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**Ciencia, tecnología, innovación y desarrollo económico en perspectiva histórica**  
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**Sesión 12. Natural Capital, Resources and Sustainability in historical perspective**

Over the past quarter-century, Genuine Savings (GS) –or Adjusted Net Savings (ANS)– has emerged as an important indicator of Sustainable Development. It is based on the concept of wealth accounting (Hamilton & Hepburn, 2014) and represents a measure of how the country’s total capital stock (physical, natural, social, institutional and human) changes year-on-year. Following the pioneering studies of Pearce & Atkinson (1993) and Kirk Hamilton (1994), the World Bank has published estimates of GS from the mid-1990s to the present (World Bank, 1995, 1997, 2015). Hamilton & Clemens (1999) and World Bank (2006, 2011, 2018) illustrate the nature of these estimates for almost all countries in the world and show how a negative GS indicator can be interpreted as a signal of unsustainable development. Current World Bank data to support the calculation of GS at the country level stretches back to the 1970s, and provides empirical evidence of the level of sustainable/unsustainable economic development throughout the world. However, the social and economic development is, by definition, a long-run process where path-dependence, persistence and multiple equilibriums interact in the construction of “the future”. What can we learn from history about the sustainable development? We propose a session to discuss on this subject to offer novel views about the economic history of regions and countries and contribute in the current debate about development policies.

Therefore, we propose analysing the sustainable development of different economies in historical perspective focusing on empirical approaches on the topic. Based on the notion of GS as a framework we expect to receive methodological and empirical works in diverse stages of research (initial and advanced papers) which consider different components of the estimation. GS adds up the value of year-on-year changes in each individual element of capital stock and we will look for long-run estimates (from the 19<sup>th</sup> century to nowadays) offering information about fixed capital formation, natural resource use and educational investment, as well as the respective shadow prices to reflect the marginal value product of each stock in terms of its contribution to welfare. Changes in human capital can be approximated using expenditures on education, as a rate of return on time spent in education, or as a measure of discounted lifetime earnings by skill level. The effects of technological change, resource price appreciation (capital gains/losses) for resource exporters and importers, and population change can also be incorporated into the GS indicator and we will welcome efforts in this sense. Changes in the stock of certain pollutants (such as CO<sub>2</sub>) –valued using marginal damage costs– can also be presented in the estimates of the index. We encourage particularly contributions in this matter because we pretend to open the possibility of discussing the role of economic history in climate change, a main topic in the sustainability debate (Blum, Ducoing, & McLaughlin, 2017; Greasley et al., 2014; Kunnas et al., 2014).

Studying the last two hundred years through the lens of natural resources, sustainability and alternative measures of development enables us to make a broader contribution to the understanding of the economic history of the period and to shed light on the prediction of the future well-being. Along this period interacted stages of increasing world integration (as the First Globalization era) with other of progressive enclosing (the interwar period), deep dislocations of the international economy (with both World Wars) and periods of sustained growth in the world core with persistent divergence in the periphery. Our aim is to identify different stylized facts of the international economy to contribute in the construction of a research agenda on the matter and to enhance welfare measures in the long run.

## References

- BLUM, M., DUCOING, C., & MCLAUGHLIN, E. (2017). A Sustainable Century? Genuine Savings in Developing and Developed Countries, 1900 - 2000. In Kirk Hamilton & C. Hepburn (Eds.), *National Wealth What Is Missing, Why It Matters*. Oxford Univ Pr.
- GREASLEY, D., HANLEY, N., KUNNAS, J., MCLAUGHLIN, E., OXLEY, L., & WARDE, P. (2014). Testing genuine savings as a forward-looking indicator of future well-being over the (very) long-run. *Journal of Environmental Economics and Management*, 67(2), 171–188. <https://doi.org/10.1016/j.jeem.2013.12.001>

