RESEARCH STATEMENT

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My research interests lie in Applied Microeconomics, broadly speaking, and span the areas of Environmental and Energy Economics, Industrial Organization, Public Economics, and Computational Economics. A common thread in my research is the application of microeconomic theory and econometric estimation for the study of topics that are relevant in daily life with a certain degree of urgency. I have resorted to models and methods that are borrowed from the areas of modern Industrial Organization and to some extent also Operations Research. In addition, a substantial part of my research belongs to the area of Public Economics that deals with optimal governmental policy design.

This research statement is organized as follows. The first section discusses my work on empirical estimation using a dynamic structural model and the second section discusses my work on Political Economy, applying and extending existing game-theoretic models of entry from Industrial Organization to investigate the effects of corruption. The next section discusses my work on technology adoption and R&D. The last section concludes.

1 Dynamic Structural Estimations

The motivation for my job market paper, *Subsidies, Tariffs and Investments in the Solar Power Market* is to evaluate the different forms of subsidy programs in the solar power market and to provide welfare-improving policy recommendations. In order to capture consumers' expectations of falling system prices and their investments in the durable good (solar power systems), I adopt a dynamic structural model and use the nested fixed point maximum likelihood estimation to recover the parameters in consumers' utility functions. The structural estimation here refers to the branch of econometrics "in which economic theory and statistical method are fused in the analysis of numerical and institutional data" (Hood and Koopmans, 1953). The dynamics refers to setting up the Bellman equation and solving for the optimal stopping problem of a forward-looking consumer. The estimation is carried out with the methodology developed by Rust (1987). This paper extends the single agent dynamic model of Rust (1987)to aggregate market level data. Once the underlying structural parameters are identified, the estimated model becomes extremely versatile, allowing researchers to engage in counterfactual policy analysis and welfare analysis. In particular I am able to derive the welfare neutral CO_2 price under the current subsidy programs. The results of this paper also serve as quantitative evidence to address many misleading policy discussions on the effectiveness of production-based subsidies and capacity-based subsidies.[1] The inference of the model is computationally intensive due to the nonlinear search in the multidimensional objective function and requires knowledge of both programming and optimization routines. This is particularly interesting because of my training in industrial engineering. I plan to synthesize and to extend the different routines of dynamic structural models as found in Rust (1987) and Su and Judd (2012) in ways that might reduce the entry barriers of researchers who would like to adopt structural models. During the last five years, the solar manufacturing industry experienced dramatic growth and decline. I observed existing firms expand production capacity at an astonishing speed, later followed by many firms entering the market with others exiting at the same time. It's an ideal situation to empirically study the supply side market and to address the question of firms' expectation of the future and the evaluation of the percentage of the domestic subsidy of household solar power systems that ends up in Chinese manufacturers' pockets. I will extend my current

[1]Many policy discussions simply states that production-based subsidies are more effective because of the success in encouraging solar adoptions in Germany by using production based subsidy. The common misconception can be best put forward by the Wikipedia entry, "Experience has demonstrated that a feed-in tariff is both the least expensive and the most effective means of developing solar power.

dynamic demand model to incorporate a dynamic model of the supply market that is similar to Berry et al. (1995). To the best of my knowledge, not too many works estimate both the dynamic demand and supply models from the empirical data due to the complexity in both the dynamic models and the computational requirements. The immediate step that I will take on next is to work on the supply side model using insights developed in Ryan (2012), where he estimates the welfare cost associated with the 1990 Clean Air Act amendment imposed on the Portland cement industry.

2 Environmental Regulations and the Political Economics

Government intervention is often required in environmental issues due to the externalities associated with public resources and pollution. However government regulations are implemented by politicians and are often imperfect. In the joint work with Husnain Ahmad and Rabah Amir, we study a case that is an extreme and particular result derived from regulation involving bureaucratic corruption. We propose a multi-stage game describing the scenario where one or more corrupt officials are in charge of the entry process of an industry. The officials are given full discretion on determining the industry concentration in the last stage where firms engage in Cournot competition. We use a model closely related to the entry literature (Mankiw and Whinston, 1986) and divisionalization literature (Baye et al., 1996) and show how a benevolent social planner can still reach a socially optimal number of firms despite corruption.

3 Technology Innovation and R&D

Another central theme in the studies of Environmental Economics is the role of technology innovation. Many long term environmental problems such as climate change can be mitigated through technological progress. Governments can provide incentives for firms to innovate through market-based regulation and R&D subsidies. My work with M. Knauff and I. Maret considers a standard two-stage model of R&D and product market competition with R&D spillover effects (as in d'Aspremont and Jacquemin (1988)) and investigates various scenarios under which investing in R&D becomes a Prisoner's dilemma game for the firms invloved. My other joint work, with Dallas Burtrow, Karen Palmer and Joel Darmstadter, studies the diffusion pattern of renewable energy technologies in the last 20 years and constitutes another effort towards the goal of studying environmentally related technology advancement and adoption patterns with formalized models as summarized in (Geroski, 2000).

4 Concluding Remark

Looking forward, I anticipate sharpening and extending my current research and continuing to combine models and techniques from different fields and disciplines. As mentioned in the first section, my immediate next step is to estimate a dynamic game model of the solar manufacturing industry. There are many other interesting topics pertaining to the Environmental regulations that I would like to focus on such as permit trading and its effect on the downstream market competition (Hahn, 1984) or the effect of technology innovation on the marginal abatement cost (Amir et al., 2008).

References

Amir, R., M. Germain, and V. V. Steenberghe (2008). On the impact of innovation on the marginal abatement cost curve. *Journal of Public Economic Theory 10*, 985–1010.

Baye, M. R., K. J. Crocker, and J. Ju (1996). Divisionalization, franchising, and divestiture incentives in oligopoly. *The American Economic Review 86*, 223–236.

Berry, S., J. Levinsohn, and A. Pakes (1995). Automobile prices in market equilibrium. *Econometrica 63*, 841–890.

d'Aspremont, C. and A. Jacquemin (1988). Cooperative and noncooperative r&d in duopoly with spillovers. *American Economic Review 78*, 1133–1137.

Geroski, P. (2000). Models of technology diffusion. *Research Policy 29*, 603–625.

Hahn, R. W. (1984). Market power and transferable property rights. *The Quarterly Journal of Economics 99*, 753–765.

Hood, W. and T. Koopmans (Eds.) (1953). *Studies in Econometric Method*. Cowles Commission Monograph no. 14. John Wiley.

Mankiw, N. G. and M. D. Whinston (1986). Free entry and social inefficiency. *The RAND Journal of Economics 17*, 48–58.

Rust, J. (1987). Optimal replacement of gmc bus engines: An empirical model of harold zurcher. *Econometrica 55*, 999–1033.

Ryan, S. P. (2012). The cost of environmental regulation in a concentrated industry. *Econometrica 80*, 1019–1061.

Su, C.-L. and K. L. Judd (2012). Constrained optimization approaches to estimation of structural models. *Econometrica 80*, 2213–2230.