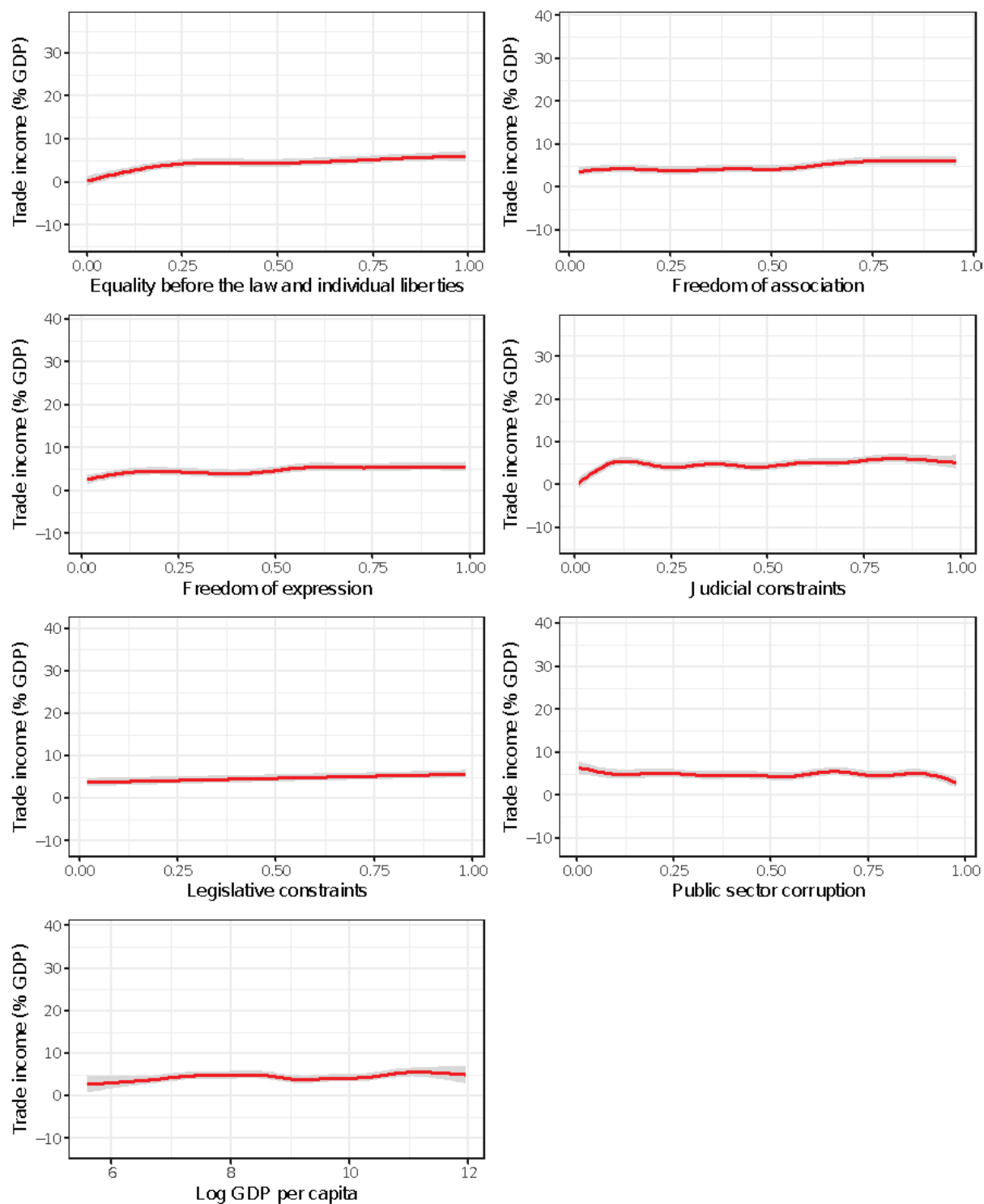
Figure 9. Predictors of Internet use (% Population) (Non-linear estimates)
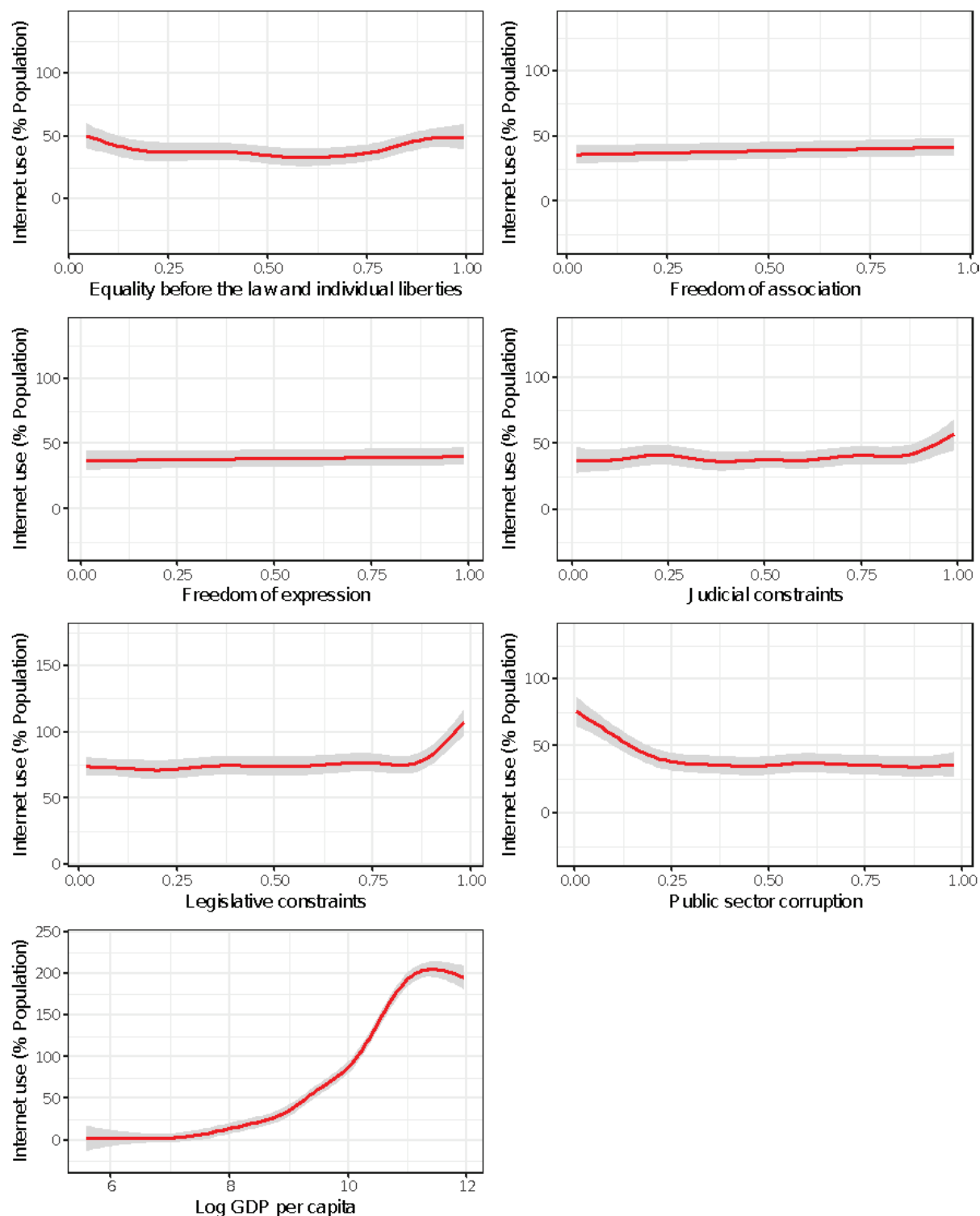
As for the percentage of population using the internet, which can be considered as a proxy for public good provision, we find several noteworthy results. Increasing legislative constraints on the executive is a strong positive predictor of the share of population using the internet, but this association emerges

only in contexts that have already developed robust legislative institutions. Similarly, we find evidence that increasing public sector corruption is negatively associated with the share of population using the internet, yet this pattern is only present in countries that already have transparent and impartial public institutions. To summarize, the quality of public institutions matters but only once countries develop very high-quality public institutions. Finally, economic development seems to boost the use of the internet. Strong and exponentially growing association between the two variables suggests that a country's economic resources are especially important when it comes to the building of infrastructure to promote the use of the internet.

