



VNIVERSITAT DE VALÈNCIA

Lectio de Doctor Honoris Causa
per la Universitat de València
Prof. Dr. Dale W. Jorgenson

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PRODUCTIVITY AND WORLD ECONOMIC GROWTH

Rector Estaban Morcillo,
Members of the University of Valencia community,
Colleagues and friends from other universities,
Ladies and gentlemen:

I am greatly honored to receive the award of Doctor Honoris Causa from the University of Valencia. I will begin by thanking my escorts for today's ceremony – Professors Matilde Mas, Francisco Perez, and Javier Quesada of the Faculty of Economics, Professor Jose Manuel Pastor, Dean of the Faculty, Professor Vicent Soler, former Dean of the Faculty, and Professor Andreu Mas-Colell of Pompeu Fabra University in Barcelona, my former colleague from Harvard. I am very pleased that Professors Jose Garcia-Montalvo and Marta Reynal-Querol of Pompeu Fabra are able to join us today. Professor Garcia-Montalvo is a graduate of both Valencia and Harvard. Let me conclude with special thanks to Professor Perez for his truly remarkable Laudatio.

I will next address the new doctors who have completed their degrees at the University of Valencia during the academic year 2014-2015. On occasions like this, a long tradition among economists is to discuss the economic outlook. My focus in this brief lecture will be on the outlook for the world economy. This has importance for all of us, but has special relevance for the members of the audience at the begin-

ning stages of their careers. While the economic fundamentals for the world economy are sound, dramatic changes in economic leadership are taking place in the twenty-first century. The industrialized economies of Europe, Japan, and the United States are growing less rapidly than the world economy, while emerging economies like China and India are growing more rapidly. The balance of the world economy is shifting and we need to consider the momentous changes that will accompany the emergence of a new world order.

The second topic I will address today is the meaning of knowledge on a topic as broad as the world economy. I have worked closely with colleagues at Valencia on the subject of “Productivity and World Economic Growth.” Earlier this week we participated in the Fourth World KLEMS Conference in Madrid. The conference included research on productivity and economic growth for more than forty countries in Asia, Europe and North and South America. This research will be reported in a new book that will be published by the Cambridge University Press this summer, *The World Economy: Growth or Stagnation?* I have edited this book with Kyoji Fukao of Hitotsubashi University in Tokyo, who is here with us today, and Marcel Timmer of Groningen University in The Netherlands.

The World KLEMS Initiative, the research consortium that met in Madrid this week, represents a new approach for acquiring knowledge about the world economy. For each of the forty countries discussed in Madrid a team of country experts has developed information about the country’s growth. For example, the country experts for Spain include members of the faculty of the University of Valencia who are associated with IVIE, a distinguished economic research institute in Valencia.

The efforts of the experts are closely coordinated by means of a common set of international standards established by institutions like the OECD in Paris and the Statistical Division of the United Nations in New York. The standards specific to research on economic growth have been established by the leaders of the World KLEMS Initiative.

Recent Performance of the World Economy

Let me now turn to the outlook for the world economy. The United States has emerged from the Great Recession of 2007-2009 with low unemployment and a substantial slowdown in economic growth. Japanese growth has continued to languish after more than two Lost Decades. In Europe the fiscal and financial burden of public debt and the challenges of financial crises pose barriers to the restoration of economic growth. The emerging Asian economies have continued to grow more rapidly than the world economy, but also face daunting challenges. Can China cope with the pressures that follow a vast expansion of lending to deal with the world-wide crisis? Will India succeed with fiscal consolidation and a gradual reduction in the rate of inflation?

My first conclusion is that the world economy is undergoing a fundamental transformation. The balance of the world economy in the twenty-first century is shifting from the industrialized economies, led by Europe, Japan, and the United States, to the emerging economies of Asia, especially China and India. These massive changes are generating a new world economic order. China is now overtaking the U.S., which was the world's largest economy throughout the twentieth century. India has already overtaken Japan as the world's third largest economy. The new world economic order will be led by China, followed by the United States, then by India, and, finally, by Japan.

My second conclusion is that world economic growth has accelerated during the twenty-first century. While faster growth will continue, I project that the leading industrialized economies will grow more slowly than the world economy, while China and India will grow more rapidly. However, Chinese economic growth has already slowed and Indian growth will follow. Nonetheless, the Chinese and Indian economies will increase in relative importance as the world's economic growth rate gradually declines. It is important to keep in mind that not all emerging economies will grow faster than the world economy. Brazil and Russia, two of the largest of these economies, will be growing more slowly.

My third conclusion is that economic growth in the twenty-first century relies on a new paradigm that I will call the Asian model of economic growth. The Asian model is based on globalization and relies on investment in human and non-human capital rather than innovation. This new growth paradigm places a high premium on the formulation of an effective growth strategy and skillful management by private and public authorities. The performance of the leading economies in implementing the new growth paradigm, most recently China and India, has changed the course of economic development in Asia and around the world.

