1. **Social media analysis and stock markets**  
   **Sotsiaalmeedia analüüs ja aktsiaturud**

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| Social media analysis and stock markets | Lecturer Mustafa Hakan Eratalay  
   Senior Research Fellow Rajesh Sharma | Economics | We are living in an information age thanks to the use of internet which has become increasingly common and in today’s world almost all information is shared on and through internet. Through various multimedia devices such as computers, tablet computers, mobile phones and other possibilities, people receive information from different online social platforms such as news, social media posts, Youtube, blogs, and online interactions and discussion with their acquaintances. This big source of information, especially in particular the written texts – create an enormous and invaluable source of data. This data could be useful for inferring the impact of various events on individuals. For example, in the present scenario, one could use this data to understand the mood of people with respect to COVID-19 which has impacted the economy very badly. If one could aggregate all this information and somehow quantify it, he/she would be able to study the mood of people about the current events. One could then analyze for example how the panic behavior evolves during the Covid-19 pandemic, how the investors are seeing the effect of possible upcoming economic crisis, how saturated the real estate markets are, etc. All this type of “mood” information is in this enormous internet text data and it can be extracted. Thus, taking inspiration from these real world events and free available data on web, we would like to study the impact of online social media data on the financial market. This PhD topic offers an interdisciplinary approach in studying these effects. In particular, the methodology combines social media analysis and financial econometrics. Firstly, the information will be collected from social media posts through crawlets, which will then be analysed using natural language processing (NLP) techniques. This big data will then be feed into state of the art machine learning algorithms for modelling and forecasting financial returns and volatilities of stock market data. The chosen PhD candidate(s) will work on this topic, which has a big potential for future research as well. Based on the mutual interest, there are multiple possibilities to work on such as (1) stock market return and volatility behavior and predictions, (2) the part of social media and news in systemic risk, (3) explaining the tail behavior of financial returns, (4) the impact of social media in the stock market networks, (5) news sentiments approach in evaluating Value at Risk and Expected Shortfall. |
Transformative innovation policy for digitalization

Digitalization of the economy envisages far-reaching innovations in manufacturing and service sectors (e.g. Industry 4.0, see Kagermann et al. 2013) and net benefits for the society. These benefits are seen in vertical integration (of production and management levels), horizontal integration (collaboration between the firms and public sector agencies, especially in real-time information exchange) and end-to-end engineering across the whole value chain (Dalenogare et al. 2018). Despite these aspirations, positive impacts in terms of productivity growth are not always realised, but may even compromise long-run profitability, considering the high initial investments and implementation costs (Hirsch-Kreinsen 2016). For deeper and more versatile technological change it seems no longer enough to “optimize” old systems, but rather to achieve more profound system-level change (Schot, Kanger 2016). So far, six public sector intervention points are identified for this transformative change (Kanger, Noorkõiv, forthcoming) at niche creation, diffusion, network and global levels. However, these intervention points need to be developed further in terms of a) innovation policy, i.e. how public sector influences innovation processes of private sector via policies and institutions it creates (so-called framework conditions), but also more specifically, what stimuli it offers (e.g. via specific R&D grants) for both, science and technology system; and b) innovation in public sector itself as a producer of (public and semi-public) goods and services (a more technological view on innovation).

Specific research questions could be the following:

· Broader question: What kind of intervention instruments for transformative change in relevant sectors (e.g. ICT, energy and transportation sectors) of economies?

· More narrowly, what innovation policy options exist for supporting specific digital technologies (e.g. energy-saving robots) in manufacturing SMEs?

· More narrowly, what capabilities are developed in public sector for managing electronic data platforms and related AI solutions?

The data could be used from qualitative interview data to country and sector level digital economy and society data of Eurostat (depending on the research question).
3. **The effects of time allocation on management heuristics**  
   **Ajakasutuse roll juhtimisheuristikute rakendamisel**  
   **Professor**  
   Maaja Vadi  
   Lecturer  
   Anne Aidla  
   **Economics**  
   Real-life managerial decisions often entail a good deal of uncertainty and accordingly the literature on heuristics has vastly increased. The most management heuristics are verbal statements that have not been fully systematized yet. Information and time allocation are both crucial in management decisions, however, the influence of framing of the cues and other cognitive biases have yet to be sufficiently detailed in management heuristics. This project addresses a research gap in understanding how the representation of cues for decision-making in regard with information and time allocation affect the performance in a managerial context.

   One main avenue is with time constraints and time allocation differences, as this promises a more objective method of measuring the use and outcome of management heuristics. This could yield important implications when it comes to alleviating the ill effects of cognitive bias on management decisions. The chosen method for the study is experiments. Experiments are common way of mapping heuristics and cognitive biases in behavioral economics and offer addition insight that other methods cannot.

