



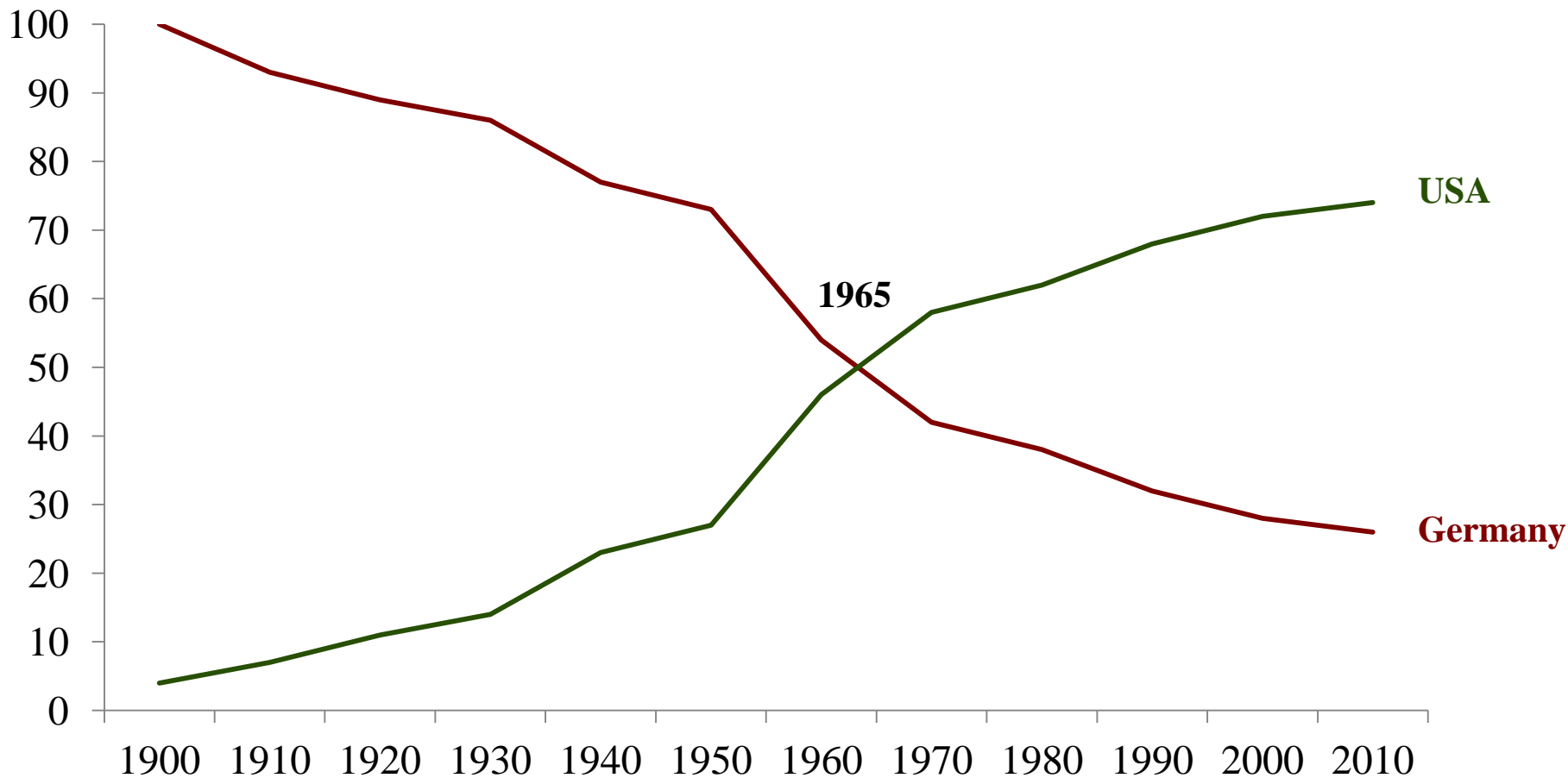
**The race between education and technology:  
some comments on the essentiality of higher  
education in the knowledge society.**

