Appendix 1

Full definitions of the commercial policies included in the WHO NCD progress monitors

Tobacco policy cluster

- 5a: Member State has implemented measures to reduce affordability by increasing excise taxes and prices on tobacco products
- 5b: Member State has implemented measures to eliminate exposure to second-hand tobacco smoke in all indoor workplaces, public places and public transport
- 5c: Member State has implemented plain/standardized packaging and/or large graphic health warnings on all tobacco packages
- 5d: Member State has enacted and enforced comprehensive bans on tobacco advertising, promotion and sponsorship
- 5e: (2017 and 2020 only) Member State has implemented effective mass media campaigns that educate the public about the harms of smoking/tobacco use and second-hand smoke

Alcohol policy cluster

- 6a: Member State has enacted and enforced restrictions on the physical availability of retailed alcohol (via reduced hours of sale)
- 6b: Member State has enacted and enforced bans or comprehensive restrictions on exposure to alcohol advertising (across multiple types of media)
- 6c: Member State has increased excise taxes on alcoholic beverages

Food policy cluster

- 7a: Member State has adopted national policies to reduce population salt/sodium consumption
- 7b: Member State adopted national policies that limit saturated fatty acids and virtually eliminate industrially produced trans-fatty acids in the food supply
- 7c: Member State has implemented the WHO set of recommendations on marketing of foods and non-alcoholic beverages to children
- 7d: Member State has legislation/regulations fully implementing the International Code of Marketing of Breast-milk Substitutes
Appendix 2

Literature review: Proxies for the commercial-political nexus

Background

We conducted a literature review to identify indicators that can be used to assess the extent to which commercial actors are able to directly influence the policy-making process. The central issue is not whether commercial interests can influence policy, but whether they have an outsized influence over policy-making due to their financial clout. The latter would grant them an advantage over non-commercial interest groups, including those advocating for public health measures to constrain the sale and marketing of unhealthy products. Much depends, therefore, on whether there are formal restrictions on the use of corporate resources to directly influence policy-makers.

The legal and political science literature on political financing and the role of interest groups is extensive. Similarly a large public health literature has emerged on the use of corporate resources to influence health policy. Based on these two literatures we identified four regulatory areas that affect the ability of commercial interests to use their greater financial resources to directly influence politicians and political parties and, thereby, the policy-making process:

(1) Campaign financing: whether there are limits on campaign donations from companies and/or a requirement to publicly disclose the source and amount of those donations.

(2) Business and financial interests of politicians: whether the financial and business interests of politicians must be publicly disclosed.

(3) Lobbying transparency: whether the activities of lobbyists must be publicly disclosed.

(4) Enforcement: whether an independent administrative or judicial body (e.g. electoral monitoring board, general prosecutor, etc.) has the capacity to enforce financing limits and disclosure requirements (i.e. 1-3).

It is important to note that most of the channels through which corporations can use their resources to influence policy-making do not involve corrupt incentives in the traditional sense (i.e. the offering of material incentives that personally benefit politicians). Lobbying activities and campaign donations typically do not provide material benefits to individual politicians. Campaign donations enhance the electoral chances of politicians and political parties, but individual politicians may only materially benefit if they embezzle those donations. Nevertheless, corrupt incentives remain one way in which
commercial interests can gain unequal influence over policy. This is covered by the second regulatory area above.

We set aside the ability of corporations to indirectly influence policy-makers by shaping consumer preferences (via, for example, product advertising and media ownership) and, thereby, the policies that citizens support. Instead we focus on the ability of corporations to directly influence the decisions of policy-makers.

We aimed to construct a robust overall indicator that captures the level of regulation in each of these four areas. To achieve this, we sought to identify individual indicators for each regulatory area that could then be combined via factor analysis (see Appendix 4) to form a de novo composite indicator of corporate financial influence.