4. **Adjustment of people with technological changes in labour markets**  
   **Inimeste kohanemine tehnoloogiliste muutustega tööturgudel**  
   **Professor**  
   Tiiu Paas  
   **Economics**  
   Possible consequences of technological changes and digitalization processes are pushing people to adjustment with labour market developments through using new labour forms. These developments allow flexible combination of working and leisure time, better use of skills and abilities, generate new institutional settings and necessary adjustments with social and legal changes. What are the main socio-demographic and human capital indicators that characterize people first look for the new labour forms; to which forms? People with which socio-democratic and educational characteristics, personal traits, cognitive and non-cognitive skills etc. have better preconditions for labour market adjustments? Which spatial developments and institutional settings accompany labour market changes? These are some possible research questions that can be considered in the studies.
Entrepreneurial opportunity identification and creation in the early stages of the innovation process: systemic innovation approach

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<tr>
<td><strong>Professor Tõnis Mets</strong></td>
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<td><strong>Associate Professor Mervi Raudsaar</strong></td>
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The commercialization of university research continues to be both a scientific and a practical problem, also known as the "European Paradox" that became topical even for Estonia. The internationally recognized level of Estonian science (Lauk and Allik, 2018, Nature, 2009, 2019) has not been expressed to the same extent in innovations. So far, the issue of R&D commercialization has been addressed in the context of technology and knowledge transfer and the entrepreneurial university (Castillo, Holley and Watson, 2017, Kalar and Antocic, 2015, Grimaldi et al., 2011, Etzkowitz, 2003, 2004). Most research seeks to provide an ex-post answer to knowledge transfer projects from university to industry. Still, there is virtually no understanding of the structure of the internal processes of such projects in the early stage of innovation. To a large extent, the problem starts with the design of research projects and funding applications, where researchers frequently focus on scientific excellence but not on the use - innovation.

The study aims to find out the models, regularities and criteria for identifying and creating entrepreneurship and innovation opportunities in the early phase of the R&D project and innovation process.

The methodology of this exploratory research include systems thinking, and systemic innovation (Senge and Sterman, 1990, 1992, Galanakis, 2006) and process theory (Langley, 1999) approaches for theoretical model building. Specific tasks:

1. Systemic innovation process model building for the early stage of innovation.
2. Design and test of elements and criteria of the temporal realization of the early stage of the innovation process, and ex-ante evaluation.
3. Participatory observation and interviews within several R&D projects' design.
4. Analysis and generalization of (up to 100) internal projects' documents, created by the R&D teams, matching and using different computational methods and artificial intelligence (AI).
5. Conclusions and recommendations for R&D and innovation project development support measures and policies (on institutional – applicant, and funder level) to enable more efficient commercialization at later stages.

The empirical study includes case studies and participatory observation in the initial phase, followed by the collection of data for database and analysis using different classical and computer-based instruments (statistical software, AI, etc.). Compilation of the R&D projects' and associated documents database, analysis and recommendations are the task of the doctoral student.

The novelty of the study includes unique process data of R&D projects at the early stage of innovation and based on that patterns of successful project design, pattern components/elements and criteria for ex-ante evaluation of the innovation potential of research projects in the early stage and based on these policy recommendations.
| 6. The impact of international graduates on the Estonian economy | Professor Raul Eamets  
Economics  
Professor Tiit Tammaru | In the light of increasing internationalization of education and transnational social grids, the internationally degree-seeking students in higher education have been increasing dramatically in the last thirty years. Globally the numbers reach to 5.3 million students studying abroad. In Estonia the numbers of International students have increased from 900 in 2006 to 5500 in 2019.

Ageing population and declining birth rates will increase labour shortages in future labour markets and current migration flows will move mostly go old EU member states where income levels are above the OECD average. International students are considered to be a source of highly qualified labour and if they enter to destination country’s labour market, they help to compensate labour deficit.

The purpose of the project is to analyse the economic effects of international students to the destination’s countries labour market. Most migration studies have analysed effects of low skills migrants as this is the dominant flow of migration. There are very few papers dealing with internationalisation of university education and productivity gains in destination country. We plan to use Estonia as the case study. Estonia is interesting case as it is one of the few Eastern European countries where we can observe migration turn, as before 2015 the migration balance was negative.

Major research questions are followings:
1. What are the future intensions of foreign students studying in Estonia
2. What kind of jobs they occupy during the studies and after graduation
3. In macro level: what are the potential effects of foreign graduates on general labour productivity
4. What are the effects on internationalisation of firms

We organise the quantitative survey among international students of public universities about their future intentions, Tax office data and firm data are needed for productivity analyses. In addition to the quantitative analyses the qualitative analyses (semi-structured interviews) of focus groups with students from different destination countries are in the research plan.
Effects of technological changes on labour market
Tehnoloogiliste muutuste mõjud tööturul

Senior Research Fellow
Jaan Masso
Senior Research Fellow
Jaanika Meriküll

Economics

Technological changes (e.g. automation, digitalization) are expected to have tremendous effects on the labour market and the organisation of work, e.g. skill-biased technological change, routine-biased technological change, job polarization, growing wage inequalities etc. However, the extent of the associated effects is highly uncertain with wide range of estimates found in the literature. In the proposed thesis it is in particular expected to look at the interplay of technological transformations with globalisation and its associated effects on, for example, employment, skills, the distribution of income and wealth, inequality, labour mobility, and migration (though not covering all of these in one thesis).