**Dr. Jorge Grünberg, Rector, Universidad ORT Uruguay.  
National Directors Forum, London, June 2014.**

**Higher education.  
The calm before the storm.**



# % of science Nobel prizes by citizenship of USA and Germany.



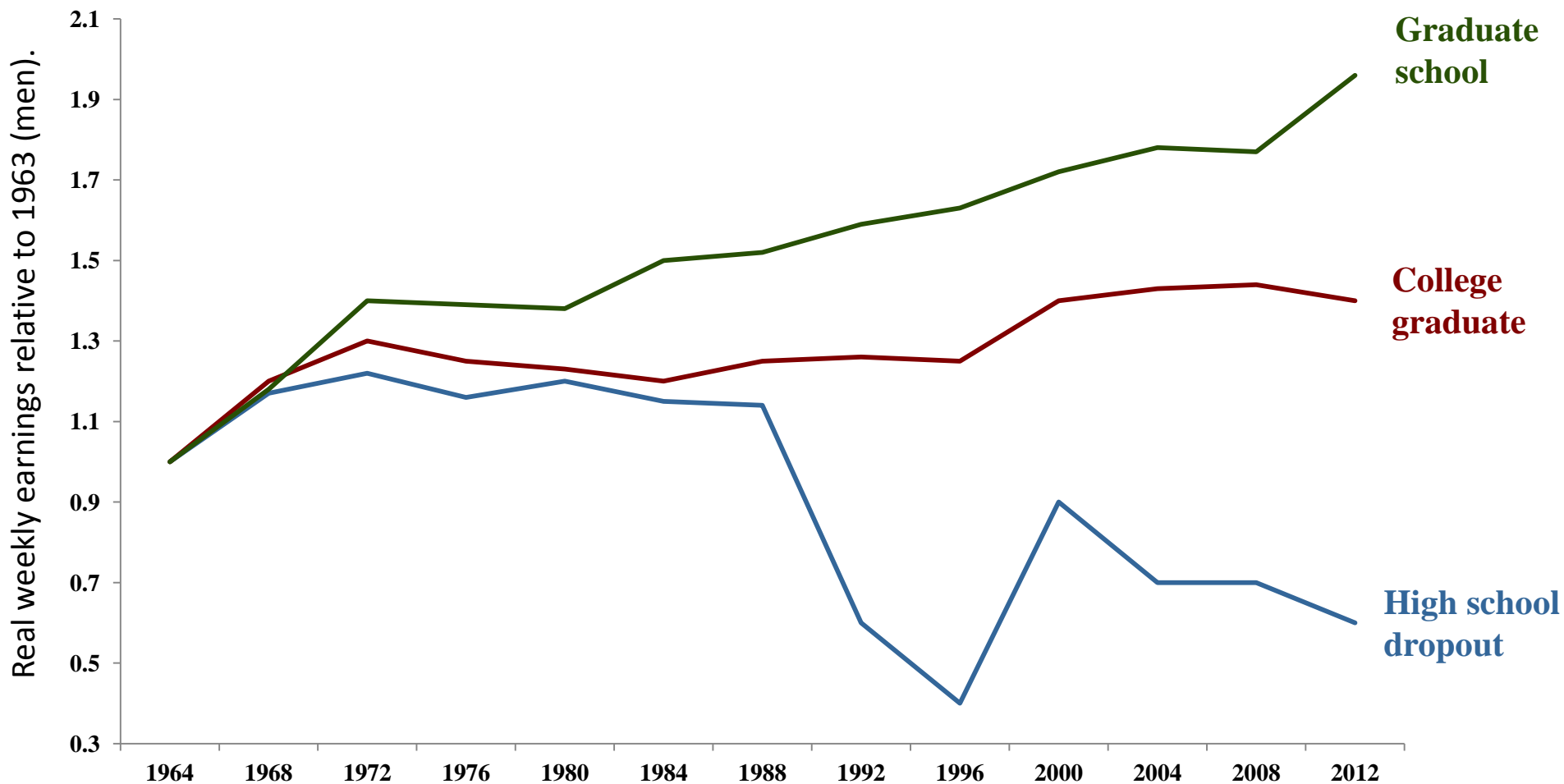
Source: Schmidhuber, J. (2010). Evolution of national Nobel Prize shares in the 20th century. Accessed June 5, 2014, from

<http://www.idsia.ch/~juergen/phys.html>

## **Social trends in the 21<sup>st</sup> century: Valorization of knowledge.**

- **Knowledge and talent have become the key source of wealth and sustainable competitive advantage.**
- **Who are now the richest countries?  
The ones who have oil or those who produce knowledge and nurture talent?**
- **High stakes for individuals excluded from high-quality higher education. A university degree will be the minimum entry-level qualification to function in the creative economy.**

