Fuel Economy Fiscal Measures - Feebate Tool Training

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Overview

- Fiscal measures to improve vehicle fuel efficiency
- Highlight of the day- feebate program
- Feebate benefits
- Introduction of Feebate Tool
  - Case study using China 2014 data
- Summary- Feebate best practices

Fiscal measures to improve vehicle fuel efficiency

- Vehicle tax/fee
  - Based on CO_2 emissions or fuel efficiency
  - One-time (e.g. at registration) or annually(e.g. circulation tax)
- Incentive schemes for very fuel-efficient vehicles
- Feebate- a mix of fees/tax and rebate/incentives
- Fuel tax
- Infrastructure support, e.g. charging stations, discounted electricity

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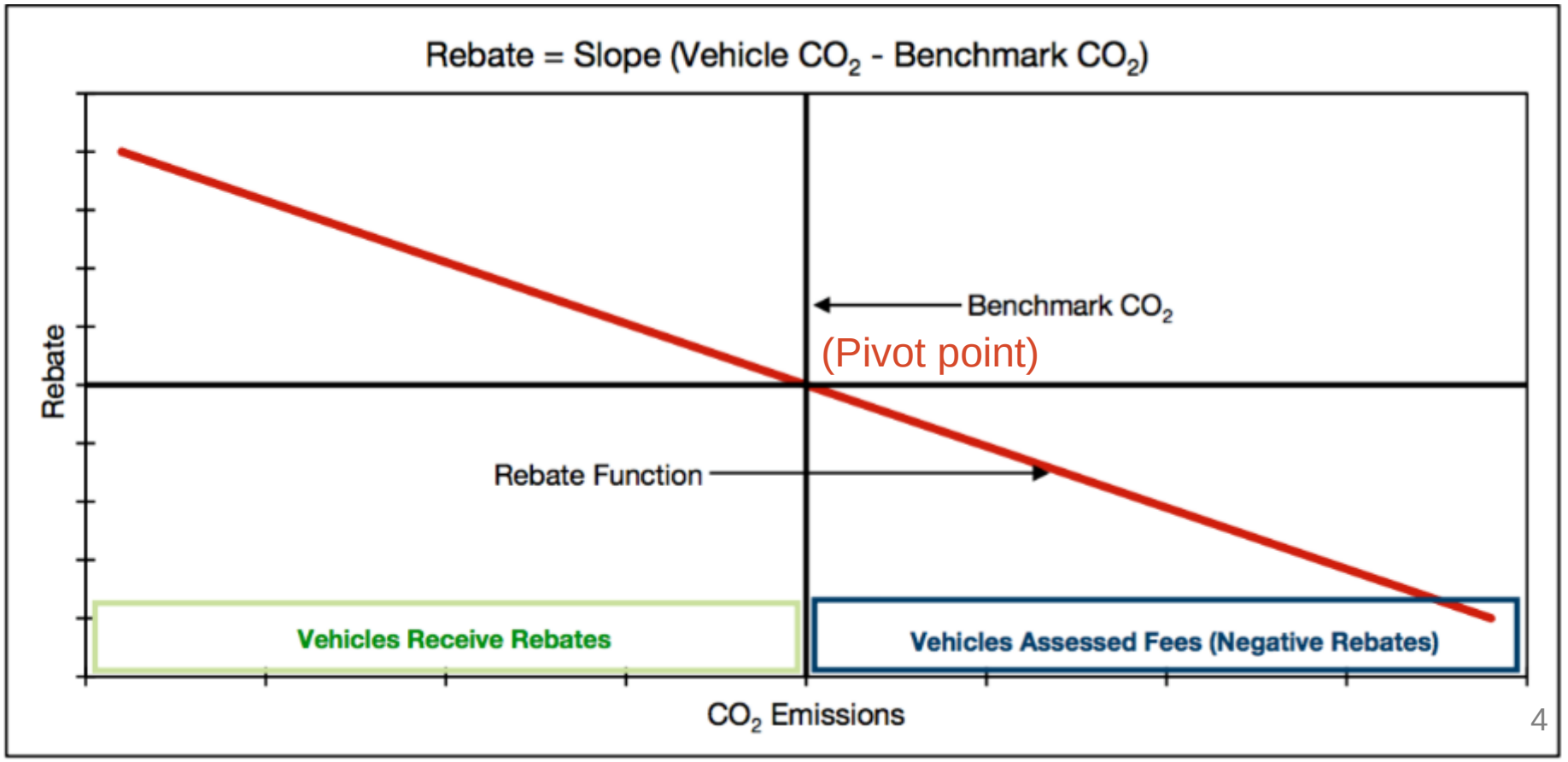
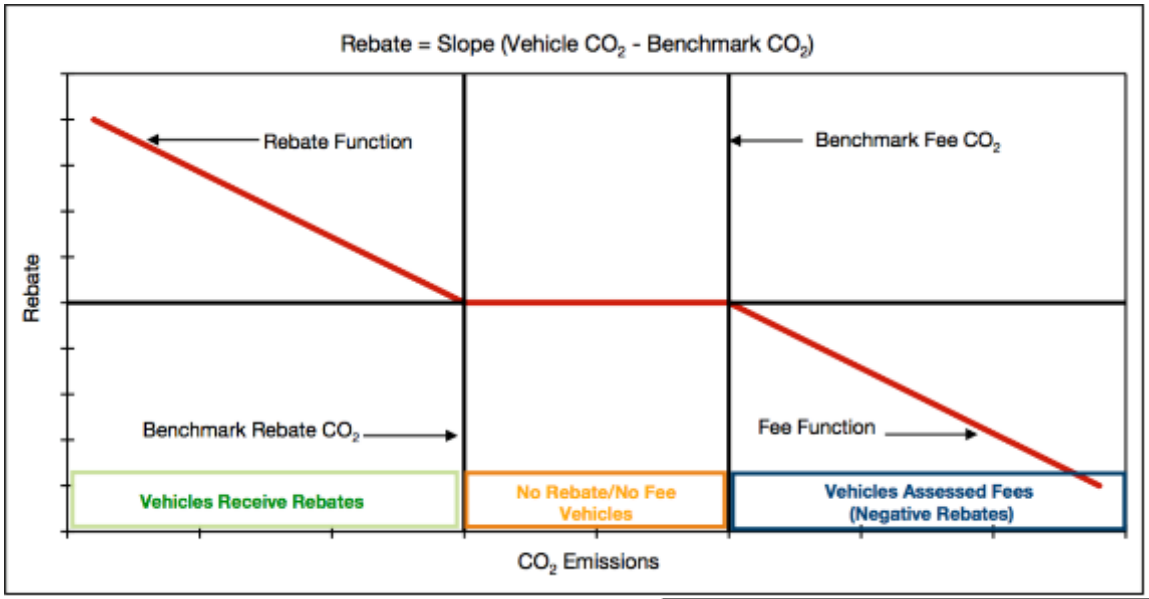
What is a feebate program

- Feebate – Higher efficiency vehicles receive rebates, lower efficiency vehicles pay fees

