Commercial Determinants of Health: How Do They Shape Health Policy and the Consumption of Unhealthful Commodities?

Joana Madureira Lima

Trinity College



Thesis submitted for the degree of Doctor of Philosophy in Sociology

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Abstract

This thesis is about the role that commercial interests, such as multinational corporations, play in driving the consumption of unhealthful commodities such as tobacco and alcohol. The focus is on the role that health policy, namely tobacco and alcohol control policy, plays in mediating any positive association that may exist between the power of these commercial interests and the prevalence and/or incidence of tobacco and alcohol consumption.

To investigate these associations, I built a novel measure of corporate power – the Corporate Permeation Index. I then use it to explain variations in the consumption of tobacco and alcohol as well as variations in the quality and/or comprehensiveness of the regulatory framework for these commodities. I also use it to quantify the interaction

between state interventions such as monopolies on alcohol production and/or retail and corporate power and how the former may curb the capacity of the latter to boost alcohol consumption. Finally, I address the question of whether these associations differ by country income level. The rationale is that countries with fewer economic and human resources may be more vulnerable to corporate power and thus to weaker formulation and implementation of evidence-based health policy.

I find that that corporate power is associated with higher prevalence of smoking and drinking and with weaker policy packages. I also find that the protective effect of public health policy varies according to income level but not for both substances.

My findings suggest that there is a role for evidence-based public health policy in reducing the prevalence and the incidence of risk behaviours and in weakening the associations between corporate power and the adoption of these behaviours. While state interventions such as government monopolies seem to be associated with lower alcohol consumption at all income levels, tobacco control policy seems to be less effective at lower income levels. This finding suggests that more resources could be devoted to assist countries with fewer resources to improve tobacco control policy implementation.

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Commercial determinants of health:

How do they shape health policy and the consumption of unhealthful commodities?

"We learn that your country is a 60 or 7000 lee away from China and yet foreign vessels come here to make great profit out of the wealth of our country. But by what right, in return, do they sell us this poisonous drug that does so much harm to the Chinese people? They may not necessarily intend to hurt us, but by putting profit above all things they are disregarding the harm they do to others"

Commissioner Kin to Queen Victoria soon before the start of the first Opium War [1820-1840](1)

Chapter 1

Overview

1.1. Introduction

The focus of my DPhil thesis is threefold. First, is the common aetiology of consumption of unhealthful products such as tobacco, alcohol, processed foods and sugary drinks. All of these products are risk factors for Non-Communicable Diseases (NCDs) and all are produced and promoted by commercial entities whose statutory duty to their shareholders is to increase the consumption of their products. Second, is the role that public health policy plays in protecting population health from the pressures exerted by commercial entities to promote consumption. Third, it focuses on the role of country income level in shaping the protective effect of health policy. Countries at lower income levels, who may have less leverage to counter commercial pressures and uphold evidence based public health policy, may be in a weaker position to lower the incidence and prevalence of risk factors for NCDs.

1.2. Background

1.2.1. Epidemiology

NCDs encompass heart disease, cancer, diabetes, and respiratory diseases that together cause more than half of all deaths in low and middle-income countries (LMICs) (2). LMICs countries bear a disproportionate burden of NCDs - NCDs are the leading cause of death and individuals living in LMICs are 1.5. times more likely to die prematurely

from these conditions than those in High Income Countries (HICs) (3). Without action, the number of premature deaths (age < 60) caused by NCDs is expected to rise from 3.8 million each year to 5.1 million in poor countries by 2030, and to kill four times as many people as infectious diseases (2). NCDs have been described as the social justice issue of our generation and as one of the greatest development challenges of the 21st century (4).

The Global Burden of Disease study estimates that approximately a third of deaths worldwide are attributable to behavioural risk factors, including alcohol, drug and tobacco use, and poor dietary profile. In 2016, smoking was a leading risk factor in terms of attributable Disability Adjusted Life Years (DALYs) at the global level for men. It was among the leading five risk factors for DALYs for 109 countries (5,6). Alcohol use in men has gone from the 8th place in the ranking of risk factors by attributable DALYs at the global level in 1990 to the 4th place in 2016(6). As it happens with the distribution of the NCDs burden of disease the distribution of behavioural risk factors differs across country income levels – alcohol consumption, smoking and consumption of processes foods high in salt and saturated fat, for example, are increasing at a faster pace in LMICs than in HICs(7,8).

1.2.1. Drivers of the increasing incidence in risk factors

Although, the biological determinants of NCDs in LMICs are likely to be similar to those in affluent countries the drivers of these determinants are likely to differ. For example, rural–urban migration may be an important factor in promoting the adoption of Western

dietary habits and activity patterns, leading to an increased incidence of risk factors such as smoking and alcohol consumption (9–12).

These behavioral risk factors for NCDs share their roots in the consumption of unhealthful products produced by commercial entities e.g. tobacco, alcohol, sugary drinks, foods high on salt and saturated fat. It thus seems apposite to consider the role that these commercial entities play in driving consumption of their products, and in turn, influencing population health. The ultimate goal of a commercial enterprise is to maximize returns to their shareholders(13). In the case of corporations, this is so by virtue of their Charter (14).Whilst creating disease is not their primary goal, fostering widespread acceptability, availability, and active consumption of their products are necessary conditions for profit maximization in fulfilment of the statutory duties of the corporation towards its shareholders.

As the aggregate incidence of smoking and alcohol consumption in HICs plateaus in HICs, the tobacco and alcohol industries have shifted their attention to more profitable markets in LMICs where relatively young populations with increasing purchasing power are adopting more flexible social norms around smoking and drinking (15,16). There are very close parallels between the tactics deployed by the tobacco and alcohol industries to promote their products(17–19). A substantial part of these tactics is deployed to promote policies that have a weak evidence base to the detriment of effective, evidence informed policies with the greatest potential to curb consumption of these commodities(20–22).

While these tactics have been documented in HICs and LMICs alike, LMICs may be worse placed than HICs to uphold evidence based policies for a number of reasons. First, weaker governance structures mean that state legal teams are stretched, and there is often a lack of expertise available to draft legislation regulating the use of harmful substances (16,23). Second, poorer countries also have higher incentives to react to the promises of job creation and expansion of the tax base(24,25). Third, poorer countries may have less leverage when negotiating international trade deals and may accept unfavourable terms that can be used in disputes with multinational corporations to pre-empt legislation. International trade agreements make tobacco and alcohol control policy particularly vulnerable to legal action from the tobacco and alcohol industries, via for example, investor-state dispute settlement or investment court system through which investors can sue nation states for alleged discriminatory practices. In Africa, at least 8 countries that attempted regulatory efforts to reduce tobacco consumption — Uganda, Namibia, Togo, Gabon, Democratic Republic of Congo, Ethiopia and Burkina Faso — received warnings from the tobacco industry that their laws run afoul of international treaties which had a chilling effect on these regulatory efforts(26). Lastly, Ministries of Health in these countries have limited economic resources that they must prioritise to address imminent threats to public health such as insufficient sanitation, malnutrition and infectious disease(16).

1.2.3. Debates in NCD Prevention

How to contain the pandemic of NCDs is matter of vigorous debate in the Public Health community with some in the field placing high hopes on targeted prevention

interventions – e.g. personalised or precision medicine - and others advocating for investment in universal population based strategies(27–29). In his 1985 "Sick Individuals and Sick Populations" (30) Geoffrey Rose differentiated targeted strategies that identify and intervene on individuals with high disease risk from universal strategies that target populations. The two tenets of universal population-based approaches are, first, that the distribution of risk in a population is shaped by contextual conditions that differ between populations and, second, that most cases arise from the large population with only an average level of risk, rather than from the small population at high risk. Intervening on the entire population thus improves the risk distribution for all, resulting in the most effective improvement in population heath. Whereas the universal approach deals with the root of the problem by shifting the population risk distribution, the targeted approach is tailored to the individual treated and their specific risk factor, which means it must continue indefinitely treating those at highest risk(30).

The increasing popularity of precision medicine epitomises the current shift towards targeted prevention strategies to the detriment of universal ones. Personalised or precision medicine refers to an approach that tailors therapies to subcategories of disease, often defined by genomics(29). It maintains that Public Health will be radically transformed by prevention and treatment programmes targeted to the individual patient. For example, the provision of genomic risk information to patients is supposed to improve adherence to lifestyle interventions (31). The contention with this line is that it presupposes that the individual is isolated from their social context and that cellular data are sufficient to predict disease. Historically, however, improvements in Public Health

have come from either general improvement in socio-economic conditions or from programmes applied broadly to entire populations, such as improved sanitation, mass immunization or tobacco control. Overemphasis on precision medicine by the scientific community could thus pose a challenge to the health of populations because the increasing centrality of the precision medicine movement may deter from efforts to tackle the foundational causes of ill health such as commercial pressures to over consume unhealthful commodities such as tobacco or alcohol. In the US, for example, funding grants with a population health or public health goal has declined in the past 10 years whereas funding for "omic" research has increased substantially (28).

The tensions between individual and population approaches are also apparent beyond the medical community. Changing of social norms around the consumption of unhealthful products such as alcohol, tobacco or sugary drinks through regulation is increasingly presented as heavy handed and paternalistic. So-called "libertarian paternalism" is quickly emerging as an alternative to statutory regulation of risk factors for disease, aiming to "leverage the power of social norms without going to the extent of changing behaviour via legislative action"(32). It hinges on the application of behavioural economics to health promotion. Behavioural economics relies heavily on the two-system theory proposed by, among others, Daniel Kahneman in Thinking Fast and Slow (33). Two system theory claims that our brains employ two distinct kinds of cognition: a System 1 that is intuitive, fast, effortless and emotional; and a separate System 2 that is reasoned, slow, controlled and rule governed. The reflective system makes better decisions than the intuitive system.In his critique of the two-system underpinning the

increasing popular nudging approaches, Zimmerman remarks that “power distorts the ways of thinking that underlie all thought. Where there are low quality decisions, there are often power imbalances. (…) Although nudging [unhealthful] behaviours back into place can be useful, a more effective public health approach would document, quantify and reverse the power imbalances that shape unhealthy cognitive habits in the first place” (34).

It is important to note that some proponents of nudging recognise, for example, the potential exploitation from markets exerted upon consumers(35). They favour, however, the provision of clearer information to individuals on potential abuse from commercial operators over statutory regulation. Critics of nudging have pointed to its potential to draw attention and resources away from more traditional approaches to social policy, including health promotion, regulation and pricing. Geoff Rayner and Tim Lang facetiously ask, “How can "nudge" reshape the agri-food business's long commitment to lower the price of fat, soft drinks or high calorie readymade foods or the ubiquitous “offer” of food at every newsagent, station, platform or petrol station?”(36). The implication of both Zimmerman’s and Rayner and Lang’s critiques of targeted, individual approaches is that, if we are to create the conditions for populations to make healthy choices we must structure our thinking beyond the proximal causes of risky health behaviour onto their “causal architecture”(37).

In my doctoral project, I study corporate power as a driver of ill health at the population level and of polarization of health inequalities among countries. I also study the role of

population level interventions- packages of alcohol and tobacco control measures- in attenuating the influence exerted by corporate power. The social production of disease and/or political economy of health (29–31) theory offers an overarching frame to guide my inquiry into corporate power and population health. Its underlying hypothesis is that "economic and political institutions and decisions that create, enforce and perpetuate economic and social privilege and inequality are root or fundamental causes of social inequalities in health. (…) (T)heoretical analyses examine interdependence of institutional and interpersonal manifestations of unjust power relations (…)" (31) . My contribution to the field is outlined in the following sections.

1.3. Research gaps in the study of the determinants of NCDs

A comprehensive review of empirical work in social epidemiology carried out by Beckfield and Krieger revealed important gaps in the current state of research(38). The first one is choice of health outcomes- the vast majority of studies focuses on mortality and self-assessed health. This leaves morbidity unexamined with only one of the studies studying a risk factor for disease. The second is the narrowness of political determinants, with a glaring gap in inquiry on the health effects of the construction of political-economic structures such as the European Union; trade liberalisation and corporate regulation. The third is the near absence of empirical studies in all three approaches in developing countries, with the vast majority of empirical studies focusing on differences between advanced industrial countries or rich democracies. Although health inequalities have been described, their production and possible interaction with the welfare state have only now begun to be explored (38).

Beckfield and Olafsdottir echo some of the gaps above and point out yet another two missing areas of inquiry in the empirical study of socio political production of disease. The first is an absence of inquiry into how the process of stakeholder mobilization varies cross nationally and how that mobilization, e.g. on part of capitalist firms', interfaces with the political institutions. The second is the recognition of the impact of global political economy in health policy. They note that, "although the welfare state research has focused on economic globalization as an additional source of convergence, macro institutionalist approaches within sociology offer good reasons to expect health systems to change in ways that are isomorphic to one another, through the adoption of common policy scripts created and diffused in and through international organizations. Attention to the evolution of health policy and politics could shed light on this question of global or even regional convergence in the face of national institutional heterogeneity"(39).

1.4. My Doctoral Research Project

My work contributes to filling each one of the gaps listed in the previous section. First, I study health outcomes other than mortality and self-assessed health and focus on variations in the distribution of two risk factors – incidence of smoking in the population and prevalence of alcohol per capita consumption. Second, I widen the range of determinants of risk factors by looking into commercial determinants of the distribution of risk factors for NCDs, namely the power exerted by multinational corporations on health policy and ultimately on the consumption of unhealthful commodities. I create a novel measure of corporate power that is comparable across countries al all income

levels, the Corporate Permeation Index (CPI). Third, I use the CPI to explain variations in "common policy scripts created and diffused in and through international organizations", i.e. sets of policy recommendations for tobacco and alcohol control proposed by an international organization, the World Health Organization (WHO). I ask whether health policy mediates the association between corporate permeation and the consumption of unhealthful commodities. The study of this association addresses the gap in research on the associations between commercial entities such as corporations and political institutions. Finally, I widen the scope of the research in this field by studying the associations between corporate permeation, health policy and consumption of unhealthful commodities in HICs as well as LMICs. In all three empirical studies, I introduce the hypothesis that a country's level of income moderates the associations between corporate power and consumption of tobacco and alcohol and between corporate power and the quality of the regulatory framework for these substances. The underlying mechanism is that countries with fewer resources have less bargaining power to uphold public health principles when faced with powerful commercial pressures.

1.5. Thesis Structure

In Chapter 1 I lay out the theoretical basis of my work. I create a framework to systematically study practices used by large commercial entities, such as multinational corporations, to shape consumption of unhealthful commodities. I expand on how corporate power, may be exerted through five vehicles that I name as follows: the Political Environment, Preference Shaping, the Knowledge Environment, the Legal Environment and the Extra Legal Environment. These vehicles find their expression

through technical means of implementation that I call Practices of Power. Practices of Power are the tools that commercial interests use to operationalize their agenda. They include, for example, lobbying activities and campaign donations as well as illegal activities. The distal outcome of the exertion of corporate power is an unbalance in the macrosocial determinants of health, which in turn, have an effect in the incidence of risk factor for disease. The proximal outcome is a deterioration of population health. A revised version of this Chapter, co-authored with Sandro Galea was published in 2018 in *Globalization and Health*(40).

The CPI (Chapter 2) lends a quantitative expression to these theoretical constructs. Using this framework for the analysis of commercial influences on health as a theoretical basis, I collected 25 indicators of corporate permeation comparable across 148 countries in five continents for six years 2010-2015. I assessed the Index's criterion-related validity by calculating the strength of the association among different formulations of the Index. Alternative formulations of the CPI are highly correlated. Whilst HICs are generally overrepresented among the lowest scores, some HICs have high permeation scores. There is no clear regional pattern, with scores showing as much intra-regional as inter-regional variability. The CPI appears to be a robust measure of corporate permeation at the national level, suggesting tremendous variability in permeation worldwide. A revised version of Chapter 2, co-authored with Sandro Galea was published in 2019 in *Social Science and Medicine- Population Health*(41).

In subsequent Chapters, I use the CPI to explain variations in the quality and levels of implementation of tobacco and alcohol control policy and in the consumption of these two commodities in the population across countries at different income levels. Chapters 3, 5 and 6, shed light on the first issue of capitalist firm's interfaces with the political institutions by addressing the mediating role of health policy in the association between corporate permeation and consumption of unhealthful commodities. The measures of health policy I use address the second issue of convergence processes as both tobacco and alcohol control polices– are prescribed by WHO. WHO was established as a specialised agency of the United Nations with the authority to adopt and approve normative instruments. In its normative and standard-setting work, WHO is a science- and evidence- based organisation with a focus on public health. Normative instruments include conventions, regulations and recommendations endorsed by the World Health Assembly. Evidence based policies are prescribed within the remit of this normative work but they may have different levels of adoption and implementation in different national contexts.

In Chapter 3 I use a set of policies outlined in the WHO Framework Convention on Tobacco Control (FCTC)[1] - a treaty developed in response to the globalization of the tobacco epidemic under the auspices of WHO - to investigate whether the association between corporate power and tobacco consumption is mediated by tobacco control policy

[1] Framework Convention on Tobacco Control (FCTC), a treaty developed in response to the globalization of the tobacco epidemic under the auspices of the World Health Organisation (WHO), explicitly states that "In setting and implementing their public health policies with respect to tobacco control, Parties shall act to protect these policies from commercial and other vested interests of the tobacco industry in accordance with national law(44)

across and within countries. I ask whether the relationship between corporate power and tobacco control policy and between tobacco control policy and smoking prevalence is stronger in LMICs than in HICs and whether it is stronger within the former than within the latter.

In Chapter 4, I build a new composite indicator – the Alcohol Control Policy Index (ACPI) – that compares the regulatory environment for alcohol in 167 countries across the world at all levels of income. I use alcohol control measures recommended in the WHO Global Strategy to Reduce the Harmful Consumption of Alcohol. This index expands the geographic and economic scope of its predecessors – it includes LMIC- , which focused on countries of Europe or the OECD. A revised version of this Chapter, co-authored with Sandro Galea was published in 2017 in the *Journal of Epidemiology and Community Health* (42).

In Chapter 5, I investigate whether government monopolies on alcohol are associated with lower alcohol per capita consumption and whether this association is mediated by stricter and more comprehensive alcohol control policies. I also ask if government monopolies moderate the association between alcohol control policy and alcohol consumption. Finally, I ask if government monopolies could also weaken any positive associations that may exist between increasing alcohol industry concentration and alcohol consumption, I ask whether a country's income level may weaken the protective role that government monopolies on alcohol may have on population level alcohol consumption. I also ask if a country income level moderates the association between

stricter and more comprehensive alcohol control policies, as measured by the ACPI created in Chapter 4, and alcohol consumption.

In Chapter 6, I ask if government monopolies on alcohol can moderate the association between corporate power and alcohol consumption. I explore if the moderator effect of government monopolies on alcohol on the association between corporate power and alcohol consumption differs between HICs and L&MICs.

1.6. Methods

My doctoral research relies on the creation of composite indicators that encapsulate complex realities such as corporate power or the regulatory framework of countries for alcohol or tobacco. The former is used to explain variations in the regulatory frameworks and in the levels of consumption of unhealthful commodities. The latter composite indicators are then used to explain variations in risk factors. When composite indicators of regulatory environments already existed, I made use of them. This is the case of the Tobacco Control Scale (TCS) developed by Joossens and Raw (43). In the case of alcohol control policy no global comparison tool was available so I created the ACPI using national policies compiled by WHO. I created the CPI by combining 25 indicators of corporate practices known to be deployed to promote the consumption of unhealthful commodities. I used established methodologies for the development of composite indicators explained in detail in Chapters 2 and 4. For data on alcohol consumption I used the WHO Global Information System on Alcohol and Health; for tobacco, I used data from the WHO Global Health Observatory and commercial data from Euromonitor.

As for my analytical models, where I had longitudinal policy and consumption data, I used fixed effects models. When one of the two was unavailable, I used cross sectional random effects linear regression models.

1.7. Results

In Chapter 2, the CPI captures country level dimensions of the interaction between corporations and the wider society that are neglected by popular measures of quid pro quo corruption, traditionally employed by the World Bank or by Transparency International, with a focus on the public sector. Whilst HICs are overrepresented among the lowest scores, there is no clear regional pattern, with scores showing as much intra-regional as interregional variability.

In Chapter 3 I find that there is a positive association between corporate power as measured by the CPI and tobacco consumption and a negative association between corporate power and the regulatory framework for tobacco control. I also find that higher scores on a tobacco control policy scale were associated with lower prevalence of smoking and mediate the association between corporate power and smoking across and within the HICs in Europe. I also find that globally, the positive association between corporate power and smoking prevalence is not statistically significant, nor is the mediator effect of compliance with smoke free regulation. I find, nonetheless, a negative effect of corporate power on compliance with smoke free regulation, using both random and fixed effects, which is statistically significant in LMICs but not in HICs. In my analysis, a country's income level does not moderate the association between CPI and

smoking but the negative association between CPI and compliance with national smoke free regulations is stronger in LMICs than in HICs. This effect is also negative over time within countries globally and within LMICs.

In Chapter 5, I find that Government Monopolies are associated with lower alcohol consumption and stricter and more comprehensive alcohol control policies regardless of the country's income level. There is no overall association between alcohol industry concentration and alcohol consumption, but in Government Monopolies the association is negative. I find that in countries where corporate permeation is low, there is no association between government monopolies on alcohol and alcohol consumption. On the other hand, among countries with high corporate permeation, government monopolies have less than half the alcohol consumption than those with competitive markets.

In Chapter 6 I find that in countries where corporate permeation is low, there is no association between government monopolies on alcohol and alcohol consumption. On the other hand, among countries with high corporate permeation, government monopolies have less than half the alcohol consumption than those with competitive markets. These results hold both within high and in LMICs. In competitive alcohol markets there is a positive association between corporate permeation and alcohol consumption that is larger in LMICs countries. In government monopolies there is no such association in LMICs and a negative, albeit it not statistically significant, one in high income countries.

1.8. Discussion

Even though the CPI adds value to the study of the interface between corporate and public governance, country rankings must be examined with caution. The CPI does not accurately measure aspects of illicit corporate behaviour that became licit through processes of "privatization of the public policy", including, for example amounts spent on lobbying at the country level or the frequency of revolving doors between the public and the private sector.

The finding that the capacity of corporate power to boost smoking prevalence seems to work via the weakening of tobacco control policy calls for improved governance of the interface between corporate interests and those of population health in Europe. Similarly, the stronger negative associations between CPI and compliance with smoke free regulations in LMICs versus HICs and within LMICs versus within HICs lends support to theoretical work and qualitative work that shows that tobacco industry deploys its structural and agency power to weaken enforcement of tobacco control regulations in LMICS.

The finding that government monopolies are associated with lower alcohol consumption and stricter and more comprehensive alcohol control policies regardless of the country's income level, does not lend support to the theory that LMICs do worse at harnessing the benefits of monopolies on alcohol. As for the role of the concentration in the alcohol industry and alcohol consumption, I find no overall association between the two. This finding too, fails to lend support to the theory that higher concentration in the industry is

associated with higher levels of consumption. Nonetheless, is worth highlighting that in government monopolies the association between concentration in the alcohol industry and alcohol consumption is negative. Furthermore, government monopolies also seem to be efficacious in protecting populations when commercial pressures are high. In HICs, they could have a role in harnessing the benefits of corporate permeation that can be used to effectively implement alcohol control regulations and thus reduce alcohol consumption.

Implications for tobacco and alcohol control

The FCTC acknowledges that direct participation of commercial interests in policy making is only one of the ways in which weaker policies are formulated and strong policies are not adequately implemented. Article 5·3 of the FCTC requires that "in setting and implementing their public health policies with respect to tobacco control, Parties shall act to protect these policies from commercial and other vested interests of the tobacco industry in accordance with national law"(44). My findings suggest that countries that do not have the capacity to implement evidence-based policies are likely to benefit from greater resources and capacity building initiatives. Given that part of the differences in the results observed between LMICS and HICs could potentially be attributed to weaker leverage of the former in international trade negotiations, the FCTC itself could be improved as tool to correct these power imbalances.

Alcohol has not yet been the subject of a framework convention and there are no binding regulations for the role of the alcohol industry in the formulation of alcohol control

policy. Nonetheless, the Global Status Report on Alcohol of 2014 proposes a "licensing system on retail sales, or public health oriented government monopolies on the production and/or sale of alcohol" as a policy option to curb alcohol consumption (45). My findings are in line with this recommendation and suggest that the reversal of privatisation or the maintenance of existing government monopolies on alcohol may be desirable public health interventions in jurisdictions faced with high alcohol consumption, in rich and poor countries alike.

Broader implications and significance for health policy

My findings suggest that there is room for improving, strengthening and expanding WHO's normative instruments. On the improvement of the existing normative instruments, the Framework Convention on Tobacco Control Conference of the Parties should develop guidelines to eliminate ambiguity and help signatories address trade-health relations obstacles that may arise in the implementation of the FCTC(46). For example, in 2008, the WHO Commission on Social Determinants of Health recommended action to ensure that health and health equity was not harmed by global trade. The Commission recommended the institutionalization of health equity impact assessment of global, regional, and bilateral economic agreements(47). My results back the call for these assessments.

As for alcohol control, lax attitudes towards regulation along with free trade and competition rules, which treat alcohol as any other commodity, have undermined effective alcohol control measures, such as increasing taxes or restricting the hours or

days of sale(48). Instead, at country level, ineffective control strategies (warning labels, education in schools) have been adopted. Internationally, resolutions on alcohol control exist but are non-binding and easily flouted. For alcohol-control measures to be taken more seriously by governments, some have called for a Framework Convention on Alcohol Control (49), and international treaty modelled on the FCTC. My findings are in line with previous work showing that evidence based policies such as government monopolies are effective in reducing alcohol consumption regardless of the country income level and break the association between corporate permeation and alcohol consumption. These findings support the argument in favour of a Convention binding countries to the adoption of evidence based alcohol control policies, and to banning the alcohol industry from policy making.

Recommendations for future research

The limitations of my studies highlight a need for more and better data that will allow for more robust quantitative measures of corporate power. Renewed efforts to systematically collect lobbying expenditure in both cash and kind and the frequency and intensity of revolving doors between the private and public sector are indubitably needed but quantitative research into corporate power should move beyond these measures. Gaps in our knowledge of the scale and intensity of corporate shaping of science, via funding and other mechanisms, should be addressed. The same goes for the gaps in our knowledge of how levers of public opinion – think thanks, the traditional media, so called "influencers, etc.- are targeted to shape public sentiment around the role of regulation in particular and

the role of the government in general in mediating between commercial interest and the health of the public.

Future research could make use of the CPI to shed light on variations in emerging public health threats such as increasing density of gambling outlets or online marketing to children as well in regulatory efforts being deployed to curb them. Research efforts should also be invested in systematically analysing the gaps between de jure and de facto policy, in other words, the difference between policy that is adopted and its implementation. In the same line, a systematic analysis of the level of evidence base underpinning countries' policy choices would allow social epidemiologist and public health scholars to start answering the question of "if health policy making is not based on the best available scientific evidence, what is it based on?". This would, in turn, allow for alternative hypotheses to the one offered in this thesis that health policy is substantially shaped by the strength of the commercial interests in a country.

In sum, the findings of my doctoral research project lend quantitative support to theoretical and qualitative work calling for the recognition of the role that commercial, namely corporate interests, play in shaping public health policy and consumption of unhealthful commodities.

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Chapter 2

Corporate practices and health: A framework and mechanisms

Abstract

Background: The Global Burden of Disease estimates that approximately a third of deaths worldwide are attributable to behavioural risk factors that, at their core, have the consumption of unhealthful products and exposures produced by profit driven commercial entities. I use Steven Lukes' three-dimensional view of power to guide the study of the practices deployed by commercial interests to foster the consumption of these commodities. Additionally, I propose a framework to systematically study corporations and other commercial interests as a distal, structural, societal factor that causes disease and injury.

My framework offers a systematic approach to mapping corporate activity, allowing us to anticipate and prevent actions that may have a deleterious effect on population health.

Conclusion: My framework may be used by, and can have utility for, public health practitioners, researchers, students, activists and other members of civil society, policy makers and public servants in charge of policy implementation. It can also be useful to corporations who are interested in identifying key actions they can take towards improving population health.

2.1. Introduction

The Global Burden of Disease estimates that approximately a third of deaths worldwide are attributable to behavioural risk factors, including alcohol, drug and tobacco use, and poor dietary profile. Underlying these risk factors is a common aetiology: overconsumption of unhealthful products and exposures all of which are, essentially, produced by commercial entities. It therefore seems apposite to consider the role these commercial entities play in shaping their products, driving consumption, and in turn, influencing population health.

Naturally, not all corporate products are unhealthful. Lifesaving medical technologies and medicines are produced and distributed by corporations, as are some high nutrient-low calories content foods. Furthermore, in recent years, demand for more corporate responsibility has increased and numerous companies have stated their commitment to a "Triple Bottom Line" approach of People, Planet and Profit. The operative question therefore is: how can we better understand corporate practices to the end of promoting salutary practices and minimize negative consequences of corporate influences on health.

Research in this area has documented corporate practices of influence in particular industries such as tobacco[1–6], alcohol [7–12], food and drink [13–17] , chemicals [18–21], automobile, weapons, extractive industries and pharmaceuticals [22–26]. Another field of inquiry has shown commonalities across corporate behaviour in different industries [27–31].

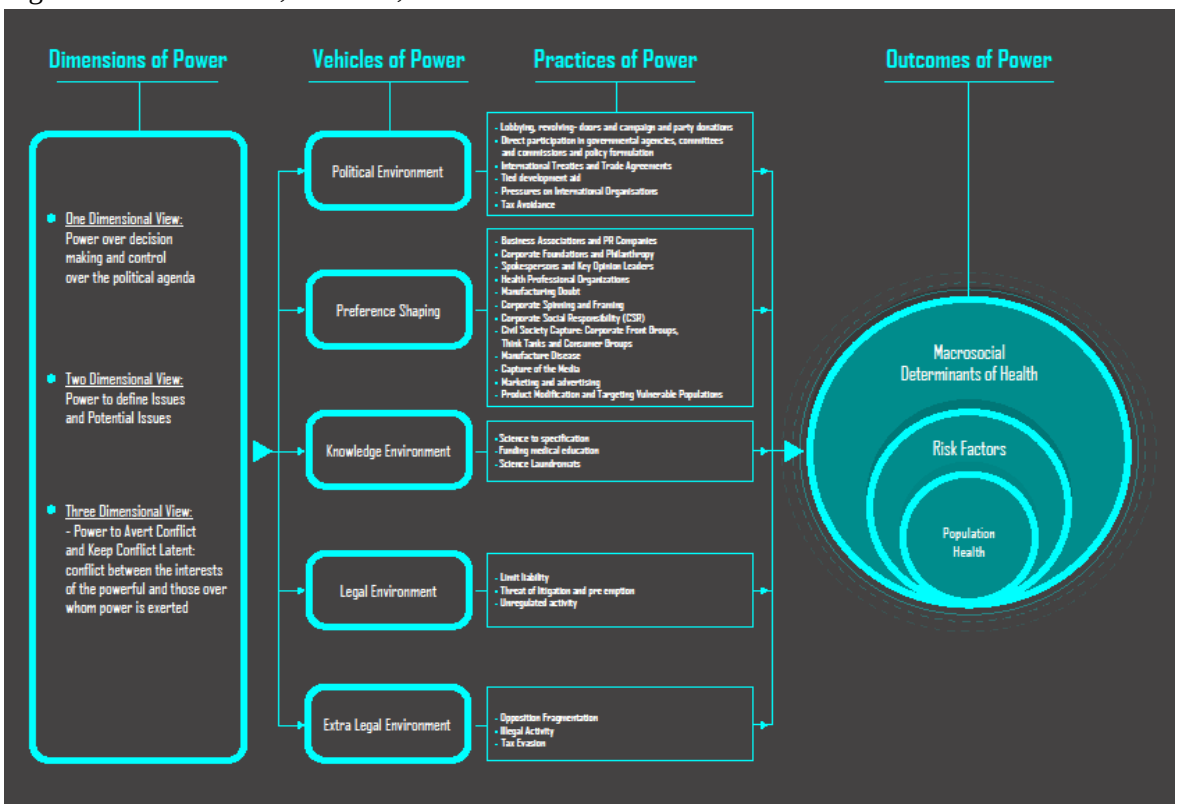
What is missing from this analysis is an overarching theoretical framework to systematically study commercial interests as distal, structural, societal factors that cause disease and injury. This framework will help guide the study of these practices in the wider social, political and economic context[27].

A comprehensive framework is needed to ensure that no aspect of corporate action is left unexamined by academics and practitioners alike. For example, in their otherwise thorough framework for conducting corporate health impact assessment Baum and colleagues do not mention how corporations may interfere with the research process and redefine what constitutes scientific evidence for policy making. Neither do they include a measure of how corporations engage in changing the social discourse around the role of the state or the social value of regulation [32,33].

I put forward such a contribution using the work of Steven Lukes as a starting point. Lukes proposes a three-dimensional view of power that builds on the one and two-dimensional views of his predecessors. The study of these dimensions can be guided by a focus on four features of power. The One-Dimensional View focuses on Power over decision making and control over the political agenda - not necessarily through decisions- . The Two-Dimensional View focuses on Power to define what constitutes an issue and a potential issue. The Three Dimensional View expands its focus to encompass the Power to avert observable conflict (overt or covert) and Power to keep conflict

between the interests of the powerful and those over whom power is exerted latent [34]. (Figure 2.1)

Figure 2.1. Dimensions, Vehicles, Practices and Outcomes of Power



The power lens structures our thinking and inquiry around the practices through which commercial power is exerted and ultimately, how population health is influenced. To this end, I suggest five vehicles through which each of the Dimensions of power express themselves, as well as the specific practices that enable that expression. The One-Dimensional View of Power focuses on decision-making, and how influencing decision-making exerts control over the political agenda. The Two-Dimensional View refers to the ability to keep issues out of the political and social spheres by shaping public perceptions, cognitions, and preferences in such a way that no other options are deemed

possible or desirable. The Three-Dimensional View extends its focus beyond that of the One- and Two-Dimensional Views to encompass the aversion of conflict over issues that may harm the interests of those in power. The aversion of conflict results in latent conflict between the interests of the powerful and those of society at large, often to the detriment of the latter.

Power, in its three Dimensions, may be exerted through five vehicles that I named as follows: the Political Environment, Preference Shaping, the Knowledge Environment, the Legal Environment and the Extra Legal Environment. These vehicles will find their expression through technical means of implementation which I call Practices of Power. Practices of Power are the tools that corporations use to operationalize their agenda. They include, for example, lobbying activities and campaign donations as well as illegal activities. The distal outcome of the exertion of power is an unbalance in the macrosocial determinants of health, which in turn, have an effect in the incidence of risk factor for disease. The proximal outcome is a deterioration of population health.

In the rest of this paper I discuss what constitutes each of the vehicles of power and how they find their expression through examples of the use of different enablers.

2.1.1. Political tactics: State and Institutional Capture

Control over decision-making, agenda-setting, and non-decision allows commercial actors to keep statutory regulation at bay and to shape the narrative and public

perceptions around the role that governments should play. Regulation can be averted through deregulation and non-enforcement of existing legislation [4], the promotion of self-regulation with the adoption of voluntary codes and non-regulatory initiatives [35], delaying implementation of existing regulations, and the perpetuation of loopholes that make tax avoidance legal and tax evasion go unpunished. Changing public perceptions around the role of government as a regulator can be achieved through support for candidates and parties who endorse reduced government participation in public life; through watering down of regulatory powers via direct participation in regulatory bodies and through support of models of international trade that perpetuate historical power differentials in ways that leave little or no room for reducing health inequalities across and within countries. I discuss below the vehicles through which political tactics consolidate the influence of corporations and their potential impact on health.

Lobbying

Lobbying confers undue influence on corporate actors for two reasons. First, corporations invest enormous amounts of money in lobbying. The food industry, for instance, spent $1.5 billion lobbying against the European Union's [EU] adoption of the traffic-light approach, opposing most aggressively the use of a red light suggesting that "any food was too high in anything" [36]. This gives corporations access to policy makers unavailable to regular voters and public interest organisations. Corporate resources invested in lobbying far outweigh those invested by other civic sectors who might advance a more balanced public discussion about societal investment that may ultimately shape health. For example, in 2015 the EU Transparency Registry reported

177 full-time lobbyists working on pharmaceuticals issues on behalf of the pharmaceutical industry versus the 48 advocating on behalf of civil society [37]. Second, the information that corporate lobbyists share with government officials carries weight as expert information, even though it may be biased, incomplete, or erroneous [17,38].

Revolving doors

The flow between public and private sector employment may advance corporate interests in three ways. First, it may result in policy decisions about products and practices that favor industry interests [17,38,39]. Second, it guarantees industry a voice in the policymaking process, even though other stakeholders have no assurance that their concerns will be addressed by regulatory agencies [40]. Thirdly, it gives industry a competitive advantage when former regulators bring confidential information into their corporate roles. For example the European Medicines Agency has come under scrutiny when it surfaced that a number of high ranking officials, including the Director, were either previously employed in or moved on to the pharmaceutical industry after employment at the Agency [41–43]. Concerns were raised over the objectivity of these individuals in regulating, for instance, publication and access to clinical trials data [44].

Campaign and party donations

Corporate donations enable favourable decision-making and political agenda-setting because reciprocity may be expected once the party or candidates are in office. In the US, for instance, corporations have acquired 1st Amendment rights and can make unlimited contributions to election campaigns directly from the corporate treasury [45]. These donations have observable effects on health policy. In 2003 the US House of

Representatives voted on the Pharmaceutical Access Act that would have allowed US retailers to buy the same drug from countries offering lower prices. The bill never became law. Evidence shows that the coalition to block drug re-importation received more cash than the coalition to allow re-importation and that the pharmaceutical industry used campaign contributions to reward or punish each representative's vote. Whilst other factors may explain voting patterns, pharmaceutical campaign donations were found to be the most important explanatory variable [46,47].

Direct participation in governmental agencies, committees and commissions and partnerships with government for policy delivery

Companies whose interests may conflict with the public's may protect and expand their activities by becoming partners in the formulation of public policy [48]. The US Department of Agriculture not only receives financial contributions from agribusiness, but also, historically, has had staff and agriculture committee members from the farming community - particularly meat producers [49–51]. This is an important factor explaining why the antibiotic use for meat growth – a driver of antimicrobial resistance- is left to be voluntarily regulated by the meat and pharmaceutical industries as opposed to statutorily regulated by government agencies [49,52,53]. Similarly, the UK's Department of Health anti-obesity marketing campaign Change4Life was drafted by a coalition of food and drink industries whilst the campaign marketing, paid for by the obesity budget, was awarded to companies which had processed and fast food clients in their portfolio. Moreover, industry was allowed to contribute to the campaign in kind which led to the introduction of obesogenic foods into schools [11].

Commercial pressures on international trade negotiations

Commercial pressures may shape population health via trade agreements in three ways: increased availability and decreased prices of unhealthful commodities, increased patent protection of essential medicines via bilateral trade agreements, and decreased levels of protection for occupational health and the environment.

The first mechanism is a consequence of the removal of barriers to imports and FDI. Increased penetration of supermarkets in food retail, for instance, facilitates a shift towards the consumption of processed foods [54,55]. Furthermore, FDI by multinational food companies has driven an increase in availability of processed food in developing countries [56].

Through the second mechanism, trade agreements between two countries eliminate WTO provisions that protect public health under multilateral agreements. For example, under the Agreement on Trade-Related Aspects of Intellectual Property (TRIPS), low income countries may invoke flexibilities allowing them to produce generic versions of patented medicines in a public health emergency, which may cause large pharmaceutical companies to lose revenues. Since 2001, every trade agreement signed or under negotiation by the US has increased the terms and scope of intellectual property right protection of pharmaceuticals, including patent terms beyond the 20 years provided for under the WTO eroding these hard-fought flexibilities [57].

In the third mechanism, pressures on the international trade architecture have ensured that adherence to labour standards is not a requirement either in trade agreements administered by or a condition for membership in the WTO. In fact, article XX, often

referred to as the escape clause, outlines when members do *not* have to fulfil trade commitments and that covers public health and environmental standards" [58].

Tied aid

Large corporations shape population health in the developing world by lobbying governments to formulate development aid so to increase their participation in it. Tying food and medicines aid to purchases from corporations in donor countries acts as de facto export promotion and overcharges recipient countries for commodities they could procure elsewhere at lower prices [59,60]. Consequently, excess crops are dumped in developing country markets reducing local food production and bringing down food prices for local farmers [61], new markets for food exports open [62] and competition from developing economies eliminated. In 1986 strong lobbying efforts by the American Soybean Association resulted in the passage of the "Bumpers Amendment" by the US Congress so that no financing, technical assistance or capacity building should be delivered to crops that might compete with US exports and assistance of any kind should be directed at palm or coconut oil, so not to compete with US soy oil. Soy oil is one of the substrates for the production of trans fatty acids whose consumption is associated with increased risk of heart disease [63].

Pressures on International Organisations

Commercial players may protect their interests via their governmental representatives or directly via participation in delegations to international bodies with mandates to regulate their activities. During the 1970s, the International Labour Organisation, the Organisation for Cooperation and Development and the United Nations Centre on

Transnational Corporations each attempted to create mandatory codes of conduct for corporations. The former two complied with the call of business to create suggestive codes without penalties for non-compliance and the latter never achieved consensus to adopt its recommended accountability structures [64]. More recently, the Sugar Association, representing the U.S. sugar industry, was critical of a WHO report on guidelines for healthy eating, which suggested that sugar should account for no more than 10 % of a healthy diet. The association demanded that Congress end its funding of the WHO unless it withdrew the guidelines. Moreover, the association and six other big food industry groups also asked the U.S. Secretary of Health and Human Services to use his influence to get the WHO report withdrawn [13,65].

2.1.2. Preference shaping: Perception, Cognition and Need Creation

Power over preference shaping is exerted not only by fostering preferences for particular products and lifestyles but also for the role of personal responsibility, and that of the government, in mediating the public's interactions with these products.

Commercial entities exercise power over preferences by ensuring that tensions between the interests of population health and theirs are never constructed as political or social issues. For example, if a harmful product is portrayed as safe, healthful, and even necessary, as long as the consumer perceives it as such, there will be no need to confront the manufacturers about its toxicity. Accordingly, an absence of health grievances should not be taken to mean that there is a genuine social consensus around unhealthful commodities. Rather, we should focus on the question of whether that consensus was fabricated by shaping preferences in such a way that grievances never arise [34].

The conflict aversion feature of power ensures that tensions between corporate and public health interests never result in open confrontation. Open confrontation may harm the corporate image and the bottom line and so a number of tactics, such as the deployment of public relations companies or the enlistment of key opinion leaders described below, are used to manage conflict. When it arises, these enlisted actors keep conflict latent or completely avert it when it can be anticipated.

Public Relations companies

International public relations (PR) companies pool together expertise and financial resources from industries with similar needs in terms of regulation and social acceptability for their products. They mount multi-pronged campaigns that target the media, legislators and consumers to dismiss public health concerns. PR companies working for the supplements industry in the US to fight against stricter regulations by the FDA built a comprehensive campaign. It included questioning the Agency's mandate to "tell citizens how to choose their diet", the portrayal of regulatory action as prohibition of health enhancing supplements and convincing consumers of the benefits of these substances despite the lack of scientific evidence [51].

Key opinion leaders [KOL] and funding health professions organisations

Through enlisting key opinion leaders, commercial interests may shape the background of accepted issues and opinions in a given field and prepare the target audience to welcome new drugs, technologies and diagnosis. Researchers on female sexual dysfunction held industry sponsored workshops and wrote position papers that solidified female sexual dysfunction as an illness, thereby positioning themselves as the very

experts to whom the FDA would turn on for advice on drug submissions and to whom the media would turn to for interviews and information [66].

Manufacturing doubt

Corporations may avoid both a negative image and statutory regulation of their products by casting doubt on the scientific evidence documenting negative effects associated with them and by discrediting the scientists who produce such evidence. The rationale is that if the existing evidence around the harmful effects of a given product is ambiguous and there is no consensus around it, then there is no need for regulatory action [67].The cases of tobacco, acid rain, ozone, global warming, and DDT all have this tactic in common: a group of scientists with extensive political connections, ran effective campaigns to mislead the public and deny well-established scientific knowledge over four decades [68].

Corporate Foundations and Corporate Social Responsibility [CSR]

There are two ways in which CSR increases exposure to harmful corporate products that would otherwise be more tightly regulated. Firstly, the voluntary nature of CSR prevents its meaningful formalization into statutory regulation [15,64] removing incentives to protect public health. This is an explicit corporate strategy: "Companies should not allow social responsibility to divert their attention from their main goal, which is to maximize shareholder value…Behind the pressure to adopt social responsibility there is a profit motive. Putting people before profits is wrong tactic" [69].

Secondly, CSR expands corporate marketing reach and product acceptability by associating it with an image of social commitment. The tobacco industry engaged in

youth smoking prevention programmes as part of its CSR in North and Latin America. Even though there is no evidence that these programs reduce smoking among youths, they have met the industry's goal of portraying the companies as concerned corporate citizens. What is more, they undermined effective tobacco control interventions such as those outlined in the WHO Framework Convention on Tobacco Control [70]:among youths, each additional viewing of a tobacco company parent-targeted advertisement is, on average, associated with lower perceived harm of smoking [71].

Global Health Philanthropy

Philanthropic institutions may act as channels for unhealthful corporate products in two ways. First, foundations may extract revenue from products that are harmful to health. Stuckler and colleagues found that Bill & Melinda Gates Foundation's [BMGF] corporate stock endowment is heavily invested in food and pharmaceutical companies, directly and indirectly. For example, it holds significant shares in McDonald's and Coca-Cola [72]. The stock on major determinants of NCDs –highly processed foods and sugary drinks- deserves attention given the low priority the Foundation gives to NCDs, despite their growing importance in the global burden of disease.

Second, through their expanding role in financing supranational organizations such as WHO, WB, GAVI or the Global Fund, these foundations have a say in setting international health policy priorities. The funders' priorities are often driven by personal interests and not necessarily aligned with the health policy priorities of the recipient country [73]. The BMGF's portfolio of pharmaceutical companies calls for attention given Mr Gates' personal belief in the role of patents as motors for innovation in

medicines and medical technology. Activists in the access to medicines movement have publicly criticised this stance [74] given his involvement in initiatives such as GAVI or the Global Fund that rely heavily on relationships with the pharmaceutical industry to secure access to drugs.

Civil Society Capture

The corporate co-option of grassroots formations - e.g. consumer and patient groups, or research organisations – e.g. think tanks - prevents public health issues from arising and averts conflict over them in three ways. It confers legitimacy to industry claims, it deflects criticism from public health advocates and serves as a media response tool.