Method

Search strategy

To identify indicators of corporate influence over political decision-making aligned with the four domains listed above, we searched the following global political data collections on July 7th, 2021: Varieties of Democracy (V-Dem) data set, Quality of Government (QoG) standard data set, and Institute for Democracy and Electoral Assistance’s (IDEA) Political Finance Database. In addition, we searched the first 1,000 records of Google Scholar using the following broad search terms; ("disclosure" OR "transparency") AND ("politician" OR "lobbying" OR "donation" OR "campaign financing") AND "data". We limited the search to the years 2005-2021.

Inclusion criteria

We included metrics that met the following criteria:

- Conceptual alignment with the four regulatory areas noted above
- Global coverage: data available for an arbitrary threshold of >85% (>165) WHO Member States
- Data gathering methodology is publicly available and complete
- Data is comparable between countries

Two authors (SW and LA) independently reviewed each potential indicator for alignment with the inclusion criteria. Disagreements were resolved by discussion and - where necessary – arbitration by the third author (HH). The rationale for inclusion or exclusion was documented for each indicator.
Findings

Table 1 presents the set of relevant indicators that have global coverage, as well as the rationale for inclusion and the quality of the data gathering process in each case.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
<th>Rationale</th>
<th>Source</th>
<th>Country coverage</th>
<th>Data gathering methodology publicly available and complete?</th>
<th>Data gathering method</th>
<th>Comparable between countries?</th>
<th>Scale</th>
<th>Years</th>
<th>Include/exclude</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Campaign finance</strong></td>
<td></td>
<td></td>
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<tr>
<td>Disclosure of campaign donations</td>
<td>To what extent are there disclosure requirements for donations to national election campaigns?</td>
<td>Absence of transparency increases the opportunity for commercial interests to influence politicians and political parties and, thereby, policy.</td>
<td>V-Dem Dataset v11.1 [variable name: v2eldonate]</td>
<td>172</td>
<td>yes</td>
<td>Coded by multiple country experts and converted to interval scale using Bayesian item response theory measurement model.</td>
<td>yes</td>
<td>Interval scale where the lowest score indicates the least disclosure and the highest score indicates the most disclosure.</td>
<td>2015, 2017, 2019</td>
<td>Meets inclusion criteria - include</td>
</tr>
<tr>
<td>Public campaign finance</td>
<td>To what extent is significant public financing available for parties’ and/or candidates’ campaigns for national office?</td>
<td>Greater public financing ameliorates the influence of large private donors on politicians and political parties and, thereby, policy-making.</td>
<td>V-Dem Dataset v11.1 [variable name: v2elpubfin]</td>
<td>172</td>
<td>yes</td>
<td>Coded by multiple country experts and converted to interval scale using Bayesian item response theory measurement model.</td>
<td>yes</td>
<td>Interval scale where the lowest score indicates the least public financing and highest score indicates the most public financing.</td>
<td>2015, 2017, 2019</td>
<td>Less direct, but still meets inclusion criteria - include</td>
</tr>
<tr>
<td>Corporate campaign donations</td>
<td>Is there a ban on donations from domestic or foreign interests to political parties or candidates?</td>
<td>Ban reduces the opportunity for commercial interests to influence politicians and political parties and, thereby, policy.</td>
<td>IDEA (2021) 12</td>
<td>180</td>
<td>yes</td>
<td>Expert coded based on laws, regulations, and reports. Aggregate score is the average of questions 1-4 listed under &quot;Bans and limits on private income&quot; in the IDEA database: 1. Is there a ban on donations from foreign interests to political parties? 2. Is there a ban on donations from foreign interests to candidates? 3. Is there a ban on corporate donations to political parties? 4. Is there a ban on corporate donations to candidates?</td>
<td>yes</td>
<td>Interval scale ranging from 0 to 1, where 0 represents no restrictions on donations from corporations and 1 represents the most restrictions on donations from corporations.</td>
<td>2019</td>
<td>Discussion around whether the foreign element for this composite marker excludes it. We decided to include on the basis that most foreign donations are likely to come from corporate actors.</td>
</tr>
</tbody>
</table>