The possible research questions include (but are not limited to): which groups of workers (in terms of age, gender, ethnicity, skills, occupations etc.) are most affected in terms of employment and wages due to the technological changes; how the companies’ performance is affected by their workforce composition; how the migration patterns are affected by and associated with technological transformations; what is the effects on international trade and global value chains due to the interplay of technological transformation, globalization and the crises like the one due to COVID-19.

The thesis would mostly use the firm and individual level micro data, in particular matched employer-employee data, and applying microeconometric methods. One may consider datasets from particular country or cross-country datasets from agencies like Eurostat. In addition to the latter sources of data, the applicants are encouraged to look towards novel and alternative data sources, like Internet data (company webpages, job search portals data, job vacancies), novel registry data, human genetics data. Data processing methods could cover also alternative means like computer science methods.

The effects and compensation measures of climate change policy
Kliimamuutuse politiika mõjud ja kompensatsioonimeetmed

Lecturer
Helen Poltimäe

Economics

Climate change has attracted attention among scientists for decades already, but only recently it has lead to everyday policies of different level (national and international). In Estonia, there have been discussing regarding the sustainability of Estonian oil shale industry due to increased price of CO₂ Emission Allowance. European Union has elaborated Green Deal, targeted to achieving no greenhouse gas emissions by 2050. It is well-known that such policies have enormous economic and social effect, and some (preliminary) compensation measures have been proposed to ensure fair transition. At the same time, it is not researched and reasoned whether the proposed action plans lead to desired change, which groups of society are the most affected and what is the effectiveness and efficiency of compensation measures.

The main focus of the PhD thesis would be the effects of more stringent climate change policy. The work should cover distributional effects (both direct and indirect ones), but if
possible, also other effects (behavioural effects coming from increased energy prices, effects on state budget, etc). At the same time, thesis should aim at assessing the compensation measures (the ones proposed, but also the ones that could be most efficient to address the negative effects of climate change policies), to evaluate the purposefulness and fairness of the measures. The thesis should cover both, Estonian and European Union contexts, as much as data allows. The analysis methods of PhD are quantitative ones (to assess distributional effects and indirect effects coming from energy price change based on microsimulation), and combining different datasets is assumed.

| 9. | Cultural differences and economic consequences of migration | Professor Anneli Kaasa | Economics | Migration brings together people with very different cultural background. Although the economic success of immigrants and their possible impact on the host country’s economy has been investigated before, this topic focuses on differences in cultural background using the theory of cultural dimensions (Hofstede, Schwartz, Inglehart, etc) as a basis. This enables to go in depth in investigating whether and why different cultures clash or not and whether some patterns of cultural dimensions can be expected to hinder or foster adaptation in new country. The topic also needs profound research of the possibilities to measure culture and taking into account the requirements set by the specifics of the research questions related to migration.

Although strictly based on the concept of cultural dimensions and demanding carefully thought out methodology for measuring culture, this is a wider topic, where the applicant is expected to offer a set of research problems that are planned to be answered in the doctoral thesis. Some possible research questions might be: Does the cultural distance between the origin and host country of the immigrant influences the adaptation success? Are some host country cultural pattern/dimensions or some origin country cultural patterns/dimensions hinder or foster adaptation? Are there some dimensions that are more relevant than others? How long does it take until immigrants’ values differ significantly from those in the country of origin? Are the next generations’ values closer to the host country? Does the adaptation speed depend on cultural background and if yes, on which dimensions? |

| 10. | Complementarities and Learning Effects of Innovation Activities | Professor Pritt Vahter | Economics/Business | The need for complementary investments, skills and organizational change at firms has been often argued to be one reason why the strong positive effects of adoption of new technologies may take long time to emerge (e.g. Brynjolffson et al. 2018). This study investigates whether, how and under which conditions the complementarities of various innovation activities or learning in the innovation process at firms take place. Organization’s practices have complementarities if the joint effect of a combination of these practices is larger than the sum |
of the effects of individual practices adopted on their own (see, for example, Milgrom and Roberts 1990, Brynjolfsson and Milgrom 2013, Ballot et al. 2015).