For example, the National Smokers´ Alliance was developed by Burson-Mersteller, a PR company, on behalf of Philip Morris, and the Californians for Realistic Vehicle Standards is a front for the auto industry opposing air pollution regulation [18]. Under the guise of a patient constituency, for instance, pharmaceutical industry founded and funded patient advocacy organisations may pressure third party payers to pay for certain drugs regardless of efficacy or efficiency or regulatory agencies for drugs to enter the marketplace more quickly despite the potential harms of an expedited review [75,76]. Health and patient organisations lobbying the European Institutions who receive funding from the pharmaceutical industry include the European Kidney Health Alliance, the European Respiratory Society and the European Union Geriatric Medicine Society [37]

Corporate funded think-tanks are the top down counterpart to the "grassroots" movement. These institutions operate under the veil of academic independence to lead public opinion and set the terms of public discussion. In the first year of the Bush

administration alone, out of the 44 pieces of regulation contested by Mercatos, a think-tank funded by the libertarian Koch brothers, 66% were selected for elimination of modification [18].

Issue framing and attention deflection

Framing public health issues in terms of personal responsibility for making informed choices takes the onus away from the harmful composition of certain products, from their availability, marketing and advertising and ultimately from their regulation. The automobile industry has long avoided stricter regulations by shifting responsibility to the driver and claiming that the driver, not the vehicle nor the built environment in which it operates, is the problem. This rhetoric was documented in vehicle safety regulation, alcohol blood levels, speed limits, mandatory seat belts and airbag regulations, etc. [77].

Promoting actions outside the corporation's area of expertise deflects criticism from its main line of business. Tobacco companies have promoted campaigns to prevent violence against women and funded shelters for victims of domestic abuse [13,78]. Similarly, the tobacco and alcohol industries have engaged in activism and advocacy against the smuggling of alcohol and tobacco products as a means to avoid regulation of their activities [6]. For example, cigarette smuggling is often cited as an argument against a tobacco tax increase [79] even though the tobacco industry engages in the smuggling of its own products to avoid duty tax [4].

Manufacturing disease

By creating new diagnostics and thresholds for medical intervention, commercial interests expand the consumer base and reduce the scope for less profitable population

wide approaches for tackling diseases rooted in social and environmental problems. This may be done in two ways. One is to expand diagnostic criteria to include what were previously considered normal laboratory results, behaviours or feelings [80,81]. The financial ties between DSM-V panel members and the pharmaceutical industry have shed light on this mechanism [82,83]. More encompassing diagnostic criteria are then complemented by an effort to increase acceptability of a given condition. This is evidenced by the penetration of the pharmaceutical industry into the education sector by approaching teachers to diagnose Attention Deficit and Hyperactivity Disorder [84].

When diagnostic guidelines are not yet available, new conditions may be created by pathologizing complex behaviours and promoted directly to the public, as was the case of female sexual dysfunction [85].

Capturing the media

The media has the power to mould perceptions of product acceptability and desirability and to shape the discourse around the role of government, personal responsibility and accountability of private interests when their products harm health. Corporations harness this power through media ownership, control over advertising as a lever over editorial decisions, and by using the media to influence jurors on litigation cases against harmful products. Together, these tactics hedge against the coverage of harmful stories and secure favourable treatment of corporate activities and image. When the tobacco industry levered its advertising clout to avoid coverage of anti-smoking stories it enlisted newspapers' backing against restrictions on tobacco advertising, a crucial source of revenue [18].

Marketing and advertising

Combined, marketing and advertising expand the number of consumers for a given product and shape the psychological and social predisposition to accept and endorse hyperconsumption. Advertising strategies have drawn on advances in neuropsychology, anthropology, and neuroscience to capitalise on the susceptibilities of a developing brain to marketing messages [69]. Point in case, neuromarketing uses physiological and clinical information about brain functions to bypass evaluation processes underpinning decisions about what to buy that came about through millennia of evolution [31]. The yield of these technical advances is then complemented by a consonant consumption environment. For example, well-funded marketing strategies are applied to corporate social responsibility, as it becomes the only source of health education in some settings, namely in more economically deprived environments [30]. These compete with underfunded, yet evidence based public health campaigns.

Product Modification and Targeting Vulnerable Populations

Markets in traditional consumer demographics in the developed world have reached saturation, partly due to tighter regulation. Consequently, multiple industries have turned to the developing world where disposable incomes are increasing and regulations are still weak to expand its consumer base [16,86,87].

Others expanded into previously untapped markets, e.g. young people [9], women [88] or problem drinkers. Low income groups, for example, are a particularly profitable demographic to the alcohol industry. This is partly why it resists attempts to raise the price of alcohol, be it through minimum unit pricing or by increasing excise taxes,

measures shown to discourage drinking [10]. Low prices allow industry to sell greater quantities in low income groups, who traditionally have shown higher prevalence of alcohol abuse.

2.1.3. Shaping the Knowledge Environment

The breadth and depth of knowledge about corporate products and how they affect health bears directly on consumption, perceived need for consumption, and corporate image. Accordingly, corporations carry out scientific work with the express purpose of reaching a conclusion that supports industry regulatory or litigation objectives as well as providing scientific underpinnings for a commercial venture such as a new drug [18].

Seen through a power lens, commercial interests set the research agenda, define what is studied, and thus what constitutes an issue and what does not. The power to constitute non-issues, in turn, generates power to avert conflict over products and processes that harm health. In other words, if harmful effects of corporate products are not systematically documented and attributed to that product, ascription of responsibility will not trigger conflict. Should conflict arise nonetheless, power over research interpretation and dissemination keeps it latent. As long as conflict is averted or kept latent there is no threat to the bottom line.

Control over the research process

Three tactics enable corporate control over the research process. First, the funder sets the research agenda by funding research at universities, in-house corporate laboratories, non-profit research institutes or for-profit science-for-hire firms. Second, funding allows control over study design, analysis methodology and ownership of the data. Corporations

funded £250 million of university research in 2001 in the UK. In the US, private commercial funding grew from $264 million in 1980 to $2 billion in 2001 [19]. Naturally, corporate funding, per se, is not a problem but there is substantial empirical evidence that the independence of the research is compromised by it. An analysis of published randomised control trials in 12 specialties showed that financial competing interests were significantly associated with authors' conclusions [89,90]. The selective reporting of studies funded by the pharmaceutical industry to regulatory agencies was found to be the major cause of bias in estimates of a drug's efficacy and safety when these studies were submitted for approval of new indications for existing drugs [91]. Furthermore, conclusions of meta-analyses [92] and cost effectiveness analysis [93] have also been shown to be biased towards the funding industry's interests.

In the third mechanism, the funders may suppress or misreport unfavourable results through exclusive ownership of the data [24,25,94]. Access to unpublished trial reports submitted to drug regulatory agencies sheds light on possible side effects of the drugs because they provide more reliable data than published papers. Editors, peer reviewers, and editorial writers who are trusted to evaluate the accuracy of the analyses are thus often unable to do so [95]. Consequently, side effects that are known only to the sponsor result in avoidable deaths, as evidenced by the Vioxx [Rofecoxib] scandal. Rosiglitazone's withdrawal from the market illustrates yet another layer of control over the data: GSK had direct access to the Data and Safety Monitoring Board - in charge of monitoring data being collected in clinical trials. The fact that commercial sponsors of

the trial have direct access to these bodies, thwarts due course and prevents them to stop trials that endanger participants [96].

Funding medical education

Funding of symposia, hospital lectures, and medical specialty meetings ensures that the educational content is shaped to favour certain products and procedures over others, without mandatory scrutiny of claims of superiority. The recruitment of KOL lends scientific and pedagogic credibility to the financial efforts. These unfiltered exposures fulfil the double objective of influencing prescription patterns and shaping the medical community's attitude towards critically appraising what counts as evidence [97].

Scientific Advisory Boards [SABs] and Science Institutes

This last tactic pertains to image control once health damaging effects of corporate products are made public. SABs are organized groups of "industry friendly "third party" scientists who support industry's scientific positions in regulatory processes, the courtroom and public opinion [18]. Tobacco companies established the Centre for Tobacco Research Advisory Board [13] and beryllium companies established the Beryllium Industry Scientific Advisory Committee [18]. There is no requirement for these companies to disclose their funding when lobbying regulatory agencies or when expressing their views in other public fora. Science Institutes fulfil a similar role [19]. The Asbestos Information Association is a front group created by this industry to dismiss public and governmental concerns about their product. It has a successful track record of weakening regulations coming from the Occupational and Safety Health Agency and the Environment Protection Agency in the United States [18].

2.1.4. Legal systems and the law

A strategic use of the law can lower barriers to undue influence over the political process - e.g. giving corporations personhood - thereby facilitating political agenda-setting and decision-making. This prevents contentious public health protection issues from ever being brought to the legal system, thus averting open conflict between corporations and those advocating for public health.

Influence over judicial systems may stifle legislative attempts to protect against harmful products and practices or water down more comprehensive occupational or environmental health legislation. It can also ensure that sanctions for harming population health are not enforced. Both instances are profitable because they allow, among other things, for a legal mechanism to externalise costs.

Finally, when the interests of commercial players are in open conflict with those of population health and are brought to trial, the legal system may be used in such in a way that conflict is never resolved. This is beneficial from a corporate perspective because the product or practice in question remains available, profitable, accountability never ascertained and corporate image intact.

<u>Liability</u>

Corporations protect themselves against accountability for wrongdoing by changing the law and reinterpreting its spirit and intent. By averting liability, corporations avoid negative associations with their brand, reparations and regulation that may curtail further exposure to their unhealthful practices and products. In the US, 4th Amendment rights confer corporations the right to privacy and thus enable avoidance of health and

environmental inspections. In 1986 corporations claimed the right to refuse surprise inspections by the US Environment Protection Agency and the Occupational Health and Safety Administration severely limiting these agencies scope for health protection [64].

Corporations may also have an unlimited lifespan and limited liability of shareholders for corporate practices [69].When a corporation is treated as a person under the law, it is liable for its actions. This means that its directors and managers may not be held responsible for any wrongdoing in which the company has engaged [98]. This eliminates the dissuasive effect that may deter harmful practices.

Threat of litigation

Corporations use the possibility of costly and time-consuming litigation to deter action that may bring the public's attention to unhealthful products and practices. Litigation may be used as retaliation, as in the case of the McDonalds's lawsuit against British activists [99], or as a deterrent for legal action. The lawsuits that Philip Morris brought against Uruguay over graphic cigarette health warnings [100] and against Australia over plain packaging, are warning signs for countries considering similar legislative attempts [101]. This is may be an especially strong message against regulatory initiatives for poorer countries with fewer resources.

Externalize costs using unregulated areas of activity

Corporations may keep prices of harmful products artificially low and more available when the final price does not reflect the full cost of production. This is the case with environmental and occupational health costs when they befall on taxpayers. In a practice known as "tolling", for instance, a manufacturer sends its chemical product to another

company to have it processed, maintaining ownership of the product, but not responsibility for occupational health [18]. Similarly, the meat industry has long kept meat prices low by avoiding the environmental, social and occupational health costs of large concentrated feeding operations for animals raised for food [102–104]. What is more, externalizing occupational health costs is effectively sanctioned by the international trade architecture as pointed out in section 1.5.

2.1.5. Extra Legal Tactics

When, despite efforts to influence decision-making and agenda-setting, non-issues become public health issues, open conflict over those issues arises and corporations may break the law in order to secure their interests. Of all corporate criminal offenses prosecuted by the US Department of Justice between 1974 and 1976, for instance, 60 % occurred in just three industries, all of which directly relevant to population health – petrochemicals, pharmaceutical and automobile manufacturing [105].

Fragmentation of opposition groups

By discrediting public health advocates' opposition or portraying the public health community as fragmented, commercial interests ensure that there is no countervailing discourse. Phillip Morris' Project Sunrise explicitly aimed at fragmenting the anti-tobacco movement by dividing advocates into "extremists" and "moderates" and building partnerships with the latter, which brought them some legitimacy [106]. Direct tactics include corporate infiltration of opposition groups [105,107] as in the case of corporate infiltration of anti- bovine growth hormone advocacy groups [50].

Corporate Illegal activity

This category includes bribing [108], smuggling and illicit trade [4,109], and price fixing [110] among others.

When these offenses are prosecuted, out of court settlements elude corporate accountability. Corporations avert criminal prosecution and the ensuing fines are still financially attractive to companies for whom the penalty is only a small fraction of annual profits. In 2009 Pfizer paid what at the time was the largest criminal fine ever imposed in the US ($2.3 billion) in an out-of-court settlement for the off label promotion of several drugs only to be surpassed in 2012 by GSK with a $3 billion settlement after pleading guilty to unlawful promotion and failure to disclose drug safety data [111].

2.2. Conclusion

Corporate activities have immediate and observable effects on perceptions and behaviour patterns that can lead to increased consumption of unhealthful corporate products and subsequently to changes to individual and population health. This should not be interpreted as suggesting that corporate activities are necessarily harmful to health, nor that there is anything untoward about most corporate action, which with few exceptions, operates well within legal and culturally acceptable bounds. My intention in critically and systematically studying the mechanisms of corporate action is to highlight how corporations may influence population health to the end of mitigating corporate action on poor health.

My framework offers a systematic way of mapping corporate action as a way of guiding research and practice. It is meant to be used by public health practitioners, researchers, students, activists and other members of civil society, policy makers and public servants

in charge of policy implementation. It can also be useful to corporate managers who wish to establish or improve triple bottom line principles.

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Chapter 3

The Corporate Permeation Index – A tool to study the macrosocial determinants of Non-Communicable Disease

Abstract

Background: Commercial interests have long been identified as a macrosocial determinant of health. I introduce a composite indicator of corporate permeation- the Corporate Permeation Index (CPI) -, a novel tool for explaining variations in the consumption of products such as alcohol or tobacco and in the strictness and comprehensiveness of health policy regarding these products.

Methods: Using a published framework for the analysis of commercial influences on health as a theoretical basis, I collected 25 indicators of corporate permeation comparable across 148 countries in five continents for six years 2010-2015. Two alternative approaches were used in each of the steps taken to build the measure – imputation of missing data, multivariate analysis, and weighing and aggregation of the subcomponents. I assessed the CPI's criterion-related validity by calculating the strength of the association among the different formulations of the Index.

Results: Alternative formulations of the CPI are highly correlated. Whilst High Income Countries are generally overrepresented among the lowest scores, some High Income

Countries have high permeation scores. There is no clear regional pattern, with scores showing as much intra-regional as inter-regional variability.

Discussion: The CPI appears to be a robust measure of corporate permeation at the national level, suggesting tremendous variability in permeation worldwide. There are limitations to the CPI, the most notable of which is the lack of large scale cross-country comparable data on some important mechanisms of corporate permeation (e.g., lobbying expenditures by large corporations). Further work should target proxy measures for these phenomena to be incorporated in the Index calculation.

3.1. Introduction

Corporate permeation refers to the extent to which corporations penetrate all aspects of society, from macrosocial and political aspects, such as corporate donations to election campaigns (1), to shaping individual consumption patterns, though, for example, advertising that encourages eating calorie-dense, nutrition poor foods at fast food chains (2). Corporate permeation does not measure whether corporate presence in a given society is positive or negative but rather, measures the extent to which corporations are embedded in the political, legal, social, economic and cultural fabric of a country. Corporate permeation, like corporate power is a capacity(3). Whether this capacity is translated into influence over people's health will be ascertained in subsequent chapters.

This capacity often relies on collusion between both the private and the public sector. Where the rules of the game -laws, and institutions - have been shaped to benefit vested interests, corporate influence may be entirely legal, even if it adversely affects public health outcomes (4). Accordingly, vested interests that remove public policy from the realm of democratic, contestable decision making should be taken into account by measures gauging undue corporate capture of the public sector. Kauffman proposes the term "privatization of public policy"(5,6) to describe this phenomenon. Furthermore, vested interests may be *drivers* of undue corporate influence. Using a cross-country dataset, Wu found that low corporate governance standards have an important role in the supply side of undue corporate behaviour (versus the demand side whereby public officials offer to incur in wrongdoing) (7). For example, in their study of the influence of transnational tobacco companies (TTC) on social policy, Holden and Lee point out how

TTC derive structural power in their relationships with states from integrated supply chains and the opportunities to exit from any given national economy (8), this enables corporations to punish and reward countries for their policy choices (9). The reward and punishment may erode even the sturdiest of institutional governance systems. Countries such as the United States (US) or Germany may score highly on indicators of institutional governance merely because reward and punishment systems– e.g. the magnitude of campaign donations from industry and revolving doors between the public and private sectors - are not incorporated into popular tools such as Transparency International's Perceptions of Corruption Index. Despite their high institutional governance scores, both countries have documented histories of tight relationships between industry and regulators leading to institutional erosion as evidenced by the current state of gun control legislation in the US (10–12) or the car emissions revelations in Germany in 2015(13,14).

I present the Corporate Permeation Index (CPI), a composite indicator of the degree to which corporate power is embedded in the social, political and cultural fabric of a country. The CPI intends to be a tool for academics, public health practitioners and advocates to explain variations in the consumption of products such as alcohol or tobacco and in the comprehensiveness of health policy regarding these products, in individual countries over time and across different countries.

A composite indicator is likely the most suitable tool to quantify a complex concept such as corporate permeation because most often commercial interests deploy myriad tactics

to promote their products (15–17). For example, in the 1960's the sugar industry funded research highlighting saturated fat as a major contributor to cardiovascular disease (18). As a result, the medical community and public at large became concerned with the nefarious effects of saturated fat on cardiovascular health, while sugar's equivalent contributions remain largely ignored. This has implications on medical advice regarding lifestyle and on product regulation. The discourse on the health effects of sugar consumption puts pressure on legislators to, for example, subsidize sugar crops to bring sugar prices down, increasing availability (19). At the same time, industries funnel their energy into public health solutions that will not impact their profits. The sugar industry funds organisations that advise increased physical activity to combat childhood obesity to the detriment of policies that curtail exposure to obesogenic foods (20). Last but not least, industries employ these tactics in a climate where an emphasis on personal responsibility for individual and population health increasingly limits statutory regulation of food environments (17). Seemingly independent industry sponsored think tanks and media in turn fuel the personal responsibility rhetoric without disclosing industry funding or conflicts of interest (21,22).

The CPI is the quantitative expression of theoretical concepts organised in the framework proposed in Chapter 2 (23) to guide the study of corporate practices that influence the health of populations. I used the categories "Vehicles of [Corporate or Commercial] Power"- the Political Environment, Preference Shaping, Knowledge Environment, Legal Environment, and Extra-Legal Environment- and the corresponding "Practices of Power" —the tactics that enable corporate power—to guide the selection of indicators. The first

category quantifies the Vehicle of Political Environment: it covers national regulations on party, campaign, and election financing, trade related indicators and factors related to how corporations interact with the public sector. The second category quantifies the Vehicle of Extra-Legal Environment: unambiguously illegal practices such as bribing. The third category quantifies the Vehicle of Legal Environment: aspects of corporate governance and corporate ethics which include practices inherent to the corporate structure, the transparency of reporting systems, and whether shareholders can hold management accountable for unethical or risky behaviours. The fourth category includes aspects of the Vehicle of Preference Shaping or explicit strategies directed at making the consumption environment more receptive to their products including increased ownership of media outlets and intensity of marketing. Some of the Practices of Power, by virtue of their unofficial nature, are impossible to quantify or to compare across countries. This is the case with lobbying expenditure, revolving doors between the public and the private sector or contributions of industry representatives to trade agreement negotiation. Where exact indicators of the Practices could not be found e.g. corporate capture of trade negotiations, proxies were found e.g. Foreign Direct Investment, tariffs, and barriers to trade.

3.2. Methods

3.2.1. Data selection

(Table 3.2 in the Annex provides a Checklist of step by step construction of a composite indicator).

Each source was evaluated against the following criteria:

A) Reliable data collection and methodology from a credible institution: each source should originate from a professional institution that clearly documents its methods for data collection.

B) Quantitative granularity: The scales used by the data sources must allow for sufficient differentiation in the data on the perceived or directly measured levels of corporate dominance across countries.

C) Cross country comparability: As the aim is to compare countries, the source data must also be legitimately comparable between countries; the source should measure the same thing in each country scored, on the same scale.

D) Multiyear data-set: Sources that capture indicators for a single point in time, but that are not designed to be repeated over time, are excluded.

This is because one of the applications of the CPI is to explain variations in the consumption of unhealthful commodities and strictness and comprehensiveness of health policy. If I don't use comparable measures over time, the only possible design is a cross sectional one, which means that I will not be able to quantify these associations within countries, only between them.

The data sources are: The World Economic Forum's Executive Opinion Survey, International IDEA's database on Political Finance, Political Risk Index; United Nations Conference on Trade and Development UNCTD; Freedom of the Press Index; and KOF Swiss Economic Institute. (I provide additional details in Table 3.3. in the Annex.)

3.2.2. Indicators

I selected 25 indicators of corporate permeation. I describe each indicator, its source and the rationale for inclusion in detail in Annex 2 and I provide a summary of each indicator in Table 3.1.

Table 3. 1. Summary of CPI indicators for 2015 [2]

Variable	Observations	% Missing	Mean	SD	Minimum	Maximum
Political Environment						
Cluster Development	140	5,40%	3,78	0,76	2,32	5,49
Electoral Policy	138	6,80%	1,84	0,48	1,00	2,88
Foreign Direct Investment as % of GDP	148	0%	5,30	11,10	-4,13	100,20
Foreign Ownership of Companies	140	5,40%	4,48	0,84	2,14	6,26
Impact of Rules on FDI on Business	140	5,40%	4,45	0,79	2,05	6,57
Inward Flows of Trade	0	100%				
Market Dominance of Firms	140	5,40%	4,24	0,73	2,10	5,72
Outward Foreign Direct Investment as % of GDP	131	11,40%	2,52	8,68	-4,62	68,91
Restrictions to Trade	0	100%				
Trade Barriers	140	5,40%	4,30	0,49	2,98	5,63
Trade Tariffs	140	5,40%	22,60	5,03	1,66	29,00
Value Chain	140	5,50%	3,93	0,75	2,73	6,15
Preference Shaping						
Extent of Marketing	140	5,40%	4,34	0,68	2,41	6,04
Freedom of the Press from Economic Interests	148	0,00%	14,26	5,90	4,00	27,00
Legal Environment						
Anti Monopoly Policy	140	5,40%	4,12	0,72	2,43	5,66
Audit Reporting Standards	140	5,40%	3,35	0,86	1,42	5,48
Efficacy of Corporate Boards	140	5,40%	3,23	0,66	1,73	5,60
Investor Protection	140	5,40%	4,53	1,20	1,80	8,00

[2] Authors own calculations

Judicial Independence	140	5,40%	4,02	1,27	1,32	6,87
Protection of Minority Shareholders	140	5,40%	3,86	0,76	1,93	5,53
Extra Legal Environment						
Corruption	126	5,40%	3,19	1,19	0,50	5,00
Diversion of Public Funds	140	5,40%	4,39	1,20	1,59	6,78
Ethical Behaviour of Firms	140	5,40%	3,89	0,88	1,70	5,60
Favouritism of Government Officials	140	5,40%	4,76	0,92	2,35	6,59
Irregular Payments and Bribes	140	5,40%	3,85	1,20	1,32	5,91

3.2.3. Normalization, Missing value imputation and Multivariate Analysis

I used z scores to normalise the variables. To address missing values, I used multiple imputation (24–26) to produce 10 imputed datasets using predicted mean matching for arbitrary patterns of missingness with three nearest neighbours. This means that I use a Stata command that specifies the number of closest observations (nearest neighbours) from which to draw imputed values. The default is to replace a missing value with the "closest" observation. The closeness is determined based on the absolute difference between the linear prediction for the missing value and that for the complete values. The closest observation is the observation with the smallest difference (27). I created a complete dataset using conditional mean imputation as a robustness check.

Some of the 25 indicators used in the construction of the CPI are highly correlated with each other (See Table 3.4 in the Annex). Accordingly, it is plausible that among these 25 indicators, there are some that capture the same underlying concept. It was thus necessary to shed light on how these different indicators vary in relation to each other. I used Factor Analysis (FA) to detect the structure in the relationships among the variables (28). FA aims to describe a set of Q variables $x_1, x_2, \ldots, x_Q$ in terms of a smaller number of m factors and to highlight the relationship between these factors. The FA model assumes that the data is based on the underlying factors of the model and that the data variance can be decomposed into that accounted for by common and unique factors. It does this by transforming correlated variables into a set of uncorrelated variables using a covariance matrix. Largest factor loadings are assigned to the individual indicators that have the largest variation across countries.

The standard practice to determine which factors to retain is as follows (29) : have associated eigenvalues larger than one; individually contribute to the explanation of overall variance by more than 10%; cumulatively contribute to the explanation of the overall variance by more than 60%. (28). I applied FA to each of the10 imputed datasets and extracted between 3 and 4 factors per dataset[3]. The factor loadings, i.e. the correlations of the variables to the factor, seem to indicate the presence of five "underlying concepts" – Factor 1 (Public – Private Sector Governance) ; Factor 2 (Firms' Commercial Strategy); Factor 3 (Trade Conditions); Factor 4 (Foreign Direct Investment); Factor 5 (Election Policies vis a vis Engagement with Corporations). These show some resemblance to those based on the theoretical framework: Political Environment, Legal Environment, Extra Legal Environment and Preference Shaping Environment. The composition of the factors was fairly constant across imputed datasets as well as in the dataset imputed using a conditional mean (Tables 3.5 to 3.10 in the Annex). The factor loadings for some variables were quite similar in two or more factors i.e. they were as important in capturing the concept underlying factor 1 as they were in capturing the concept underlying factor 2. Furthermore, the criteria for factor selection meant that more often than not, factors 4 and 5 were simply dropped. The problems that these challenges present to the validity of the Index will be addressed in subsequent sections.

3.2.4. Weighing and Aggregation

[3] Tables 3.5 to 3.10 show the rotated factor loadings for individual CPI indicators on the first through fourth imputed dataset, and in the two datasets resulting from conditional mean imputation using two normalisation methods

The literature on composite indicator building puts forward several methods for weighing variables, a significant part of which entails consultation with experts. This is the case of the Budget Allocation Process or the Analytic Hierarchy Process. I decided against expert opinion based weights on technical and theoretical grounds. The technical argument is that expert opinion based weights are not recommended for large numbers of indicators as they may hinder the trade-off process among the different options (30). The theoretical argument is that the current state of the theoretical and empirical evidence on corporate permeation does not allow us to allocate a quantitative figure to each of the indicators nor to the magnitude of the trade-off between two indicators. In other words, the body of existing evidence is not sufficient to allow any expert to confidently say that media ownership is, say, 30% more important to corporate permeation than corporate funding of science.

I decided instead to source the weights from the matrix of factor loadings after rotation. The individual indicators with the highest factors loadings are grouped into intermediate composite indicators. The resulting intermediate composites, which in this case varied from one imputed dataset to another between two and four, are aggregated by assigning each a weight equal to the proportion of the explained variance in the dataset. As for the aggregation method, I chose linear aggregation, or the summation of weighted and normalized individual indicators. This is the most widespread method of aggregation used by the most commonly used composite indicators.

The formula for the CPI is thus

CPI $_{Imputed\ dataset\ 1}$ = Variance Explained by Factor 1* Factor 1+ Variance Explained by Factor 2* Factor 2 + Variance Explained by Factor 3* Factor 3

Linear aggregation implies full (and constant) compensability, i.e. poor performance in some indicators can be compensated by sufficiently high values in other indicators. Weights express trade-offs between indicators: deficits in one dimension can be offset by surplus in another. When different goals are equally legitimate and important, a non-compensatory logic may be necessary (29). Here too, I decided against compensatory methods because this would imply a judgement on the relative merits of one dimension versus another. In the case of corporate permeation where mechanisms such as the ownership of the media by corporations or the funding of science over policy decisions has not been studied exhaustively, it is nearly impossible to attribute the quantitative value to each of these tactics necessary to a non-compensatory approach.

3.2.5. Uncertainty Analysis

Because the various components of the CPI construction process can introduce uncertainty into the output, I calculated six alternative formulations varying the type of imputation (multiple imputation and conditional mean imputation) and the type of multivariate analysis (FA Weighing; FA Equal Weighing and Equal Weighing). Each of the six formulations were arbitrarily assigned a letter to distinguish them. Formulations A, AA and B use multiple imputation and Z-scores and FA Weighing, FA Equal Weighing and Equal Weighing, respectively. Formulations E, EE and F use conditional

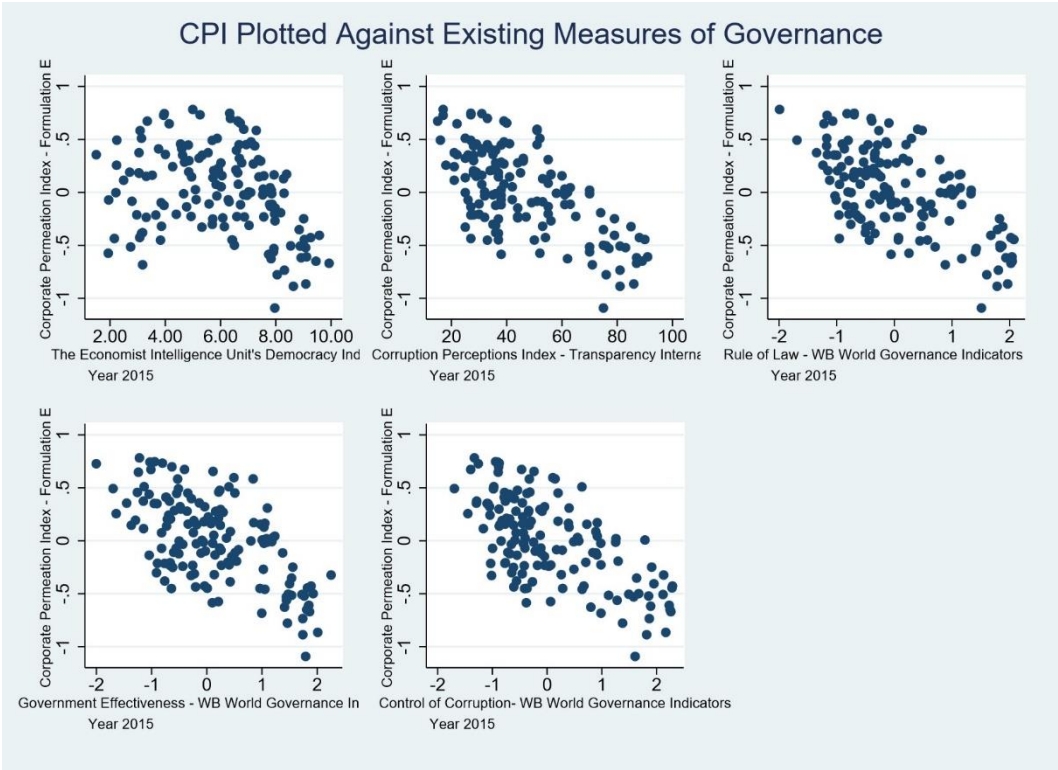
mean imputation and FA Weighing, FA Equal Weighing and Equal Weighing, respectively. The six formulations are highly correlated (Table 3.11. in the Annex).

3.2.6. Links to other Indicators- Which Components are driving the results?

As discussed in Chapter 2, measures of quid pro quo corruption or de jure institutional governance, studied in isolation, are not enough to explain Corporate Permeation in all its Dimensions. The multivariate analysis methods used to produce some of the CPI formulations deserve a word of caution because they may produce indicators that award undue weight to such measures of quid pro quo corruption or de jure institutional governance. The need for caution arises because these multivariate analysis methods consist of a reduction of the dimensionality of the data to fewer components or factors which measure unique "statistical" dimensions in the data. Some authors argue, however, that "the disadvantage of using this approach to weighting is that the correlations do not necessarily correspond to the real-world links and underlying relationships between the indicators and the phenomena being measured"(31). The authors of the EAPAI, an alcohol policy measure for European countries, for example, go a step further and attribute equal weights to all items on their Index because "(A)ll meaningful items in the European Action Plan to Reduce the Harmful use of Alcohol, regardless of their statistical contribution ought to be retained in the composite indicator as an indication of their practical importance" (32). In this light, it is possible that formulations of the CPI that rely on FA based weights, for example, may be capturing a limited number of Dimensions of Corporate Permeation. In what follows I will explore the differences and similarities between the CPI and existing measures of corporate undue influence.

I took CPI Formulation E (calculated using FA and weights derived from FA) and plotted it against known measures of governance and of corporate governance (Figures 3.1 to 3.9).

Figure 3. 1. CPI and traditional measures of Governance



It is possible that what is driving these associations is the higher weight being put on the first Factor, the one translating "Public – Private Sector Governance", given that its variable composition overlaps to some extent with that of these Indicators.

The figures that follow explore both the associations among the Factors and that of each Factor with the existing Indexes. The aim is to shed light on what is driving the correlation.

The “Public Private Governance” component seems to be driving the correlations. This explains the correlations observed in Figure 1, as a higher weight was placed on that factor.

Figure 3. 2. Correlations between CPI constituent Factors and Transparency International’s (TI) Corruption Perceptions Index

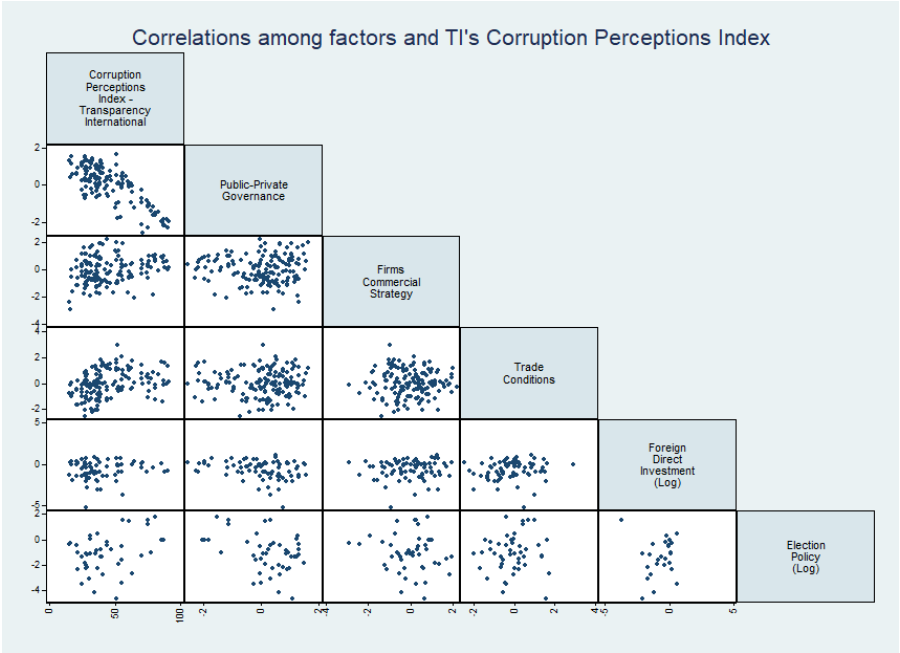


Figure 3.3.Correlations between CPI constituent Factors and World Governance Indicators – Control of Corruption

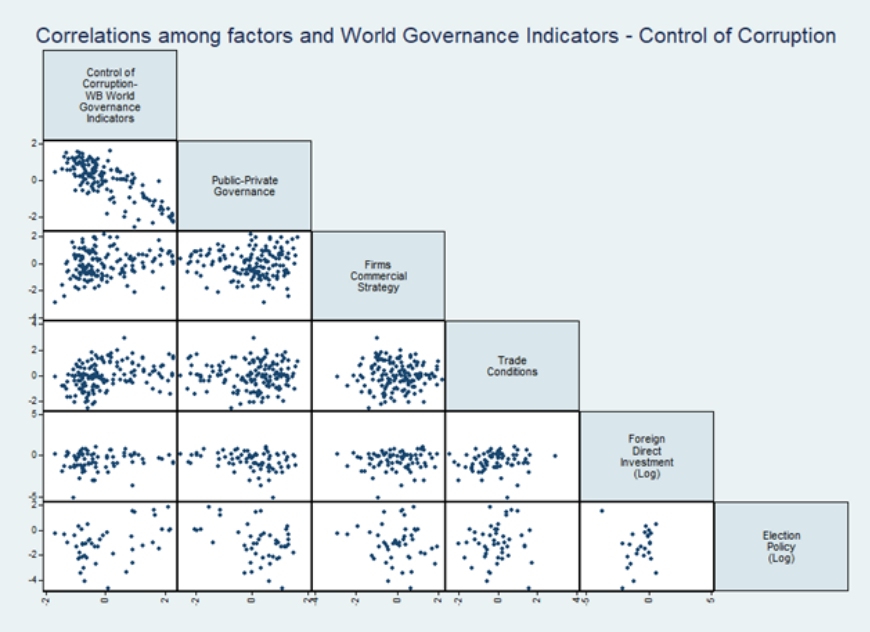


Figure 3. 4. Correlations between CPI constituent Factors and World Governance Indicators – Rule of Law

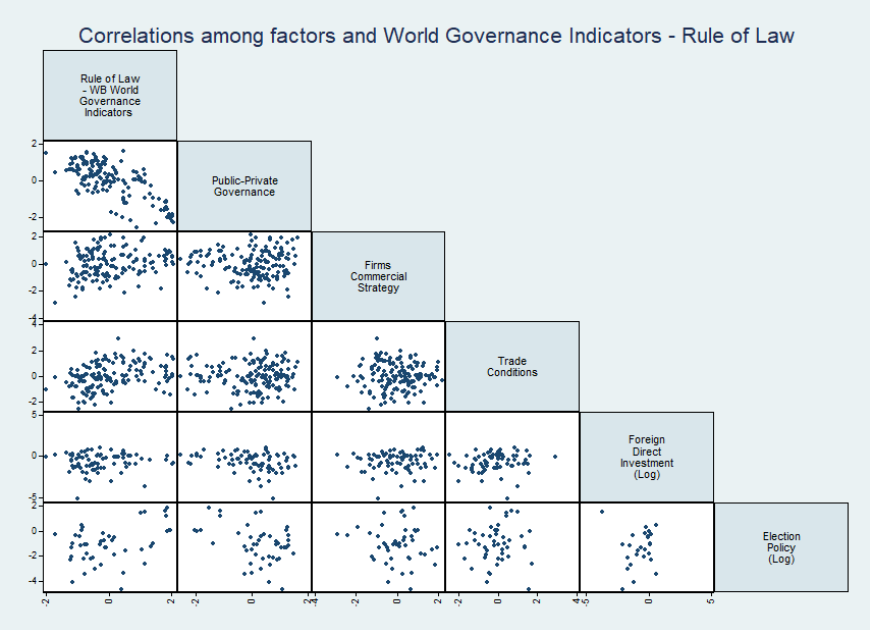


Figure 3. 5. Correlations between CPI constituent Factors and World Governance Indicators – Regulatory Quality

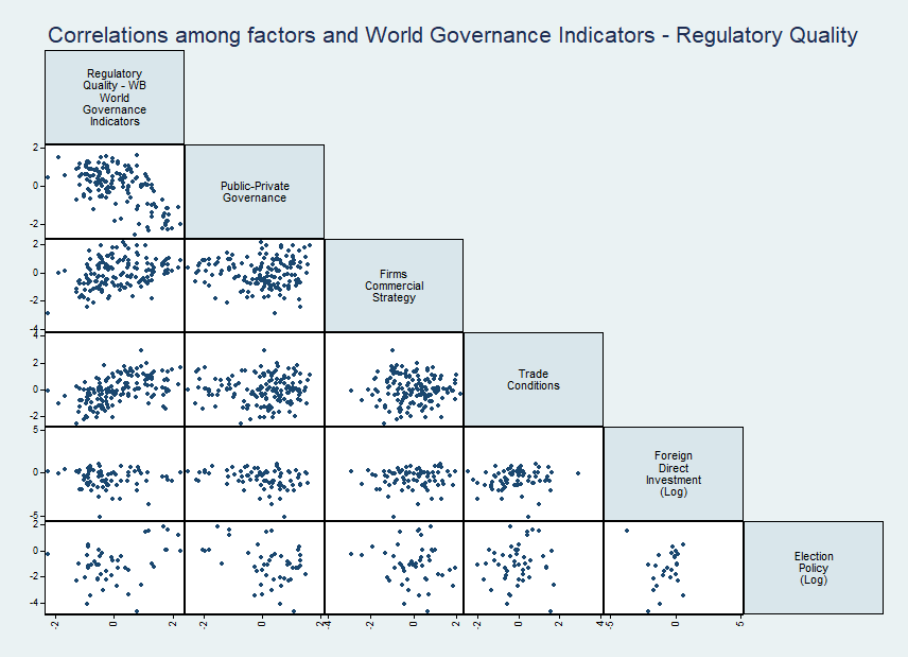


Figure 3. 6. Correlations between CPI constituent Factors and EOS- Corporate Governance Index

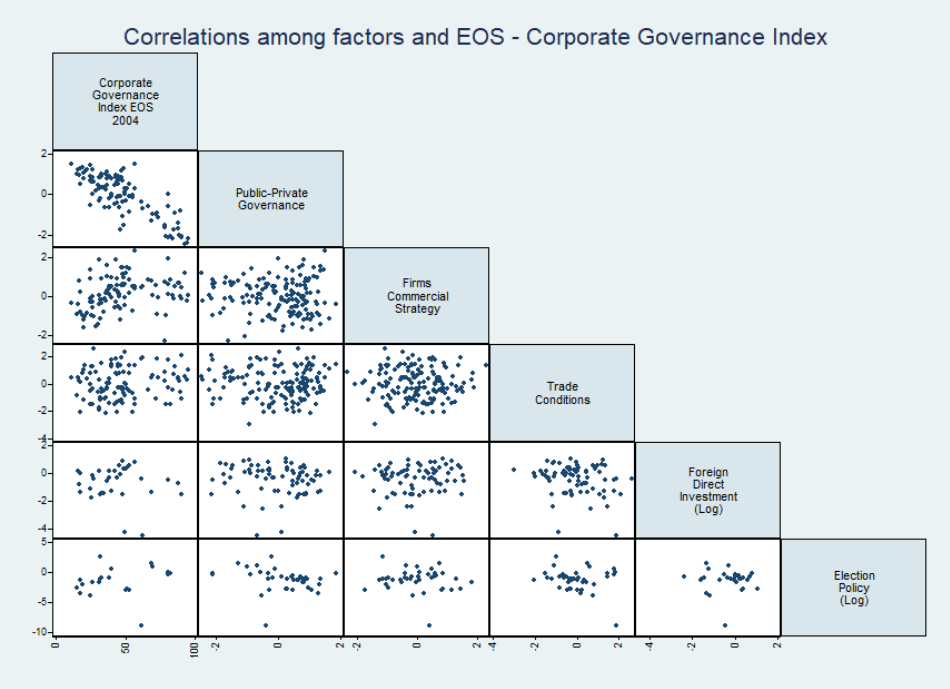


Figure 3. 7. Correlations between CPI constituent Factors and EOS – Public Sector Ethics

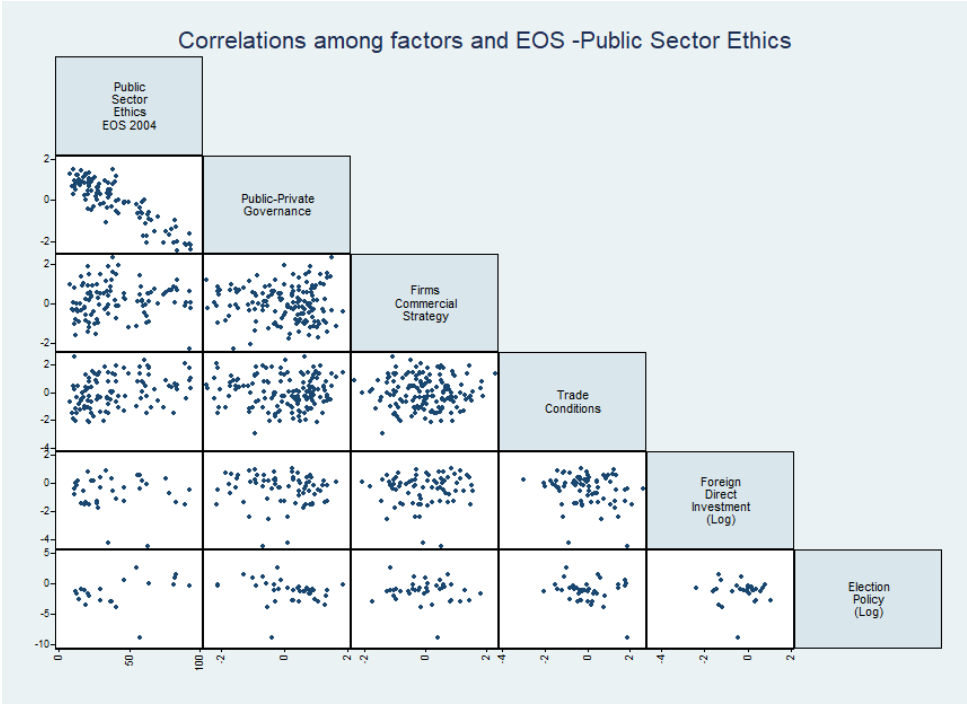


Figure 3. 8. Correlations between CPI constituent Factors and EOS Corporate Legal Corruption

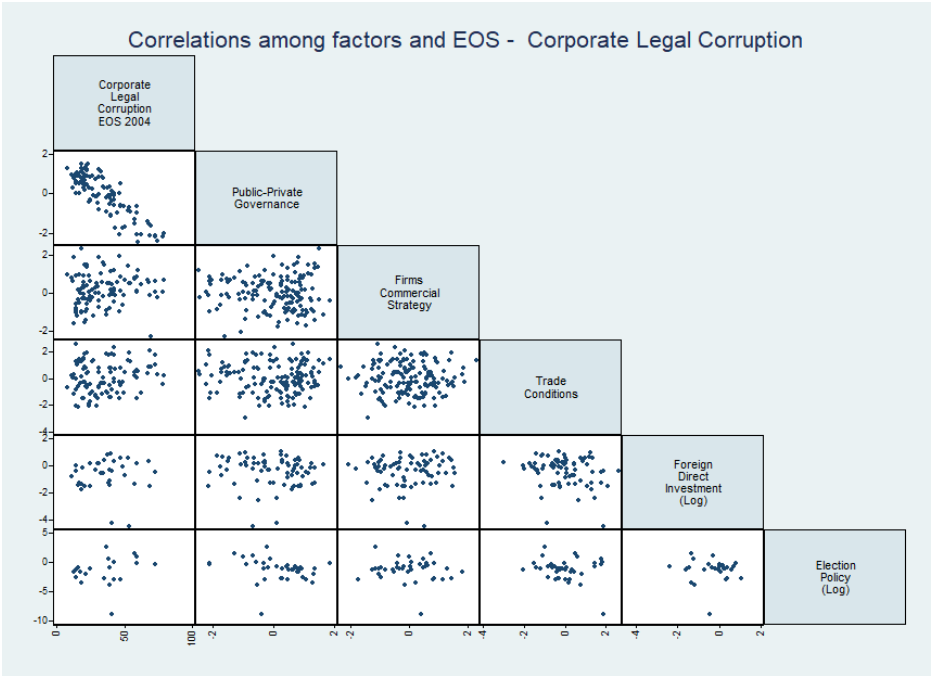
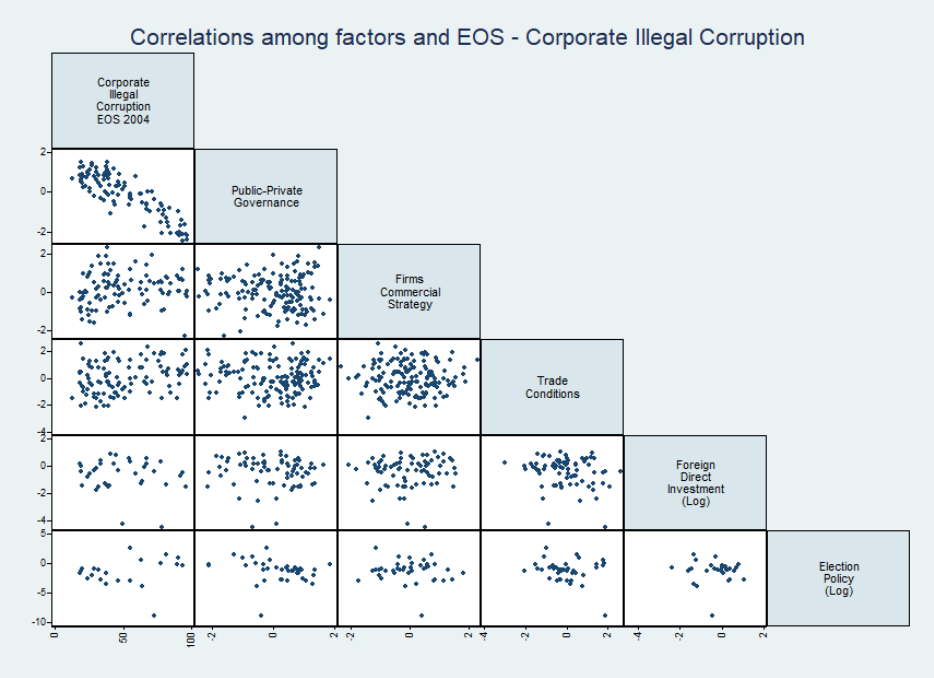


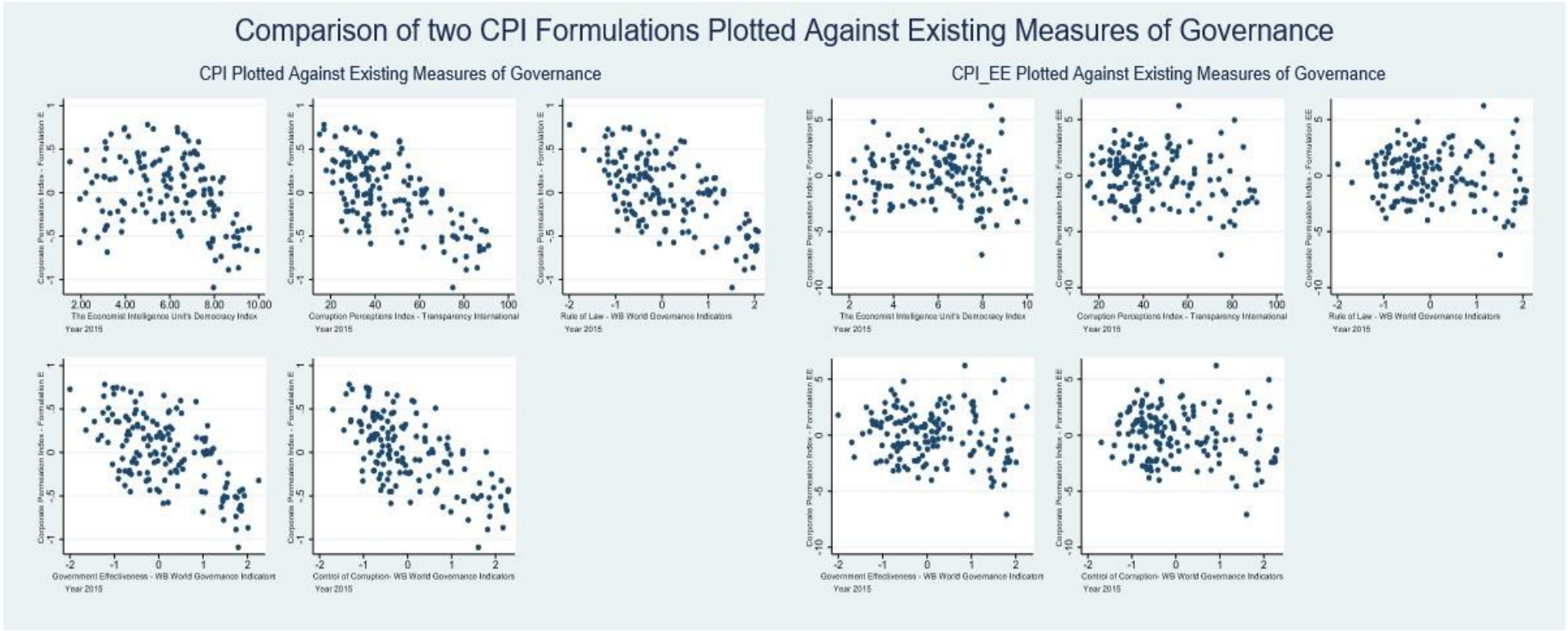
Figure 3. 9. Correlations between CPI constituent Factors and – EOS Corporate Illegal Corruption



The next step was to use a formulation that relied on equal weights (CPI_EE) and see if the patterns of associations with the known measures of governance changed. Figure 3.10 illustrates that different weighting systems/ formulations may potentially capture different aspects of corporate permeation as strength of the correlation with traditional measures of governance is substantially reduced.

