Frontier Issues:

The impact of the technological revolution on labour markets and income distribution

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Development Policy and Analysis Division
UNDESA, New York

Objective of study

- **Whether recent and expected breakthroughs will transform the nature of work, and what consequences this will have on income distribution**

“recent and expected breakthroughs”

= a new revolution?

Fourth Industrial Revolution (4IR)

- Recent breakthroughs in several areas
  - Digital-tech, bio-tech, nano-tech, neuro-tech, green-tech
- Spurred by:
  - Greater computational power at decreasing costs
  - Rapidly growing datasets
  - Advances in artificial intelligence (AI)

What can we learn from the past?

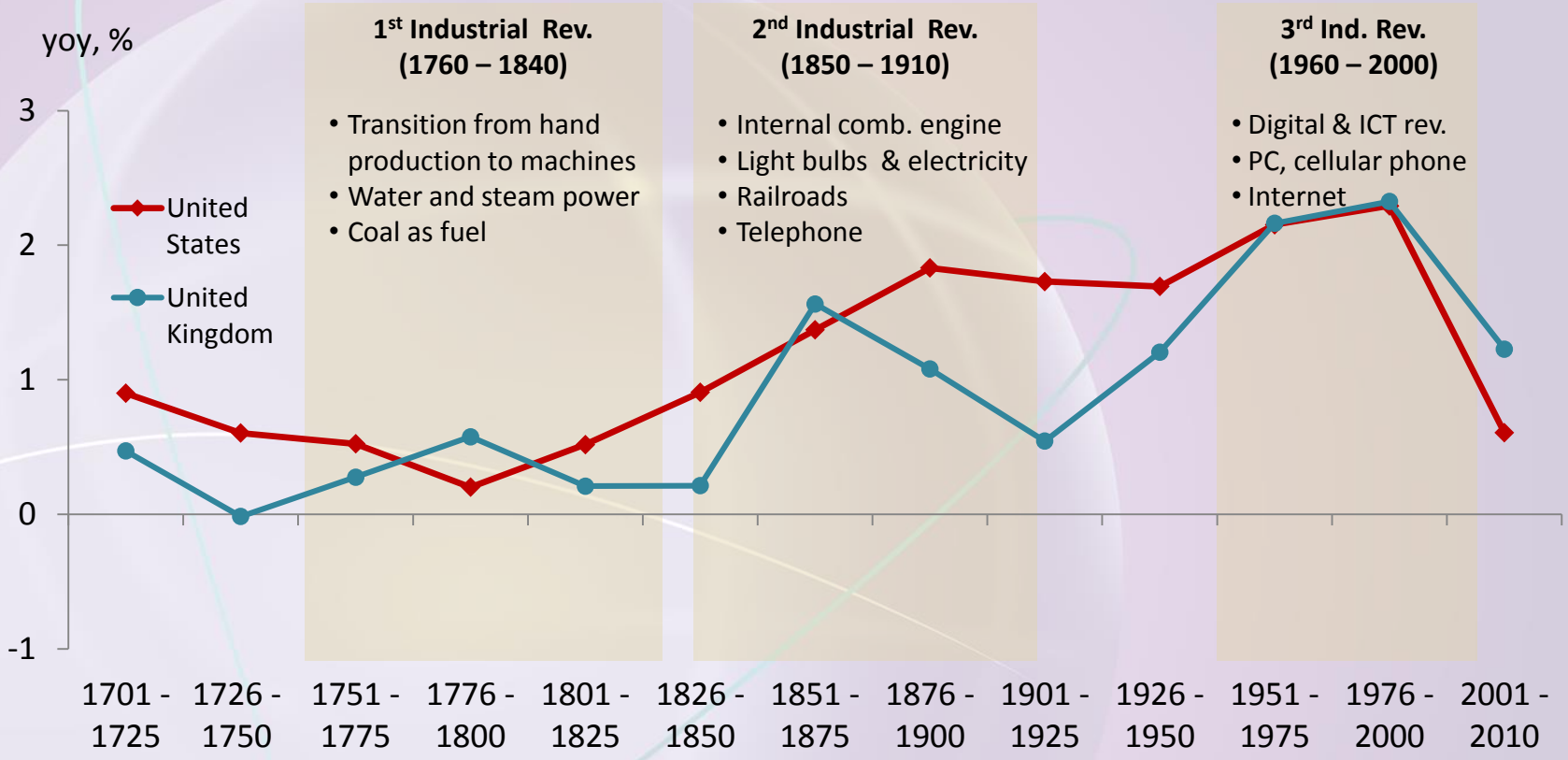
- A few times in history, major breakthroughs in the right circumstances transformed societies and economies

