

Chapter 18

Are CO₂ Emission Targets of C40 Cities Realistic in View of Their Mayoral Powers Regarding Climate Policy?



Martina Siskova and Jeroen van den Bergh

Abstract We evaluate the level of cities' ambition regarding CO₂ emission targets and implementation of climate policies, and factors explaining this. Our empirical analysis explores a dataset for a subset of C40 cities. The reason for studying these cities is that they supposedly are at the forefront of mitigation action. For example, they were the first to disclose their self-imposed emission targets. We determine the targeted future emission levels based on the targeted reduction from the baseline emissions. We calculate these for discrete 10-year periods: 2020, 2030, 2040 and 2050. Next, we contrast the resulting emission levels with those in the base year 2015. In addition, we study how distinct explanatory variables, notably mayoral powers regarding climate policy, city characteristics and geographical location affect target emission levels.

Keywords Climate policies · Cities · CO₂ emission targets · C40 cities · Policy stringency · Urban policy

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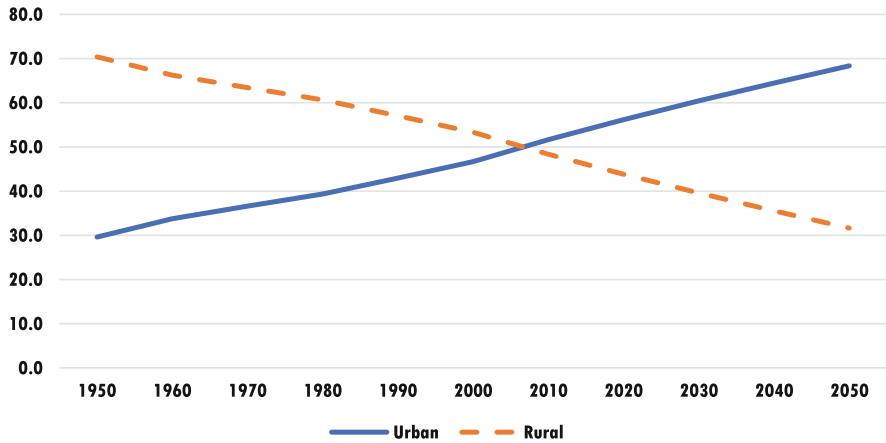


Fig. 18.1 Past and predicted urban and rural population shares between 1950 and 2050 (Source: OWID, based on UN World Urbanization Prospects 2018 and historical sources)

18.1 Introduction

In the last decade, cities have moved to the forefront of policy debates about effectively combating climate change through reducing greenhouse gas emissions. Currently, about 4.2 billion of the world's population (55%) reside in urban areas, a tremendous increase from 0.75 (29%) in 1950 (United Nations 2018). World population is expected, according to the most likely scenario, to grow from 7.7 billion in 2019 to 8.5 billion in 2030 and to 9.7 billion in 2050, while much higher projections are available too (United Nations 2019). Figure 18.1 depicts the trend in population shares of rural and urban populations since the 1950 and projected until 2050.

According to the UN World Urbanization Prospects 2018, a settlement is considered urban if it is inhabited by at least 30,000 people. However, the definition of an urban settlement varies among countries, which may result in inconsistent reporting and complications for comparing nations. For instance, in Denmark, Greenland, Iceland and Sweden a locality is considered urban if 200 or more inhabitants live there. Conversely, in Japan, it requires the number of inhabitants to exceed 50,000. The second highest threshold to define urban is set by Mali, namely 30,000 inhabitants, followed by a threshold of 20,000 in the Netherlands, Nigeria and Syria. This diversity of thresholds is summarized in Fig. 18.2. It complicates comparison and representative samples of cities worldwide. Any results for city studies in this respect have to be taken with a grain of salt.

The economic activities and household consumption conducted within city boundaries account for about 70% of global CO₂ emissions, while using about 78% of the world's energy (UN Habitat 2011). The relationship between emissions and urbanization was extensively covered in the literature (e.g. Arnott (2004), Borck and Pflueger (2019), Cavailhès et al. (2007), Gaigne et al. (2012), Lucas and Rossi-

Definition of an urban area around the world

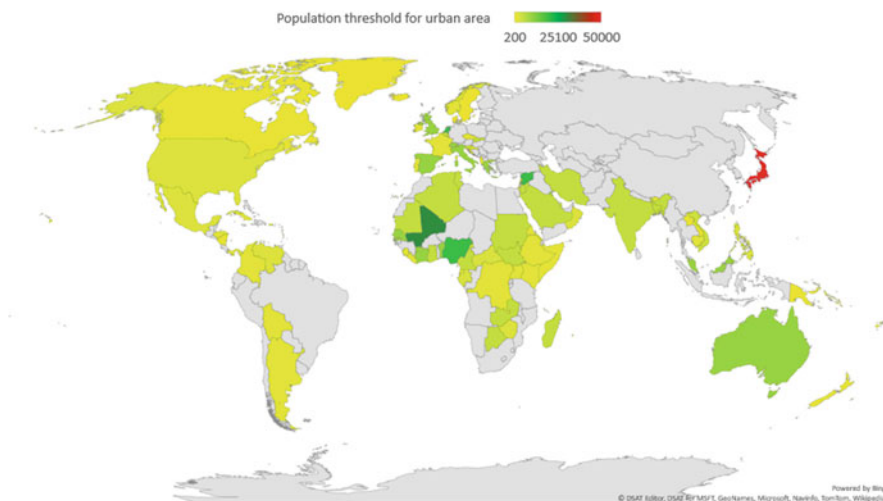


Fig. 18.2 Population threshold to define an urban area (own figure; Data from UN World Urbanization Prospects 2018)

Hansberg (2002), Kyriakopoulou and Xepapadeas (2013, 2017), Regnier and Legras (2018), Rossi-Hansberg (2005), Schindler et al. (2017), Verhoef and Nijkamp (2002, 2003), Xepapadeas (2005), etc.). Given projected population growth in cities, as well as economic growth in developing countries where most of future urbanization will happen, the emissions created within the city boundary are expected to rise with future urbanization (Seto et al. 2014). However, not all the emissions created within the city boundary or by the people living in the cities are controlled by urban climate policies. The reason is that cities have limited control over environmentally relevant decisions by businesses (e.g. energy use and pollution abatement by industries) and households (e.g. car ownership and miles driven, purchase and use of energy-using equipment), as well as over fossil fuel prices and electricity generation.

Nevertheless, in order to mitigate climate change, many cities have begun to implement new climate policies. In order to account for their progress, these cities set their future emission targets. In addition, some cities have joined networks and coalitions, such as C40 Cities Climate Leadership Group (henceforth C40), Local Governments for Sustainability (ICLEI) or the Covenant of Mayors, in order to share experiences and learn from each other. Several studies have examined emission targets at city level. Liu et al. (2018) study the efficient distribution of carbon emissions reduction targets of Chinese cities. They suggest that emission targets which are being allocated to individual cities should not be assigned according to the cities' GDP as is the current practice, but instead more ambitious emission targets should be assigned to cities with greater emission abatement and financial capacities. Zhang et al. (2019) model the time of peak CO₂ emissions for Baoding—a city

which is designated to be a pilot for Chinese low-carbon cities and associate sectoral transitions. They find that the emission structure of this city's emissions is composed primarily of industrial emissions (80%) which have been driven by the consistent economic growth and energy intensity. Population growth was concluded to have little contributions to emission increase. According to their estimates, the city's peak emissions (54 million tons of CO₂) will be reached in 2024 and the estimated emissions for 2040 were 80.18 million tons of CO₂. A study by Kuramochi et al. (2017) analyses the impact of U.S. sub-national and non-state actions on national greenhouse gases (henceforth GHGs). The authors show that by following the sub-national and non-state commitments, GHG emissions can be reduced to 12–14% below 2005 level by 2025. However, in their estimates they assume all of the commitments to be implemented and fully exercised, which is a rather strong assumption given that they are voluntary. ICLEI (2015) discusses the policies and results of actions which were implemented in four U.S. cities—Atlanta, Cincinnati, Minneapolis and Portland. Though the actions here are relevant, the common issue in all was how to integrate their efforts and policies with other governmental bodies as the powers of municipalities to reduce greenhouse gas (GHG) emissions are limited.