NON-LINEAR ESTIMATES OF ELECTED OFFICIALS INDEX AND SUFFRAGE

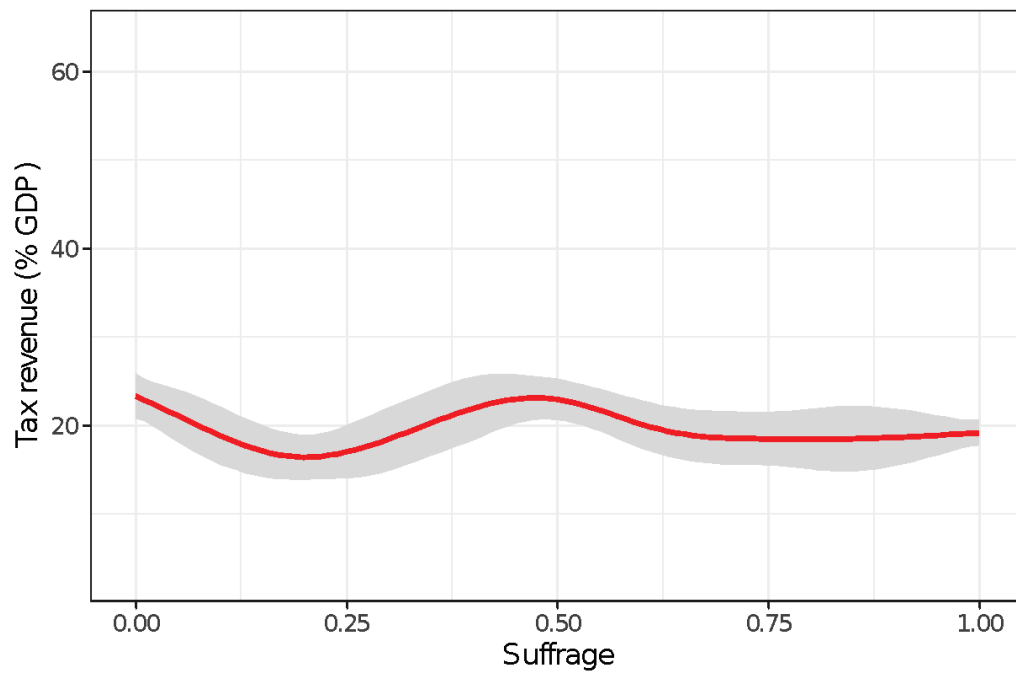### Figure 10.   