REM Newsletter 4/2019

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The Latest REM Working Papers

The center of **Research in Economics and Mathematics** (REM) circulates research, notably by its affiliated members, as working papers intended for professional and public discussion and comment. The papers have not been peer reviewed.

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Events

29-31/05/2019, 09:00h. LxDS Spring School 2019 – three free minicourses on Dynamical Systems, Faculdade de Ciências, Universidade de Lisboa.

05-06/09/2019, 09:00h. International Workshop on Differential Equations – On the Occasion of Luis Sanchez's 70th Birthday, Faculdade de Ciências, Universidade de Lisboa.

13/09/2019, 09:00h. 7th UECE Conference on Economic and Financial Adjustments, ISEG/UL – School of Economics and Management.

25-26/10/2019, 09:00h. 6th International Workshop on the Socio-Economics of Ageing, ISEG/UL – School of Economics and Management.

REM Working Papers

1. How Big Should Government Be?, António Afonso, Ludger Schuknecht. *Working Paper 078-2019.*

We assess how "big" government should reasonably be in a number of advanced countries. First, we will link the recent findings of Data Envelope Analysis on efficient public expenditure with the question of the

size of the government. Second, we report descriptive analysis of various government performance indicators in relation to public expenditure to provide indications of overall “optimal” across spending categories. In principle, the highest savings potential is in the biggest expenditure categories, public consumption and social expenditure.

2. Controlling Algorithmic Collusion: short review of the literature, undecidability, and alternative approaches , João E. Gata. *Working Paper 077-2019.*

Algorithms have played an increasingly important role in economic activity, as they becoming faster and smarter. Together with the increasing use of ever larger data sets, they may lead to significant changes in the way markets work. These developments have been raising concerns not only over the rights to privacy and consumers’ autonomy, but also on competition. Infringements of antitrust laws involving the use of algorithms have occurred in the past. However, current concerns are of a different nature as they relate to the role algorithms can play as facilitators of collusive behavior in repeated games, and the role increasingly sophisticated algorithms can play as autonomous implementers of pricing strategies, learning to collude without any explicit instructions provided by human agents. In particular, it is recognized that the use of ‘learning algorithms’ can facilitate tacit collusion and lead to an increased blurring of borders between tacit and explicit collusion. Several authors who have addressed the possibilities for achieving tacit collusion equilibrium outcomes by algorithms interacting autonomously, have also considered some form of ex-ante assessment and regulation over the type of algorithms used by firms. By using well-known results in the theory of computation, I show that such option faces serious challenges to its effectiveness due to undecidability results. Ex-post assessment may be constrained as well. Notwithstanding several challenges face by current software testing methodologies, competition law enforcement and policy have much to gain from an interdisciplinary collaboration with computer science and Mathematics.

3. Into the heterogeneities in the Portuguese labour market: an empirical assessment, Fernando Martins, Domingos Seward, *Working Paper 076-2019.*

This paper provides a comprehensive study of the heterogeneity in the Portuguese labour market. We use Labour Force Survey microdata covering a complete business cycle, from1998:1 to 2018:1, to evaluate the labour market attachment of several labour states and assess the most suitable allocation of individuals across statuses. We also evaluate the adequacy of the conventional unemployment criteria. Following the relevant strand of literature on this topic, we apply an evidence-based categorisation of labour market status by exploiting the information on the results of the behaviour of non-employed. To that end, we use multinomial and binary logit models of the determinants of transitions of workers across labour market states to test for the equivalence between non-employed groups. We conclude that heterogeneity is an evident feature of the Portuguese labour market, both between and within the conventional non-employment states. In particular, we find that the status comprising those inactive workers which want work constitutes a distinct state in the labour market and displays a transition behaviour closer to unemployment than to the group of inactive workers which do not want work. Moreover, the classification as inactive workers of individuals which report "waiting" as a reason for not having searched for a job, those individuals who have searched for a job but are still considered to be out-of-the-labour-force, as well as those individuals which are due to start work in more than three months might not be reasonable, since they show considerable attachment to the labour market and we reject the pooling of such states with their counterparts.

4. Regional development of education as a "coordination game", Ana Paula Buhse, José Pedro Pontes, *Working Paper 075-2019.*

In this paper, we try to assess the ability of educationally backward countries, such as Portugal, to catch-up with more developed nations within the EU. For that purpose, we use a framework composed by a symmetric coordination n person game that is played by a set of candidates to attend a post-compulsory educational degree, such as university. Higher education has a positive payoff only if a "critical mass" (indeed the unanimity) of students with a low socioeconomic background decide to attend the university. Two strict Nash equilibria exist in this game: either all players decide to attend the university or none does it in equilibrium. By using the "risk dominance" approach to the selection of a unique Nash equilibrium that was suggested by HARSANYI and SELTEN (1988), we are able to recognize the factors that make either strict Nash equilibrium the likely solution. In spite of the progress they have achieved in schooling, structurally lagging countries such as Portugal seem to be hindered in education development by the fact

that, in a large majority of households, income is low and parents lack post-compulsory education. While low household income makes the relative cost of university education high even if tuition fees are modest, a small share of highly educated parents makes the achievement of a "critical mass" of students who attend the university more difficult and thus renders the benefits of college education riskier and less safe.