In this chapter we assess emission targets and how these relate to city features and mayoral powers. Prior to the actual analysis we normalize future emission targets by expressing them as percentages of change relative to a common baseline for each city. Despite numerous reports on emission targets, exact levels often remain unclear. This is due to discrepancies among cities' baselines. It is difficult to immediately associate the emission targets based on past emissions with current emissions since they might differ greatly. For instance, a 40% reduction from 1990 levels may represent only 10% in 2015 levels. These discrepancies in baseline settings are partly summarized in UNEP (2018) and Bansard et al. (2017).

Furthermore, in order for national and sub-national governments to combat climate change, it is vital that their emission targets are set below the estimated business-as-usual (BAU) levels. BAU emissions are by definition insufficient to offset climate change, as BAU represents the scenario without climate mitigation policies being implemented. The relevance of BAU, New policies and The Sustainable Development scenarios is depicted in WEO (2019) under the "World primary energy demand and energy-related CO₂ emissions by scenario". According to these estimates, "New Policies", representing the policies that are implemented, leading to fewer emissions in comparison to BAU. However, "New Policies" far exceed the emissions from the desirable "Sustainable Development" scenario.

Henceforth, we wish to explore why some cities are more ambitious in their future emission targets than others. We focus on cities from the C40 group, which are considered to be at the forefront among cities in terms of climate change policies. We investigate whether cities adapt their emission targets for the future according to their mayoral powers (ARUP 2015). In other words, we want to assess if the two are consistent. If not, then the targets may be unrealistic and impossible to achieve. The reason for us to focus on emission targets rather than current levels of emissions is that we expect the impact of current policies to be reflected with some time lag. Our

hypothesis is that levels of mayoral powers today are reflected in level of ambition regarding future emission targets.

18.2 Stylized Facts

In this section we explain the terminology and concepts used throughout the chapter as well as provide some further details regarding the trends found in our dataset.

18.2.1 *Mayoral Powers*

We use the term mayoral powers, used by C40 cities, to denote the jurisdictional opportunities and legislative capabilities of a city to enforce environmental actions in distinct sectors. The data originate from a survey among C40 cities on Mayoral Powers (ARUP 2015). Here cities stated the type and extent of their power over various climate policies. The survey categorized these into the following four dimensions: (a) own or operate, (b) set or enforce policy/regulations, (c) control budget and (d) set vision. Each of these dimensions covers nine distinct sectors within every city, where discrete performance scores range from 0 to 3. A score of 0 implies no power, 1 implies very limited power; 1–2 represents partial power and a score of 2–3 indicates strong power over the respective emission-producing sector. In our estimates we use the average values of each of the mayoral power categories over all sectors. The emission-producing sectors included in the analysis as defined in the data collection of the C40 cities are the following nine:

¹ Private buildings	Finance and economy	Urban land use
Public buildings	Public transport	Waste
Energy supply	City roads	Water

Here we first examine whether emission targets depend on the mayoral powers. If mayoral powers were to have no impact on the emission targets, then this would imply that cities' targets could be decoupled from actual policies. In this case targets could easily be too ambitious given the policies in place. We normalize the mayoral powers in our sample using a logarithmic transformation, which will also be used in our regressions. Among the cities included, Melbourne was the smallest with a value of 0.48, as depicted in Fig. 18.3. On the contrary, Heidelberg has the highest average mayoral power with value of 1.01, followed by Los Angeles (0.97) and New York (0.94). Heidelberg has employed various policies over the past decades to promote low-carbon options, including the use of electric trams and electric railways, the use of bicycle transport and a subsidy for electric vehicles. The most significant urban policy includes a city district called Bahnstadt—an old freight yard turned into a new city district for jobs and living. It is considered an exemplary case of sustainable

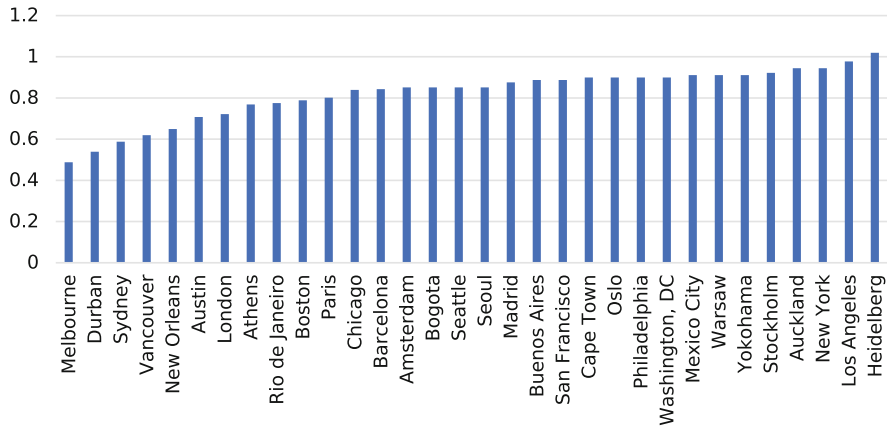


Fig. 18.3 Average mayoral powers normalized by the mean and ranked

urban construction, making use of high energy-efficient buildings and sustainable energy supply (C40 2019). Los Angeles is also pro-active in terms of climate policy, making use of rebates for more energy- and water-efficient appliances, such as washers, providing free resources such as trees for households, and undertaking projects studying efficient water use and sanitation projects (LA City 2020).

18.2.2 Correlations of Emission Targets with City Features

Cities included in our analysis, in terms of population size (accounting for population residing within the city boundary and not its metropolitan area), fall into the following three categories: below two million, two to four million and above four million inhabitants. The cities included represent all different continents. This is displayed in Fig. 18.4. The smallest city included is Melbourne and the largest is Seoul.

We calculated the emissions targets for years 2020, 2030, 2040 and 2050, for which these cities reported (fully or partly) their commitments. Given the inconsistency of target years in the reports, we estimate emissions directly, either by using the emission baseline and targeted reduction, or by a proxy based on an average of two emission target or a target and baseline emissions.¹ This results in normalized emission targets that are comparable among all cities. They are depicted in Table 18.1. Emissions calculated directly from targets are highlighted in grey. The remaining estimates were based on proxies, assuming a linear relationship between baseline emissions and target emissions. Zero values in the table represent a city's ambition to become a city with zero net emissions by that year (e.g. Melbourne). On

¹Table 18.5 in Appendix presents the complete data used to obtain these estimates.