First industrial revolution:	1760-1840
Second revolution:	1850-1910
Third digital revolution:	1960-2000

Revolutions are difficult to identify

Impact of tech. revolution on productivity growth and living standards only visible after long lags – slow diffusion

GDP Per Capita Growth in the United Kingdom and the United States



Source: Maddison Project, UN/DESA estimates

Technological progress changes economic structures

Mechanization and productivity gains led to large declines in agricultural employment

Employment in agriculture as a share of total

United States	
In 1820	70 per cent
In 1913	27.5 per cent
Today:	< 2 per cent

China	
In 1970	80.8 per cent
In 2015	28.3 per cent

- **Technological revolutions have been highly disruptive**
- **While there is long-term societal gain, there are also winners and losers**

A new revolution? Not clear

- Requires technology
  - AI, 3D printing, new materials, gene editing, etc.
- Adoption & diffusion depend on many factors
  - Maturity, cost, complementary infrastructure
  - Social, economic and regulatory environment.
- Right conditions create General Purpose Technologies:
  - Steam, electricity, ICT

Economic potential of artificial intelligence and other breakthroughs

Broad commercial potential

- 3D printing
- More capable robots
- Software to assist on decision-making
- Service robots to interface with consumers

Applicable in many sectors

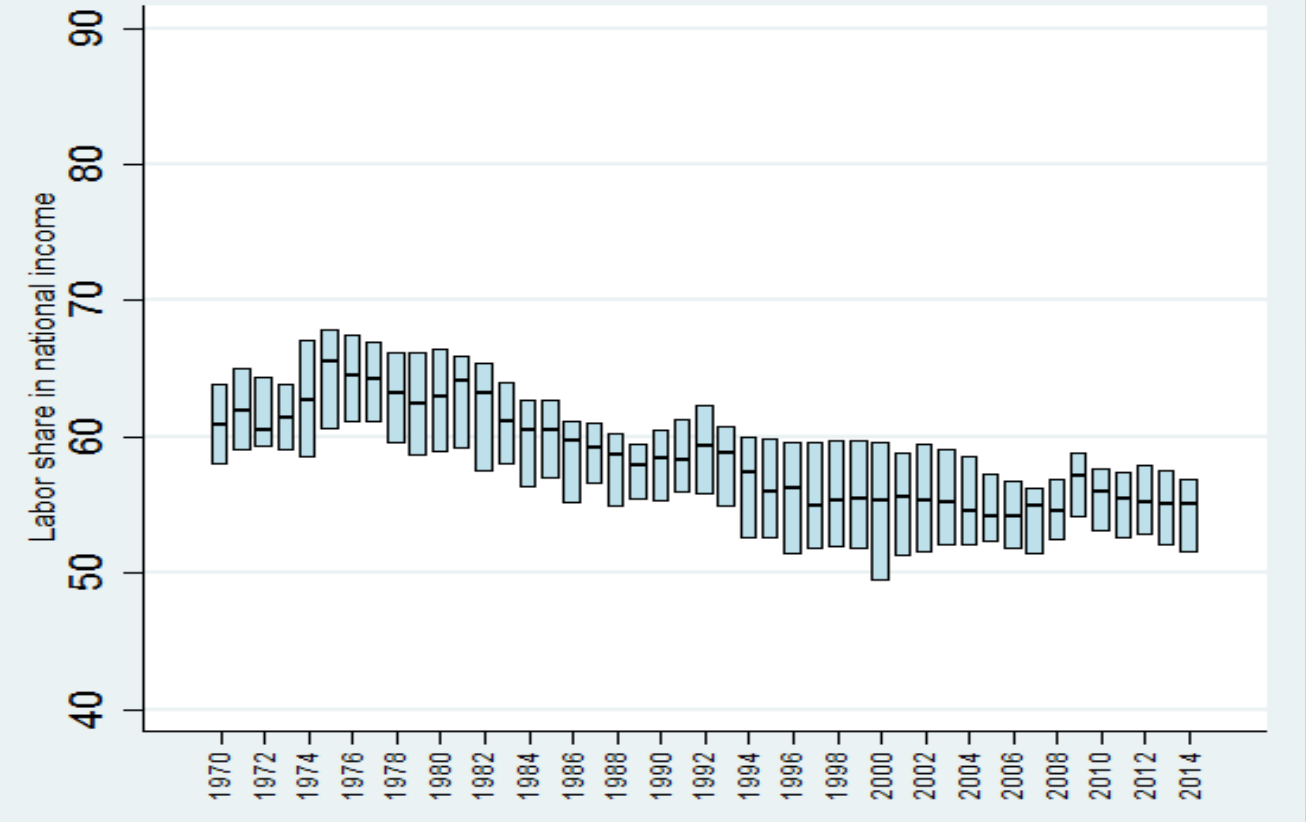
- Healthcare
- Manufacturing
- Services
- Agriculture
- Finance
- Research and development