Exclusion by gender
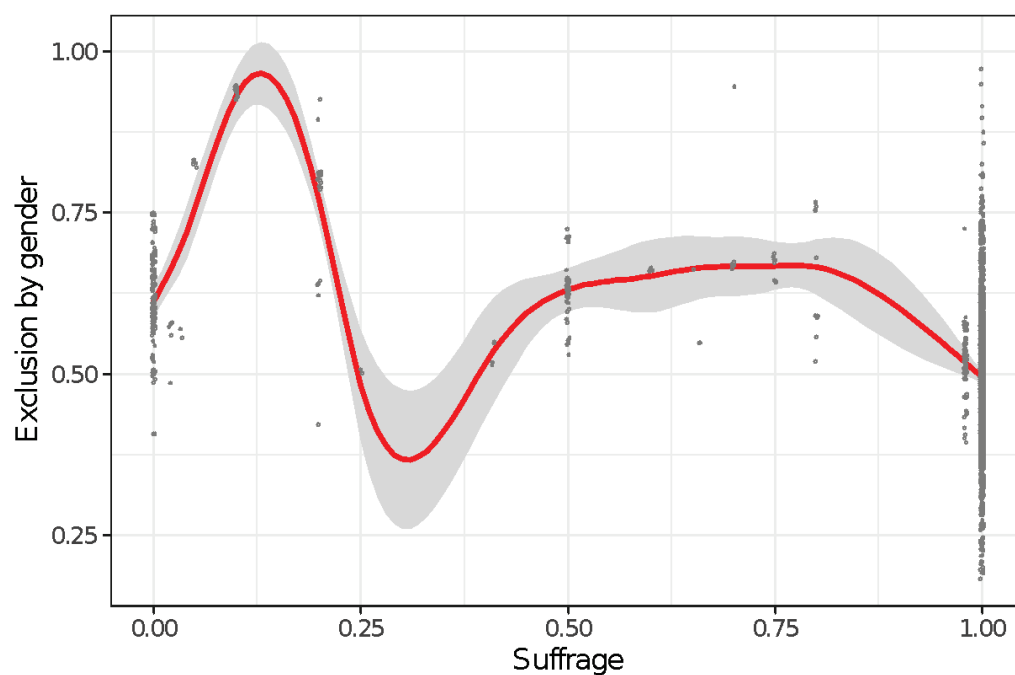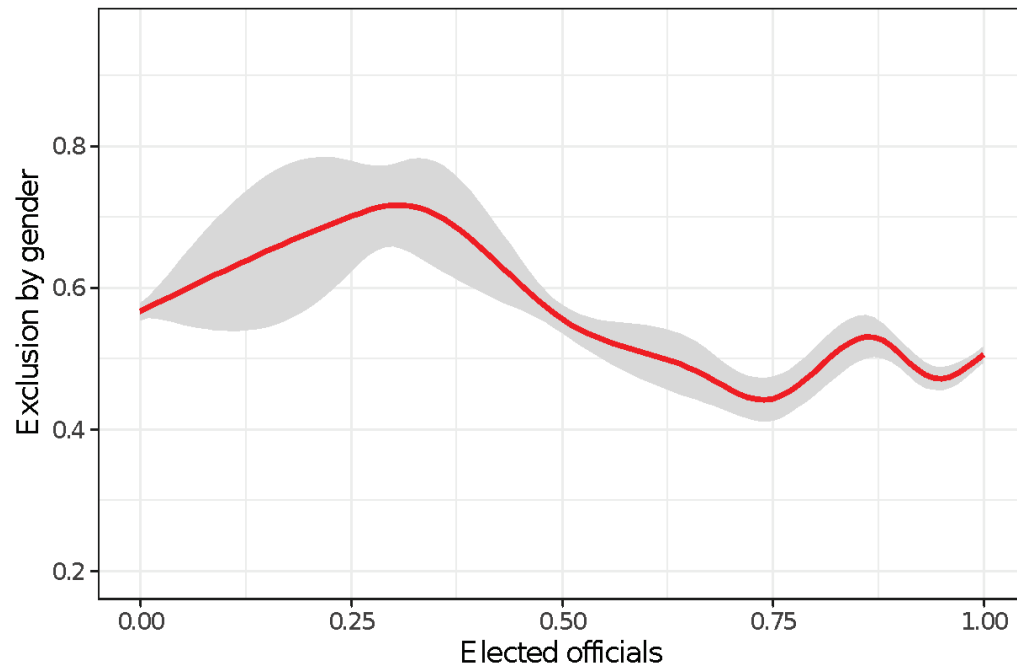
Figure 11.   