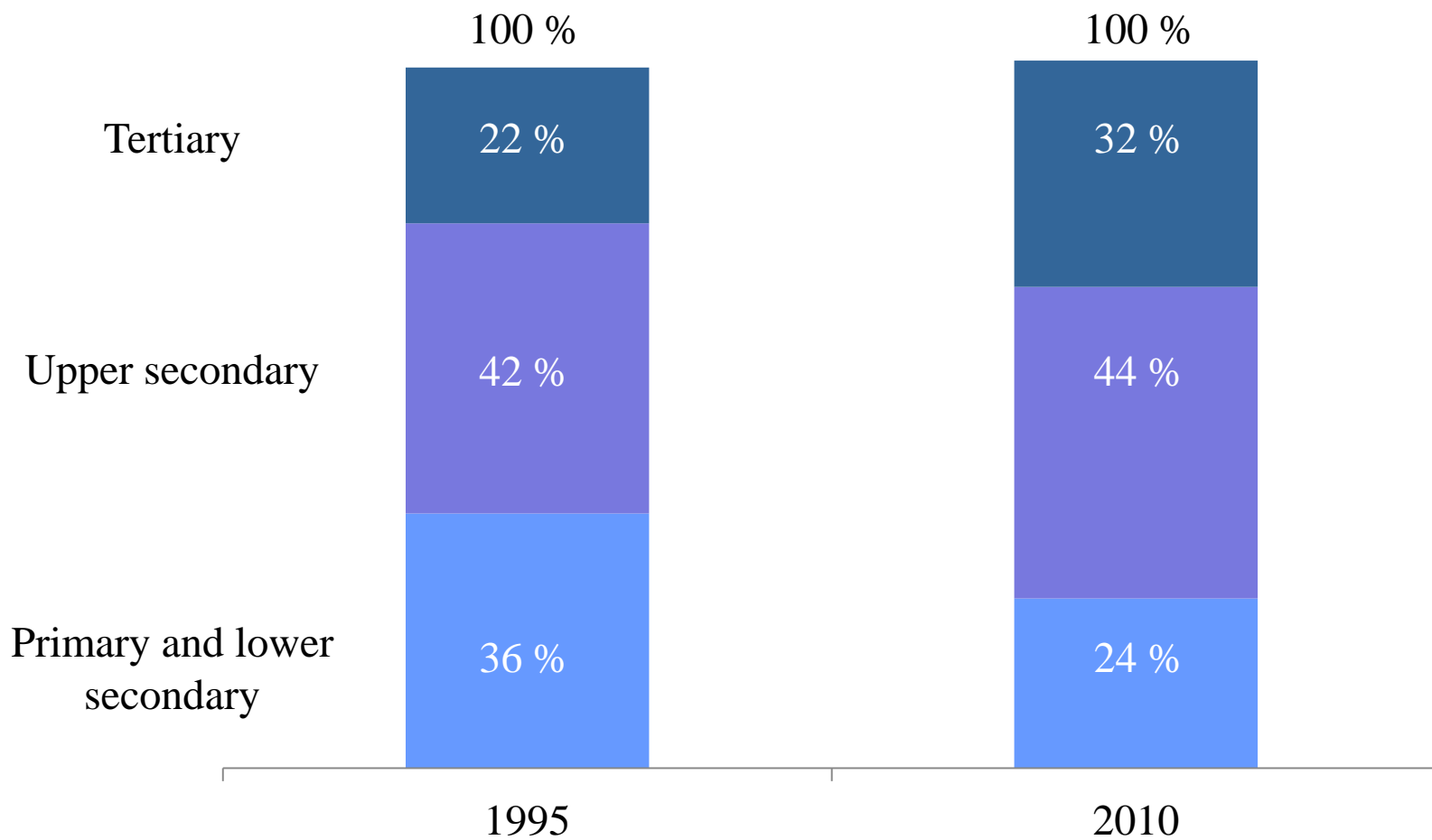
# Changes in wages for full-time male U.S. workers, 1964 - 2012.



Source: Autor, D. H. (2014). Skills, education, and the rise of earnings inequality among the other 99 percent. *Science*, 344(6186), 843-851.

