Hertie School

Master Thesis Supervision Plan
Academic Year 2020-2021
MIA/MPP

Name:	Lion Hirth
Professor of…	Assistant Professor of Governance of Digitalisation and Energy Policy

Advisor Information

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Office Hours	Tbc (Please make an appointment with Simone Dudziak)

Research & Advising Profile:
General Academic Field: What is your academic field, and what are your areas of supervision?

The closer your topic is to my research interest, the better my supervision will be. If your topic is only remotely connected to my fields of expertise, I will be able to grade your thesis, but I won't be able to support you in any meaningful way.

I am an economist by training (and by heart), and I primarily work quantitatively. My own research interest and my area of expertise lie in energy economics; please have a look at my publications to get a better idea. In particular, I am familiar with the following fields:

- The economics of renewable energy, such as the market value of wind and solar energy, system integration, and impacts on electricity markets and prices;
- Energy policy, in particular carbon pricing, support schemes for renewable energy and auction design for renewables;
- Electricity system modeling, in particular numerical power market modeling such as EMMA;
- Electricity markets, including topics such as electricity market design, energy-only markets, balancing systems, the European integration of electricity markets, prosumers and behind-the-meter storage;
- Power markets and networks, in particular nodal pricing, re-dispatch, locational markets for flexibility and locational investment incentives; and
- Open science, including open data, open source software and re-use of scientific methods.

I am willing to supervise theses that (i) have energy as a topic, or (ii) fall within economics as a field, or (iii) use a quantitative method such as econometrics or numerical modeling. Ideally, a thesis fulfills two or three of these criteria.

Character of a master thesis

In my view, a master thesis is a piece of research. It should broadly resemble an academic article, implying it should be focused and quite narrow, be novel and make a contribution, and be rigorous. A master thesis is not a business plan, a consulting report, a policy brief, or an opinion piece.

Methodology: What methodologies and methods are you able to supervise?

Practice partners and group work

I strongly encourage students to work with practice partners. To find a practice partner, a good option is the mentoring program run by HEEN, the Hertie Energy and Environment Network. The HEEN mentoring program aims to match Hertie students with alumni and non-alumni professionals in the field of energy and environment. Program participants are free to choose the exact scope and intensity of the mentoring envisioned for the development of the master thesis.

I strongly encourage students to work in pairs. Group proposals will generally be given priority over individual proposals.

Supervision Style: Please include information on what your advisees can expect from you in terms of supervision format.

Process: We will meet in six sessions during the supervision process. Each session represents a milestone for which you will be asked to provide certain assignments (see below). The supervision takes place during the colloquium sessions. If you have a specific and concrete question, you can write me an email or come to my office hours. More general feedback during office hours or by email will be given only in exceptional circumstances.

Drafts: I will read and comment on the material requested for the colloquium sessions. I never read drafts; when I read your thesis, I am reading it to grade it.

Attendance: For each session, you are expected to be present, prepared, and to actively participate; this includes contributing thoughtful and constructive feedback to your fellow classmates' work during every session. You are expected to attend all sessions and cannot miss more than one of the sessions. Your absence must be compensated with an additional assignment.

Assignment submission: You will be asked to prepare written material (texts, slides). *All material must be submitted 24 hours ahead of the sessions* via Moodle. Late submissions will lead to grade deductions and will not be read. Please submit only PDF (no DOCX) files and provide your last name in the file name, e.g. "Hirth – Lit Review.pdf" or "Hirth – Structured Proposal v1.pdf". Please merge all deliverables of each session into one file (except slides).

Changing topic: You are expected to refine, sharpen and focus your research topic. However, you are not supposed to change topic. After the second colloquium session, no change of topic will be accepted.

Proposed Projects:

Below you find a list of ideas for master thesis topics. Some are pretty specific and well thought-through, others are mere fields or topics that I find interesting. In some projects, Tarun Khanna (TK), Oliver Ruhnau (OR), Anselm Eicke (AE) or Raffaele Sgarlato (RS) would be interested in co-supervising.