- HAMILTON, K., & HEPBURN, C. (2014). Wealth. *Oxford Review of Economic Policy*, 30(1), 1–20. <https://doi.org/10.1093/oxrep/gru010>
- HAMILTON, Kirk. (1994). Green adjustments to GDP. *Resources Policy*, 20(3), 155–168. [https://doi.org/10.1016/0301-4207\(94\)90048-5](https://doi.org/10.1016/0301-4207(94)90048-5)
- HAMILTON, KIRK, & CLEMENS, M. (1999). Genuine Savings Rates in Developing Countries. *World Bank Economic Review*, 13(2), 333–356. Retrieved from <http://ideas.repec.org/a/oup/wbecrv/v13y1999i2p333-56.html>
- KUNNAS, J., MCLAUGHLIN, E., HANLEY, N., GREASLEY, D., OXLEY, L., & WARDE, P. (2014). Counting carbon: historic emissions from fossil fuels, long-run measures of sustainable development and carbon debt. *Scandinavian Economic History Review*, 62(3), 243–265. <https://doi.org/10.1080/03585522.2014.896284>
- PEARCE, D. W., & ATKINSON, G. D. (1993). Capital theory and the measurement of sustainable development: an indicator of “weak” sustainability. *Ecological Economics*, 8(2), 103–108. [https://doi.org/10.1016/0921-8009\(93\)90039-9](https://doi.org/10.1016/0921-8009(93)90039-9)

## COMUNICACIONES

**DUCOING, Christian** (Lunds Universitet, Sweden), **MCLAUGHLIN, Eoin** (University College of Cork, Ireland); **OXLEY, Les** (University of Waikato, New Zealand), *Tracing sustainability in the long run. Genuine Savings estimations 1850-2018.*

The economic history of America shows an enormous divergence in the income per capita. The GDP per capita of USA is almost 3 times the respective figure of Latin America (weighted). This noticeable divergence has been tried to explain from different perspectives: institutions, inequality, factor endowments, economic policy and so on. However, a relevant point of this divergence has been absent in the majority of the works regarding this topic: sustainability. Using a novel data base on Genuine Savings for USA and Latin America, represented by six of the bigger economies of the region, the authors test if the divergence is bigger or lower when weak sustainability is taken into account. The results show that USA, even its unsustainable model, it has better figures in sustainability comparing with Latin America. The policy implications are relevant to developing countries. If the goal is increase GDP, depletion of Natural Resources doesn't assure this achievement and put in risk sustainability in the medium and long run. Moreover, the role of TFP is determinant in the differences, highlighting the role played by allocation of resources in both economies.

**IRIARTE, Iñaki** (Universidad de Zaragoza, Spain), *Genuine Saving in Spain in the long run (1860-2010) a first approach.*

Concerns about the environmental implications of economic growth are clearly increasing. Taking into account that GDP (which, as is well known, is the indicator commonly used in growth measurements) was not designed to capture the environmental effects of economic decisions, it seems desirable to explore which macroeconomic indicators can be used to capture these effects and assess their usefulness to be applied and analyzed in historical perspective. One of these indicators is the Genuine Saving (GS), which has been proposed as a tool to measure the sustainability, albeit in a “weak” sense, of an economy and that allows us to observe at what extent its evolution over time has been sustainable. Based on this idea, this communication reconstructs the GS for the Spanish case in the long run, making a critical assessment of the pros and cons that this indicator has to incorporate environmental issues into the measurement of growth. Likewise, the communication analyzes the GS already calculated for different countries, comparing them with the evolution of GDP and trying to see what are the main differences that arise from analyzing international growth with one or another.

**DUCOING, Cristian** (Lunds Universitet, Sweden), **MCLAUGHLIN, Eoin** (University College of Cork, Ireland); **RUBIO-VARAS, Mar** (Universidad Pública de Navarra, España); **WILLEBALD, Henry** (Universidad de la República, Uruguay), *Historical Genuine Savings in Latin America (1880 – 2020). Stylized facts on natural resource dependence and development.*

Latin America has been characterized as a region dependent on natural resources. The economic cycles of Latin American countries are related with raw materials demand from the core economies, hampering the autonomy of its economic policy. In this article we found that Latin America has a bigger gap with the developed world than mainstream income estimations suggest (mainly GDP estimations). If we take into account environmental degradation and lack of reinvestment of natural resources rents (under the adjusted net savings framework), Latin America have not achieved the basics of weak sustainability, meaning the compensation of natural resource extraction and environmental damages through investment in physical and human capital. Using a sample of seven countries, including Argentina, Brazil, Chile, Colombia, Mexico, Uruguay and Venezuela, the study covers more than 130 years of history.