Environmental performance
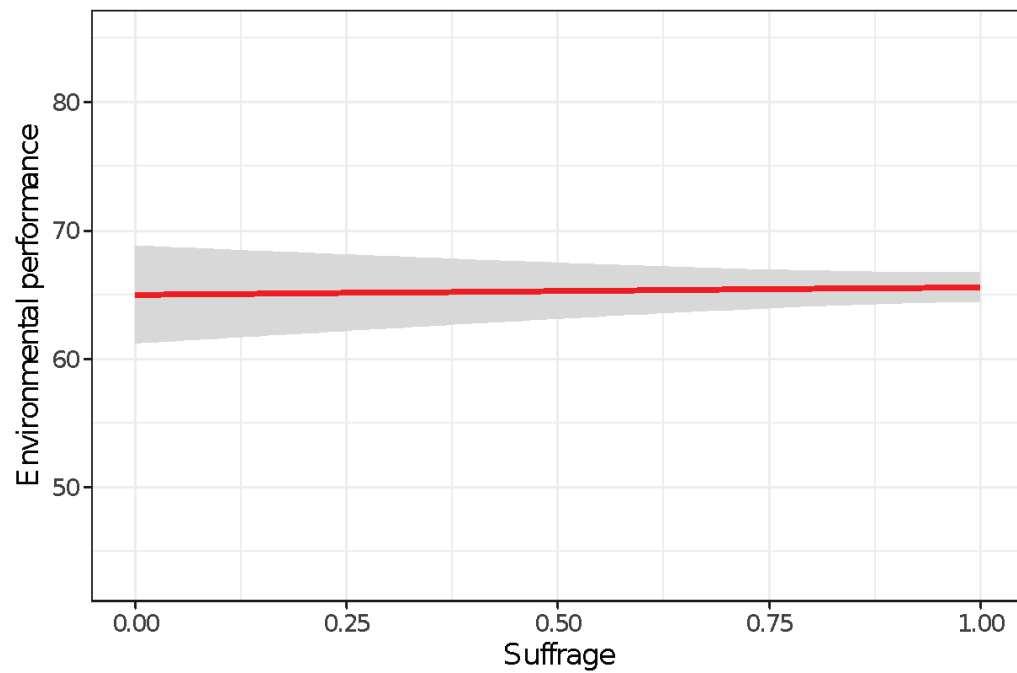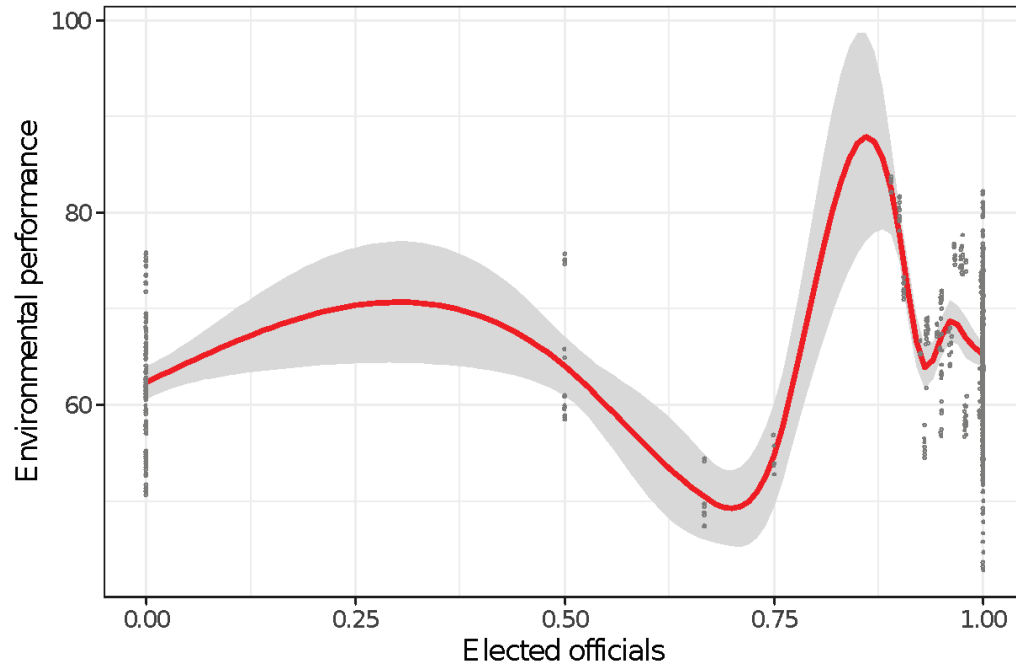
Figure 12.   Tax revenue