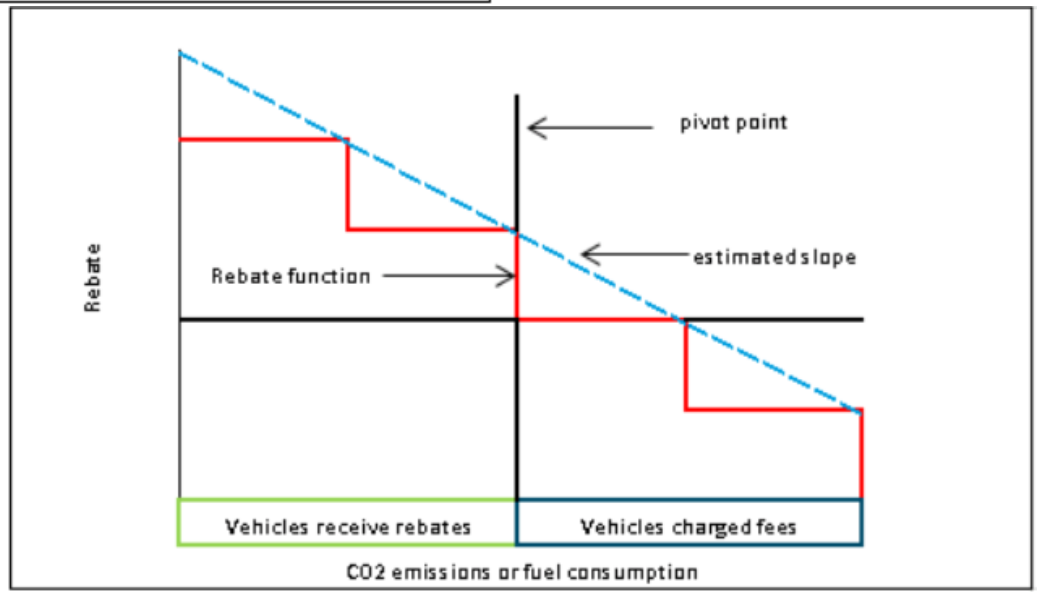


Feebate program in various forms



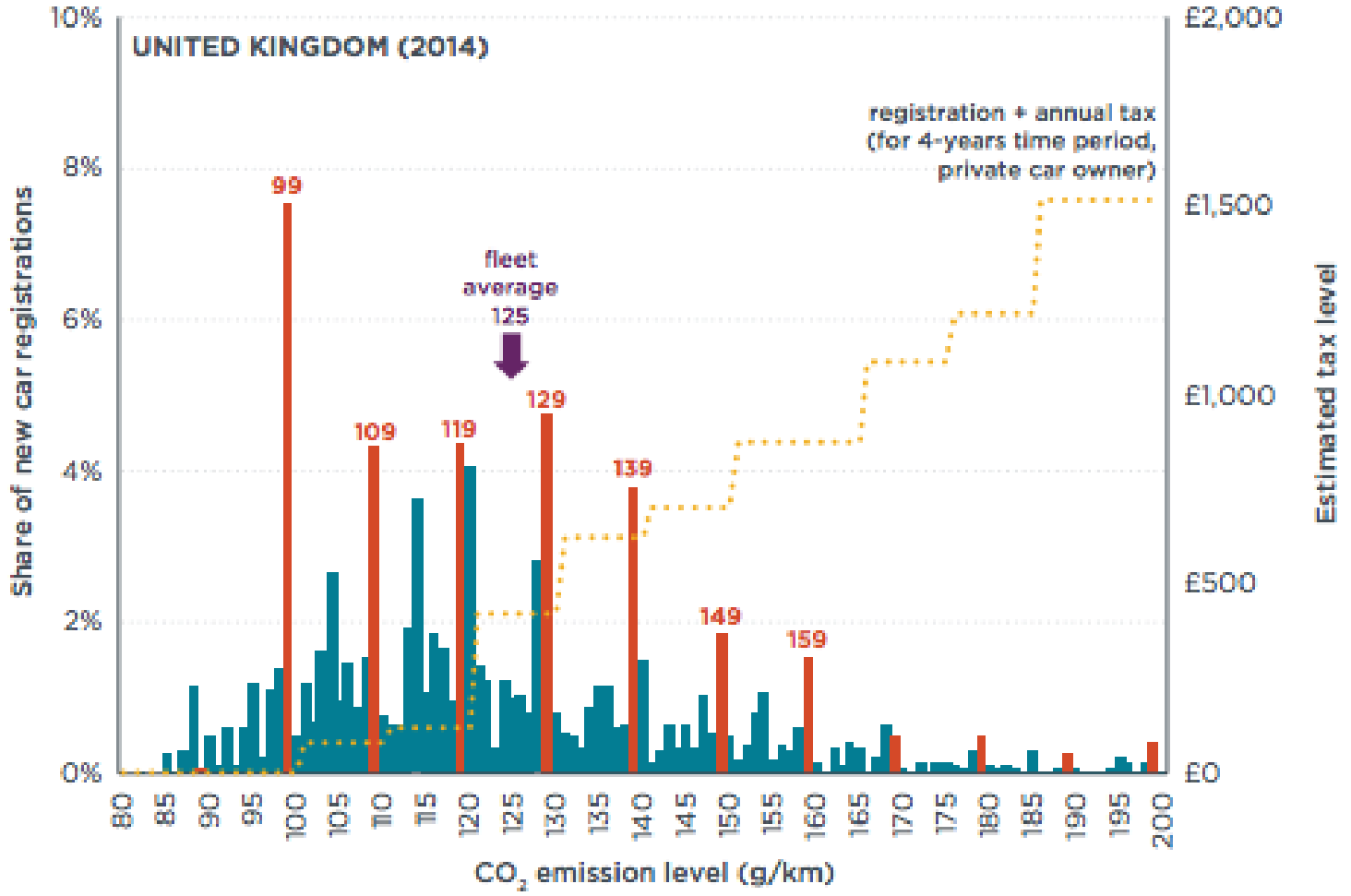
- **Non-continuous feebate program**

- **Step-wise feebate program (example of France)**



The design of the rebate influences how manufacturers response

- **Tax-optimized vehicles**



Link to the report: Optimizing to the last digit: how taxes influence vehicle CO2 emission level
http://www.theicct.org/sites/default/files/publications/Tax_Step_Analysis_201510.pdf

Why feebate system

- ✓ Can be used as an alternative to establishing fuel economy standards
- ✓ Modest amount of data & expertise
- ✓ Could provide fiscal incentives to go beyond fuel economy standards
- ✓ Bolsters FE in consumer decision making
- ✓ Establishes an explicit price for efficiency
- ✓ Enables revenue-raising or -neutral
- ✓ Easy to maintain if properly constructed

Feebate system compare to other measures

- Compared to fuel economy standards:
  - Effective at improving efficiency of imported vehicles
  - Requires less expertise and information
- Compared to separate tax and incentives:
  - Budget neutral, more sustainable
  - Perceived more positively by consumers

Feebate Tool*

Tool designed to educate, inform, and allow experimentation

- User-friendly: Excel-based system with front-end
- Preloaded default data and helps the user input new data
- User selection of multiple design parameters
- Menu-driven system with clear boundaries
- Layered complexity for different types of user
- Integrated with user guide

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* Developed by ICCT & UNEP for GFEI

Feebate Tool: Control Panel

FEEBATE FUNCTION CONTROL PANEL

Modification options:	Adjustable by user	Fixed

QUICK START

Current country: Australia

Start year: 2015

Run

Change country or upload new data

View Results

PIVOT POINT CONTROL ?

? Annual adjustment based on observed changes

Revenue neutral system

Revenue to the government [mUSD/year] 0

METRICS ?

CO2 Emissions

Update

UNITS ?

Kilometers

Liters

Update

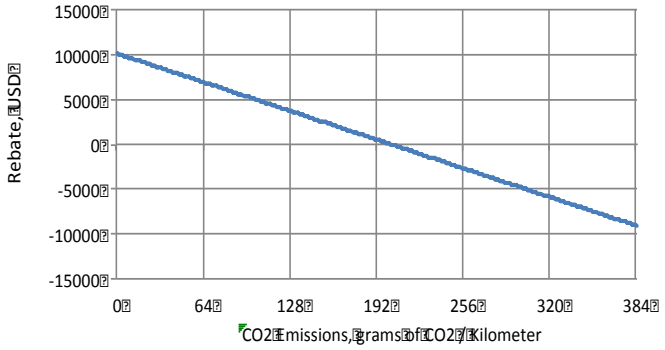
REBATE FUNCTION SHAPE CONTROL

Shape examples ? Linear ? Pivot Point= 202

How many sections?	1	1				
Section limits, g of CO2/ Kilometer		0	384			
Shape of the individual sections		SLOPED				
Rebate/fee value	?	N/A				
Rate USD per g of CO2/ Kilometer	?	50				

Advanced Design Options

Update



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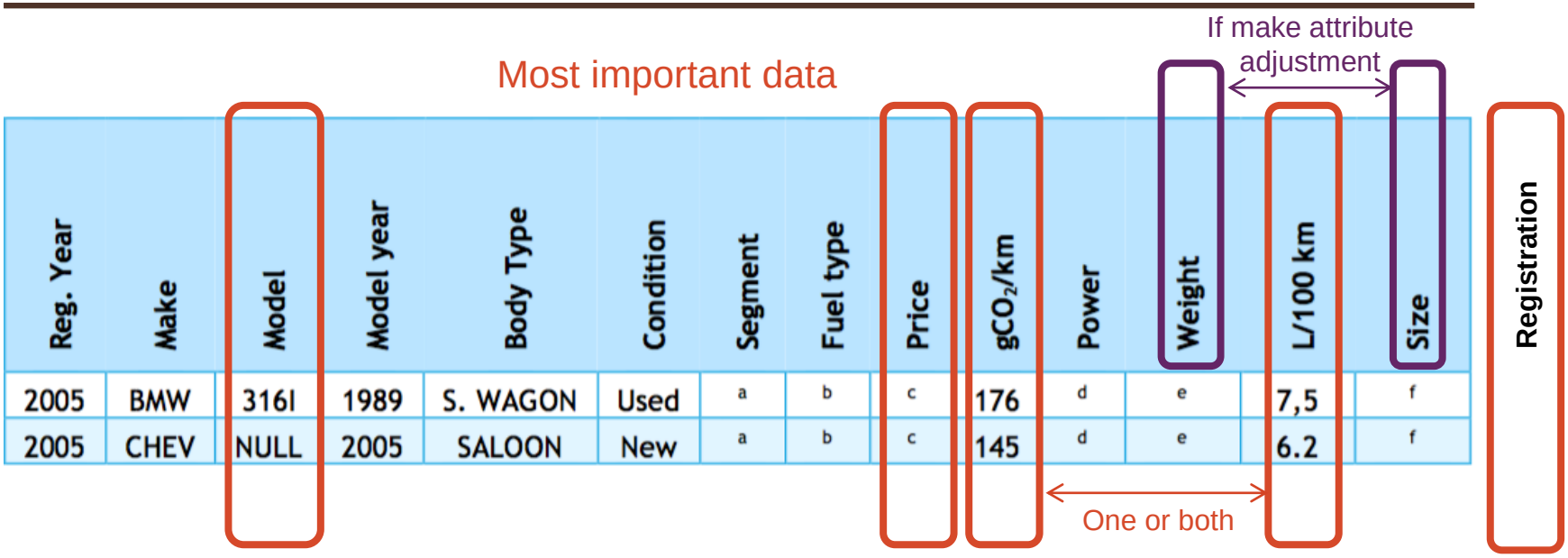
To get started…

- What data is needed?

- What decision should be made?

Prepare for the input: new vehicle registration record



Formats compatible for the tool	
Segment	A, B, C, D, E, F, SUV
Fuel type	Petrol, diesel, gas/LPG; (hybrid/petrol, hybrid/diesel, electric, flexible, natural gas, ethanol-petrol mix, fuel cell, unspecified)
Price	Any currency (require exchange rate, reported in USD)
Power	Any unit (reported in the same unit)
Weight	
Size	

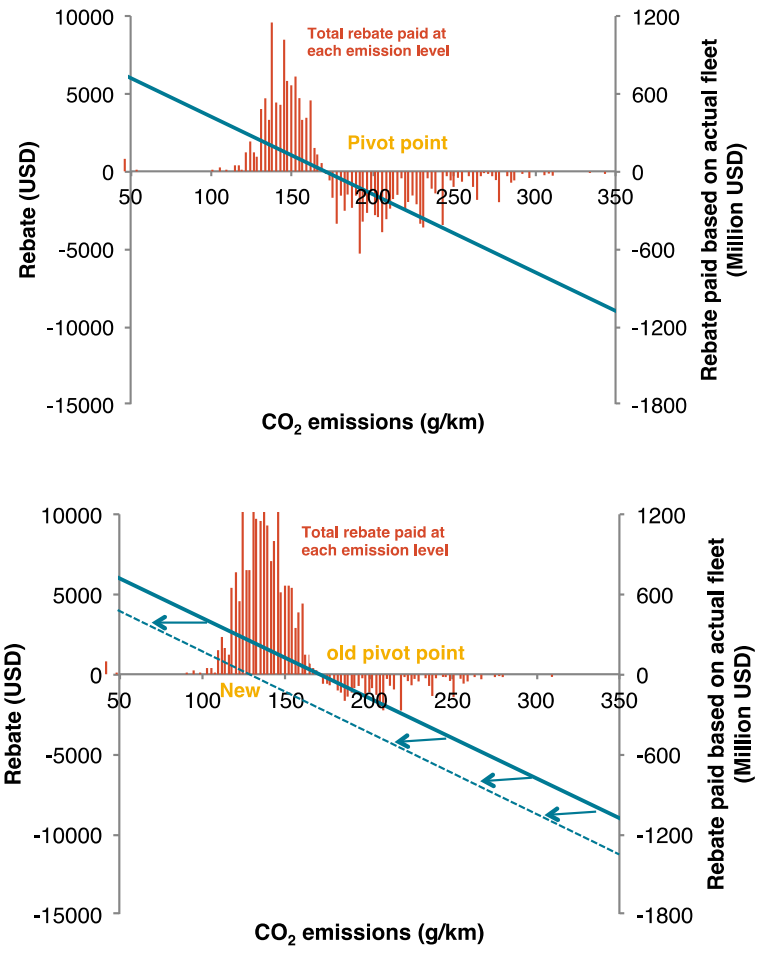
Flexibility of input data

- New vehicle vs. second-hand vehicle
  - Assumption for used vehicles FE value: same as new vehicles, or apply a “discounting” rate
- Individual vehicle vs. aggregated dataset
  - Individual vehicle: micro-dataset provides more reliable results
  - Aggregated dataset allows the tool run faster

There is default fleet database of several countries in the Feebate Tool that you could use to generate results directly

Design the feebate system- pivot point control

- Pivot point and fleet structure determine the revenue of government
  - **Adjustment based on observed change** provides steady revenue flow
  - **Adjustment with fixed percentage** provides clear policy indication
  - **Lagged adjustment based upon trigger** minimizes potential confusion to consumers, and still provides steady revenue flow



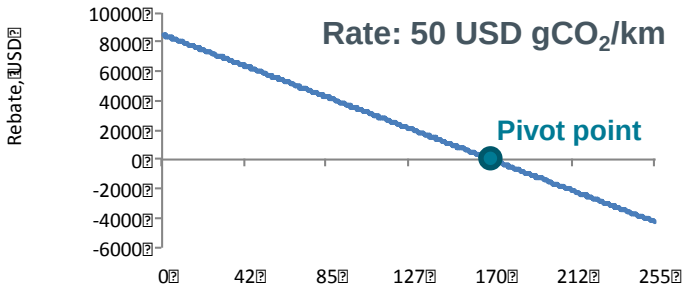
Design the feebate system- rebate function shape control

