

BOOK OF ABSTRACTS

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Title: Socio-economic determinants of mental health status of employees in the EU countries. A comparative analysis

Abstract

The COVID-19 pandemic is downgrading mental health, with negative consequences for economic functioning. As a result, mental health promotion has become a major focus of health policy in many countries. Despite this worldwide interest in population mental health research, there are still very few studies that comprehensively describe this issue based on international comparisons. The aim of this study is to identify the key determinants of mental health employees in the European Union countries through an interdisciplinary approach including an analysis of lifestyle factors, socioeconomic status, physical health and environment-related factors (e.g. access to a doctor). The study employs data from the 2nd edition of the European Health Interview Survey (EHIS) which includes a sample of over 100,000 working people (population aged over 18 years) from 27 European Union countries. Machine learning techniques were deployed: decision trees and clustering. On the basis of this analysis, it is possible to define a social policy strategy aimed at addressing the negative effects of deteriorating mental health among EU workers. The study identified differences between the mental health status of workers and described effective social policy tools on a regional or local scale in order to improve mental health status in the EU.

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Title: Export Patterns in Medical Products in the Times of the Covid-19 Pandemic. Focus on Pharmaceuticals

Abstract

The aim of this chapter is to identify a pattern of international trade in medical products in the context of tackling the COVID-19 pandemic. Medical products are grouped according to classifications of the World Trade Organization into four categories: pharmaceuticals, medical equipment, medical consumables, and personal protective products. This study focuses on the international trade of pharmaceuticals, which represents over a half of the total value of medical product trade. The United States, Germany, and Switzerland are key players regarding exports of medical products; however, the leaders differ in exports of the four medical product groups. Switzerland holds a predominant position in exports of pharmaceuticals, the US leads in exports of both medical equipment and medical consumables, while China is the world's top exporter of personal protective products, occupying the 7th place in total exports of medical products. The analysis of Revealed Comparative Advantage (RCA) indices showed that high trade values do not necessarily translate into specialization in trade. Switzerland and Ireland are the world's leaders in terms of relative trade specialization in medical products, in particular they enjoy high comparative advantages in trade of pharmaceuticals. The US and China, although both have relative specialization in overall medical exports, do not reveal comparative advantages in trade of pharmaceuticals.

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Title: Chicago structural violence and its effects on predicting colorectal adenoma in patients receiving colonoscopy

Abstract

In our retrospective study, we evaluate associations between neighborhood-level indicators of structural violence and colorectal adenoma using University of Illinois Health electronic medical record (EMR) data obtained from patients receiving screening colonoscopy between the year 2015 and 2018. We will report on these associations as well as the differentiated effects on various ethnic groups. Lastly, we will also report on a new statistical methodology for predicting colorectal adenoma.

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Title: Ecotherapy Promotes Responsible Environmental Behavior: the Example of Skyros Project

Abstract

Environmental communication addresses the need to boost responsible environmental behavior in order to raise environmental awareness and to transform future generations into environmental stewards. Unfortunately, the widespread lack of professionals in the communication and educational fields, who are adequately trained on environmental issues, makes it tough to proceed successfully with environmental awareness projects. The distinctiveness in environmental education stems from the didactic approach and the effectiveness of environmental communication in motivating trainees' emotions. A proposed method where ecosystem services are tuned with environmental communication serves as the driving force for promoting a sustainable way of living. Based on the above, this paper presents the multi- awarded Skyros Project as a successful "ecotherapy" approach. This project equips participants with the necessary skills to effectively communicate pertinent environmental and public health concerns. The end outcome is the enrichment of our society with committed environmental stewards, capable of championing sustainability issues.