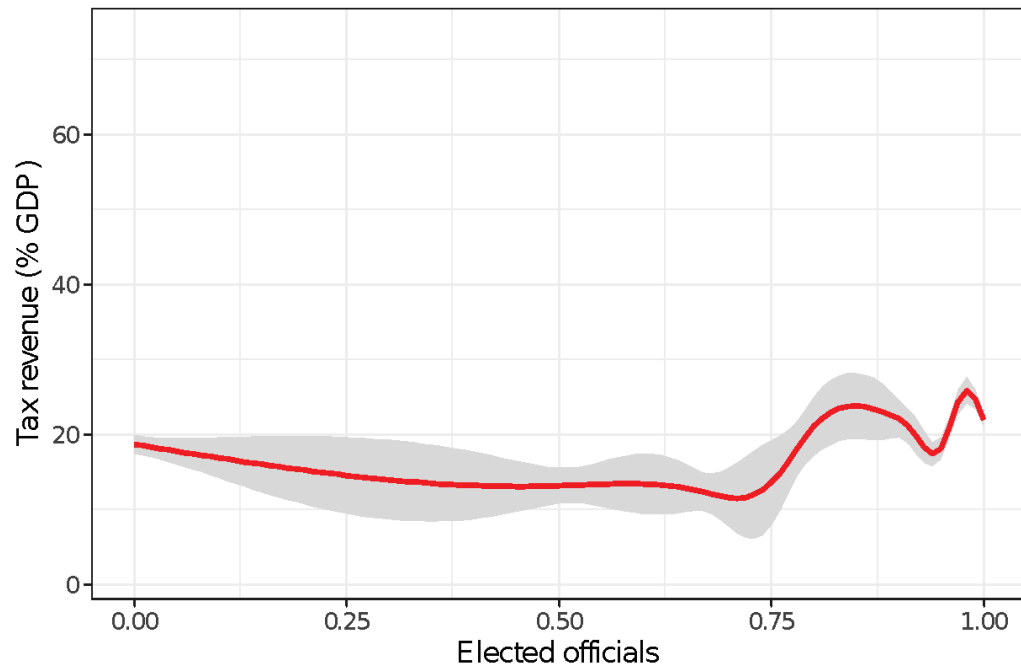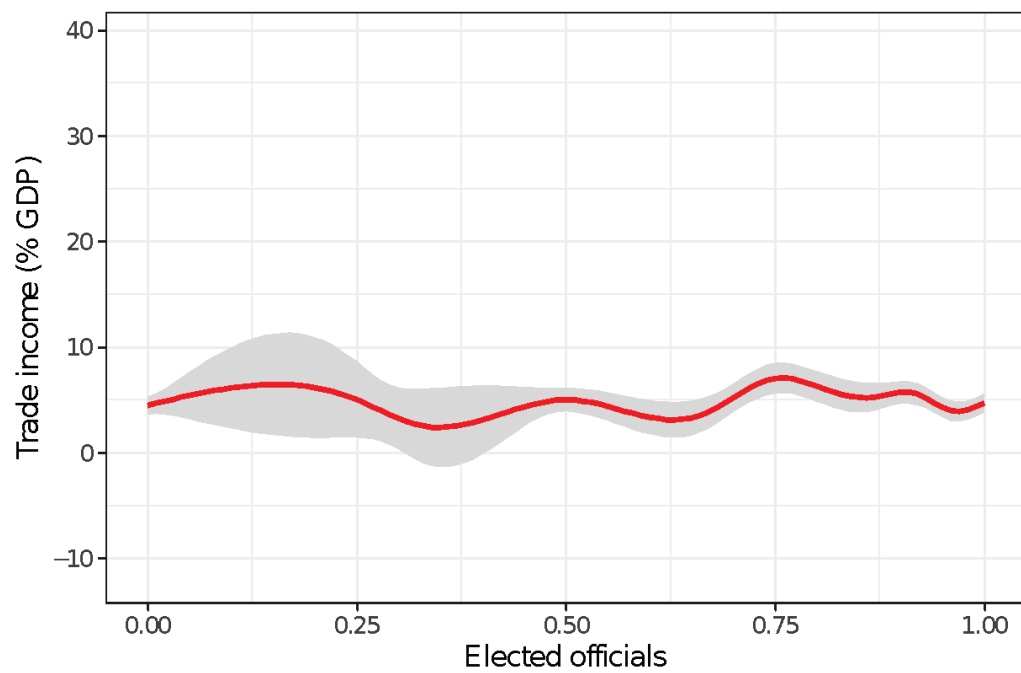
Figure 13.   Trade income