In the next section, I will discuss selected country ranks in terms of the formulation from which they arise in the context of what is known about corporate permeation in the country in question.

Figure 3. 10. Comparison of two CPI formulations



3.3. Results

Graphs 1 to 6 show the rankings for all six index formulations. The blue rectangle represents the median of all scores obtained with different formulations and the red rectangle represents the score obtained with the EE formulation (equal weighing) (Graphs 1 to 6). Countries are ordered according to the median of all scores, from the lowest to the highest.

[Insert Graph 1 to 6 here]

In order to better understand the CPI, I focus here on countries in the fourth and first quartile of corporate permeation (calculated after ranking the countries by the median of the value of each formulation), discussing the countries in each quartile and the extent to which the CPI captures realities.

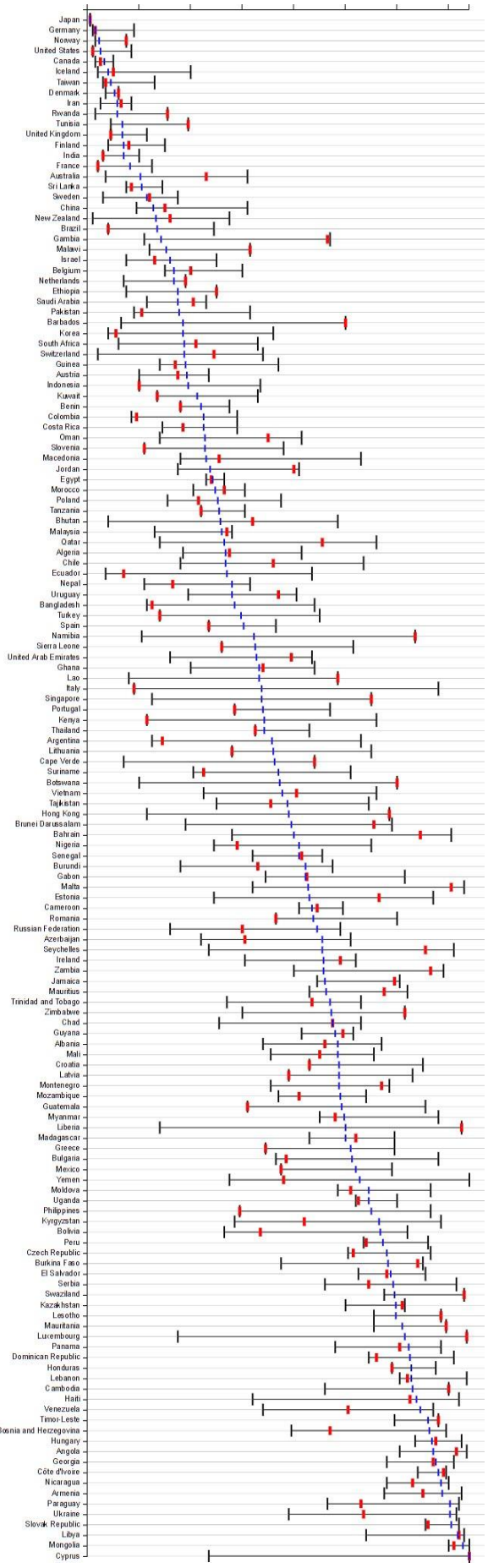
First quartile – Low Corporate Permeation

The top quartile of countries with low corporate permeation comprises the 30 lowest ranking countries. Within the first quartile, in 2010 for example, Japan shows the lowest permeation and Saudi Arabia the highest (Graph1 Although high-income countries are overrepresented in the first quartile of ranked countries, they are also represented in the fifth quartile.

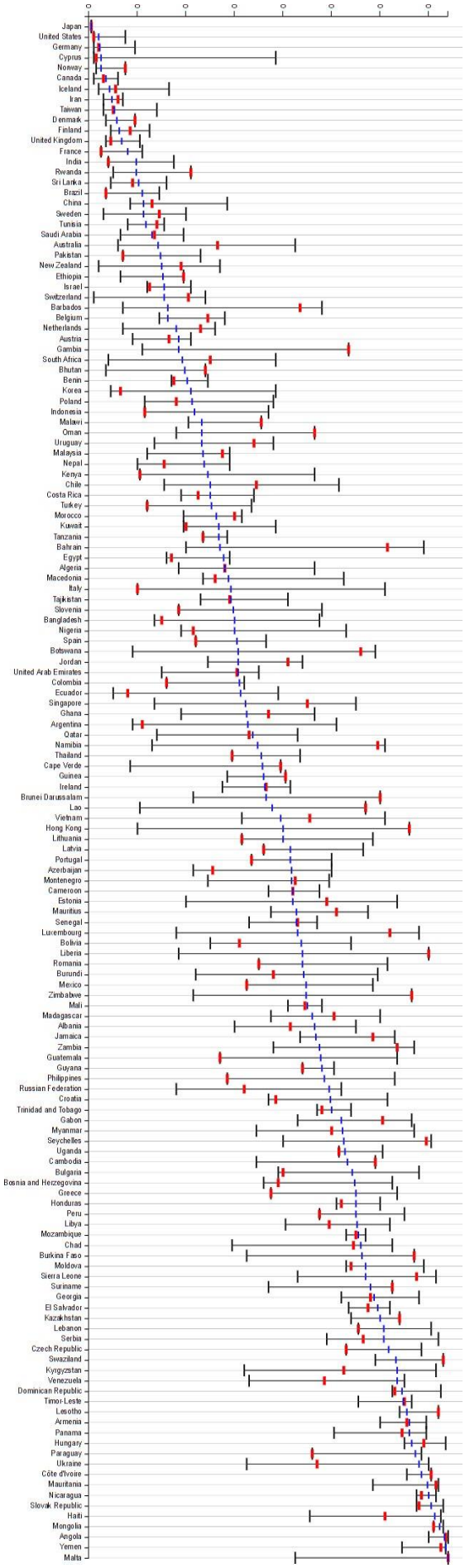
Fourth quartile, high permeation index

The fourth quartile of the permeation index is populated with countries from across the development and geographic spectrum. It is an interesting finding that the high-income countries among the highest ranks are tax havens –Luxembourg, Malta, Cyprus, Ireland (in some years).

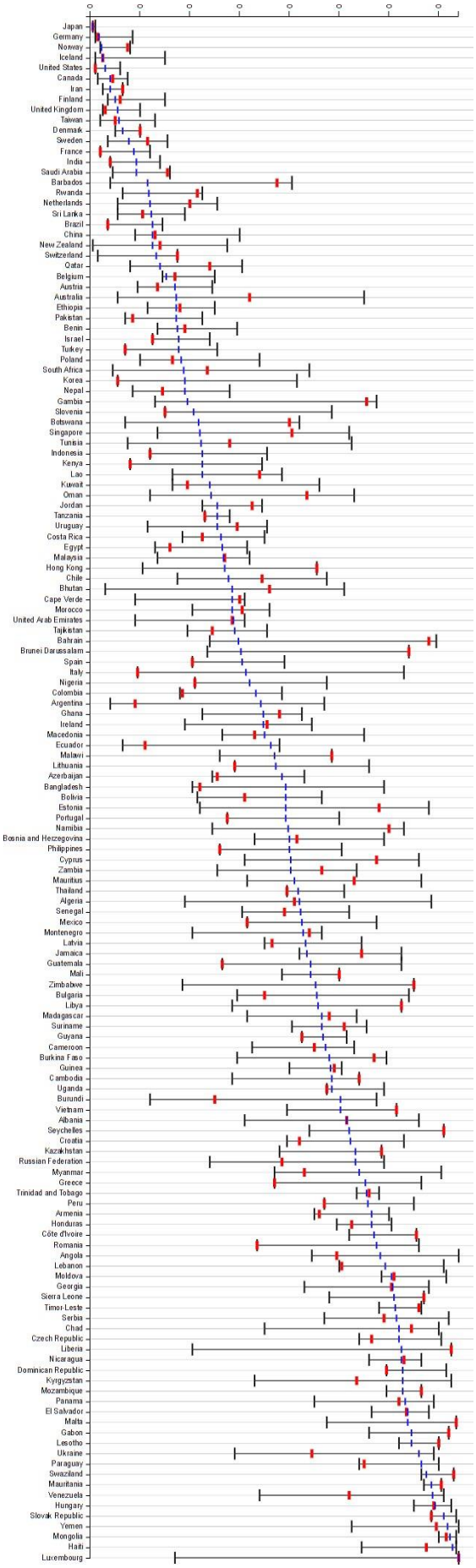
The geographic distribution of corporate permeation does not reflect regional lines; within some regions, median scores vary tremendously. In fact, I find more intraregional variability than international variability (Table 3.12)



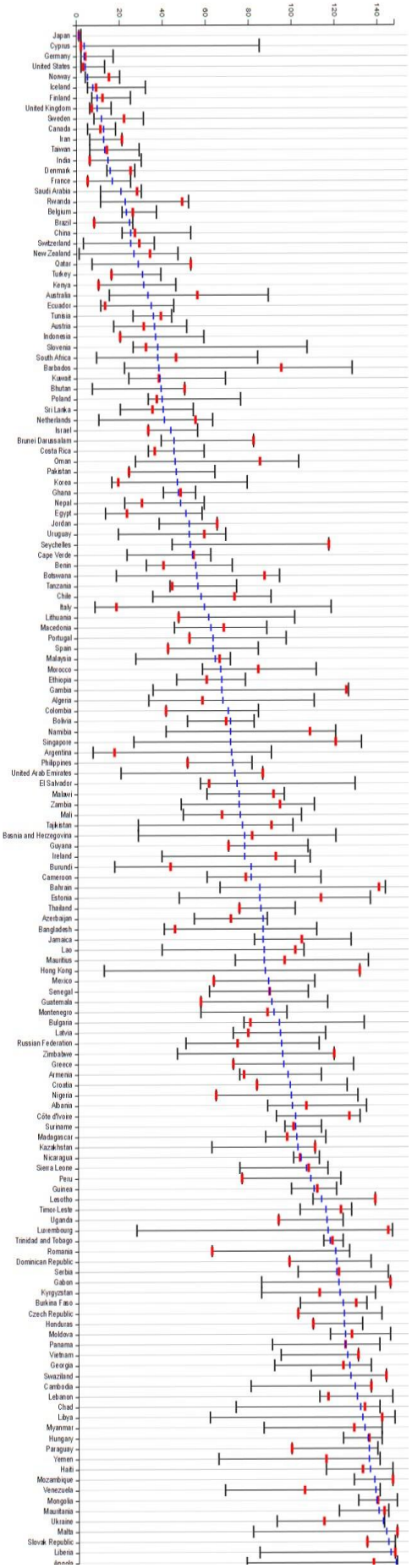
Graph 1. CPI in 2010



Graph 2. CPI in 2011

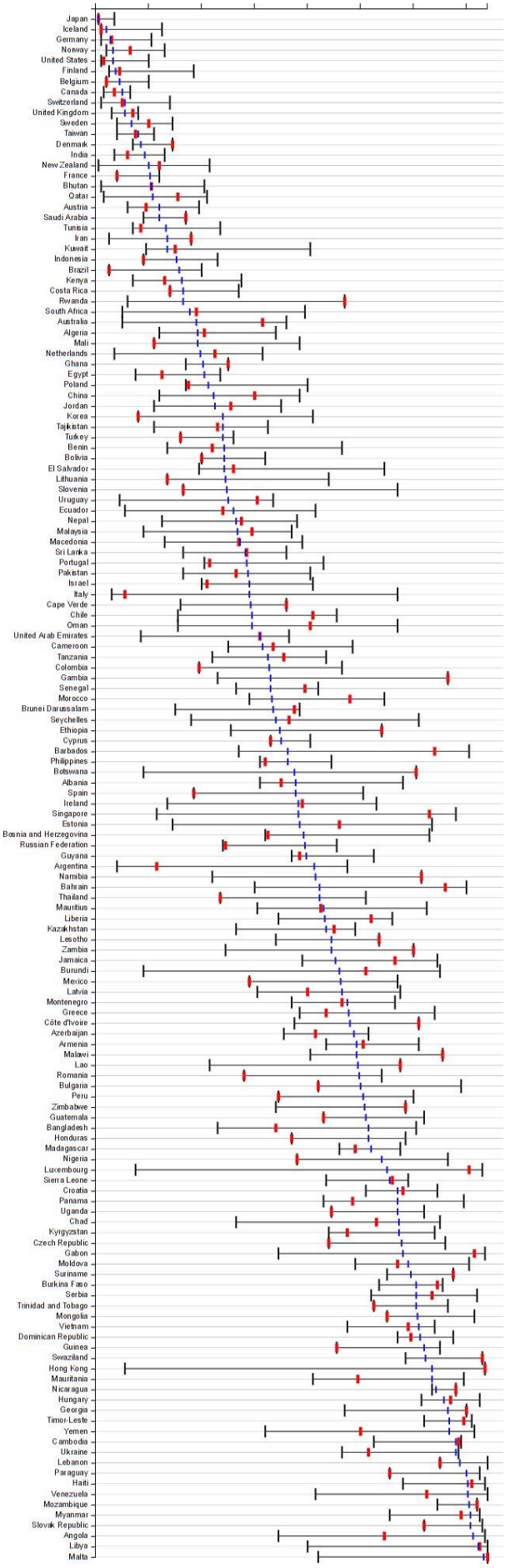


Graph 3. CPI in 2012

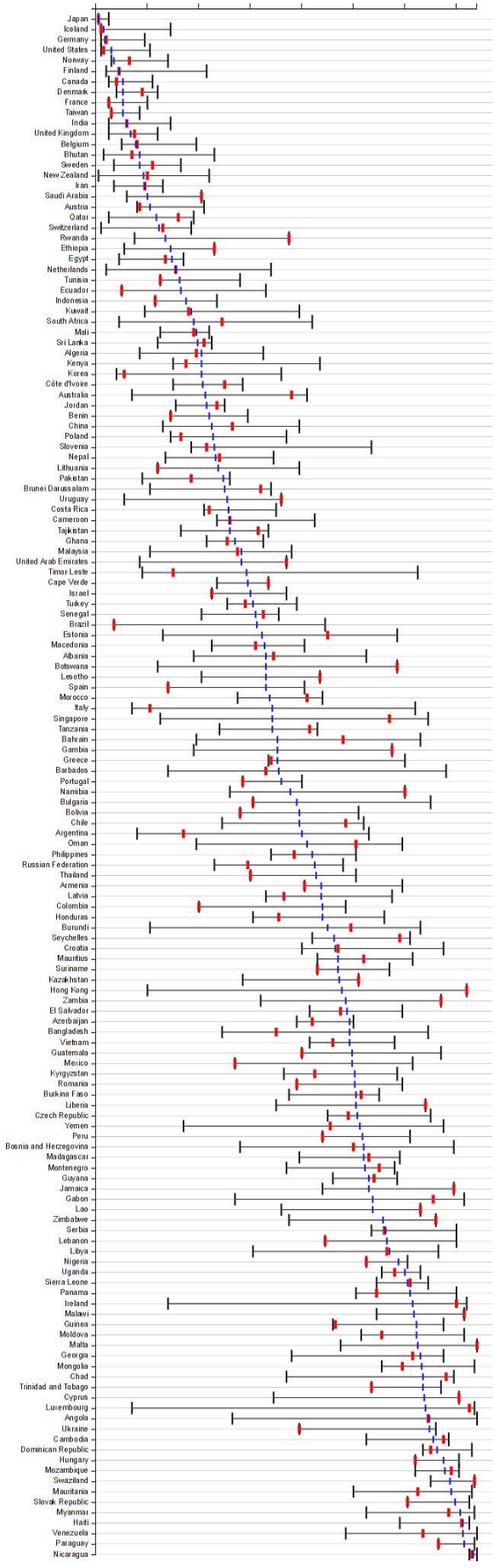


Graph 4. CPI in 2013

Arg



Graph 5. CPI in 2014



Graph 6. CPI in 2015

3.4. Discussion

First quartile – Low Corporate Permeation

Iceland features consistently in the lowest quartile for corporate permeation. This may come as a surprise, given the collapse of the country's banking system in the early days of the 2007 financial crisis that exposed a lack of transparency and accountability in the financial services industry. I would argue, however, that the low ranks reflect how a country responded to the crisis. In other words, all CPI formulations include variables that paint a multidimensional picture of corporate power in Iceland, including the country's response to this crisis of transparency and accountability with an independent judiciary and media. For example, while some countries like the US and France convicted low ranking financial cadres following the 2007 crisis, in Iceland, bank chief executives received convictions and jail terms. Iceland's response in the aftermath of the financial crisis sheds light on the weak corporate permeation of its financial sector, especially when compared with other severely affected economies such as those of the European Union or the United States where brokered deals managed to avert lawsuits (33). For example, in 2013 Eric Holder, the former US Attorney-General, explained his reticence to prosecute large banks:

> "When we are hit with indications that if you do prosecute , it will have a negative impact on the national economy, perhaps even the world economy." (34)

He later backtracked but, so far, no chief executive at a big US or European bank has been prosecuted in the aftermath of the collapse of the financial sector ten years ago.

Iceland's attitude towards international financial institutions highlights the limits of corporate permeation of the banking and financial services sector. The International Monetary Fund's (IMF) rescue package prescribed that the Icelandic Government would assume liability for the banks' losses, which would have resulted in 50% of the national income between 2016 and 2023 being paid to the UK and Dutch Governments. The Icelandic president refused to approve the deal stating:

> "Ordinary people, farmers and fishermen, taxpayers, doctors, nurses, teachers, are being asked to shoulder through their taxes a burden that was created by irresponsible greedy bankers" - President Olafur Ragnar Grimsson (35)

While, arguably, the CPI may be trusted to portray limited corporate permeation in Iceland, the low-ranking positions of some other high-income countries such as the United Kingdom, who ranked 12 in 2010, is more surprising. Holden and Lee document how in the late 1990's New Labour "did not require the protestations and representations of business to place corporate interests centre stage: perceived structural pressures were enough to drive the party's corporate centred social policy." (36)

> "When I last addressed the CBI's National conference, I promised a new partnership between New Labour and business. Six months into office, we have laid the foundations of that partnership. There are business people bringing their experience and expertise by serving in Government, on Advisory Groups, leading task forces, all contributing to the success of Government policy. But there is also great commitment and enthusiasm, right across the Government, for forging

> links with the business community. That this is the approach of a Labour government is of historic importance. It demonstrates we are entering a new era in British politics. (Tony Blair, Speech to the CBI Conference, 11 November 1997)" (cited in Farnsworth & Holden 2006 p.481)

It is therefore plausible that the CPI fails to fully capture all aspects of corporate permeation in the UK, namely, the first two vehicles of corporate power in the corporate power framework – Political Environment and Preference Shaping. In other words, the CPI does not incorporate any variables that could feasibly measure a government's ideological proclivity to "place corporate interests centre stage" nor does it incorporate variables that lend quantitative support to that proclivity. These include volumes of corporate donations to parties and election candidates, prevalence of revolving doors between cabinet members and business, the dominance of business representatives in advisory committees (versus a balanced representation of other social actors) , funding of think tanks that take advisory roles to government and government officials owning stock in corporations and using insider information from their official roles in hearings, to personally benefit and use their influence to support corporations

Similarly, Germany's and the US's relatively low positions are striking because an abundance of research documents strong ties between the corporate sector and virtually every sphere of public and private life in both countries. In the US, the ultimate expression of these ties is found in the increasing legal personification of corporations (37). Recent US Supreme Court Rulings in *Citizens United* and *Hobby Lobby* expanded

corporations' First Amendment rights. *Citizens United* grants corporations the right to make unlimited campaign donations, while *Hobby Lobby* protects corporations' religious freedom by allowing corporate religious objections to carve out exceptions to federally mandated guarantees i.e. insurance coverage for birth-control mandated by the Affordable Care Act (38).

It is possible that the US's rank range from number 2 to number 30 sheds some light on this apparent dissonance between documented and quantified corporate power. The US's highest CPI score of 30 is obtained when I attribute higher weights to Factors 1 and 2, factors that capture Public – Private Sector Governance and Firm Commercial Strategy, respectively and lower weights to factors that measure Trade Conditions, Foreign Direct Investment and Election Policies. This finding, to some extent, is consistent with the US corporate power literature as most of the empirical studies document state capture. The Factors pertaining to Trade and FDI are arguably less accurate at predicting permeation within US borders than they are in predicting permeation within the borders of US trade partners, which explains why their inclusion yields a lower ranking.

Germany's relative low CPI rank also deserves some discussion. On one hand, low CPI ranks may be explained by the composition of the German economy. More than 99 %of German companies are small and medium enterprises - in absolute figures, more than 3.6 million companies, providing more than 60 percent of all jobs (39). Although Germany does have some world market leaders such as Volkswagen and Siemens, they are fewer than would be expected given the size of the economy. It is plausible that the CPI questions, chosen deliberately to grasp permeation by large international conglomerates

fail to capture permeation by national small and medium enterprises. On the other hand, both of Germany's Fortune 500 corporations -Volkswagen and Siemens - have been involved in high profile corporate corruption scandals that revealed close ties between government and the corporate sector on the national and international stages (13,14). As it was the case with the UK, it is likely that the absence of measures of corporate donations, revolving doors, prevalence of corporate members in advisory committees, and insider trading explains part of the CPI's failure to portray this layer of government and institutional permeation.

Bhutan is worth highlighting as a low middle-income country that consistently features among the lowest CPI ranks over the years, especially after 2013. Its score ranges are relatively narrow, lowest ranks tend to be produced by formulations that weigh all indicators equally and highest ranks by those that attribute more weight to the Public Private Governance Factor. Low scores on Factors capturing Firms Commercial Strategy, Trade Conditions and FDI are unsurprising given the country's history of isolation. It was never colonised and it did not join the United Nations until 1971. Its broadcasting company was launched in 1973 and it was the last country in the world to introduce television in 1999. Its integration into the globalised economy has been slow – its trade and other economic relationships are, for the most part, confined to India, Bangladesh and Nepal, and a few countries outside the region. Moves towards economic liberalization have been cautious with ascension to the World Trade Organization currently underway. According to the World Bank, Bhutan's economy remains dominated by state owned enterprises with the private sector contributing only eight

percent to the national revenue (40). The country has also adopted a unique and people centred approach to its socio-economic development that promotes population wellbeing over material development making Bhutan the first country in the world to pursue happiness as a state policy (41). The perceived extent of corruption in Bhutan is low and this is expressed consistently across different national and international survey instruments (42). More encompassing formulations of the CPI are thus more likely to capture this holistic approach to development and bring the country down in the permeation ranks.

India, China and Brazil's relative low scores are interesting findings given the high incidence of corruption scandals in all three countries. The results are consistent, however, with each country's protectionist trade policy. High levels of protectionism mean enhanced trade barriers for foreign companies, including large corporations. This is not to say that domestic companies do not attain high levels of permeation, just that the CPI is not as well equipped to detect domestic permeation. The ranges of these countries back this hypothesis. In India and in Brazil, maximum scores are obtained with calculations that attribute higher weights to Factor 1 (Public – Private Sector Governance) and lower weights to factors related to trade policies and FDI. The lowest scores are obtained with approaches that weigh all factors equally, so that the protectionist nature of their trade policy is more prominent and is translated into lower permeation.

It is worth singling out Brazil among low-ranking countries. The impeachment of Brazil's former President on the grounds of corrupt relations, the subsequent accusations of corruption pending over half of the members of the senate, the police force, and the President who subsequently took office, may *prima facie* raise concerns about the plausibility of its low position. On the other hand, a closer examination of Brazil's exercise of soft power in the international arena to defy large corporate interests and to assist other developing countries in following suit may lend some credibility to its apparent low corporate permeation. Brazil's involvement in the Framework Convention on Tobacco Control (FCTC) and in challenging Intellectual Property Rights over antiretroviral drugs at the WTO may also explain this apparent low level of permeation. During negotiations for the FCTC, Brazil set a strong example, as its National Tobacco Control Programme implemented many innovations: Brazil was the second country (after Canada) to adopt graphic warnings on cigarette packages, the first to create a body to regulate tobacco contents and emissions, and the first to ban the use of ''light'' and ''mild'' to describe tobacco products (43). Of relevance to this discussion is the fact that Brazil is one of the biggest producers and exporters of tobacco. In the words of Brazil's then coordinator of the National Tobacco Control Programme, Vera Luiza da Costa e Silva,

> "To be a big producer, a big exporter with a strong and influential industry, and a big consumer market for tobacco products, with pressures in the domestic market generated by allies of a powerful industry, Brazil actively supported all the WHO resolutions that led to the creation of the Intergovernmental Negotiating Body. "(43)

Brazil opposed large US-backed pharmaceutical companies who brought a WTO panel against Brazil for infringement of Intellectual Property Rights on antiretroviral drugs (ARVs). In the early 90's Brazil provided universal coverage of antiretroviral drugs to HIV patients at zero cost. The affordability of this strategy hinged largely on domestic production of the drugs in a mix of state pharmaceutical enterprises and private generic manufacturers. Brazil purchased the remaining drugs on the international market, where the government sought to negotiate the best possible prices with international pharmaceutical companies (Galvão 2002). This included the threat of issuing compulsory licenses for ARV. In 2001, the WTO accepted a request for a panel by the US, who challenged Brazil's patent laws that permit the compulsory license of patents under special conditions. Brazil fought the challenge and, in June 2001, the US withdrew its complaint before the WTO (45) (46).

Fourth quartile, high permeation index

Among the first group, Luxembourg is particularly interesting because it has a very wide range of ranks, going from 31 to 147 in 2010 and 11 to 148 in 2015. In both years, the lowest ranks are obtained with the formulation that attributes the highest weights to factors that capture traditional quid pro quo corruption, the Public Private Sector Governance Factor. The highest ranks were obtained with formulations that weighted all indicators equally. The former is unlikely to singlehandedly capture the type of corporate permeation that put the country in the international spotlight for its role in facilitating large scale tax evasion. The so called "sweetheart deals" it secured with the world's largest corporations were not overtly illegal. For example, in 2003 Amazon secured a confidential deal from the Luxembourg tax authorities. In 2014 that deal became the

subject of a formal investigation by the European Commission on whether it constituted state aid (47). On the nature of the relationship between the company, the Luxembourg government and the then Prime Minister, Jean Claude Junker, Amazon's former head of tax said

> "The Luxembourg government presents itself as business partner, and I think it's an accurate description: it helps to solve problems." (…) [Jean Claude Junker and top civil servants' message was:] "If you encounter problems which you don't seem to be able to resolve, please come back and tell me. I'll try to help" (48)

In sum, formulations that relied more heavily on indicators of traditional illegal corruption seemed to fail to capture undue but borderline legal corruption. On the other hand, formulations that treated a wider range of variables on equal footing seem to better lend a quantitative explanation to the qualitative evidence of corporate permeation. This interpretation of ranges in light of the components of their underlying formulations can be used to analyse the wide score ranges in, for example, Ireland where similar tax deals have been documented.

Limitations of the CPI

The CPI has a number of limitations. First, we were unable to find comparable indicators for each of the "Enablers" of Corporate Power which means that some "Vehicles" of Corporate Power are better represented and characterized than others in the CPI. Second, the reliance on opinion surveys such as the EOS introduces a number of biases. Third, the time span of only six consecutive years may not be entirely informative.

I was unable to find comparable indicators for all the Enablers of permeation of the political environment. Quantitative measures of undue influence such as "lobbying, revolving-doors, and donations to political parties, candidates and campaigns" and "Direct participation in governmental agencies, committees and policy formulation" are particularly, if not impossible to find, especially in formats that render these measures comparable across countries. Data on financial contributions to parties, candidates, and election campaigns are not always systematically collected at the country level. Some exceptions should be noted such as the case of the Centre for Responsible Politics Lobbying Database in the US, who collects data on lobbying resources by company, lobbying firm or individual lobbyist. It also tracks total spending by a particular industry; the interests that lobbied a particular government agency and lobbying on a general issue or specific piece of legislation(49). This initiative illustrates that it is possible to systematically track money and human resources invested in lobbying, and, pending more countries requiring such reporting, wider geographic data sources could make the CPI more accurate. As it stands, where information exists, accuracy in reporting may vary from industry to industry and from institution to institution. Further, comparability among the few countries that do collect and report financial contributions is impractical at best. Lobbying, almost by definition [4], is a difficult activity to observe and quantify. Nonetheless, a wealth of public health research has drawn links between lobbying efforts and health research and health policy outcomes(50–54)

[4] Lobbying is any direct or indirect communication with public officials, political decision-makers or representatives for the purposes of influencing public decision-making, and carried out by or on behalf of any organised group"

Industries deploy diverse lobbing techniques, from open participation in consultative processes to direct communications with decision-makers to organizing sometimes intentionally misleading grassroots campaigns. Further, a notable portion of influencing efforts occur outside of any formal participatory or consultative channels, drawing on informal relationships and a variety of social interactions. Again, many of these communications and interactions are "by design" kept off the record. One attempt by Transparency International to quantify undue influence in the EU found that the vast majority of countries have no comprehensive regulation of lobbying. Few countries have any requirements on the public sector to record information about their contacts with lobbyists and lobbying interest groups. Documented information is frequently too narrow or sporadic, and is rarely, if ever proactively released to the public. Where they exist, lobby registers are not coupled with meaningful oversight mechanisms. Although the majority of EU states have some revolving door regulations requiring a 'cooling-off' period before former public officials can lobby former colleagues, no state has effective monitoring and enforcement of these provisions (55). Moreover, lawyers have been particularly reluctant to identify themselves as lobbyists and have argued that transparency requirements would violate lawyer-client privilege. Of the approximately 7,000 organisations registered in the EU's voluntary Transparency Register, only 88 are law firms.

Most countries regulate participation in public consultations, but implementation is usually inconsistent across governments, and in no states have comprehensive

requirements to provide detailed explanations regarding decision-making processes. A potentially interesting proxy for the "capacity" for undue influence is the prevalence of public-private partnerships. Outsourcing of public services, secondments into the public sector, and the use of advisory bodies all carry the risk of lobbying from the "inside," with private actors having access to potentially privileged information and performing dual private-public functions (55,56). The World Bank keeps a database of public-private partnerships in 139 low and middle-income countries. Whilst this is very good coverage by any measure, it leaves out a substantial part of our sample i.e. developed countries. I will, however, incorporate this measure into future calculations of the CPI when the World Bank expands its country coverage.

International trade enables corporate permeation of the political environment. Fortunately, quantitative and comparable indicators for trade are more readily available than for other enablers. This is not to say that there are no limitations to the use of these indicators. Trade indicators may mean different things in terms of corporate permeation in rich developed countries than they do in poor countries as a result of the power differential in the negotiation and implementation of multilateral and bilateral trade agreements. In other words, power imbalances may mean different things in developed and developing countries. For example, countries with small populations and economies might have to grant major concessions, increasingly beyond the stipulations of the World Trade Organisation agreements, to secure even modest improvements in market access. The differential is exacerbated by the common ground fostered by corporations and national bureaucratic political elites who will advocate on their behalf. For example,

during the US negotiations for the Trans Pacific Partnership agreement, private industry and trade groups represented 85% of the committee members, vastly outweighing the representation of all other sectors such as civil society. At the supranational level, the weighting of IMF and World Bank votes by financial contribution propagates power imbalances in trade policy emanating from these institutions. Kentikelenis and colleagues argue that skilled social actors can introduce and legitimate new norms without recourse to formal processes of change. They demonstrate this by documenting how the U.S. and its allies engineered the rise of 'structural adjustment' at the International Monetary Fund in the 1980s. This entailed reorienting the organization towards intrusive, market-oriented policy reforms, even though its mandate formally precluded this approach (57). In sum, whereas the CPI encompasses objective measures of the vibrancy of trade in the different countries such as Foreign Direct Investment or the value of Trade Tariffs, they many translate different realities of corporate permeation depending on the negotiating power of the country in question in international trade negotiations or in the institutions that host these negotiations.

Indicators of "Enablers" of Corporate Permeation of "Preference Shaping" are equally hard to collect systematically in a comparable format. For example, like with public-private partnerships, it can be difficult to measure the influence of corporate interests on think-tanks and other institutions that help shape public discourse around corporate power. One survey by the Bertelsmann Stiftung on the Sustainable Development Indicators, examines this question. They ask their national informants "*To what extent are economic interest associations capable of formulating relevant policies? In order to*

formulate such policies, interest groups will draw on capabilities such as their own academic personnel, associated institutes and think tanks, or they undertake cooperative efforts with academic bodies", but only in developed countries. Future formulations of the Bertelsmann Stiftung Transformation Index, which focuses on developing countries, may include questions that capture the same concept and will be included in the next formulations of the CPI.

In sum, in the absence of objective measures of corporate undue influence, I relied on measures of *perceived* undue influence as captured by a variety of surveys. In the case of the Executive Opinion Survey, the respondents are business executives from small- and medium-sized enterprises and large companies representing the main sectors of the economy (agriculture, manufacturing industry, non-manufacturing industry, and services). This brings us to the second set of limitations of the CPI: challenges presented by these measures.

The business community may be more prone to underreporting or failing to report illicit behaviour, such as "informal lunches" with government officials, which despite their dubious connotations, may be entirely normalised and internalised within the community. There is also a risk that the reporting of illicit behaviour is inconsistent across countries. It is plausible that the business community in low and middle-income countries is composed of expatriates from high income countries. I cannot discard the possibility that business people have some inherent bias or double standards and report differently on the same phenomenon depending on whether they are in, say, countries of

the G8 or in less advanced economies. In other words, practices that would not be reported as corrupt in G8 or OECD countries, e.g. revolving doors or business lunches, could potentially be reported as such in the rest of the world. In fact, I see a similar phenomenon occurring when it comes to the enforcement of anti-bribery laws. A significant number of high income countries who perform well on bribery control domestically, have a poor record of enforcing international antibribery laws abroad (58). If I assume that business people from OECD countries, for example, are overrepresented in business communities in both countries of origin and in less advanced economies, there is potential for this reporting bias to artificially polarize countries based on valid or even unsubstantiated perceptions of corruption. Flawed as it may be, however, the EOS is still by far the most comprehensive survey of attitudes and behaviours in the international business community.

The third limitation results from the modest time coverage of only six years, from 2010 to 2015, a compromise between data availability for the largest possible number of countries and length of the "observation period." The fourth limitation regards the actual timing of the observations. Yearly differences in CPI values over just six years may not reflect long-term policy phenomena such as changes in health policy. A six year period still allows for cross-sectional analysis. The timing of the observations may pose a problem because the period coincides with either the economic crisis or its aftermath, which had diverse global affects.

Both limitations can be addressed by continuing to calculate the CPI in subsequent years.

3.5. Conclusion

The CPI is a novel tool that captures country level dimensions of the interaction between corporations and the wider society that are neglected by popular measures of quid pro quo corruption, traditionally employed by the World Bank or by Transparency International, with a focus on the public sector.

Whilst High Income Countries are overrepresented among the lowest scores, there is no clear regional pattern, with scores showing as much intra-regional as interregional variability.

Even though the CPI adds value to the study of the interface between corporate and public governance, country rankings must be examined with caution. The CPI does not accurately measure aspects of illicit corporate behaviour that became licit through processes of "privatization of the public policy", including, for example amounts spent on lobbying at the country level or the frequency of revolving doors between the public and the private sector. This highlights the need for devising and strengthening legislation around mandatory reporting of lobbying activities and provisions of cooling off periods between employment in the public and the private sector, to name a few. Similarly, CPI gaps highlight the urgent need for robust monitoring and data collection systems for existing legal provisions.

In the future, the CPI may be used to explain variations in alcohol consumption and provide alternative explanations to the arguments that differences in alcohol consumption across countries are attributable to culture. Similarly, it can also be used to explain variations in obesogenic diets and the proliferation of gambling outlets. The CPI

can also be used to explain variations in the formulation and implementation of public health policy and shed light on the associations between corporate permeation and the quality of public policy and the ability of health policy to mitigate against pressures from commercial interests to boost the consumption of unhealthful products. The CPI can also shed light on the role of corporate permeation in polarizing inequalities in the strictness and comprehensiveness of health policies among countries and in the prevalence of risk factors both between and within countries. Lastly, the CPI can be used as a monitoring tool for advocates and public health practitioners to track the relative progress of their countries in tackling the commercial determinants of health.

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3.6. Annex

Table 3. 2 Checklist of step by step construction of a composite indicator (adapted from "OECD Handbook on Constructing Composite Indicators")

STEP	***Why is it needed?***
0.Theoretical Framework Provides the basis for the selection and combination of variables into a meaningful composite indicator under a fitness-for-purpose principle	• To get a clear understanding and definition of the multidimensional phenomenon to be measured. • To structure the various sub-groups of the phenomenon. • To compile a list of selection criteria for the underlying variables, e.g., input, output, process.
1. Data selection Should be based on the analytical soundness, measurability, country coverage, and relevance of the indicators to the phenomenon being measured and relationship to each other. The use of proxy variables should be considered when data are scarce (involvement of experts and stakeholders is envisaged at this step).	• To check the quality of the available indicators. • To discuss the strengths and weaknesses of each selected indicator. • To create a summary table on data characteristics, *e.g.*, availability (across country, time), source, type (hard, soft or input, output, process).
2. Imputation of Missing Data Is needed in order to provide a complete dataset (e.g. by means of single or multiple imputation).	• To estimate missing values. • To provide a measure of the reliability of each imputed value, so as to assess the impact of the imputation on the composite indicator results. • To discuss the presence of outliers in the dataset.
3. Multivariate analysis Should be used to study the overall structure of the dataset, assess its suitability, and guide subsequent methodological choices (e.g., weighting, aggregation).	• To check the underlying structure of the data along the two main dimensions, namely individual indicators and countries (by means of suitable multivariate methods, *e.g.*, principal components analysis, cluster analysis). • To identify groups of indicators or groups of countries that are statistically "similar" and provide an interpretation of the results. • To compare the statistically determined structure of the data set to the theoretical framework
4. Normalisation Should be carried out to render the variables comparable**.**	• To select suitable normalization procedure(s) that respect both the theoretical framework and the data properties. • To discuss the presence of outliers in the dataset as they may become unintended benchmarks. • To make scale adjustments, if necessary. • To transform highly skewed indicators, if necessary.
5. Weighting and aggregation Should be done along the lines of the	• To select appropriate weighting and aggregation procedure(s) that respect both the theoretical framework and

underlying theoretical framework.	the data properties. • To discuss whether correlation issues among indicators should be accounted for. • To discuss whether compensability among indicators should be allowed.
6. Uncertainty and sensitivity analysis Should be undertaken to assess the robustness of the composite indicator in terms of e.g., the mechanism for including or excluding an indicator, the normalisation scheme, the imputation of missing data, the choice of weights, the aggregation method**.**	• To consider a multi-modelling approach to build the composite indicator, and if available, alternative conceptual scenarios for the selection of the underlying indicators. • To identify all possible sources of uncertainty in the development of the composite indicator and accompany the composite scores and ranks with uncertainty bounds. • To conduct sensitivity analysis of the inference (assumptions) and determine what sources of uncertainty are more influential in the scores and/or ranks.
7. Back to the data Is needed to reveal the main drivers for an overall good or bad performance. Transparency is primordial to good analysis and policymaking.	• To profile country performance at the indicator level so as to reveal what is driving the composite indicator results. • To check for correlation and causality (if possible). •To identify if the composite indicator results are overly dominated by few indicators and to explain the relative importance of the sub-components of the composite indicator.
8. Links to other indicators Should be made to correlate the composite indicator (or its dimensions) with existing (simple or composite) indicators as well as to identify linkages through regressions.	• To correlate the composite indicator with other relevant measures, taking into consideration the results of sensitivity analysis. • To develop data-driven narratives based on the results.
9. Operationalisation of the CPI against measures of policy implementation A study of how the extent of health policy implementation varies in function of how countries perform in the CII.	Alcohol Control Policy Implementation: A measure of implementation of alcohol control policies in 167 Countries of the WHO European Region in 2012
	Tobacco Control Scale developed by (59) and a measure of compliance with national smoke free regulations collected by the World Health Organisation.