Prominent concerns of the effect of technological progress

1. "Technological unemployment"
   - The potential of technology to replace workers at a large scale
2. "Quality of work"
   - The routinization and dehumanization of work
   - Lower wages and benefits
3. Rising inequality
   - Creation of winners and losers can result in growing inequality

Labour has been losing its share of income

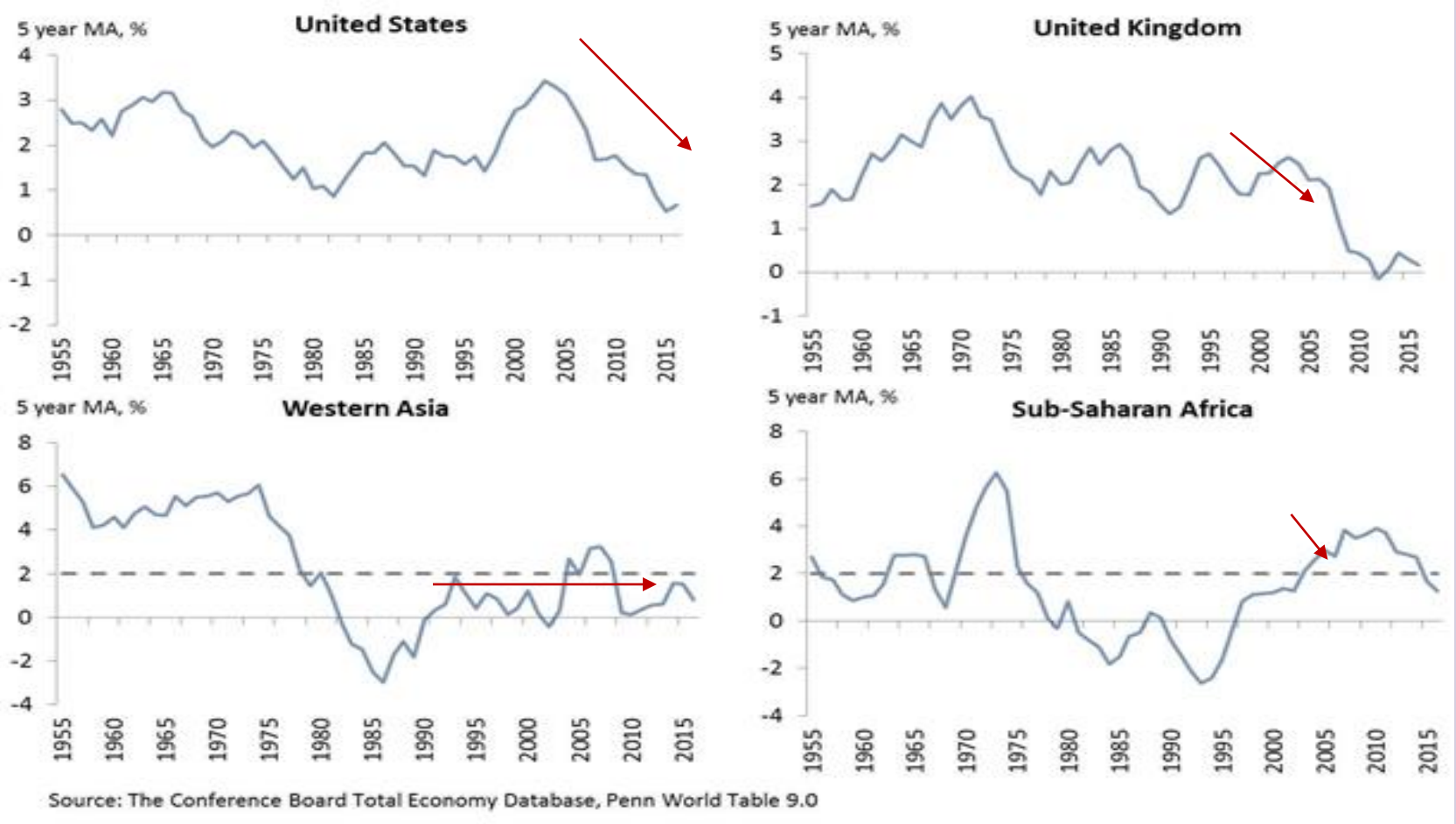
Trends of labour income share, selected 19 developed countries (1970-2014)