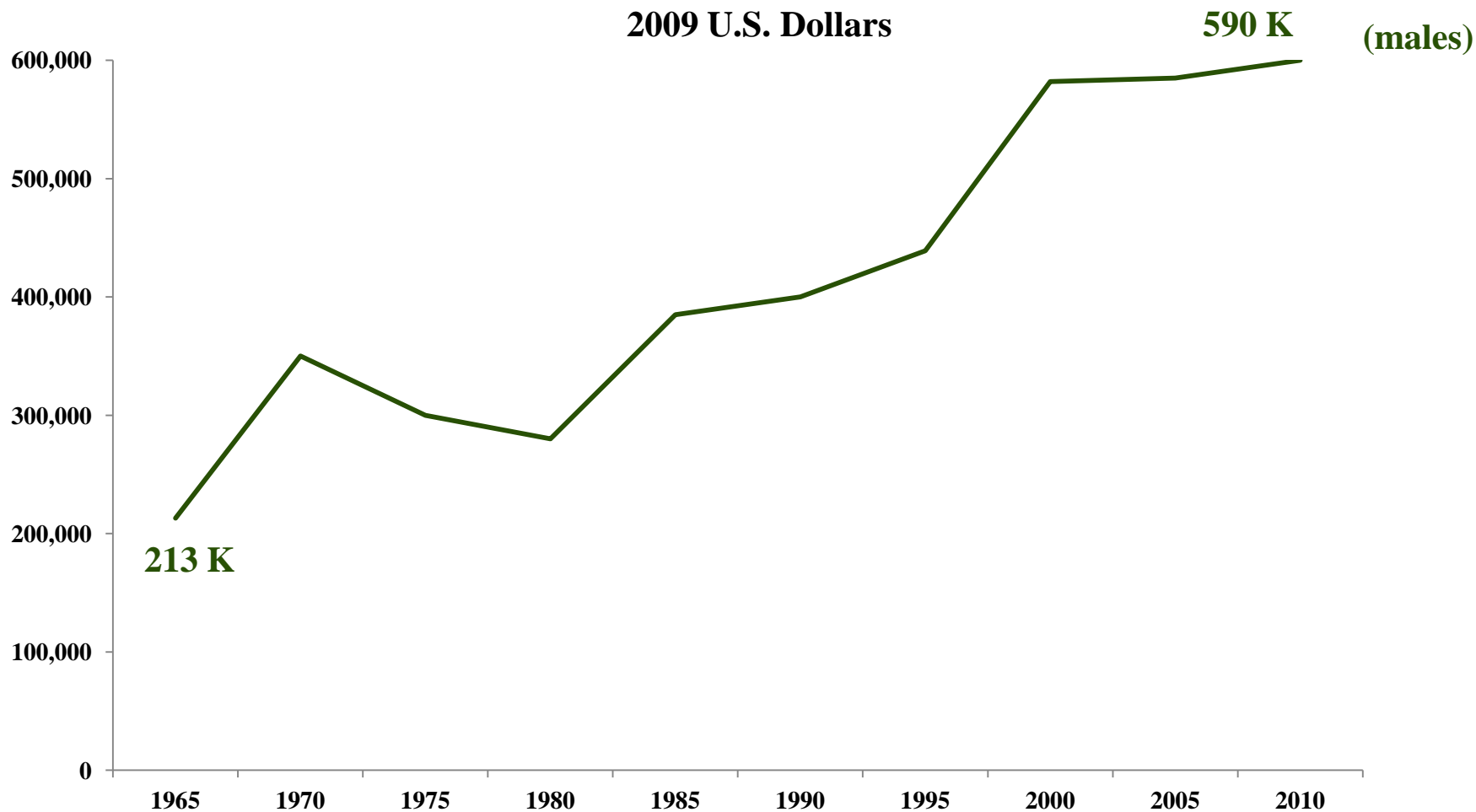
Accessed 5 June, 2014 from <http://www.sciencemag.org/content/344/6186/843.full#F3>

# More jobs require higher education. Jobs in OECD countries by the level of education required to perform it.



Source: Organisation for Economic Co-Operation and Development, Education at Glance 2011; McKinsey Global Institute analysis.

# Present discounted value of college relative to high school degree net of tuition, 1965 – 2010.



Source: Autor, D. H. (2014). Skills, education, and the rise of earnings inequality among the other 99 percent. *Science*, 344(6186), 843-851.

Accessed 5 June, 2014 from <http://www.sciencemag.org/content/344/6186/843.full#F3>

# **Social trends in the 21<sup>st</sup> century: globalization, automation and digitization.**

- **No market is out of reach but no job is secure.**
- **You are within reach of jobs and customers on the other side of the world. But you are also in competition with the best talent in the world.**
- **Many jobs are disappearing as computers become cleverer.**