Table 3. 3. Data sources

Institution	Data	Description
World Economic Forum	Executive Opinion Survey	Every year since 1979, the World Economic Forum conducts the Executive Opinion Survey (EOS). Each year, executives in over 144 economies are surveyed.
IDEA International Institute for Democracy and Electoral Assistance	International IDEA's database on Political Finance	The world's leading source of comparative information on political finance regulations. It includes laws and regulations from 179 individual countries, namely on the regulations on corporate donations to elections and campaigns.
International Country Risk Guide (ICRG)	Political Risk Index	The ICRG rating comprises 22 variables in three subcategories of risk: political, financial, and economic. A separate index is created for each of the subcategories. My subcategory of interest is the Political Risk index which condenses 12 weighted variables covering both political and social attributes based on a 100-point scale.
United Nations Conference on Trade and Development UNCTD	Foreign Direct Investment	Country year data on Foreign Direct Investment as percentage of GDP
Freedom House	Freedom of the Press Index	The level of press freedom in each country and territory is evaluated through a questionnaire - administered yearly since 1980 in 199 countries and territories - with questions divided into three broad categories: the legal environment, the political environment, and the economic environment. I selected the subset of questions in the economic environment category that inquired directly after influences of major economic interests on the media.
KOF Swiss Economic Institute	Index of Economic Globalization	KOF Globalization Index measures the three main dimensions of globalization: economic, social and political. In addition to three indices measuring these dimensions, KOF calculates an overall index of globalization and sub-indices referring to actual economic flows and economic restrictions

Table 3. 4 Correlations amongst the variables

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
1	1.0																								
2	0.1	1.0																							
3	0.8	0.1	1.0																						
4	0.4	0.2	0.5	1.0																					
5	0.4	0.2	0.4	0.7	1.0																				
6	0.4	0.2	0.5	0.6	0.6	1.0																			
7	-0.6	-0.1	-0.6	-0.4	-0.3	-0.5	1.0																		
8	0.3	0.7	0.4	0.4	0.3	0.5	-0.4	1.0																	
9	0.6	0.2	0.6	0.5	0.5	0.7	-0.6	0.6	1.0																
10	0.8	0.1	0.8	0.4	0.5	0.4	-0.5	0.2	0.5	1.0															
11	-0.7	-0.2	-0.7	-0.5	-0.4	-0.6	0.7	-0.4	-0.6	-0.6	1.0														
12	-0.7	-0.1	-0.8	-0.6	-0.6	-0.6	0.5	-0.3	-0.5	-0.7	0.7	1.0													
13	-0.6	-0.2	-0.7	-0.6	-0.5	-0.7	0.5	-0.5	-0.6	-0.6	0.7	0.8	1.0												
14	-0.7	-0.2	-0.7	-0.5	-0.5	-0.6	0.6	-0.5	-0.6	-0.7	0.9	0.8	0.8	1.0											
15	-0.5	-0.1	-0.7	-0.7	-0.5	-0.5	0.4	-0.3	-0.4	-0.6	0.6	0.8	0.8	0.7	1.0										
16	-0.7	-0.2	-0.8	-0.6	-0.5	-0.6	0.6	-0.5	-0.6	-0.7	0.9	0.8	0.8	1.0	0.8	1.0									
17	-0.6	-0.2	-0.6	-0.5	-0.5	-0.6	0.4	-0.4	-0.5	-0.6	0.8	0.8	0.7	0.9	0.7	0.9	1.0								
18	-0.3	0.0	-0.4	-0.2	-0.4	-0.3	0.2	-0.2	-0.4	-0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.3	1.0							
19	-0.7	-0.2	-0.8	-0.5	-0.5	-0.6	0.6	-0.5	-0.7	-0.6	0.9	0.8	0.8	0.9	0.7	0.9	0.9	0.4	1.0						
20	-0.7	-0.2	-0.7	-0.5	-0.5	-0.6	0.6	-0.4	-0.6	-0.7	0.8	0.8	0.8	0.9	0.7	0.9	0.8	0.4	0.9	1.0					
21	-0.8	-0.1	-0.7	-0.4	-0.4	-0.5	0.5	-0.3	-0.5	-0.8	0.6	0.8	0.7	0.7	0.6	0.7	0.7	0.2	0.7	0.7	1.0				
22	-0.6	-0.2	-0.7	-0.6	-0.6	-0.6	0.4	-0.3	-0.5	-0.6	0.7	0.8	0.9	0.8	0.8	0.8	0.8	0.4	0.8	0.8	0.7	1.0			
23	0.5	0.1	0.5	0.4	0.2	0.5	-0.6	0.6	0.8	0.3	-0.5	-0.3	-0.4	-0.4	-0.3	-0.4	-0.3	-0.3	-0.5	-0.4	-0.3	-0.2	1.0		
24	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.0	-0.2	0.1	-0.1	0.2	-0.2	-0.1	-0.3	-0.2	-0.2	0.2	-0.1	-0.2	-0.2	-0.3	-0.2	1.0	
25	0.0	0.9	0.1	0.2	0.2	0.1	-0.1	0.2	0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.0	-0.1	0.1	0.0	1.0

Table 3. 5 Factors extracted from multiply imputed dataset 1

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Value Chain	-0,6002	**-0,6657**	0,1118	0,0706	-0,1356
Corruption	**0,6381**	0,455	-0,2783	-0,1368	0,1949
Inward Flows of Trade	-0,0895	0,0391	**0,7528**	0,1456	0,2485
Restrictions to Trade	-0,3166	-0,3032	**0,7313**	0,0424	-0,2528
Cluster Development	**-0,6433**	**-0,5916**	0,0913	0,091	0,0275
Anti-Monopoly Policy	**0,7769**	0,5255	-0,1078	-0,0515	-0,0777
Extent of Marketing	-0,5263	**-0,7357**	0,2041	0,0311	-0,0191
Foreign Ownership of Firms	-0,3159	**-0,6383**	0,3341	0,2333	0,3502
Impact of Rules on FDI	-0,4315	**-0,4554**	0,3436	0,3165	0,2813
Trade Barriers	-0,3701	-0,3033	**0,6101**	0,1175	0,1448
Mean Electoral Policy Score	-0,0867	-0,0971	-0,0582	-0,01	**0,8254**
Audit Report Standards	**0,5789**	**0,6**	-0,3115	0,0131	-0,1504
Diversion of Public Funds	**0,9467**	0,0788	-0,1556	-0,123	0,0476
Efficacy of Corporate Boards	0,5437	**0,6205**	-0,1583	0,0462	-0,2545
Ethical Behaviour of Firms	**0,9027**	0,2705	-0,213	-0,0476	-0,0694
Favouritism of Government Officials	**0,9468**	0,0597	-0,0008	-0,1055	-0,0612
Investor Protection	0,2531	**0,3796**	**-0,3919**	0,0148	0,3448
Irregular Payment of Bribes	**0,8102**	0,2798	-0,3474	-0,019	0,0924
Judicial Independence	**0,8413**	0,3114	-0,1579	-0,1119	-0,0045
Market Dominance	**0,6528**	**0,5363**	-0,029	-0,0718	-0,0178
Protection of Minority Shareholders	**0,7352**	0,488	-0,203	-0,0215	-0,2352
Trade Tariffs Percentage	-0,2261	-0,3405	**0,6898**	0,0844	-0,2787
Foreign Direct Investment Outward	-0,1862	-0,1817	-0,0137	**0,8016**	-0,0556
Freedom of the Press from Commercial Interests	0,0787	**0,6284**	-0,2559	-0,1529	0,3581
Foreign Direct Investment as Per of GDP	-0,0717	0,0258	0,1881	**0,8454**	0,0329

Table 3. 6. Factors extracted from multiply imputed dataset 2

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Value Chain	-0,493	**-0,7248**	0,1765	0,0833	-0,1505
Corruption	**0,6067**	0,4483	-0,4166	-0,1119	0,1469
Inward Flows of Trade	-0,1409	0,0393	**0,7213**	0,2554	0,2122
Restrictions to Trade	-0,2718	-0,2832	**0,806**	0,0589	-0,16
Cluster Development	-0,5304	**-0,722**	0,0271	0,1205	-0,0015
Anti Monopoly Policy	**0,6979**	0,6393	-0,0778	-0,0589	-0,0396
Extent of Marketing	-0,3951	**-0,79**	0,26	0,027	-0,0373
Foreign Ownership of Firms	-0,2333	**-0,651**	0,3943	0,2351	0,3115
Impact of Rules on FDI	-0,3725	**-0,4737**	0,3481	0,3481	0,2378
Trade Barriers	-0,3223	-0,3174	**0,5597**	0,177	0,1003
Mean Electoral Policy Score	-0,0577	-0,1176	-0,1201	-0,0023	**0,838**
Audit Report Standards	0,4815	**0,6462**	-0,3811	0,017	-0,1557
Diversion of Public Funds	**0,9413**	0,1508	-0,177	-0,1123	0,0319
Efficacy of Corporate Boards	0,4633	**0,6612**	-0,2423	0,0643	-0,259
Ethical Behaviour of Firms	**0,8727**	0,3478	-0,2253	-0,0403	-0,0798
Favouritism of Government Officials	**0,936**	0,1626	-0,0253	-0,0946	-0,059
Investor Protection	0,2124	**0,3963**	-0,2313	-0,0686	0,3772
Irregular Payment of Bribes	**0,7705**	0,3097	-0,4345	0,0115	0,0679
Judicial Independence	**0,7963**	0,4035	-0,1463	-0,11	-0,0113
Market Dominance	0,5533	**0,6493**	0,0123	-0,0875	0,0309
Protection of Minority Shareholders	**0,6528**	0,594	-0,1844	-0,0439	-0,2203
Trade Tariffs Percentage	-0,1868	-0,2268	**0,8063**	0,0431	-0,2082
Foreign Direct Investment Outward	-0,1714	-0,1978	0,075	**0,7601**	-0,0466
Freedom of the Press from Commercial Interests	-0,0169	**0,5747**	-0,344	-0,1293	0,3544
Foreign Direct Investment as Per of GDP	-0,0702	0,0104	0,1472	**0,8541**	0,009

Table 3. 7 Factors extracted from multiply imputed dataset 3

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Value Chain	-0,493	**-0,7248**	0,1765	0,0833	-0,1505
Corruption	**0,6067**	0,4483	-0,4166	-0,1119	0,1469
Inward Flows of Trade	-0,1409	0,0393	**0,7213**	0,2554	0,2122
Restrictions to Trade	-0,2718	-0,2832	**0,806**	0,0589	-0,16
Cluster Development	-0,5304	**-0,722**	0,0271	0,1205	-0,0015
Anti Monopoly Policy	**0,6979**	0,6393	-0,0778	-0,0589	-0,0396
Extent of Marketing	-0,3951	**-0,79**	0,26	0,027	-0,0373
Foreign Ownership of Firms	-0,2333	**-0,651**	0,3943	0,2351	0,3115
Impact of Rules on FDI	-0,3725	**-0,4737**	0,3481	0,3481	0,2378
Trade Barriers	-0,3223	-0,3174	**0,5597**	0,177	0,1003
Mean Electoral Policy Score	-0,0577	-0,1176	-0,1201	-0,0023	**0,838**
Audit Report Standards	0,4815	**0,6462**	-0,3811	0,017	-0,1557
Diversion of Public Funds	**0,9413**	0,1508	-0,177	-0,1123	0,0319
Efficacy of Corporate Boards	0,4633	**0,6612**	-0,2423	0,0643	-0,259
Ethical Behaviour of Firms	**0,8727**	0,3478	-0,2253	-0,0403	-0,0798
Favouritism of Government Officials	**0,936**	0,1626	-0,0253	-0,0946	-0,059
Investor Protection	0,2124	**0,3963**	-0,2313	-0,0686	0,3772
Irregular Payment of Bribes	**0,7705**	0,3097	-0,4345	0,0115	0,0679
Judicial Independence	**0,7963**	0,4035	-0,1463	-0,11	-0,0113
Market Dominance	0,5533	**0,6493**	0,0123	-0,0875	0,0309
Protection of Minority Shareholders	**0,6528**	0,594	-0,1844	-0,0439	-0,2203
Trade Tariffs Percentage	-0,1868	-0,2268	**0,8063**	0,0431	-0,2082
Foreign Direct Investment Outward	-0,1714	-0,1978	0,075	**0,7601**	-0,0466
Freedom of the Press from Commercial Interests	-0,0169	**0,5747**	-0,344	-0,1293	0,3544
Foreign Direct Investment as Per of GDP	-0,0702	0,0104	0,1472	**0,8541**	0,009

Table 3. 8 Factors extracted from multiply imputed dataset 4

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Value Chain	-0,6387	0,1687	**-0,6483**	0,0307	0,0656
Corruption	**0,6872**	-0,2872	0,4609	0,1673	-0,1424
Inward Flows of Trade	-0,03	**0,6427**	-0,1181	0,2523	0,0383
Restrictions to Trade	-0,3219	**0,7784**	-0,5252	0,1671	0,086
Cluster Development	**-0,6919**	0,1213	-0,5252	0,1671	0,06
Anti Monopoly Policy	**0,8266**	-0,177	0,3967	-0,1694	-0,0508
Extent of Marketing	-0,5599	0,3208	**-0,6416**	0,1645	0,0126
Foreign Ownership of Firms	-0,3614	**0,4674**	-0,4209	0,4167	0,247
Impact of Rules on FDI	**-0,4886**	**0,4442**	-0,225	0,2631	0,3444
Trade Barriers	-0,383	**0,7313**	-0,0086	0,1234	0,1547
Mean Electoral Policy Score	-0,087	-0,0804	0,0631	**0,8279**	0,0006
Audit Report Standards	**0,618**	-0,4338	0,4088	-0,2785	0,012
Diversion of Public Funds	**0,9457**	-0,1315	0,0252	0,0823	-0,1207
Efficacy of Corporate Boards	**0,5939**	-0,3253	0,4091	-0,3812	0,0419
Ethical Behaviour of Firms	**0,9198**	-0,2435	0,1452	-0,076	-0,0512
Favouritism of Government Officials	**0,9482**	0,0126	-0,0001	-0,0284	-0,1048
Investor Protection	**0,3216**	-0,4385	**0,3372**	0,247	0,0222
Irregular Payment of Bribes	**0,8188**	-0,397	0,1822	0,0675	-0,0195
Judicial Independence	**0,8606**	-0,1884	0,2125	-0,0329	-0,11
Market Dominance	**0,6766**	-0,0534	0,4983	-0,1097	-0,078
Protection of Minority Shareholders	**0,7741**	-0,291	0,2964	-0,3283	-0,0268
Trade Tariffs Percentage	-0,212	**0,6483**	-0,3672	-0,2376	0,114
Foreign Direct Investment Outward	-0,1898	0,0413	-0,1882	0,0321	**0,7825**
Freedom of the Press from Commercial Interests	0,1028	-0,2603	**0,7452**	0,1928	-0,1384
Foreign Direct Investment as Per of GDP	-0,0635	0,1434	0,0188	-0,0168	**0,8469**

Table 3. 9 Factors extracted from dataset imputed using conditional mean imputation and Z_Scores

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Value Chain	-0,6358	**-0,6463**	0,1017	0,0759	-0,1333
Corruption	**0,6108**	0,4498	-0,278	-0,1555	0,2117
Inward Flows of Trade	-0,1794	-0,0076	**0,6571**	0,344	0,0121
Restrictions to Trade	-0,2891	-0,1679	**0,8092**	0,0066	-0,1773
Cluster Development	**-0,6731**	-0,5854	0,05	0,0984	0,0274
Anti Monopoly Policy	**0,795**	0,4777	-0,1794	-0,0463	-0,0677
Extent of Marketing	-0,5482	**-0,7019**	0,2487	0,0168	-0,0144
Foreign Ownership of Firms	-0,3413	-0,58	**0,4799**	0,1964	0,316
Impact of Rules on FDI	**-0,4426**	**-0,4279**	**0,4577**	0,2534	0,2369
Trade Barriers	-0,348	-0,2741	**0,6596**	0,1086	0,0905
Mean Electoral Policy Score	-0,0545	-0,0497	-0,0993	0,0087	**0,801**
Audit Report Standards	**0,5678**	**0,5526**	-0,4238	0,0281	-0,1425
Diversion of Public Funds	**0,9358**	0,0612	-0,1844	-0,1175	0,0756
Efficacy of Corporate Boards	**0,5583**	0,5501	-0,341	0,0831	-0,2645
Ethical Behaviour of Firms	**0,9003**	0,1969	-0,2521	-0,054	-0,0348
Favouritism of Government Officials	**0,9505**	0,027	-0,0464	-0,0965	-0,0331
Investor Protection	0,2762	0,4041	-0,2528	-0,0114	**0,4474**
Irregular Payment of Bribes	**0,7914**	0,2245	-0,425	-0,0187	0,1112
Judicial Independence	**0,8425**	0,2708	-0,172	-0,1237	0,0105
Market Dominance	**0,6959**	0,4975	-0,0415	-0,0734	-0,0034
Protection of Minority Shareholders	**0,7402**	0,4527	-0,2848	-0,0058	-0,2069
Trade Tariffs Percentage	-0,1977	-0,2927	**0,6495**	0,1161	-0,331
Foreign Direct Investment Outward	-0,1928	-0,1697	0,0728	**0,7685**	-0,0076
Freedom of the Press from Commercial Interests	0,0405	**0,6679**	-0,1817	-0,2011	0,3307
Foreign Direct Investment as Per of GDP	-0,0693	-0,0086	0,1322	**0,8431**	-0,002

Table 3. 10 Factors extracted from dataset imputed using conditional mean imputation and normalization using the reference to a mean method

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Value Chain	**-0,7098**	0,2926	0,0464	-0,5177	0,0663
Corruption	**0,717**	-0,1585	-0,2677	0,3652	-0,1412
Inward Flows of Trade	-0,1798	0,2115	**0,5913**	0,0669	0,3678
Restrictions to Trade	-0,322	0,2397	**0,7892**	-0,1165	0,0215
Cluster Development	**-0,7355**	0,3544	-0,0371	-0,377	0,0915
Anti Monopoly Policy	**0,8382**	-0,3585	-0,0984	0,2326	-0,0381
Extent of Marketing	**-0,6092**	0,487	0,1503	-0,4792	0,0052
Foreign Ownership of Firms	-0,3619	**0,7689**	0,2718	-0,1725	0,1534
Impact of Rules on FDI	-0,4468	**0,6129**	0,3045	-0,0806	0,2371
Trade Barriers	-0,3538	0,4621	**0,5518**	-0,0397	0,136
Mean Electoral Policy Score	-0,0989	**0,4855**	**-0,4212**	**0,452**	0,0657
Audit Report Standards	**0,6261**	-0,5497	-0,2852	0,2237	0,0294
Diversion of Public Funds	**0,9468**	-0,0697	-0,2012	0,0169	-0,1393
Efficacy of Corporate Boards	**0,6275**	-0,591	-0,1781	-0,1538	0,088
Ethical Behaviour of Firms	**0,9265**	-0,1905	-0,1999	0,0579	-0,0796
Favouritism of Government Officials	**0,9567**	-0,0564	-0,0672	-0,0721	-0,0878
Investor Protection	0,3094	-0,0141	-0,3548	**0,5331**	0,006
Irregular Payment of Bribes	**0,8568**	-0,1631	0,139	-0,0724	-0,0724
Judicial Independence	**0,8649**	-0,2062	-0,1486	0,1422	-0,1358
Market Dominance	**0,7415**	-0,292	0,0341	0,3404	-0,0679
Protection of Minority Shareholders	**0,7798**	-0,4839	-0,1586	0,1051	0,0004
Trade Tariffs Percentage	-0,245	0,1427	**0,6653**	-0,3533	0,127
Foreign Direct Investment Outward	-0,2426	0,0642	0,0464	-0,1338	**0,7707**
Freedom of the Press from Commercial Interests	0,2299	-0,02652	-0,1829	**0,6689**	-0,1878
Foreign Direct Investment as Per of GDP	-0,0536	0,0685	0,1169	-0,0106	**0,8372**

Table 3. 11 Correlations among the different formulations of the CPI

	CPI A	CP AA	CPI B	CPI E	CPI EE	CPI F
CPI A	1					
CPI AA	0.667***	1				
CPI B	0.791***	0.726***	1			
CPI E	0.960***	0.651***	0.747***	1		
CPI EE	0.549***	0.919***	0.627***	0.600***	1	
CPI F	0.770***	0.713***	0.972***	0.781***	0.655***	1

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3. 12 Within and Between World Region variation in CPI Scores

	(1) Corporate Permeation Index - Formulation A	(2) Corporate Permeation Index - Formulation AA	(3) Corporate Permeation Index - Formulation B	(7) Corporate Permeation Index - Formulation E	(8) Corporate Permeation Index - Formulation EE	(9) Corporate Permeation Index - Formulation F
main						
Constant	0.015 [-0.083,0.11]	0.041 [-0.52,0.60]	0.018 [-0.034,0.071]	0.0046 [-0.11,0.12]	-0.14 [-0.83,0.56]	0.014 [-0.045,0.074]
sigma_u						
Constant	0.15*** [0.076,0.22]	0.86*** [0.44,1.28]	0.079*** [0.039,0.12]	0.17*** [0.089,0.26]	1.08*** [0.55,1.60]	0.090*** [0.045,0.14]
sigma_e						
Constant	0.35*** [0.33,0.37]	1.95*** [1.86,2.04]	0.23*** [0.22,0.24]	0.36*** [0.34,0.38]	2.21*** [2.11,2.32]	0.23*** [0.22,0.24]
Observations	888	888	888	888	888	888
95% confidence intervals in brackets						
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$						

Description of Indicators

All the following indicators are available for the time period from 2010 to 2015. The indicators are grouped according to the theoretical categories - Vehicles of Power - outlined in the theoretical framework proposed by Lima and Galea 2018 (23) . They are: Political Environment, Preference Shaping, Legal Environment, Extra Legal Environment.

Political Environment
Cluster Development
Source: EOS

Definition**:** *In your country, how widespread are well-developed and deep clusters (geographic concentrations of firms, suppliers, producers of related products and services, and specialized institutions in a particular field)? [1 = nonexistent; 7 = widespread in many fields] (EOS)*

Rationale for inclusion: The geographic dispersion of the firms in a given industry is an important determinant of firms' ability to influence the political process. Firms' geographic concentration affects both organizational costs for lobbying purposes and its geopolitical representation. For example, a high geographic concentration, which characterizes regional or localized industries, implies lower lobbying costs but lacks representation in the countries' political capitals (60)

Electoral Policy
Source: IDEA International Institute for Democracy and Electoral Assistance
Definition: Indicators used to capture the de jure permeability of the electoral system to corporations include:

Is there a ban on donations from foreign interests to political parties?

Is there a ban on donations from foreign interests to candidates?

Is there a ban on corporate donations to political parties?

Is there a ban on corporate donations to candidates?

We took the average of these indicators to produce the indicator "Electoral Policy"

Rationale for inclusion**:**

The extent to which the electoral system is reliant on donations from powerful actors opens the door for quid pro quo exchanges of money in return for favourable political decisions (61)**.** International trade is major vehicle through which large transnational corporations could exert pressure on national governments via multilateral and bilateral trade agreements, through pressure on international organizations that formulate international treaties regulating health policy - e.g. The Framework Convention on Tobacco Control (62)or the International Code of Marketing of Breastmilk Substitutes (63) - or resolutions or international declarations on issues pertaining to health e.g. the UN General Assembly "Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Diseases or the WHO's Global Strategy for Diet, Physical Activity and Health (4,64).

Foreign Direct Investment as percentage of GDP and Outward Foreign Direct Investment as percentage of GDP

Source**:** United Nations Conference on Trade and Development UNCTD

Definition**:** FDI inflows and outflows comprise capital provided (either directly or through other related enterprises) by a foreign direct investor to a FDI enterprise, or capital received by a foreign direct investor from a FDI enterprise. FDI includes the following three components: equity capital, reinvested earnings and intra-company loans. Equity capital is the foreign direct investor's purchase of shares of an enterprise in a

country other than its own; Reinvested earnings comprise the direct investor's share (in proportion to direct equity participation) of earnings not distributed as dividends by affiliates or earnings not remitted to the direct investor. Such retained profits by affiliates are reinvested; Intra-company loans or intra-company debt transactions refer to short- or long-term borrowing and lending of funds between direct investors (parent enterprises) and affiliate enterprises. Data on FDI flows are presented on net bases (capital transactions' credits less debits between direct investors and their foreign affiliates). Net decreases in assets or net increases in liabilities are recorded as credits (with a positive sign), while net increases in assets or net decreases in liabilities are recorded as debits (with a negative sign). Hence, FDI flows with a negative sign indicate that at least one of the three components of FDI is negative and not offset by positive amounts of the remaining components. These are called reverse investment or disinvestment.

Rationale for inclusion**:**

FDI, by definition, involves a foreign investor/ parent and thus a multinational component. Its extent, therefore, is an indicator of the degree of corporate presence in a given country. This has a number of implications for permeation. Holden and Lee, referring to TTCs, argue that their investment tends to increase the structural power of tobacco corporations in their relation with states as a result of the dependence on employment provided by leaf growing or cigarette manufacturing and the income taxes and export earnings that flow from this (8). FDI thus, increases corporate structural power because it enables corporations to punish and reward countries for their policy choices (9).

The same principle applies to Outward FDI: the level domestic companies foreign investments can be a proxy of corporate structural power by virtue of their role in economy via exports.

Foreign Ownership of Companies
Source**:** EOS
Definition: *In your country, how prevalent is foreign ownership of companies? [1 = extremely rare; 7 = extremely prevalent] (EOS)*

Rationale for Inclusion**:**

Transnational companies are, by definition, foreign owned in all countries except in the one where they are registered. The prevalence of foreign ownership of companies is thus pertinent to the study of corporate permeation. Furthermore, concentrated ownership of TNCs allows owners to accrue a great deal of power and leverage in the political and social spheres of the countries in where they operate. Vitali and colleagues studied the structure of the control network of transnational corporations. They find that, despite its small size, the core holds collectively a large fraction of the total network control. In detail, nearly 4=10 of the control over the economic value of TNCs in the world is held, via a complicated web of ownership relations, by a group of 147 TNCs in the core, which has almost full control over itself. The top holders within the core can thus be thought of as an economic ‘‘super-entity’’ in the global network of corporations.”(65) Since many TNCs in the core have overlapping domains of activity, the fact that they are connected by ownership relations could facilitate the formation of blocs, which would hamper market competition. Their results show that, globally, top holders are at least in the

position to exert considerable control, either formally (e.g., voting in shareholder and board meetings) or via informal negotiations."(65)

Impact of rules on FDI on Business
Source: EOS
Definition: *In your country, how restrictive are rules and regulations on foreign direct investment? (EOS)*

Rationale for Inclusion: The extent to which governments have power over FDI is a proxy to their ability to counter corporate structural power.

Inward flows of Trade
Source**:** KOF
Definition**:** KOF Indicator of trade flows into a country is composed of the following variables: Trade (percent of GDP) (22%); Foreign Direct Investment, stocks (percent of GDP) (27%); Portfolio Investment (percent of GDP) (24%); Income Payments to Foreign Nationals (percent of GDP) (27%)

Rationale for Inclusion: See rationale for FDI

Market Dominance of Firms
Source**:** World Economic Forum, Executive Opinion Survey
Definition**:** *In your country, how do you characterize corporate activity? (1= dominated by a few business groups 7= spread among many firms)*

Rationale for inclusion**:**

Zardkoohi explains the importance of industry size and industry concentration in securing political favours using a public good lens. The benefits from the firm's political activities are not likely to be received exclusively by the firm; others in the industry probably share the benefit. Beneficiaries gain according to their relative market shares so that, in absolute terms, small firms benefit less than large ones. The implication of this

result for the firm is that the larger the market share, the greater the firm's political contributions, all else equal. But not all corporate penetration is attained through corporate political participation. The notion that large firms will make larger political contributions than small firms is blunted by the possibility that market power may be a substitute for political favours. The market power of noncompeting firms may allow them to restrain trade and make monopoly rents. As for concentration of firms Zardkoohi theorizes that market concentration or (power) is a cheaper method for obtaining market influence than campaign contributions (66).

Restrictions to Trade
Source: KOF
Definition**:** KOF Indicator of Restrictions to trade in a given country is composed of the following variables: Hidden Import Barriers (23%); Mean Tariff Rate (28%); Taxes on International Trade (percent of current revenue) (26%); Capital Account Restrictions (23%).

Rationale for inclusion**:** Proxy for the structural power of domestic companies

Trade Barriers
Source**:** EOS
Definition**:** *In your country, to what extent do non-tariff barriers (e.g. health and product standards. Technical and labelling requirements) limit the ability of imported products to compete in the domestic market? (EOS)*

Rationale for inclusion:

A country's ability to enforce non-tariff barriers is important because trade agreements permit national trade-restrictive measures that protect human health—but only those that are the least trade-restrictive relative to any other measure (67). Scotland's initiative to

instate a minimum unit pricing for alcohol as means to tackle alcohol misuse, for instance, was challenged by the Scotch Whisky Association at the European Court of Justice on trade grounds, despite the scientific evidence that backs it as an effective measure to curb alcohol consumption (68)

Trade Tariffs
Source: EOS
Definition: An applied tariff is a customs duty that is levied on imports of merchandise goods. This indicator is calculated as a weighted average of all the applied tariff rates, including preferential rates that a country applies to the rest of the world. The weights are the trade patterns of the importing country's reference group.

Rationale for Inclusion: As above

Value Chain
Source: World Economic Forum, Executive Opinion Survey
Definition**:** Vertical integration is a process whereby companies take charge of different steps on the production path that results in the final product. This is the case, for example, when a manufacturer owns its supplier and distributor. This may reduce costs and improve efficiencies**.**

In your country, how broad is companies' presence in the value chain? [1 = narrow, primarily involved in individual steps of the value chain (e.g., resource extraction or production); 7 = broad, present across the entire value chain (e.g., including production marketing, distribution, design, etc.)] (EOS)

Rationale for inclusion**:** Vertical integration of the supply chain contributes to corporate permeation in two ways. First, greater control over the supply chain means greater corporate presence across different sectors of a country's economy. Second, apart from

the efficiency gains and risk reduction, vertical integration is also used as a means of erecting barriers to the entry of new rivals to the market and thus protecting oligopoly (69). Oligopoly, in turn, confers instrumental and structural power to firms (70)

Preference Shaping

Extent of Marketing

Source**:** EOS

Definition**:** *In your country, how successful are companies in using marketing to differentiate their products and services?* (EOS)

Freedom of the media from economic interests

Source**:** Economic Freedom of the Press Index by Freedom House.

Definition**:** To gauge the level of interaction between the media and economic interests, I selected the subset of questions in the economic environment category of the Economic Freedom of the Press Index by Freedom House. This set of questions inquires directly after influences of major economic interests on the media. For example:

Do the formal owners of media outlets have unofficial ties to other powerful actors that compromise the outlets' objectivity?

Are many news outlets owned or controlled by a few industrial or commercial conglomerates, whose resources allow them to suppress competition, limit diversity of content or viewpoints, and dominate the media landscape?

Is there an excessive concentration of media ownership in the hands of private interests linked to state patronage or that of other powerful societal actors?

Are media overly dependent on the state, political parties, big business, or other influential political actors for funding?

Do foreign investors or donors play an unusually large role in helping to sustain media outlets?

Are private owners subject to intense commercial pressures and competition, causing them to tailor or cut news coverage in order to remain financially viable?

Rationale for inclusion**:**

The role of the media in shaping popular support for, for example, redistributive policies has been empirically tested using indices that measure the extent of media capture by governments, religious institutions and economic interest (71).

Legal Environment

Anti-Monopoly Policy

Source: EOS

Definition***:*** *In your country, how effective are anti-monopoly policies at ensuring fair competition? [1 = not effective at all; 7 = extremely effective]*

Rationale for inclusion: See rationale for inclusion of Value Chain. Anti- monopoly policies have the ability to prevent monopolies and oligopolies and the accruement of economic and political power that they entail.

Audit Reporting Standards

Source**:** EOS

Definition: *In your country, how strong are financial auditing and reporting standards? (EOS)*

Rationale for Inclusion: The ability of a country to monitor corporate financial activity is a proxy for its ability to keep corporate power accountable.

Efficacy of Corporate Boards

Source: EOS

Definition: *In your country, to what extent is management accountable to investors and board of directors?* (EOS)

Rationale for Inclusion:

Large firms have a problem of separation of ownership and control. These firms are run not by professional managers without equity ownership who are unaccountable to shareholders, but by controlling shareholders. These controlling shareholders are ideally placed to monitor the management, and in fact the top management is usually part of the controlling family, but at the same time they have the power to expropriate the minority shareholders as well as the interest in so doing."(72)

Investor Protection
Source: World Economic Forum, Executive Opinion Survey
Definition: *In your country, to what extent is management accountable to investors and board of directors?* (EOS)

Rationale for Inclusion**:** Please see below

Judicial Independence
Source**:** EOS
Definition**:** *In your country, how independent is the judicial system from influences of the government, individuals or companies?* (EOS)

Rationale for Inclusion**:**

Capture of the judicial system has been documented as a corporate pathway of influence. Friedman, for example, showed direct financial ties between the tobacco industry and groups that organise judicial seminars in an effort to influence jurisprudence, and judges who attend these seminars (73). It has also been shown to result in industry friendly regulation interpretation and implementation (74).

Protection and Minority Shareholder Protection
Source**:** World Economic Forum, Executive Opinion Survey
Definition

Strength of investor protection? (Involves shareholders' ability to sue officers and directors for misconduct as well as the transparency of corporate transactions (EOS)

In your country, to what extent are the interests of minority shareholders protected by the legal system?

Rationale for inclusion:

Poor legal protection of minority shareholders reduces the checks and balances on the decisions taken by majority shareholder who may also concentrate corporate ownership. Each shareholder has the right to a fraction of the firm revenue and to a voice in the decision-making process (e.g., voting rights at the shareholder meetings). Thus, the larger the ownership share in a firm, the larger is the associated control over it. Intuitively, control corresponds to the chances of seeing one's own interest prevailing in the business strategy of the firm. Control is usually computed from ownership with a simple threshold rule: the majority shareholder has full control"(65). The issue is that the controlling shareholders typically have control over firms considerably in excess of their cash flow rights, or ownership. This is so, in part, because they often control large firms through pyramidal structures, and in part because they manage the firms they control. As a consequence, large firms have a problem of separation of ownership and control. These firms are run not by professional managers without equity ownership who are unaccountable to shareholders, but by controlling shareholders. These controlling shareholders are ideally placed to monitor the management, and in fact the top management is usually part of the controlling family, but at the same time they have the power to expropriate the minority shareholders as well as the interest in so doing."(72)

Extra-legal Environment

Corruption

Source**:** The Political Risk Index (ICRG)

Definition**:** The Political Risk Index (ICRG) condenses 12 weighted variables covering both political and social attributes based on a 100-point scale

Rationale for Inclusion**:** I chose to include this measure of corruption because unlike other measures of corruption in the public sector, the authors make the following distinction

"*The most common form of corruption met directly by business is financial corruption in the form of demands for special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans (…). Although our measure takes such corruption into account, it is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for favors', secret party funding, and suspiciously close ties between politics and business"*

Diversion of Public Funds

Source: EOS

Definition**:** *In your country, how common is illegal diversion of public funds to companies, individuals, or groups? [1 = very commonly occurs; 7 = never occurs]* (EOS)

Ethical Behaviour of Firms

Source: EOS

Definition: *In your country, how do you rate the corporate ethics of companies (ethical behaviour interactions with public officials, politicians and other firms)* (EOS)

Irregular Payments and Bribes

Source: EOS

Definition: The EOS asks the question "*Average score across the five components of the following Executive Opinion Survey question: In your country, how common is it for firms to make undocumented extra payments or bribes connected with (a) imports and exports; (b) public utilities; (c) annual tax payments; (d) awarding of public contracts and licenses; (e) obtaining favorable judicial decisions? In each case, the answer ranges from 1 [very common] to 7 [never occurs]* (EOS)

Favouritism of Government Officials
Source**:** EOS
Definition**:** *In your country, to what extent do government officials show favouritism to well-connected firms and individuals when deciding upon policies and contracts?*

Rationale for inclusion**:** The reality of undue corporate influence most often requires collusion between both the private and the public sector. Accordingly, vested interests that remove public policy from the realm of democratic, contestable decision making should be taken into account by measures gauging undue corporate capture of the public sector (5)

Chapter 4

Commercial determinants of tobacco control policy and smoking prevalence- Is corporate power the smoking gun?

Abstract

Introduction: The influence of the tobacco industry is an obstacle to the reduction of smoking globally. Due to low levels of financial and human resources in the health sector, Low- and Middle-Income countries (LMICs) may be particularly vulnerable to this influence. I investigate whether the association between corporate power and smoking is mediated by tobacco control policy across and within countries. Furthermore, I ask whether the relationship between corporate power and tobacco control policy and between tobacco control policy and smoking is stronger in LMICs than in High Income Countries (HIC) and whether it is stronger within LMICS than within HICs.

Methods: I used the Corporate Permeation Index (CPI) as a proxy for the power of the tobacco industry between 2010 and 2015. I used variations in the CPI over time to explain variations in: the prevalence of smoking, the Tobacco Control Scale (TCS) in Europe and in the compliance with national smoke free regulations globally. I used path analysis to determine whether tobacco control policy mediates the relationship between corporate permeation and smoking prevalence. I also tested whether these associations are stronger across LMIC than across HICs using random effects models and whether they were stronger within LMICs than within HICs using fixed effects.

Results: Corporate power is associated with both increased prevalence of smoking and a weaker regulatory framework for tobacco in Europe. Each standard deviation increase in

the CPI was associated with a 3.16 percent increase in smoking across Europe (90% CI [-0.11,6.42] and a 10.8point reduction in the TCS (95%CI [-20.7, -0.80]). Within countries of Europe, these coefficients were 2.97 (95%CI [-0.27,6.20] and -24.9 (95%CI [-38.8, -11.0]), respectively. Higher TCS scores were associated with lower prevalence of smoking and mediate the association between corporate power and smoking across and within countries in Europe. Globally, the positive association between corporate power and smoking prevalence was not statistically significant, nor was the mediator effect of compliance with smoke free regulations. There was, nonetheless, a negative effect of corporate power on compliance with smoke free regulation, found using both random and fixed effects, which was statistically significant in LMICs but not in HICs. A country's income level did not moderate the association between CPI and smoking. The negative association between CPI and compliance with national smoke free regulations is stronger in LMICs (-3.14 95%CI [-5.50,-0.78]) than in HICs (-1.28 (95% CI [-4.01,1.44])). This effect is also negative over time within countries globally (-4.66(95%CI [-9.25, -0.07]) and within LMICs (-5.32(95%CI [- 10.5,-0.10])).

Discussion: The finding that the ability of corporate power to boost smoking prevalence seems to work via the weakening of tobacco control policy calls for improved governance of the interface between corporate interests and population health in Europe. Similarly, the stronger negative associations between CPI and compliance with regulations in LMICs versus HICs and within LMICs versus within HICs lends support to the idea that the tobacco industry deploys its structural and agency power to weaken enforcement of tobacco regulations in LMICS.

4.1. Introduction

When used as intended, tobacco kills half of its users (1). Smoking-attributable deaths have increased by 20.1% since 1990, with most deaths occurring in China, India, the USA, and Russia. In 2016, 7.1 million deaths and 177.3 million Disability Adjusted Life Years (DALYs) were attributable to tobacco smoking. Smoking is the second-leading risk factor for death in men and the sixth-leading risk-factor among women, accounting for 16.3% and 5·8% of deaths respectively (2). Smoking is also driver of health inequalities within countries – it is more common among men of lower social class, education, or income (3) – and between countries : 80% of the world's 1.1 billion smokers live in low- and middle-income countries (LMICs) (1). Furthermore, smoking has a disproportionate impact on the economies of LMICs where it adds to the financial and operational burdens of already resource constrained health systems(4,5).

Fortunately, there are evidence-based packages of tobacco control policies that are cost effective, (6) shown to prevent harm by reducing smoking in the population and are an effective tool for reducing inequalities within countries (5,7). Unfortunately, the formulation and implementation of such measures remains slow and incomplete. One obstacle to the implementation is, arguably, the interference of the tobacco industry (8,9). Article 5.3 of the Framework Convention on Tobacco Control (FCTC), a treaty developed in response to the globalization of the tobacco epidemic under the auspices of the World Health Organization (WHO), explicitly states that “In setting and implementing their public health policies with respect to tobacco control, Parties shall act

to protect these policies from commercial and other vested interests of the tobacco industry in accordance with national law"(10). Nevertheless, there are various documented instances of tobacco industry participation in policy formulation at the national and international level. For example, the process of formulation of the FCTC itself was targeted by industry(11) as was the revision of the 2014 European Tobacco Products Directive(12).

The tobacco industry is widely credited with having created the "playbook" of corporate influence on policy (13–16). Companies such as Philip Morris - the maker of Marlboro cigarettes - and British American Tobacco BAT - Lucky Strike, Dunhill, Rothmans, among others- by virtue of their near oligopoly, have amassed a great deal of structural and agency power which they lever to shape health policy(17). In other words, since business investment is a key determinant of future production, employment and consumption levels, tobacco companies may use the threat of moving production plants to other countries to secure weaker tobacco control policies – structural power. Increased resources also increase tobacco companies' agency power - political engagement (e.g. lobbying), institutional participation (e.g. revolving doors). Altria, for example, a Fortune 200 company that owns Philip Morris USA and U.S. Smokeless Tobacco Company also holds significant equity investment in Anheuser-Busch InBev – the world's largest brewer(18) who has similar incentives to pursue weaker public health regulations around the availability of their products.

The tobacco industry frequently claims that tobacco control policies will have negative unintended consequences, that there are legal barriers to regulation – it often challenges policy measures in court(19)-, and that the regulation is unnecessary because, for example, industry does not market to youth or adheres to a voluntary code. The industry primarily conveys these arguments through direct and indirect lobbying, the promotion of voluntary codes and alternative policies, and the formation of alliances with other industrial sectors(20). It challenges the evidence base underpinning tobacco control(21,22) and circumvents marketing regulations, including through Corporate Social Responsibility initiatives(23). It also uses countries with weaker political processes to challenge tobacco control policies in countries with stronger public policy standards. For example, Ukraine, Honduras, the Dominican Republic, Cuba and Indonesia initiated formal World Trade Organization (WTO) proceedings against Australia and in Poland the industry tried to push the government to oppose UK display bans as well as the Australian plain packaging law(24,25). When it fails to mobilise its structural and agency power to shape policy, the tobacco industry undermines it as it is the case with government tax policy that increase cigarette prices. Through price segmentation, for example, tobacco companies absorb price increases on the cheapest cigarettes to keep them cheap, launch new cheaper products; lock prices down through price marking and introduce smaller packs (26). I hypothesise that the association between corporate power and smoking prevalence is mediated by tobacco control policy both within and between countries - Hypothesis 1**(H1).**

As aggregate level smoking rates decline in High Income Countries (HICs), the tobacco industry has shifted its attention to emerging markets in LMICs with relatively low smoking prevalence, notably among women, increasing levels of disposable income, and a younger population (27,28). Tobacco companies deploy the same tactics used in HICs but these may be more effective in LMICs for a number of reasons. First, weaker governance structures mean that state legal teams are stretched, and there is often a lack of expertise available to draft tobacco control legislation (29). Second, the corporate strategy in LMICs relies on heavy marketing to expand the smoker base and normalize smoking, particularly among women (30,31) – "females can be drawn into the market via menthol offers or lighter brands" (32) - and young people (23,31). Regulatory framework for marketing tend to be weaker in LMICs. For example, when Uzbekistan's tobacco industry was privatized in 1994 and British American Tobacco established a production monopoly, the health authorities planned to ban tobacco advertising and smoking in public places and introduce health warnings. British American Tobacco responded by delaying completion of its investment until the decree was replaced with a voluntary advertising code that resulted in ubiquitous advertising throughout the country(32).Third, tobacco companies then sell their products cheaply. Through smuggling, tobacco companies bypass tariff and non-tariff barriers to trade and get cigarettes into otherwise closed or protected markets, a key market entry technique that tobacco companies have used extensively in LMICs (33). As smuggled cigarettes either have no excise duties on them or duties from a lower tax jurisdiction they are sold more cheaply than they should(28). Despite unequivocal evidence of involvement in this illicit trade(34,35), tobacco companies have used it to shape policy in their own interest by arguing that

higher taxation will drive illicit trade and that plain packaging will enable it(36). I hypothesise that the association between corporate power and smoking prevalence is moderated by the country income level **(H2)** –i.e. the association between corporate power and smoking prevalence is stronger in LMICs than in HICs. Furthermore, I hypothesise that the association between corporate power and smoking prevalence is stronger within LMICs than within HICs **(H2A)**

International trade agreements make tobacco control policy particularly vulnerable to legal action from the tobacco industry. Philip Morris Asia's challenge to Australia's plain packaging laws was made possible by the investor–state dispute settlement provisions set out in an investment treaty between Australia and Hong Kong. Other such disputes include investor-state actions by tobacco companies against Uruguay and Norway and challenges within the dispute mechanisms of the WTO brought against both the USA and Australia by other countries(37,38). In Africa, at least 8 countries — Uganda, Namibia, Togo, Gabon, Democratic Republic of Congo, Ethiopia and Burkina Faso — have received warnings from the tobacco industry that their legislative proposals run afoul of international treaties(39). In Namibia, the tobacco industry said that requiring large warning labels on cigarette packages violates its intellectual property rights and could fuel counterfeiting(40). In Togo, an excerpt from a memo on plain packaging from chief executive of Philip Morris West Africa to the Minister of Commerce said "'"As a country whose economy heavily relies on exports, Togo can ill afford to anger its international partners by introducing plain packaging."(39). Unlike Australia and Norway, these

countries do not have the resources to sustain protracted legal battles. Uruguay, for example, recognized that it would have had to drop its tobacco control law and settle with Philip Morris if the Bloomberg Foundation had not paid to defend the law(40).