| Disclosure of interests | Disclosure by politicians | Do the law or regulations of the country require politicians to provide either financial and/or business interests disclosures and are the disclosures publicly available? | Absence of transparency increases the opportunity for commercial interests to influence politicians and political parties and, thereby, policy. | Djankov et al (2010) 30 [variable names: disc_req and ft_pubprac_all] | 175 | yes | Expert coded based on laws, regulations, and information requests. Score is the sum of disc_req and ft_pubprac_all | yes | Ordinal scale: 0 Disclosure not required and not publicly available 1 Disclosure required or publicly available 1.5 Disclosure required but financial or business disclosures not publicly available. 2 Disclosure required and publicly available | 2010 | Data are quite old; however, this is a slow-moving domain. As such we decided to include, but run a sensitivity analysis that drops this variable from the latent factor analysis. |
| **Legislature corrupt activities** | To what extent do members of the legislature abuse their position for financial gain? | Willingness of politicians to accept material incentives for personal gain increases the opportunity for commercial interests to influence policy. | V-Dem Dataset v11.1[^1] [variable name: v2jgcrprpt] | 172 | yes | Coded by multiple country experts and converted to interval scale using Bayesian item response theory measurement model. | yes | Interval scale where the lowest score indicates the most corruption and the highest score indicates the least corruption. | 2015, 2017, 2019 | We noted that we are interested in licit and illicit financial influence, not just corruption. However this indicator is likely to helpfully capture non-disclosures, and is a proxy for opportunities for influencing politicians. We agreed to include. |

| **Lobbying transparency** | Are lobbyists for commercial interests required to register their identity and the company they represent? | Absence of transparency increases the opportunity for commercial interests to influence politicians and political parties and, thereby, policy. | IDEA (2021)[^2]; OECD (2021)[^3]; Chari et al (2019)[^4] | 127 | yes | Expert coded based on laws and regulations. This variables was constructed based on the three sources noted. Each country was sorted according to the following four categories: (1) no disclosure requirements, (2) voluntary registration of lobbying activities, (3) some lobbying activities must be registered, (4) most lobbying activities must be registered. The binary variable takes the value of 1 if some or most activities must be registered, otherwise 0. | yes | Dichotomous variable which takes the value of zero if there is no requirement to register lobbying activities, otherwise 1. | 2019 | Because data is not available for a sufficient number of countries we did not use this indicator during the construction of CFII. We assume that the latent variable identified using factor analysis will also capture this regulatory area - countries with demanding disclosure requirements for campaign donations and the financial/business interests of politicians are more likely to have disclosure requirement for lobbying activities, and vice versa. By way of robustness we will test whether our regression results are sensitive to the inclusion of this variable in the factor analysis. |

| **Enforcement** | If executive branch officials were engaged in unconstitutional, illegal, or unethical activity, how likely is it that a body other than the | Indicates the likelihood that bans and disclosure requirements are enforced in practice. | V-Dem Dataset v11.1[^5] [variable name: v2jgotovst] | 172 | yes | Coded by multiple country experts and converted to interval scale using Bayesian item response theory measurement model. | yes | Interval scale where the lowest score indicates the least oversight and the highest score indicates the most oversight. | 2015, 2017, 2019 | Meets the inclusion criteria - include. |

[^1]: BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s).
legislature, such as a comptroller general, general prosecutor, or ombudsman, would question or investigate them and issue an unfavorable decision or report?
We identified a total of six indicators that were methodologically robust, available for >80% of countries, internationally comparable, and conceptually aligned with the ability of commercial actors to influence policymakers. As we were only able to find lobbying transparency data for 127 countries that input indicator was set aside. However, it is reasonable to expect that the other three regulatory areas are correlated with the level of transparency in terms of lobbying activities. That is, polities that require the disclosure of campaign donations and business/financial interests are more likely to require disclosure by lobbyists. For the sake of robustness we will check whether our regression results are sensitive to the inclusion of the lobbying transparency indicator during the construction of the CFII.
Appendix 3