**20<sup>th</sup> century waves of innovation  
reducing the need for physical  
labour.**

Electrification

Motorised  
transport

Telecommunications

Automation  
+  
digitization



Increasing importance of cognitive skills

## The effects of digitization.



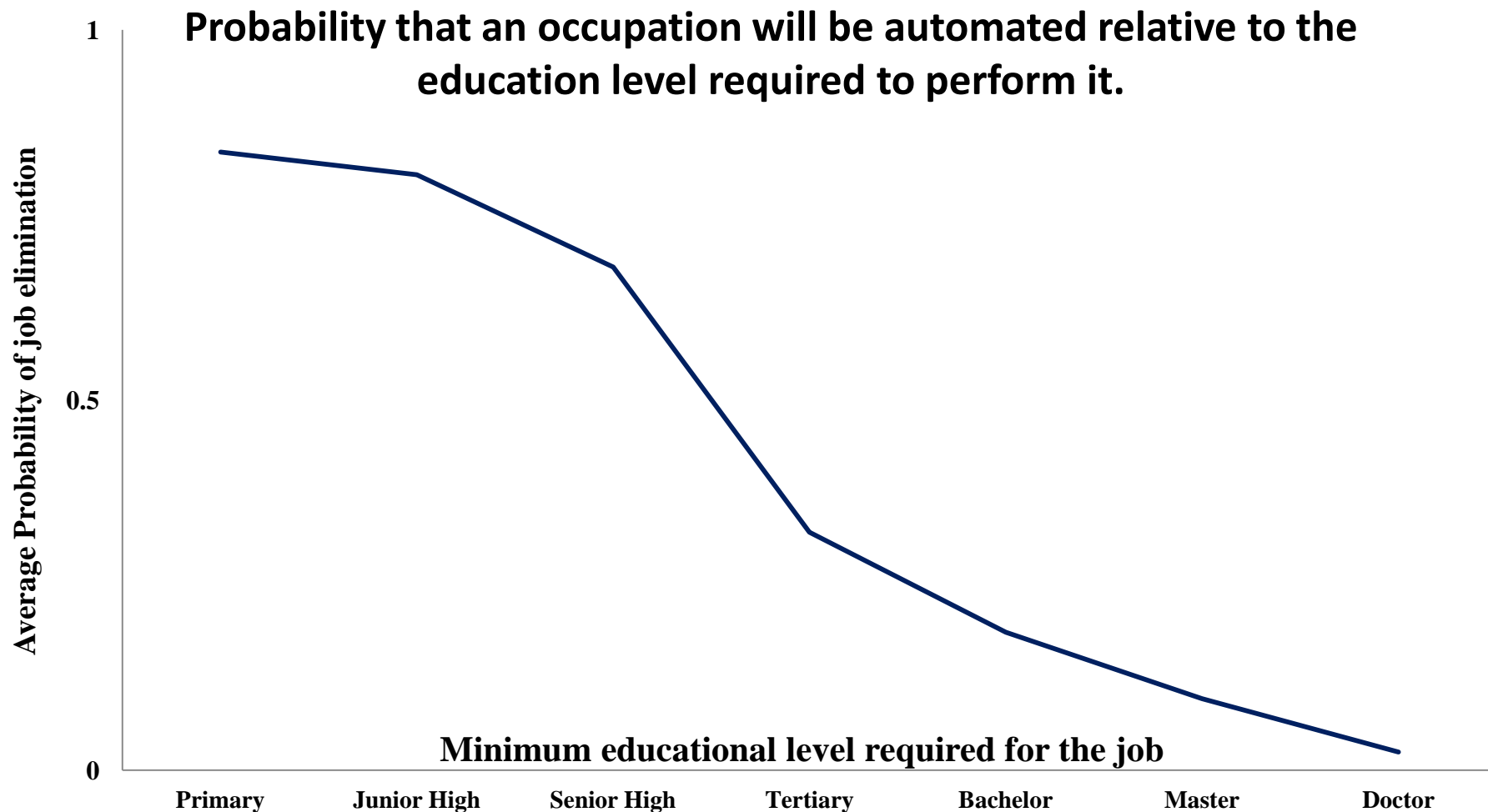
**140,000 workers**  
(filed for bankruptcy in 2012).

*Instagram*



**13 workers**  
(sold to Facebook for 1 billion dollars  
in 2012).

# The effects of automation: Probability that your job will dissapear.



Source: Calculations of Julio Fernández based on Frey, C.B. & Osborne, M.A. (2013). *The future of employment: how susceptible are jobs to computerisation?*. Accessed 12 May, 2014 from [http://www.oxfordmartin.ox.ac.uk/downloads/academic/The\\_Future\\_of\\_Employment.pdf](http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf)

# Jobs at risk of automation.

	<b>Routine Predictable task</b>	<b>Non routine, Non predictable tasks</b>
<b>Cognitive tasks</b>	Bookkeepers Cashiers	Paralegals Researchers Managers Artists
<b>Manual tasks</b>	Assembly line workers	Drivers Cleaners



**Jobs at risk of automation**



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**Driverless cars mean less drivers.**