The growing significance of the Asian model in the world economy is overturning long-established theories of economic growth and accelerating overdue revisions of the official statistics. The ruling theories of growth of the twentieth century placed enormous weight on innovation, which has played a relatively modest role. These theories neglected investments in human and nonhuman capital, which are much more important for industrialized economies as well as for emerging

economies. The rise of a new economic order will help to establish this empirically-based view of the sources of world economic growth. I will show that the new twenty-first century theory of growth has become a practical tool for formulating and evaluating economic policies.

The World KLEMS Initiative

I will next consider the acquisition of knowledge about the broad topic of the world economy. The Madrid conference was based on the research of participants in the World KLEMS Initiative. This is a research consortium covering Europe, Latin America, and Asia, as well as major economies such as Australia, Canada, Russia, and the United States. The key insight of the World KLEMS Initiative is that data on the growth of outputs, inputs, and productivity at the industry level are essential for identifying the sources of economic growth. The modest rates of innovation needed to sustain long-run growth are concentrated in a relatively small number of industries. For example, the production of information technology equipment, software, and services has dominated recent innovation in the U.S.

The first data set using the World KLEMS framework was published for the United States in my 1987 book, *Productivity and U.S. Economic Growth*, co-authored with Frank Gollop and Barbara Fraumeni. This study provided a template for the methods of economy-wide and industry-level productivity measurement presented in the OECD *Productivity Manual* in 2001. The hallmarks of the new framework for productivity measurement are new measures of capital (K) and labor (L), as well as new measures of energy (E), materials (M), and services (S), all at the industry level. This gives rise to the acronym KLEMS, spelled K-L-E-M-S.

The U.S. dataset was revised to include investment in information technology in my 2005 book, *Information Technology and U.S. Economic Growth*, co-authored with Mun Ho and Kevin Stiroh. This book presented data on the production of computer hardware, telecommunications equipment, and software, as well as information technology services. The dataset captured the importance of innovation in the information technology-producing industries in understanding of the U.S. investment boom of the 1990s. The Madrid conference included current research for nearly forty countries, almost all of it incorporating the impacts of investment in information technology on economic growth.

The starting point for the World KLEMS Initiative is the methodology established by the OECD, beginning with the OECD Productivity Manual in 2001. The participants in the World KLEMS Initiative have adapted this methodology to industry-level data generated in a wide variety of settings. The international standards for productivity measurement were greatly extended by their adoption by the United Nations Statistical Commission in 2007. The revised version of the OECD Manual Measuring Capital, published in 2009, was an important outcome of these deliberations.

The United States has played an important role in establishing official standards for KLEMS-type data. In Chapter 2 of our new book, *The World Economy: Growth or Stagnation?* Mun Ho, Jon Samuels, and I present industry-level data for the U.S. from the earliest available starting point up to the present. Official industry-level productivity statistics were incorporated into the U.S. National Income and Product Accounts in 2014. These statistics were updated and revised to incor-

porate intellectual property products in the benchmark revision of the U.S. accounts in the same year. Official systems of industry-level production accounts are part of the national accounts in Australia, Canada, Denmark, Finland, Italy, Mexico, The Netherlands, Sweden, and the United Kingdom, as well as the United States.

The World KLEMS Initiative in Europe, Latin America, and Asia

The European Union KLEMS project was initiated in 2003 and completed in 2008. This project applied the international standards for productivity measurement to data for 25 of the (then) 27 countries of the European Union. The EU KLEMS datasets are essential for understanding the slowdown in European economic growth that came before the fiscal and financial crisis. Marcel Timmer, Robert Inklaar, Mary O'Mahony, and Bart van Ark have analyzed the sources of economic growth in Europe at the industry level in their 2010 book, *Economic Growth in Europe: A Comparative Industry Perspective*. Mary O'Mahony and Bart van Ark are with us today.

Matilde Mas, Francisco Perez and Javier Quesada of the University of Valencia contributed to EU KLEMS through their important work on Spain at IVIE in Valencia. Cecilia Jona-Lasinio of Luiss Guido Carli in Rome, who is also here today, contributed to EU KLEMS through her work on Italy and made important contributions to the measurement of investments in intangibles like human capital and intellectual property. Matilde Mas and Robert Stehrer have presented international comparisons within Europe and between Europe and the advanced economies in Asia and North America in their 2012 book, *Industrial Productivity in Europe: Growth and Crisis*.

