Tobacco control policies and socio-economic inequalities in smoking cessation

Evaluating natural experiments

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Tobacco control policy development in the European Union: do political factors matter?

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ABSTRACT

Background
There has been much variation between European countries in the development of tobacco control policy. Not much is known about the factors that shape this variation. This study aimed to assess the role of political factors in tobacco control policy development.

Methods
We used data from 11 European countries from 1996 through 2010. Multilevel regression modelling was used to investigate associations between the Tobacco Control Scale (TCS) and indicators of left-wing government and government effectiveness (policy formulation, implementation, and enforcement), with control for confounders.

Results
An association was found between left-wing government and TCS over the period 1996–2003, but not over the whole period. The association between government effectiveness and TCS was significant and negative over the whole period, but positive between 2001 and 2005. Residual analysis showed that TCS scores from 2002 onwards were higher than expected based on the political factors. Associations varied among the five subscales of the TCS.

Conclusion
The results suggest that, on the whole, national political factors have had only a minor influence on the large variations in tobacco control policy development in Europe over the last 15 years. However, there are indications that left-wing governments were important for early adoption of tobacco control policy, and high government effectiveness was important in the phase of adopting innovative policies. However, since 2002, with the advent of international treaties, the influence of national politics has diminished.
Introduction

Action is required to fight the unrelenting tobacco epidemic, which results in much of the world’s avoidable morbidity and mortality. This has come in the form of tobacco control policies, which have developed impressively in Europe over the past 20 years. Tobacco advertising has been banned from all traditional media in most countries, large health warnings on tobacco packaging have been made mandatory throughout the European Union (EU), and in many countries smoking has been banned from workplaces and many other public places. Internationally, a notable achievement has been the development of the Framework Convention on Tobacco Control (FCTC) by the World Health Organization (WHO).

The process through which these policies were implemented has varied widely across Europe, in terms of both the strength of policies and the timing of their implementation. To be able to predict policy development in the future, it is important to know which drivers are behind this process. To date, this topic has been studied mainly with a qualitative approach that focuses on general patterns rather than on inter-country differences. In contrast, only very few quantitative studies have focused on variations between countries and over time. Factors that have been studied using a quantitative approach include corruption and political ideology. However, because these studies were cross-sectional, they could not identify factors that influence developments in tobacco control over time.

For our study, we selected two factors that are theorised to influence policy development. First, before proposed policies (ideas) can be implemented, they must be accepted by decision-makers. Whether this happens depends to a large extent on their receptivity to these ideas, which is determined by their ‘belief systems’. The importance of political receptivity to ideas is also shown in Kingdon’s model of three streams. Action will only occur when the three streams come together and there are: a clearly defined problem, feasible and effective solutions, and the political will and means to impose these solutions. To measure this political receptivity to ideas, we have selected political ideology, more specifically, a left-wing political ideology.

Second, policy continuity or change is determined by a ‘comprehensive rationality’, i.e. the means of a political or legislative system to formulate policy aims and to ensure that these aims are implemented and enforced. Although tobacco control policies are usually made by the national government, their uptake and success is heavily dependent on the functioning of the public sector at large. To capture this...
aspect of politics, we have selected a measure of government effectiveness that focuses mainly on a country’s civil service.
The aim of this study was to provide insight into the role of these two political factors in the development of tobacco control policy over time. More specifically, we studied trends in tobacco control policy across 11 European countries from 1996 through 2010, and their association with political factors. We had two specific hypotheses: We expected the adoption of tobacco control policies to be associated with the presence of a predominantly left-wing government, with a more progressive ideology, rather than a central, liberal or conservative government. This was based on the observation that socialist and social democratic governments tend to take more action to improve the health determinants of their citizens through public policies.\textsuperscript{11,12} And we hypothesised that a higher score on government effectiveness would be associated with comprehensive development of tobacco control policy, because proper functioning of the civil service and other government agencies seems to be important for the adoption, effective implementation, and enforcement of policies.\textsuperscript{13,14}

**METHODS**

**Population**
The study population consisted of 11 EU countries (Austria, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom (UK)), with 15 observations (the years 1996 through 2010) each. The selection was based on the availability of data on the main outcome, which is described below.

