Present and future road vehicles: EBP's databases and simulation tools for energy policy forecasting and analysis

#### sim.offer

Technical characteristics of all vehicle types being on offer in the car market for a given year

Technical description (version May 2016)



Purpose What does the detailed car fleet being on offer look like for a given					
year in the future, accounting for CO <sub>2</sub> goals and electrification?					
<i>sim.</i> offer	<i>sim.</i> car	sim. fleet	<i>sim.</i> drive		
technical characteris- tics of tomorrow's flee of car types on offer, based on type- approval data	et microsimulation of car purchase beha- vior, policy effects, and resulting new car registrations	combining annual new car registra- tions with survival rates for the static fleet in a given year	joining kilometric performances to the static fleet for the dynamic fleet in a given year		
<ul> <li>Input data &gt; Type-approval data (from national road admission authority)</li> <li>&gt; Sales price per vehicle type, for given year</li> <li>&gt; Scenario data based on Autonomous Technical Potential, and – if present – on g CO<sub>2</sub>/km policy targets</li> <li>&gt; Algorithms for the switch of vehicle types from fossil to electric</li> </ul>					
Output data	List of 6000+ vehicle types (make, model, powertrain) incl. detailed engine configuration, g $CO_2$ /km, fuel consumption, rated power, empty weight, total weight, engine capacity; for the chosen scenario, for a given future target year; to be used as input for <i>sim</i> .car.				
Implementation	sim.offer is implemented a user-defined input parame	is MS Access application; eters are supplied as MS E	Excel table.		

www.ebp.ch Phone ++41 44 395 11 11 Fax ++41 44 395 12 34 Phone ++41 44 395 11 14 (direct) peter.dehaan@ebp.ch 1\_sim.offer\_description\_v160528.doc

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#### *sim*.car

Purpose

Microsimulation of car purchase behavior, annual new car registrations and effects of tax rebates or other incentive schemes

Technical description (version May 2016)



How does car purchase behavior translate the offer side to the de-
mand side? What is the effect of incentive schemes and taxes?

<i>sim.</i> offer		<i>sim.</i> car	<i>sim.</i> fleet	<i>sim.</i> drive
technical charac tics of tomorrow of car types on based on type- approval data	cteris- w's flee offer,	t microsimulation of car purchase beha- vior, policy effects, and resulting new car registrations	combining annual new car registra- tions with survival rates for the static fleet in a given year	joining kilometric performances to the static fleet for the dynamic fleet in a given year
Input data	<ul> <li>&gt; Sociodemographics of synthetic population</li> <li>&gt; Fleet of currently registred vehicles (allocated to households by <i>sim</i>.cat</li> <li>&gt; Fleet of all new vehicle types on offer in the market (from <i>sim</i>.offer)</li> <li>&gt; Car choice model parameters for 41 consumer groups</li> <li>&gt; User settings, if present including policy parameters of incentive scher</li> <li>&gt; Retention rates (from BAM survey): brand retention, size class retentic fuel type retention, gear type retention</li> </ul>		households by <i>sim</i> .car) ket (from <i>sim</i> .offer) roups ers of incentive scheme ion, size class retention,	
Output data	> Detailed data on millions of car sales> Aggregated data (input file to sim.fleet) on new car registrations per		car registrations per year	
Implementation		Fortran2000, proprietary software (40 000 code lines)		
Literature	Mueller I of new c de Haan consume	M G, de Haan P, 2009. How much do in ars, part I: Model structure, simulation of P, Mueller M G, Scholz R W, 2009. He r choice of new cars, part II: Forecasting	centives affect car purchase? Agent-base f bounded rationality, and model validat ow much do incentives affect car purcl effects of feebates based on energy-effi	ed microsimulation of consumer choice ion. Energy Policy, 37, 1072–1082. hase? Agent-based microsimulation of iciency. Energy Policy, 37, 1083–1094.

Ernst Basler + Partner AG www.ebp.ch Resources, energy + climate Phone ++41 44 395 11 11 Dr Peter de Haan van der Weg Zollikerstrasse 65, 8702 Zollikon, Switzerland 2\_sim.car\_description\_v160528\_long.doc

Fax ++41 44 395 12 34 Phone ++41 44 395 11 14 (direct) peter.dehaan@ebp.ch

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#### sim.fleet

Modeling of the static fleet of registered cars for the next year, based on last year's fleet and new car registrations

Technical description (version May 2016)



Purpose Which fleet of registered vehicles emerges from past new car regis- trations, yielding which annual car ownership tax revenues?				
sim. offer	<i>sim.</i> car	<i>sim.</i> fleet	<i>sim.</i> drive	
technical characteris- tics of tomorrow's fle of car types on offer, based on type- approval data	et microsimulation of car purchase beha- vior, policy effects, and resulting new car registrations	combining annual new car registra- tions with survival rates for the static fleet in a given year	joining kilometric performances to the static fleet for the dynamic fleet in a given year	
<ul> <li>Input data &gt; Annual new car registrations for subsequent years <i>T</i>+1 to <i>T</i>+<i>t</i> (series of output files from <i>sim</i>.car)</li> <li>&gt; Starting fleet (static) for year <i>T</i> (data source: national car registry)</li> <li>&gt; Survival rates per car segment and cohort, derived from comparison of two static fleets for years <i>T</i>-1 and <i>T</i> (data source: national car registry)</li> </ul>				
Output data	Lists with static fleet share for all vehicles types (highly detailed: $6000+$ vehicles types, differentiated by gearbox and powertrain configuration) for years $T+1$ to $T+t$ ; .All possible car ownership tax parameters are included. To be used as input file to <i>sim</i> .drive.			
Implementation	<i>sim</i> .fleet is implemented rived using MS Access.	as an MS Excel applicatior	n. Survival rates are de-	

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### sim.drive

Computation of CO<sub>2</sub> emissions (and CO<sub>2</sub> reduction due to policies) using annual kilometres per car segment.

Technical description (version May 2016)



Purpose How does total annual mileage split up to the different detailed car types, resulting in which energy demand and CO <sub>2</sub> emissions?				
<i>sim.</i> offer	sim. car	sim. fleet	<i>sim.</i> drive	
technical characteris- tics of tomorrow's flee of car types on offer, based on type- approval data	et microsimulation of car purchase beha- vior, policy effects, and resulting new car registrations	combining annual new car registra- tions with survival rates for the static fleet in a given year	joining kilometric performances to the static fleet for the dynamic fleet in a given year	
Input data> Total annual kilometric performance> Input parameters on relative share per car segment in km driven				
Output data	<ul> <li>&gt; Kilometers driven for a given year, per car segment, type approval, etc.</li> <li>&gt; Related energy demand, CO<sub>2</sub> emissions, etc.</li> <li>&gt; Difference between BAU run and a policy run yields energy savings and CO<sub>2</sub> reduction per year, for the policy in question</li> </ul>			
Implementation	<i>sim</i> .drive is implemented as MS Access application; user-defined input parameters are supplied as MS Excel tables.			

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