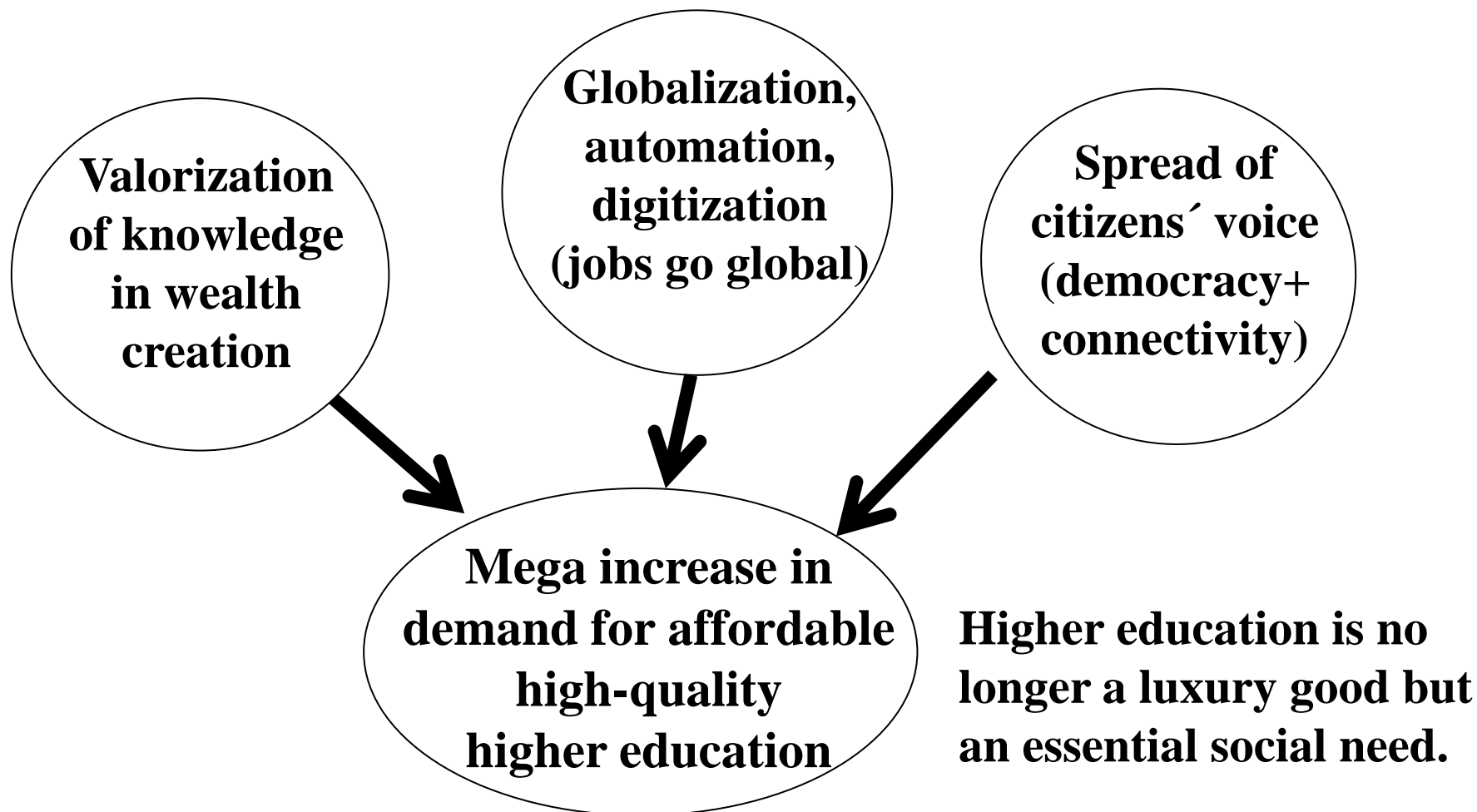
## Occupations at high risk of disappearing (due to automation).

<b>Probability</b>	<b>Occupation</b>
0.98	Models
0.98	Sports umpires and referees
0.97	Cashiers
0.96	Cooks
0.96	Secretaries
0.94	Accountants and auditors
0.86	Taxi and bus drivers

# Occupations at low risk of disappearing.

<b>Probability</b>	<b>Occupation</b>
0.004	Choreographers
0.004	Fire fighters
0.004	Physicians and surgeons
0.004	Police detectives
0.004	Teachers
0.005	School principals
0.007	Athletic trainers
0.01	Artists

# Forces leading to fundamental change in higher education.





**Human development is a race  
between education and technology.**

Technology

Education

## **Access to higher education as a social bottleneck for progress.**

- **There are not enough teachers to provide high quality advanced education to all seekers. Teaching is a personalized service.**
- **Teaching productivity is constrained by the “Baumol effect” (a string quartet cannot become more productive by playing faster).**
- **To raise productivity, teaching must be unconstrained by co-location, co-temporality and linearity (more students requiring proportionally more teachers and buildings).**

**Socratic teaching: excellent for a  
lucky few.**



**“Industrialised teaching”: uniform content and pace for many.**



# Historical trade-offs in education: personalization or coverage?

Agrarian economy

**Socratic teaching**

Primary education

High personalisation  
Low coverage

Quality of the land

Industrial economy

**“Industrialized” teaching**

Secondary education

Low personalization  
High coverage

Quality of the tools

Knowledge economy

**“Networked” teaching**

Higher education

High personalization  
High coverage

Quality of cognitive abilities

Organizational  
change

Technological  
change

- uniformisation of content
- Impersonal teaching techniques
- logistic organization based on age



**Education must meet modernity.**



# MIT classroom, 1954 and 2014. (spot the difference)



The most recent technological change in education took place before Columbus discovered America (the printing press, 1450).