The EU KLEMS project identified Europe's failure to develop a knowledge economy as the most important source of the slowdown in economic growth. A knowledge economy requires investments in human capital, information technology, and intellectual property – all involving intangibles. A very significant policy implication is that extension of the European single market to the service industries, particularly those intensive in the use of information technology, is essential for removing the barriers that limit European growth. The analysis of European economic growth in the EU KLEMS project is updated and extended by van Ark and O'Mahony in Chapter 4 of our book, *The World Economy: Growth or Stagnation?*

Regional organizations in Asia and Latin America have joined the European Union in supporting research on productivity and economic growth. Ariel Coremberg, who is with us today, has been a leader in preserving the statistical system of Argentina in the face of political manipulation which has now ended. The current state of the Latin America project is summarized by Andre Hofman, Matilde Mas, Claudio Arevena, and Juan Fernandez de Guevara in Chapter 5 of *The World Economy: Growth or Stagnation?* The authors have presented industry-level data on outputs, inputs, and productivity for Argentina, Brazil, Chile, Columbia, and Mexico. The most remarkable finding is that none of these Latin American economies experienced growth in productivity during the two-decade period 1990-2010.

The Asian regional organization of the World KLEMS Initiative, Asia KLEMS, includes industry-level databases for Japan, Korea, and China. Industry-level databases have been constructed for Taiwan and work is underway to develop a database for Malaysia. The Japan In-

dustrial Productivity database is compiled in collaboration between the Research Institute for Economy Trade and Industry (RIETI), an agency of the Japanese government, and Hitotsubashi University. The Japan Industrial Productivity database has been compiled annually since 2006 under the direction of Kyoji Fukao.

Fukao and his colleagues have employed the Japan Industrial Database in analyzing the Lost Decades of the Japanese economy in Chapter 3 of our book, *The World Economy: Growth or Stagnation? An initial downturn in productivity growth followed the collapse of a “bubble” in Japanese real estate prices in 1991. Japan experienced a much more severe downturn in productivity growth and a larger decline in output than the U.S. in the aftermath of the Great Recession of 2007-2009. The decline in the size of the Japanese labor force, the stagnation of productivity growth, and the collapse of investment have resulted in a sharp decline in Japan’s growth rate. This has led to the prolonged stagnation of the Japanese economy that has continued to the present.*

The China Industrial Productivity database was released in April 2015 by the Research Institute for Economy, Trade, and Industry (RIETI). This database was constructed by Harry Wu of Hitotsubashi University and is reported in Chapter 6 of our book, *The World Economy: Growth or Stagnation? The database covers 1980-2010, almost the entire period since the epoch-making reforms in China under Deng Xiaoping in 1978. The India KLEMS database was released in July 2014 by the Reserve Bank of India. This database covers 26 industries for the period 1980-2011. The India KLEMS database is presented by Deb Kusum Das, Abdul A. Erumban, Suresh Aggarwal, and Sreerupa Sengupta in Chapter 7 of *The World Economy: Growth or Stagnation?**

Conclusions

The most striking finding from recent research on the world economy is the rise of a new world economic order with China as the leading economy, followed by the United States, and then by India and Japan. We recognize the emergence of Asia from the underdevelopment that characterized the major part of the twentieth century as the great economic achievement of our time. The economic advances in Asia are at their early stages, but are already dominating the outlook for world economic growth. This is no longer a topic solely for specialists, like members of the World KLEMS Initiative, but will affect all of our lives as these far-reaching changes continue into the twenty-first century.

The World KLEMS Initiative has established a new organizational framework for understanding the outlook for world economic growth. This framework relies on the expertise of country specialists who have compiled the relevant information about economic growth for more than forty countries, beginning with the United States and now including Asia, Europe, and Latin America. These data have been incorporated into the official statistics for ten countries. The parallel efforts of the country experts are coordinated through a common set of standards. The standards are established by international organizations such as the United Nations Statistical Division, the OECD, and the World KLEMS Initiative. A current initiative at the United Nations Statistical Division will include World KLEMS in a new official system of global and international accounts for the world economy.

In concluding my remarks I will return to the implications of the world economic order for the new doctors from the University of Valencia whom we honor today. Many of the new doctors are combining their efforts with others from all over the world through the emerging global market place. I have emphasized that the new world order rests on globalization and on investments in human and non-human capital. What is globalization? A leading example is the iPhone and I have here the latest version. The iPhone 6S is designed by Apple in Cupertino, California. Apple also manages an elaborate global value chain involving literally hundreds of suppliers in more than thirty countries all over the world. The final assembly takes place in Shenzhen, China, but only a tiny fraction of the value of the iPhone is added there. A substantial share of the value is added by the design teams in Cupertino that work continuously on new versions of the iPhone with new features and new software.

The new doctors from the University of Valencia have spent many years investing their time and effort in the studies that have led to their degrees. In return they have acquired a very valuable asset, namely, the lifetime returns from a productive professional career. An economist would describe this as investment in human capital. Investment in human capital is by far the most important form of investment in a modern economy. I am confident that the next generation of scholars in every discipline represented here today will contribute through their talents and their knowledge to meeting the many challenges that lie ahead of us. An economist would say that they will utilize the valuable human capital that they have accumulated at the University of Valencia. This is a leading example of the process that drives the growth of the world

economy in the twenty-first century. In addition, some of the contributions will produce work of great scholarly distinction. It is a privilege for me to participate in the launching of so many careers and to be granted membership in the University of Valencia as Doctor Honoris Causa.



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