

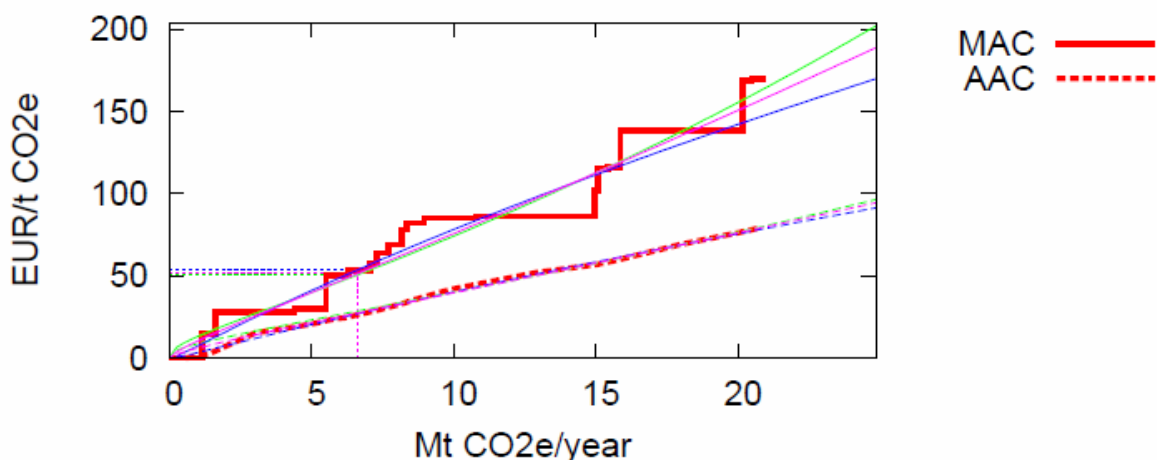
ABATEMENT OPTIONS AND CLIMATE POLICY CHOICES

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Marginal abatement cost estimates have had a notable impact on public perceptions regarding the economic cost of greenhouse gas abatement policies, yet these estimates are narrowly defined on a partial equilibrium basis. This paper focuses on the question of how to integrate bottom-up assessments of greenhouse gas abatement options into top-down analyses of economic cost.

Our methodology is illustrated for an analysis of abatement options using McKinsey data for Switzerland. The McKinsey & Company study (2009), "Swiss Greenhouse Gas Abatement Cost Curve" finds that abatement of 8.3 Mt CO₂e is possible at zero cost. The McKinsey analysis is intriguing yet incomplete, as they examine only technical rather than market potential. We consider how to best integrate these technical assessment in an economy-wide framework. Depending on how the McKinsey data are interpreted, the cost of greenhouse gas abatement covers a substantial range. The relative attractiveness of technology mandates as compared with uniform pricing depends on the existence of significant market imperfections in individuals' vehicle investment decisions.

We demonstrate three approximation approaches in which we fit neoclassical constant elasticity functions to approximate the McKinsey technology options using ordinary least square method. The following Figure illustrates one of the results for marginal (MAC) and



average (AAC) abatement cost curves approximation. The representation of decreasing returns to scale technologies is explained using Marshallian concepts in Arrow-Debreu models.

We then incorporate explicit sectoral dimensions of the bottom-up model within an economy-wide model to explore alternative explanations of market failures in the markets for energy efficiency investments. Using Swiss social accounts and energy statistics we quantify the implications of these perspectives, focusing on the implications of improvements in motor vehicle technologies for the cost of fulfilling Switzerland's climate obligations.

Finally, we test the approximation in a static top-down model for Switzerland, calibrated to 2005 social accounts. The key issue in climate policy design is instrument choice. In stark

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terms, there is a choice between *uniform taxation* which is first best in the undistorted competitive economy and *efficiency standards* which can be used to correct for systematic errors in vehicle choice. We find that when pollution abatement options are represented in the aggregate through either activity analysis or smooth approximation, the economic cost of abatement is virtually identical. However, we find that the smooth representation fails to account for induced impacts in the demand for energy services and can lead to a substantial underestimate of the cost of climate policy objectives.