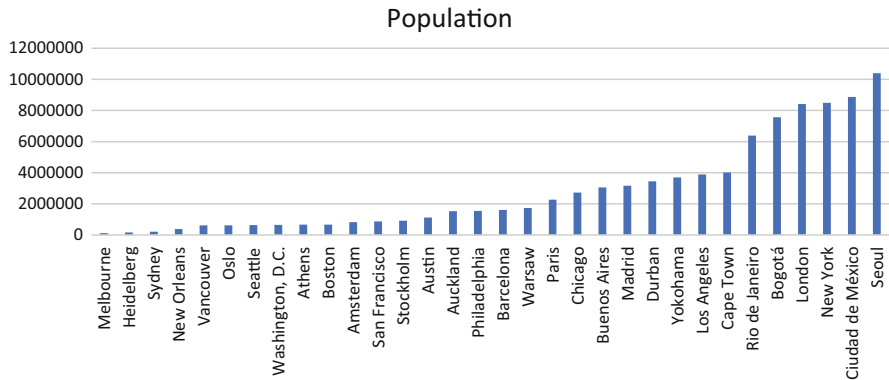


Fig. 18.4 Cities included in our study ordered by population size for the year 2015

Table 18.1 Target emission levels for years 2020, 2030, 2040 and 2050 and emission in 2015 as a reference

City	2015	2020	2030	2040	2050
Amsterdam	4471000	3100500	1860300	1033500	206700
Athens	4711576	4147141.33	3041424	1935706.67	829989.333
Auckland	11309000	8002800	6669000	5335200	4446000
Austin	15200000	13057859.5	9173578.63	5289297.71	1405016.8
Barcelona	3433000	3323460	2608859	1894258	1179657
Bogotá	13217521	15465314.1	12372251.3	9279188.46	6186125.64
Boston	6900000	5512701	3675134	1837567	0
Buenos Aires	19667128	13230000	12,742,478	12,254,956	11,767,434
Cape Town	22683041	18,798,711	14893569	13282888.1	11672207.2
Chicago	33500000	24225000	18303333.3	12381666.7	6460000
Durban	22587081	16167499	11364696.7	7988640.15	5615492.69
Heidelberg	806000	697392.857	480178.571	262964.286	45750
London	40750490	29510000	16218000	12614000	9010000
Los Angeles	29024807	29350000	25650000	18000000	10800000
Madrid	10257048	8885900	7771800	6797384.08	5945138.89
Melbourne	5805437	0	0	0	0
Mexico City	24084942	29409567	36038443	44161458.5	54115390.5
New Orleans	4600000	3201549.75	1803099.5	1015498.14	571924.326
New York	50692754	46212000	36636000	24424000	12212000
Oslo	1298000	600000	60000	30000	0
Paris	5195663	4694571.75	3755657.4	2660257.33	1564857.25
Philadelphia	19212870	17084200.6	12977410	8595427.39	4213444.8
Rio de Janeiro	20268045	9121744	4160310.68	1897464.45	865409.248
San Francisco	4574578	4418888.5	3225013.6	2232702	1240389.8
Seattle	3171000	2652453.33	1557360	778680	0
Seoul	48550952	42555666.7	29667000	20681872.9	14418035.7
Stockholm	2511000	2000000	1500000	0	0
Sydney	5052256	3992000	1776000	790124.248	351518.203
Vancouver	2625609	1879350	1358444.78	981920.459	709758.544
Warsaw	12706696	10362387.2	8259928.34	6584044.29	5248185.87
Washington DC	8204579	3367298.33	2244865.56	1122432.78	0
Yokohama	21000000	16413600	14850400	9379200	3908000

Note: The highlighted (grey) values represent the stated emission targets set by cities and the non-highlighted numbers are estimates based on stated targets and baseline emissions (see text for explanation)

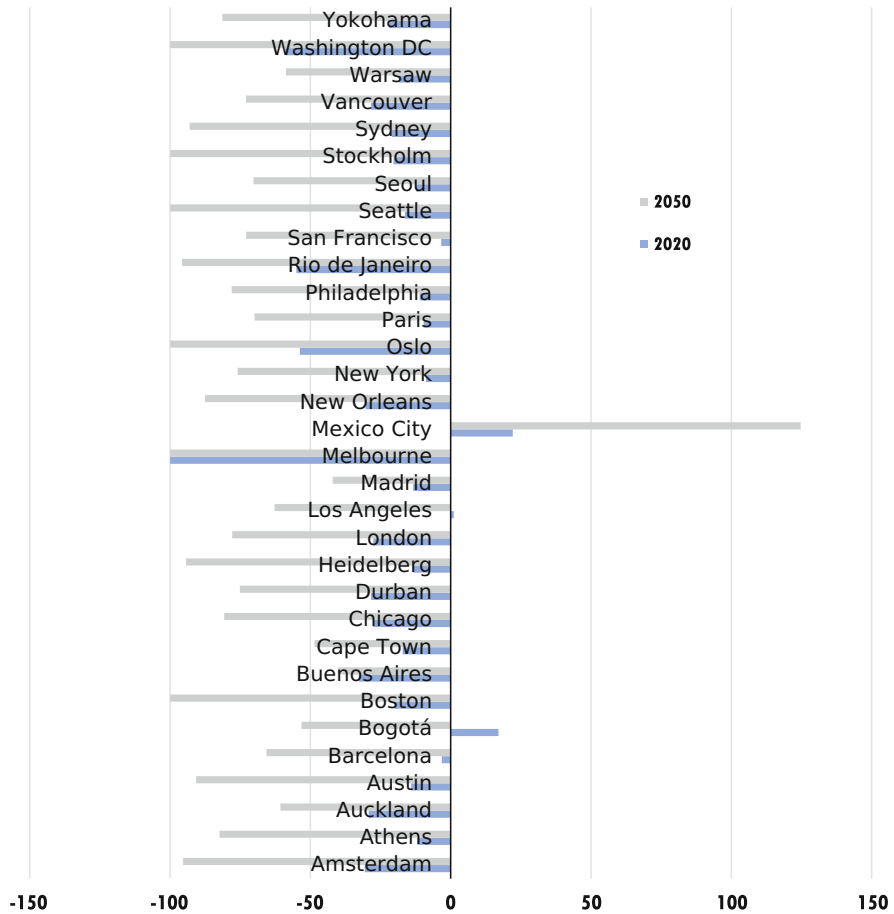


Fig. 18.5 Emission targets for years 2020 (blue) and 2050 (grey) compared to 2015 (baseline) emissions

the other hand, some cities are far less ambitious with their targets, setting them very close to their expected business-as-usual values, such as Mexico City. Furthermore, some cities increase the ambition of their emission target over time, such as Heidelberg, while others remain close to their 2020 levels even in 2050, such as Buenos Aires.

Figure 18.5 depicts the emission targets (%) for 2020 (blue) and 2050 (grey) in contrast to the 2015 baseline. In both, Mexico City has the highest emission targets, which is consistent with the fact that only a small deviation from its BAU scenario is expected. Bogota is also not very ambitious. On the other hand, cities such as Boston, Oslo, Seattle and Stockholm are ambitious and intend to reduce emissions by 100% by the year of 2050. Melbourne wants to accomplish this goal by 2020 already.

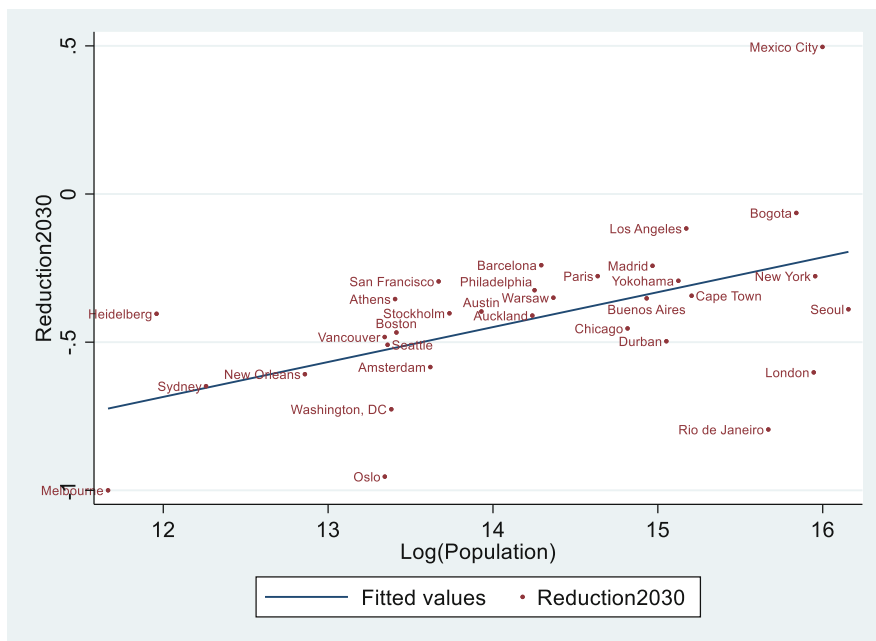


Fig. 18.6 Correlations between population size and emission targets for 2030

Figure 18.6 depicts the correlation between emission targets (%) and logarithmic transformation of population size. The relationship’s trend is upward sloping, implying that with the increase in population size, the emission targets become less ambitious (due to higher emission targets).