Source: Market Gini coefficient data is from the Global Consumption and Income Project (GCIP); labour income share data is from the International Labour Organization (ILO).

Productivity growth has slowed to a crawl

Trends in labour productivity growth in selected countries and regions (1955-2016)



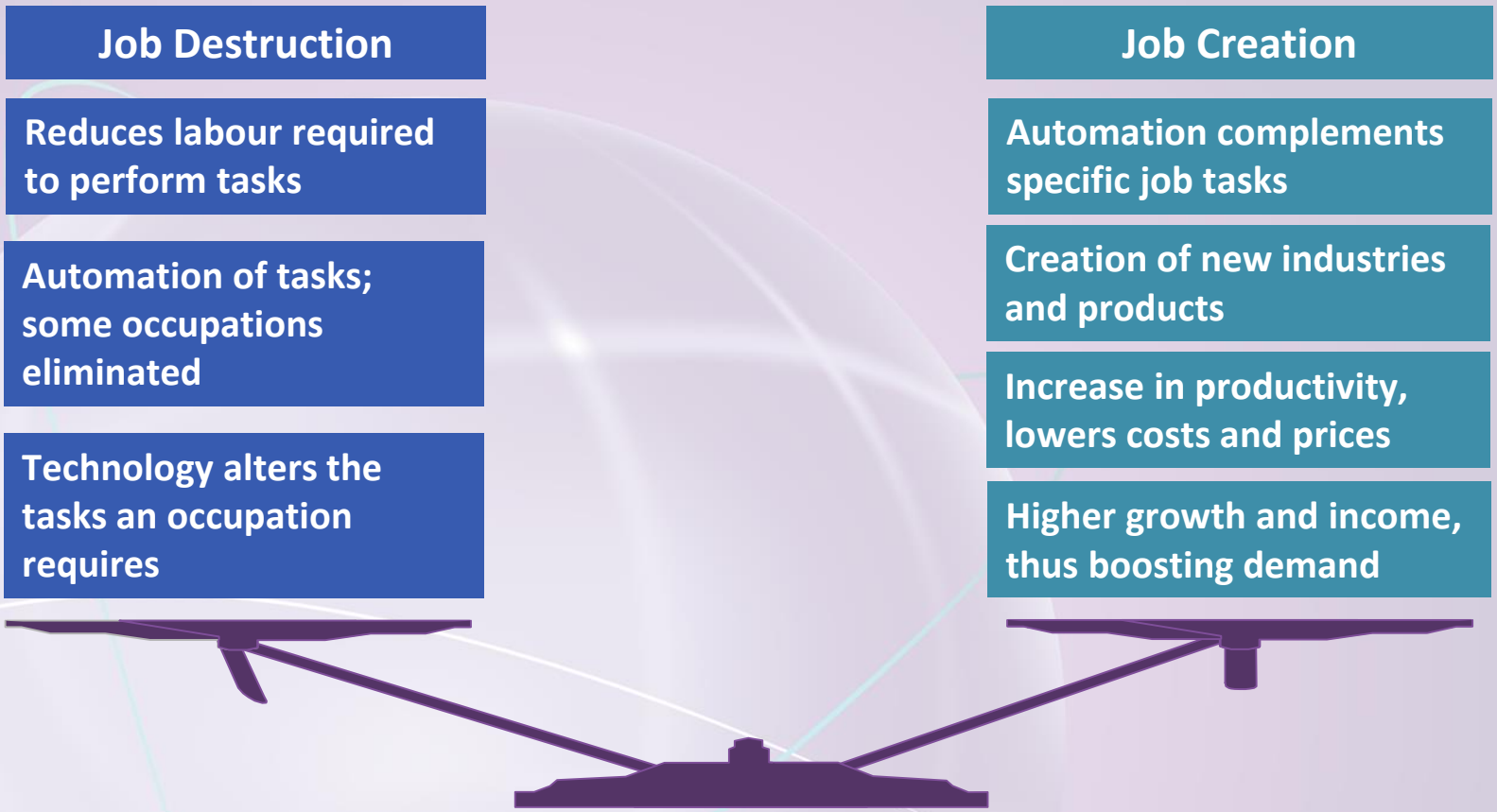
Source: The Conference Board Total Economy Database, Penn World Table 9.0

Productivity gains versus labour-replacing effects

- An optimistic view
  - Historical record of aggregate gains
- The pessimistic view
  - The short run effects matter
  - This time is different

- The actual impact will depend on:
  - The economic response
  - The interplay of technologies
  - Industry characteristics
  - Policies and institutions
  - Labour market conditions