- Rebate function shape control
  - Allows the user to increase rebates for advanced technology vehicles and/or increase fees for the worst vehicles.
- Others that users could decide
  - Government revenue
  - Metrics and units in the output

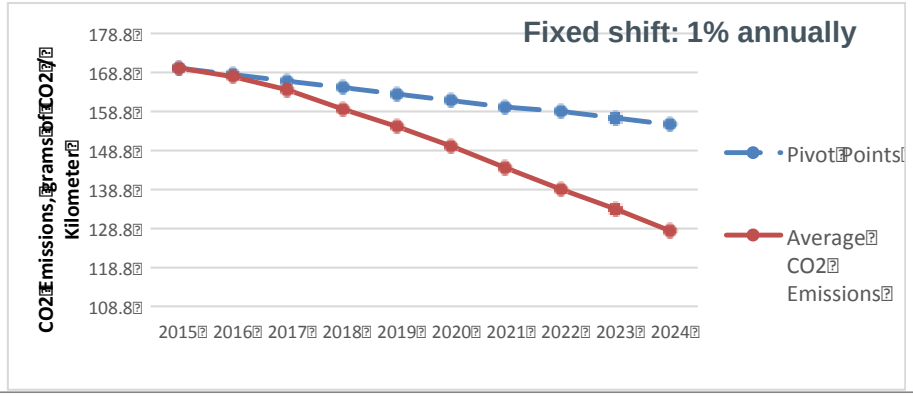
There is default design in the Feebate Tool that you could use to generate results directly

Results- figures with statistics

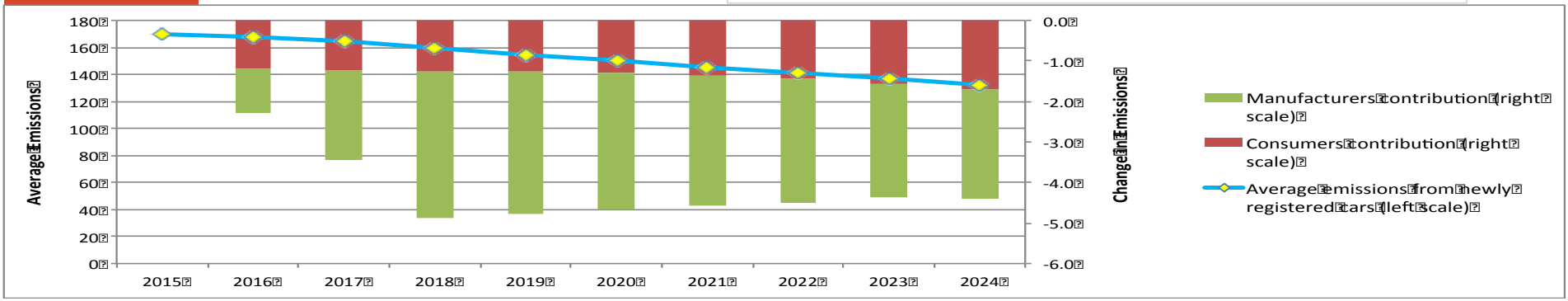
Policy summary



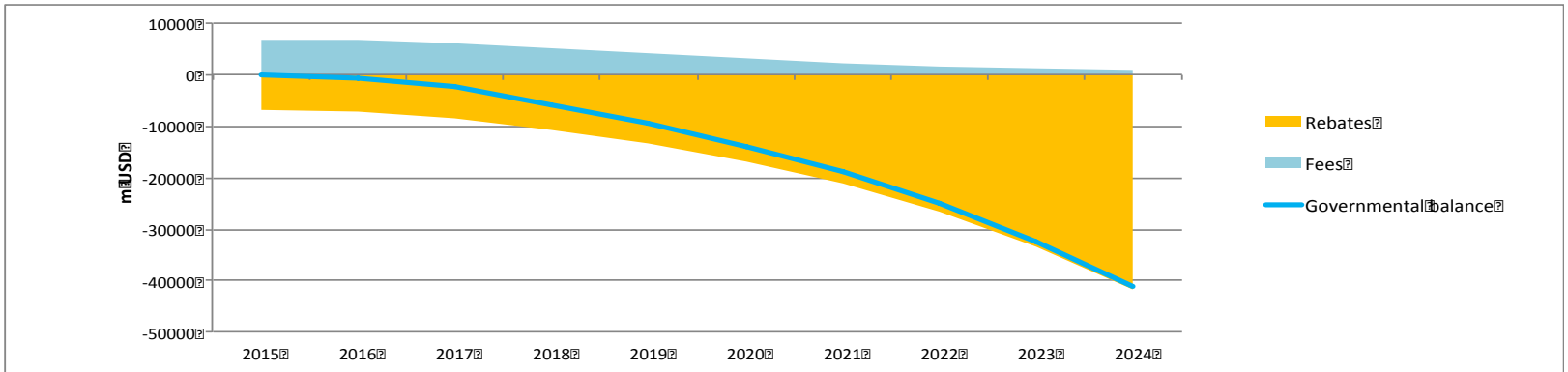
Evolution of the pivot point over time



Emissions



Budget



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Advanced design options (1 of 2)

- Budget control
  - Point of administration
    - Manufacturer/Distributor level
    - Consumer level
  - Administrative cost (% of average fees and rebates)

Point of Administration ?

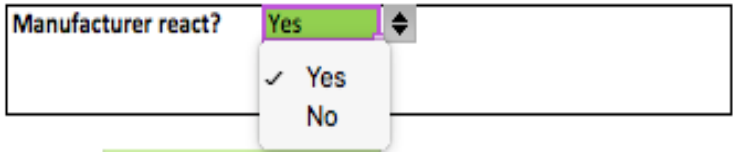
Manufacturer/Distributor Level

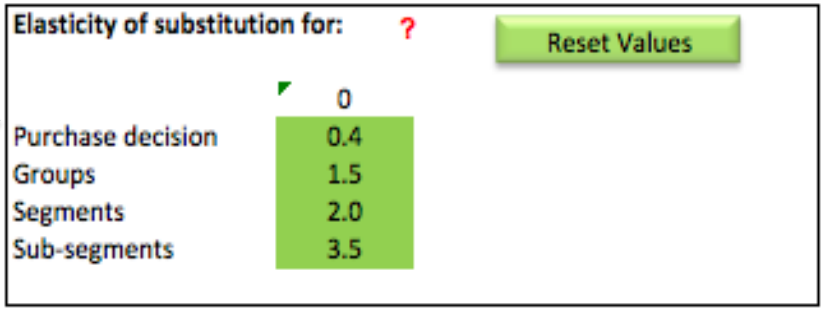
Administrative Costs ?
[% of average Fees and Rebates]

		Pivot Point adjustment based on	
		Observed changes or Lagged adjustment	Fixed criteria or Manual control
Point of Administration	**Manufacturer/ Distributor**	1	0.5
	Consumer	2	1

Advanced design options (2 of 2)

- Manufacturer behavior- react to feebate or not
- Consumer behavior
- Attribute adjustment
  - Size, weight, power





Size	Weight	Power
Disabled Flat rate= 0.6	Disabled Flat rate= 0.6	Disabled Flat rate= 0.6

Adjusting for size targets the feebate at the level of technology on the vehicle;
No adjustment also incentivizes smaller vehicles