**Variables**
The main outcome variable was the Tobacco Control Scale (TCS), with the original points distribution first published by Joossens and Raw in 2006.\textsuperscript{1} This scale scores a country’s tobacco control policies, based on six domains: 1) price increases through higher taxes on tobacco products, 2) bans/restrictions on smoking in public places and workplaces, 3) public information campaigns, 4) comprehensive bans on advertising and promotion of tobacco products, 5) large, direct, health warning labels on cigarette packages, and 6) treatment to help dependent smokers quit, including medication. Data on cigarette prices were obtained from the Tobacco Manufacturers’ Association (P. Stockall, personal communication, 2012) and data on domains 2, 4, 5, and 6 were derived from the report of the Pricing Policies and
Control of Tobacco in Europe (PPACTE) Project. Because data on public information campaigns were not available for each year in every country, this domain was omitted from our analyses.

The political context was measured by the variables ‘left-wing government’ and ‘government effectiveness’. Left-wing government was defined as the percentage of cabinet positions held by social democratic, socialist and other left-wing parties, weighted by their number of days in office in that year. This variable was obtained from the Comparative Political Data Set III 1990-2010, which, in line with Schmidt, classified political parties as left wing, centre, or right wing. The measure of government effectiveness (one of the Worldwide Governance Indicators) was developed by the World Bank Development Research Group. It draws from household surveys, business information, non-governmental organisations (NGOs) and public sector information to measure: ‘…perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies.’ This score ranges from 0 to 100, with 100 indicating the highest government effectiveness. More details can be found online. Because government effectiveness scores were not available for 1997, 1999, and 2001, we have imputed these scores. For each individual country we fit the observations with a first order dynamic linear model with a Kalman filter. These smoothed means were used to impute the missing scores.

We included two other variables as confounders. Data on gross domestic product (GDP) per capita at purchasing power parity were obtained from the World Bank. Smoking prevalence rates among the adult population (males and females combined) were taken from Organisation for Economic Co-operation and Development (OECD) statistics on health and the WHO Global Infobase. For some countries, smoking prevalence rates were not available for all of the years (on average 7 out of a possible 21 per country were missing), and we then used the same imputation technique as for government effectiveness. To avoid bidirectional effects, we did not control for the current smoking prevalence, but rather for the smoking prevalence from five years earlier.

Analysis
We used multilevel linear regression models with a random intercept to investigate associations between the political variables and the TCS. Annual observations were clustered, with their countries as the higher-level variable. The analyses for left-wing
government and government effectiveness were performed separately with a series of nested models. Model 1 was adjusted for the long-term trend by including time in years as a continuous variable. Because there were many changes around 2003, we also added a dummy variable for period (0 for 1996–2003 and 1 for 2004–2010). Model 2 also included GDP; Model 3 additionally adjusted for the other political variable and smoking prevalence. Outcomes are presented as standardised regression coefficients, indicating the change in outcome associated with a change of one standard deviation in the determinant. All analyses were performed in R, version 2.13.1.

These analyses were also performed with the five separate subscales of the TCS as outcomes. In a more detailed analysis, the associations between political variables and TCS were also analysed per year, but here the small number of datapoints did not allow controlling for confounders. Finally, to check for any systematic trends that could not be explained by the variables in our model, we plotted the standardised residuals per year for each country individually.

Because lag time is an important issue in determining policy effects, we performed a sensitivity analysis to determine whether the political variables were associated with TCS in the same year and with TCS one, two, or three years later. We concluded that these results were all very similar, and therefore present only the associations between the political variables and TCS in the same year. Furthermore, we performed a sensitivity analysis using left-wing government averaged over the previous four years. We found that although some individual associations for specific years did change, the overall trend remained similar to the one found using the one-year variable.