*In 500 years colleges will be fairly similar*





# Isaac Asimov on the impact of the Internet on education (1988).



# Leave your devices out of the classroom.

- **Do not speak to me or to each other. Listen to me, enraptured. Turn off your smartphone (and camera and GPS and...).**
- **Turn off your IPOD, forget about music even in music class.**
- **Do not Wat! Do not Twit!**
- **Do not search. If you search, do not use the results.**
- **Do not access YouTube, it will clog the school's network.**

# Is higher education ripe for “disruption”?

- **The centuries-old university model was shaped by the high costs of travel and the necessity of physical presence for access to teachers and books.**
- **Universities bundle teaching, assessment, credentialing and research. This vertical integration introduces inefficiencies and conflicts of interest.**
- **Disruptive innovations start by offering benefits to people who had previously been unserved by the existing providers technologies.**

## Universities “bundling” of services.

- **Classes “bundled” into courses.**
- **Courses “bundled” into degrees.**
- **Degrees “bundled” into credentials.**

# Little Toyota disrupted big GM in the 1960's.



Toyota 1960  
(approx. US\$ 1,200)



GM Pontiac 1960  
(approx. US\$ 3,000)

# Who is the dominant car maker now?



GM Spark  
(approx. US\$ 12,000)



Toyota Lexus  
(approx. US\$ 43,500)

# Waves of Digital Disruption.

**1995+**

Music  
Photography  
Books

**2010+**

TV  
News  
Travel  
Recruitment

**2015+**

Retail  
Finance  
Transport  
Education?

...