Project title or research question
Predicting network congestion. In electricity systems, it is often relevant to predict the occurrence of line overload (grid congestion) a few hours or days before they occur. In this work, econometric methods are used to predict congestion based on variables such as wind and solar generation, imports and exports of electricity, load levels, among other regressors. Prediction could be made at the national level (redispatch volumes), individual lines, or redispatch of individual power plants. (econometrics)
Incentive-based instruments for electricity generation I. Why has the EU, unlike the U.S., opted for command control instruments for pollutants, rather than incentive-based instruments such as an ETS or a tax? (literature review)
Incentive-based instruments for electricity generation II. Which power generation externalities are well-suited for incentive-based regulation, which are not? (literature review)
Market value of wind and solar energy. An update of Hirth (2013) based on new and expanded data, new econometrics, more geographies. (econometrics)
What caused the decline in electricity consumption? (TK) Electricity consumption in many rich countries has dropped during the financial crisis and has not recovered since then. Various explanations are discussion: the ongoing sluggish economic growth, improved energy efficiency, and outsourcing of energy-intensive industries to other countries. The goal of this thesis is to disentangle and quantify these effects for a number of countries. (data analysis / econometrics)
Estimating emissions intensity of power systems: Emissions intensity of electricity generation is needed for estimating impact of all forms of demand side interventions, EVs, storage. Marginal vs. Average emissions intensity. What is also required for a proper analysis is not the average emissions intensity in a system but rather the marginal emissions intensity. There is decent literature on the diffence between the two mostly using models in the US. The results are indeed different. For example, just because a measure, say EV charging at night, reduces electricity consumption during peak hour it may not reduce emissions if generation in peak hours is from hydro. Many of these papers employ econometrics but clearly production cost can also be employed. Short term vs. long term intensity. Further as systems decarbonize the marginal impact of such measures will change. Clearly when the system is 100% decarbonized demand side measure make no difference from a emissions perspective. But what is interesting is how the marginal emissions evolve during the process. I only found one paper that uses the TIMES model for UK to assess such long term marginal emissions intensities. That paper assumes a decarbonized system with basically nuclear at it's core, which seems unrealistic to me. Assessing how these systems evolve with high VRE could be interesting.
Risk in low-carbon electricity systems. Renewable energy and other low-carbon power generation technologies are investment-intensive. This exposes them to high market risk. (theoretical discussion & analytical model)
The value of the solar PV learning curve. Germany has spent about EUR 250bn in solar PV deployment. The main benefit, it is sometimes argued, lies in reduction of future costs due to learning-by-doing, a phenomenon often represented as a learning curve. What is the economic value of this learning and which actors/countries/generations are the one benefitting? (theoretical discussion & quantifications)

Recent electricity market liberalization (AE). Case study of two recent cases of electricity market liberalization; review of crucial design choices. (literature review)
Smart meter and retail pricing review (OR). Review of the status quo of electronic ("smart") meter globally; overview of purpose (electricity theft vs. price-elastic demand); review of corresponding retail pricing (time-of-use pricing, dynamic pricing, invariant prices, etc.). (literature review)
Variable tariffs (OR). How prevalent are variable tariffs across Europe and across different consumer segments? What are the policy and technology (smart meters) drives behind these? (literature review & interviews)
The impact of batteries on balancing. (TK) Review of battery expansion in Germany plus 1-2 further European countries. Empirical analysis of balancing reserve prices in DE. Discussion of possible effects of reserve prices with a focus on the impact of the expansion of batteries on capacity prices. (literature review + data analysis).
Economic value of subsidized loans for renewable energy. (TK) Estimate the (global) economic value of below-interest rate loans issues to renewable energy project developers by state-owned banks such as EIB, EBRD, KfW and World Bank.
Network tariff design (AE). An theoretical discussion of efficient / sensible / feasible design of (distribution) network charges, possibly complemented with some data-based assessment. Focus should be the multiple objectives (energy conservation, climate policy, distribution and fairness, risk), the various options (capacity vs. volumetric charges, time-of-use and critical peak pricing).
Can storage be a substitute for transmission investment? (AE) How does the location of storage effect the need for transmission infrastructure? How do the market design and other regulatory incentives affect this outcome? (Literature review and modeling time series analysis)
Locational instruments for electricity consumption. (AE) Literature review on regulatory instruments that incentivize consumers of electricity to move to locations in which generation is cheapest. Which instruments are there and how effective are they?
The effect of flexibility options on the revenues of generators (AE) Modelling exercise: what is the effect of different flexibility options such as storage or transmission infrastructure on the market value of different generation technologies? How do they affect power prices and the need for curtailment?
Free bids in balancing markets (OR). In 2021, Germany will introduce so called "free bids" ("Regelarbeitsmarkt") in balancing markets. What is the effect that this will have on balancing markets, imbalance prices, and system security?