List of 22 microstates not covered by the V-Dem data

- Andorra
- Antigua and Barbuda
- Bahamas
- Belize
- Brunei Darussalam
- Cook Islands
- Dominica
- Micronesia
- Grenada
- Kiribati
- Saint Kitts and Nevis
- Saint Lucia
- Monaco
- Marshall Islands
- Niue
- Nauru
- Palau
- San Marino
- Tonga
- Tuvalu
- Saint Vincent and the Grenadines
- Samoa

Appendix 4

Latent Factor Analysis

Structural equation modelling (SEM), with full information maximum likelihood, will be used to identify the latent variable underlying the six selected input indicators. The factor loadings will be checked to ensure they are statistically significant and of sufficient magnitude. In addition, goodness of fit statistics will be used to check whether the latent variable is sufficiently related to the input variables. The model will then be used to produce a factor score reflecting the level of corporate financial influence over
policy-making in each country. Those scores will then be rescaled to range from 0 (least corporate influence) to 100 (most corporate influence). The factor analysis will be carried out using the State command –SEM, method(mlmv) –.
References


29 Lima JM, Galea S. The Corporate Permeation Index – A tool to study the macrosocial determinants of Non-Communicable Disease. SSM - Popul Health 2019; 7: 100361.


Appendix 5
Statistical analysis plan

**Administrative information**

1. **Title:** Implementation of policies to tackle the commercial determinants of non-communicable diseases from 2015 to 2020: a cross-sectional analysis of 172 countries exploratory analysis
2. **SAP version:** Version 1.0 (July 1 2021)
3. **SAP Revisions:**
4. **Roles and responsibility:**
   i. Person writing SAP: Simon Wigley and Luke Allen
   ii. Senior statistician responsible: Simon Wigley
   iii. Chief investigator: Luke Allen

**Introduction**

5. **Background and rationale:**

   A growing body of work describes the myriad channels through which corporations seek to undermine effective public health measures to constrain the sale and marketing of unhealthy commodities. [1–6] Although case studies are plentiful, there has been a paucity of empirical research to quantify the association between corporate influence and policy implementation.

   All 194 World Health Organization (WHO) Member States have endorsed a set of 12 policies that target tobacco, alcohol, foods high in fats and salt, child-focused junk food marketing, and marketing of breastmilk substitutes. These policies designed to tackle the ‘commercial determinants’ of non-communicable diseases (NCDs) were first endorsed in 2013.

   WHO monitors the implementation of these commercial policies through regular NCD country capacity surveys, completed by national ministries of health. WHO has produced three global progress monitor reports – in 2015, 2017, and 2020 [7–9] – providing country-level assessments of whether each of the 12 commercial policies has been ‘fully implemented’, ‘partially implemented’, or ‘not implemented’.
This WHO data on commercial policy implementation provides a unique opportunity to examine whether indicators of corporate influence over policymaking processes are associated with implementation of key commercial policies, according to the three policy clusters delineated in Box 1.

Box 1: Commercial policies in three ‘policy clusters’

**Tobacco**
- Tobacco tax
- Smoke free places
- Tobacco packaging
- Tobacco advertising bans
- Tobacco mass media

**Alcohol**
- Alcohol sales restrictions
- Alcohol advertising bans
- Alcohol tax

**Food**
- Salt reduction
- Fat reduction
- Child marketing restrictions
- Marketing of breast milk substitutes

6. Objectives:

In this exploratory analysis we aimed to provide a summary of international implementation trends over time, develop a composite corporate financial influence index (CFII), and perform three sets of regression analyses assess the association between:

1. Overall country-level implementation of all 12 commercial policies (aggregate score) and CFII.
2. Country-level implementation of each of the three clusters and CFII.
3. Country-level implementation of each individual policy and CFII.
4. Country level prevalence of risk factors (tobacco use, alcohol use, hypertension, obesity, and child obesity) and each of the respective policies.
We hypothesise that countries with higher levels of corporate financial influence will have the lowest levels of policy implementation.