RESULTS

The development of the TCS scores over time is shown per country in Figure 1. The Scandinavian countries had the highest scores throughout the 1990s until around 2004, when sharp rises in TCS scores in the UK and Ireland put these countries in the lead. Upward trends can be seen for all other countries, with less marked increases. Overall, three periods can be distinguished: marginal growth from 1996 through 2001, accelerated growth from 2001 through 2008 and reduced growth from 2008 through 2010.
Tobacco control in Europe and political factors

Figure 1  Development of the Tobacco Control Scale scores from 1996 through 2011

Table 1  Associations between political variables and the TCS

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th></th>
<th>Model 2</th>
<th></th>
<th>Model 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>stB*</td>
<td>95% CI</td>
<td>stB</td>
<td>95% CI</td>
<td>stB</td>
<td>95% CI</td>
</tr>
<tr>
<td>Left-wing government</td>
<td>1.21</td>
<td>0.18 - 2.24</td>
<td>1.13</td>
<td>0.11 - 2.14</td>
<td>0.45</td>
<td>-0.65 - 1.55</td>
</tr>
<tr>
<td>Government effectiveness</td>
<td>-4.06</td>
<td>-6.46 - -1.65</td>
<td>-4.14</td>
<td>-6.46 - -1.81</td>
<td>-3.76</td>
<td>-6.38 - -1.14</td>
</tr>
<tr>
<td>Year</td>
<td>2.21</td>
<td>1.82 - 2.60</td>
<td>1.40</td>
<td>0.73 - 2.07</td>
<td>1.28</td>
<td>0.60 - 1.97</td>
</tr>
<tr>
<td>Period</td>
<td>5.10</td>
<td>1.74 - 8.47</td>
<td>4.60</td>
<td>1.29 - 7.90</td>
<td>3.53</td>
<td>0.22 - 6.84</td>
</tr>
<tr>
<td>GDP</td>
<td>-</td>
<td>-</td>
<td>4.71</td>
<td>1.49 - 7.93</td>
<td>5.10</td>
<td>1.91 - 8.29</td>
</tr>
<tr>
<td>Smoking prevalence</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.51</td>
<td>-1.56 - 2.59</td>
</tr>
</tbody>
</table>

Model 1 = Left-wing government and government effectiveness modelled separately, adjusted for time only. Model 2 = Model 1 + GDP. Model 3 = Full model, including both left-wing government and government effectiveness, adjusted for time, GDP and smoking prevalence. * stB = standardized regression coefficient

The percentage of cabinet positions held by left-wing parties is shown in Appendix Figure 1. Although the prevalence varied from 0% to 100%, there seems to have been a trend, with peaks around 1999 and 2007 and troughs around 1996, 2002, and 2010. The overall trend in government effectiveness was quite stable, with a minor decrease between 2003 and 2006, as shown in Appendix Figure 2. The largest decreases in this period were in Spain and Italy.
Table 1 shows the association between the political factors and the TCS, along with selected confounders. There was a significant positive association between left-wing government and TCS in Models 1 and 2, which disappeared after adjusting for government effectiveness and smoking prevalence in Model 3. A stronger, albeit negative, association was seen between government effectiveness and TCS, which remained significant throughout all of the models. Of the confounders, time and GDP showed a positive association with TCS, which were significant in all models; this association was stronger for GDP than for time. Smoking prevalence was not significantly associated with TCS in Model 3.