Plagiarism:

Plagiarism is an infringement of § 11 Good Academic Conduct, 2a: "Infringements of the standards of good academic conduct include for instance to use wordings, ideas or other intellectual work of others in an academic work without clearly indicating the author. The obligation to indicate the authorship of others shall apply irrespective of whether or not the sources used are protected by copyright" (See: Exam Rules, § 11 Good Academic Conduct for more information).

It is vital to keep track of your sources and to cite all material properly.

The Library will offer a session available to all students on resource management and proper citation.

Extra (individual) note on plagiarism

Attendance:

Students receive 8 ECTS for the Master´s thesis colloquium. Attendance for supervision—whether in the form of a colloquium or an individual meeting—is compulsory. Students are expected to be present, prepared, and engaged in each session, and to adhere to deadlines set for assignments.

In case of an excused absence, students must notify their supervisor. Absence must be compensated with an additional assignment.

Students on an academic exchange programme in the Fall Semester should be given the opportunity of remote supervision.

Participation & Milestones:

What do you expect students to prepare for each session?

Possible assignments include (the following are just examples):

- Fully developed thesis proposal
- Literature review
- Argument & hypotheses (where applicable)
- Research design
- Operationalisation
- Methods of analysis
- Overview of empirical findings

Colloquium & Meeting Information:

	Colloquium Dates	Session Title
Meeting times (suggested)	Session 1: November/December 2020	Initial Proposal
	Session 2: November /December 2020	Revised proposal
	Session 3: Early February 2021	Literature Review and Contribution
	Session 4: Mid-February/Beginning March 2021	Thesis Outline and Methodology
	Session 5: Late March 2021	Preliminary findings
	Session 6: Beginning/Mid-April 2021	Final Presentation

Colloquium Sessions:

Session 1: xx.xx.2020 Initial Proposal	
Aim	Present and discuss your initial thesis proposal. At this point you should be clear about your topic and your (initial) research question. You should be able to present your motivation and a first overview of the existing literature.
Assignment	To be submitted 24h ahead (one single PDF) • Structured thesis proposal (1 page, template provided) To be delivered in class • Presentation of your proposal, 3-5 slides
Readings	Introductory readings (While some of these are written to inform PhD thesis development, similar basic issues play out with a Master Thesis.) • Oxbridge (2018): A guide to writing your master thesis • Oxbridge (2017): Your dissertation plan • Van Evera, Stephen 1997: Guide to Methods for Students of Political Science, Ithaca, NY: Cornell University Press, "Chapter 4: Helpful Hints for Writing a Political Science Dissertation", p.97-113.
During the session	Input by advisor and class discussion (30 min) • What is a good thesis? • Timeline and deadlines Student presentations (70 min) • 4 min presentation by student • 3 min questions and feedback

Session 2: xx.xx.2020 **Revised proposal**	
Aim	Discuss the progress you have made, in particular: How has your proposal evolved, and why? What is your methodology, why do you prefer it over alternatives? How do you define and operationalize your key concepts? Which challenges have you identified?
Assignment	To be submitted 24h ahead (one single PDF). Example submission is available on Moodle.