**LABAT, Juan** (Universidad Carlos III, Spain), *Environmental Pollutants in truncated industrialization economies. South American Southern Cone in the 20<sup>th</sup> century.*

I plan to research about how societies affect the environment. For doing so, I will focus on the main pollutants looking to understand how societies generate them, how those pollutants impact the environment and the relationship between pollutant emissions and different development processes and economic activities. Each pollutant has its particularities which implies specific approaches to understand and measure each one. A long run analysis will be needed in order to understand changes in their emissions and their relationship with development processes, economic performance and structural change. Moreover, a comparison between different societies will be needed in order to analyse different development paths. Analysing Uruguay, I look to shed light to the question: Does "developed" societies went through a development process impacting less in comparison with "developing" societies? My hypothesis is that developed societies will show something similar to what is called an environmental Kuznets curve (Stern, 2004), which implies that those societies increased in a first stage their environmental affection and only after certain point in time they reduced their impacts. In contrast, developing societies (or "late" developed) will present a developing process with less negative impacts to the environment. It's important to mention that verifying a hypothesis like this contradicts in itself the definition of sustainable development, where economic, socially and environmental sustainability is needed, which brings the question if we should call "developed" a society which impacted much the environment in order to achieve certain levels of prosperity. The main contribution of this research line will be to present a more complete or comprehensive consideration of the environmental impacts of societies in time. Most articles and research which analyses the environmental impact over time considered just one environmental indicator and its relation with GDP per capita. In order to make this analysis more complete, I will try to consider the main pollutants and to compare them with different variables which show not only economic performance but also human development and structural change.

**BARTOLOMÉ RODRIGUEZ, Isabel** (University of Seville, Spain); **HENRIQUES, Sofia Teives**, (University of Porto, Portugal), *Electric dreams: electrifying Iberia through renewable energy*

Portugal and Spain share many similarities in their long-term economic and political development and natural resource endowments; however, their electrification trajectories were not in tandem. Spain relied from the early 1900s on hydro-power, while Portugal hydro-period started only in the 1950s. While Spain embraced nuclear power, Portuguese policy makers rejected it. Today, while both countries have an important share of renewables, the penetration of different technologies (wind-power, hydro-power, biomass and solar) and degree of electrification differs. With this case study we seek to understand how national governments, business elites and other policy-makers of the two countries

have envisioned the role of renewable electricity and deep electrification of their societies across time and how this may have led to different electrification patterns and mixes. First, for the governments and elites of many coal-poor countries such as Portugal and Spain, hydro-power electrification was seen as a way to achieve energy independence with a domestic resource and at the same time reduce the industrialization gap relative to coal-endowed countries. We will analyse who were the main visionaries, how this vision evolved in Spain and in Portugal over the period 1900-1970s, how it translated into policy intended to facilitate its diffusion and how outcomes of such policies differed from the visions of policy-makers. Second, we will contrast these early visions with the renewable electricity policies of Portugal and Spain from the first oil crisis until today, with specific focus on how the concept of a renewable electricity system and deep electrification was affected by the emergence of environmental concerns along with energy security and economic growth objectives.

**SAN JUÁN RUIZ, Ángel** (Universidad Pablo de Olavide, España), **INFANTE AMATE, Juan** (Universidad de Granada, España), **RUBIO, Juan Antonio** (Universidad de Granada, España) **GARRUÉS, Josean** (Universidad de Granada, España), *La transición energética en la industria española (1960-2020). Un estudio por ramas de actividad.*

La transición energética ha sido señalada como uno de los principales factores explicativos del crecimiento económico moderno. Aunque en los últimos años se han llevado a cabo ambiciosos trabajos que han reconstruido el consumo total de energía en perspectiva histórica en varios países del mundo, apenas se han realizado análisis a nivel sectorial. En el caso de España sabemos cómo ha evolucionado el consumo de energía por tipo de producto, sin embargo, no contamos con información seriada sobre el consumo a nivel sectorial. En este trabajo presentamos una estimación del consumo de energía y la producción, tanto en unidades monetarias como en unidades físicas, en la industria española, distinguiendo más de 70 ramas de actividad. Con esta información estimamos los ritmos de la transición en las diferentes ramas; la evolución de la eficiencia energética, medida como la energía consumida por kg de producto generado; así como la intensidad energética, medida como la energía consumida por valor añadido generado. Esta información nos permitirá mediar en importantes debates abiertos. En primer lugar, mediante análisis de descomposición, analizaremos en qué grado el aumento productivo que ha tenido lugar durante la aceleración del crecimiento económico español ha sido ‘energy-expanding’ (añadiendo más energía) o ‘energy-saving’ (produciendo más con la misma energía). En segundo lugar, analizaremos si los cambios en la eficiencia han tenido lugar por mejoras tecnológicas generalizadas o por cambios estructurales, esto es, por

cambios en el mix productivo. Por último, estudiaremos qué variables determinan los diferentes niveles de eficiencia, así como la velocidad en completar la transición en las diferentes ramas de actividad analizadas.