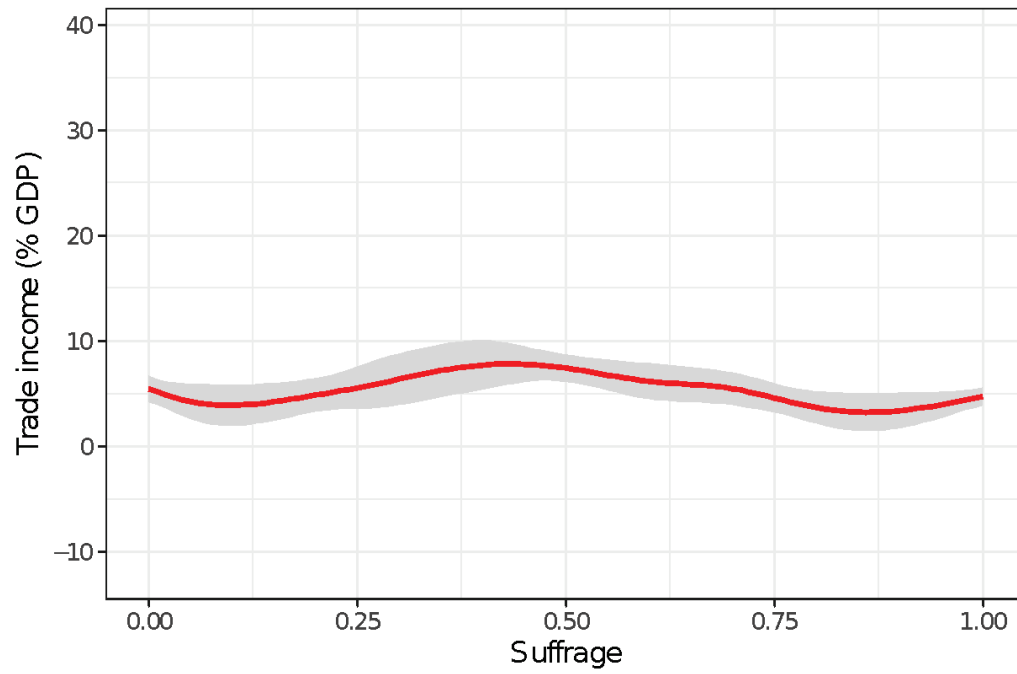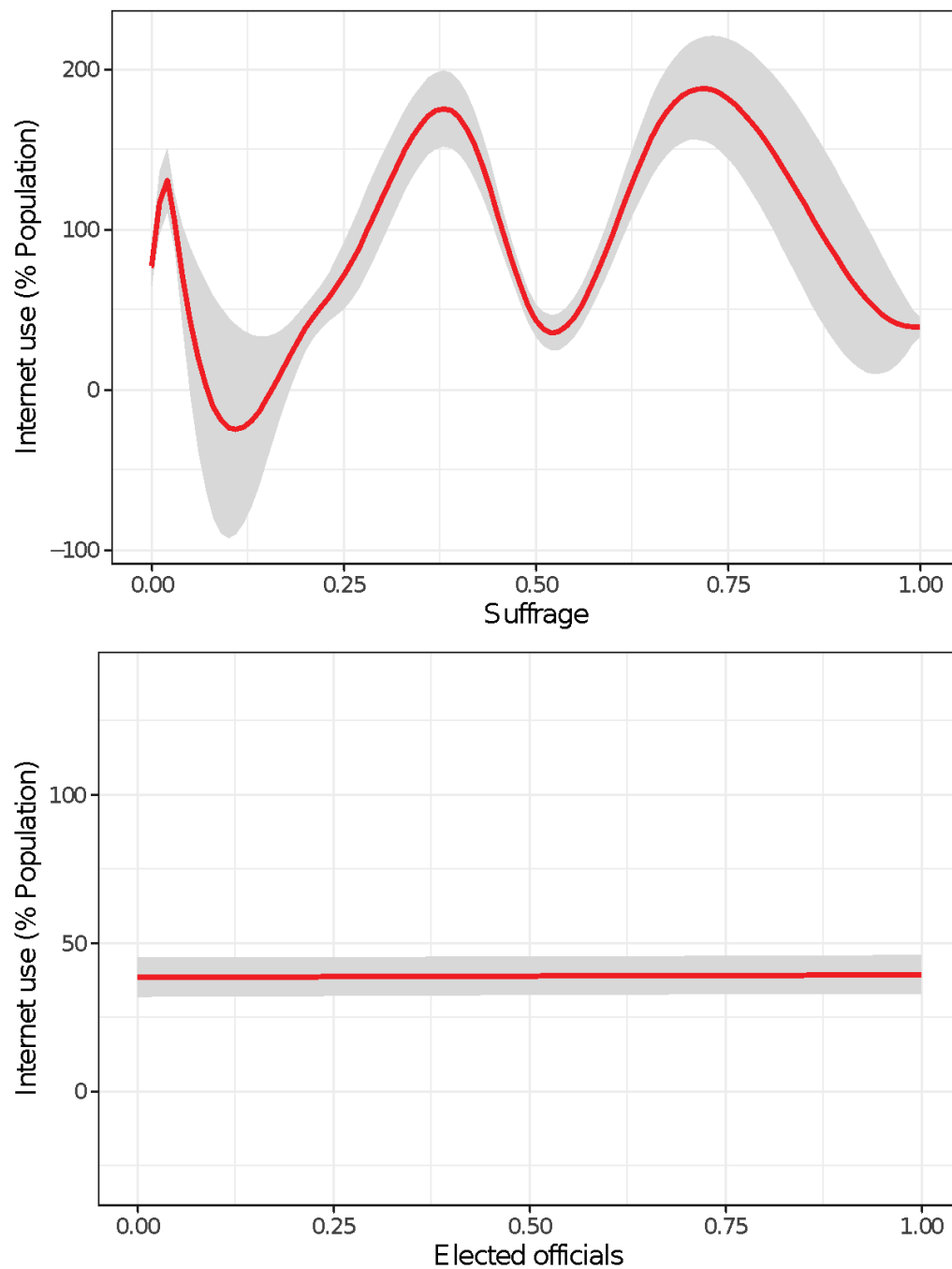**Figure 14.   The share of population using the internet**

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

1300 Pennsylvania Avenue, NW

Washington, DC 20523