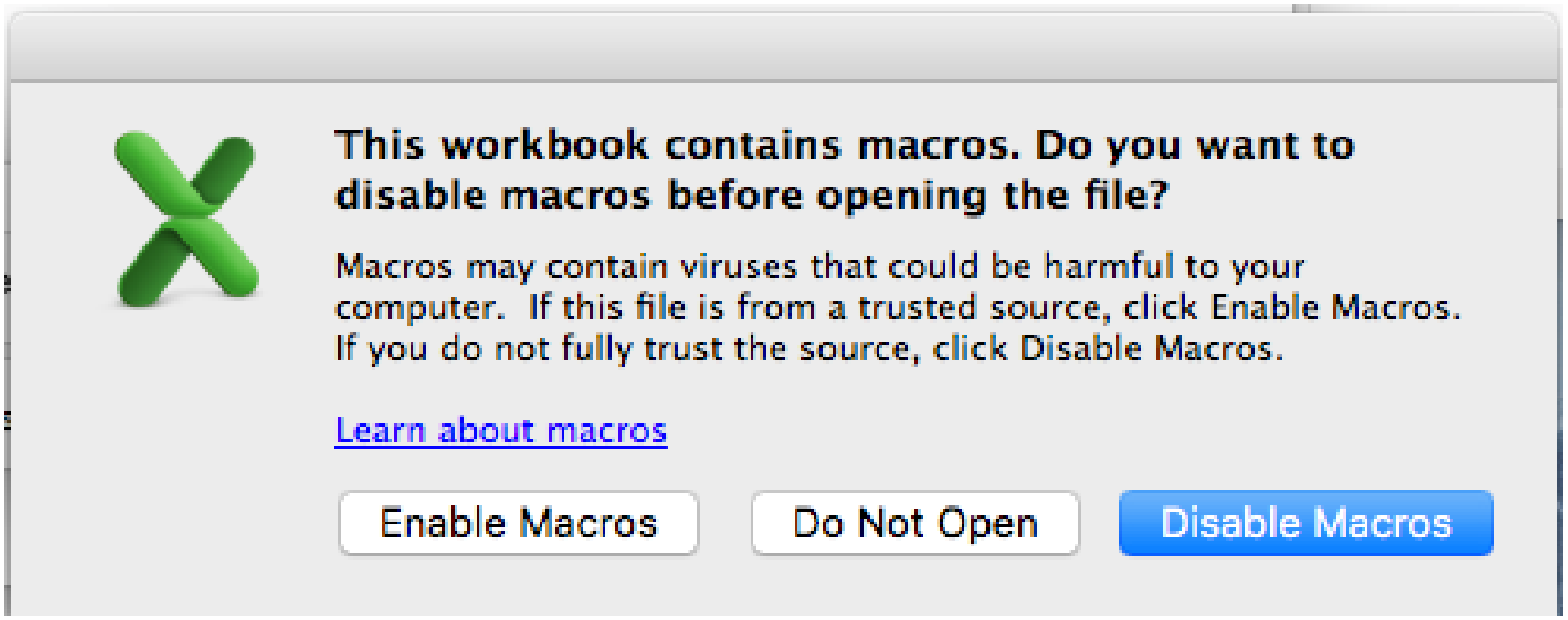
Tool demonstration backup slides

Case study

China 2014 fleet data

Open the Feebate Tool

First: ENABLE Macros



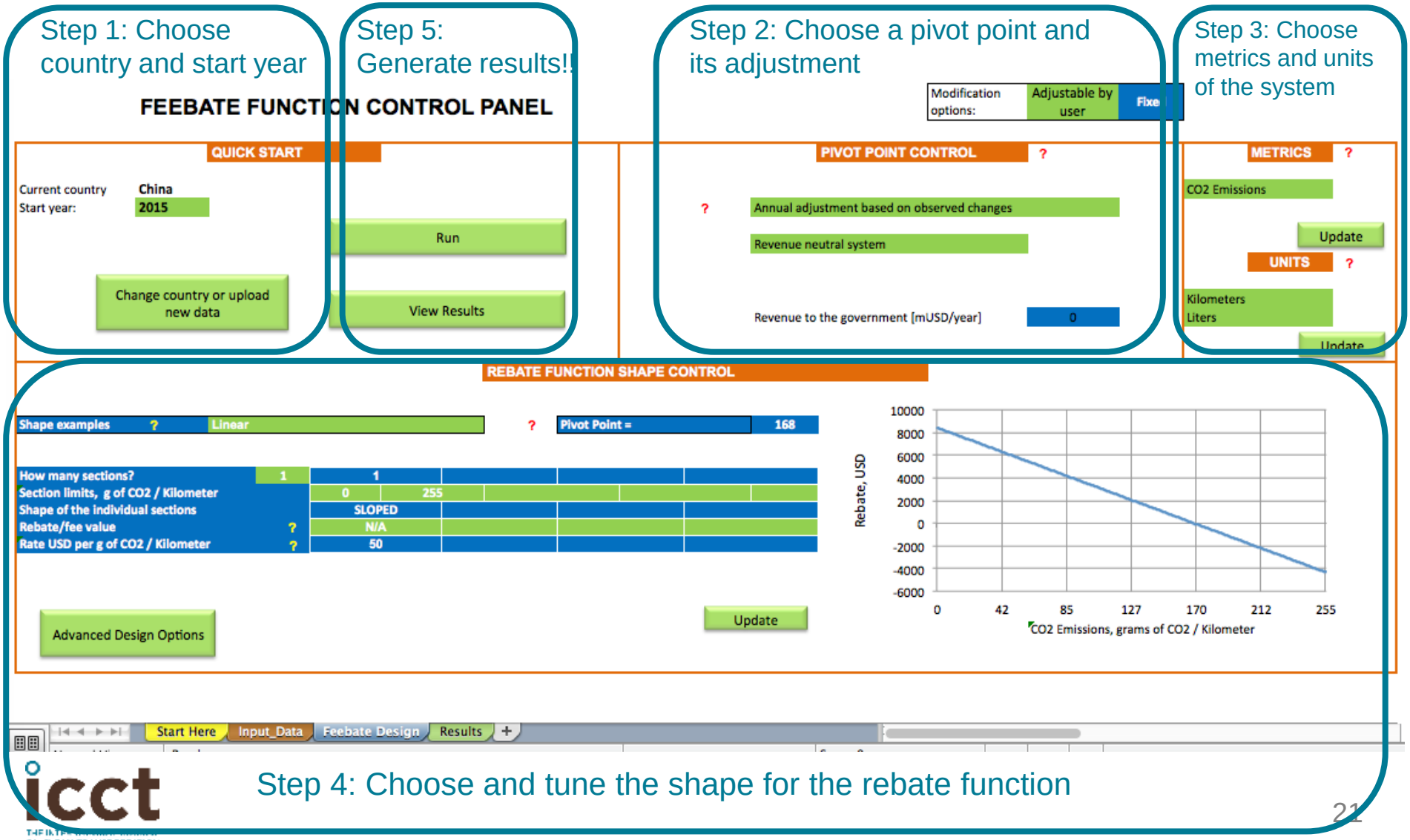
Start to design the feebate system!

Step 1: Choose country and start year

Step 5: Generate results!!

Step 2: Choose a pivot point and its adjustment

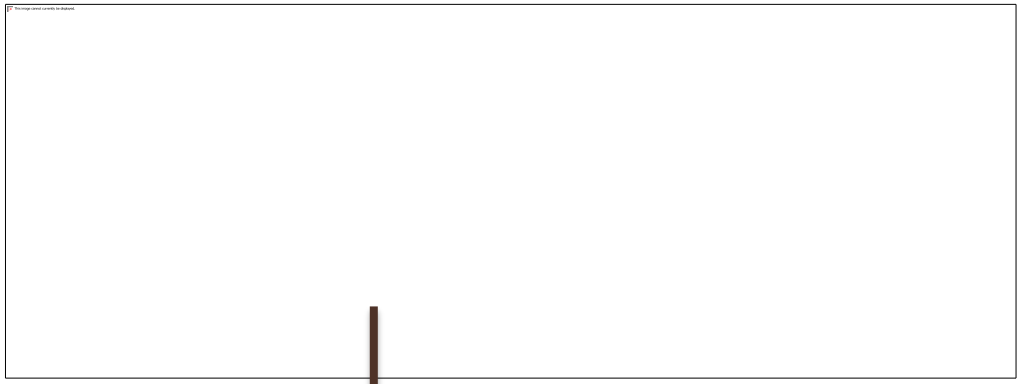
Step 3: Choose metrics and units of the system



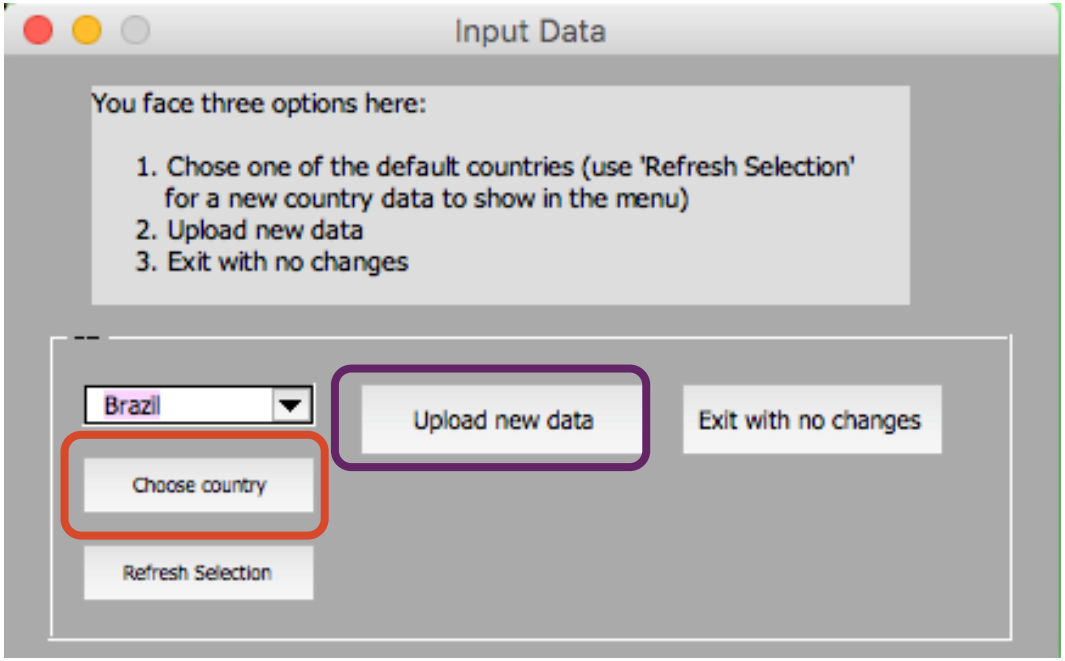
Step 4: Choose and tune the shape for the rebate function

Step 1(a): Choose country

- Choose a default country from the pull down menu



- Or upload your own data (the tool provides instruction as you click)



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Use your own data- get the data ready

- 2014 sales of new vehicles
- Aggregated dataset
  - Aggregate for vehicle segments with a particular fuel type
- Prepared in a separated excel file
  - **Exactly match** with columns in Feebate Tool

CNY

Year	Country	Segment	Fuel	Sales 2014	Price (CNY)	Emission	Power (KW)	Weight (Kg)	l/100km	Size (mm)
2014	China	A	petrol	273548	46205.4	136.6	54.5	907.4	5.8	3.2
2014	China	B	hybrid/petrol	16	516800.0	16.4	125.0	1235.0	0.7	4.0
2014	China	B	petrol	2392708	58056.3	156.0	66.8	1095.1	6.7	3.6
2014	China	C	hybrid/petrol	7659	347898.8	105.2	72.9	1439.5	4.5	4.0
2014	China	C	Natural gas	58586	104218.9	165.3	70.3	1358.1	7.1	3.9
2014	China	C	petrol	6073920	106401.2	155.3	87.2	1233.6	6.6	4.0
2014	China	D	diesel	68	141200.0	189.5	110.0	1615.0	8.1	4.3
2014	China	D	hybrid/petrol	21802	211395.8	67.7	112.0	1654.7	2.9	4.1
2014	China	D	petrol	3278181	153740.3	171.2	105.6	1413.2	7.3	4.2
2014	China	E	hybrid/petrol	12455	401229.1	126.5	118.4	1690.8	5.4	4.5
2014	China	E	petrol	403653	347593.8	176.7	143.2	1542.4	7.6	4.5
2014	China	F	hybrid/petrol	1303	1497527.6	164.4	229.1	2060.3	7.0	5.2
2014	China	F	petrol	481244	603058.7	192.5	163.7	1769.2	8.2	4.9
2014	China	SUV	diesel	339867	219323.0	183.7	112.6	1764.1	7.9	4.3
2014	China	SUV	hybrid/diesel	3	1198000.0	255.0	215.0	2365.0	10.9	4.9
2014	China	SUV	hybrid/petrol	5705	954153.5	201.1	216.5	2200.5	8.6	4.7
2014	China	SUV	petrol	5819740	188361.9	189.9	110.5	1515.3	8.1	4.1

PC Database | PC Database (clean) | Data for feebate tool | +

Upload data to Feebate tool is easy

- Copy and paste into "Input_Data" tab

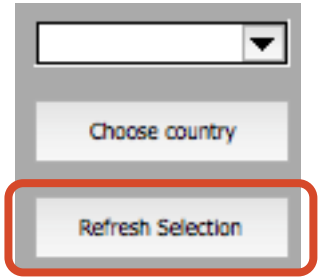
Year	Country	Segment	Fuel	Quantity	Price	Emissions	Power	Weight	l/100km	Size
2014	China	A	petrol	273548.45	46205.4	136.6	54.5	907.4	5.8	3.2
2014	China	B	hybrid/petrol	16	516800.0	16.4	125.0	1235.0	0.7	4.0
2014	China	B	petrol	2392708.13	58056.3	156.0	66.8	1095.1	6.7	3.6
2014	China	C	hybrid/petrol	7659	347898.8	105.2	72.9	1439.5	4.5	4.0
2014	China	C	Natural gas	58586.26	104218.9	165.3	70.3	1358.1	7.1	3.9
2014	China	C	petrol	6073920.28	106401.2	155.3	87.2	1233.6	6.6	4.0
2014	China	D	diesel	67.6	141200.0	189.5	110.0	1615.0	8.1	4.3
2014	China	D	hybrid/petrol	21801.518	211395.8	67.7	112.0	1654.7	2.9	4.1
2014	China	D	petrol	3278180.73	153740.3	171.2	105.6	1413.2	7.3	4.2
2014	China	E	hybrid/petrol	12455	401229.1	126.5	118.4	1690.8	5.4	4.5
2014	China	E	petrol	403652.75	347593.8	176.7	143.2	1542.4	7.6	4.5
2014	China	F	hybrid/petrol	1303	1497527.6	164.4	229.1	2060.3	7.0	5.2
2014	China	F	petrol	481243.65	603058.7	192.5	163.7	1769.2	8.2	4.9
2014	China	SUV	diesel	339867.49	219323.0	183.7	112.6	1764.1	7.9	4.3
2014	China	SUV	hybrid/diesel	3	1198000.0	255.0	215.0	2365.0	10.9	4.9
2014	China	SUV	hybrid/petrol	5704.6	954153.5	201.1	216.5	2200.5	8.6	4.7
2014	China	SUV	petrol	5819739.91	188361.9	189.9	110.5	1515.3	8.1	4.1
2012	Georgia	A	Petrol	419	4419.4	112.7	1287.1	886.3	5.235	
2012	Georgia	B	Diesel	23	4500.0	131.0	1766.7	1150.0	4.800	
2012	Georgia	B	Petrol	2510	4694.7	136.1	1331.0	1025.6	5.699	
2012	Georgia	C	Diesel	85	5466.7	156.7	1873.3	1140.0	5.840	
2012	Georgia	C	Petrol	5076	5506.9	168.0	1693.8	1192.2	7.073	