Figure 18.7 displays the relationship between the logarithmic transformation of GDP per capita and emission targets (%) for 2030. The downward sloping trend indicates that the greater the per capita GDP is, the higher is the reduction of emissions (%) which are being targeted. Henceforth, cities which are more ambitious in their targets tend to have a higher per capita GDP.

Figure 18.8 is the visual representation of the average mayoral powers and emission targets (%) for 2030. As we may observe, the relationship demonstrates that the greater the average mayoral power, the greater the emission targets and hence the lower the city ambition.

18.3 Database and Estimation Strategy

In this section we aim to provide insight about how emission targets relate to city attributes and mayoral powers. The database we have constructed consists of 32 C40 cities that have defined emission targets for coming decades. The data on variables such as emission targets, current emission levels, population and GDP was accessed



Fig. 18.7 Correlation between GDP per capita and emission targets for 2030

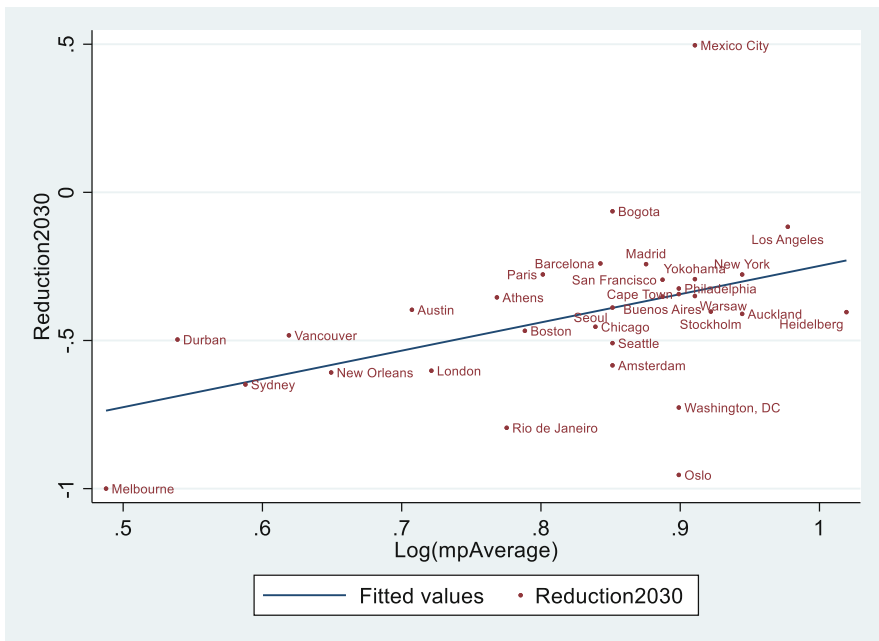


Fig. 18.8 Correlation between average mayoral powers and emission targets for 2030

Table 18.2 Descriptive statistics

Variable	Mean	Std. dev.	Min	Max
Reduction2020	-0.2185	0.22455	-1	0.22108
Reduction2030	-0.4176	0.26942	-1	0.49631
Reduction2040	-0.5864	0.32246	-1	0.83357
Reduction2050	-0.7192	0.40023	-1	1.24686
Log(Population)	14.2678	1.20703	11.6651	16.1562
Log(GdpCap)	11.1867	1.15284	8.66389	13.2725
Log(mpOwn)	0.84513	0.14813	0.55962	1.0116
Log(mpSetEnforce)	0.86954	0.15409	0.53063	1.06471
Log(mpBudget)	0.76871	0.14987	0.36772	0.98083
Log(mpSetVision)	0.79512	0.15057	0.44183	1.06087
Log(mpAverage)	0.82243	0.12869	0.4877	1.01936
Africa	0.0625	0.24593	0	1
LatinAmerica	0.125	0.33601	0	1
AsiaOceania	0.15625	0.3689	0	1
Europe	0.3125	0.47093	0	1

through the CDP database on C40 cities (CDP 2019a, b, c, d, e, f) and complemented by data on cities' emission targets from Yokohama (2019) and Buenos Aires (2019). Data on mayoral powers was accessed through the official C40 website (C40 2019). The descriptive statistics of data for the 32 cities used in our analysis is depicted in Table 18.2.

We aim to determine the impact of city attributes and mayoral powers on emission targets by accounting for multiple factors simultaneously. To this end, we use a quantile regression, using bootstrap repetition of 100 to correct for the small sample size.² The advantage of using a quantile regression is that its coefficients are fitted to the median and not the mean of the distribution, allowing for inclusion of outliers without distorting the results. Furthermore, this approach also allows us to analyse how different parts of the distribution behave, by dividing the distribution into quantiles. This enables us to estimate coefficients of the independent variable for distinct parts of the distribution. This approach considers that distinct parts of the distribution may behave differently. We test for each type of mayoral powers (own and operate, set or enforce policy/regulations, control budget, set vision) separately and we also run one regression including an overall average of mayoral powers. The regression specification used to arrive at estimates is based on the minimization problem as formulated in Eq. (18.1):

²Because of extensive computational time required for estimates, we resorted to using bootstrap of 100, which is sufficiently high to improve confidence intervals.

$$\min_{\beta \in \mathbb{R}^k} \left[\sum_{i \in \{i: y_i \geq x'_i \beta\}} \theta |y_i - x'_i \beta| + \sum_{i \in \{i: y_i < x'_i \beta\}} (1 - \theta) |y_i - x'_i \beta| \right] \quad (18.1)$$

Here θ represents the quantile estimated ($0 < \theta < 1$), y_i the dependent variable, x_i the vector of explanatory variables (with $k \times 1$ vector) for city i .

The small sample size refrained us from using many additional independent explanatory variables. This also narrowed down and specified our research question. Hence, we determine which cities are more ambitious: (1) those with lower population size (alternately population density) as suggested by the correlations shown in the previous section, (2) cities with greater mayoral power or (3) those with greater GDP per capita. We expect to find that mayoral powers encourage cities to be more ambitious in their targets and that cities' size may be a constraint to lowering emission targets.

18.4 Results

We display some of our regression results for emission targets in this section. We only display those which found at least one explanatory variable significant at 10%, 5% or 1% levels. The rest of the regressions found none of the explanatory variables to be statistically significant. Full regression results for years 2020, 2030, 2040 and 2050 are depicted in the Appendix in Tables 18.6, 18.7, 18.8, and 18.9. For our quantile regression we used quantiles equal to 10%, 25%, 50%, 75% and 90%.

Table 18.3 depicts results for quantile regressions for emission targets in 2020. In the short run, the impact of population size on emission targets is positive and significant at 5% (eq. 1) and 10% (eq. 2). The impact of a city being from Latin America is found to be significant at 5% (eq. 11, 16) for the bottom 10% of the distribution of emission targets in the presence of mayoral powers with budgetary policies or policies of setting a vision. Mayoral policies for budgetary measures were found to be significant at 5% for the 90th quantile (eq. 15) with impact of 0.429. Moreover, with 1% increase of average mayoral powers, the emission targets increase by 0.576% at significance level of 5% (eq. 25), implying lower ambition levels for the 90th quantile of our distribution. Therefore, the impact of mayoral powers is relevant only for the top 10% of the sample distribution of cities' emission targets and the direction of the impact is positive, implying lower ambition levels in cities.