LMICS also have higher incentives to react to the promises of job creation and expansion of the tax base, which gives the tobacco industry a significant amount of power over policy making. An excerpt of a letter from BAT to the Government of Burkina Faso regarding new regulations on plain cigarette packaging and large graphic health warnings illustrates this point: "If these measures are brought into effect, the economic and social impact will be extremely negative. They could even threaten the continuation of our factory which has operated in Bobo Dioulasso for more than fifty years with more than 210 salaried employees."(39). A petition by BAT Kenya to the country's high court against aspects of the Kenyan government's proposed tobacco regulations reiterates the point ""[A proposal for a new 2% tax on the industry in Kenya] ... is arbitrary, capricious and inaccessible … it will have a significant effect on cigarette manufacturers and importers putting at risk further investment and direct and indirect employment opportunities in Kenya." A similarly worded letter was sent to the Uganda Parliamentary Committee (39). Lastly, Ministries of Health in these countries have limited economic resources that they must prioritise to address more imminent threats to public health such as insufficient sanitation, malnutrition and infectious disease(41). I hypothesise that the negative association between corporate power and tobacco control policy is moderated by Country Income Level: it is stronger in LMICs than in HICs **(H3).** I also hypothesise

that the association between corporate power and tobacco control policy it is stronger within LMICs than within HICs (H3A). Finally, I hypothesize that the negative association between tobacco control policy and prevalence of smoking in the population is moderated by country income level. The association is weaker in LMICs than in HICs **(H4).** I also hypothesize that the negative association between Tobacco Control Policy and prevalence of smoking in the population is weaker within LMICs than within HICs **(H4A)**

[Insert Figure 4.1 Here]

4.2. Methods

4.2.1. Data sources and measurement

A cross country longitudinal dataset containing yearly, country-level indicators (2010-2017) of corporate permeation and tobacco policy in 60 countries was constructed from a range of secondary data.

Outcome variables: Prevalence of Cigarette Smoking in the Adult Population, National Tobacco Control Policy and Compliance with national smoke free policies

Data on the percentage of adult cigarette smokers in the population for the years 2010 to 2017 comes from Euromonitor. There isn't a global composite indicator that allows for a comparison of tobacco control policies and their implementation across the world. Such a measure - the Tobacco Control Scale (TCS) - is only in available in selected countries in Europe –. To gauge the state of the regulatory framework for tobacco use globally, I recurred to a less comprehensive measure – an assessment of compliance with existing national smoke free regulation collected by WHO for all its member states. The choice of this indicator is a compromise between the accuracy in the representation of the state of

tobacco control at the national level and the number and geographic representation of countries in our analysis.

The TCS was developed by Luk Joossens and Martin Raw(42,43) to quantify the quality of the content and the implementation of tobacco control policies at country level on a 0 to 100 scale (100 being the most comprehensive and better implemented). The TCS captures the formulation and extent of implementation of six policies: Price increases through higher taxes on cigarettes and other tobacco products; Bans/restrictions on smoking in public and work places; Better consumer information, including public information campaigns, media coverage, and publicising research findings; Comprehensive bans on the advertising and promotion of all tobacco products, logos and brand names; Large, direct health warning labels on cigarette boxes and other tobacco products and Treatment to help dependent smokers stop, including increased access to medications. The TCS covers 34 European countries[5] and was calculated for the years 2010, 2013 and 2016.

There is no similar measure that allows for a comparison of policies and their implementation beyond Europe and across the world. I therefore used an indicator of compliance with national smoke free legislation collected by WHO for 191 countries in

[5] Austria ; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany, Greece; Hungary; Iceland; Ireland; Italy, Latvia ;Lithuania; Luxembourg ;Malta; Netherlands; Norway; Poland Portugal; Romania; Serbia ;Slovakia ;Slovenia ;Spain; Sweden; Switzerland; Ukraine; United Kingdom and Turkey

2010, 2012 and 2014, available in the Global Health Observatory Website. The level of compliance with the law was measured by asking in-country experts to provide their assessments by interview. These experts included at least three, and up to five, of the following persons: the most senior government official in charge of tobacco control or tobacco-related conditions; the head of a prominent NGO dedicated to tobacco control; a health professional (e.g. physician, nurse, pharmacist) specializing in tobacco-related conditions; a staff member of a public health university department; the Tobacco Free Initiative focal point at the WHO country office. Assessments were requested for each provision which is in place under a national law banning smoking in public places and enclosed workplaces. Provisions not in place, or provisions put in place too recently to assess, were excluded from the request. An assessment of overall compliance with the law (all provisions considered together) was also requested. A compliance score of 0-10 was calculated based on the average responses of the 3-5 experts. If all experts said compliance was "high", a score of 10 was achieved. If all experts said compliance was "minimal", this resulted in a score of zero. A mix of high, moderate and minimal responses resulted in an average score calculated out of 10. Missing responses were scored as "missing" unless there were at least 3 non-missing responses given (44)

Explanatory Variable

The measure of corporate power is the Corporate Permeation Index (CPI), developed in Chapter 3. The CPI is the quantitative expression of a wide array of documented tactics that commercial interests deploy to influence the health of populations quantified using a composite indicator of corporate power composed of 25 indicators available for 148

countries for the years 2010 to 2015. These indicators include traditional measures of undue influence in a country such as the level of *quid pro quo* corruption but also the level of independence of the media and the judicial system of corporate interests as well as measures of foreign direct investment and corporate ethical behaviour. The theoretical framework underpinning the CPI relied substantially on literature about corporate tactics of the tobacco industry, widely credited for having written the proverbial "corporate playbook".

The final sample of countries for which there were data on tobacco policy, consumption and corporate power consists of 31 countries and 67 observations in Europe and 61 countries and 108 observations worldwide.

Control Variables

The models are adjusted for differences in GDP per Capita (Purchasing Power Parity) and Urban population as a percentage of the total population. Data for the 2010 to 2017 period were sourced from the World Bank Development Indicators Database. GDP per capita was included because there is a documented association between income and tobacco consumption. Similarly, urbanisation is associated with a number of risk factors for NCDs(45).

4.2.2. Analytic Models

I tested the mediator hypotheses with path analysis(46,47) using multilevel models (random intercept and random coefficients linear regression). I used a two year lag for

the CPI to observe the requirements of temporal antecedence of corporate permeation vis a vis the state of tobacco control policy and population smoking. These coefficients are, nonetheless, capturing mostly variation across countries. I ran fixed effects models to estimate the effect of variations in CPI within countries over time on smoking prevalence and on scores in the two tobacco control. I also used fixed effects models to estimate the effect of variations in scores in the two tobacco control measures on smoking prevalence. To test the moderator hypotheses I created cross level interaction terms between CPI scores and a HIC/LMIC variable as well as between Compliance with national smoke free regulations and a HIC/LMIC variable and a High/Low Corporate Permeation variable. All models were run in Stata version 13.

4.4. Results

Hypothesis 1: The association between corporate power and smoking prevalence is mediated by tobacco control policy both within and between countries

One standard deviation (SD) increase in the CPI is associated with a 3% (95% CI [-0.11; 6.42]), - the coefficient is significant at the 90% level - increase in the percentage of adult smokers in the population in Europe, controlling for GDP and percentage of urban dwellers. One standard deviation increase in the CPI is also associated with an 11 point decrease in the TCS (95%CI [-20.7;-0.80]) (Table 4.1). The association between corporate permeation and prevalence of smoking when I control for the TCS is of a smaller magnitude, nearly a third, and no longer statistically significant: I find a mediator effect of tobacco control policies. This means that part of the positive association

between corporate power and smoking prevalence is channeled via its influence over tobacco control policy.

[Table 4.1]

When I focus on all countries, I find a similar mechanism in action but none of the coefficients is statistically significant. One SD increase in the CPI is associated with a 1.3% increase in the prevalence of smoking and with a 1.3 point decrease in the scale of Compliance with National Smoke Free Legislation. The magnitude of the association between CPI and smoking prevalence once I control for Compliance with National Smoke Free Regulations does not change, however.

The fixed effects linear regression tells a similar story. I find that, within the countries of Europe, a change in one SD in the CPI is associated with a nearly 3% increase in the prevalence of smoking and a 25 point reduction in the TCS. The coefficient for the association between CPI and Prevalence is reduced to nearly a fifth after the controlling for the TCS and is no longer statistically significant. When I look at the all the countries, I find a negative association between CPI and smoking prevalence, a negative association between CPI and compliance with national smoke free legislation and a negative association between CPI and prevalence after controlling for compliance with national smoke free legislation. Here too none of the coefficients is statistically significant (Table 4.2). I cannot reject H1.

[Insert Table 4.2 here]

Hypothesis 2: The association between corporate power and smoking prevalence is

moderated by the country income level

Hypothesis 2A: The association between corporate power and smoking prevalence is stronger within LMICs than within HICs

I do not find evidence that the positive association between corporate power and smoking prevalence is moderated by the country's income level nor that the association is of a different magnitude within LMICs and HICs countries i.e. the interaction coefficient is not statistically significant (Tables 4.3 and 4.4). I cannot accept H2 and H2A

[Insert Tables 4.3 and 4.4 here]

Hypothesis 3: The association between corporate power and Tobacco Control Policy is moderated by country income level: it is stronger in LMICs than in HICs (H3).

I find a negative association between corporate power and compliance with national smoke free legislation. A one SD increase in the CPI is associated, on average, with a 3 point decrease (95%CI [-5.2;-0.82]) in the scale of compliance with national smoke free legislation. What is more, this association is moderated by country's level of income. The negative association between CPI and compliance with national smoke free legislation is statistically significant and of a larger magnitude in LMICs (-3.14 95%CI [-5.20;-0.78]) than in HIC, where it is still negative but not statistically significant (Table 4.5).

H3A: The association between corporate power and Tobacco Control Policy it is stronger within LMICs than within HICs (H3A)

These patterns are replicated in within country variation analyses. One SD increase in CPI within a LMIC country is associated with a 5 point (95%CI [-10.5,-0.098]) decrease in the scale of compliance with national smoke free regulations. The coefficients for

countries in HICs, on the other hand, are positive but not statistically significant (Table 4.6). I cannot reject H3A.This finding lends some empirical support to case studies and reports of the tobacco industry targeting LMICs and exerting its structural power to weaken compliance with smoke free regulations(29).

[Insert Table 4.5 and 4.6 here]

Hypothesis 4: The negative association between Tobacco Control Policy and prevalence of smoking in the population is moderated by Country Income Level. The association is weaker in LMICs than in HICs.

I find that in European countries, all of which HICs, the negative association between TCS scores and prevalence of smoking is statistically significant – for each point increase on the scale, there is a 0.13% reduction in smoking prevalence (95% CI [-0.19;-0.074]. This finding is consistent with the literature: comprehensive packages of duly implemented tobacco control measures are effective tools in reducing smoking at the population level(1,7). When I look at the association between compliance with national smoke free legislation and the prevalence of smoking, controlling for known confounders, I find a negative association that is not statistically significant. (Table 4.7).

The results from the analysis of within country associations (fixed effects model) between changes in TCS and the prevalence of smoking may shed some light on the previous findings.

H4A: The negative association between Tobacco Control Policy and prevalence of smoking in the population is weaker within LMICs than within HICs

Within countries of Europe, a one point increase in the TCS over time is associated with

a 0.1% (95% CI [-0.18,-0.024]) reduction in the prevalence of smoking. As for within country variation in compliance with national smoke free legislation, I find that a one point increase in the scale is associated with a reduction of 0.26% (95% CI[-0.52;-0.0069]) in smoking prevalence in that country, but only in HICs. The fixed effects linear regression coefficient for LMICs is nearly zero and not statistically significant (Table 4.8).

4.5. Discussion

Corporate power is associated with both increased prevalence of smoking and weaker tobacco control policy - be it lower strictness and comprehensiveness of tobacco regulations in the HICs of Europe or with lower compliance with national smoke free regulations in the world at large. In fact, tobacco control policy seems to mediate the association between corporate power and smoking in Europe, with no conclusive results for the mediating role of compliance with national smoke free regulations the rest of the world. The negative association between corporate permeation and compliance with national smoke free regulations is stronger in LMICs than in HICs, a finding that is in line with qualitative work describing the tactics that the tobacco industry uses to weaken tobacco control policy in countries with fewer economic and human resources. Overall, my work lends some quantitative, cross- country support to qualitative, national and institutional level research exposing the influence of commercial interests in the consumption of unhealthful commodities through the weakening of health policy.

Although the tobacco industry tactics in this domain are perhaps the best studied and

documented, many have argued that they form the blueprint for other industries such as food, chemicals or alcohol and are commonly deployed by them. Industries that rely on the promotion of risk factors for NCDs – smoking, alcohol, processed foods – have similar regulatory requirements and often work together towards weaker regulation or deregulation all together, not least to avoid regulatory precedents from areas that are not necessarily related to them(48,49).

My study has a number of limitations. Firstly, one of the outcomes - smoking prevalence in the adult population – refers to legally traded cigarette smoking. Illegal trade has been shown to inject large amounts of cheaper tobacco products especially in the markets of LMICs(35,50,51). Because the tobacco industry has also been shown to promote smuggling this limitation may result in an underestimation of the association between CPI and smoking. Similarly, my measure does not cover smokeless tobacco which is widely used in many parts of the world, especially in Africa and Southeast Asia, leading to an underestimation of the prevalence of smoking. Finally, this measure does not capture consumption among the youth, a primary target of the tobacco industry, especially in LMICs. Tobacco control policies that increase the price of cigarettes reduce exposure to marketing and promote plain packaging of tobacco products are especially effective at protecting youth from smoking initiation. As a result, our findings are likely to be an underestimation of the association between corporate permeation and smoking prevalence, especially in LMICs.

My measure of tobacco control policy implementation - compliance with national smoke free legislation – is imperfect as a moderator because it focuses on an essential albeit not sufficient component of tobacco control, smoke free spaces. It does not, capture whether the national smoke free legislation is strict or comprehensive nor does it speak to other drivers of consumption affordability of cigarettes or marketing, for example. It does, nonetheless, allow us to answer questions about the associations between corporate power and the weakening of the roll out of evidence based policies limiting the availability of smoking spaces. As for the explanatory variable, the CPI, it has some limitations of its own which are discussed elsewhere (Chapter 3). A couple of these limitations should be singled out, nonetheless. Some quantitative measures of undue influence that have been extensively used by tobacco companies are not captured by the CPI. These include measures such as lobbying, the prevalence of revolving-doors between the tobacco industry and policy making spheres and donations to political parties, candidates and campaigns. These variables are particularly, if not impossible to find, especially in formats that render these measures comparable across countries.

4.6. Conclusion

My findings show that corporate power is associated with poorer policy and smoking outcomes, providing evidence that systematically substantiates prior qualitative work (12,52). This has important implications for public health policy. First, whilst acknowledging that direct participation of commercial interests in policy making is only one of the ways in which weaker policies are formulated and strong policies are not adequately implemented, my findings suggest that a higher level of scrutiny and

reporting of breaches of article 5.3 of the FCTC is required. Second, countries that do not have the capacity to implement evidence-based policies are likely to benefit from greater resources and capacity building initiatives. For example, WHO Europe carried out a legal training and capacity-building workshop on law and NCDs for technical staff from member states in the Region(53), similar initiatives could be scaled up in other Regions. Third, given that part of the differences in the results observed between LMICS and HICs can be attributed to weaker leverage of the former in trade, the FCTC itself could be improved as tool to correct these power imbalances. It is the first global concerted effort to shift the venue for settling trade health conflicts among countries from the trading regime of the World Trade Organization to a public health one and yet, as a result of a political compromise and not evidence-base decision making, it does not include an explicit trade provision(38). The FCT Conference of the Parties should develop guidelines to eliminate ambiguity and help signatories address trade-health relations obstacles that may arise in the implementation of the FCTC(38). In 2008, the WHO Commission on Social Determinants of Health recommended action to ensure that health and health equity was not harmed by global trade. The Commission recommended the institutionalization of health equity impact assessment of global, regional, and bilateral economic agreements(54). My results back the call for these assessments.

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Figure 4. 1. Associations among Corporate Permeation, Smoking Prevalence and Tobacco Control Policy

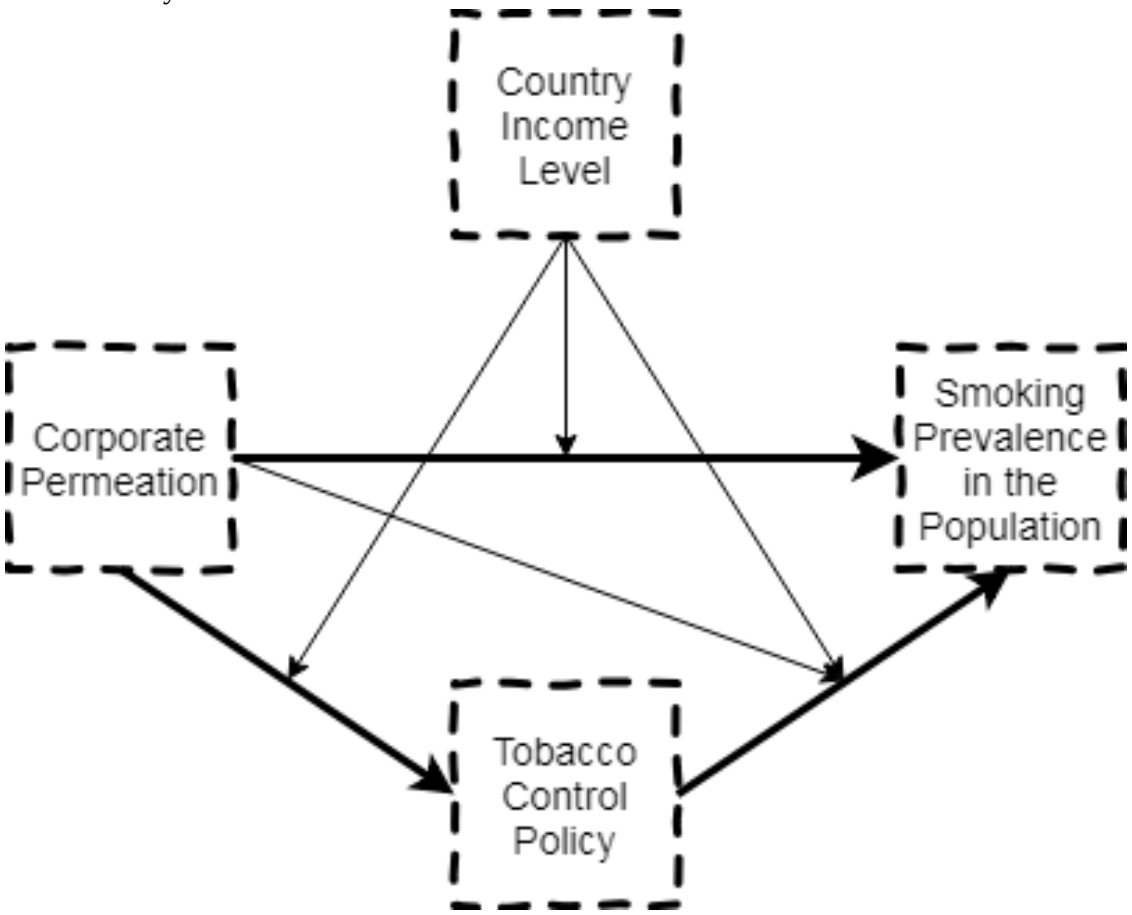

Table 4. 1. Random Intercept and Random Coefficients Linear Regression of Smoking Prevalence on Corporate Permeation - Does Tobacco Control Policy Mediate the Association?

	(1) Prevalence of Smoking (Europe)	(2) Tobacco Control Scale (Europe)	(3) Prevalence of Smoking (Europe)	(4) Prevalence of Smoking (All Countries)	(5) Compliance with National Smoke Free Legislation (All Countries)	(6) Prevalence of Smoking (All Countries)
Corporate Permeation Index (CPI) (Lagged)	3.16* [-0.11,6.42]	-10.8** [-20.7,-0.80]	1.21 [-1.93,4.35]	1.27 [-1.62,4.17]	-1.30 [-2.89,0.29]	1.30 [-1.67,4.26]
GDP Per Capita (Purchasing Power Parity)	-0.000077** [-0.00014,-0.000011]	0.0000068 [-0.00026,0.00027]	-0.000049* [-0.00011,0.0000085]	-0.000033 [-0.00016,0.000098]	0.000051** [0.0000091,0.000092]	-0.000032 [-0.00016,0.000099]
Urban population as % of total population	-0.16* [-0.32,0.010]	0.0096 [-0.25,0.27]	-0.16** [-0.32,-0.0036]	-0.038 [-0.17,0.098]	0.055*** [0.019,0.091]	-0.039 [-0.17,0.098]
Tobacco Control Scale			-0.12*** [-0.19,-0.063]			
Compliance with National Smoke Free Legislation						0.0071 [-0.13,0.14]
Constant	39.2*** [27.2,51.1]	46.8*** [26.1,67.4]	44.4*** [32.9,55.9]	26.6*** [18.3,34.9]	1.52 [-0.57,3.61]	26.6*** [18.3,34.9]
lns1_1_1						
Constant	1.16 [-	2.56*** [1.86,3.27]	1.37*** [0.50,2.23]	-1.53 [-1.53,-1.53]	0.30 [-0.78,1.38]	-1.71 [-1.71,-1.71]

	0.36,2.69]					
lns1_1_2						
Constant	1.63*** [1.26,2.00]	1.71*** [1.08,2.33]	1.59*** [1.24,1.95]	2.04*** [1.86,2.23]	0.42** [0.082,0.76]	2.04*** [1.86,2.23]
atr1_1_1_2						
Constant	0.49 [-0.74,1.73]	-0.65* [-1.37,0.074]	0.41 [-0.38,1.19]	7.10 [-1630.8,1645.0]	7.38 [-851.0,865.7]	6.91 [-2205.7,2219.5]
lnsig_e						
Constant	-0.44*** [-0.74,-0.15]	1.15*** [0.88,1.43]	-0.70*** [-1.01,-0.39]	-0.21* [-0.43,0.0090]	0.52*** [0.32,0.71]	-0.21* [-0.43,0.0092]
Observations	61	61	61	108	108	108

95% confidence intervals in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0$

Table 4. 2. Fixed Effects Linear Regression of Smoking Prevalence on Corporate Permeation – Does Tobacco Control Policy Mediate the Association?

	(1) Prevalence of Smoking	(2) Tobacco Control Scale	(3) Prevalence of Smoking	(4) Prevalence of Smoking	(5) Compliance with National Smoke Free Legislation	(6) Prevalence of Smoking
Corporate Permeation Index (CPI) Lagged	2.97*	-24.9***	0.65	-0.78	-5.54	-0.87
	[-0.27,6.20]	[-38.8,-11.0]	[-3.06,4.36]	[-4.15,2.60]	[-13.0,1.92]	[-4.38,2.63]
GDP Per Capita (Purchasing Power Parity)	-0.000025	0.000035	-0.000022	-0.00017	-0.00021	-0.00018
	[-0.000096,0.000046]	[-0.00027,0.00034]	[-0.000089,0.000044]	[-0.00039,0.000046]	[-0.00069,0.00027]	[-0.00040,0.000047]
Urban population as % of total population	-0.90***	2.78***	-0.64**	-0.16	0.21	-0.15
	[-1.35,-0.44]	[0.82,4.73]	[-1.13,-0.15]	[-0.56,0.25]	[-0.70,1.11]	[-0.57,0.26]
Tobacco Control Scale			-0.093**			
			[-0.18,-0.0068]			
Compliance with National Smoke Free Legislation						-0.017
						[-0.16,0.12]
Constant	90.4***	-154.0**	76.1***	37.4***	-2.86	37.3***
	[58.7,122.2]	[-290.3,-17.7]	[43.5,108.7]	[12.0,62.8]	[-59.0,53.3]	[11.6,63.1]
Fixed Effects						
N	61	61	61	108	108	108

95% confidence intervals in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. 3. Random Intercept and Random Coefficients Linear Regression of Smoking Prevalence on Corporate Permeation - Does Income Level Moderate the Association?

	(1) Prevalence of Smoking
Corporate Permeation Index (CPI) Lagged	1.22 [-2.09,4.54]
Country Income Level	
LMICs (Reference)	-
High Income Countries	5.78** [0.71,10.8]
LMICs # CPI	-
HIC#CPI	0.14 [-6.30,6.57]
GDP Per Capita (Purchasing Power Parity)	-0.00013 [-0.00028,0.000025]
Urban population as % of total population	-0.059 [-0.20,0.078]
Constant	27.6*** [19.2,35.9]
lns1_1_1	
Constant	-1.56 [-1.56,-1.56]
lns1_1_2	
Constant	2.03*** [1.84,2.21]
atr1_1_1_2	
Constant	6.30 [-940.6,953.2]
lnsig_e	
Constant	-0.24** [-0.46,-0.023]
Observations	108

95% confidence intervals in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. 4. Fixed Effects Linear Regression of Smoking Prevalence on CPI by income level – Does income level moderate the association?

	(1) Prevalence of Smoking
Corporate Permeation (CPI)	0.10 [-3.91,4.11]
LMICs# CPI	-
HICS # CPI	-4.67 [-14.0,4.69]
GDP Per Capita (Purchasing Power Parity)	-0.00016 [-0.00038,0.000071]
Compliance with National Smoke Free Legislation	0.0054 [-0.14,0.15]
Urban population as % of total population	-0.17 [-0.59,0.24]
Constant	37.9*** [12.2,63.7]
Fixed Effects	
N	108

95% confidence intervals in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. 5. Random Effects Linear Regression of Tobacco Control Policies on Corporate Permeation - Moderated by Income Level

	(1) Compliance with National Smoke Free Legislation	(2) Compliance with National Smoke Free Legislation - LMICs	(3) Compliance with National Smoke Free Legislation - HICs
Corporate Permeation Index (CPI) Lagged	-3.01*** [-5.20,-0.82]	-3.14*** [-5.50,-0.78]	-1.28 [-4.01,1.44]
Country Income Level			
LMICs (Reference)	-		
HICs	0.79 [-0.92,2.50]		
LMICs# CPI (Lagged) (Reference)	-		
HICs# CPI (Lagged)	3.36* [-0.046,6.76]		
GDP Per Capita (Purchasing Power Parity)	0.000054 [-0.000016,0.00012]	0.00016** [0.0000049,0.00031]	0.0000025 [-0.000073,0.000078]
Urban population as % of total population	0.058*** [0.022,0.094]	0.041 [-0.014,0.096]	0.030 [-0.028,0.087]
Constant	1.05 [-1.21,3.31]	0.79 [-1.98,3.56]	5.55** [0.073,11.0]
lns1_1_1			
Constant	-0.083 [-1.61,1.44]	-0.46 [-5.24,4.31]	0.23 [-3.12,3.58]
lns1_1_2			
Constant	0.34* [-0.030,0.71]	0.33 [-0.25,0.90]	0.13 [-0.73,0.99]
atr1_1_1_2			
Constant	8.16 [-3290.3,3306.7]	6.23 [-532.9,545.4]	0.59 [-1.61,2.78]
lnsig_e			
Constant	0.51*** [0.31,0.71]	0.67*** [0.40,0.93]	0.26* [-0.047,0.56]
Random Effects	108	58	50

95% confidence intervals in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. 6. Fixed Effects Linear Regression of Compliance with Tobacco Free Regulations on Corporate Permeation - By Country Income Level

	(1) Compliance with National Smoke Free Legislation	(2) Compliance with National Smoke Free Legislation – LMICs	(3) Compliance with National Smoke Free Legislation - HICs
Corporate Permeation Index (CPI) Lagged	-4.66** [-9.25,-0.073]	-5.32** [-10.5,-0.098]	4.44 [-3.78,12.7]
LMICs# CPI	-		
High Income Countries##CPI	10.5* [-1.13,22.2]		
GDP Per Capita (Purchasing Power Parity)	-0.00020 [-0.00054,0.00014]	-0.00072 [-0.0017,0.00024]	-0.000058 [-0.00035,0.00024]
Urban population as % of total population	0.27 [-0.34,0.88]	0.61 [-0.25,1.46]	-0.51 [-2.16,1.14]
Constant	-5.61 [-39.8,28.6]	-19.7 [-59.0,19.7]	48.6 [-69.0,166.2]
Fixed Effects			
N	191	126	65

95% confidence intervals in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. 7. Random Effects Linear Regression of Tobacco Prevalence on Tobacco Control Policies and Moderator Effect

	(1) Prevalence of Smoking (Europe)	(2) Prevalence of Smoking (All Countries)	(3) Prevalence of Smoking (All Countries)	(4) Prevalence of Smoking (LMICs)	(5) Prevalence of Smoking (HICs)
Prevalence of Smoking Tobacco Control Scale	-0.13*** [-0.19,-0.074]				
Compliance with National Smoke Free Legislation		-0.0082 [-0.14,0.12]	0.0082 [-0.14,0.15]	0.011 [-0.057,0.079]	-0.21 [-0.57,0.15]
GDP Per Capita (Purchasing Power Parity)	-0.000060** [-0.00012,-0.0000042]	-0.000048 [-0.00018,0.000080]	-0.00015* [-0.00030,0.0000037]	-0.00016 [-0.00039,0.000072]	-0.00023*** [-0.00038,-0.000076]
Urban population as % of total population	-0.18** [-0.34,-0.027]	-0.041 [-0.18,0.096]	-0.059 [-0.19,0.076]	0.018 [-0.16,0.19]	-0.12 [-0.29,0.042]
Country Income Level LMICS (Reference)			-		
HICs			6.77** [1.10,12.4]		
LMICs# Compliance with National Smoke Free Legislation (Referenc			-		

e)					
HICs# Compliance with National Smoke Free Legislation			-0.11 [-0.41,0.19]		
Constant	46.8*** [35.8,57.9]	27.2*** [18.8,35.5]	27.9*** [19.6,36.1]	23.3*** [13.9,32.7]	43.4*** [30.9,55.9]
lns1_1_1 Constant	-3.50*** [-5.22,-1.78]	-3.36* [-7.10,0.39]	-3.70 [-3.70,-3.70]	-5.33 [-22.2,11.5]	-2.68*** [-3.89,-1.47]
lns1_1_2 Constant	1.91*** [1.47,2.35]	2.09*** [1.89,2.29]	2.06 [2.06,2.06]	2.21*** [1.95,2.47]	1.76*** [1.51,2.01]
atr1_1_1_2 Constant	-9.00 [-11196.3,11178.3]	-7.67 [-1950.5,1935.2]	-9.39 [-9.39,-9.39]	7.96 [-21055.2,21071.1]	-9.08 [-23849.4,23831.3]
lnsig_e Constant	-0.57*** [-0.83,-0.30]	-0.23** [-0.44,-0.021]	-0.26 [-0.26,-0.26]	-1.04*** [-1.34,-0.75]	0.078 [-0.23,0.39]
Random Effects	61	108	108	58	50

95% confidence intervals in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. 8. Fixed Effects Linear Regression of Smoking Prevalence on Tobacco Control Policies and Compliance with Tobacco Free Regulations

	(1) Prevalence of Smoking (Europe)	(2) Prevalence of Smoking (All Countries)	(3) Prevalence of Smoking (LMICs)	(4) Prevalence of Smoking (HICs)
Tobacco Control Scale	-0.10** [-0.18,-0.024]			
Compliance with National Smoke Free Legislation		0.0059 [-0.13,0.14]	0.024 [-0.042,0.091]	-0.26** [-0.52,-0.0069]
GDP Per Capita (Purchasing Power Parity)	-0.00010*** [-0.00017,-0.000034]	-0.00032*** [-0.00044,-0.00021]	-0.00058*** [-0.00073,-0.00044]	-0.00015** [-0.00028,-0.000012]
Urban population as % of total population	-0.73*** [-1.12,-0.33]	-0.095 [-0.34,0.15]	0.27*** [0.12,0.43]	-2.66*** [-3.54,-1.78]
LMICs # Compliance with National Smoke Free Legislation		-		
HICs # Compliance with National Smoke Free Legislation		-0.091 [-0.37,0.19]		
Constant	85.9*** [59.9,111.8]	37.0*** [21.3,52.7]	12.6*** [4.61,20.5]	232.0*** [166.8,297.1]
Fixed Effects				
N	90	162	87	75

95% confidence intervals in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Chapter 5

Alcohol control policies and alcohol consumption: an international comparison of 167 countries

Abstract:

Background: Alcohol control policy has a fundamental role in limiting negative health, economic and social harm caused by alcohol consumption. However, there is substantial inter-national heterogeneity in country level policy adoption, implementation and monitoring. Comparative measures so far focused on Europe or the OECD.

Methods: I created an Alcohol Control Policy Index (ACPI) for 167 countries using 5 different methodologic approaches. National policies were sourced from WHO's Global Information System for Alcohol and Health. I assessed ACPI's criterion-related validity by calculating the strength of the association among the different approaches. As for content validity, I tested whether the resulting scores explained variations in alcohol per capita consumption cross-nationally, controlling for GDP, population age, urbanization and world region using OLS and random coefficients models.

Results: Index scores and ranks from different methodological approaches are highly correlated (r=0.99). Higher scores were associated with lower consumption across the 5 methods. For each 1 score increase in the ACPI, the reduction in per capita alcohol consumption varies from -0.024L (95% CI [-0.043; -0.004]) to -0.014 L (95% CI [-0.034 ; 0.005]. I obtain larger coefficients and p-values < 0.005 when estimating random coefficients.

Conclusion: ACPI offers a measure of alcohol control policy across countries that makes use of a larger number of countries than its predecessors as well as a wider range of methodologies for its calculation, both of which contribute to its validity. Furthermore, it shows that the statutory strictness of alcohol control policies is associated with lower levels of alcohol consumption.

5.1. Introduction

Alcohol use is deeply rooted in the ancient and modern culture of many countries and regions across the world. Its effects often go beyond the celebratory and gregarious to include undesirable health, social and economic outcomes. Alcohol accounts for 3.8% of all global deaths, 4.6% of global disability adjusted life years and costs associated with its use represent over 1% of GDP in high and middle income countries.[1] These costs are not limited to healthcare expenditures - they include productivity losses and various other social harms such as violence. In fact, harm inflicted upon others is at times estimated to equal that incurred by the drinker.[2] Although some beneficial effects have been attributed to moderate consumption, these are largely outweighed by the negative ones.[1,3]

Attempts to mitigate the adverse consequences of alcohol drinking have largely rested on health policy efforts to modify the environments that promote alcohol use. However, the suite of policies adopted at the national level varies tremendously across countries, as does the strength and effectiveness of the implementation of these policies. In order to gauge the range of policies and levels of effectiveness of alcohol control policies, several authors have developed composite measures and compared countries in Europe and the OECD [4–7], in the Western Pacific [8] and in Africa [9]. Some have used these indices to predict per capita consumption estimates and found positive associations[5,8,10], but no one, to the best of my knowledge, has applied a scale to data from all over the world.

I contribute to the existing evidence with a composite indicator – the Alcohol Control Policy Index (ACPI) - that comprises alcohol control policies from 167 countries worldwide. My large sample adds nuance to previous analysis of policy scores and consumption, namely adjusting for known confounders in the association between scores in the ACPI and per capita alcohol consumption.

5.2. Methods

Over 100 national level alcohol control policies and alcohol consumption per capita were downloaded from WHO's Global Information System on Alcohol and Health (GISAH) for 190 countries. Policy areas and individual policies reflect the ten areas outlined in WHO's Global Strategy to Reduce the Harmful Use of Alcohol: Leadership, Awareness and Commitment; Health Services' Response; Community Action; Drink Driving Policies and Countermeasures; Availability of Alcohol; Marketing of Alcoholic Beverages; Pricing Policies; Reducing the Negative Consequences of Drinking and Alcohol Intoxication; Reducing the Public Health Impact of Illicit Alcohol and Informally Produced Alcohol and Monitoring and Surveillance. GISAH portraits the state of alcohol policy as of 2012.

I excluded countries that have a ban on alcohol use – Afghanistan, Brunei Darussalam, Iran, Libya, Maldives, Mauritania, Saudi Arabia, Somalia, Sudan and Yemen - or substantial missing information -Democratic People's Republic of Korea, Djibouti, Haiti, Kuwait, Lebanon, Marshall Islands, Solomon Islands, South Sudan, United Arab Emirates, which resulted in a sample of 167 countries.

To capture the state of the policy area pertaining to Pricing Policies I created a new variable, a measure of alcohol affordability based on alcohol prices collected by GISAH.[5,11]

$$\text{Alcohol Affordability:100} * \frac{Price\ calculated\ based\ on\ standard\ containers\ of\ 50cl\ beer,75cl\ wine,70\ cl\ spirits}{(Gross\ National\ Income\ at\ PPP\ Per\ Capita\ (current\ international\ \$))}$$

Data on Gross National Income was downloaded from the World Bank World Development Indicators Database.

The Alcohol Policy Index

The first step in the ACPI calculation was to address the incompleteness of the dataset. Missing data were nearly negligible, under 1%. Accordingly, I ruled out sophisticated imputation methods and replaced missing values with the mode of the policy category of the variable in question. For example, if information on restrictions on advertising for spirits on the internet was missing, that value was replaced with the mode of the category "Advertising restrictions for Beer, Wine and Spirits on the Internet". Ordinal variables denoting policy options were not homogenously coded across the dataset. To ensure comparability across policy categories, I re-coded ordinal variables to obtain 4 ordinal categories as follows: 0 "Voluntary/No Restriction" 1"Partial Restriction" 2"Partial restriction Time Place and Content" 3"Ban". Binary variables were not recoded and continuous variables were coded into discrete categories. For example, "Blood alcohol

concentration limit was coded as “0 "No BAC Limit" 1 "Limit above the median" 2 "Limit equal or below median" 3 "Zero tolerance and bans".

Second, I proceeded to normalize, weigh and aggregate policy variables. I used two approaches to variable normalization– transformation of each categorical and continuous variable into a binary variable and transformation of all variables into Z_scores -, one to multivariate analysis – factor analysis - and two approaches to weighing and aggregation – equal weighing of all variables and “Budget Allocation” weighing, based on theory and expert opinion and not on technical manipulation.[12]. The rationale behind the binary transformation is that it is problematic to build a measure that assumes that the leap from one level of policy adoption to another is of equal magnitude than that from another level to the next. In other words, the step from “No restrictions to advertising of beer” to “Partial restrictions on the advertising of beer” is not necessarily equivalent in magnitude to the step from “"Partial Restriction on Time Place and Content of the advertising of beer” to “Total Ban on the Advertising of Beer”. I address this issue by recoding both continuous and categorical variables into the binary variable “Above or equal / Below the variable mean”. Z_score transformation is a widespread method of normalization, albeit it one that does not address this issue.

The third step of composite indicator building, multivariate analysis, consists of a reduction of the dimensionality of the data to fewer components or factors which measure unique “statistical” dimensions in the data. Some authors argue, however, that

"the disadvantage of using this approach to weighting is that the correlations do not necessarily correspond to the real-world links and underlying relationships between the indicators and the phenomena being measured".[13] The authors of the EAPAI, an alcohol policy measure for European countries, for example, go a step further and attribute equal weights to all items on their index because "(A)ll meaningful items in the European Action Plan to Reduce the Harmful use of Alcohol, regardless of their statistical contribution ought to be retained in the composite indicator as an indication of their practical importance".[7] I undertook a factor analysis of the variables normalized using Z_Scores. The weights attributed to each factor come from the proportion of the overall variance that the factor explains.[12]

Fourth, I attributed theory based weights to each of the variables. The theoretical scoring framework was developed by WHO Regional Office for Europe.[11] The framework groups policies according to the ten areas for national action outlined in the Global Strategy to Reduce Harmful Use of Alcohol and attributes weights to each policy according to the quality of the scientific evidence underpinning it i.e. policies with a stronger evidence base are weighted proportionally higher than those with weaker evidence base. The scoring scheme relies on the principle that countries adopting stronger policies should be rewarded, but that it should be possible for all countries to obtain the maximum score.

In the fifth and last step, all resulting index scores were normalized to a 0 to 100 scale to ensure comparability.

I used 5 different approaches to calculate the ACPI. These approaches differ from each other in the methods used in each of the above steps to composite indicator calculation - normalization, multivariate analysis and weighing and aggregation.[12] Formulation ACPI is a simple unweighted average of binary variables; Formulation ACPI_Z is a simple unweighted average of variables transformed into Z_Scores; Formulation ACPI_Z_Weight is a weighted aggregation of Z_scores according to theory and expert opinion and Formulation ACPI_Z_FA is obtained by a weighted aggregation of Z_scores according to the weights produced by factor analysis.

Once I obtained the alternative measures, I proceeded to test the Index's measurement validity. I assessed criterion-related validity - or the strength of relation between the measure and a measurable external criterion-, as well as content validity - or the extent to which the measure's content represents the concept to be measured.[14] To assess the former, I used the ACPI as an explanatory variable in a regression of alcohol consumption per capita on ACPI scores. I employed, first, a simple multivariate OLS regression followed by a random coefficient multilevel model as a robustness check. To assess the latter, for each country, I calculated a median rank and score under each of the five ACPI formulations (ACPI; ACPI_Z; ACPI_Z_FA; ACPI_Z_Weight and

ACPI_Weight) and compared them to a baseline, which I set to the simple mean of a binary variables, using Pearson or Spearman correlation coefficients.

I controlled for GDP Per Capita, percentage of the population between 0 and 14 years old, percentage of urban dwellers as part of the total population as well as world region. GDP Per Capita was included because the prevalence of drinking increases as income rises from very low amounts[1] and it influences a country's ability to formulate and instate alcohol control policies. The extent of urbanization is related to drinking patterns – increasing urbanization has been associated with both increasing [15,16] and decreasing alcohol consumption [17]- and with the alcohol policy architecture as urban settings require different policy tools to those of rural areas. Adjusting for urbanization will account for this effect in either direction. The age composition of a population bears influence on both drinking patterns - incidence of heavy drinking and alcohol problems decreases with age (18,19)]- and on the policy architecture – for example, the need to regulate advertising on social media. Furthermore, the alcohol industry's increasing investment in areas of the globe with rapid population growth and urbanization means increased availability of alcoholic beverages and an incentive to weaken alcohol control policies that curb alcohol consumption.[20]

Lastly, alcohol consumption and regulatory attitudes to alcohol show some regional clustering. The European Region as a group has the world's highest alcohol consumption, followed by the Americas. With the exception of some African countries,

alcohol consumption is lower in the rest of the world.[1] Similarly, factors such as religion, that may confound the association tend to be geographically clustered. The regional grouping of countries is that of the United Nations' Millennium Development Goals (MDG). Data on GDP per capita PPP, population age distribution and urbanization were obtained from the World Bank World Development Indicators Database.

Finally, I correlated my measure with existing composite indicators of alcohol policy developed for Europe – EAPA Index [7]- , the OECD – the API [5]- , in 46 African countries [9] and in the Western Pacific.[8]

5.3. Results

Criterion-related validity

The results are displayed in Figures 5.1.1 to 5.1.4. For ease of interpretation I clustered the 167 countries per the MDG regional groupings: Developed Regions, Northern Africa, Sub-Saharan Africa, Caribbean, Latin America, Caucasus and Central Asia, Eastern Asia, Southern Asia, South-eastern Asia, Western Asia, and Oceania.

[Insert Figure 1.1 here Footnote to the graph should say "Formulation ACPI is a simple unweighted average of binary variables; Formulation ACPI_Z is a simple unweighted average of variables transformed into Z_Scores; Formulation ACPI_Z_Weight is a weighted aggregation of Z_scores according to theory and expert opinion and Formulation ACPI_Z_FA is obtained by a weighted aggregation of Z_scores according to the weights produced by factor analysis.]

Countries in the MDG "Developed Countries" regional grouping median scores ranged from 13 in San Marino to 88 in Sweden (Table 1.3); from 35 in Armenia to 96.7 in Uzbekistan in the "Caucasus" regional grouping (Supplemental Table 1.2); from 9.6 in Bolivia to 64.6 in Costa Rica in the "Latin America" regional grouping (Table 1.6) ; from 3 in Antigua and Barbuda to 96 in Cuba in the Caribbean (Supplemental Table 1.1) Several countries shifted several positions under the different methodological approaches. For example, within the Developed Countries group, Japan has a range of 76 positions between its minimum and maximum scores while France has a range of only 4 (Table 5.1). It is worth noting that the width of the range seems to be driven primarily by the scores calculated using the theory weighing.

[Insert Tables 5.4;5.12]

The correlation coefficients between the baseline and the median of all six approaches was $r = 0.99$ for both ranks and scores.

Content validity

Simple bivariate associations between scores in the ACPI and alcohol per capita consumption in liters show a negative association across all approaches for index calculation, with the exception of theoretically weighed variables. Controlling for GDP per capita, Population from 0 to 14 years old, Urban population and dummies for world region, not only increases the magnitude of the negative association for all approaches but also results in a negative coefficient for the association between ACPI scores

calculated with theoretically weighed variables and alcohol per capita consumption (Table5. 3).

[Insert Table 5.3 here]

For each 1 score increase in the ACPI, the reduction in per capita alcohol consumption varies from -0.024L (95% CI [-0.043; -0.004]), when ACPI is calculated using factor analysis on z_scores, to -0.014 L (95% CI [-0.034 ; 0.005]), when ACPI is calculated using equal weighing of binary variables.

As a robustness check I performed a region random coefficient analysis which yielded similar results. I find that the association between scores in the ACPI and alcohol consumption is always negative and $p < 0.05$. Reductions ranged from – 0.035 L of alcohol per capita (95% CI [-0.054;-0.017]) when ACPI is calculated using factor analysis on z_scores to -0.028 L(95% CI [-0.046;-0.009]) when calculated using equal weighing of binary variables. The region random coefficient for the effect of ACPI scores on Alcohol per capita consumption varies according to unobserved region level characteristics, hinting at regional factors potentially related to drinking culture (Table 5.3).

[Insert Table 5.3 here]

Finally, Figure 2 shows the plots of ACPI scores and the scores of existing measures. The correlation coefficient between the ACPI and the EAPA was r= 0.7886, the API was r=0.4232 and the indicator for 46 African Countries was r= 0.4635.

[Insert Figure 5.2 here]

5.4. Discussion

The worldwide distribution of ACPI scores shows similar levels of intra and inter regional variation. The Developed Countries Region, for instance, the one with the highest prevalence of high APCI scores, ranges from 100 points in some formulations in Sweden to under 20 points in Andorra and San Marino. The same is true in Sub Saharan Africa where Zimbabwe scores over 80 in some formulations and Sao Tomé consistently scores near zero. A number of factors may drive differences between countries. Developed countries, in particular those of Europe, for example, by virtue of their higher alcohol consumption may be more inclined to formulate more stringent policies. Postmodern values too have been put forward as possible explanations for more stringent policy formulation. It has been hypothesised that societies that have moved beyond a focus on basic survival towards self-expression will be more likely to invest in the future well-being by enacting both health enhancing. On the other hand, countries where survival values prevail may view investments in regulatory enforcement as a luxury[21,22]. Postmodern values can partly explain the higher scores observed in developed countries. The religious composition of the population may affect alcohol policy formulation. Turkey, Jordan and Oman in the West Asia Region, or Bangladesh and Indonesia in South Asia, all of which have large Muslim populations show fairly high scores. It could also be argued on the other hand, that the prevalence of religious norms around alcohol consumption renders policy redundant given the normative incentive to abstain. This could explain why countries such as Syria or Iraq show low

scores. Naturally, protracted armed conflict may also explain weak alcohol policy formulation as governments prioritise more pressing areas. Finally, the saturation of developed countries' alcohol markets and the subsequent expansion of the alcohol industry into middle and low income countries has been identified as factor in the weakening of alcohol control policies[20,23,24]

My analysis has a number of limitations, the most important of which is arguably the absence of measures of implementation and enforcement of the policies on which the Index relies. This has at least two implications. First, the absence of measures of implementation precludes an analysis of a possible lagged effect between policy implementation and changes in consumption. GISAH captures the state of alcohol policy as of 2012, but we know very little about how long a particular policy had been in place. Second, it is difficult to disentangle the effects of poor de facto implementation from those of a pervasive drinking culture that evades regulation. Hungary, for example, has very strict statutory alcohol control policies and a very high level of alcohol consumption.[5]

The Index scores correlate quite highly with previous measures, suggesting that the tools devised by both Tan and Brand and colleagues were capturing the same underlying concept than the ACPI, albeit using different data (Figure 5.2). The few outliers - Portugal and France and the Slovak Republic in the case of the comparison with Brand's API may be a consequence of policy changes in the 10 years separating the data used in

the two indices. The apparent low correlation obtained with Carragher and colleague's measure must be interpreted with caution due to the small sample of countries. Nonetheless, one potential explanation could lie in the fact that the authors incorporated measures of enforcement of the policies.