# Innovations that might disrupt higher education.

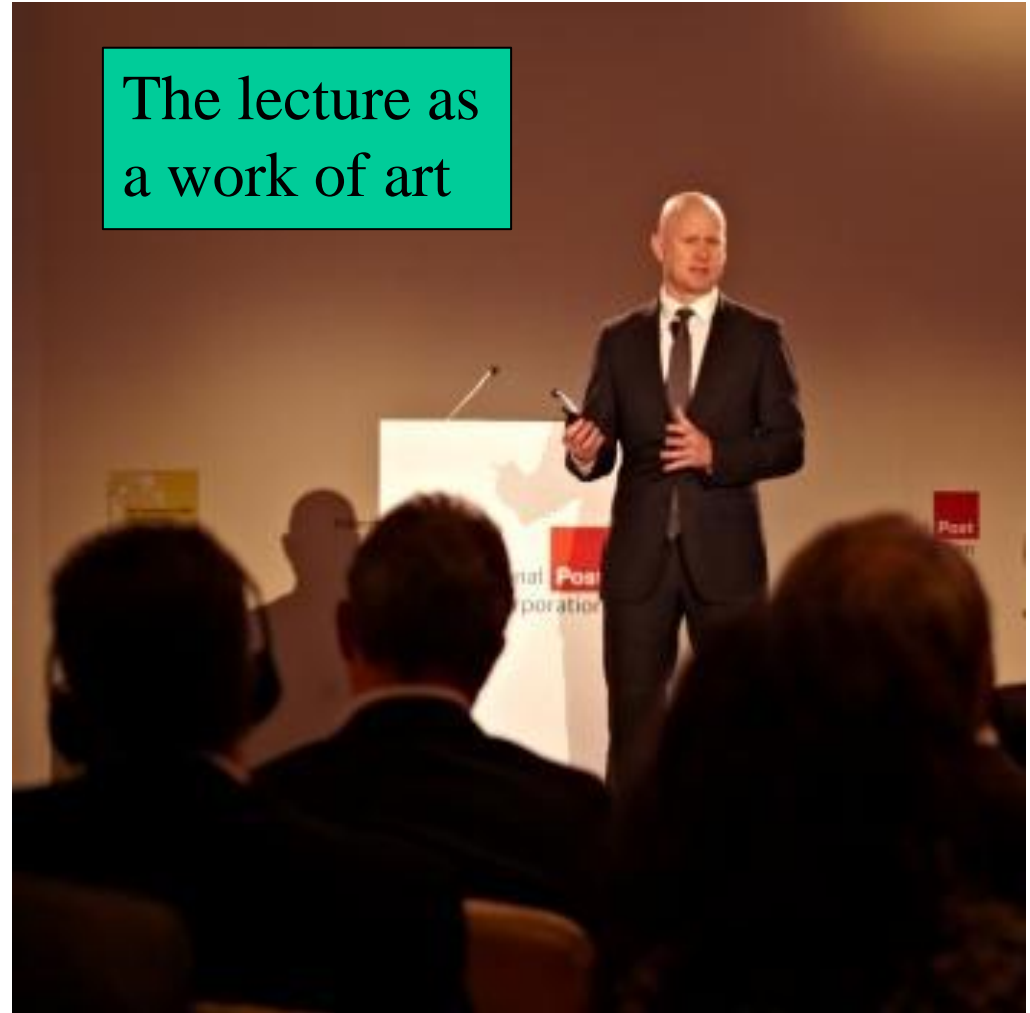
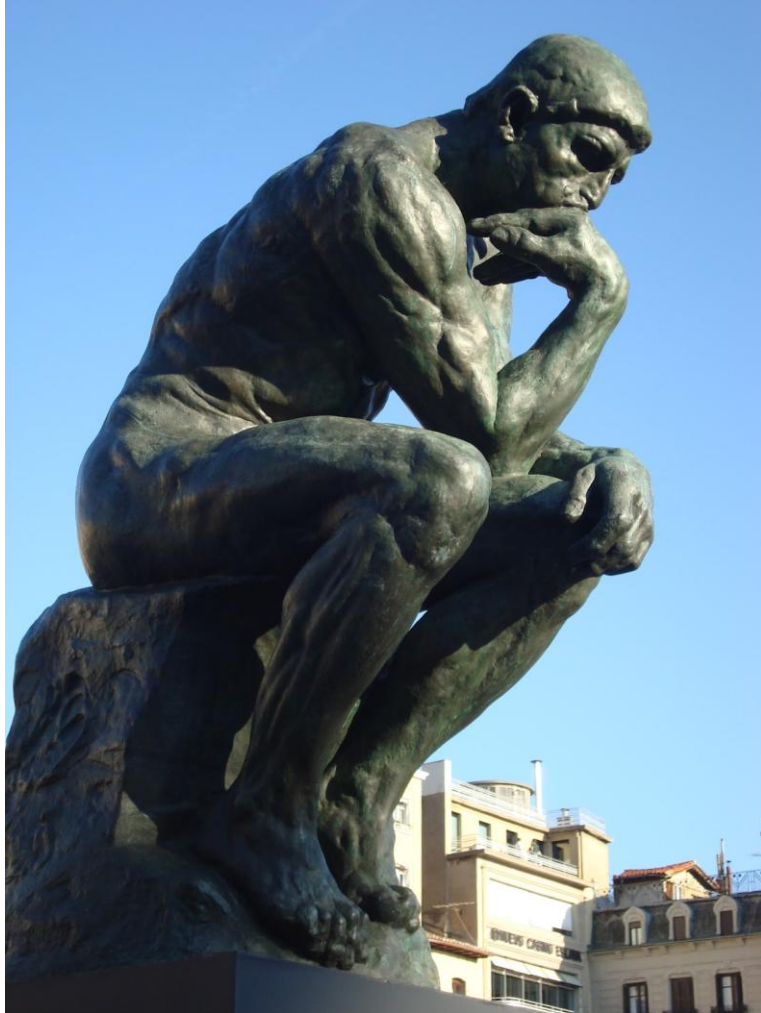
- **MOOC (massive open online courses).**
- **Flipped teaching.**
- **Educational Games.**
- **Big data, learning analytics + artificial intelligence recommendation systems.**



## Massive open online courses (MOOCs).

- **Until now interactive learning required co-location and co-temporality. MOOCs provide interactive on-line teaching.**
- **Online learning is highly scalable, the expense of adding an additional student is close to zero (0 marginal cost).**
- **MOOCs, are hailed as a disruptive innovation that will do to higher education what the Internet has done to newspapers or what Napster did to music.**
- **MOOC critics object their lack of “personalization” but, how personal are large classrooms?**

Walter Benjamin: The “aura” of uniqueness and the mechanical reproduction of works of art.



The lecture as  
a work of art

How personalized is this setting?

“Are you talking to me?”



**University of Obafemi Awolowo,  
Nigeria.  
Is this not “distant” education?**



## **Flipped teaching.**

- **Teachers assign lectures to watch at home and save class time for working on homework together.**
- **Flipping uses the resources on the Internet to free up valuable teacher classroom time, changes the teacher-student relationship and opens the door to “discovered” learning.**

## **Educational games.**

- **Games are goal-oriented, have strong social components and simulate real world experience.**
- **Ideal method of assessing student comprehension, provides immediate performance feedback to the players.**
- **Allows for experimentation, the exploration of identities, and a safe place to learn from failure.**



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*“I cannot teach  
anybody anything,  
I can only make  
them think.”*

*Socrates.*

**Thank you for your attention.  
Sorry to disrupt you!**