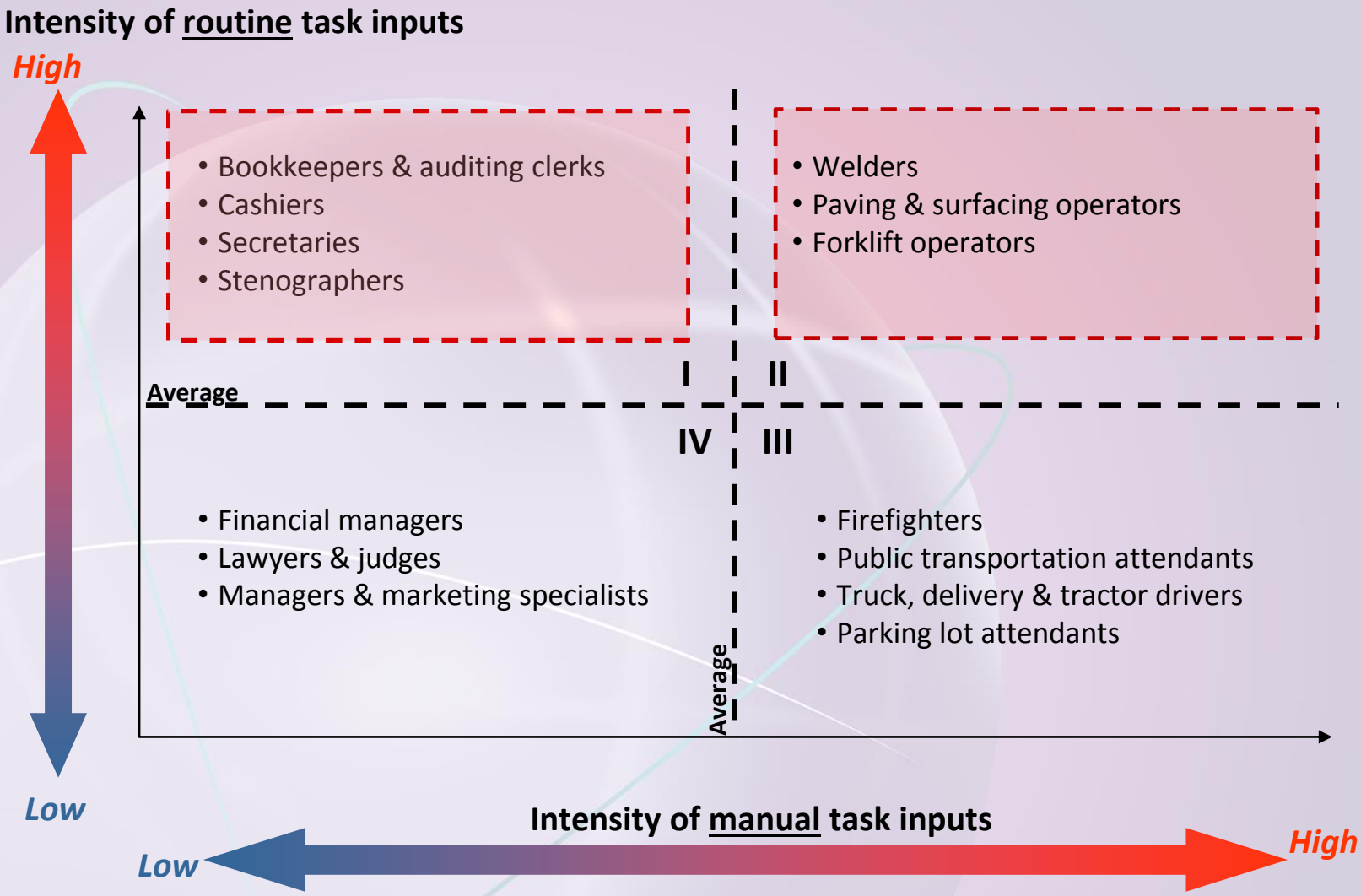
Technological progress has both destroyed and created jobs



In the long run, technological progress has reinforced the need for human labour, but often with highly disruptive effects

Which occupations are most technically susceptible?

- Primarily routine tasks have so far been automated (routine-biased TP)