Comparative studies of alcohol policy enforcement have so far included a limited number of countries and covered only a portion of the policies collected by GISAH [8,25] making it impossible for us to incorporate this element into the analysis. I traded off a marginal loss of accuracy for the advantages that my large sample awarded, namely the possibility to control for known confounders such as GDP or urbanization. Another limitation is that the diversity of alcohol control policies in countries with federal systems where alcohol policy is determined at the state level – e.g. India or the United States – is not reflected in the measure as it only encompasses the federal level. Federal states, however, represent only a fraction of the sample.

As far as the dependent variable is concerned, reliance on recorded consumption does not adequately capture illicit trade in alcoholic beverages and may result in an underestimation of per capita alcohol consumption in some regions of the world. The very nature of illicit trade implies an impossibility of accurately ascertaining its dimension. Whereas figures exist, it is plausible that their accuracy is not homogenous across the globe which could further bias my results.

The ACPI contributes to the alcohol control scholarship in two ways. First, it adds a measure of the state of alcohol control policy across countries, one that makes use of a larger number of countries than its predecessors as well as a wider range of methodologies for its calculation, both of which contribute to its validity as an indicator. Second, it highlights the need for improved data collection on the implementation of these policies. Including a measure of policy implementation in the ACPI would allow for more precise benchmarking of countries as well as a finer analysis of the role of levels of implementation of existing policies in protection populations from alcohol exposure.

In addition, I showed that the statutory strictness of alcohol control policies is associated with lower levels of alcohol consumption. This finding has policy implications: governments should formulate and enact strict alcohol control policies as they seem to be effective tools in reducing population exposure to alcohol, a net contributor to the global burden of disease.

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Table 5. 1. Developed Countries

Country	Ranks			Scores		
Developed Countries	Baseline	Median	Range	Baseline	Median	Range
San Marino	5.5	10.5	[5.5-30]	9.1	13	[9.01-29.3]
Andorra	28	29	[16-59]	20.5	22.4	[19.1-39.7]
Albania	31.5	41.5	[30-57]	21.6	26.9	[21.6-38.7]
Monaco	35.5	35.25	[31.5-37]	22.7	24.9	[22.6-31.5]
Greece	35.5	37.25	[27-94]	22.7	25.3	[21.3-53.2]
Luxembourg	39	39	[36-72]	23.9	25.6	[23.3-45.6]
Japan	39	40	[36-112]	23.9	26.5	[22.2-58.1]
Austria	39	40.5	[29-86]	23.9	24.5	[23.9-49.6]
Belgium	45.5	54	[45-81]	26.1	29.7	[26.1-44.2]
Germany	64	67.5	[51-64]	31.8	32.6	[31.2-49.2]
Malta	72	63	[47-72]	34.1	34.2	[31.0-36.1]
Slovakia	74	76.5	[65-130]	35.2	37.2	[34.5-62.7]
Switzerland	80.5	67.5	[48-80.5]	38.6	36.7	[31.9-39.7]
United States	82.5	88	[80-114]	39.8	41.5	[39.2-59.1]
Estonia	82.5	84.5	[82-129]	39.7	41.8	[38.6-63.9]
Spain	84	87	[83-108]	42	42.4	[40.1-56.9]
Canada	85.5	95	[85.5-104]	43.2	45.1	[43.0-56.1]
Netherlands	87	100.5	[87-102]	44.3	45.4	[43.8-54.2]
Australia	92.5	102	[92.5-135]	47.7	48.9	44.6-64.6
Ukraine	92.5	106.5	[92.5-142]	47.7	51.7	[44.9-70.9]
Denmark	98	85.5	[83-98]	50	44.8	[41.6-50]
New Zealand	98	108.5	[98-128]	50	51.9	[44.8-63.4]
United Kingdom	102.5	105.25	[79-113]	52.2	49.9	[47.0-81.0]
Croatia	102.5	106.75	[97-121]	52.2	53.3	[50.4-55.4]
Bosnia and Herzegovina	102.5	115	[102.5-119]	52.2	52.7	[49.2-60.5]
Ireland	106.5	105.25	[96-144]	53.4	52.7	[44.9-71.7]
Lithuania	106.5	110.5	[106.5-164]	53.4	54.6	[46.8-81.0]
Czech Republic	106.5	100.25	[91-136]	53.4	50	[42.1-68.0]
Montenegro	111	94.5	[70-111]	54.5	47.2	[41.8-54.5]
Hungary	111	105	[93-122]	54.5	52.3	[42.6-59.6]
Moldova	114.5	127.5	[114.5-171]	55.7	61.6	[55.7-91.4]
Romania	119	124.5	[119-151]	60.22	61.7	[53.3-74.0]
Cyprus	121.5	112	[99-129]	61.4	54.2	[49.2-64.3]
Bulgaria	129	107	[95-129]	63.7	52.3	[47.2-63.6]
Israel	129	119	[114-134]	63.7	59.1	[48.8-65.0]
Italy	129	122	[116-129]	63.7	59.8	[54.1-63.6]
Iceland	132	135	[117-142]	65.9	66.3	[60.7-67.8]
Slovenia	134	133	[126-149]	67	65.5	[59.7-72.4]

Latvia	134	132.5	[122-140]	67	64.5	[55.2-70.5]
Serbia	137	138.5	[133-150]	68.2	67.03	[60.6-74.5]
Russia	140.5	151	[140.5-167]	71.6	76.6	[71.4-83.6]
Belarus	140.5	141.25	[135-155]	71.6	68.9	[64.1-77.3]
Poland	147.5	147.75	[138-168]	77.3	73	[64.4-85.9]
France	150.5	150.75	[149-153]	78.4	75.1	[72.1-78.4]
Macedonia	153.5	156	[153.5-161]	80.7	79.5	[77.3-82.8]
Norway	153.5	155.5	[150-170]	80.7	79.6	[77.5-91.0]
Portugal	156.5	134.5	[118-156.5]	81.8	62.4	[58.0-81.8]
Finland	156.5	143	[139-156.5]	81.8	68.8	[66.0-81.8]
Sweden	163	163	[160-174]	92	88.8	[84.3-97.2]

Table 5. 2. Latin America

Country	Ranks			Scores		
Latin America	Baseline	Median	Range	Baseline	Median	Range
Bolivia	7	5	[1-7]	9.7	9.6	[0.0-11.2]
Suriname	17	27	[17-42]	15.9	23.8	[15.9-32.9]
Guatemala	26	25	[20-42.5]	20	23.2	[17.0-32.2]
El Salvador	31.5	36.5	[23-43]	21.6	25.7	[21.6-31.9]
Uruguay	35.5	37.75	[29-91]	22.7	25.9	[20.8-60.0]
Honduras	41.5	45	[37-60]	25	30.4	[25-33.5]
Guyana	56.5	56.75	[52-65]	29.5	30.9	[28.3-40.6]
Chile	60	60	[58-127]	30.7	32	[28.8-63.5]
Panama	60	63	[21-71]	30.7	30.2	[25.1-35.4]
Belize	66	56.5	[36-66]	32.4	31.6	[28.3-32.7]
Ecuador	85.5	102	[85.5-123]	43.2	49.1	[42.9-62.8]
Peru	102.5	103.75	[74-113]	52.3	47.3	[44.9-57.0]
Paraguay	109	81	[39-109]	54	42.6	[32.4-54.0]
Colombia	114.5	120.5	[114.5-154]	55.7	57.8	[49.7-76.9]
Brazil	116	96	[75-116]	56.8	48.5	[43.0-56.8]
Nicaragua	124.5	121.5	[98-125]	62.5	55.4	[52.4-62.5]
Argentina	124.5	126.5	[120-139]	62.5	63.2	[54.8-65.9]
Mexico	139	137.5	[129-145]	70.5	67.6	[57.0-71.9]
Venezuela	144	146	[132-152]	75	73.1	[64.8-78.3]
Costa Rica	152	138	[125-154]	79.5	64.6	[60.4-79.5]

Table 5. 3.Summary of coefficients of OLS regression of alcohol consumption on scores of the ACPI

	API (Binary Variables)	API (Binary Variables)	API (Z_Scores)	API (Z_Scores)	API (Z_Scores)
	Simple Mean	Theory Weighing	Simple Mean	Factor Analysis	Theory Weighing
Alcohol Per Capita Consumption					
Simple Bivariate Association Coefficients	-0.005 [-0.030;0.021] p- value 0.720	0.021 [-0.007 ;0.050] p- value 0.145	-0.013 [-0.040;0.014] p- value 0.337	-0.024 [-0.050;0.001] p- value 0.064	0.017 [-0.013;0.046] p- value 0.269
Adjusted Coefficients	-0.014 [-0.034 ; 0.005] p- value 0.140	-0.020 [-0.043;0.002] p- value 0.078	-0.019 [-0.040;0 .002] p- value 0.070	-0.024 [-0.043 ; -0.004] p- value 0.019	-0.023 [-0.046; 0.000] p- value 0.052
GDP Per Capita	0.00 [-0.00;0.00] p- value 0.107	0.00 [-0.00;0.00] p- value 0.099	0.00 [-0.00;0.00] p- value 0.103	0.00 [-0.00;0.00] p- value 0.112	0.00 [-0.00;0.00] p- value 0.090
Population 0 to 14 (% of total)	-0.156 [-0.242;-.0704] p- value 0.000	-0.160 [-0.246;-0.075] p- value 0.000	-0.157 [-0.242;-0.072] p- value 0.000	-0.158 [-0.242;-0.074] p- value 0.000	-0.164 [-0.250;-0.078] p- value 0.000
Urban population (% of total)	-0.008 [-0.035;0.018] p- value 0.529	-0.010 [-0.036 ;0.017] p- value 0.462	-0.010 [-0.035;0.018] p- value 0.537	-0.008 [-0.034;0.018] p- value 0.545	-0.010 [-0.036;0.017] p- value 0.475
Dummy World Region	…	…	…	…	…
Observations	167	167	167	167	167
Adj R- Squared	0.62	0.62	0.62	0.62	0.62

Table 5. 4. Summary of coefficients of random coefficients multilevel analysis

	API (Binary Variables)	API (Binary Variables)	API (Z_Scores)	API (Z_Scores)	API (Z_Scores)
	Simple Mean	Theory Weighing	Simple Mean	Factor Analysis	Theory Weighing
Alcohol Per Capita Consumption					
Bivariate Association	-0.011 [-0.030;0.008] p- value 0.275	-0.015 [-0.038;0.007] p- value 0.183	-0.015 [-0.036;0.005] p- value 0.143	-0.020 [-0.041;-0.000] p- value 0.047	-0.014 [-0.037;0.010] p- value 0.252
Adjusted Coefficients	-0.028 [-0.046;-0.009] p- value 0.003	-0.030 [-0.052;-0.008] p- value 0.006	-0.032 [-0.051 ;-0.012] p- value 0.001	-0.035 [-0.054;-0.017] p- value 0.000	-0.033 [-0.055;-0.011] p- value 0.004
Observations	167	167	167	167	167

Supplementary Tables

Table 5. 5.Caribbean

Country	Ranks			Scores		
Caribbean	Baseline	Median	Range	Baseline	Median	Range
Antigua e Barbuda	2	2	[2-4]	3.4	3	[1.5-10.9]
Dominica	11	11	[4-17]	12.5	13.1	[11.3-20.6]
Barbados	11	9.5	[6-12]	12.5	13.6	[9.4-17.4]
Saint Lucia	14	15.5	[10-25]	14.8	16.4	[14.8-26.9]
Saint Vincent and the Grenadines	24	19	[13-24]	19.3	19.4	[16.8-23.2]
Jamaica	28	34.5	[21-40]	20.5	24.3	[20.5-32.1]
Grenada	31.5	25	[12-31.5]	21.6	21.5	[16.7-24.8]
Dominican Republic	45.5	45.75	[34-61]	26.1	30.2	[24.9-35.6]
Trinidad and Tobago	54	54	[45-80]	28.4	29.6	[27.9-44.3]
Saint Kitts and Nevis	60	53.5	[44-64]	30.7	31.8	[29.0-34.8]
Bahamas	129	128	[93-138]	63.6	59	[52.7-67.4]
Cuba	165	165	[164-175]	94.3	94.1	[92.11-98.14]

Table 5. 6. Caucasus

Country	Ranks			Scores		
Caribbean	Baseline	Median	Range	Baseline	Median	Range
Armenia	68.5	70.75	[63-114]	33	35	[28.9-59.4]
Georgia	100	90	[60-100]	51.1	45.7	[38.2-51.1]
Kazakhstan	106.5	111.5	[98-124]	53.4	55.7	[43.1-62.9]
Azerbaijan	119	115	[107-120]	60.2	55.8	[48.1-60.7]
Tajikistan	121.5	139.5	[121.5-160]	61.3	67.1	[61.4-78.8]
Kyrgyzstan	124.5	117	[80-134]	62.5	52.8	[47.9-65.6]
Turkmenistan	164	165	[164-172]	93.2	92.7	[92.04-95.6]
Uzbekistan	166	167	[166-176]	95.5	96.7	[94.4-100.0]

Table 5. 7. Eastern Asia

Country	Ranks			Scores		
Eastern Asia	Baseline	Median	Range	Baseline	Median	Range
Korea	72	77	[67.5-87]	34.1	39.8	[34.1-46.8]
China	98	85	[68-102]	50	44.4	[34.9-55.9]
Mongolia	147.5	150.25	[90-154]	77.3	77.2	[51.9-78.4]

Table 5. 8. North Africa

Country	Ranks			Scores		
North Africa	Baseline	Median	Range	Baseline	Median	Range
Egypt	161	161	[158-163]	83.5	84	[78.4-90.7]
Algeria	162	162	[162-177]	89.8	86.5	[85.2-100]
Tunisia	167	167	[164-169]	97.2	96.8	[85.9-100]

Table 5. 9. Oceania

Country	Ranks			Scores		
Oceania	Baseline	Median	Range	Baseline	Median	Range
Kiribati	49	46.5	[43-73]	26.7	28.45	[24.7-42.8]
Palau	55	55.5	[41-76]	28.9	29.9	[26.7-43.3]
Fiji	60	62.5	[55-72]	30.7	33.4	[29.6-42.2]
Tonga	76.5	76.75	[66-143]	36.4	37.4	[30.9-71.1]
Samoa	79	79	[68-131]	37.5	38.2	[32.3-64.6]
Papua New Guinea	95	98	[50-110]	48.9	46.6	[35.3- 52.5]
Tuvalu	96	97.5	[59-101]	49.4	16.4	[37.3-51.5]
Micronesia	113	81.5	[47-113]	55.1	40	[34.4-55.1]

Table 5. 10. Southern Asia

Southern Asia	Ranks			Scores		
Country	Baseline	Median	Range	Baseline	Median	Range
Nepal	124.5	128.75	[78-137]	62.5	61.3	[43.6-67.2]
Bhutan	137	133.5	[95-144]	68.2	65.2	[53.4-68.2]
Pakistan	150.5	155.5	[143-158]	78.4	78.3	[73.7-80.3]
Sri Lanka	156.5	157.75	[119-161]	81.8	81.2	[62.1-84.9]
India	156.5	154.25	[147-165]	81.8	78.3	[68.3-82.9]
Bangladesh	168	166.5	[161-168]	100	98.6	[82.7-100]

Table 5. 11. South Eastern Asia

South-eastern Asia	Ranks			Scores		
Country	Baseline	Median	Range	Baseline	Median	Range
Lao	17	24.5	[17-35]	15.9	22.2	[15.9-30.6]
Timor-Leste	24	17	[11-24]	19.3	19.1	[16.4-22.6]
Cambodia	28	27.5	[10-32]	20.5	21.1	[18.8-24.6]
Singapore	35.5	35.25	[26-61]	22.7	24.3	[21.8-38.4]
Philippines	51.5	49.75	[39-62]	27.3	30.9	[26.3-34.0]
Vietnam	68.5	76.5	[68.5-90]	33	38	[33.0-49.3]
Malaysia	111	108.5	[87-115]	54.5	50	[48.5-54.5
Myanmar	119	119	[110-129]	60.2	58.8	[55.6-60.6]
Indonesia	147.5	156	[147.5-157]	77.3	78.4	[75.7-82]
Thailand	159.5	151.5	[147-161]	83	75	[70-86.5]

Table 5. 12 Western Asia

Western Asia	Ranks			Scores		
Country	Baseline	Median	Range	Baseline	Median	Range
Iraq	45.5	42	[31-45.5]	26.1	27.4	[23.4-33.5]
Syria	80.5	75.25	[3-89]	38.6	37.2	[10.7-41.8]
Jordan	142.5	135.5	[70-151]	72.7	68.4	[44.1-73.8]
Oman	145	142.5	[78-153]	76.1	70.2	[47.0-76.1]
Turkey	147.5	144	[120-147.5]	77.3	69.8	[62.2-77.3]

Figure 5. 1. Comparison of 5 methodological approaches to the calculation of the ACPI

Figure 5.1.1. Comparison of 5 methodological approaches to the calculation of the ACPI-Developed Countries

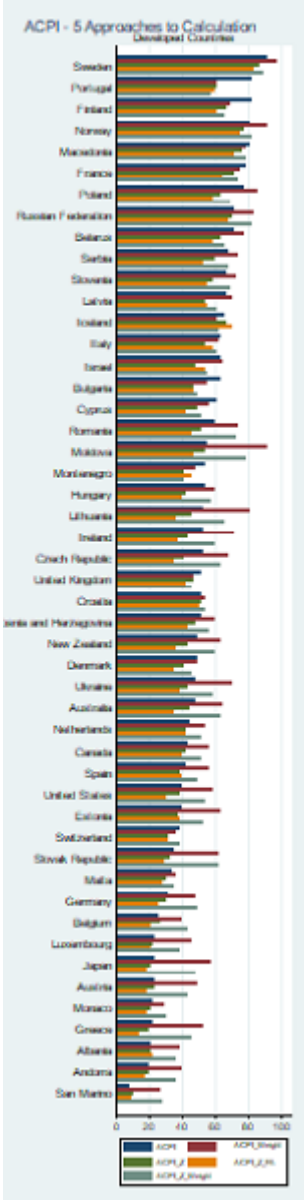


Figure 5.1.2. Comparison of 5 methodological approaches to the calculation of the ACPI - Latin America

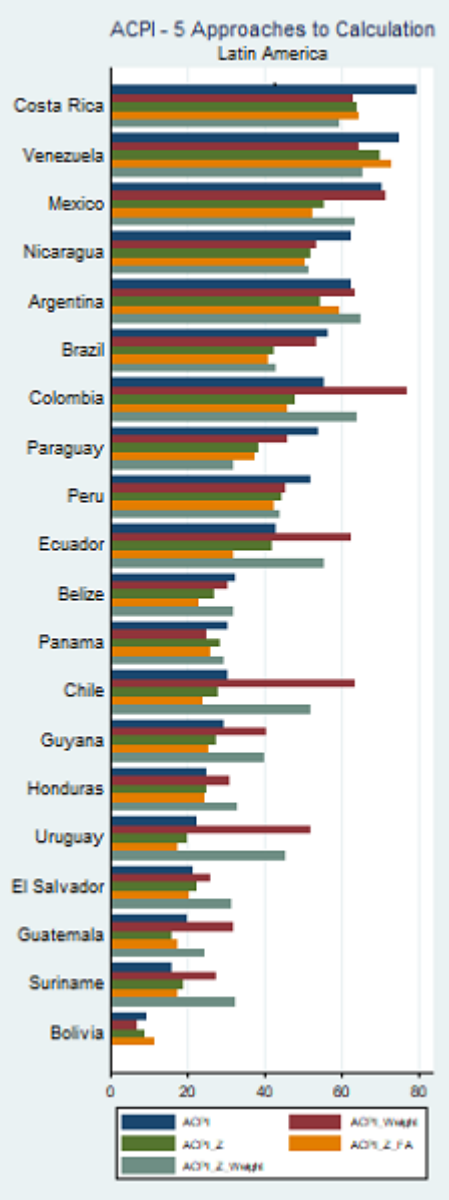


Figure 5.1.3 Comparison of 5 methodological approaches to the calculation of the ACPI - Sub Saharan Africa

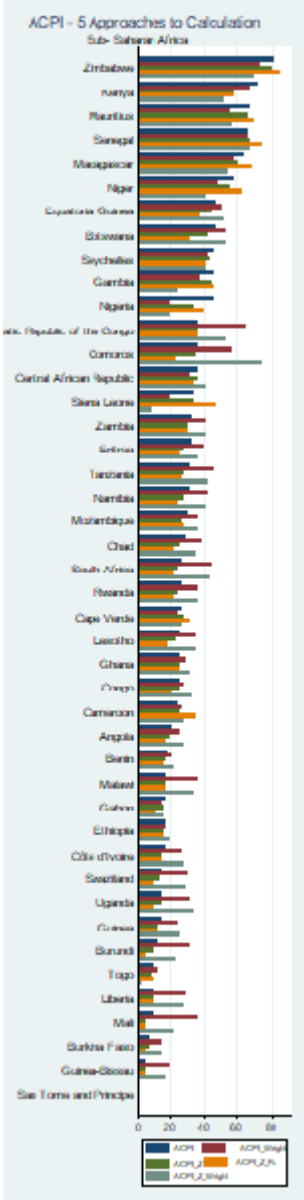


Figure 5.1.4. Comparison of 5 methodological approaches to the calculation of the ACPI - Caribbean

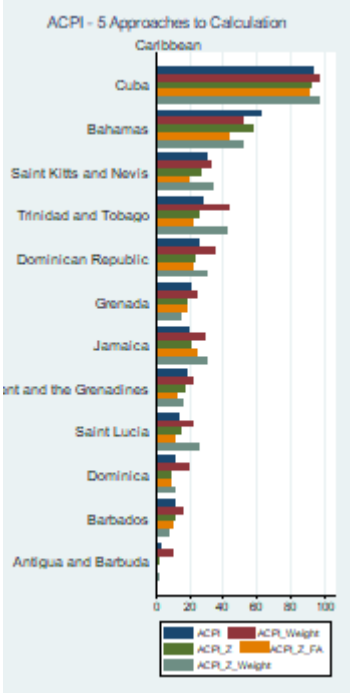
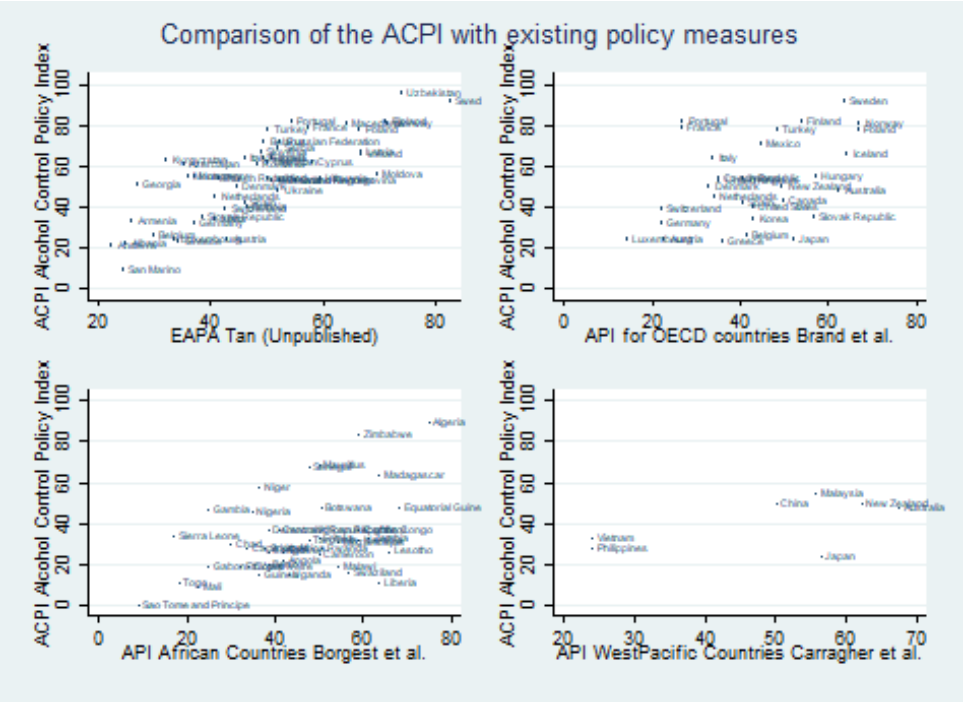


Figure 5. 2. Plots of ACPI against existing measures



Chapter 6

Government Monopolies, Alcohol Industry Concentration and Alcohol Control Policy Walk into a Bar - Implications for Global Inequalities in Alcohol Consumption

Abstract

Background: Government monopolies on the production and/or retail sales of alcohol have a role to play in reducing alcohol consumption either directly or by promoting higher quality and enforcement of other national alcohol control policies. This role may be helped or hindered by a country's wealth. Government monopolies could also weaken any positive associations that may exist between increasing alcohol industry concentration and alcohol consumption.

Methods: A cross sectional design and OLS regressions were used to estimate associations between government monopolies and alcohol consumption, Government Monopolies and the strictness and comprehensiveness of alcohol control policies and the role of monopolies in moderating the association between alcohol policy and consumption. A matching algorithm was used as a robustness check. The same type of analysis was applied to the association between the level of concentration in the alcohol industry, alcohol consumption and alcohol control policy. Interaction terms were introduced to test the moderator effect of country income levels in these associations.

Results: Government Monopolies are associated with lower alcohol consumption and stricter and more comprehensive alcohol control policies regardless of the country's

income level. There is no overall association between alcohol industry concentration and alcohol consumption, but in Government Monopolies the association is negative.

Conclusion: The reversal of privatisation or the maintenance of existing government control may be desirable public health interventions in jurisdictions faced with high alcohol consumption, in rich and poor countries alike. The analysis suggest the optimal combination for reducing consumption is a government monopoly with concentrated alcohol industry.

6.1. Introduction

Alcohol use accounts for 3.8% of all global deaths, 4.6% of global disability adjusted life years and costs associated with its use represent over 1% of GDP in High and Middle Income countries (1). These costs are not limited to healthcare expenditures - they include productivity losses and various other social harms such as interpersonal violence. In fact, harm inflicted upon others – e.g. intimate partner violence and drunk driving accidents - is at times estimated to equal that incurred by the drinker themselves (2). Although some beneficial effects have been attributed to moderate consumption, these are largely outweighed by negative effects (1,3).

In the context of a global expansion in alcohol consumption (1), alcohol control policy has a critical role to play in mitigating the harmful effect of alcohol at the population level (4,5). However, the suite of policies adopted at the national level varies widely across countries, as does the strength and effectiveness of the implementation of these policies. The formulation, adoption, and implementation of alcohol control policies at the national level is a process whose success is likely to depend, at least in part, upon the alignment of political, social, religious, and commercial forces (6–9).

Commercial forces play a major role in shaping alcohol control policy and alcohol consumption. Close relations among intergovernmental organisations, governments, and industry lead to weak policy formulation and implementation as trade associations and front groups lobby governments to adopt low efficacy policies, such as awareness campaigns, and fight highly effective ones such as minimum unit

pricing or government monopolies on retail sales(10). Alcohol industry bodies sit on international committees - from which the tobacco industry is banned - to collaborate in policy formulation. This was the case at the 2011 UN High Level Meeting on the Prevention and Control of Non-Communicable Diseases, where the Global Alcohol Consumers Group was included in the official US delegation, and drinks companies Diageo and SABMiller were part of the UK delegation (11,12). This presence is also documented in the processes leading to the formulation and negotiation of international trade agreements. Trade agreements are crucial elements in the global alcohol trade due to their role in reducing trade barriers, increasing competition, lowering prices, promoting alcohol consumption and setting the legal framework for alcohol companies to challenge effective alcohol control policies (13,14). These patterns are replicated at the national level. In England, the Drinkaware Trust was established in 2006 as part of the 2004 Alcohol Strategy for England, which advocated establishing a new independent national fund to support a reduction in national harm. The Trust is funded entirely by the alcohol industry and its approach to harm reduction policy is not evidence-based as it supports educational activities, the least effective alcohol control measure, to the detriment of alcohol regulation, the most effective measure according to the evidence (34,35). In sum, through close relations with intergovernmental organisations and governments, influence over trade agreements, threats of litigation and support for voluntary codes of conduct, the alcohol industry creates new alcohol markets by recruiting new drinkers and promotes weak regulatory frameworks in order to boost alcohol consumption.

Leadership for alcohol policy formulation and implementation at the national level has increasingly come from the World Health Organization (WHO), a technical agency of the United Nations mandated with, among other things, producing normative guidelines for policy. For the first time, delegations from all 193 Member States reached consensus at the World Health Assembly on a global strategy to confront the harmful use of alcohol. The Global Strategy to Reduce the Harmful Consumption of Alcohol can be seen as policy script created and diffused by an international organisation. While adoption and adherence to these prescribed alcohol control policies seems to be associated with lower levels of alcohol consumption (15,16), Low and Middle Income Countries (LMICs) may at a disadvantaged position to formulate and adopt evidence based policies vis a vis High Income Countries (HICs). LMICs may have fewer economic and governance resources to adopt and implement policies prescribed by international bodies such as WHO (17). Reasons for this include: narrow tax bases which means scarce financial resources for health policy, donor funding bias towards communicable diseases(18), prioritization of areas perceived as more pressing (such as sanitation or nutrition), and comparatively fewer skilled health policy professionals often as a result of brain drain to high income countries (19), to design and implement policies. Furthermore, LMICs may be more susceptible to the instrumental and structural power of the alcohol industry(20). Since business investment is a key determinant of future production, employment and consumption levels, low levels of investment by the business sector will often translate into future lower spending capacities and electoral failure for ruling parties(21). Countries may create favourable investment climates by adopting policies less likely to curtail profit and less likely to protect health (22). Lastly, globalization

has brought with it competition among countries to retain existing investments and attract new forms of investment which often means a race to the bottom in regulatory standards(23).

Failure to account for this possibility could potentially render the most evidence-based policy ineffective and even inadvertently help to polarise health inequalities between HICs and LMICs. I theorise that the state has a role in mitigating harmful consequences of the activities of the alcohol industry, curbing alcohol consumption via government monopolies on alcohol and their role in upholding effective alcohol control policies. Furthermore, I theorise that a country's wealth and resources may help, in the case of HICs, or hinder, in the case of LMICs, state interventions to reduce alcohol consumption and that this may polarise global health inequalities in alcohol consumption.

My research contributes to the field of alcohol policy studies in three ways. First, the clear majority of research on government monopolies and alcohol consumption comes from either the US and Canada (where different states and provinces, respectively, have varying levels of control over alcohol retail) or from Finland, Sweden and Norway. This study adds a cross-national comparison that includes Low Income Countries, Lower Middle-Income Countries and Upper Middle-Income Countries - collectively, LMICs - to a field populated exclusively by the study of variations within HICs. Second, it lends empirical support to hypotheses formulated in conceptual work highlighting the role of industry concentration in shaping alcohol control policies and alcohol consumption patterns (10,24). Third, it addresses the

interaction between government intervention, in the form of monopolies, the alcohol industry and its concentration and the role of the former in containing damage to population health incurred by the latter.

Background

Government monopolies on alcohol and the broader suite of alcohol control policies

Government monopolies here are to be understood as the government holding a full control of production and/or sale of alcoholic beverages (26). Historically, there has been a range of motivations for a government's exercise or grant of a monopoly on the sale of a commodity or service. One motivation has been to maximize revenue for the government from the sale of the commodity. Another motivation has been the promotion of public health or public order (25). Alcohol monopolies in developed countries started appearing in the 1800s and by 1940 most present-day government alcohol monopolies had been set up. In the following decades, monopolization of the alcohol market increased in Europe, China, Indochina and some other developing countries as part of the spread of state socialism(26). In most cases these monopolies were introduced without alcohol specific public health motivations (25). In Europe, for example, the alcohol monopolies of Iceland, Sweden, Finland, Norway and Faroes Islands are the only ones whose stated purpose and common overriding objective is to reduce individual and social harm as a result of alcohol consumption (27). Outside of Europe, it is more difficult to ascertain whether monopolies have clear public health or fiscal goals, with mixed messages in states of the United States and provinces of Canada (28,29).

When designed and maintained with the explicit purpose of protecting the health of the public, as opposed to being a means of increasing state revenue, monopolies seem to reduce overall alcohol availability (5). A consensus narrative review of alcohol interventions assessed government control of the retail sale of alcohol and rated it 3+ (the highest rating) for effectiveness in reducing excessive alcohol consumption and related harms and for the extent of research supporting the finding. It rated it 2+ on cross-cultural testing, suggesting generalizability across settings (5). At present, the most widespread form of monopolization is the monopolization of off-premise sales of spirits, beer and wine at the retail level (i.e. alcohol is sold for consumption off the premises) although wholesale trade and monopoly on production of can still be found (25).

Government monopolies reduce alcohol consumption through a number of mechanisms. The monopoly ensures that demand is not able to stimulate increased availability, e.g. the number of retail outlets, as it would in an open market. In a free market, alcohol outlets increase as demand increases. Greater demand for alcohol in competitive markets (if alcohol regulations permit) may increase hours of sale, and the sale of alcohol in conjunction with other products such as food, drug products, or gasoline, options that are more restricted in government monopolies (30,31). Equally, competitive markets may stimulate demand by allowing for more widespread availability of alcohol via, for example, increased outlet density and their opening hours.

Country level evidence from individual states in the US, provinces in Canada, and Finland consistently shows that privatization of retail alcohol sales is associated with a substantial increase in per capita sales of the privatized beverages. There is also evidence from Sweden that re-monopolization is associated with a decrease in alcohol consumption and alcohol-related harms (26,27). International comparisons between countries with government monopolies and countries with liberalized markets in terms of their alcohol consumption are absent from the literature. These comparisons are useful because they provide a population health element to inform the decision of countries considering dismantling government monopolies or decreasing resources allocated to the maintenance of existing ones. I hypothesise that there is a negative association between Government Monopolies and per capita alcohol consumption. Countries in which government holds a monopoly over the production and/or retail of alcohol have lower alcohol consumption than countries in which alcohol production and/or retail are liberalised **(H1).** (Figure 6.1)

[Figure 6.1]

It is important to clarify that, insofar as a government monopoly on the production and/or retail of alcohol that has a clear public health ethos is a form of alcohol control policy, it does not necessarily follow that there is a perfect overlap between government monopolies and the strictest and most comprehensive set of alcohol control policies. This happens for two reasons. First, even in countries where the monopoly has a clear public health goal, there is still variation in the extent of policy coherence with these goals that can be attributed in part to a compromise between public health and fiscal goals. Within the Scandinavian retail monopolies, for example, there is variation in the suite of alcohol control policies in place e.g.

variations in store opening days, opening hours, levels of taxation and the range of monopolised products (27). Second, the institution of government monopolies predates the adoption of many of the alcohol control policies used in this study. They were established prior to the expansion of individual transportation and thus precede any legislation on drink driving, blood alcohol levels for driving, designated drivers, etc. The same argument applies to regulations on all types of marketing as all of the monopolies under study precede, for example, the Internet and its role as a vehicle for alcohol advertising and any attempt at regulating TV advertising or sports events sponsorship. It is thus fair to assume chronologic antecedence of monopolies vis a vis the current state of the suite of national alcohol control policies.

Variation and chronologic antecedence notwithstanding, in government monopolies, accompanying alcohol policies may be formulated so to be coherent with the monopoly goals and their enforcement may be more thorough and more systematic. For example, regulation of density of and regulation of opening hours of establishments where alcohol is sold, regulation around marketing of alcoholic beverages and minimum pricing for alcohol may be more feasibly enacted in countries with monopolies because the monopoly may set the regulatory bar higher than a competitive market. Furthermore, the existence of the monopoly may sensitise society to alcohol control increasing the acceptability of stricter and more comprehensive alcohol control (31,32). I hypothesise that there is a positive association between government alcohol monopolies and the strictness and comprehensiveness of alcohol control policies as measured by the Alcohol Control Policy Index (ACPI) **(H2).** It follows that the association between government

monopolies and alcohol consumption may be *mediated* by the association between government monopolies the strictness and comprehensiveness of alcohol control policy **(H3).**

Others have hypothesized a negative association between alcohol control policies and alcohol consumption and found empirical evidence of that association (15,16,33). These regulations are easier to enforce in a monopoly system. In private licensed systems regulations must be enforced, usually by agents who police these regulations, which carries a higher risk of lower compliance. For example, in a government monopoly, the enforcement of a minimum age for alcohol purchase can be ensured through the direct administration of sales personnel in state alcohol outlet. In a private licensed system, each outlet develops its own level of identification checking, often resulting in varying levels of compliance with the law (24). I hypothesize that the association between alcohol control policies and consumption is *moderated* by government monopolies i.e. in countries where government holds a monopoly over production and/or retail of alcohol, the negative association between strictness and comprehensiveness of alcohol control policy and alcohol consumption is stronger than in countries where there is a liberalized alcohol market **(H4).**

There is evidence that LMICs are at increased risk of weaker formulation and implementation of alcohol control policies vis-a-vis HICs. As markets in rich countries become saturated, the alcohol industry has expanded into LMICs with a younger population and increasing levels of disposable income (34,35) to ensure profitability and, according to Casswell, ‘ensure the diffusion and normalization of

drinking in emerging markets before governments and civil society are able to ensure adequate policies to limit the spread of heavy drinking and alcohol-related harm in the population' (36). In fact, alcohol sales are increasing at a slower rate in HICs than in LMICs (34).

While economic growth seems to be strongly correlated with rising consumption of many commodities, among which we find alcohol, this is only the case when markets are highly integrated enabling the large scale entry of transnational corporations into LMICs(34–36). Enforcement of trade agreements by the World Trade Organization as they pertain to alcohol have resulted in weaker alcohol control in various countries (37–41). While this is happening in both rich and poor countries, the threat of imposition of economic sanctions could potentially carry more pre-emptive weight in countries with fewer resources to engage in legal disputes. Poor countries also have higher incentives to react to the promises of job creation and expansion of the tax base (19,35,37). By virtue of their direct contribution to the economy namely through job creation, large alcohol multinationals are allowed to weigh in on policy formulation. SABMiller[6], for example, has stated that 'our significant tax (excise) contribution gives us a place at the table'(24). Evidence from Lesotho, Malawi, Uganda and Botswana also shows that industry de facto wrote the alcohol control policy in these countries. The resulting policy choices favour measures that have been proved not to be effective in changing alcohol consumption and related harm. These ineffective policies—that include public awareness and educational programmes, messages focusing upon personal responsibility and moderation-draw attention away

[6] SABMiller is a multinational brewer bought by Anheuser-Busch InBev in 2016. Prior to that date, it was the world's second-largest brewer measured by revenues (after Anheuser-Busch InBev)

from two of the most effective policy responses—control of availability and taxation (37). Lastly, Ministries of Health in these countries have limited economic resources that they must prioritise to address imminent threats to public health such as insufficient sanitation, malnutrition and infectious disease. The development and enforcement of evidence based alcohol policy is not a priority (38).

Formulation and implementation of health policy may be jeopardized by commercial interests to a greater extent in LMICS than in HICs. In LMICs the state may have less leverage to counter industry pressures on Government Monopolies and uphold whatever public health goals the monopoly may have. I hypothesise that the negative association between government monopolies and per capita alcohol consumption is moderated by the country income level and the negative association is stronger in HICs than in LMICs. In other words, the protective role of government monopolies on alcohol consumption is weaker in LMICs than in HICs **(H5).** In the same vein, I hypothesise that the negative association between the strictness and comprehensiveness of alcohol control policies and alcohol consumption is weaker in LMICs than in HICs **(H6).**

The role of alcohol industry concentration in shaping health policy and alcohol consumption

Government monopolies have been challenged by international free trade and common market agreements all over the world (39). For example, spurred on by brewers, Canada and the US have countered each other under the General Agreement on Tariffs and Trade (GATT) to force each other's beer markets open (25). In Europe,

as a consequence of the EU/EEA negotiations, Finland, Iceland, Norway and Sweden were forced to abolish their import, export, wholesale and production monopolies on alcohol (27,40). Whilst it is conceivable that a powerful industry such as the alcohol industry, who would stand to benefit from the dismantling of government monopolies, could influence the breaking of these monopolies or at least, limit their scope, the study of this effect is beyond the scope of this study. Regardless of the influence the alcohol industry may or may not have over the dismantlement of monopolies, it does have a documented record of influencing international and national policy making efforts so to obtain the regulatory framework that is the least threatening to alcohol consumption and thus to its bottom line (37,41–43).

The alcohol industry has been consolidating at a very fast rate (44,45). The level of concentration in the industry has a bearing on the amount of resources available for marketing as well as on the marketing and pricing strategies of the sector (46). Different takes on the interplay between political and marketing power result in two competing views on how industry concentration may be associated with alcohol consumption. Some say that oligopolistic firms can more easily pressure each other to avoid price wars that would lead to lower profits. Instead, rivalries are played in the fields of advertising and product differentiation (46) with the most successful players using their resources to deploy and invent specific themes and modalities of marketing attuned to the country's market (47). These factors translate into increased exposure of the population to images promoting the social acceptability and consumption of alcoholic beverages. Others suggest that firms in an oligopoly need not compete for market share and thus do not advertise as intensely. It is the smaller

firms who invest the most in advertising to differentiate their products, leading to increased population exposure to products and consumption. According to this view, a concentrated industry is an easier target for government regulation and taxation (48). Whilst both positions recognise that the level of industry concentration in the alcohol industry influences alcohol consumption, they differ on the mechanism through which that influence is exercised. The first one posits a positive association that is stronger at higher levels of concentration (Exponential function). The second position posits an association that it is positive and stronger at the lower end of the concentration spectrum (Logarithmic function).

Concentration of the alcohol industry may also boost alcohol consumption through its role in enabling and enhancing industry efforts to formulate alcohol policy. As industries consolidate, they overcome collective action problems and optimize their joint political power which they can collectively levy to participate in policymaking and promote their policy interests, namely ineffective policy options that are known to have little to no effect in alcohol consumption (49,50). This may be done via financial contributions to the political process, through increased resources into front groups or industry trade bodies or through direct corporate lobbying. In fact, a new pattern is emerging whereby the better resourced actors are increasingly doing their own lobbying rather than relying on representation from business associations (51). I hypothesise that there is a negative association between the concentration in the alcohol industry and alcohol consumption that is mediated by the negative effect of the former on alcohol control policy **(H7).** As a robustness check, I test for an exponential relationship between alcohol industry concentration and alcohol

consumption i.e. one that is stronger at higher levels of concentration, as well as for a logarithmic association i.e. one that is stronger at lower levels of industry concentration.

Independently of the shape of association, countries in which government holds a monopoly on alcohol have more leverage over the alcohol industry, not least because industry relies on government outlets to sell its products. This leverage may be used to protect public health from unhealthful industry practices. I hypothesise that the association between alcohol industry concentration and alcohol consumption is moderated by government monopolies i.e. a positive association in competitive markets weakens in government monopolies **(H8).** Figures 1 and 2 illustrate the theoretical framework and hypotheses

[Figure 6.2 here]

In sum, against this backdrop, I advance the following hypotheses:

- Countries in which government holds a monopoly over the production and/or retail of alcohol have lower alcohol consumption than countries in which alcohol production and/or retail are liberalised **(H1).**
- There is a positive association between government alcohol monopoly and the strictness and comprehensiveness of alcohol control policies as measured by the Alcohol Control Policy Index (ACPI) **(H2).**
- The association between government monopolies and alcohol consumption may be *mediated* by the association between government monopolies the strictness and comprehensiveness of alcohol control policy **(H3).**

- In countries where government holds a monopoly over production and/or retail of alcohol, the negative association between strictness and comprehensiveness of alcohol control policy and alcohol consumption is stronger than in countries where there is a liberalized alcohol market **(H4).**
- The negative association between government monopolies and per capita alcohol consumption is moderated by the country income level and the negative association is stronger in HICs than in LMICs (**H5).**
- The negative association between the strictness and comprehensiveness of alcohol control policies and alcohol consumption is weaker in LMICs than in HICs **(H6).**
- There is a negative association between the concentration in the alcohol industry and alcohol consumption that is mediated by the negative effect of the former on alcohol control policy **(H7).**
- The association between alcohol industry concentration and alcohol consumption is moderated by government monopolies i.e. a positive association in competitive markets weakens in government monopolies **(H8).**

6.2. Methods

6.2.1 Study Design

The ideal design to test my hypothesis would have relied on a longitudinal dataset that documented changes in alcohol consumption, the nature of the country monopolies and changes in the suite of alcohol control policies over time. Data limitations precluded the assembly of a such a dataset. Alcohol consumption data is only available for 2010 and 2015; the comparative alcohol control policy data was collected once in 2012; and the status of government control over the production,

distribution and sale of alcohol was also collected once in 2012. To ensure a plausible temporal sequence between policy and consumption I had to restrict my sample to 2015 and opt for a cross-sectional design.

6.2.2 Measures and Data Sources

Outcome variables

Total Alcohol Consumption Per Capita in Litres (APC) was obtained from WHO's Global Information System on Alcohol and Health (GISAH). This measure comprises both the recorded and the unrecorded per capita consumption, which together provide a more accurate estimate of the level of alcohol consumption in a country. It is defined as the total (sum of recorded APC three-year average and unrecorded APC) amount of alcohol consumed per adult (15+ years) over a calendar year, in litres of pure alcohol. Recorded alcohol consumption refers to official statistics (production, import, export, and sales or taxation data), while the unrecorded alcohol consumption refers to alcohol which is not taxed and is outside the usual system of governmental control. The measure is available for 2015.

