Science and Technology Group
Annual Report FY2022

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1 Introduction

Project 1. Vaccination is the most effective tool to control infectious diseases. However, the evolution of vaccine resistance, exemplified by vaccine-resistance in SARS-CoV-2, remains a concern. We model complex vaccination strategies against a pathogen with multiple epitopes - molecules targeted by the vaccine.

Project 2. Married women are 50% more likely to enter the labor market when their husbands lose their jobs, the so-called added worker effect (AWE). At the same time, the share of married women who are added workers is tiny, a monthly average of 0.085% of all wives during the 1976-2021 period. In this project we study the impact of the AWE on aggregate labor market outcomes.

2 Activities and Findings

Project 1. We found that a vaccine targeting one epitope was ineffective in preventing vaccine resistance. Vaccine resistance in highly infectious pathogens was prevented by the full-epitope vaccine, one targeting all available epitopes, but only when the rate of pathogen evolution was low. Strikingly, a bet-hedging strategy of random administration of vaccines targeting different epitopes was the most effective in preventing vaccine resistance in pathogens with low rate of infection and high rate of evolution. Thus, complex vaccination strategies, when biologically feasible, may be preferable to the currently used single-vaccine approaches for long- term control of disease outbreaks, especially when applied to livestock with near 100% vaccination rates.

Project 2. We propose a new method to assess the role of the AWE in determining the aggregate levels of employment, unemployment, and non-participation. Our results show that the AWE increases married women's participation and employment rates by at most half a percentage point. We show that the extensive-margin labor market outcomes of married couples are significantly correlated and couples coordinate to be both employed or both non-employed.

3 Collaborations

1. Complex vaccination strategies prevent the emergence of vaccine resistance.

Collaborators: Simon Rella (PhD student, IST Austria), Aygul Minnegalieva (technician, OIST) and Fyodor Kondrashov (Professor, OIST)

2. Family-Friendly Policies and Fertility: What Firms Got to Do With It?
   Collaborators: Olympia Bover (Director of Department of Structural Analysis and Microeconomic Studies Department, DG Economics, Statistics and Research, Bank of Spain), Nezih Guner (Professor, Universitat Autonoma de Barcelona and Barcelona School of Economic), Alessandro Ruggieri (Assistant Professor, University of Nottingham), Carlos Sanz (Research Economist, Bank of Spain)
3. Does the Added Worker Effect Matter?
   Collaborators: Nezih Guner (Professor, Universitat Autonoma de Barcelona and Barcelona School of Economics) and Arnau Valladares-Esteban (Assistant Professor, University of St.Gallen)
4. Life is about timing: Age at cardiovascular health shocks and its role for survival and socioeconomic inequalities across the life cycle.
   Collaborators: Michael Kuhn (Director of Economic Frontiers Program, IIASA), Sonja Spitzer (PostDoc, University of Vienna), Vanessa di Lego (Post-doc Research scientist, Vienna Institute of Demography, Austrian Academy of Sciences (OeAW))

4 Publications and other output

Research Articles:

Project 1. Complex vaccination strategies prevent the emergence of vaccine resistance (with Simon Rella, Aygul Minnegalieva and Fyodor Kondrashov) *submitted*

Project 2. Does the Added Worker Effect Matter? (with Nezih Guner and Arnau Valladares-Esteban) *R&R in Review of Economic Dynamics*

Presentations:

"Family-Friendly Policies and Fertility: What Firms Got to Do With It?": Gender and Family Economics Webinar (virtual, Cergy Paris Université), 2022 CIGS Year End Macroeconomics Conference (Tokyo), OIST STG Forum

External Funding:

KAKENHI Start-Up Grant, 2022-2024 – 2,860,000 yen

KAKENHI Early Career Scientist, 2023-2025 – 4,680,000 yen