Essays on Empirical Microeconomics

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Abstract

This thesis consists of four essays on empirical microeconomics. The first three essays focus on the 2008 differentiation of Finnish car tax rates. The focus of the fourth essay (joint work with Christina Gathmann and Kristiina Huttunen) is on the health consequences of job loss.

In the first essay, I estimate the distributional and environmental effects of the 2008 CO2 differentiation of Finnish ad valorem car tax rates on the market for new cars. My differentiated-product oligopoly model shows that this environmentally motivated demand-side fiscal policy did not drive the observed decline of new-car CO2 emissions rates, given the concurrent introduction of mandatory EU CO2 emissions standards for manufacturers. However, the preferential tax treatment of cars with low CO2 emissions rates increased local pollution due to higher sales of diesel cars. The tax reform was a regressive policy with substantial tax revenue losses and a disproportional benefit to high-income consumers. Optimal fiscal policy aiming to balance environmental and public finance goals needs to consider both the market structure as well as other concurrent policies on different levels of government.

In the second essay, I estimate the effect of the Finnish 2008 car tax reform on CO2 emissions rates of new cars, a key statistic for policymakers. My flexible reduced-form approach uses detailed vehicle registration data, and does not rely on explicit modeling of economic primitives. The results confirm the limited impact of the domestic fiscal policy on CO2 emissions rates of new cars in Finland.

The third essay demonstrates the failure of nested logit demand models to generate reasonable economic implications in this market where the product-specific tax rate is an increasing function of a continuous product characteristic. The computational burden of the random-coefficients logit demand model used in the first essay is therefore both justified and required.

In the fourth essay, we quantify the effect of job loss on mortality and find evidence of spillover effects inside the family. The empirical analysis compares workers displaced due to plant closure in Finland’s great recession between 1991 and 1993 to workers not displaced in a plant closure. We find that the mortality risk of job loss is distributed asymmetrically across genders: if a man loses his job, both spouses suffer a higher risk of dying. If a woman loses her job in contrast, we find no increase in mortality for either spouse.

Keywords differentiated-product oligopoly, carbon taxation, environmental taxation, tax reform, automobile market, demand estimation, policy evaluation, welfare effects, displacement, mortality, family

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**Essay 1:** “Distributional and Environmental Effects of an Emissions-Differentiated Car Sales Tax”, unpublished manuscript

**Essay 2:** “CO\textsubscript{2} Differentiation of Automobile Sales Tax Rates and Emissions Rates of New Cars”, unpublished manuscript

**Essay 3:** “Automobile Demand Estimation with Differentiated Taxation: Implications of Model Choice”, unpublished manuscript

**Essay 4:** “Job Loss and Health Spillovers in the Family”, unpublished manuscript joint with Christina Gathmann and Kristiina Huttunen
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Eteenpäin, sanoi mummo lumessa.

(Forward, said the grandmother in the snow.)

Finnish proverb
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1 Introduction

This thesis is a collection of four essays on empirical microeconomics. The first three essays focus on the 2008 differentiation of Finnish car tax rates and address the research question: What are the effects of this environmental tax reform on the market for new passenger cars, and how can we estimate them? The first three essays contribute (in alphabetical order) to the fields of environmental economics, industrial organization, and public economics. The focus of the fourth essay (joint work with Christina Gathmann and Kristiina Huttunen) is on the health consequences of job loss: Does job loss increase the risk of mortality, the ultimate health outcome, and is there a spillover effect in the family? The fourth essay contributes to the fields of health economics and labor economics.

1.1 Automobile Taxation as Environmental Policy

Passenger cars are both horizontally and vertically differentiated products, and the market is an oligopoly. The effect of taxation in such a differentiated-product oligopoly critically depends on tax incidence. Firms can respond to taxation by adjusting price-cost markups depending on their market power. Key challenges to the empirical analysis of tax incidence are price endogeneity, consumer heterogeneity, and the large size of the consumer choice set. Berry (1994) develops a methodological framework from market data to estimate the supply and demand of a differentiated product in an oligopoly. His approach corrects for price endogeneity and keeps the consumer choice set tractable by modeling products in a characteristics space. Berry et al. (1995, thereafter BLP) extend this framework to include consumer heterogeneity in the demand model. Petrin (2002) further shows how to use information from micro-level data in the BLP estimation to increase the precision of the estimation and to allow for a richer demand specification.