The distribution of alcohol consumption is truncated and skewed, therefore, I performed a logarithmic transformation. The coefficient of a logged variable regressed on a dummy variable (Government Monopoly) is interpreted as a percentage (52).

The state of alcohol policy control at the national level was captured with the Alcohol Control Policy Index (ACPI) (Chapter 5). The ACPI is a composite indicator of alcohol control policies in the policy areas considered by WHO's Global Strategy to

Reduce the Harmful Use of Alcohol- They are: Leadership, Awareness and Commitment; Health Services' Response; Community Action; Drink Driving Policies and Countermeasures; Availability of Alcohol; Marketing of Alcoholic Beverages; Pricing Policies; Reducing the Negative Consequences of Drinking and Alcohol Intoxication; Reducing the Public Health Impact of Illicit Alcohol and Informally Produced Alcohol and Monitoring and Surveillance. Over 100 national level alcohol control policies and alcohol consumption per capita were obtained from WHO's Global Information System on Alcohol and Health (GISAH) for 190 countries. Policy areas and individual policies are described elsewhere as is the methodology (16), but it is worth noting that it excluded countries that have a ban on alcohol use – Afghanistan, Brunei Darussalam, Iran, Libya, Maldives, Mauritania, Saudi Arabia, Somalia, Sudan and Yemen - or substantial missing information -Democratic People's Republic of Korea, Djibouti, Haiti, Kuwait, Lebanon, Marshall Islands, Solomon Islands, South Sudan, United Arab Emirates. The resulting ACPI scores are measured on a 0 to 100 scale, where higher scores indicate a more comprehensive set of policies and stricter alcohol control, available for 167 countries in 2012. I recalculated the Index extracting the variables that pertain to government monopolies.

Explanatory variables

Countries were grouped according to whether the government holds a monopoly over the production and/ or retail and sales of alcohol. Data on whether countries hold government monopolies over the production and/or sales of beer, wine and spirits was obtained from GISAH, who in turn, used the Global Survey on Alcohol and Health sent to all WHO Member states in 2012 Countries where the government has full control over the production of at least two of the three alcohol product categories –

beer, wine and spirits – was coded as "Government Monopoly over Alcohol Production" and countries where the government has full control over retail sales of at least two of the three alcohol product categories was coded as "Government Monopoly over Alcohol Retail Sales". Countries where there is a government monopoly over the production and/or the retail sales where coded as "Government Monopolies".

The question posed to countries in the Global Survey does specifically ask countries with federal systems such as the US or India to provide a proportion of the states or provinces that hold monopolies. Rather, it is up to the nominated country respondent to make a decision as to the classification of the whole country.

I calculated the Herfindahl-Hirschman Index (HHI) of Industry Concentration for the alcohol industry by adding the square of market shares of each firm competing in a market. The values range from zero to 10 000. Markets in which the HHI is between 1 500 and 2 500 points are said to be moderately concentrated, and markets in which the HHI is in excess of 2 500 points to be highly concentrated or oligopolistic (53). I divided the scores by 1000 to be able to use Stata's exponential commands. I also calculated a log and a quadratic term for the HHI because the association between concentration in the industry and alcohol consumption has been hypothesised by some to be nonlinear. Data on market share for different companies comes from Euromonitor, a market analysis company that collects data from nearly 80 countries. This is not a representative sample of all 192 countries in the world but rather a collection of countries with commercial appeal to investors. This means that countries

from Low Income Countries are not represented. The geographic reach is also limited with countries from Africa and Southeast Asia underrepresented in this dataset.

Controls

I included Country Income Level – classified as Low, Lower Middle, Upper Middle or High-Income Countries - as a country's wealth influences its capacity to formulate and instate alcohol control policies as well as its prevalence of drinking. Prevalence of drinking increases with the economic wealth of a country. In low- to middle-income countries – up to approximately US$ 20 000 per capita purchasing power parity-adjusted GDP – the higher the economic development, the higher the consumption of alcohol and the lower the number of abstainers (1,54). Economic wealth is also associated with lower proportions of unrecorded alcohol per capita consumption and of total alcohol per capita consumption. For example, in high-income countries only 8.5% of all alcohol consumed consists of unrecorded alcohol, whereas in low-income and lower-middle income countries more than 40% of all alcohol consumed is unrecorded alcohol(55) . The choice of a dummy for country income level versus using GDP per capita is underpinned by the assumption that the association between alcohol consumption and income is not monotonic. Alcohol consumption in HICs has plateaued while it is increasing in LMICs. Data on countries' income level were obtained from the World Bank World Development Indicators Database.

In addition to the control for country income level, I re-ran the analysis controlling for GDP Per Capita adjusted for purchasing power.

Religion is also known to influence both alcohol consumption and policy architecture. Muslims tend to abstain from drinking alcohol and some countries where the majority of the population are Muslim have national bans on alcohol consumption. This is the case for Afghanistan, Brunei Darussalam, Iran, Libya, Maldives, Mauritania, Saudi Arabia, Somalia, Sudan and Yemen, which were excluded from the study. For the countries retained in the analysis I introduced the control variable "Percentage of Muslims in the Population" obtained from the Pew Foundation Database(56).

Lastly, alcohol consumption and attitudes towards alcohol show some regional clustering. For example, the European Region has the world's highest alcohol consumption, followed by the Americas. With the exception of some African countries, alcohol consumption is lower in the rest of the world(57) Similarly, other cultural factors, that may confound the association tend to be geographically clustered. I introduced a dummy variable for World Region. The grouping of countries used to create the variable is that of the Millennium Development Goals (MDG). They are: Developed Countries, the Caribbean, the Caucasus, Eastern Asia, Latin America, North Africa, Oceania, Sub Saharan Africa, South Asia, South East Asia and West Asia.

6.2.3. Statistical Analysis

Type Government Monopoly and HHIA on ACPI scores and Type Government Monopoly and HHIA on Alcohol Consumption

Data availability limitations preclude a longitudinal and analysis. I used ordinary least squares regression (OLS) and a cross sectional design. I used robust standard errors. I compare coefficients using the Stata 13 command "suetest".

Government Monopoly and Country Income Level as effect modifiers

To test the potential modifying effect of Government Monopoly on the association between alcohol control policy and alcohol consumption and of the association between alcohol industry concentration and alcohol consumption I introduced an interaction term between the variable government monopoly and ACPI scores in the regression of alcohol consumption on alcohol control policy. I repeated the procedure to test the modifying effect of country income level on the association between government monopoly and alcohol consumption and government monopoly and ACPI; and ACPI and alcohol consumption. Similarly, I introduced an interaction term between the variable government monopoly and HHIA scores in the regression of alcohol consumption on HHIA.

Mediator effect of ACPI

I test the mediator effect of ACPI using path analysis. I use linear regressions to calculate, total and direct effects of government monopoly on alcohol consumption, government monopoly on ACPI and government monopoly on alcohol consumption, controlling for ACPI (58,59).

Robustness checks

There is a possibility that monopolies lower alcohol consumption and that, concomitantly, countries that for cultural or religious reasons have low levels of alcohol consumption are also more likely to instate alcohol monopolies. Bearing in mind the limitations posed by a cross sectional design in addressing the issue of endogeneity, I apply a matching algorithm - coarsened exact matching in Stata. This matching algorithm relies on a propensity score that condenses information about the

covariates in the model for each of my observations. At the same level of this propensity score, ie. given the value of the propensity score, the probability of a country being a government monopoly is different from that of it being a competitive market. This allows for a comparison of cases that are similar on all covariates but the monopoly status. Cases that are not comparable are pruned out. The model is then run on the matched sample.

Longstanding cultural (religious and other) attitudes towards drinking in the population may determine alcohol consumption, alcohol policy formulation, and the concentration strategy of the alcohol industry. This may pose an endogeneity problem because it is plausible that in countries with a higher prevalence of religious people, there is a normative pressure to abstain from alcohol consumption and adopt more stringent and comprehensive alcohol regulations. The cultural composition that drives low consumption may also imply that policy is unnecessary as a mean to curb consumption as in such circumstances even with a very weak set of policies the population may drink very little. To address this issue, I ran the analysis excluding countries with a majority of abstainers (>75% of the population). These analyses are identified in the tables.

6.3. Results

Table 1 provides summary measures of the variables.

Figure 6.3 shows that there is a difference between the average alcohol per capita consumption and the average policy scores in countries where government holds full control over production and/or sales of alcohol and countries where it does not.

[Figure 6.3 Here]

The results of the analysis described above are given in Table 6.2 and are discussed below.

H1*: There is a negative association between Government Monopolies and per capita alcohol consumption*

The coefficient of the regression of alcohol consumption (Logged) on government monopoly (Table 6.2, column 1) shows, that on average with all confounders held at constant values, in countries where government holds a monopoly on alcohol annual, alcohol per capita consumption is 31% lower (95% CI [-0.54; -0.09]) than in countries where the alcohol market is competitive (Table 6.2). When I remove high abstinence (75%+) countries, I obtain a 20% reduction 95% CI [-0.37; -0.023]. The coefficients in the two samples are not statistically different.

Most control variables have statistically significant coefficients. All country income levels show higher average consumption than Low Income Countries, i.e. all other factors held constant, on average, consumption is higher in Higher Middle-Income Countries than in Low Income Countries, and so on, with coefficients for Higher Middle-Income Countries showing the largest positive association. These findings are in line with existing research that finds that alcohol consumption increases with income and highlights that the association between GDP and alcohol consumption is not monotonic.

When I run the model controlling for the weights derived from the matching process in order to account for cultural differences across countries, I obtain similar results (Table 2A). I therefore cannot reject H1.

H2: *There is a positive association between Government Monopoly on Alcohol and the Alcohol Control Policy Index scores.*

The regression coefficient (Table 6.2, column 2) shows that in countries where government holds a monopoly on alcohol, ACPI scores are 23 points higher, 95% CI [16.08;30.03], on average, than in countries with competitive alcohol markets, adjusting for known confounders. When I remove high abstinence countries, I still obtain a 23-point difference 95% CI [16.12; 30.78] (Table 6.2, column 5). I find significant coefficients for the World Region control. Compared to Developed Countries, on average, all other regions of the world, except for North Africa, the Caucasus, West and Eastern Asia (not significant) show even lower ACPI scores with confounders held constant. The findings in the subset of countries echo those from the larger sample.

When I run model controlling for the weights derived from the matching process, I obtain similar results (Table 6.2A). I cannot reject H2.

H3: *The association between government monopolies and alcohol per capita consumption is mediated by Alcohol Control Policy*.

The coefficient for the regression of alcohol consumption on government monopoly is unchanged when I control for ACPI. In other words, there is no evidence that the

association between government monopolies and alcohol consumption is mediated by the effect of government monopolies on alcohol control policy (as measured by the ACPI). The coefficient for ACPI as a control in the regression of alcohol consumption on government monopoly is not statistically significant (Table 6.2, column 3). I obtain similar result in the matched sample (Table 6.2A).

The effect that government monopoly may have on consumption does not seem to work via policy coherence with other alcohol control policies. One explanation is that reduction in consumption is associated with characteristics of the monopoly itself for example designated alcohol purchasing locations such as government liquor stores and restricted opening times. It is worth pointing out that in the subsample, the magnitude of the association between government monopolies and alcohol consumption increases substantially once I control for ACPI. This is to say that at constant levels of alcohol control policy, consumption is lower in government monopolies.

[Insert Table 6.2 and Table 2A Here]

H4: *The association between the Alcohol Control Policy Index and alcohol per capita consumption is moderated by government monopoly on alcohol. The association is stronger in government monopolies than in competitive alcohol markets.*

The main coefficient for the regression of alcohol consumption on alcohol control Policy nears zero. The coefficient for the interaction between ACPI and government

gonopoly is negative and not significant (Table 6.3, column 2.) [See Figure 6.4 for a plot]. I reject H4.

[Insert Table 6.3 Here]

H5*: The association between government monopolies and alcohol per capita consumption is moderated by the country income level. The negative association is stronger in HICs than in LMICs.*

The main coefficient more than doubles in magnitude when I introduce the interaction term between government monopoly and country income level i.e. controlling for the association between government monopoly and alcohol consumption at different level of country income. Government monopolies, have on average, 74% of the alcohol consumption of competitive markets 95%CI [-1.17; -0.31]. The coefficients for the interaction terms are positive but, with the exception of the result for Lower Middle-Income Countries, none are significant (Table 6.4). This finding holds both when I use the four categories of Income Level and when I use a binary variable of LMICS and HICs. They remain unchanged when I remove High Abstinence Countries (Table 6.4.1). In the matched sample, the interaction terms are statistically significant for Lower and Upper Middle Countries, where in government monopolies, alcohol consumption is higher than in Low Income Countries (Table 6.4A).

The evidence for income level moderating the association is mixed. I reject H5.

H6: *The negative association between the Alcohol Control Policy Index and alcohol per capita consumption is moderated by the country income level. The association is stronger in HICs than in LMICs*

With the addition of the interaction term, the main coefficient changes direction and magnitude but remains insignificant. Similarly, none of the interaction coefficients are statistically significant (Table 6.5, column 2). Moreover, I fail to find statistically significant coefficients for the regression of Alcohol Consumption on ACPI when I split the sample into LMICs and HICs. These findings are replicated in the sub sample that excludes High Abstinence Countries as the coefficients are not different (Table 6.5, column 3). I reject H6.

H7: *There is a positive association between the concentration in the alcohol industry and alcohol per capita consumption. This association between the concentration in the alcohol industry and alcohol per capita consumption is mediated by alcohol control policy*

The coefficients for the regression of alcohol consumption on HHIA are not statistically significant. They remain unchanged by the introduction of a control for alcohol control policy. This finding holds, regardless of the shape of the association, be it log or exponential (Tables 6 and 6.6.1). I reject H7.

H8: *The positive association between alcohol industry concentration and alcohol per capita consumption is moderated by government monopoly. In other words, in*

government monopolies this association is weaker (or non-existent) than in competitive markets.

I find evidence of a moderator role for government monopolies. While there is no overall association between concentration in the alcohol industry and consumption, in government monopolies, increases in the concentration of the alcohol industry are associated with reductions in alcohol consumption (-0.01 , 95%CI[-0.01; -0.00]) (Table 6..1). This finding is compatible with the theory that government monopolies on alcohol are better equipped to counter the political and economic clout conferred to the alcohol industry by its concentration and thus prevent increases in alcohol consumption.

6.4. Discussion

At the global level, government monopolies on the production and/or retail of alcohol are associated with lower per capita consumption of alcohol and with stricter and more comprehensive alcohol control policies. This negative association is not mediated by alcohol control policy, which is to say that the protective effect of government monopolies does not seem to work through a mechanism of policy coherence between the public health goals of monopoly and the strictness and comprehensiveness of other alcohol control policies. Nor is the negative association moderated by country income level– consumption is lower in government monopolies across all income groups. Similarly, while I find a positive association between government monopolies and stricter and more comprehensive alcohol control policies, country income level does not seem to moderate this association i.e.

on average, ACPI scores are higher in government monopolies in both LMICS and HICs.

On the associations between alcohol industry concentration and alcohol consumption I do not find empirical support for either theory of log or exponential functions linking the two nor for the role of policy in mediating this association. I do find evidence that in monopolies the association between industry concentration and alcohol consumption is negative.

The association between government monopolies and both lower levels of consumption and stricter and more comprehensive alcohol control policies holds across income levels. This finding lends further support to the theoretical work on monopolies as public health tools to be deployed by governments to curb alcohol consumption and highlights the ability of governments that hold monopolies to ensure that better policies are adopted regardless of how wealthy the country is. The findings on the ability of government monopolies to enhance the protective effect of alcohol control policies on consumption address a gap in the literature about interventions by the state to alter market forces and safeguard health. It also sheds light on the role of national government interventions (via monopolies) in ensuring that policy prescriptions issued by international organisations such as WHO achieve their goals of lowering alcohol consumption.

My study has a number of limitations. The cross-sectional nature of the data precludes any attribution of an effect of the type of monopoly on the levels of alcohol

consumption. To be able to make such claims I would have needed a longitudinal dataset that documented changes in country monopolies over time. Such datasets exist only for states within countries such as the US or provinces within Canada. The absence of an international dataset is highlighted by the lack of longitudinal cross-country comparisons of the effects of changes in national alcohol monopolies on any health outcome. I will be able to address these issues, at least partly, when WHO releases new consumption and comparative policy data in the next two years. Meanwhile, this is still a valuable contribution to the extent that it provides useful descriptive cross country and cross regional information, the only one of its kind.

The absence of a measure of the quality of the implementation of alcohol control policies and the stated goals of the alcohol monopoly may lead to an underestimation of the magnitude of the associations under study. For example, where high levels of consumption are associated with high scores in the ACPI, it is plausible that what we are seeing are countries with relatively strict and comprehensive de jure alcohol control measures and very poor de facto implementation. Hungary, for instance, is documented as such case (60). Similarly, I have no way to systematically assess the veracity of the data reported to GISAH by countries. In the case of Moldova, for example, further inquiry into country policy documents revealed that the county had been misreported as a Government Monopoly to GISAH, when in reality, alcohol is freely sold at all hours. The absence of an association between ACPI and alcohol consumption in competitive alcohol markets (Table 5 and Figure 4) may thus merely indicate that high de jure ACPI scores correspond to lower de facto alcohol control on the ground, which would explain the high levels of consumption. The role of the

alcohol industry in weakening alcohol policy implementation and bypassing regulation has been thoroughly documented and is another possible explanation for these findings – in competitive markets alcohol policy is weakened beyond any usefulness in curbing drinking, only existing de jure. On a similar vein, the policies that comprise the ACPI are not weighed according to the level of evidence base that underpins them. This means that less effective policies such school based awareness raising receive the same weight as highly effective policies such as increased excise tax (6) i.e. technically, it is possible to have high ACPI scores made of many ineffective policies. This too could explain the association between higher scores and higher levels of consumption observed in competitive markets.

Differential reliability of the estimations of unrecorded consumption by geographic region can also lead to an underestimation of the strength of the association between ACPI scores and alcohol consumption. The prevalence for unrecorded consumption is generally proportional to a country's level of income, with lower-income countries having a higher percentage of consumption that is unrecorded (61). Within Latin America, for example, the poorest countries have higher levels of unrecorded consumption than the better off ones (62). It is therefore plausible that the low levels of consumption that we observe in Bolivia and Guatemala (Figure 4) are underestimations even though the figures incorporate estimates of illegal alcohol consumption.

The measure of alcohol industry concentration does not paint the full picture of the clout that large alcohol multinationals may have in a given country because it is

designed to characterise *horizontal* integration within a national market. Concentration is increasingly occurring through *vertical* integration as firms buy upstream suppliers or downstream retailers both in national markets and at the global level. Because means of control that go beyond ownership, such as strategic alliances or contracting arrangements are not captured, we are likely to underestimate the ability of firms to affect consumption (46). Furthermore, the HHI does not allow me to distinguish between large multinational companies and large national companies. It is plausible that these two types of companies behave differently in their marketing efforts and strategies for political influence. For example, threats to leave the country and operate elsewhere in response to regulatory action may carry more credibility if issued by a large multinational company than by a national one (21,63). My measure of HHIA carries yet another set of limitations. Because I rely on market share data from commercial operators, I am bound to analyse countries with commercial interest for investors which very possibly skews my sample. Countries from Africa and Southeast Asia are nearly absent from this dataset. This is very likely to introduce bias resulting in an underestimation of the association between HHIA and consumption as previous qualitative research points to the role of an increasingly concentrated industry in watering down regulation and promoting consumption in the African Region (24,45,64,65), for example. With these limitations in mind, I fail to find an association between the level of concentration in the alcohol industry and alcohol consumption and to conclusively lend support to either theory. It is also worth noting that alcohol consumption is still lower and alcohol policy strictness and comprehensiveness still higher in government monopolies even after controlling for the level of concentration in the industry. Further research should take company

ownership into consideration as well as variations in concentration and consumption over time.

In conclusion, the implications of my findings for alcohol control policy and alcohol control research are two-fold. First, the reversal of privatization or the maintenance of existing government control may be desirable public health interventions in jurisdictions faced with high alcohol consumption. Better data may shed some more light on this question in the future. For the time being, it is important to stress that government monopolies are important tools in reducing alcohol consumption and raising the strictness and comprehensiveness of alcohol control polices across income groups. Second, assuming that countries are accurately reporting their policies to GISAH, the finding that in competitive alcohol markets alcohol control policies are worse positioned to control consumption than in monopolies should signal to such countries that sound policy implementation and monitoring of existing policies is paramount to curb alcohol consumption. In the more plausible scenario in which data quality is poor and countries are misreporting policy and consumption figures, data collection on the current state of adopted alcohol control policies and their implementation must improve.

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Figure 6. 1. Association between Government Monopolies on Alcohol and Alcohol Consumption; Country Income Level and Mediator effect of Alcohol Control Policy

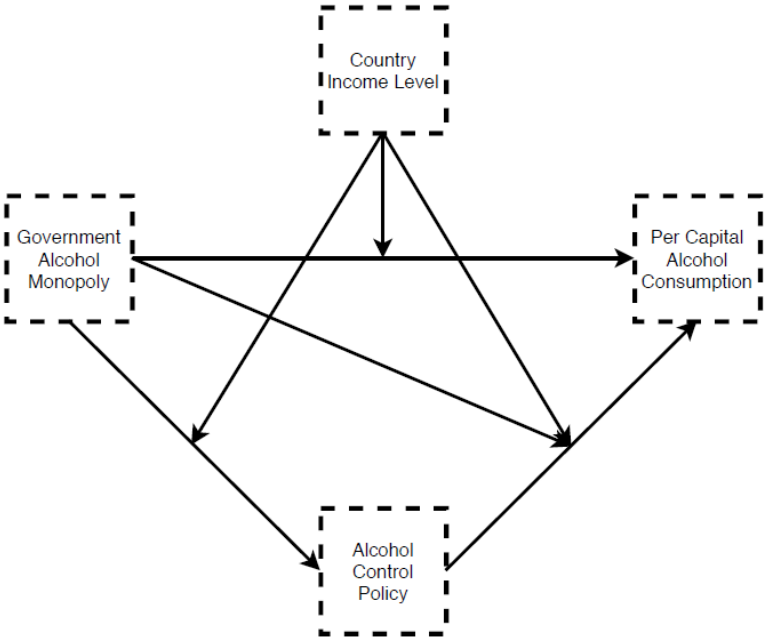

Figure 6. 2. Association between Alcohol Industry Concentration on Alcohol Consumption. Moderator effect of Government Monopolies

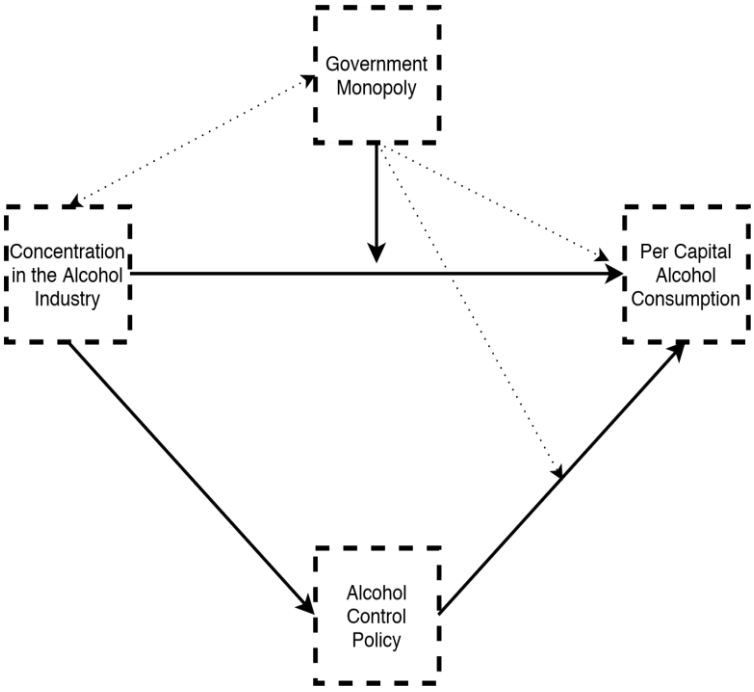

Figure 6. 3. Box plots of Alcohol Control Policy Scores and Alcohol Consumption according to market type

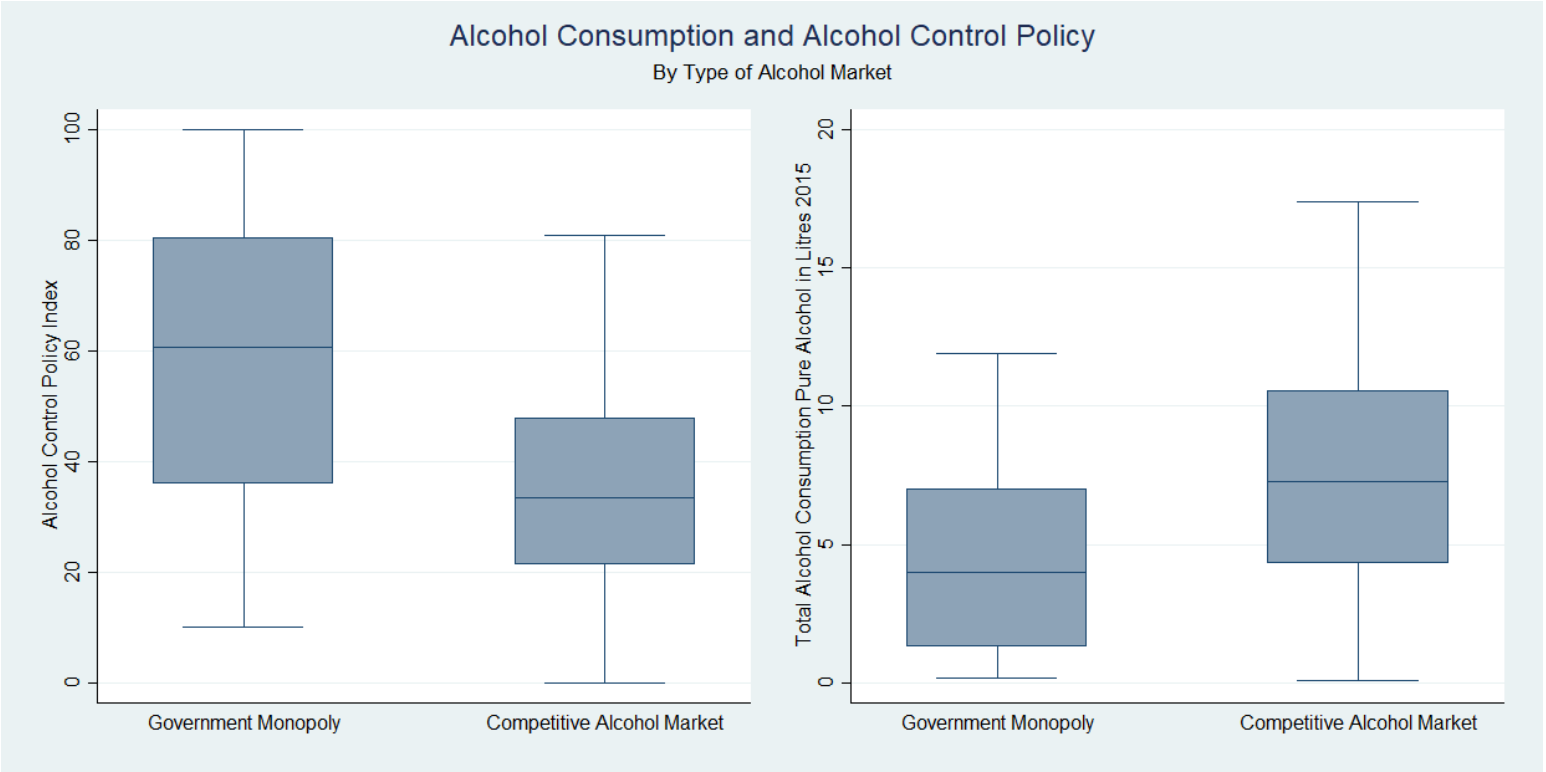

Figure 6. 4. Association between Alcohol Consumption and Alcohol Control Policy by type of alcohol regulation arrangement

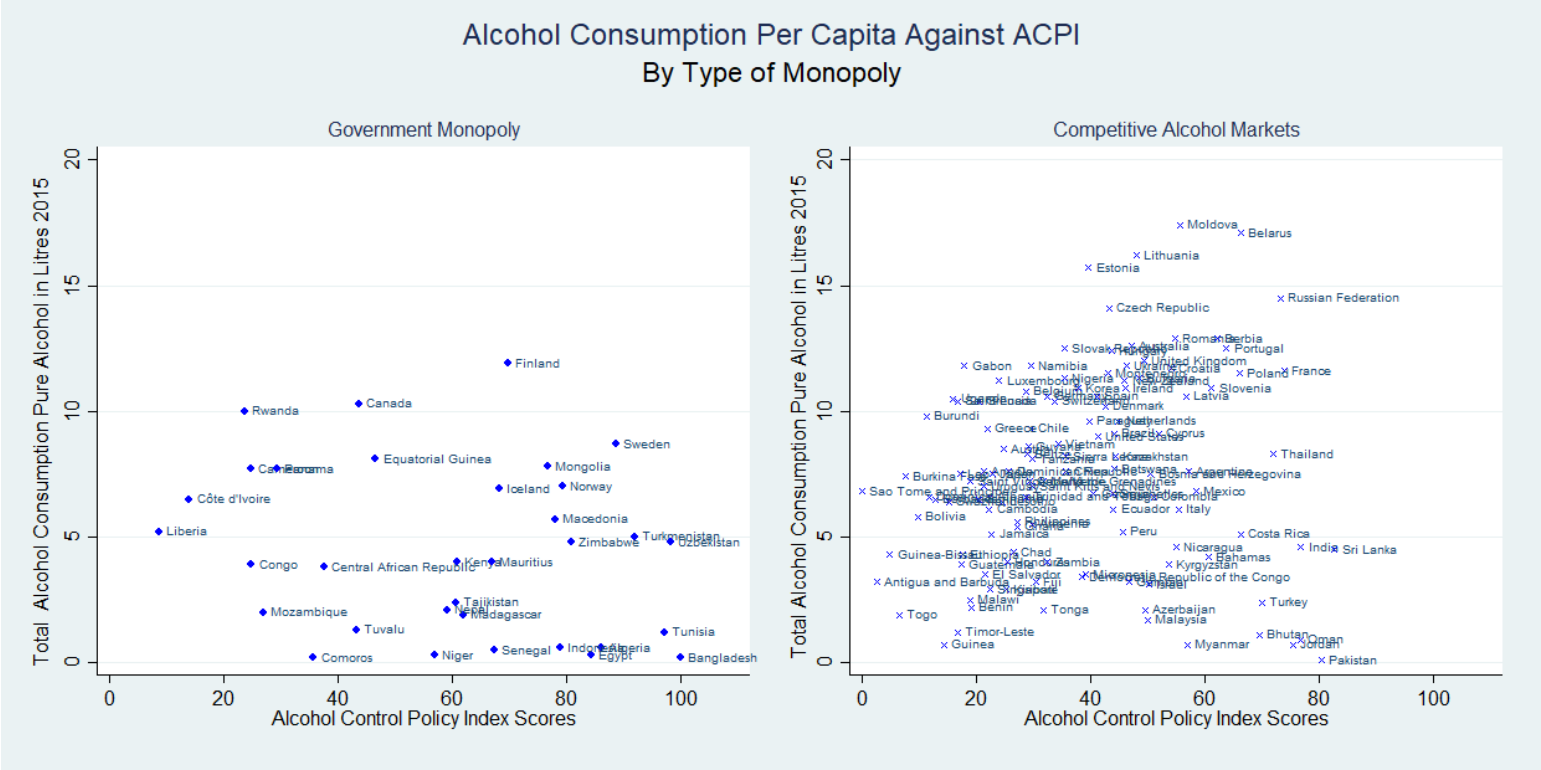

Table 6. 1. Dependent, Independent and Control Variables – Descriptives

	Mean	Standard Deviation	Observations	Total number of observations
Variables				
Total Alcohol Per Capita Consumption (Litres per Capita Per Year)	6.18	4.10		183
Abstainers (% of Total Population)	44.22	27.67		162
Alcohol Control Policy Index	44.03	27.67		164
Type of Alcohol Market				164
Government Monopoly			35	164
Competitive Alcohol Market			129	164
Country Income Level				
Low Income Countries			29	183
Lower Middle-Income Countries			48	183
Upper Middle-Income Countries			53	183
High Income Countries			57	183
Region of the World				
Developed Countries			49	183
Caribbean			13	183
Caucasus			8	183
Eastern Asia			4	183
Latin America			20	183
North Africa			5	183
Oceania			8	183
Sub Saharan Africa			48	183
South Asia			8	183
South East Asia			11	183
West Asia			11	183

Table 6. 2. Linear Regression of Government Monopoly on Alcohol Consumption; Government Monopoly on Alcohol Control Policy Index Scores and Mediator effect of Alcohol Control Policy Index in the association between Government Monopolies and Alcohol Consumption

VARIABLES	(1) Total Alcohol Consumption Per Capita (Logged)	(2) Alcohol Control Policy Index Scores	(3) Total Alcohol Consumption Per Capita (Logged)	(4) Total Alcohol Consumption Per Capita-Excluding High Abstinence Countries	(5) Alcohol Control Policy-Excluding High Abstinence Countries	(6) Total Alcohol Consumption Per Capita-Excluding High Abstinence Countries
Competitive Alcohol Market (Reference)						
Government Monopoly	-0.314***	23.27***	-0.318**	-0.197**	23.46***	-0.199*
	(0.113)	(3.437)	(0.130)	(0.0879)	(3.699)	(0.101)
Alcohol Control Policy Index Scores			0.000169			6.28e-05
			(0.00275)			(0.00213)
% of Muslims	-0.0163***	0.0955	-0.0163***	-0.00372*	0.0151	-0.00372*
	(0.00195)	(0.0593)	(0.00197)	(0.00211)	(0.0889)	(0.00212)
Country Income Level						
Low Income (Reference)						
Lower Middle Income	0.247	5.318	0.246	0.355***	1.115	0.355***
	(0.174)	(5.285)	(0.175)	(0.135)	(5.659)	(0.135)
Higher Middle Income	0.511***	13.16**	0.509***	0.517***	10.77*	0.517***
	(0.185)	(5.624)	(0.189)	(0.142)	(5.984)	(0.145)
High Income	0.210	6.869	0.209	0.318*	2.838	0.317*
	(0.220)	(6.690)	(0.222)	(0.166)	(6.969)	(0.166)
Region of the World						

Developed Countries (Reference)						
Caribbean	-0.710***	-20.30***	-0.707***	-0.585***	-22.14***	-0.584***
	(0.182)	(5.517)	(0.191)	(0.130)	(5.449)	(0.138)
Caucasus	0.135	-2.433	0.135	-0.600***	2.555	-0.600***
	(0.256)	(7.778)	(0.257)	(0.204)	(8.589)	(0.205)
Eastern Asia	-0.247	-2.703	-0.246	-0.188	-4.047	-0.188
	(0.327)	(9.951)	(0.328)	(0.232)	(9.744)	(0.233)
Latin America	-0.736***	-9.910*	-0.735***	-0.606***	-11.78**	-0.605***
	(0.171)	(5.185)	(0.174)	(0.123)	(5.162)	(0.126)
North Africa	-1.160***	12.18	-1.162***			
	(0.384)	(11.69)	(0.387)			
Oceania	-1.490***	-16.41**	-1.487***	-1.424***	-17.74**	-1.423***
	(0.263)	(7.998)	(0.268)	(0.188)	(7.893)	(0.192)
Sub Saharan Africa	-0.422**	-20.67***	-0.418**	-0.431***	-22.73***	-0.429***
	(0.181)	(5.490)	(0.190)	(0.133)	(5.580)	(0.142)
South Asia	-1.736***	26.01***	-1.740***	-0.816***	37.06***	-0.818***
	(0.275)	(8.359)	(0.285)	(0.295)	(12.39)	(0.306)
South East Asia	-1.107***	-7.781	-1.106***	-0.565***	-11.95	-0.564***
	(0.218)	(6.632)	(0.220)	(0.182)	(7.653)	(0.184)
West Asia	-1.170***	4.372	-1.171***			
	(0.332)	(10.10)	(0.334)			
Constant	2.213***	36.50***	2.207***	2.021***	41.45***	2.018***
	(0.223)	(6.770)	(0.245)	(0.168)	(7.078)	(0.191)
Observations	163	164	163	140	140	140
R-squared	0.719	0.531	0.719	0.540	0.472	0.540

- Robust standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1
- These models test H1, H2 and H3. High Abstinence countries were removed as a robustness check.
- The Alcohol Control Policy Index is measured on a 0 to 100 scale
- The coefficient of the logged variable Alcohol Consumption regressed on the dummy variable Government Monopoly is interpreted as a percentage

Table 6.2A. Linear Regression of Government Monopoly on Alcohol Consumption; Government Monopoly on Alcohol Control Policy Index Scores and Mediator effect of Alcohol Control Policy Index in the association between Government Monopolies and Alcohol Consumption. All models adjusted for Coarse Matching Weights

VARIABLES	(1) Total Alcohol Consumption Per Capita(Logged)	(2) Alcohol Control Policy Index Scores	(3) Total Alcohol Consumption Per Capita	(4) Total Alcohol Consumption Per Capita-Excluding High Abstinence Countries	(5) Alcohol Control Policy Index Scores-Excluding High Abstinence Countries	(6) Total Alcohol Consumption Per Capita-Excluding High Abstinence Countries
Competitive Alcohol Market (Reference)						
Government Monopoly	-0.377***	22.49***	-0.431***	-0.212*	22.54***	-0.160
	(0.127)	(3.798)	(0.152)	(0.116)	(4.125)	(0.141)
Alcohol Control Policy Index Scores			0.00241			-0.00231
			(0.00378)			(0.00351)
% of Muslims	-0.0161***	0.0836	-0.0163***	0.00438	-0.00482	0.00437
	(0.00215)	(0.0647)	(0.00218)	(0.00613)	(0.218)	(0.00615)
Country Income Level						
Low Income (Reference)						
Lower Middle Income	0.677***	-1.037	0.679***	0.374*	0.718	0.376*
	(0.208)	(6.232)	(0.208)	(0.193)	(6.862)	(0.194)
Higher Middle Income	0.631**	-0.507	0.633**	0.400*	-0.383	0.399*
	(0.252)	(7.572)	(0.253)	(0.219)	(7.783)	(0.220)
High Income	0.340	-5.613	0.351	0.952**	-8.385	0.932**

	(0.418)	(12.54)	(0.420)	(0.387)	(13.74)	(0.390)
Region of the World						
Developed Countries (Reference)						
Caribbean	-0.696*	-14.76	-0.660	0.194	-18.60	0.151
	(0.409)	(12.27)	(0.414)	(0.422)	(14.99)	(0.429)
Caucasus	0.0205	-0.851	0.0225	-0.909**	4.044	-0.900**
	(0.376)	(11.30)	(0.378)	(0.410)	(14.56)	(0.412)
Latin America	-0.658	-9.324	-0.635	0.234	-13.17	0.204
	(0.409)	(12.27)	(0.412)	(0.422)	(15.00)	(0.427)
Oceania	-1.638***	-18.14	-1.594***	-0.673	-23.63	-0.728
	(0.478)	(14.34)	(0.485)	(0.483)	(17.15)	(0.492)
Sub Saharan Africa	-0.269	-29.87***	-0.197	0.294	-33.19***	0.217
	(0.368)	(11.05)	(0.387)	(0.345)	(12.24)	(0.365)
South Asia	-3.275***	24.01*	-3.333***			
	(0.478)	(14.33)	(0.488)			
Constant	2.114***	48.77***	1.996***	1.407***	52.49***	1.528***
	(0.402)	(12.06)	(0.443)	(0.382)	(13.57)	(0.426)
Observations	91	92	91	75	75	75
R-squared	0.796	0.604	0.797	0.488	0.578	0.491

- Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
- All models control for weights derived from a coarse matching algorithm
- The coefficient of the logged variable Alcohol Consumption regressed on the dummy variable Government Monopoly is interpreted as a percentage

Table 6. 3. Linear Regression of Alcohol Control Policy Index Scores on Alcohol Consumption - Moderator effect of Government Monopoly in the Association between Alcohol Control Policy and Alcohol Per Capita Consumption

VARIABLES	(1) Alcohol Per Capita Consumption (Logged)	(2) Alcohol Per Capita Consumption (Logged)	(3) Alcohol Per Capita Consumption (Logged) - Excluding High Abstinence Countries
Alcohol Control Policy Index Scores (ACPI)	0.000169	0.000638	0.00159
	(0.00271)	(0.00328)	(0.00225)
Competitive Alcohol Markets (Reference)			
Government Monopoly	-0.318**	-0.249	-0.0107
	(0.148)	(0.328)	(0.238)
Competitive Markets#ACPI		-	-
Government Monopoly#ACPI		-0.00137	-0.00395
		(0.00556)	(0.00387)
% of Muslims	-0.0163***	-0.0162***	-0.00342
	(0.00310)	(0.00324)	(0.00275)
Country Income Level			
Low Income (Reference)			
Lower Middle Income	0.246	0.246	0.356*
	(0.212)	(0.212)	(0.182)
Higher Middle Income	0.509**	0.506**	0.505***
	(0.203)	(0.202)	(0.186)
High Income	0.209	0.209	0.316
	(0.218)	(0.218)	(0.203)
Regions of the World			
Developed Countries (Reference)			
Caribbean	-0.707***	-0.695***	-0.543***
	(0.117)	(0.131)	(0.117)
Caucasus	0.135	0.139	-0.587***
	(0.311)	(0.309)	(0.200)
Eastern Asia	-0.246	-0.238	-0.161

	(0.191)	(0.196)	(0.160)
Latin America	-0.735***	-0.733***	-0.599***
	(0.104)	(0.105)	(0.103)
North Africa	-1.162**	-1.138**	
	(0.455)	(0.449)	
Oceania	-1.487***	-1.487***	-1.417***
	(0.188)	(0.189)	(0.182)
Sub Saharan Africa	-0.418***	-0.419***	-0.425***
	(0.131)	(0.131)	(0.119)
South Asia	-1.740***	-1.748***	-0.882***
	(0.414)	(0.411)	(0.153)
South East Asia	-1.106***	-1.103***	-0.551***
	(0.251)	(0.253)	(0.180)
West Asia	-1.171***	-1.186***	
	(0.399)	(0.416)	
Constant	2.207***	2.188***	1.956***
	(0.245)	(0.270)	(0.230)
Observations	163	163	140
R-squared	0.719	0.719	0.544

- Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
- These models test H4
- High alcohol abstinence countries were excluded as a robustness check
- ACPI – Scores on the Alcohol Control Policy Index measured on a 0 to 100 scale

Table 6. 4. Linear Regression of Government Monopoly on Alcohol Consumption - Moderator Effect of Country Income Level

VARIABLES	(1) Total Alcohol Consumption Per Capita (Logged)	(2) Total Alcohol Consumption Per Capita (Logged)	(3) Alcohol Control Policy Index Scores	(4) Alcohol Control Policy Index Scores
Competitive Alcohol Markets (Reference)				
Government Monopoly	-0.314***	-0.738***	23.27***	21.49***
	(0.113)	(0.217)	(3.437)	(6.727)
Income Level				
Low Income (Reference)				
Lower Middle Income	0.247	-0.0633	5.318	5.150
	(0.174)	(0.213)	(5.285)	(6.622)
Higher Middle Income	0.511***	0.291	13.16**	12.38*
	(0.185)	(0.214)	(5.624)	(6.631)
High Income	0.210	-0.0330	6.869	6.028
	(0.220)	(0.242)	(6.690)	(7.495)
Competitive Market#Low Income		-		-
Government Monopoly#Low Income		-		-
Competitive Market #Lower Middle Income		-		-
Government Monopoly#Lower Middle Income		0.748**		0.213
		(0.305)		(9.459)
Competitive Market #Upper Middle Income		-		-
Government Monopoly# Upper Middle Income		0.453		2.736
		(0.308)		(9.556)
Competitive Market #High Income		-		-
Government Monopoly#High Income		0.526		5.305
		(0.333)		(10.33)
% of Muslims	-0.0163***	-0.0175***	0.0955	0.0983
	(0.00195)	(0.00201)	(0.0593)	(0.0623)
World Regions				

Developed Countries (Reference)				
Caribbean	-0.710***	-0.721***	-20.30***	-19.97***
	(0.182)	(0.181)	(5.517)	(5.611)
Caucasus	0.135	0.160	-2.433	-2.275
	(0.256)	(0.254)	(7.778)	(7.875)
Eastern Asia	-0.247	-0.334	-2.703	-1.986
	(0.327)	(0.329)	(9.951)	(10.20)
Latin America	-0.736***	-0.731***	-9.910*	-9.721*
	(0.171)	(0.169)	(5.185)	(5.245)
North Africa	-1.160***	-1.225***	12.18	12.60
	(0.384)	(0.385)	(11.69)	(11.96)
Oceania	-1.490***	-1.506***	-16.41**	-16.33**
	(0.263)	(0.263)	(7.998)	(8.166)
Sub Saharan Africa	-0.422**	-0.454**	-20.67***	-20.49***
	(0.181)	(0.181)	(5.490)	(5.622)
South Asia	-1.736***	-1.656***	26.01***	26.21***
	(0.275)	(0.274)	(8.359)	(8.510)
South East Asia	-1.107***	-1.071***	-7.781	-7.712
	(0.218)	(0.217)	(6.632)	(6.722)
West Asia	-1.170***	-1.067***	4.372	4.511
	(0.332)	(0.332)	(10.10)	(10.29)
Constant	2.213***	2.452***	36.50***	36.89***
	(0.223)	(0.245)	(6.770)	(7.582)
Observations	163	163	164	164
R-squared	0.719	0.730	0.531	0.532

- Robust standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1
- The coefficient of the logged variable Alcohol Consumption regressed on the dummy variable Government Monopoly is interpreted as a percentage
- Models on this table test H5
- ACPI – Scores on the Alcohol Control Policy Index measured on a 0 to 100 scale

Table 6.4A. Linear Regression of Government Monopolies on Alcohol Consumption - Moderator Effect of Country Income Level Adjusted for Coarse Matching Algorithm Weights