Table 2 Associations between the political variables and subscales of the TCS

<table>
<thead>
<tr>
<th></th>
<th>Taxes</th>
<th>Smoke-free laws</th>
<th>Advert bans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>stB* (95% CI)</td>
<td>stB (95% CI)</td>
<td>stB (95% CI)</td>
</tr>
<tr>
<td>Left-wing government</td>
<td>0.12 (-0.27 - 0.51)</td>
<td>-0.08 (-0.76 - 0.60)</td>
<td>0.35 (0.02 - 0.68)</td>
</tr>
<tr>
<td>Government effectiveness</td>
<td>-0.55 (-1.51 - 0.41)</td>
<td>-2.55 (-4.00 - -1.10)</td>
<td>-1.74 (-2.53 - -0.95)</td>
</tr>
<tr>
<td>GDP</td>
<td>-0.78 (-1.93 - 0.36)</td>
<td>2.98 (1.08 - 4.88)</td>
<td>2.93 (1.96 - 3.89)</td>
</tr>
<tr>
<td>Smoking prevalence</td>
<td>0.44 (-0.30 - 1.19)</td>
<td>-0.44 (-1.66 - 0.79)</td>
<td>-0.69 (-1.31 - -0.06)</td>
</tr>
<tr>
<td>Year</td>
<td>0.85 (0.61 - 1.09)</td>
<td>0.10 (-0.33 - 0.52)</td>
<td>-0.33 (-0.54 - -0.12)</td>
</tr>
<tr>
<td>Period</td>
<td>0.55 (-0.61 - 1.70)</td>
<td>1.36 (-0.75 - 3.48)</td>
<td>0.70 (-0.30 – 1.69)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Warning labels</th>
<th>Cess. support</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>stB* (95% CI)</td>
<td>stB (95% CI)</td>
</tr>
<tr>
<td>Left-wing government</td>
<td>-0.19 (-0.34 - -0.04)</td>
<td>0.28 (0.07 - 0.49)</td>
</tr>
<tr>
<td>Government effectiveness</td>
<td>0.17 (-0.14 - 0.48)</td>
<td>1.23 (0.73 - 1.74)</td>
</tr>
<tr>
<td>GDP</td>
<td>-0.17 (-0.58 - -0.24)</td>
<td>-0.03 (-0.64 - -0.58)</td>
</tr>
<tr>
<td>Smoking prevalence</td>
<td>0.37 (0.11 - 0.64)</td>
<td>0.68 (0.28 - 1.08)</td>
</tr>
<tr>
<td>Year</td>
<td>0.22 (0.12 - 0.31)</td>
<td>0.47 (0.34 - 0.60)</td>
</tr>
<tr>
<td>Period</td>
<td>1.10 (0.63 – 1.57)</td>
<td>-0.04 (-0.67 – -0.58)</td>
</tr>
</tbody>
</table>

All models are adjusted for all predictor variables, confounders and adjusted for time. * stB = standardized regression coefficient.

Table 2 shows the results for the subscales of the TCS. Taxation of tobacco was not found to be associated with either political factor. Policies on smoke-free public areas were inversely associated with government effectiveness. Advertising bans were associated positively with left-wing government and inversely with government effectiveness. Policies on health warning labels were only associated inversely with
Tobacco control in Europe and political factors

left-wing government. Policies on cessation support were positively associated with both left-wing government and government effectiveness.

Table 3 Associations between the political variables and TCS, per year

<table>
<thead>
<tr>
<th>Year</th>
<th>Left-wing government</th>
<th>Government effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>stB*</td>
<td>95% CI</td>
</tr>
<tr>
<td>1996</td>
<td>4.37</td>
<td>-1.01 - 9.75</td>
</tr>
<tr>
<td>1997</td>
<td>6.35</td>
<td>1.22 - 11.48</td>
</tr>
<tr>
<td>1998</td>
<td>4.75</td>
<td>-0.26 - 9.76</td>
</tr>
<tr>
<td>1999</td>
<td>2.37</td>
<td>-2.52 - 7.25</td>
</tr>
<tr>
<td>2000</td>
<td>3.36</td>
<td>-1.64 - 8.36</td>
</tr>
<tr>
<td>2001</td>
<td>3.26</td>
<td>-1.59 - 8.11</td>
</tr>
<tr>
<td>2003</td>
<td>2.86</td>
<td>-1.88 - 7.60</td>
</tr>
<tr>
<td>2004</td>
<td>-0.92</td>
<td>-7.51 - 5.68</td>
</tr>
<tr>
<td>2006</td>
<td>2.76</td>
<td>-4.46 - 9.99</td>
</tr>
<tr>
<td>2007</td>
<td>0.50</td>
<td>-7.46 - 8.46</td>
</tr>
<tr>
<td>2008</td>
<td>-0.12</td>
<td>-8.60 - 8.36</td>
</tr>
<tr>
<td>2009</td>
<td>-0.76</td>
<td>-8.71 - 7.19</td>
</tr>
<tr>
<td>2010</td>
<td>-1.37</td>
<td>-9.98 - 7.24</td>
</tr>
</tbody>
</table>