In the first essay, I build on these important methodological contributions to study the distributional and environmental effects of an emissions-
differentiated car sales tax. The European Union and its member countries introduced a combination of supply- and demand-side policies during the last ten years to reduce CO$_2$ emissions rates of new passenger cars. Supply-side CO$_2$ standards for manufacturers effectively force the industry to produce cleaner cars, and individual member countries employ a range of additional fiscal policies to guide consumers towards the purchase of cleaner cars. CO$_2$ emissions rates of new cars sold in Europe have been declining strongly following the introduction of these policies, but disentangling their individual impact is non-trivial. Finland used one of the most drastic fiscal policies targeting consumers. The country has long taxed the value of passenger cars at first registration in the country with the so-called car tax, a de facto ad valorem sales tax on new cars. In January 2008, Finnish policymakers differentiated car tax rates by vehicle-specific CO$_2$ emissions ratings. Vehicle-specific tax amounts thus became increasing functions of both price and CO$_2$ emissions rating. Total tax rates under the differentiated car tax range from 39 to 138 percent, whereas the non-differentiated pre-reform car tax had a total tax rate of around 77 percent including VAT. I study this tax reform to evaluate the impact of demand-side fiscal policy on the observed decline of CO$_2$ emissions rates in Europe. My focus on the Finnish market has two main advantages beyond the study of a drastic fiscal policy. First, the market is small. Local tax policy has no effect on the design decisions of manufacturers, allowing me to isolate the market response to taxation from the supply-side standards driving the change in CO$_2$ emissions rates of cars available to consumers. Second, Statistics Finland provides high-quality register data to researchers. I use official vehicle registration and car tax data as well as individual-level income data from tax records for the estimation of my demand and supply model. The latter data allow me to include net household income as an observed characteristic in the demand model to also evaluate the distributional effects of the tax reform. Among others, the OECD (2006) highlights the need to evaluate the distributional incidence of environmental policy.

My results show that domestic tax policy only had a negligible effect on CO$_2$ emissions rates of new cars. Consumers would have predominantly bought cleaner cars regardless of the tax reform, given the concurrent introduction of mandatory supply-side standards. While the car tax reform did little to reduce CO$_2$ emissions rates, it increased the market penetration of
diesel engines due to favorable tax treatment. The car tax CO₂ differentiation therefore led to higher emissions of diesel-specific local pollutants such as particulate matter and nitrogen oxide. A reduction of the average tax rate implied by the rate differentiation further exaggerated this unintended negative environmental effect by increasing vehicle sales. Policymakers anticipated this effect of the intended average rate reduction to help rejuvenate the country’s aging car fleet by boosting sales. However, registration statistics show that the Finnish car fleet continues to age and grow. Furthermore, the tax reform had substantial distributional implications. It led to higher vehicle sales but also to a strong decline of government tax revenue. Policymakers were anticipating stable tax revenue, but higher sales were not sufficient to offset the decline of the average tax. Despite the large loss of tax revenue, the Finnish tax reform had a positive net welfare effect due to a large aggregate consumer welfare gain. However, the reform was also regressive, as high-income households benefited disproportionally. Producers benefited from higher sales but also from an average higher price-cost markup. The markup adjustment by producers for specific car models was inversely proportional to CO₂ emissions and differentiated tax rates, thereby mitigating the intended relative price difference for consumers. The key conclusion of this study is therefore the need to consider both the market structure as well as concurrent, interdependent policies on other levels of government for optimal fiscal policy design.