VARIABLES	(1) Total Alcohol Consumption Per Capita (Logged)	(2) Total Alcohol Consumption Per Capita (Logged)	(3) Alcohol Control Policy Index Scores	(4) Alcohol Control Policy Index Scores
Competitive Alcohol Markets				
Government Monopoly	-0.377***	-0.851***	22.49***	22.40***
	(0.127)	(0.204)	(3.798)	(6.311)
Country Income Level				
Low Income (Reference)				
Lower Middle Income	0.677***	0.467**	-1.037	2.034
	(0.208)	(0.219)	(6.232)	(6.777)
Higher Middle Income	0.631**	0.420	-0.507	-2.689
	(0.252)	(0.260)	(7.572)	(8.064)
High Income	0.340	0.169	-5.613	-7.050
	(0.418)	(0.415)	(12.54)	(12.82)
Competitive Market#Low Income		-		-
Government Monopoly#Low Income		-		-
Competitive Market#Lower Middle Income		-		-
Government Monopoly#Lower Middle Income		0.777**		-11.18
		(0.322)		(9.978)
Competitive Market#Upper Middle Income		-		-
Government Monopoly#Upper Middle Income		0.788**		8.177
		(0.341)		(10.56)
Competitive Market#High Income		-		-
Government Monopoly#High		0.650*		5.726

Income				
		(0.342)		(10.56)
% of Muslims	-0.0161***	-0.0160***	0.0836	0.0855
	(0.00215)	(0.00208)	(0.0647)	(0.0645)
Regions of the World				
Developed Countries (Reference)				
Caribbean	-0.696*	-0.691*	-14.76	-14.68
	(0.409)	(0.395)	(12.27)	(12.23)
Caucasus	0.0205	0.0153	-0.851	-0.939
	(0.376)	(0.364)	(11.30)	(11.27)
Latin America	-0.658	-0.653	-9.324	-9.241
	(0.409)	(0.395)	(12.27)	(12.24)
Oceania	-1.638***	-1.632***	-18.14	-18.05
	(0.478)	(0.462)	(14.34)	(14.30)
Sub Saharan Africa	-0.269	-0.266	-29.87***	-29.82***
	(0.368)	(0.356)	(11.05)	(11.02)
South Asia	-3.275***	-3.281***	24.01*	23.92*
	(0.478)	(0.462)	(14.33)	(14.29)
Constant	2.114***	2.235***	48.77***	48.67***
	(0.402)	(0.391)	(12.06)	(12.09)
Observations	91	91	92	92
R-squared	0.796	0.817	0.604	0.621

- Standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1
- The coefficient of the logged variable Alcohol Consumption regressed on the dummy variable Government Monopoly is interpreted as a percentage

Table 6.4.1. Linear Regression of Alcohol Control Policy on Government Monopoly - Moderator Effect of Country Income Level- Excluding High Abstinence Countries

VARIABLES	(1) Total Alcohol Consumption Per Capita (Logged) - Excluding High Abstinence Countries	(2) Total Alcohol Consumption Per Capita (Logged) - Excluding High Abstinence Countries	(3) Alcohol Control Policy Index Scores- Excluding High Abstinence Countries	(4) Alcohol Control Policy Index Scores - Excluding High Abstinence Countries
Competitive Alcohol Markets (Reference)				
Government Monopoly	-0.197**	-0.201	23.46***	19.85**
	(0.0879)	(0.196)	(3.699)	(8.291)
Country Income Level	-	-	-	-
Low Income (Reference)				
Lower Middle Income	0.355***	0.314*	1.115	0.278
	(0.135)	(0.166)	(5.659)	(7.016)
Higher Middle Income	0.517***	0.540***	10.77*	9.142
	(0.142)	(0.167)	(5.984)	(7.067)
High Income	0.318*	0.313*	2.838	1.270
	(0.166)	(0.187)	(6.969)	(7.911)
Competitive Market#Low Income		-		-
Competitive Market #Lower Middle Income		-		-
Competitive Market #Upper Middle Income		-		-
Competitive Market #High Income		-		-
Government Monopoly#Low Income		-		-

Government Monopoly#Lower Middle		0.148		1.878
		(0.271)		(11.44)
Government Monopoly#Upper Middle		-0.153		5.851
		(0.258)		(10.92)
Governement Monopoly#High Income		0.0444		6.031
		(0.266)		(11.25)
% of Muslims	-0.00372*	-0.00382*	0.0151	0.00578
	(0.00211)	(0.00226)	(0.0889)	(0.0955)
Region of the World Developed Countries (Reference)				
Caribbean	-0.585***	-0.584***	-22.14***	-22.03***
	(0.130)	(0.131)	(5.449)	(5.553)
Caucasus	-0.600***	-0.588***	2.555	3.070
	(0.204)	(0.208)	(8.589)	(8.776)
Eastern Asia	-0.188	-0.230	-4.047	-3.419
	(0.232)	(0.239)	(9.744)	(10.09)
Latin America	-0.606***	-0.603***	-11.78**	-11.76**
	(0.123)	(0.124)	(5.162)	(5.228)
Oceania	-1.424***	-1.403***	-17.74**	-18.03**
	(0.188)	(0.191)	(7.893)	(8.091)
Sub Saharan Africa	-0.431***	-0.428***	-22.73***	-22.67***
	(0.133)	(0.136)	(5.580)	(5.749)
South Asia	-0.816***	-0.774**	37.06***	36.70***
	(0.295)	(0.298)	(12.39)	(12.60)
South East Asia	-0.565***	-0.541***	-11.95	-12.12
	(0.182)	(0.184)	(7.653)	(7.771)
Constant	2.021***	2.021***	41.45***	42.76***
	(0.168)	(0.191)	(7.078)	(8.084)
Observations	140	140	140	140
R-squared	0.540	0.546	0.472	0.474

- Standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1
- The coefficient of the logged variable Alcohol Consumption regressed on the dummy variable Government Monopoly is interpreted as a percent

Table 6. 5. Linear Regression of Alcohol Control Policy on Alcohol Consumption - Moderator Effect of Country Income Level

VARIABLES	(1) Total Alcohol Consumption Per Capita (Logged)	(2) Total Alcohol Consumption Per Capita (Logged)	(3) Total Alcohol Consumption Per Capita (Logged)- Excluding High Abstinence Countries
Alcohol Control Policy Index Scores	0.000169	-0.00587	-0.00449
	(0.00275)	(0.00560)	(0.00488)
Country Income Level			
Low Income (Reference)			
Lower Middle Income	0.246	0.00157	0.0891
	(0.175)	(0.287)	(0.225)
Higher Middle Income	0.509***	0.289	0.505**
	(0.189)	(0.299)	(0.233)
High Income	0.209	-0.0179	0.137
	(0.222)	(0.329)	(0.247)
Low Income#ACPI		-	-
Lower Middle Income#ACPI		0.00749	0.00890
		(0.00654)	(0.00618)
Upper Middle Income#ACPI		0.00687	0.00245
		(0.00654)	(0.00561)
High Income#ACPI		0.00718	0.00635
		(0.00696)	(0.00575)
Competitive Alcohol Market (Reference)			
Government Monopoly	-0.318**	-0.294**	-0.197*
	(0.130)	(0.132)	(0.102)
% of Muslims	-0.0163***	-0.0165***	-0.00426*
	(0.00197)	(0.00205)	(0.00217)
Region of the World			
Developed Countries			

(Reference)			
Caribbean	-0.707***	-0.685***	-0.588***
	(0.191)	(0.197)	(0.141)
Caucasus	0.135	0.135	-0.593***
	(0.257)	(0.259)	(0.207)
Eastern Asia	-0.246	-0.257	-0.247
	(0.328)	(0.336)	(0.240)
Latin America	-0.735***	-0.718***	-0.587***
	(0.174)	(0.176)	(0.127)
North Africa	-1.162***	-1.210***	
	(0.387)	(0.398)	
Oceania	-1.487***	-1.475***	-1.422***
	(0.268)	(0.270)	(0.193)
Sub Saharan Africa	-0.418**	-0.406**	-0.400***
	(0.190)	(0.191)	(0.143)
South Asia	-1.740***	-1.748***	-0.996***
	(0.285)	(0.311)	(0.342)
South East Asia	-1.106***	-1.088***	-0.510***
	(0.220)	(0.223)	(0.187)
West Asia	-1.171***	-1.156***	
	(0.334)	(0.341)	
Constant	2.207***	2.379***	2.122***
	(0.245)	(0.282)	(0.220)
Observations	163	163	140
R-squared	0.719	0.722	0.551

- Robust Standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1

Table 6. 6.Regression of the Herfindahl-Hirschman Index of Concentration in the Alcohol Industry (HHIA) on Logged Alcohol on Consumption - Mediator Effect of ACPI and Moderator Effect of Income Level and Government Monopoly

VARIABLES	(1) Total Alcohol Consumption Per Capita (Logged)	(2) Alcohol Control Policy Index (Logged)	(3) Total Alcohol Consumption Per Capita (Logged)	(4) Total Alcohol Consumption Per Capita (Logged)
HHIA Log Scale	-0.130	-3.799	-0.126	-0.0542
	(0.102)	(3.951)	(0.104)	(0.109)
Competitive Alcohol Market (Reference)				
Government Monopoly				-0.243
				(0.213)
Competitive Alcohol#HHIA Log				-
Govnernment Monopoly#HHIA Log				-0.260
				(0.188)
% of Muslims	-0.0203***	0.239**	-0.0206***	-0.0220***
	(0.00299)	(0.116)	(0.00312)	(0.00307)
Alcohol Control Policy Index Scores			0.00104	0.00505
			(0.00334)	(0.00374)
Country Income				
Lower Middle Income (Reference)				
Higher Middle Income	0.164	5.664	0.158	-0.139
	(0.166)	(6.419)	(0.169)	(0.182)
High Income	-0.0871	-8.279	-0.0785	-0.281
	(0.201)	(7.755)	(0.204)	(0.202)
Regions of the World				
Developed Countries				

(Reference)				
Caribbean	-0.381	-27.62	-0.352	-0.356
	(0.483)	(18.65)	(0.496)	(0.477)
Caucasus	0.382	-16.81	0.399	0.445
	(0.301)	(11.61)	(0.308)	(0.295)
Eastern Asia	-0.287	-16.51	-0.270	-0.237
	(0.313)	(12.07)	(0.320)	(0.301)
Latin America	-0.524**	-8.835	-0.515**	-0.618***
	(0.214)	(8.245)	(0.217)	(0.216)
North Africa	-1.007**	11.20	-1.019**	-0.806**
	(0.385)	(14.86)	(0.390)	(0.371)
Sub Saharan Africa	0.0950	-19.53*	0.115	0.213
	(0.283)	(10.91)	(0.292)	(0.288)
South Asia	-1.283***	12.09	-1.296***	-2.018***
	(0.339)	(13.09)	(0.344)	(0.390)
South East Asia	-0.629***	-11.38	-0.618**	-0.680***
	(0.233)	(8.997)	(0.238)	(0.226)
West Asia	0.362	-9.632	0.372	0.381
	(0.522)	(20.14)	(0.527)	(0.506)
Constant	2.516***	55.68***	2.458***	2.506***
	(0.201)	(7.753)	(0.275)	(0.269)
Observations	75	75	75	74
R-squared	0.827	0.462	0.828	0.847

- Robust Standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1

Table 6.6.1. Regression of the Herfindahl-Hirschman Index of Concentration in the Alcohol Industry (Exponential) (HHIA) on Logged Alcohol on Consumption - Mediator Effect of ACPI and Moderator Effect of Income Level and Government Monopoly

VARIABLES	(1) Total Alcohol Consumption Per Capita	(2) Alcohol Control Policy	(3) Total Alcohol Consumption Per Capita	(4) Total Alcohol Consumption Per Capita
HHIA Exponential	-8.11e-05	-0.00104	-7.97e-05	-6.21e-05
	(7.20e-05)	(0.00279)	(7.26e-05)	(6.45e-05)
Competitive Alcohol Market (Reference)				
Government Monopoly				-0.313*
				(0.185)
Competitive Market#HHIA Exponential				-
Government Monopoly#HHIA Exponential				-0.00666***
				(0.00220)
Alcohol Control Policy Index Scores			0.00136	0.00604*
			(0.00333)	(0.00354)
% of Muslims	-0.0206***	0.233**	-0.0209***	-0.0227***
	(0.00300)	(0.116)	(0.00312)	(0.00290)
Country Income Level				
Lower Middle Income (Reference)				
Higher Middle Income	0.192	6.511	0.183	-0.194
	(0.165)	(6.396)	(0.168)	(0.174)
High Income	-0.0576	-7.041	-0.0480	-0.313
	(0.198)	(7.679)	(0.201)	(0.189)
Region of the World				
Developed Countries (Reference)				
Caribbean	-0.375	-31.34	-0.332	-0.225
	(0.496)	(19.21)	(0.510)	(0.456)
Caucasus	0.382	-16.56	0.405	0.526*

	(0.302)	(11.69)	(0.309)	(0.277)
Eastern Asia	-0.305	-16.95	-0.282	-0.227
	(0.313)	(12.14)	(0.321)	(0.285)
Latin America	-0.608***	-12.64*	-0.591***	-0.613***
	(0.184)	(7.141)	(0.190)	(0.170)
North Africa	-1.033***	10.57	-1.047***	-0.319
	(0.386)	(14.94)	(0.390)	(0.396)
Sub Saharan Africa	-0.0311	-23.01**	0.000214	0.188
	(0.269)	(10.43)	(0.282)	(0.265)
South Asia	-1.330***	10.65	-1.344***	-2.070***
	(0.338)	(13.08)	(0.342)	(0.364)
South East Asia	-0.730***	-14.18	-0.711***	-0.737***
	(0.222)	(8.610)	(0.229)	(0.203)
West Asia	0.237	-13.15	0.255	0.385
	(0.515)	(19.96)	(0.521)	(0.473)
Constant	2.465***	53.88***	2.392***	2.487***
	(0.195)	(7.533)	(0.266)	(0.247)
Observations	75	75	75	74
R-squared	0.826	0.455	0.827	0.863

Robust Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Chapter 7

Corporate power and alcohol consumption: what is the role of government monopolies on alcohol in protecting populations?

Abstract

Introduction: The role that commercial interests, namely large multinational corporations, play in driving the consumption of unhealthful commodities is now amply documented and empirically tested. Less attention has gone to mechanisms that may counter corporate power and protect populations from these pressures. I ask if government monopolies on alcohol can moderate the association between corporate power and alcohol consumption. I also ask if the protective effect of monopolies on alcohol consumption differs at different levels of corporate power. Finally, I examine if these associations differ between high (HICs) and low- and middle-income countries (LMICs).

Methods: I used multivariate regression models to estimate the association between corporate power and alcohol consumption in the period between 2010-2015. As a proxy for corporate power I used the Corporate Permeation Index (CPI). Alcohol consumption was measured in liters of pure alcohol per capita. To quantify the association between government monopolies and alcohol consumption I used a cross sectional design. To test the moderator effect of both government monopolies and levels of corporate power, I introduced interaction terms. I then calculated these associations in HICs and LMICs.

Results: In countries where corporate permeation is low, there is no association between government monopolies and alcohol consumption. On the other hand, among countries with high corporate permeation, government monopolies have less than half the alcohol consumption than competitive markets. These results hold both among HICs and among LMICs. In competitive alcohol markets there is a positive association between corporate permeation and alcohol consumption that is larger in LMICs. Conversely, in government monopolies there is no such association.

Discussion: Government monopolies may be efficacious in protecting populations when commercial pressures are high. Furthermore, in HICs, they could harness the benefits of corporate permeation that can be used to effectively implement alcohol control regulations and thus reduce alcohol consumption.

7.1. Introduction

The role that commercial interests play in driving the consumption of unhealthful commodities is now amply documented (1–3), with empirical work showing associations between many corporate strategies – marketing(4,5), lobbying (6,7), corporate social responsibility (8,9), among others- and consumption of commodities such as tobacco, sugary drinks and alcohol, and unhealthful behaviours such as gambling (10,11). There is thus little doubt, that in compliance with their commitment to their shareholders, commercial entities will harness their power to boost consumption of their products (12). Less attention has gone to mechanisms that may counter corporate power and protect populations from these commercial pressures. Alcohol consumption offers a good case study because it is a harmful substance, promoted by a powerful industry (13,14) and subjected to different levels of regulation across the world (15–17).

Globally, alcohol is responsible for approximately 3.3 million deaths yearly or 5.9% of all deaths. Global consumption is increasing, as it is its importance as a contributor to overall disability adjusted life years (DALY)(18–20). Despite the unequivocal effect of consumption on harm – the World Health Organization says that there is no safe level of consumption(21) - , there is a body of evidence that documents how the alcohol industry promotes consumption of alcohol(4,22–24). Through funding relations with research bodies, industry skews research to obtain favourable results i.e. purported benefits of moderate drinking (25). Close relations among intergovernmental organisations, governments, and industry (26,27) make it possible for these favourable findings to be

used to formulate weak policies, such as awareness campaigns (24,28). Threats of litigation and support for voluntary codes of conduct delay the adoption of highly effective ones such as minimum unit pricing(29).

I ask how can governments protect the health of populations in the face of concerted efforts from commercial operators to promote alcohol consumption? I focus on government monopolies because, when designed and maintained with the explicit purpose of protecting the health of the public, as opposed to being a means of increasing state revenue, monopolies seem to reduce overall alcohol availability (30,31). A consensus narrative review of alcohol interventions assessed government control of the retail sale of alcohol and rated it 3+ (the highest rating) for effectiveness in reducing excessive alcohol consumption and related harms and for the extent of research supporting the finding. It rated it 2+ on cross-cultural testing, suggesting generalizability across settings (32). At present, the most widespread form of monopolization is the monopolization of off sales of spirits, beer and wine at the retail level although wholesale trade and monopoly on production of can still be found (33). International comparisons between countries with government monopolies and countries with competitive alcohol markets found that government monopolies on alcohol are associated with lower levels of alcohol consumption at all levels of income (Chapter 6). Previous work did not find evidence that poor countries do worse than rich ones at upholding the protective effect of monopolies on consumption – they are efficacious at all income levels - (Chapter 6) but did not explore the interactions between country income and corporate power.

The study of the interactions between income level and corporate power are important because, when formulating and implementing health policy LMICs may be more susceptible to pressures from commercial interests than in HICs. This is so for several reasons. Enforcement of trade agreements by the World Trade Organization as they pertain to alcohol have resulted in weaker alcohol control in various countries (27). While this is happening in both rich and poor countries, the threat of imposition of economic sanctions could potentially carry more pre-emptive weight in countries with fewer resources to engage in legal disputes. Poor countries also have higher incentives to react to the promises of job creation and expansion of the tax base (34–36). By virtue of their direct contribution to the economy namely through job creation, large alcohol multinationals are allowed to weigh in on policy formulation. SABMiller, the second largest multinational brewing company, for example, has stated that 'our significant tax (excise) contribution gives us a place at the table'(37). Evidence from Lesotho, Malawi, Uganda and Botswana also shows that industry, de facto , wrote the alcohol control policy (34). The resulting policy choices in these countries favour measures that have not been proved effective in changing alcohol consumption and related harm. These ineffective policies—that include public awareness and educational programmes, messages focusing upon personal responsibility and moderation- draw attention away from two of the most effective policy responses—control of availability and taxation (28,34). Lastly, Ministries of Health in these countries have limited economic resources that they must prioritise to address imminent threats to public health such as insufficient

sanitation, malnutrition and infectious disease. The development and enforcement of evidence based alcohol policy is not a priority (36).

I build on the previous literature on government monopolies on alcohol and I delve deeper to study their role in moderating the association between corporate power and alcohol consumption. I hypothesise that the protective effect of monopolies on alcohol consumption is different at levels of corporate power. At higher corporate permeation, the protective role of government monopolies is weaker **(H1).** Furthermore, I hypothesise that the associations are moderated by the country income level: the protective role of monopolies put forward in H1 is weaker in LMICs than in HICs (**H1A**).

I test if government monopolies on the production and/or retail of alcohol can moderate the association between corporate power and alcohol consumption. I hypothesise that the association between corporate power and alcohol consumption is weaker in government monopolies **(H2).** Finally, I hypothesise that the protective role of government monopolies put forward in H1 is weaker in LMICs than in HICs (**H2A**).

7.2. Methods

7.1.1. Measures and Data Sources

Outcome variables

I used two different indicators of alcohol consumption- Total Alcohol Consumption Per Capita in litres (APC) and Recorded Alcohol Consumption Per Capita- to answer the two questions due to a combination of data availability and the requirements of the study

design. APC is the most accurate indicator of consumption because it encompasses recorded and unrecorded per capita consumption. It is defined as the total (sum of recorded APC three-year average and unrecorded APC) amount of alcohol consumed per adult (15+ years) over a calendar year, in litres of pure alcohol(33). I used the 2015 data, an average of 2013-2015. Recorded Alcohol Consumption Per Capita in Liters is defined as the recorded amount of alcohol consumed per capita (15+ years) over a calendar year in a country, in litres of pure alcohol. The indicator only takes into account the consumption which is recorded from production, import, export, and sales data often via taxation(33).This indicator has been available yearly since 2010. Both indicators come from the World Health Organization (WHO) Global Information System on Alcohol and Health.

The distribution of alcohol consumption is truncated and skewed, therefore, I performed a logarithmic transformation.

Explanatory variables

Countries were grouped according to whether the government holds a monopoly over the production and/ or retail and sales of alcohol. Data on whether countries hold government monopolies over the production and/or sales of beer, wine and spirits was obtained from the WHO's Global Information System on Alcohol and Health (33). Countries where the government has full control over the production of at least two of the three alcohol product categories – beer, wine and spirits – was coded as "Government

Monopoly over Alcohol Production" and countries where the government has full control over retail sales of at least two of the three alcohol product categories was coded as Government "Monopoly over Alcohol Retail Sales". Countries where there is a government monopoly over production and/ or retail sales where coded as "Government Monopolies". This represents my main variable of interest and its coefficient is interpreted as percentage change in the alcohol consumption associated with switching from competitive market to monopoly (38).

The measure of corporate power is the Corporate Permeation Index (CPI)(39). The CPI is the quantitative expression of a wide array of documented tactics that commercial entities, most often multinational corporations, have deployed to influence the health of populations quantified using a composite indicator of corporate power composed of 25 indicators available for 148 countries for the years 2010 to 2015. These indicators include traditional measures of undue influence in a country such as the level of *quid pro quo* corruption but also the level of independence of the media and the judicial system of corporate interests as well as measures of foreign direct investment and corporate ethical behaviour(39).

Controls

I included Country Income Level according to the World Bank's income categories– Low, Lower Middle, Upper Middle and High-Income Countries- because a country's wealth influences its prevalence of drinking. Prevalence of drinking increases with the

economic wealth of a country. The choice of a dummy for country income level versus using GDP per capita is underpinned by the assumption that the association between alcohol consumption and income is not monotonic. Alcohol consumption in HICs has plateaued while it is increasing in LMICs. In Low- to Middle-Income countries – up to about US$ 20 000 per capita purchasing power parity-adjusted GDP – the higher the economic development, the higher the consumption of alcohol and the lower the number of abstainers (40). Income is also associated with lower proportions of unrecorded alcohol per capita consumption and of total alcohol per capita consumption. For example, in HICs only 8.5% of all alcohol consumed consists of unrecorded alcohol, whereas in low-income and lower-middle income countries more than 40% of all alcohol consumed is unrecorded alcohol (41). Data on countries' income level were obtained from the World Bank World Development Indicators Database. In addition to the control for Country Income Level, I re-ran the analysis controlling for GDP Per Capita adjusted for purchasing power in 2015.

Religion is known to influence both alcohol consumption and alcohol policy architecture. Muslims tend to abstain from drinking alcohol and some countries where the majority of the population are Muslims have national bans on alcohol consumption. This is the case of Afghanistan, Brunei Darussalam, Iran, Libya, Maldives, Mauritania, Saudi Arabia, Somalia, Sudan and Yemen, which were excluded from the study. I introduced the control variable "Percentage of Muslims in the Population" obtained from the Pew Foundation Database.

Lastly, alcohol consumption and attitudes towards alcohol show some regional clustering. For example, the European Region has the world's highest alcohol consumption, followed by the Americas. With the exception of some African countries, alcohol consumption is lower in the rest of the world. Similarly, other cultural factors that may confound the association tend to be geographically clustered. I introduced a dummy variable for World Region. The grouping of countries used to create the variable is that of the Millennium Development Goals (MDG). They are: Developed Countries, the Caribbean, the Caucasus, Eastern Asia, Latin America, North Africa, Oceania, Sub Saharan Africa, South Asia, South East Asia and West Asia.

7.1.2. Analysis

To test if the association between government monopolies and alcohol consumption remains negative at different levels of corporate permeation, I introduced an interaction term between the variable High or Low CPI in the regression of alcohol consumption on Government Monopolies. The variable High or Low was obtained by splitting the ranked CPI values by the median- values below the median were classified as Low Permeation and values above the median as High Permeation. I used a cross sectional design because I don't have longitudinal cross-country data on changes to the status of Government Monopolies. I used APC as my dependent variable. As a robustness check, I split the sample into Low and High CPI and regressed alcohol consumption on Government Monopolies. Furthermore, I split the sample further along income categories – High Permeation and High Income, High Permeation and Low and Middle Income, Low

Permeation and High Income and Low Permeation and Low and Middle Income.

Given that the association between corporate permeation and alcohol consumption might vary over time I used panel data covering the period 2010-2015. To account for a potential non-direct effect, I used a one year lagged corporate permeation as additional covariate. All the standard errors are clustered at county level.

To test the moderator effect of Government Monopolies, I introduced an interaction term between the variable Government Monopoly and CPI in the regression of alcohol consumption on CPI. As a robustness check, I stratified my models according the type of market level: Competitive Markets and Government Monopolies. I then regressed alcohol consumption on CPI in each subsample. Lastly, I stratify my models according to country income level into a total of four groups – HICs with Government Monopolies, HICs with Competitive Alcohol Markets; LMICS with Government Monopolies and LMICs with Competitive Alcohol Markets. Since I am interested in the yearly alcohol consumption, I used the variable "Recorded alcohol consumption" which is not as accurate as Total consumption, but unlike it, is measured each year.

Robustness checks

There is a possibility that monopolies lower alcohol consumption and that, concomitantly, countries that for cultural or religious reasons have low levels of alcohol consumption are also more likely to instate alcohol monopolies. Bearing in mind the

limitations posed by a cross sectional design in addressing the issue of endogeneity, I apply a matching algorithm - coarsened exact matching in Stata. This matching algorithm relies on a propensity score that condenses information about the covariates in the model for each of my observations. At the same level of this propensity score, ie. given the value of the propensity score, the probability of a country being a government monopoly is different from that of it being a competitive market. This allows for a comparison of cases that are similar on all covariates but the monopoly status. Cases that are not comparable are pruned out. The model is then ran on the matched sample.

7.3. Results

H1: At higher corporate permeation, the protective role of government monopolies is weaker.

In line with previous findings (42,43). I obtain a negative association between government monopolies and alcohol per capita consumption. More precisely monopolistic countries tend to record a lower level of alcohol consumption by about 34%. When I introduce an interaction term between government monopoly and the level of corporate permeation, the main coefficient is no longer significant, but the interaction coefficient is negative and significant at the 90% level. In other words, in high corporate permeation countries, monopolies are associated with lower alcohol consumption - on average, in these countries, those that have a monopoly drink 50% less than those that have competitive markets, holding known confounders constant.

When I stratify the sample according to the county level of income, I obtain similar results in terms of magnitude: in high corporate permeation countries, those that have government monopolies drink, on average, 56% less than those that have competitive markets. In all models, the percentage of Muslims is negatively associated with alcohol consumption and Upper Middle-Income Countries have, on average, a higher consumption than Low Income Countries. These findings are consistent with the existing literature on income and alcohol consumption. (Table 7.1). As for the results of the robustness checks, the main and interaction coefficients are similar to those in the main analysis. It is worth pointing out that in the matched sample the coefficient for corporate permeation is positive and significant at the 95% level (Table 7.1A). I reject H1.

[Insert Table 7.1 Here]

H1A: The associations are moderated by the country income level: the protective role of monopolies put forward in H1 is weaker in LMICs than in HICs

When I stratify the sample along income levels, I find that government monopolies have, on average, lower per capital alcohol consumption than competitive markets, independently of income level and level of corporate permeation. The only statistically significant coefficient for the association is that found in LMICs that have high corporate permeation: in these countries, alcohol consumption is 67% lower in government monopolies than in competitive alcohol markets (Table 7.1.1.). I reject H1A.

[Insert Table 7.1.1 Here]

H2: The association between corporate power and alcohol consumption is weaker in government monopolies

I find that the coefficient for the regression of alcohol consumption on corporate permeation is not statistically significant nor is the interaction coefficient between CPI and government monopoly. It is worth mentioning that here too, on average, all known confounders held constant, in government monopolies, alcohol consumption is lower than in competitive alcohol markets. When I split the sample into countries with competitive alcohol markets and government monopolies, I find that in the former there is no association between CPI and alcohol consumption. In the latter, however, the association is negative and statistically significant: for each standard deviation increase in the CPI, we see a nearly 80% reduction in per capita alcohol consumption ($e^{\beta}= e^{(-1.541)}=0.214$). I reject H2.

[Insert Table 7.2 Here]

H2A: The protective role of government monopolies put forward in H1 is weaker in LMICs than in HICs

When I take into consideration the country income level, I find that in competitive alcohol markets the association between corporate permeation and alcohol consumption is positive. The coefficient is only statistically significant at the 90% level in LMICs countries where, on average, for each standard deviation increase in the CPI, we see a 49% ($e^{\beta}= e^{(-0.667)}=0.51$) increase in per capita consumption. In government monopolies, the association between corporate permeation is negative but not statistically significant. (Table 7.2.1). I reject H2A

[Insert Table 7.2.1 Here]

7.4. Discussion

I find that, in countries where corporate permeation is low, there is no association between government monopolies on alcohol and alcohol consumption. On the other hand, in countries with high corporate permeation, government monopolies have lower alcohol consumption than those with competitive markets. I also find that the association between corporate permeation and alcohol consumption is negative in countries where governments hold a monopoly on retail and/or production of alcohol and find no association in countries with competitive alcohol markets. The finding that the association between government monopolies and alcohol consumption is negative in high corporate permeation countries and not statistically significant in low permeation countries may indicate that government interventions are efficacious in protecting populations when commercial pressures are high. It is plausible that, in low permeation countries, these pressures are not as intense and thus the protective role of the monopoly is not as important.

The finding of no association between corporate permeation and alcohol consumption in competitive markets and a negative association in government monopolies may seem counterintuitive in light of theoretical and empirical – quantitative and qualitative – work on the instrumental and agency power of the commercial sector and how it is exerted to boost consumption of harmful commodities (24,44,45). Upon closer inspection of the unadjusted associations in Figure1, it is plausible that these findings simply reflect the composition of the group of countries that have government monopolies. Within this group, countries with low permeation and *relatively high* alcohol consumption include

the Scandinavian alcohol monopolies and other countries with good health policy governance such as Canada. Good governance in these countries, could potentially harness the benefits of corporate permeation – for example, extract taxes from corporations that can be used to effectively implement alcohol control regulations- and thus reduce alcohol consumption.

[Insert Figure 1 Here]

This interpretation is compatible with the finding that, when I look separately at HICs and LMICs the coefficients for the association between corporate permeation and alcohol consumption are substantially smaller and not statistically significant.

[Insert Figure 2 Here]

The large negative coefficient for the association in government monopolies can be driven by the sample composition. Once I take income level into account, corporate permeation and alcohol consumption show a positive association in competitive markets and a negative one in monopolies. Government monopolies on alcohol seem to be an efficacious public health tool in curbing the effects of commercial pressures, especially in LMICs.

My study has a number of limitations. The cross-sectional nature of the data precludes any attribution of an effect of the type of monopoly on the levels of alcohol consumption. To be able to make such claims I would have needed a longitudinal dataset that documented changes in country monopolies over time. Such datasets exist for states within countries such as the US or provinces within Canada. I will be able to address

these issues, at least partly, when WHO releases new consumption and comparative policy data in the next two years. With regard to the choice of indicators, on the independent variable, the absence of the stated goals of the alcohol monopoly may lead to an underestimation of the effect of government monopolies on consumption as government monopolies instituted for fiscal purposes, as opposed to public health ones, may have an incentive to sell more alcohol. The indicator of corporate power, the CPI, has limitation of its own, which are described elsewhere (39). A couple of these limitations should be singled out, nonetheless. Some quantitative measures of undue influence that have been extensively used by the alcohol industry are not captured by the CPI. These include lobbying and revolving-doors between the alcohol industry and policy making spheres which are particularly, if not impossible to find, especially in formats that render these measures comparable across countries. As for the indicators of alcohol consumption, total alcohol consumption is a better measure of alcohol intake at the population level than recorded alcohol consumption, which does not take into consideration illegally produced and smuggled alcohol. If unrecorded levels were higher in high permeation countries – e.g. via higher levels of smuggling or low enforcement of limits on cross border purchases- there could be an underestimation of the association between corporate permeation and alcohol consumption when using recorded values only.

In conclusion, the reversal of privatization or the maintenance of existing government control may be desirable public health interventions in jurisdictions faced with high

levels of corporate power. More data points and better data may shed some more light on this question in the future. For the time being, it is important to stress that Government Monopolies are important tools in reducing alcohol consumption at all levels of country income

Table 7. 1. Linear Regression of Government Monopoly on Alcohol Consumption - Moderated by Corporate Permeation

VARIABLES	(1) Total Alcohol Consumption Per Capita	(2) Total Alcohol Consumption Per Capita	(3) Total Alcohol Consumption Per Capita - ***Low Permeation Countries***	(4) Total Alcohol Consumption Per Capita - ***High Permeation Countries***
Competitive Alcohol Market (Reference)				
Government Monopoly	-0.314***	-0.106	-0.127	-0.563**
	(0.113)	(0.168)	(0.166)	(0.234)
Corporate Permeation Index (CPI)		0.0852		
		(0.114)		
Competitive Market#Low Permeation		-		
Competitive Market#High Permeation		-		
Government Monopoly#Low Permeation		-		
Government Monopoly#High Permeation		-0.502*		
		(0.261)		
% Muslims in the Population	-0.0163***	-0.0156***	-0.0238***	-0.00812**
	(0.00195)	(0.00207)	(0.00299)	(0.00322)
Country Income Level				
Low Income (Reference)				
Lower Middle Income	0.247	0.0148	-0.201	0.152

	(0.174)	(0.188)	(0.251)	(0.302)
Upper Middle Income	0.511***	0.332*	-0.0901	0.504*
	(0.185)	(0.199)	(0.317)	(0.278)
Upper Income	0.210	0.0540	-0.215	0.354
	(0.220)	(0.243)	(0.450)	(0.328)
Regions of the World				
Developed Countries (Reference)				
Caribbean	-0.710***	-0.716**		-0.688**
	(0.182)	(0.279)		(0.285)
Caucasus	0.135	-0.156	0.905	-0.495
	(0.256)	(0.269)	(0.678)	(0.299)
Eastern Asia	-0.247	-0.0956	-0.215	0.364
	(0.327)	(0.326)	(0.403)	(0.600)
Latin America	-0.736***	-0.712***	-0.578	-0.624***
	(0.171)	(0.173)	(0.375)	(0.201)
North Africa	-1.160***	-1.329***	-0.505	
	(0.384)	(0.392)	(0.532)	
Sub Saharan Africa	-0.422**	-0.338*	-0.267	-0.277
	(0.181)	(0.190)	(0.402)	(0.251)
South Asia	-1.736***	-1.674***	-1.502***	-2.591***
	(0.275)	(0.281)	(0.454)	(0.669)
South East Asia	-1.107***	-1.076***	-0.614	-1.148***
	(0.218)	(0.217)	(0.382)	(0.297)
West Asia	-1.170***	-0.989***	0.0724	-1.888***
	(0.332)	(0.359)	(0.564)	(0.597)
Oceania	-1.490***			
	(0.263)			
Constant	2.213***	2.319***	2.597***	2.127***
	(0.223)	(0.261)	(0.470)	(0.322)
Observations	133	133	64	69
R-squared	0.719	0.731	0.827	0.673

- Standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1

Table 7.1A. Linear Regression of Government Monopolies on Alcohol Consumption - Moderator Effect of Level of Corporate Permeation -Adjusted for Coarse Matching Algorithm Weights

VARIABLES	(1) Total Alcohol Consumption Per Capita (Logged)
Competitive Alcohol Market (Reference)	
Government Monopoly	-0.0964
	(0.187)
Corporate Permeation Index (CPI)	0.404**
	(0.171)
Competitive Market#Low Permeation	-
Competitive Market#High Permeation	-
GovernmentMonopoly# Low Permeation	-
GovernmentMonopoly#High Permeation	-0.522*
	(0.281)
% Muslims in the Population	-0.0133***
	(0.00256)
Country Income Level	
Low Income (Reference)	
Lower Middle Income	0.579***
	(0.199)
Upper Middle Income	0.288
	(0.246)
High Income	0.274
	(0.411)
Regions of the World	
Developed Countries (Reference)	
Caribbean	-0.861
	(0.542)
Caucasus	-0.495
	(0.346)
Latin America	-0.438
	(0.362)
Sub Saharan Africa	-0.235
	(0.333)
South Asia	-3.368***
	(0.415)
Constant	1.998***
	(0.426)
Observations	71
R-squared	0.876

Table 7.1.1. Linear Regression of Government Monopoly on Alcohol Consumption - Moderated by Corporate Permeation and Income Level

VARIABLES	(1) Alcohol Consumption Per Capita - **Low Permeation Countries** & Low and Middle Income	(2) Alcohol Consumption Per Capita - **Low Permeation Countries** & High Income	(3) Alcohol Consumption Per Capita - **High Permeation Countries** & Low and Middle Income	(4) Alcohol Consumption Per Capita - **High Permeation Countries** & High Income
Competitive Alcohol Market (Reference)				-
Government Monopoly on Alcohol	-0.0679	-0.137	-0.676**	-
	(0.290)	(0.169)	(0.271)	
Percentage of Muslims in the Population	-0.0209***	-0.0332***	-0.00962***	-
	(0.00324)	(0.0111)	(0.00347)	
Constant	1.880***	2.376***	2.002***	-
	(0.175)	(0.0894)	(0.128)	
Observations	36	28	54	15
R-squared	0.595	0.265	0.218	0.844

- Standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1

Table 7. 2. Linear Regression of Corporate Permeation on Alcohol Consumption - Moderator Effect of Government Monopolies

VARIABLES	(1) Recorded Alcohol Consumption Per Capita	(2) Recorded Alcohol Consumption Per Capita	(3) Recorded Alcohol Consumption Per Capita- **Competitive Alcohol Markets**	(4) Recorded Alcohol Consumption Per Capita- **Government Monopolies**
Corporate Permeation Index (CPI) - Lagged	-0.164	-0.200	-0.141	-1.541***
	(0.173)	(0.184)	(0.168)	(0.546)
Competitive Alcohol Market (Reference)				
Government Monopoly		-0.588***		
		(0.212)		
Competitive Market#CPI - Lagged		-		
Government Monopoly#CPI - Lagged		-0.273		
		(0.399)		
% Muslims in the Population	-0.0205***	-0.0200***	-0.0147***	-0.0322***
	(0.00413)	(0.00368)	(0.00485)	(0.00386)
Country Income Level				
Low Income (Reference)				
Lower Middle Income	0.183	0.105	0.134	0.692**
	(0.297)	(0.302)	(0.418)	(0.326)
Upper Middle Income	0.703**	0.578**	0.693*	0.685
	(0.275)	(0.277)	(0.368)	(0.453)
High Income	0.608**	0.450	0.597	0.424
	(0.298)	(0.303)	(0.395)	(0.509)
Region of the World				

Developed Countries (Reference)				
Caribbean	-0.486**	-0.545***	-0.537***	
	(0.202)	(0.202)	(0.192)	
Caucasus	0.110	0.0888	-0.00789	0.461
	(0.375)	(0.327)	(0.294)	(0.469)
Eastern Asia	-0.208	-0.0311	-0.402*	1.485**
	(0.213)	(0.374)	(0.236)	(0.708)
Latin America	-0.636***	-0.687***	-0.686***	0.752***
	(0.144)	(0.133)	(0.112)	(0.175)
North Africa	-0.737	-0.338		0.769
	(0.599)	(0.570)		(0.453)
Sub Saharan Africa	-0.261	-0.263	-0.383**	0.632
	(0.183)	(0.173)	(0.161)	(0.384)
South Asia	-2.587***	-2.560***	-2.150***	-2.698***
	(0.605)	(0.538)	(0.717)	(0.534)
South East Asia	-1.513***	-1.579***	-1.465***	-1.608***
	(0.395)	(0.382)	(0.409)	(0.484)
West Asia	-0.930*	-1.047**	-1.507***	
	(0.513)	(0.475)	(0.533)	
Constant	1.650***	1.855***	1.698***	0.792
	(0.305)	(0.310)	(0.408)	(0.504)
Observations	528	528	432	96
R-squared	0.705	0.729	0.649	0.935

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Figure 7. 1. Plots of Alcohol Consumption on Corporate Permeation Index by type of Alcohol Market

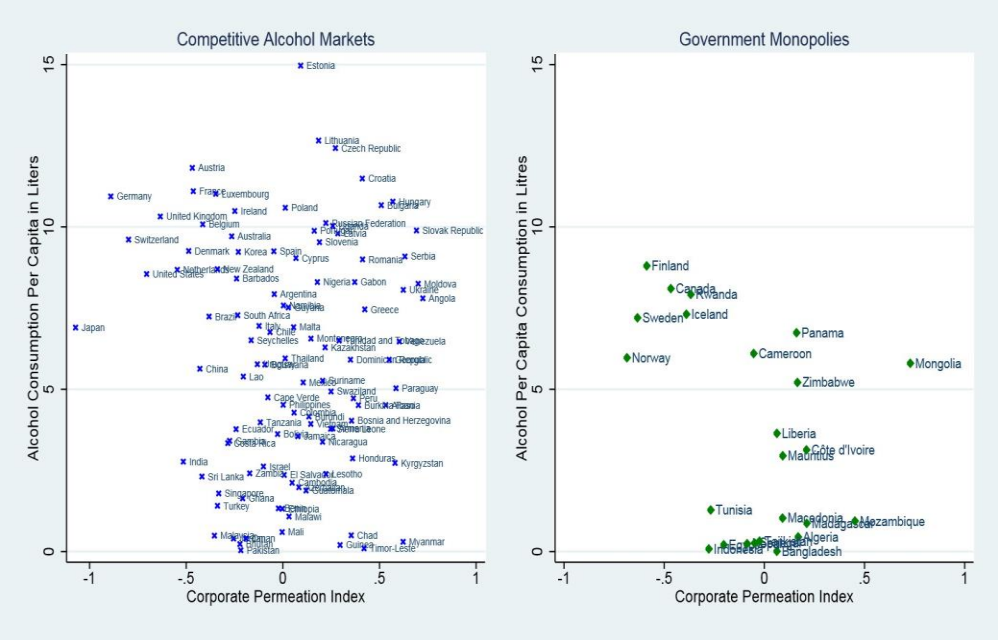

Figure 7. 2. Plots of Alcohol Consumption on Corporate Permeation Index by type of Alcohol Market and Level of Income

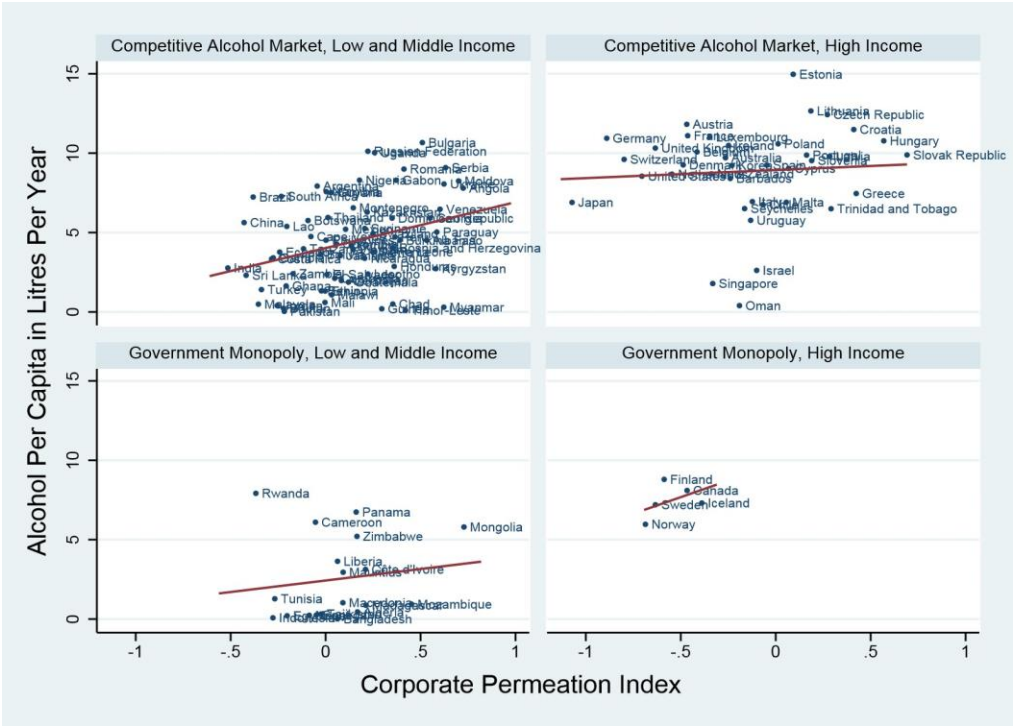

Table 7.2.1. Linear Regression of Corporate Permeation on Alcohol Consumption - Moderator Effect of Government Monopolies by Income Level

VARIABLES	(1) Recorded Alcohol Consumption Per Capita- **Competitive Alcohol Markets** & Low and Middle Income	(2) Recorded Alcohol Consumption Per Capita- **Competitive Alcohol Markets** & High Income	(3) Recorded Alcohol Consumption Per Capita- **Government Monopolies** & Low and Middle Income	(4) Recorded Alcohol Consumption Per Capita- **Government Monopolies** & High Income
Corporate Permeation Index (Lagged)	0.667*	0.0126	-0.0103	-0.0635
	(0.382)	(0.102)	(0.919)	(0.726)
Percentage of Muslims in the Population	-0.0136***	-0.0368***	-0.0296***	-0.0452
	(0.00451)	(0.00294)	(0.00840)	(0.0319)
Constant	1.315***	2.283***	1.242**	2.062***
	(0.130)	(0.0479)	(0.446)	(0.355)
Observations	350	190	95	25
R-squared	0.211	0.701	0.488	0.376

- Robust standard errors in parentheses
- *** p<0.01, ** p<0.05, * p<0.1

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