Start Her | Input_Data | Feebate Design | Problems with step functions | Results | +

Choose country or upload new data

Back to Design

- Click "Chose country or upload new data"
- Click "Refresh Selection", then the new country will show in the pull down menu



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Input exchange rates (if needed)

Advanced Design Options→ Budget Control→ Type in exchange rates

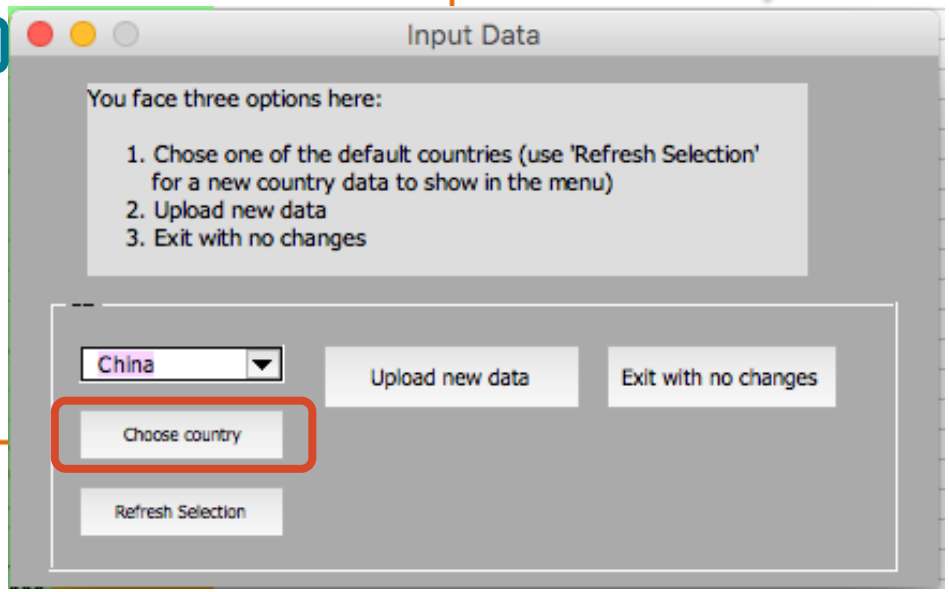
BUDGET CONTROL PANEL

Exchange rates:

Country	Currency	Unit value in USD
France	Euro	1.35
Germany	Euro	1.35
USA	Dollar	1
United Kingdom	Pound Sterling	1.62
Italy	Euro	1.35
Australia	AUD	0.92
Brazil	Real	44
Russia	Ruble	0.03
Georgia	USD	1
South Africa	Rand	0.0944738
China	*CNY*	*0.15*
country	*currency*	*rate*
country	*currency*	*rate*
country	*currency*	*rate*
country	*currency*	*rate*
country	*currency*	*rate*
country	*currency*	*rate*
country	*currency*	*rate*
country	*currency*	*rate*

Back to Design

Must do !
If not, the system will remind and guide you when you choose input data



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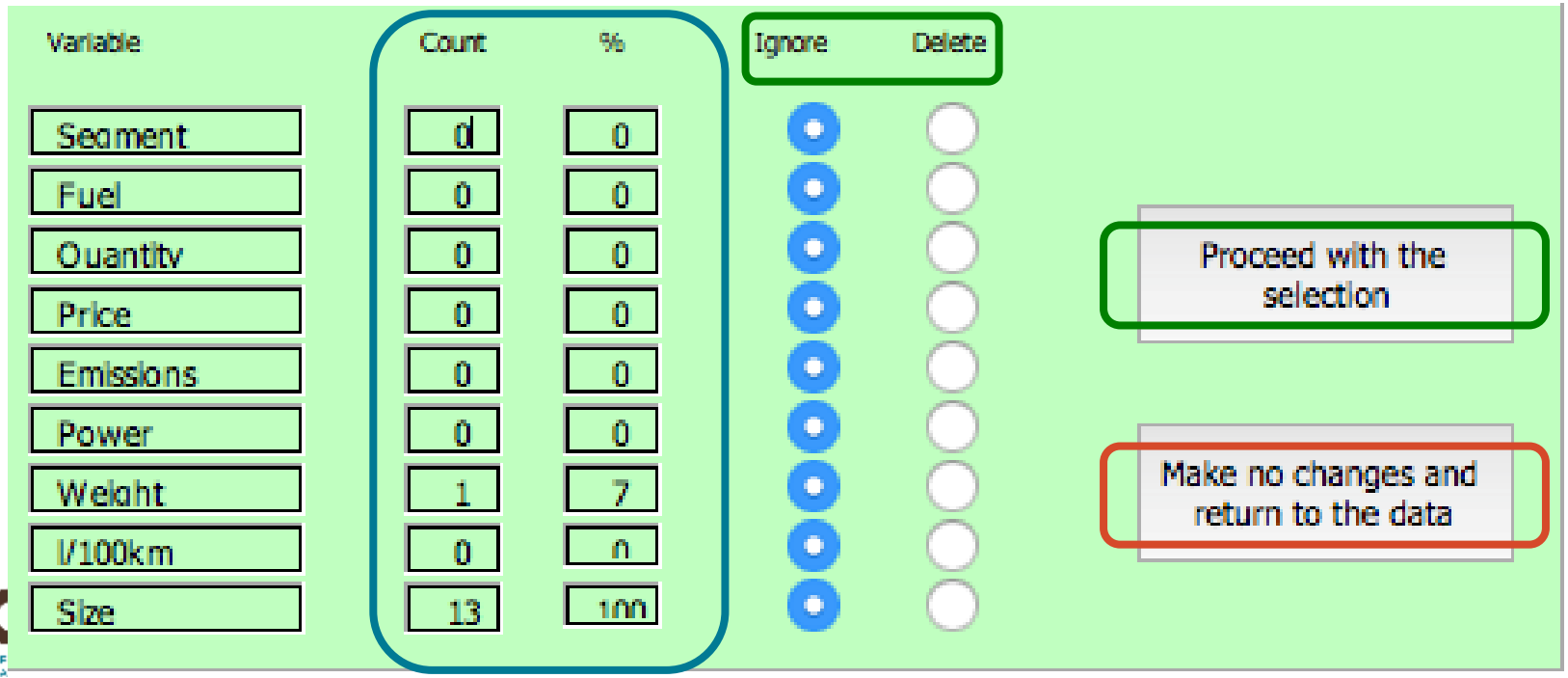
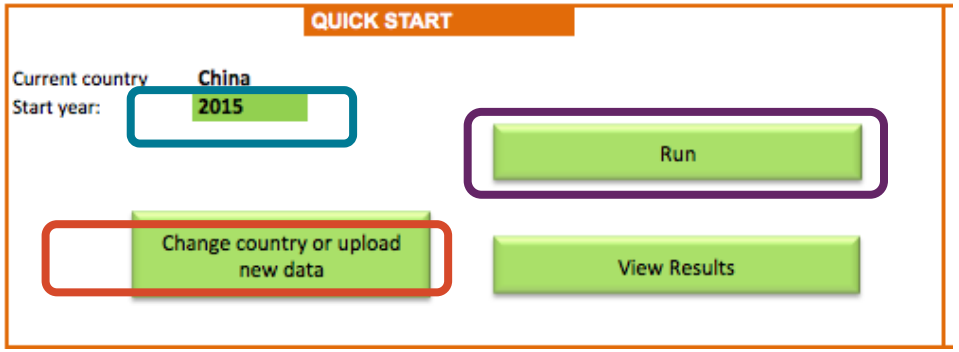
Options to deal with missing data points

- After choose country- automatic system warning
- Options:
  - Go back and estimate the missing cell, or
  - Choose ignore or delete the problematic data points, or
  - Go back and choose a default country



Step 1(b): Choose start year

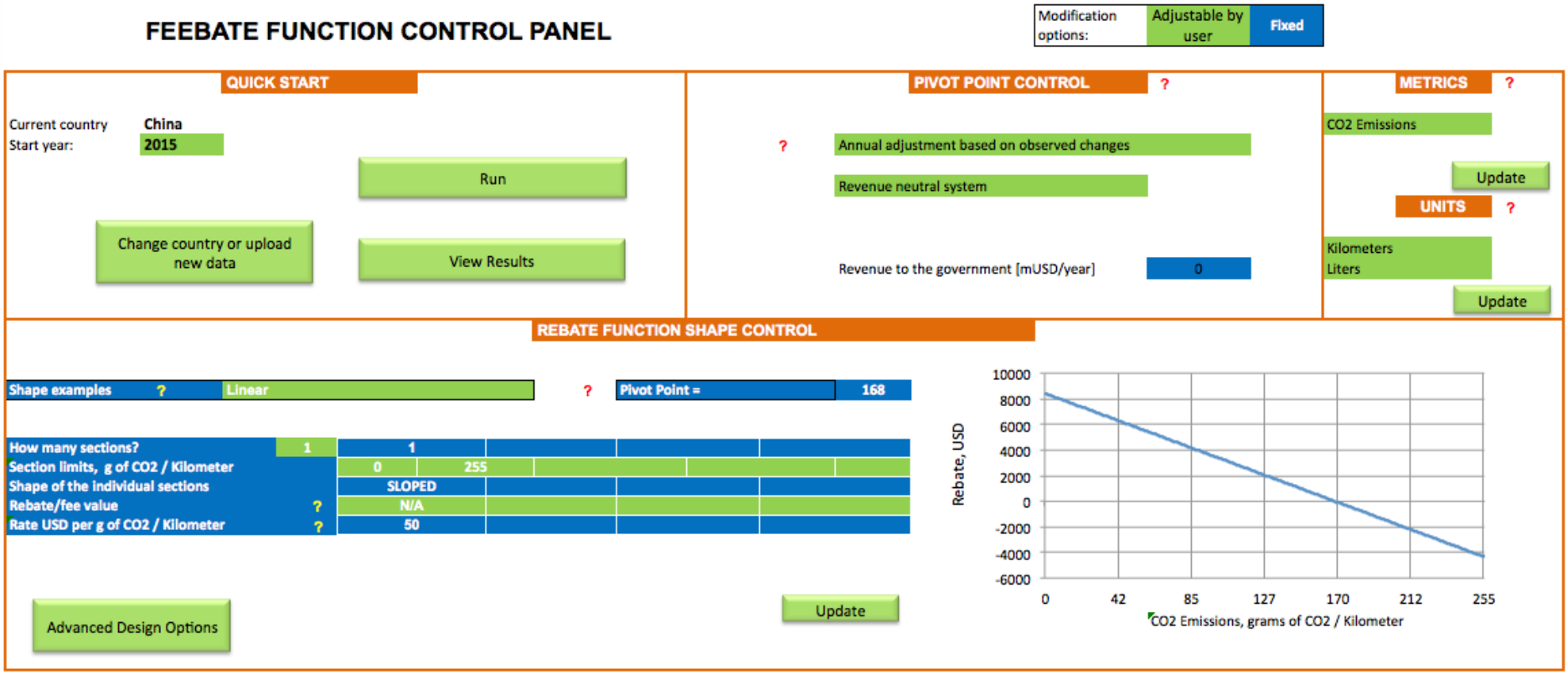
- Type in the starting year for your assessment
- Start to generate results with the default feebate system design by clicking run