We welcome especially applications that focus on the complementarity or learning effects of innovation activities on productivity and innovation performance of firms, but also proposals that link these to labour market outcomes such as individuals’ wages. For example, your analysis can focus on complementarities between technological and organizational innovation at firms (see Ballot et al. 2015), complementarities between technological change (incl. automation) and skill sets of the labour force (see for example Aghion et al. 2019), or also between various innovation inputs such as firm’s own R&D and knowledge sourcing from external sources (Love et al. 2014), or learning-by-using from adoption of new technologies and learning from innovation-related spillovers. The empirical study can, for example, involve various firm level datasets such as innovation survey data from Estonia and other European countries and matched employer-employee level panel datasets. We welcome both applications that are focused on econometric analysis, as well as those that would rely on combinations of quantitative and qualitative research.

References:
https://scholar.harvard.edu/files/aghion/files/innovation_premium_to_soft_skills.pdf


| 11. | Public Enterprises as Means to Overcome Epidemics | Associate Professor Diana Eerma Prof. Dr. Peter Friedrich (em.) | Economics | The corona epidemic crises show a breakdown of production, a shortening of production factors, a decrease in technical possibilities of production, a cut in final demand for consumption, investments, and exports, and a diminishing action field of public economic policy, and enormous fiscal stress for governments on the EU, national, regional and local level. The crises show three phases, the fight for health phase, the economic process phase, and the long term effect phase. The task of the dissertation would concern an investigation how public enterprises could be used to reduce the negative consequences in that three phases. 

(1) According to the skills and intentions of the candidate the thesis can be more theory oriented by applying existing CGE models, or macroeconomic models to find out the impact of the crises by comparing results on economic growth before and during the crises. In such a context the candidate might discuss how public enterprises could influence the parameters, the stocks of production factors and changes in final demands. (2) A candidate could also apply regression analysis for 2019 and compare the results with 2020 and argue again on influences on parameters, etc. through public enterprises. (3) Also, a more policy oriented thesis by considering the rich literature on public enterprises and how appropriate they are to support a policy to fight with the crises is possible. The result can lead to a special concept of social market economy or a new concept of efficiency measurement taking into account the prevention of epidemics. (4) A fourth orientation of the thesis might concern the distribution of the burden to overcome the crises on EU, nations, or subnational jurisdictions. For an adequate policy the candidate might figure out the possible role of public enterprises in distributing the burden financially and in reducing the real burden of the crises. The investigation may concentrate on Estonia. The candidate may use the reports, investigations and data on the development of the crises in Estonia and other countries in the phases, and the literature on the theory of public enterprises and their actions in particular in times of epidemics and disasters, and the rich literature on tasks and successes of public enterprises. |

| 12. | Participatory budgeting at the local governments: challenges and opportunities for emerging and developing countries | Professor Toomas Haldma | Economics | Participatory budgeting (PB) is an institutional innovation (De Sousa Santos, 1998; Sintomer et al, 2008), which looks for a way of resolving a variety of issues using a bottom-up approach at rural as well as urban contexts. Adoption of PB in developing and emerging countries has become an important device of neoliberal reforms, such as New Public Management and New Public Governance (Kuruppu et al., 2016; Uddin et al, 2011). PB allows formal and informal social groups to participate in the allocation of public finance for resolving the important issues in the community (Sintomer et al., 2008). Therefore, the study aims to investigate which patterns of PB introduction are used in different emerging and developing countries, how do politicians and administrators (public |
Ageing is one of the greatest social and economic challenges of the 21st century. It is important to understand how the ageing process will affect nations, economies and individuals. Most developed economies face increasing dependency ratio which translates into the tax and contribution burden of social expenditures related to ageing, such as pensions, health and long-term care. However, demography is not everything – labor force participation is an important mediating factor between demographics and the social expenditure burden.

One of the mitigating factors for the aging problem could be to keep older people longer in the labor market. Retirement ages and exit routes into retirement vary a great deal across countries. These differences are strongly related to the design of the welfare systems (Börsch-Supan et al 2005). Therefore, it is important to figure out which policies and changes (i) in the pension and health systems and (ii) in the mindset of employers and elderly employees would help to keep older people in the labor market longer.

Alternative research questions for PhD thesis could include (but are not limited to) following: (a) Factors influencing elderly labor supply; (b) Possibilities and practices to influence elderly labor supply through pension system; (c) Relationship between elderly labor supply and their living standard. Empirical analysis could be based on panel data or longitudinal data from SHARE – The Survey of Health, Ageing and Retirement in Europe. This is a multidisciplinary and cross-national panel database of micro data on health, socio-economic status, and social and family networks of about 140,000 individuals aged 50 or older (around 380,000 interviews). SHARE started in 2004 and covers 27 European countries and Israel. See more about SHARE here: http://www.share-project.org/home0.html. Doctoral candidate choosing this topic can benefit from SHARE international research community – there are more than 10,000 SHARE users since 2019.