Table 18.4 summarizes all variables, significance levels and sign of impact with number of occurrences among the remaining regressions. Population tends to have a positive impact on emission reduction targets, pointing towards lower ambition levels of these cities. The ambition in this case refers to the difference between the starting point and a future reduction. Distinct types of mayoral powers were found to have a positive impact on emission targets. On the contrary, GDP per capita has a

Table 18.3 Quantile regression for dependent variable: Reduction 2020, representing emission targets for 2030

Regression (eq.)	(1)	(3)	(11)	(15)	(16)	(21)	(25)
Quantile	0.1	0.5	0.1	0.9	0.1	0.1	0.9
Mayoral power	Own/operate	Own/operate	Budget	Budget	Set vision	Average	Average
Variables							
Log(Population)	0.201** (-0.079)	0.080* (-0.044)	0.02 (-0.09)	-0.003 (-0.051)	0.06 (-0.089)	0.057 (-0.085)	-0.01 (-0.045)
Log(GdpCap)	0.063 (-0.164)	0.005 (-0.082)	-0.326* (-0.177)	-0.022 (-0.047)	-0.22 (-0.188)	-0.224 (-0.2)	0.011 (-0.059)
Africa	0.243 (-0.436)	-0.103 (-0.21)	-0.75 (-0.503)	-0.086 (-0.172)	-0.642 (-0.469)	-0.664 (-0.609)	-0.017 (-0.175)
LatinAmerica	-0.274 (-0.413)	-0.259 (-0.299)	-0.958** (-0.382)	0.2 (-0.254)	-0.912** (-0.436)	-0.925* (-0.531)	0.282 (-0.28)
AsiaOceania	0.016 (-0.26)	-0.137 (-0.159)	-0.204 (-0.263)	-0.073 (-0.16)	-0.293 (-0.276)	-0.307 (-0.276)	-0.031 (-0.17)
Europe	0.028 (-0.211)	-0.055 (-0.106)	-0.171 (-0.207)	-0.002 (-0.059)	-0.304 (-0.23)	-0.317 (-0.25)	0.04 (-0.102)
Log(mpOwn)	0.516 (-0.598)	0.3 (-0.284)					
Log(mpSetEnforce)							
Log(mpBudget)			-0.491 (-0.736)	0.429** (-0.201)			
Log(mpSetVision)					-0.096 (-0.662)		
Log(mpAverage)						-0.114 (-0.868)	0.576** (-0.281)
Observations	32	32	32	32	32	32	32

(continued)

Table 18.3 (continued)

Regression (eq.)	(1)	(3)	(11)	(15)	(16)	(21)	(25)
Bootstrap	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reps	100	100	100	100	100	100	100

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 18.4 Summarized number of regressions from quantile regression for dependent variable: Reduction for years 2020, 2030, 2040 and 2050, with assigned sign and significance levels

Sign		Positive impact (+)			Negative impact (-)		
Significance level		10%	5%	1%	10%	5%	1%
2020	Log(Population)	1/25	1/25				
	Log(GdpCap)				1/25		
	LatinAmerica				1/25	2/25	
	Log(mpBudget)	1/25					
	Log(mpAverage)	1/25					
2030	Log(Population)	4/25					
	Africa					1/25	
	LatinAmerica	2/25					
	AsiaOceania				2/25		1/25
	Europe				2/25		
	Log(mpSetEnforce)	1/25					
	Log(mpBudget)	1/25	1/25				
	Log(mpSetVision)		2/25				
2040	Log(Population)	7/25	2/25				
	Log(GdpCap)				1/25		
	LatinAmerica	3/25	2/25				
2050	Log(Population)	4/25	8/25	1/25			
	Log(GdpCap)				2/25		
	LatinAmerica	3/25	2/25				

negative impact on emission targets, implying higher levels of ambition in cities. Being part of a European, Asian, African or Latin American continent has proven to have a weakly significant (10%) and negative impact on emission targets, but the results were not as consistent as in the case of population size. Even though one might expect the reduction in the wealthy nations to be greater—and hence having a greater ambition—possibly industries and the size of their economies do not permit considerable emissions reduction without seriously affecting the economy in the short and medium run. Note we do not explore the practices of each particular city in terms of specific policy implementation. Rather, we look at the overall impact of policies grouped by their objectives.

18.5 Conclusions

This chapter analysed the relationship between emission targets, mayoral powers and city attributes. We assessed whether mayoral powers reflect ambition regarding future emission targets. We first had to calculate future emission targets for years 2020, 2030, 2040 and 2050 using a common baseline for consistency. Statistical correlation and regression analysis suggest that mayoral powers have no impact on

the emission targets in the long run (2040 and 2050). However, some of them impact emission targets in the years 2020 and 2030 positively, implying lower levels of ambition in cities. However, most of the impacts on cities' emission targets do not depend on mayoral powers but rather on city attributes such as population size and geographical location. We find that higher GDP per capita makes cities more ambitious in the long run, but not in the short run. Population size is relevant for both long and short run, impacting emission targets positively, implying lower levels of ambition.

Further work is needed to expand the database to reinforce these results as well as higher number of bootstrap repetitions (e.g. 10,000). Our goal is to create a dynamic panel database in order to track the impact of the environmental policies of mayors on emission targets over time. This would contribute to improving the quality of our estimates and allow exploring additional research questions. Finally, one could also decompose the emission targets by production sectors and test for a relation with the associated sectorial mayoral powers.

Appendix

Table 18.5 Target emission levels for years 2020, 2030, 2040 and 2050 based on emission targets (grey) with baseline 2015

City	2015	2017	2020	2022	2025	2030	2032	2035	2040	2050
Amsterdam	4471000		3100500		2480400	1860300			1033500	2067000
Atlanta	4711576		4147141.33			3041424			1935706.67	829989.333
Auckland	11309000		8002800			6669000			5335200	4446000
Austin	15200000		13057859.5			9173578.63			5289297.71	1405016.8
Barcelona	3433000		3323460			2608859			1894258	1179657
Bogotá	13217521		15465314.1			12372251.3			9279188.46	6186125.64
Boston	6900000		5512701			3675134			1837567	0
Buenos Aires	19667128		13230000			12,742,478			12,254,956	11,767,434
Cape Town	22683041		18,798,711	17,930,902		14893569			13283888.1	11672207.2
Chicago	33500000		24255000			18303333.3			12381666.7	6460000
Durban	22587081		16167099			11364696.7			7888640.15	5615492.69
Heidelberg	806000		697392.857			480178.571			262964.286	45750
London	40750490		29510000		18020000	16218000			12614000	9010000
Los Angeles	29024807		29350000		29700000	23650000		21600000	18000000	10800000
Madrid	10257048		8885900			7771800			6797384.08	5945138.89
Melbourne	5805437		0			0			0	0
Mexico City	24084942		29409567			36038443			44161458.5	54115390.5
New Orleans	4600000		3201549.75			1803099.5			1015498.14	571924.326
New York	50692754		46212000			36636000			24424000	12212000
Oslo	1298000		600000			600000			300000	0
Paris	5195663		4694571.75			3755657.4			2660257.33	1564857.25
Philadelphia	19212870		17084200.6		15168401.3	12977410			8595427.39	4213444.8
Rio de Janeiro	20268045		9121744			4160310.68			1897464.45	865409.248
San Francisco	4574578	4651461.75	4418888.5		3721169.4	3225013.6			2322702	1240389.8
Seattle	3171000		262453.33			1557360			778680	0
Seoul	48550952		42555666.7			29667000			20681872.9	14418035.7
Stockholm	2511000		2000000			1500000			0	0
Sydney	5052256		3920000			1776000			790124.248	33518.203
Vancouver	2625609		1879350			1358444.78			981920.459	709758.544
Warsaw	12706696		10362387.2			8259928.34			658404.29	5248185.87
Washington DC	8204579		3367298.33			2244865.56			1122432.78	0
Yokohama	21000000		16413600			14850400	2020379		9379200	3908000