All models are unadjusted. * stB = standardized regression coefficient

Table 3 shows the associations between the political factors and the TCS per year. For left-wing government, there was a pattern of positive associations with TCS from 1996 through 2003, but this association was only significant for 1997. Similarly, there was a period with positive associations between government effectiveness and TCS (from roughly 2001 through 2005), in addition to weaker positive associations before and after this period. None of these associations were statistically significant, and confidence intervals were wide because of the small number of observations.

We modelled the residuals in Model 3 per year, by country these are shown in Appendix Figure 3. Although patterns do vary, in most countries the residuals tended to decrease until around 2002 and increase during the later years of the study. This indicates that after 2002, the trend in TCS scores became more favourable than could have been expected based on the full model, including the long-term trends.
As a sensitivity analysis, we added a first order autocorrelation structure to the fully adjusted model to control for the influence of the TCS score in a given year on the score in the following year. From a statistical point of view, this provided a better fit than Model 3 (AIC 932 vs. 1070). The conclusions drawn from this model did not differ from those of Model 3; only GDP was no longer significant with autocorrelation. However, because autocorrelation does hamper interpretation of the results, we have chosen to present only Model 3; this might result in slightly different estimates.

**DISCUSSION**

We found that the overall associations between both political factors and tobacco control did not confirm our hypotheses, although we did find confirming patterns in specific periods. The presence of a left-wing government was not associated with stronger tobacco control policy development and, surprisingly, higher government effectiveness was negatively associated with tobacco control policy development. However, we did see a positive trend in the influence of left-wing governments from 1996 through 2003. Also, the association between government effectiveness reversed to a positive association (though not statistically significant) from 2001 through 2005. In addition, our results show that from roughly 2002 onwards, the development in the TCS was stronger than predicted based on the two political variables.

**Limitations**

The TCS measures the extent to which tobacco control policies have been formulated, but contains little information on their enforcement in practice. Some studies complementary to our own, did assess the enforcement of policies. One study found that although smoke-free legislation in relatively corrupt countries was on par with that in less corrupt countries, these policies were not properly enforced and complied with.6

In addition, there are other factors that might have influenced the association between political factors and tobacco control policy that we did not control for. For example, the tobacco industry could have influenced policy development, both through direct lobbying and the (perceived) importance of the tobacco industry to the economy.8,23–25 Because of a lack of quantitative data of tobacco industry activity
per country and per year, we could not adjust for this possibly important factor. In addition, our study period covers widespread changes in the supranational political context, such as countries joining the EU or adopting the euro. Joining the EU requires that many national policies be brought into line with EU standards. This could be an important source of residual confounding, and our results should therefore be interpreted with caution.

**Interpretation of results**

In the main analyses, we found that time was the only factor with a significant positive association with TCS. This suggests that tobacco control policies were associated with processes that unfold over time but that were not included in our model. One such process could be the diffusion of innovations. Although tobacco control policy is not a single innovation, the development of these policies across Europe shows similarities with the theory. Sweden and Finland were innovators during the 1990s, and other countries later emulated many of their policies. Similarly, the UK and Ireland became innovators by implementing a range of new policies around 2003.

In addition, by ratifying international agreements in the 2000s, tobacco control policy might have progressed beyond a certain tipping point. Now, the social norm, support for tobacco control policies, the policies themselves, and the decline in smoking can influence each other in a circular fashion and this flywheel might be difficult to stop.