	• Updated structured proposal, clean (1 page) and with changes tracked in order for me to quickly see how your project has evolved (1 page) • Time plan (Gantt chart, 1 page) • List of issues you would like to discuss with me (1 page) To be delivered in class • Presentation of progress and changes, 3-5 slides
Readings	• Van Evera, Stephen 1997: Guide to Methods for Students of Political Science, Ithaca, NY: Cornell University Press, "Chapter 1 – Hypotheses, Laws, and Theories – A User's Guide", p.7-27.
During the Session	Input by advisor and class discussion (30 min) • Literature search and review Student discussion (70 min) • 4 min presentation by student • 3 min questions and feedback

Session 3: xx.xx.2021 **Literature Review and Contribution**	
Aim	Present a literature review. At this point you should have a comprehensive overview of the scholarly literature in your field. You should be able to present a structured summary of the existing literature, identify gaps in the literature, and specify of your own contribution.
Assignment	To be submitted 24h ahead (one single PDF). Example submission is available on Moodle. • Updated structured proposal (clean and with changed tracked) and updated Gantt chart • Literature review (2-3 pages): you should summarize the state of the literature in a structured way, mention the most important existing contributions and how your work relates to them, and identify the gap(s) in the literature that you intend to fill. Use "author (year)" references. • List of issues you would like to discuss with me (1 page)
Readings	USC The Literature Review Watch on Youtube: Zotero
During the Session	One-to-one session between student and supervisor (15 min). Slots will be communicated ahead of time. I will give feedback on the material you submitted and we will go through your issue list.

Session 4: xx.xx.2021 **Thesis Outline and Methodology**	
Aim	Present draft thesis outline and discuss challenges; present and describe the methodology applied. At this stage you should have done a significant share of your research and have developed a coherent structure. You should have applied your methodology and be clear about remaining challenges that you need to overcome.
Assignment	To be submitted 24h ahead (one single PDF) • Structured summary (1 page, template provided – different from the structured proposal) and updated Gantt chart • Thesis outline (table of contents), detailed at least to the second level and including word count per section (1 page) • Outline of methodology section comprising structure and bullet points, including methodological references (2 pages) • List of issues you would like to discuss with me (1 page)
Readings	• Hirth (2020): Master thesis guideline • Oxbridge (2019): Writing the methodology section • Nirmaldasan (2008): The average sentence length
During the session	One-to-one session between student and supervisor (15 min). Slots will be communicated ahead of time. I will give feedback on the material you submitted and we will go through your issue list.

Session 5: xx.xx.2021 **Preliminary findings**	
Aim	Present preliminary results. At this point you should have done the bulk of your research. You should be able to show your results, explain your findings, and share your conclusions.
Assignment	To be submitted 24h ahead (one single PDF) • Updated structured summary (clean and with changed tracked) and updated Gantt chart • A list of three to five findings – not more, not less (1 page) • Three alternative titles and subtitles • List of issues you would like to discuss with me (1 page)
Readings	

During the Session	One-to-one session between student and supervisor (15 min). Slots will be communicated ahead of time. I will give feedback on the material you submitted and we will go through your issue list.

Session 6: xx.xx.2021 Final Presentation	
Aim	Present draft thesis. At this point your thesis should be virtually finalized and only require minor refinement. This is the last possibility to receive feedback.
Assignment	To be delivered in class • 8 min presentation of master thesis, 7-12 slides
Readings (if applicable)	• Rougier, Droettboom, Bourne - 2014 - Ten Simple Rules for Better Figures • Novartis - Graphics Principles Cheat Sheet
During the Session	Student presentations (150 min) • 8 min presentation of draft thesis • 5 min discussion and feedback • All students are required to attend the entire session

Submission	
Assignment	When you submit your thesis, please also upload the final structure summary to Moodle.