Note: The reference baseline emission level is set at 2015. The highlighted (grey) values are the targets set by individual cities and the non-highlighted numbers are the estimates for years 2020, 2030, 2040 and 2050 based on these targets and baseline levels

Table 18.6 Quantile regression for dependent variable: Reduction 2020

Regression Quantile	(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)	
	0.1	0.25	0.5	0.75	0.9	0.1	0.25	0.5	0.75	0.9	0.1	0.25	0.5	0.75	0.9	0.1	0.25	0.5	0.75	0.9	0.1	0.25	0.5	0.75	0.9	
Maximal Power																										
Variables																										
Log(Population)	0.201**	0.034	0.088*	0.017	0.006	0.086	0.034	0.028	0.017	0.019	0.02	0.034	0.044	0.024	-0.003	0.06	0.014	0.072	0.029	0.006	0.057	0.021	0.05	0.023	0.01	-0.01
	(-0.079)	(-0.042)	(-0.044)	(-0.041)	(-0.046)	(-0.085)	(-0.065)	(-0.049)	(-0.06)	(-0.061)	(-0.09)	0.076	(-0.05)	0.009	(-0.051)	(-0.089)	0.004	0.048	0.022	(-0.041)	0.085	0.076	0.052	0.045	(-0.045)	
Log(Gdp/Cap)	0.063	-0.191	0.005	0.021	0.024	-0.091	-0.165	-0.007	0.004	0.029	-0.526*	-0.165	-0.018	0.016	-0.022	-0.22	-0.134	-0.003	0.022	-0.015	-0.224	-0.138	-0.012	0.031	0.011	
	(-0.164)	(-0.123)	(-0.082)	(-0.067)	(-0.058)	(-0.157)	(-0.13)	(-0.066)	(-0.056)	(-0.054)	(-0.177)	(0.133)	(0.077)	(0.077)	(-0.047)	(-0.188)	(-0.13)	(0.083)	(-0.05)	0.049	(-0.2)	0.168	(-0.08)	0.057	(-0.059)	
Africa	0.243	-0.474	-0.103	-0.011	-0.058	-0.181	-0.437	-0.016	-0.052	-0.065	-0.75	-5.507	-0.086	-0.088	-0.086	-0.042	-0.462	-0.164	-0.091	-0.225	-0.664	-0.427	-0.069	-0.037	-0.017	
	(-0.436)	(-0.322)	(-0.21)	(-0.213)	(-0.212)	(-0.513)	(-0.404)	(-0.215)	(-0.217)	(-0.225)	(-0.503)	(0.374)	(0.227)	(0.158)	(-0.172)	(-0.469)	(0.341)	(0.215)	(0.165)	(0.166)	(0.609)	(0.538)	(0.263)	(-0.2)	(-0.175)	
LatinAmerica	-0.274	-0.41	-0.259	0.283	0.278	-0.452	-0.34	-0.154	0.282	0.273	0.958**	-0.411	-0.278	0.25	0.2	0.912**	-0.377	-0.272	0.256	0.194	0.925**	-0.368	-0.272	0.292	0.282	
	(-0.413)	(-0.365)	(-0.299)	(-0.274)	(-0.258)	(-0.451)	(-0.375)	(-0.264)	(-0.312)	(-0.254)	(-0.382)	(0.17)	(0.261)	(-0.27)	(-0.254)	(-0.436)	(0.399)	(0.329)	(0.252)	(0.249)	(0.531)	(0.469)	(0.321)	0.276	(-0.28)	
Asia/Oceania	0.016	-0.255	-0.137	-0.002	-0.037	-0.129	-0.236	-0.048	-0.036	-0.11	-0.204	-0.268	-0.202	-0.065	-0.073	-0.293	-0.333	-0.2	-0.064	-0.107	-0.307	-0.269	-0.18	-0.048	-0.031	
	(-0.26)	(-0.171)	(-0.159)	(-0.171)	(-0.163)	(-0.281)	(-0.212)	(-0.16)	(-0.147)	(-0.169)	(-0.263)	(0.217)	(0.178)	(0.162)	(-0.16)	(-0.276)	(0.208)	(0.172)	(0.159)	(0.177)	(0.276)	(0.264)	(0.186)	(0.161)	(-0.17)	
Europe	0.028	-0.17	-0.055	0.003	0.091	-0.102	-0.154	-0.01	0.02	0.011	-0.171	-0.208	-0.065	-0.037	-0.002	-0.304	-0.187	-0.067	-0.043	-0.039	-0.317	-0.143	-0.071	-0.039	0.04	
	(-0.211)	(-0.163)	(-0.106)	(-0.101)	(-0.111)	(-0.238)	(-0.175)	(-0.091)	(-0.096)	(-0.08)	(-0.207)	(-0.16)	(0.101)	(0.052)	(-0.059)	(-0.23)	(0.154)	(0.113)	(0.092)	(0.085)	(-0.23)	(0.247)	(0.118)	(0.099)	(-0.102)	
Log(mpp/om)	0.316	0.245	0.3	0.286	0.393	0.461	0.398	0.428	0.057	0.159																
	(-0.598)	(-0.462)	(-0.244)	(-0.245)	(-0.349)	(-0.829)	(-0.654)	(-0.360)	(-0.234)	(-0.298)																
Log(mpp/Set/Enforce)											-0.491	0.095	0.333	0.27	0.423**											
											(-0.736)	(0.552)	(0.285)	(-0.18)	(-0.201)											
Log(mpp/Budget)																										
Log(mpp/Set/Vision)																										
Log(mpp/Average)																										
Observations	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Bootstrap	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reps	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, regressions highlighted (grey) have at least one result which is statistically significant