In the second essay, I develop a reduced-form approach to estimate the effect of the Finnish 2008 car tax reform on a key statistic for policymakers: CO₂ emissions rates of new cars sold. The econometric analysis does not require the explicit modeling of economic primitives, and is thus less driven by functional and distributional assumptions than a structural analysis. Furthermore, I use highly disaggregate vehicle registration data on a monthly level for the estimation, while the structural estimation in the first essay uses yearly market data with a more aggregate product definition for tractability. I specifically estimate in the second essay the tax reform’s impact on the equilibrium relationship between CO₂ emissions rating and monthly new registrations. This differences-in-differences approach to a reduced-form relationship then allows me to infer the effect of the tax rate differentiation on CO₂ emissions rates in the post-reform period. The estimated effect is comparable in magnitude to the effect estimated with the structural model in the first essay and only slightly larger in magnitude. The implication
of both studies is nonetheless the same: domestic tax policy only had a marginal effect on the observed decline of CO₂ emissions rates, as consumers would have predominantly bought cleaner cars regardless of the tax reform. The reduced-form differences-in-differences estimation of the second essay supports the structural model of the first essay. It obtains similar results to one of the research questions of the first essay in a less restrictive way. The theoretically well-founded assumptions and common econometric practice of the first essay are nonetheless required to gain a better understanding of the tax reform’s market impact, such as its distributional implications.

In the third essay, I return to demand and supply estimation, and focus on demand model choice. The BLP random-coefficients logit demand model in the first essay is flexible enough to generate realistic consumer substitution patterns by allowing for consumer-specific valuations of product characteristics. The cost of this flexibility is a high computational demand and a challenging implementation. A popular alternative demand model in the Berry (1994) framework is the nested logit demand model, which is less flexible but easy to estimate. The nested logit model does not allow for consumer-specific valuations of product characteristics but instead allows for preference correlation across predetermined groups of products. The applicability of the nested logit model thus depends on the availability of an appropriate nesting structure capturing the relevant dimensions of product differentiation. Grigolon and Verboven (2014) compare both types of demand models in the context of merger simulation in European automobile markets and find the nested logit model to perform reasonably well in this application. However, they warn that estimation of the more demanding random-coefficients logit model might be warranted in other applications and specifically cite environmental policy. In the third essay, I thus compare the performance of both logit models in the context of the Finnish automobile market and the differentiation of the car tax. Does a nested logit demand model produce reasonable economic implications in a market where the product-specific tax rate is an increasing function of a continuous product characteristic? According to my results, no. Various nesting specifications based on market segments, fuel types, and CO₂ categories fail to produce parameter estimates consistent with economic theory and reasonable economic implications. The use of a random-coefficients logit demand model in the first essay to study the effect of the Finnish tax rate differentiation is hence
both justified and necessary.

1.2 Job Loss and Health Spillovers in the Family

A large literature has documented that displaced workers suffer substantial losses in the labor market. The negative consequences of job loss are not confined to long-lasting income losses but also include negative health effects. One such health effect is a higher risk of mortality, the ultimate health outcome. For example, Sullivan and von Wachter (2009) document a substantial increase in the mortality risk of male U.S. factory workers losing their jobs in mass layoffs. Economic theory suggests that costs of job loss may not be confined to the displaced worker but might also affect other family members of the displaced individual. In the fourth essay, we empirically address this potential spillover and quantify the effects of job loss on spousal mortality. We additionally provide further robust evidence on the effect of job loss on own mortality. A key concern in this empirical analysis is the potential endogeneity of job loss. We therefore use an event study approach based on Finland’s great recession between 1991 and 1993, caused by the collapse of its main trade partner, the Soviet Union. We identify workers who lost their job during this time period due to plant closures. We then compare the mortality risk of the displaced workers and their spouses to the mortality risk of unaffected non-displaced workers and their spouses over the next 19 years. Our detailed administrative data includes all workers and firms in Finland matched to mortality statistics. The data contain annual records on employment, earnings, public transfers, and detailed individual characteristics for every resident in Finland. Our results show that the mortality risk of job loss is distributed asymmetrically across genders: if a man loses his job, both the man and his female spouse suffer a higher risk of dying. If a woman loses her job, we find no increase in mortality for neither the woman nor her male spouse. The male increase in long-term mortality due to own job loss is driven by a higher risk of dying from alcohol-related causes, whereas the higher mortality risk of affected female spouses is driven by cancer and accidents. Exploring the mechanisms underlying the asymmetric response of job loss between male and female workers, we find that income losses are larger in absolute terms after a male job loss. In contrast, labor supply responses of spouses and marital instability seem to be of only minor
importance. In further analysis, we plan to shed more light on the importance of public transfers to cushion the income loss and why exactly spousal labor supply and divorce risk respond differently to male and female job loss.

References