A complementary concept that can help to understand developments in tobacco control policy over time is that of policy learning (also called policy transfer). This concept describes how a policy is first developed and tested in one country and then transferred to another. The FCTC can be likened to a form of policy transfer itself, as a treaty based on the evidence on ‘best practices’ from innovating countries. This evidence could then be promoted in other countries, for instance, through guidelines on which policies to implement and how to implement them. The EU’s Tobacco Products Directive (TPD) is also a result of policy transfer, and sets minimum requirements for tobacco control in member states.

No clear conclusion can be drawn from the limited evidence from previous studies on the link between political ideology and tobacco control. One European overview study with data from 2008 found no association between political ideology and tobacco control policy. While this lack of an association in 2008 is supported by our
main results, our results also showed that there was an association up to 2003, when left-wing governments seem to have been more likely to adopt tobacco control policy. This is consistent with their ideological principals, which placed greater emphasis on public health interventions than other political ideologies.\textsuperscript{12}

An American study found that a higher proportion of Republican seats in state legislatures was associated with lower tobacco taxes.\textsuperscript{8} In our study, however, no significant association was found between left-wing governments and tobacco taxes. This lack of association might result from left-wing governments’ commitment to progressive income-redistribution policies,\textsuperscript{12} while tobacco taxation is regressive.\textsuperscript{30} Thus, while tobacco taxes are considered to be the most effective policy for reducing smoking (especially among low income groups),\textsuperscript{31–33} the level of acceptance of this policy may be equal across the political spectrum.

Although the TCS continuously increased, government effectiveness followed a decreasing trend. However, we did find a positive association from 2001 through 2005, a period during which the most developments in tobacco control policy took place. This could suggest that, if high government effectiveness is important for the development of policies, this is so during the phase when new, innovative policies are implemented.

The government effectiveness score can be also interpreted as the government allowing economic activity to take place by not restricting it. In this way, a higher government effectiveness score would equal fewer (restrictive) policies, and possibly even a resistance to new policies that would restrict businesses. This would explain the negative overall association between government effectiveness and TCS.

We found policies regarding smoking cessation support to be associated both with left wing government, and with the government effectiveness measure. The former association may perhaps reflect a greater dedication of left wing governments with preventive health services,\textsuperscript{12} while the positive association with government effectiveness might relate to the quality of civil services. In an ineffective and bureaucratic system, it may be harder to develop the fine-grained services that are needed to support smokers wanting to quit.
Conclusions
Our results suggest that national political factors had only a modest influence on the large variations in tobacco control policy development across Europe over the last 15 years. Their influence varied according to the stages of this development: while the presence of a left-wing government seemed important for the early adoption of tobacco control policy, high government effectiveness seemed important during the stage of comprehensive development. From 2005 onwards, the influence of national political factors decreased, while the development of tobacco control policy continued. This process was marked by the introduction of the FCTC, which has become a driving force in tobacco control policy in Europe and beyond.

Acknowledgments
The authors wish to thank Wim Busschers for his advice on and assistance with the statistical analyses.
This study is part of the project ‘Tackling socio-economic inequalities in smoking (SILNE)’, which is funded by the European Commission, Directorate-General for Research and Innovation, under the FP-7-Health-2011 program, with grant agreement number 278273.

Author contributions
JB and AK conceived and designed the study. JB prepared, analysed and interpreted the data and led the writing, he is the guarantor of this paper. MW, KS and AK interpreted the data and provided critical revisions. All authors have read and approved the final version of this paper.

Conflicts of interest
None declared.

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20. World Bank Database. Published 2010.


Appendix Figure 1 Percentage of cabinet positions held by left wing parties (1996 through 2011)

Appendix Figure 2 Government effectiveness scores (1996 through 2011)
**Appendix Figure 3** Residuals per country: systematic trends that are not explained by the variables in our model 3