Table 18.7 Quantile regression for dependent variable: Reduction 2030

	(26) 0.1	(27) 0.25	(28) 0.5	(29) 0.75	(30) 0.9	(31) 0.1	(32) 0.25	(33) 0.5	(34) 0.75	(35) 0.9	(36) 0.1	(37) 0.25	(38) 0.5	(39) 0.75	(40) 0.9	(41) 0.1	(42) 0.25	(43) 0.5	(44) 0.75	(45) 0.9	(46) 0.1	(47) 0.25	(48) 0.5	(49) 0.75	(50) 0.9	
Variables	Own/ Operate	Own/ Operate	Own/ Operate	Own/ Operate	Own/ Operate	Set/ enforce	Set/ enforce	Set/ enforce	Set/ enforce	Set/ enforce	Budget	Budget	Budget	Budget	Budget	Set/ Vision	Set/ Vision	Set/ Vision	Set/ Vision	Set/ Vision	Avg	Avg	Avg	Avg	Avg	Avg
Majoral Power																										
Log(Population)	0.091	0.081	0.054	0.075**	0.104*	0.128	0.035	0.053	0.08	0.08	0.105	0.048	0.066	0.077*	0.068**	0.182**	0.063	0.068	0.089**	0.068	0.104	0.0851	0.059	0.08	0.086	
	(-0.094)	(-0.067)	(-0.05)	(-0.039)	(-0.055)	(-0.085)	(-0.064)	(0.053)	(0.054)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Log(GdpCap)	-0.088	-0.03	-0.041	-0.014	0.013	-0.046	0.078	-0.033	-0.026	-0.08	-0.022	-0.029	0.004	-0.009	-0.037	0.104	0.089	0.061	(-0.051)	(-0.075)	0.086	0.077	0.053	0.058	0.057	
	(-0.177)	(-0.119)	(-0.062)	(-0.044)	(-0.063)	(-0.163)	(-0.11)	(0.067)	(0.043)	(0.053)	(0.162)	(0.121)	(0.088)	(0.054)	(-0.048)	(-0.166)	(-0.123)	(0.067)	(-0.032)	(-0.038)	0.181	(-0.08)	(-0.056)	(0.047)	(-)	
Africa	-0.318	-0.088	-0.138	-0.161	-0.157	-0.256	0.334	-0.072	-0.158	-0.225	-0.373	-0.056	-0.126	-0.087	-0.116	0.289	-0.178	-0.112	0.192**	-0.21	-0.246	0.039	-0.14	-0.125	-0.147	
	(-0.485)	(-0.32)	(-0.199)	(-0.154)	(-0.234)	(-0.593)	(-0.23)	(-0.168)	(-0.209)	(-0.45)	(-0.37)	(-0.223)	(-0.162)	(-0.141)	(-0.465)	(0.356)	(0.199)	(-0.096)	(-0.14)	(-0.14)	(-0.519)	(0.373)	(0.261)	(-0.19)	(-0.165)	
LatAmAmerica	-0.654	-0.057	0.099	0.043	0.57	-0.645	0.295	0.209	0.099	0.587	-0.661	-0.019	0.135	0.096	0.574	-0.445	-0.05	0.18	0.082	0.574*	-0.686	0.046	0.132	0.123	0.601*	
	(-0.444)	(-0.364)	(-0.411)	(-0.391)	(-0.404)	(-0.596)	(-0.424)	(-0.432)	(-0.443)	(-0.458)	(-0.397)	(-0.261)	(-0.339)	(-0.335)	(-0.355)	(-0.469)	(-0.43)	(0.383)	(-0.371)	(-0.334)	(-0.522)	(-0.436)	(-0.374)	(-0.383)	(-0.343)	
Asia/Oceania	-0.211	-0.131	-0.07	-0.062	-0.105	-0.191	0.044	-0.049	-0.054	-0.121	-0.224	-0.032	-0.07	-0.156*	0.171***	0.046	-0.126	-0.077	-0.145	-0.171*	-0.225	-0.04	-0.085	-0.072	-0.118	
	(-0.231)	(-0.152)	(-0.122)	(-0.095)	(-0.127)	(-0.304)	(-0.176)	(-0.113)	(-0.101)	(-0.113)	(-0.248)	(-0.179)	(-0.135)	(-0.083)	(-0.096)	(-0.206)	(-0.143)	(-0.117)	(-0.093)	(-0.093)	(-0.214)	(-0.156)	(-0.123)	(-0.102)	(-0.096)	
Europe	-0.407*	-0.148	0.046	0.022	0.061	-0.397	0.124	0.07	0.067	0	-0.370*	-0.126	0.027	-0.017	-0.014	-0.196	-0.116	0.073	-0.026	-0.014	0.404*	-0.089	0.047	0.027	0.03	
	(-0.232)	(-0.156)	(-0.097)	(-0.074)	(-0.107)	(-0.617)	(-0.353)	(-0.273)	(-0.332)	(-0.289)	(-0.773)	(-0.591)	(-0.375)	(-0.264)	(-0.354)	(-0.617)	(-0.463)	(-0.371)	(-0.262)	(-0.16)	(-0.404)	(-0.289)	(-0.142)	(-0.102)	(-0.086)	
Log(empOwn)	-0.17	0.533	0.273	0.352	0.289	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
Log(empSet/Enforce)	(-0.773)	(-0.591)	(-0.375)	(-0.264)	(-0.354)	-0.188	1.062*	0.239	0.19	0.189	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
						0.944	(-0.644)	(-0.446)	(-0.298)	(-0.339)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
Log(emp/Budget)	(-)	(-)	(-)	(-)	(-)	-0.299	0.764	0.228	0.447*	0.456**	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
	(-)	(-)	(-)	(-)	(-)	(-0.664)	(-0.55)	(-0.375)	(-0.25)	(-0.202)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
Log(emp/Set/Vision)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	0.475	0.315	0.3	0.382**	0.458**	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
Log(emp/Average)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	0.709	0.532	0.355	0.193	0.214	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
Observations	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Bootstrap	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Repns	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, regressions highlighted (grey) have at least one result which is statistically significant

Table 18.8 Quantile regression for dependent variable: Reduction 2040

Regression Quantile	(51) 0.1		(52) 0.25		(53) 0.5		(54) 0.75		(55) 0.9		(56) 0.1		(62) 0.25		(63) 0.5		(64) 0.75		(65) 0.9		(66) 0.1		(67) 0.25		(68) 0.5		(69) 0.75		(70) 0.9		(71) 0.1		(72) 0.25		(73) 0.5		(74) 0.75		(75) 0.9	
	Ow/ Operate	Ow/ Operate	Ow/ Operate	Ow/ Operate	Ow/ Operate	Ow/ Operate	Ow/ Operate	Ow/ Operate	Ow/ Operate	Ow/ Operate	Self enforce policies	Self enforce policies	Self enforce policies	Self enforce policies	Budget	Budget	Budget	Budget	Budget	Budget	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision	Set Vision		
Mayoral Power	0.08	0.017	0.067	0.1	0.088	0.107*	0.107*	0.107*	0.088	0.105**	0.105**	0.105**	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.103*	0.103*	0.103*	0.103*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	0.088*	
Log(Population)	(-0.06)	(-0.068)	(-0.062)	(-0.067)	(-0.058)	(-0.061)	(-0.045)	(-0.052)	(-0.058)	(-0.061)	(-0.045)	(-0.052)	(-0.058)	(-0.061)	(-0.045)	(-0.052)	(-0.058)	(-0.061)	(-0.045)	(-0.052)	(-0.058)	(-0.061)	(-0.045)	(-0.052)	(-0.058)	(-0.061)	(-0.045)	(-0.052)	(-0.058)	(-0.061)	(-0.045)	(-0.052)	(-0.058)	(-0.061)	(-0.045)	(-0.052)	(-0.058)	(-0.061)	(-0.045)	
Log(Gdp/Cap)	-0.037	-0.135	-0.06	-0.028	-0.017	-0.018	-0.137	-0.071	-0.033	-0.036	-0.137*	-0.071	-0.033	-0.036	-0.137*	-0.071	-0.033	-0.036	-0.137*	-0.071	-0.033	-0.036	-0.137*	-0.071	-0.033	-0.036	-0.137*	-0.071	-0.033	-0.036	-0.137*	-0.071	-0.033	-0.036	-0.137*	-0.071	-0.033	-0.036	-0.137*	
Africa	(-0.093)	(-0.094)	(-0.078)	(-0.054)	(-0.051)	(-0.07)	(-0.09)	(-0.083)	(-0.053)	(-0.064)	(-0.08)	(-0.07)	(-0.06)	(-0.08)	(-0.053)	(-0.064)	(-0.08)	(-0.07)	(-0.06)	(-0.08)	(-0.053)	(-0.064)	(-0.08)	(-0.07)	(-0.06)	(-0.08)	(-0.053)	(-0.064)	(-0.08)	(-0.07)	(-0.06)	(-0.08)	(-0.053)	(-0.064)	(-0.08)	(-0.07)	(-0.06)	(-0.08)	(-0.053)	
LatinAmerica	(-0.122)	(-0.227)	(-0.04)	(-0.117)	(-0.073)	(-0.12)	(-0.225)	(-0.06)	(-0.086)	(-0.14)	(-0.092)	(-0.221)	(-0.06)	(-0.086)	(-0.14)	(-0.092)	(-0.221)	(-0.06)	(-0.086)	(-0.14)	(-0.092)	(-0.221)	(-0.06)	(-0.086)	(-0.14)	(-0.092)	(-0.221)	(-0.06)	(-0.086)	(-0.14)	(-0.092)	(-0.221)	(-0.06)	(-0.086)	(-0.14)	(-0.092)	(-0.221)	(-0.06)	(-0.086)	
Asia/Oceania	(-0.27)	(-0.234)	(-0.238)	(-0.218)	(-0.211)	(-0.343)	(-0.257)	(-0.221)	(-0.254)	(-0.217)	(-0.203)	(-0.244)	(-0.215)	(-0.217)	(-0.205)	(-0.204)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	(-0.205)	(-0.186)	
Europe	(-0.492)	(-0.495)	(-0.55)	(-0.55)	(-0.542)	(-0.497)	(-0.442)	(-0.415)	(-0.451)	(-0.578)	(-0.373)	(-0.354)	(-0.568)	(-0.56)	(-0.444)	(-0.437)	(-0.446)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	(-0.446)	(-0.437)	
Log(tmpOwn)	(-0.127)	(-0.143)	(-0.124)	(-0.079)	(-0.089)	(-0.169)	(-0.118)	(-0.113)	(-0.154)	(-0.125)	(-0.118)	(-0.12)	(-0.103)	(-0.102)	(-0.128)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)	(-0.113)
Log(tmpSet/Enforce)	(-0.561)	(-0.417)	(-0.442)	(-0.426)	(-0.365)	(-0.214)	(-0.027)	(-0.107)	(-0.196)	(-0.218)	(-0.259)	(-0.036)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	
Log(tmpBudget)	(-0.561)	(-0.417)	(-0.442)	(-0.426)	(-0.365)	(-0.214)	(-0.027)	(-0.107)	(-0.196)	(-0.218)	(-0.259)	(-0.036)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	
Log(tmpSet/Vision)	(-0.561)	(-0.417)	(-0.442)	(-0.426)	(-0.365)	(-0.214)	(-0.027)	(-0.107)	(-0.196)	(-0.218)	(-0.259)	(-0.036)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	
Log(tmpAverage)	(-0.561)	(-0.417)	(-0.442)	(-0.426)	(-0.365)	(-0.214)	(-0.027)	(-0.107)	(-0.196)	(-0.218)	(-0.259)	(-0.036)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	(-0.203)	(-0.489)	(-0.414)	(-0.341)	(-0.378)	
Observations	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	
Bootstrap	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Betas	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, regressions highlighted (grey) have at least one result which is statistically significant