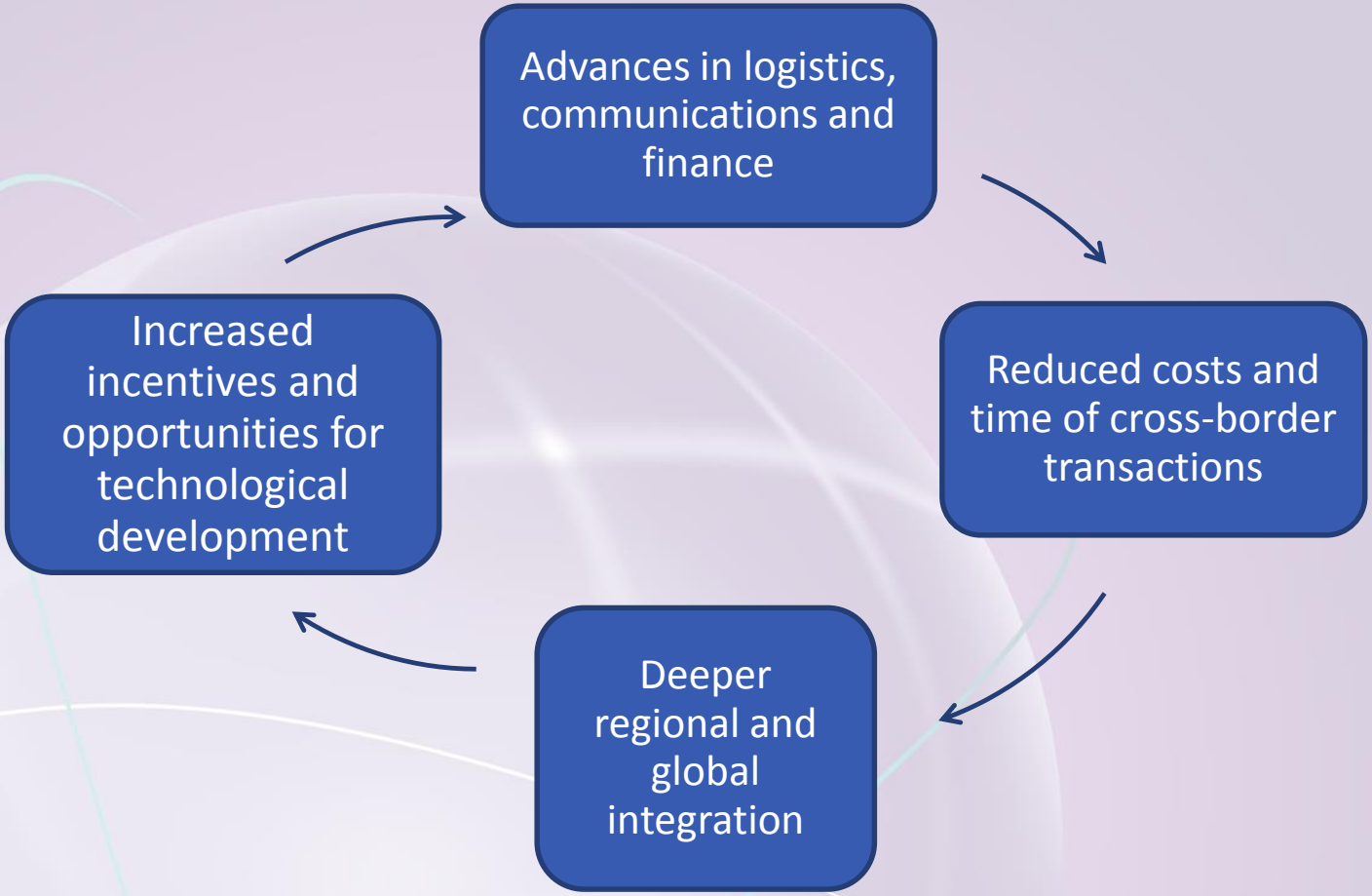
Source: UN/DESA based on Autor and Dorn (2013)

Technological change has contributed to job polarization and rising skill premium

I. Job polarization
- Shift towards high-skill / high-wage and low-skill / low-wage jobs
- Hollowing out of the middle of the wage distribution
- Main factors are routine-biased technological change and offshoring

II. Rise in skill premium
- Job polarization not necessarily associated with wage polarization
- Since 1970: real wages of high-skilled workers have risen faster than those of medium- and low-skilled workers.
- Rise in skill premium due partly to complementarities between IT and cognitive tasks -> increase in marginal productivity of higher skilled.

Technology and Globalization



1980 – 2010: Offshoring of tasks / emergence of GVCs

Future: Some reshoring?