**Study methods**

7. Study design: cross-sectional study based on observational data

**Statistical principles**

8. Confidence intervals and p-values.
   i. Level of statistical significance: 0.05
   ii. Confidence interval to be reported: 95%
   iii. Adjustment for multiplicity: see 32 below

**Study sample**


**Data gathering and construction**

10. Extract policy scores from NCD Progress Monitors for 2015, 2017 and 2020. [7–9]
11. Construct composite scores for all 12 commercial policies and each commercial policy cluster (tobacco, alcohol and food policies).
12. Assemble risk factors from various sources: adult obesity, child obesity, hypertension, alcohol consumption, and smoking prevalence.
13. Assemble control variables from various sources: GDP per capita, % urban population, % population aged 65+, level of democracy, % Muslim, legal origin, ethno-linguistic fractionalization, Small Island Developing States, and continent.
14. Construct ‘Corporate Financial Influence’ index using latent factor analysis, using structural equation modelling in Stata with FIML.
15. Exclude variables that encompass less than 165 of 194 countries.
16. Log transform variables that are right-skewed.
17. Use data from 10-16 to construct a panel for the years 2015, 2017, and 2019 for 172-194 countries.

**Model specification**

18. Random effects GLS regressions: captures between country effects and within country effects [using Stata’s xtreg, re command].
19. Confounding covariates: include control variables to address economic, cultural/historical, geographic, and population factors that may be driving the results.
20. Time trends: include year dummies to address the possibility of a spurious relationship between the outcome variable and the independent variables of interests.
Regression analyses

22. Random effects GLS regression I: total commercial policies (aggregate score for all 12 policies) regressed on CFII (with and without control variables) [using Stata’s `xtreg, re` command].

23. Random effects GLS regression II: each commercial policy cluster (tobacco, alcohol, and food) separately regressed on CFII (with and without control variables) [using Stata’s `xtreg, re` command]

24. Random effects GLS regressions III: All 12 individual commercial policies separately regressed on CFII (with and without control variables) [using Stata’s `xtreg, re` command]

25. Construct prediction-based Bland-Altman plots for 2019 using the results from 22 and 23.

Additional analysis

26. Random effects GLS regressions IV: tobacco, alcohol, fat, child food marketing, and salt policies separately regressed on corresponding risk factors (with and without control variables) [using Stata’s `xtreg, re` command]

27. Interaction model: examine whether the association between democracy and commercial policies is conditioned by level of CFII. [using Interflex command in R][10]

Robustness/ sensitivity checks


29. Repeat 22, 23, 24, and 27 using CFII constructed: 
   (i) Without disclosure by politicians (because data for that variable is only available for year 2010)
   (ii) With registration of lobbying activities (which is only available for 127 countries)

30. Repeat 22, 23, 24, and 26 using multiple imputation to address missing data [using Stata’s `mi impute mvn` and `mi est` commands]

31. Repeat 22, 23, 24, and 27 including level of corruption as a control variable (potential confounder for CFII).

32. Collinearity checks: Variable and coefficient correlation matrices for 22.

33. Multiplicity tests for regressions [using Stata’s `wyouth module`]

34. Robust Hausman test for random vs. fixed effects [using Stata’s `rhausman` module]

Statistical software

35. Stata version 14.1 and R version 4.1.0

References for SAP

1 McKee M, Stuckler D. Revisiting the Corporate and Commercial Determinants of Health. 


11 Madureira Lima J, Galea S. The Corporate Permeation Index – A tool to study the macrosocial determinants of Non-Communicable Disease. *SSM - Popul Health* 2019;7:100361.