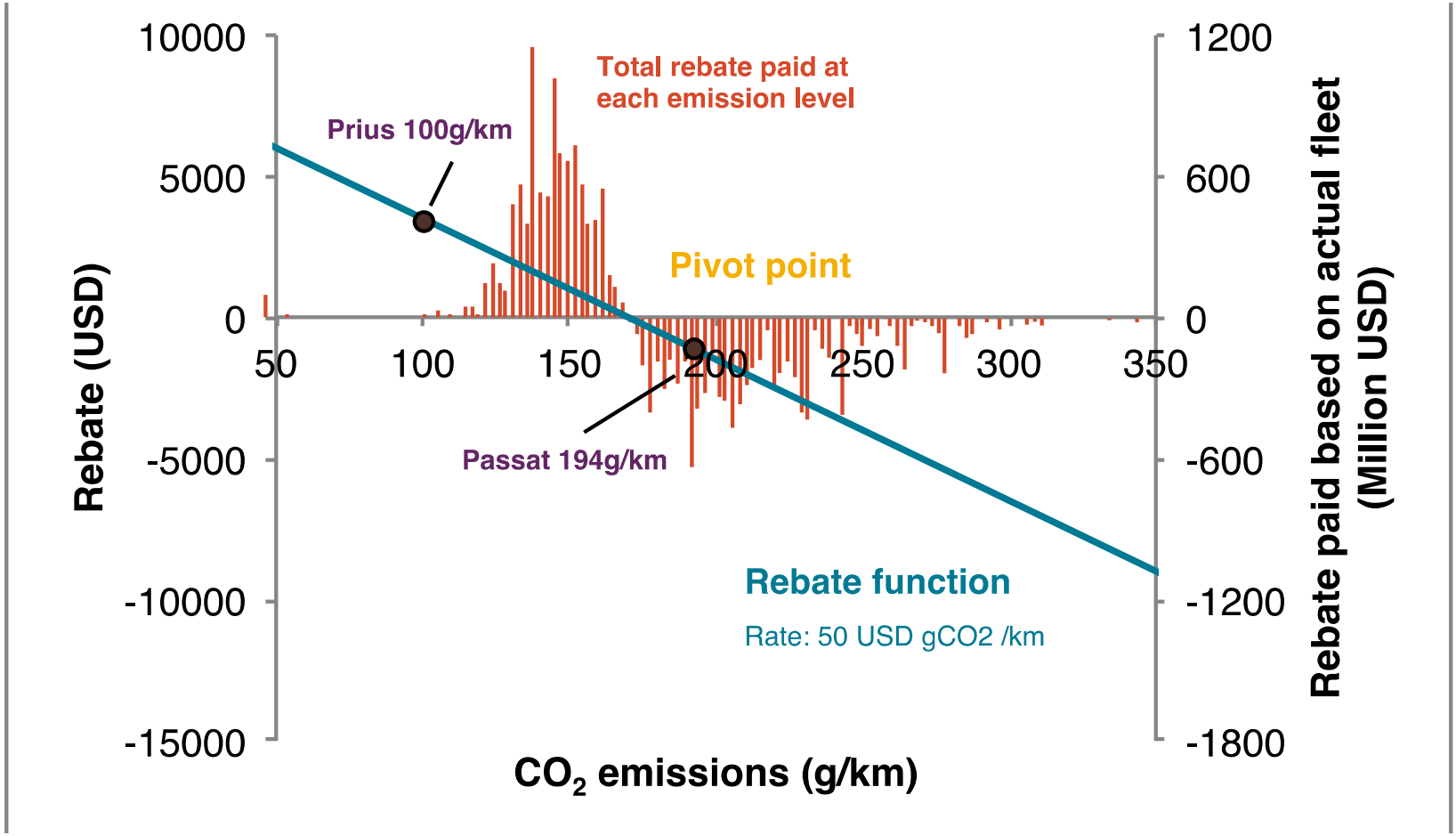
- Or modify the default design and design your own feebate system following step 2-4

What is in the default design?

- Annual adjustment based on observed changes
- Revenue neutral system
- Tax on CO_2 emission, no attribute adjustment
- Rebate function is a linear line, 50 USD per gCO_2/km

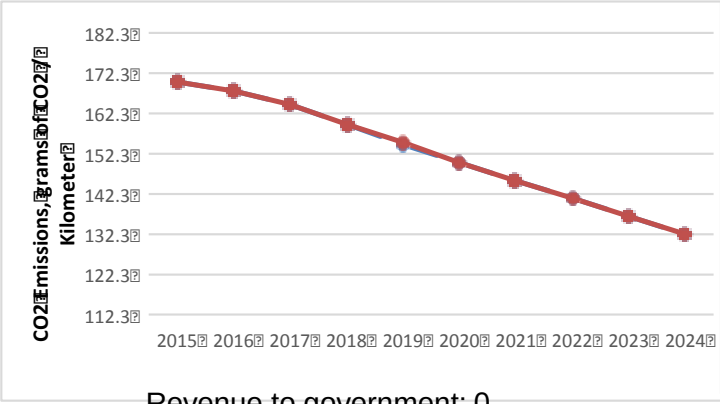


Rebate function for China feebate system based on default design

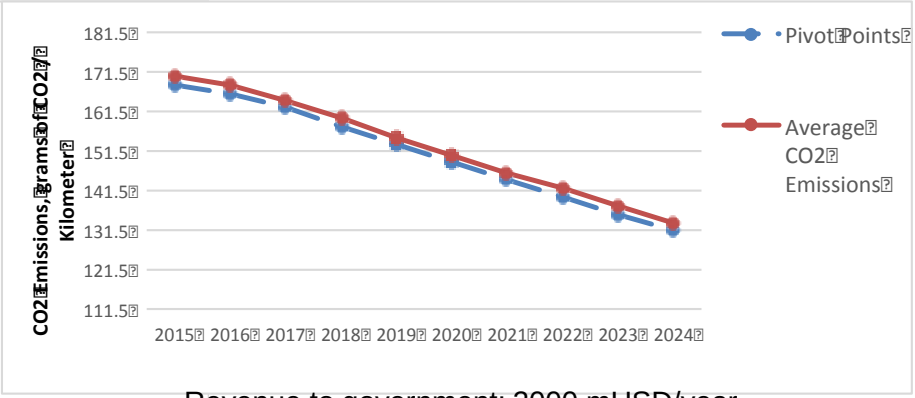


Step 2: Choose a pivot point and its adjustment

- Annual adjustment based on observe changes

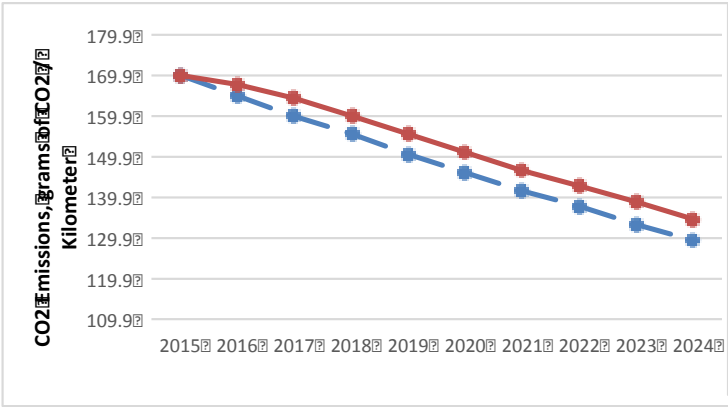


Revenue to government: 0

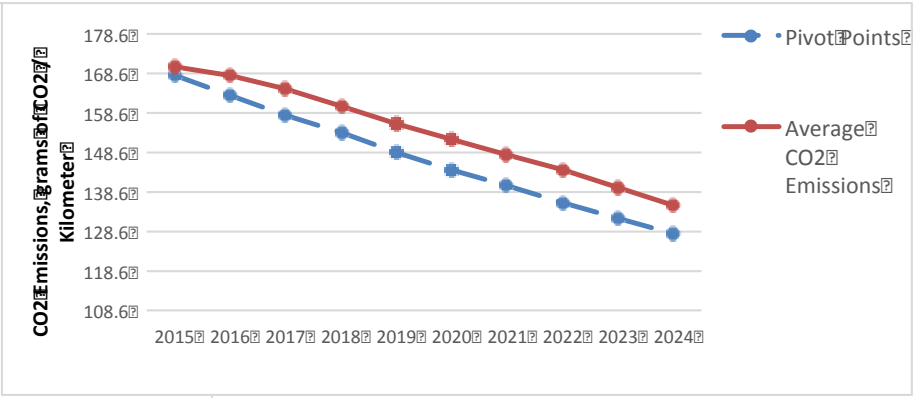


Revenue to government: 2000 mUSD/year

- Annual adjustment based on fixed criteria



Shift 3% every year; Revenue: 0 first year

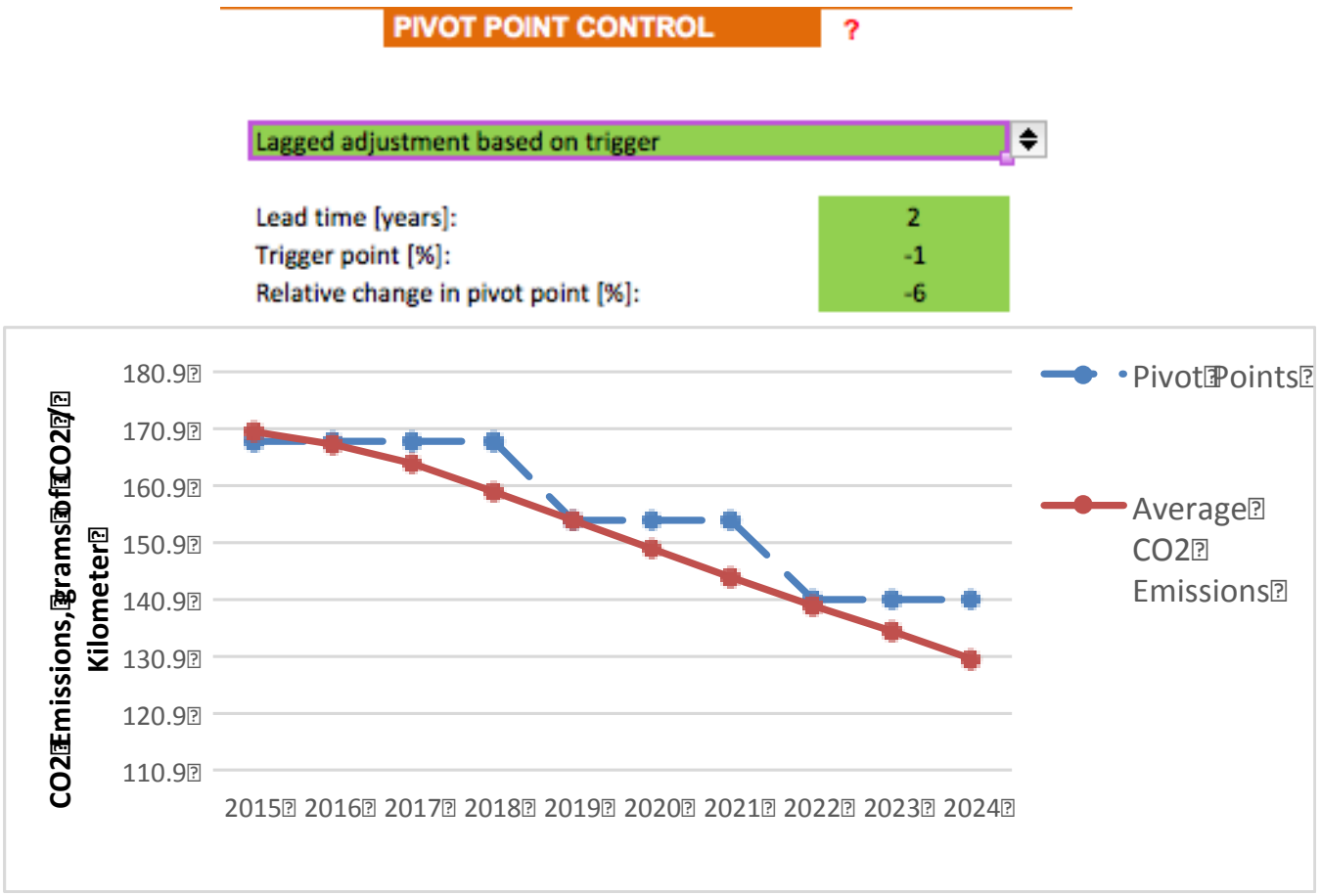


Shift 3% every year; Revenue: 2000 mUSD first year

Subject to actual market response to the feebate system and the actual net revenue is uncertain.