Table 18.9 Quantile regression for dependent variable: Reduction 2040

Regression Quantile	0.1		0.25		0.5		0.75		0.9		0.1		0.25		0.5		0.75		0.9							
	(76)	(77)	(78)	(79)	(80)	(81)	(82)	(83)	(84)	(85)	(86)	(87)	(88)	(89)	(90)	(91)	(92)	(93)	(94)	(95)	(96)	(97)	(98)	(99)	(100)	
Maximal Power																										
Variables																										
Log(Population)	0.074**	0.081**	0.076	0.109*	0.083**	0.07	0.001	0.086	0.11	0.071*	0.074**	0.061	0.117**	0.117**	0.143**	0.075**	0.061	0.117	0.136**	0.117	0.136**	0.074	0.071	0.026	0.116*	0.138**
	(-0.029)	(-0.033)	(-0.045)	(-0.058)	(-0.066)	(-0.041)	0.17	0.17	0.13	0.158	(-0.023)	0.145	(-0.065)	(-0.065)	(-0.068)	(-0.024)	(-0.034)	0.16	0.17	(-0.073)	0.17	0.16	0.15	0.16	0.14	(-0.07)
Log(Gdp/Cap)	-0.019	-0.032	0.016	-0.052	-0.071	-0.015	-0.023	-0.034	-0.024	-0.109*	-0.017	-0.007	0.014	-0.06	-0.101*	-0.017	-0.003	0.014	-0.072	-0.074	-0.016	0.01	0.01	-0.052	-0.052	-0.108
	(-0.056)	(-0.063)	(-0.075)	(-0.078)	(-0.084)	(-0.075)	0.071	0.089	0.077	0.065	(-0.046)	(-0.061)	0.058	(-0.058)	(-0.058)	(-0.044)	(-0.048)	0.068	0.067	(-0.07)	0.065	0.083	0.065	0.061	(-0.066)	(-0.066)
Africa	0.083	0.051	0.352	-0.015	-0.138	0.07	0.034	0.253	0.07	-0.288	0.031	0.026	0.327	-0.1	-0.256	0.048	0.067	0.308	-0.12	-0.143	0.062	0.036	0.239	-0.056	-0.275	
	(-0.201)	(-0.199)	(-0.254)	(-0.265)	(-0.272)	(-0.274)	(-0.22)	0.243	0.260	0.283	0.217	(-0.226)	0.241	(-0.246)	(-0.245)	(-0.156)	(-0.173)	0.261	(-0.27)	(-0.282)	0.246	(-0.25)	0.224	(-0.25)	(-0.27)	(-0.27)
Latin America	-0.162	0.136	0.436	0.158	1.612*	-0.192	0.2	0.388	0.213	1.503**	-0.154	0.238	0.407	0.104	1.506**	-0.177	0.261	0.407	0.087	1.569**	-0.167	0.243	0.39	0.134	1.494*	
	(-0.475)	(-0.462)	(-0.62)	(-0.908)	(-0.832)	(-0.392)	0.301	0.551	0.873	0.883	0.358	(-0.384)	0.717	(-0.879)	(-0.735)	(-0.366)	(-0.367)	0.498	0.866	(-0.783)	0.317	0.325	0.284	0.792	(-0.842)	(-0.842)
Asia/Oceania	0.04	0.01	0.029	0.043	-0.009	0.021	0.066	0.034	0.053	-0.037	0.083	0.063	0.048	0.014	0.118	0.06	0.062	0.048	0.031	0.039	0.051	0.068	0.075	0.043	0.084	
	(-0.085)	(-0.098)	(-0.142)	(-0.175)	(-0.173)	(-0.15)	0.114	0.124	0.148	0.153	0.095	(-0.094)	0.126	(-0.104)	(-0.105)	(-0.063)	(-0.101)	0.146	0.156	(-0.14)	0.144	0.147	(-0.15)	0.157	(-0.148)	(-0.148)
Europe	0.01	-0.013	0.119	0.032	-0.017	-0.008	-0.012	0.072	0.013	0.02	0.031	0.015	-0.023	0.006	0.008	0.008	0.003	0.07	-0.012	0.046	0.009	-0.007	0.073	-0.006	0.001	
	(-0.088)	(-0.109)	(-0.147)	(-0.141)	(-0.127)	(-0.115)	0.105	0.116	0.121	0.128	0.094	(-0.1)	0.125	(-0.115)	(-0.116)	(-0.055)	(-0.066)	(-0.12)	(-0.117)	(-0.126)	0.068	0.107	0.129	(-0.13)	(-0.135)	(-0.135)
Log(mpgOwn)	-0.044	0.035	0.046	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*	0.172*
Log(mpgSet/Enforce)	(-0.296)	(-0.292)	(-0.463)	(-0.466)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)	(-0.563)
Log(mpgBudget)																										
Log(mpgSet/Vision)																										
Log(mpgAverage)																										
Observations	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Bootstrap	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Regs	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, regressions highlighted (grey) have at least 1 result which is statistically significant

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