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Title: Are Rents Excessive in the Central City?: A Geospatial Analysis

Abstract

In many U.S. central cities, property values are relatively low, while rents are closer to those in better-off neighborhoods. This gap can lead to relatively large profits for landlords, and has been referred to as “exploitation” for renters. While much of this gap might be explained by risk, factors such as income and race might play important roles as well. This study calculates Census tract-level measures of the rent-to-property-value (*RPV*) ratio for 30 large cities and their surrounding metropolitan areas. After examining the spatial distribution of this ratio and relationships with other socioeconomic variables for Milwaukee and three other cities, Z-scores and quantiles are used to identify “extreme” *RPV* values nationwide. “Rust Belt” cities such as Detroit, Cleveland, and Milwaukee are shown to have higher median and 95% values than do West Coast cities such as Seattle and San Francisco. A spatial lag regression estimation shows that, controlling for income, property values, and vacancy rates, racial characteristics often have the “opposite” signs from what might be expected and that there is little evidence of purely race-based “exploitation” of renters. A significantly negative coefficient for the percentage of Black residents, for example, might suggest that the *RPV* ratio is lower in a given tract, all else equal. While this study shows where *RPV* values are highest within as well as between cities, further investigation might uncover the drivers of these spatial differences more fully.

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Title: Polish-U.S. Sectoral Trade Balances: Regime Shifts and the Nonlinear Impact of Currency Fluctuations

Abstract

From the collapse of state socialism, to membership in the European Union, to the 2008 Global Financial Crisis and the 2020- pandemic, the Polish economy has undergone major challenges and changes over the past few decades. The country's trade, in particular, has become more firmly tied to its Western neighbors, as it has grown in volume. This study examines Poland's trade balances in ten SITC sectors, first testing for and isolating structural breaks in each time series. These breaks are then included in a set of macroeconomic models to examine their macroeconomic determinants. Linear and nonlinear and nonlinear Autoregressive Distributed Lag models, both with and without dummies corresponding to structural breaks, produce interesting results. One key finding is that incorporating these breaks reduces the significance of the real exchange rate in the model, supporting the hypothesis that this variable already incorporates important information.

Isaiah Thomas, Russell Injerd, and Emma Turian
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Title: Fluid Mechanics versus Empirically Derived Equations: A Model Comparison of Tumor Dynamics for Avascular Tumors

Abstract

Cancer continues to be an increasing health risk for the populations of developed nations, second only to heart disease. Countless mathematical models addressing tumor growth dynamics have been developed in silico and employed clinically. While a stochastic modeling approach is favored by today's researchers given the complexity of tumor dynamics in cancer treatment, the underlying assumptions of many stochastic models remain inadequate. This is unfortunate given the importance of cancer growth modeling in preventive cancer screening and the treatment optimizations of immunotherapy, chemotherapy, and radiotherapy. We applied several ODE growth models to mouse and hamster fibroblast tumors. In addition, we applied a novel 3-dimensional model from fluid mechanics which incorporated diffusion length and rate of apoptosis parameters. We compared the sum of square error, p-values, and prediction bands using numerical solving. Lastly, we employed a sensitivity analysis to determine the most influential parameter(s) of each model. Although the 3D model represents a more realistic and robust growth model due to the incorporation of diffusion and tumor interface assumptions, improved fittings for the data belonged to some of the empirically derived models.

Mirveta Ajredini and Emma Turian

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Title: A Mathematical Model of Oscillatory Effects during Experimental Tumor Growth

Abstract

Although cancer therapies had evolved during the past years, barriers still exist in realizing their clinical impact. The basic step in developing models for cancer therapy, which ultimately could lead to improved cancer drug administration, or optimization of radiation treatment protocols, is to establish a scientific frame capturing the dynamics of tumor growth. Since the complexity of such process is not completely understood, there is no common agreement as to which mathematical model best reflects tumor growth. The choice of a model depends on factors such as the tumor cell type, the location of the tumor, and tumor's developmental stage. Current mathematical studies that are modeling the dynamics of tumor growth employ mainly exponential, logistic or Gompertz models. Since our experimental literature data displays a saturation level, our proposed models are logistic and Gompertz growth functions under oscillatory effects of white noise and time delay. The impact of the delay effects starting with mitosis are investigated using Hutchinson's equation, and its solution is obtained using numerical solving techniques. Our main goal is to assess the differences in model prediction and to establish which parameter has the most influence on changes in tumor volume. Model analysis and comparison is performed using experimental data for Ehrlich Ascites tumors in mice. Our model suggests that the proposed functions used in describing tumor growth dynamics for the given experimental data are equally good for predicting tumor growth, with some indicators predicting a slightly better fit by the logistic function. Moreover, the oscillatory factors proved to be an essential tool when it comes to fitting experimental data.