Step 2: Choose a pivot point and its adjustment

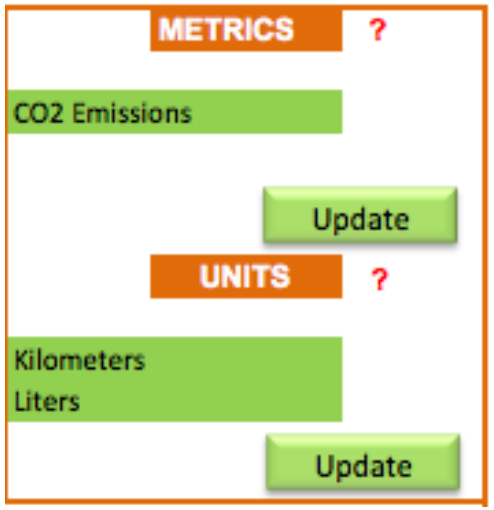
- Lagged adjustment based on trigger



Manual pivot point control: go to Step 4

Step 3: Choose metrics and units of the system

- Metrics
  - CO_2 emission
  - Fuel economy
    - Fuel consumption (Volume/Distance)
    - Fuel efficiency (Distance/Volume)

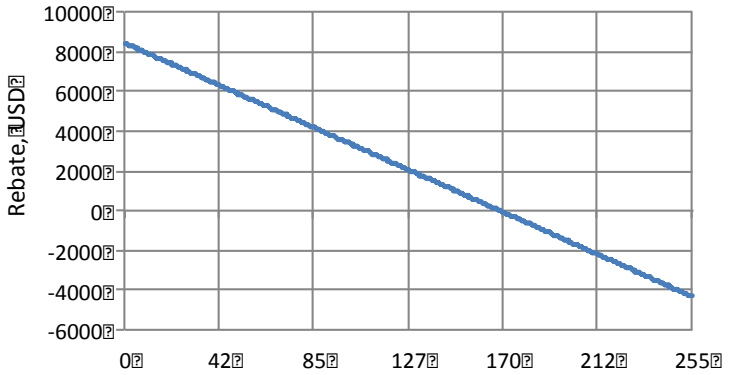


- Units (for fuel economy)
  - Kilometer/mile
  - Liters/gallon

- Must click "**Update**" after the change!

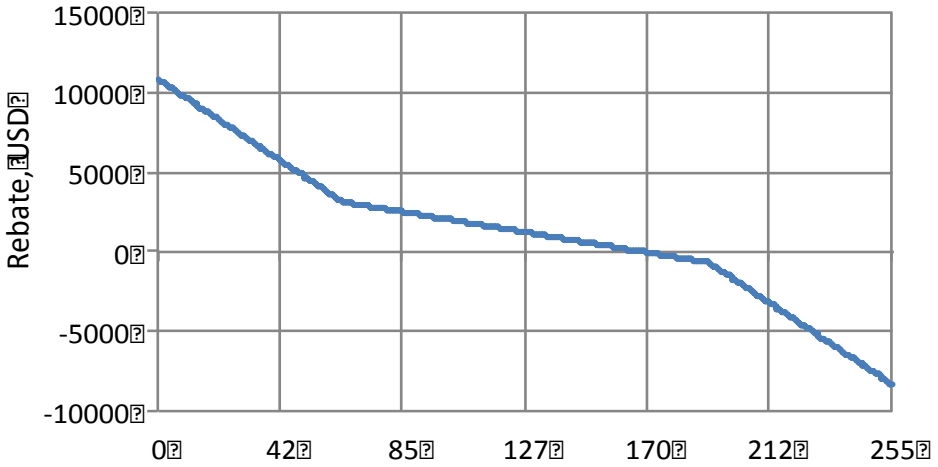
Step 4: Choose and tune the shape for the rebate function

- Linear (50 USD gCO_2/km)



- Linear piecewise

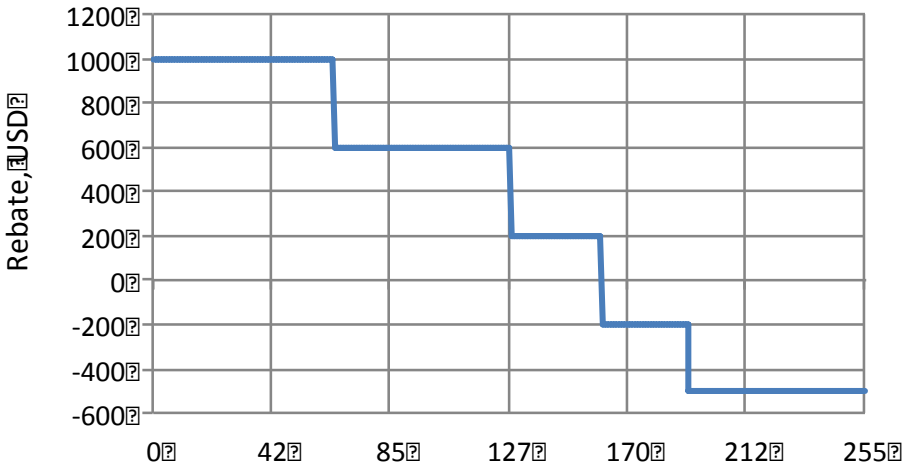
(30-120 USD gCO_2/km)



How many sections?	4	1	2	3	4
Section limits, g of CO2/Kilometer		0	64	162	191	255
Shape of the individual sections		SLOPED	SLOPED	SLOPED	SLOPED
Rebate/fee value	?	N/A	N/A	N/A	N/A
Rate USD per g of CO2/Kilometer	?	120	30	30	120

Step 4: Choose and tune the shape for the rebate function

- Step-based with uniform/uneven steps
  - By default, only feasible when “Manual Pivot Point Control” is chosen. Change pivot point manually.
  - Change default setting through “Advance Design Option”. The tool determine a pivot point that makes the balance as small as possible.
- Or “Design your own” to mix linear and step-based



Shape examples ?	Step-based with uniform steps	?	Pivot Point =	160

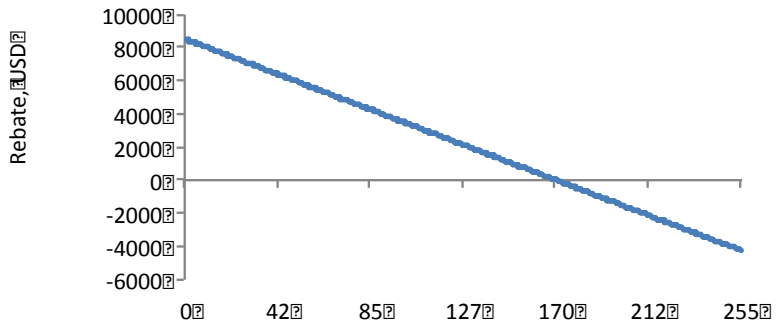
How many sections?	4	1	2	3	4
Section limits, g of CO2/ Kilometer		0	64	127	191	255
Shape of the individual sections		FLAT	FLAT	FLAT	FLAT
Rebate/fee value	?	1000	600	200	500
Rate USD per g of CO2/ Kilometer	?	N/A	N/A	N/A	N/A

Step 5 Generate results

You could general results any time after Step 1

Results -Policy summary and pivot points

Policy summary



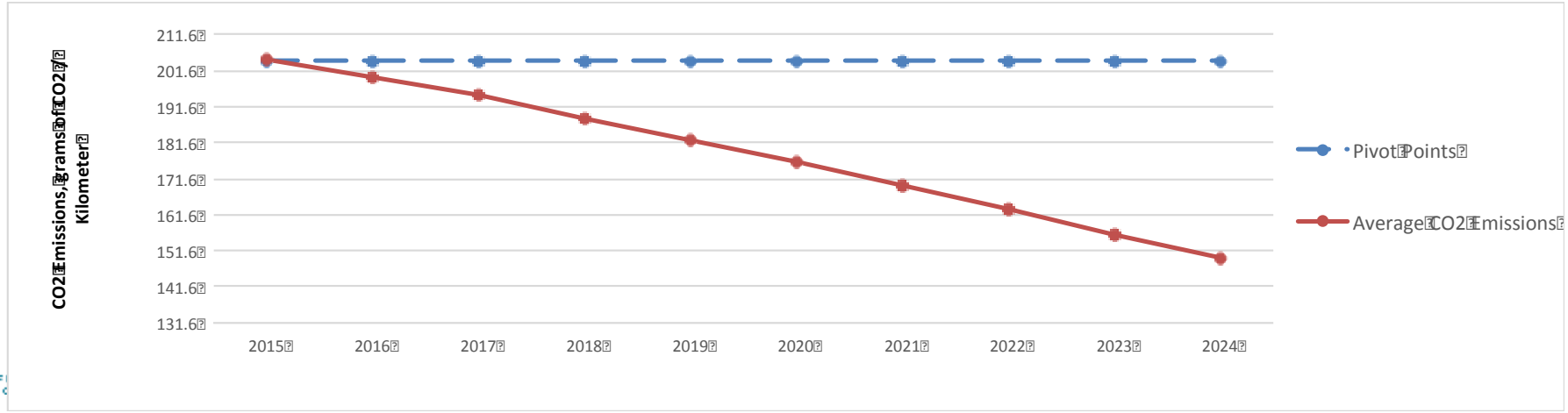
Annual□adjustment□based□on□fixed□criteria	
Revenue□neutral□system	
Shift□in□Pivot□Point□[%□/□period]	3
Revenue□to□the□government□[mUSD/year]	0

Evolution of the pivot point over time

CO2 Emissions, grams of CO2 / Kilometer

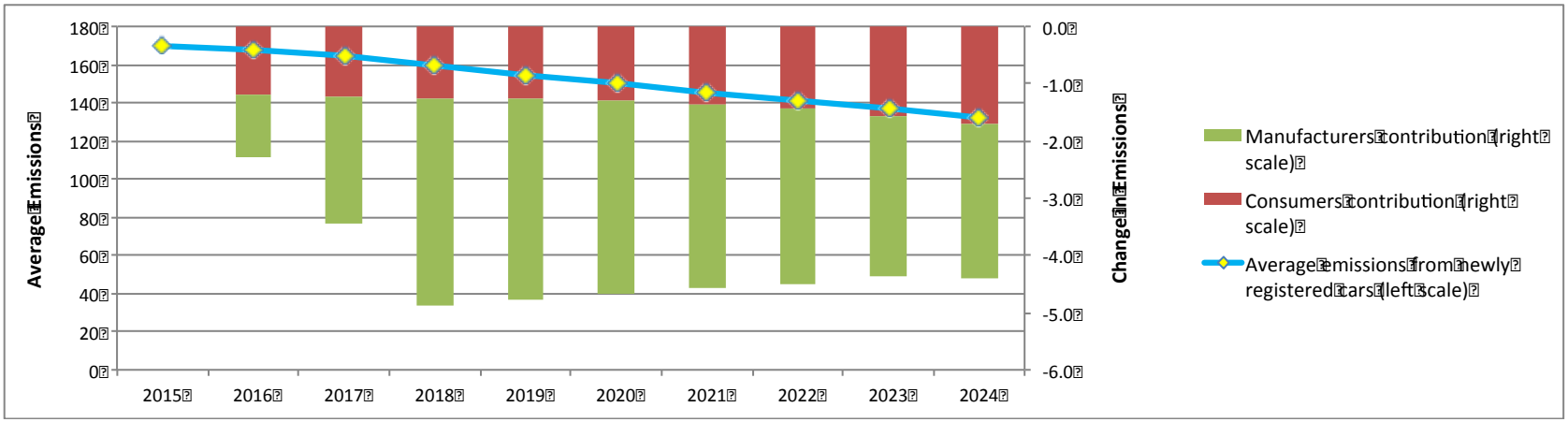
Revenue to the government [mUSD/year]

Years	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pivot□Points	204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3	204.3
Average	204.5	199.8	194.5	188.5	182.4	176.3	169.7	163.0	156.3	149.6



Results -Emissions and reduction contributions

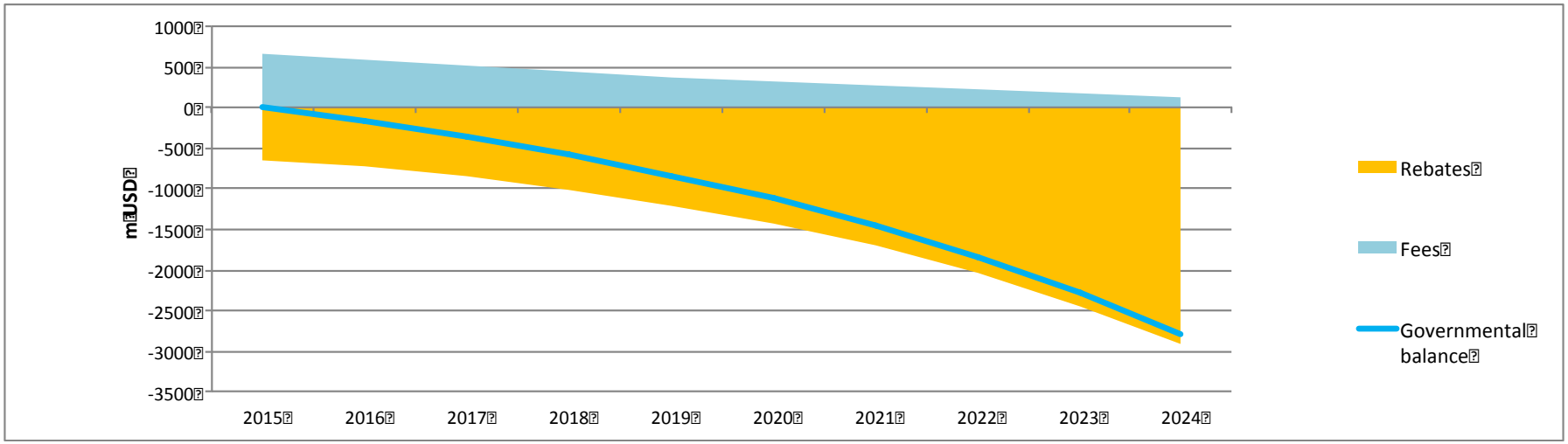
Emissions



Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Average emissions from newly registered vehicles (CO2 level)	170.2	167.9	164.4	159.6	154.8	150.1	145.6	141.1	136.7	132.3
Change in average emissions (year-on-year)	0.0	-2.3	-3.4	-4.9	-4.8	-4.7	-4.6	-4.5	-4.4	-4.4
Consumers contribution to year-on-year CO2 change	0.0	-1.2	-1.2	-1.2	-1.3	-1.3	-1.3	-1.4	-1.6	-1.7
Manufacturers contribution to year-on-year CO2 change	0.0	-1.1	-2.2	-3.6	-3.5	-3.4	-3.2	-3.0	-2.8	-2.7

Results –Monetary flow and government balances

Budget

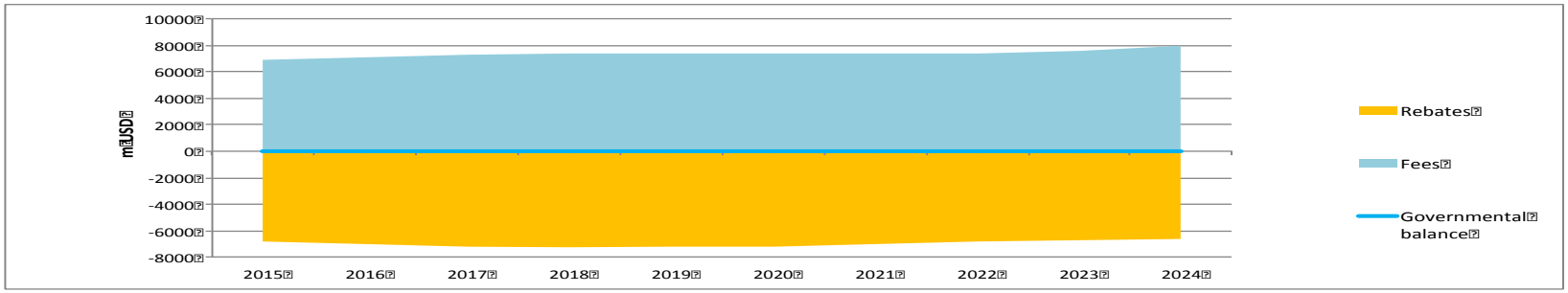


Fiscal balance of the simulated feebate system, millions USD

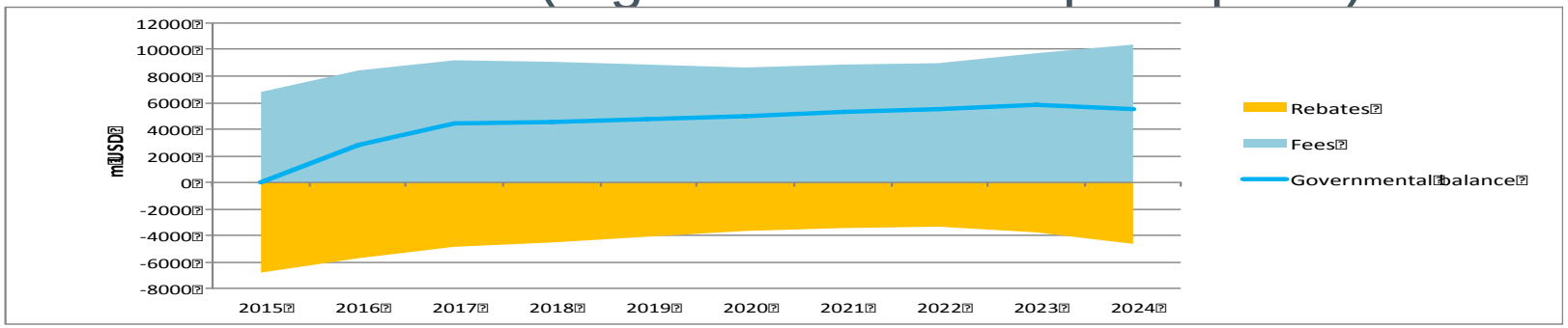
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Rebates	-644.2	-734.9	-853.2	-1011.4	-1201.3	-1428.6	-1705.5	-2038.0	-2435.8	-2908.8
Fees	650.7	577.5	504.8	432.2	371.2	318.8	260.8	209.1	163.6	124.5
Administrative costs	-6.5	-6.5	-6.7	-7.1	-7.7	-8.5	-9.5	-10.8	-12.5	-14.5
Governmental balance	0.0	-163.9	-355.1	-586.2	-837.8	-1118.3	-1454.3	-1839.8	-2284.7	-2798.9
Cumulative governmental balance	0.0	-163.9	-519.0	-1105.3	-1943.1	-3061.4	-4515.6	-6355.4	-8640.1	-11438.9

Fiscal balance

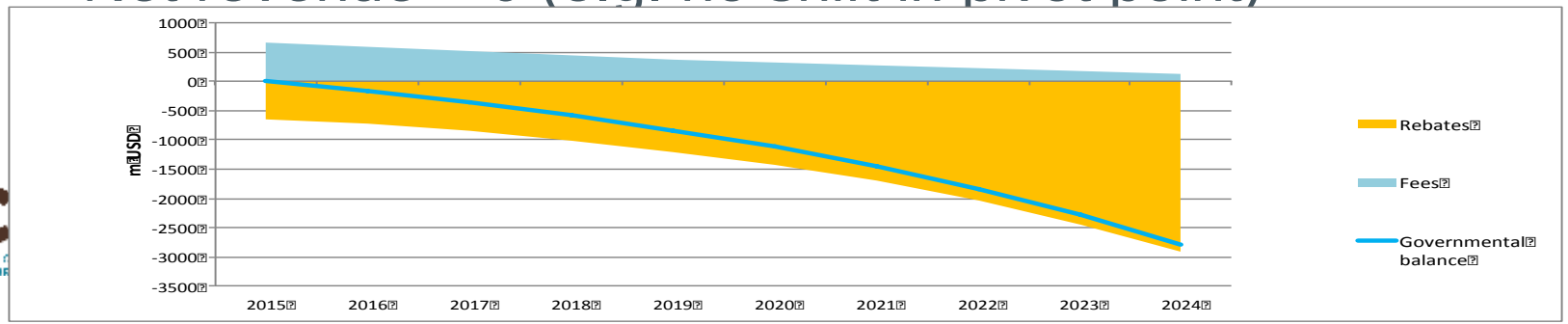
- Budget neutral (e.g. pivot point shift as observed)



- Net revenue > 0 (e.g. fix 3% shift of pivot point)



- Net revenue < 0 (e.g. no shift in pivot point)



Best practices of feebate program

Prerequisite: A mechanism that collects fuel efficiency/CO_2 emission information on individual vehicles (e.g. a labeling program)

- A continuous and linear feebate rate line, without any breaks or discontinuities.
- The pivot point set to make the system self-funding and sustainable, and periodically adjusted to compensate for changing conditions.
- A linear metric, such as CO_2 emissions or fuel consumption per unit of distance.
- An attribute adjustment (if one is used) based on vehicle size, not any other metric.

More information…

- Feebate Simulation Tool and User Guide
  http://theicct.org/feebate-simulation-tool
- Best Practices for Feebate Program Design and Implementation http://www.theicct.org/best-practices-feebate-program-design-and-implementation
- Review and comparative analysis of fiscal policies
  http://www.theicct.org/review-and-comparative-analysis-fiscal-policies

- Contact
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