Technology and Market Structures

- New industries characterized by network effects
- Winner-takes-all / Winner-takes-most
- Increased market concentration
- Rising profit margins and shares
- “Super-star firms” contribute to falling share of labour income

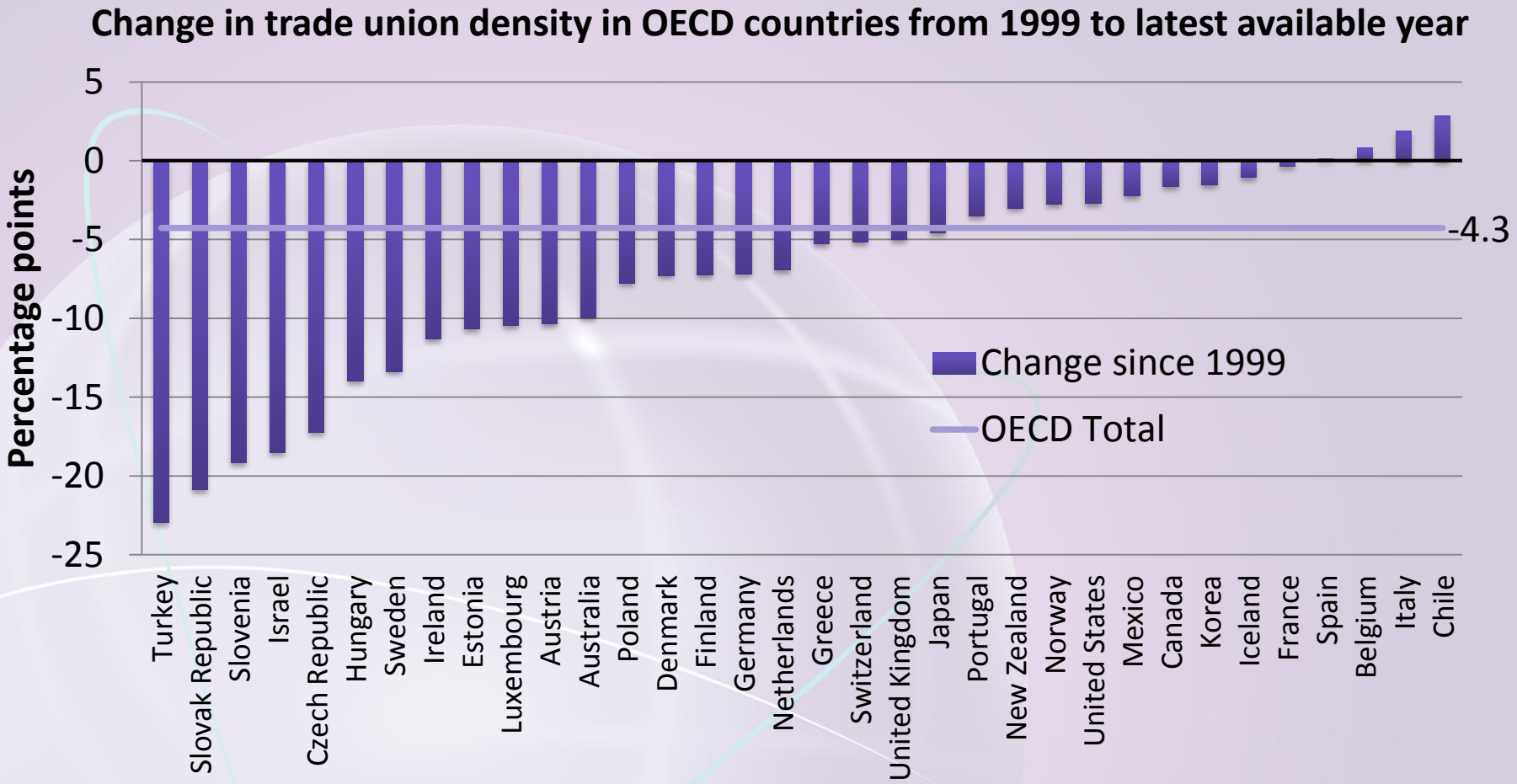
Technology and Organization of Work

- Information and communication technologies have:
  - promoted a shift away from traditional work arrangements to contingent work
  - contributed to a decline in unionization

→ Weaker bargaining position for workers (esp. unskilled)

→ Potentially reduced scope for social protection / redistribution

The fall in union membership is broad-based



Source: OECD.Stat

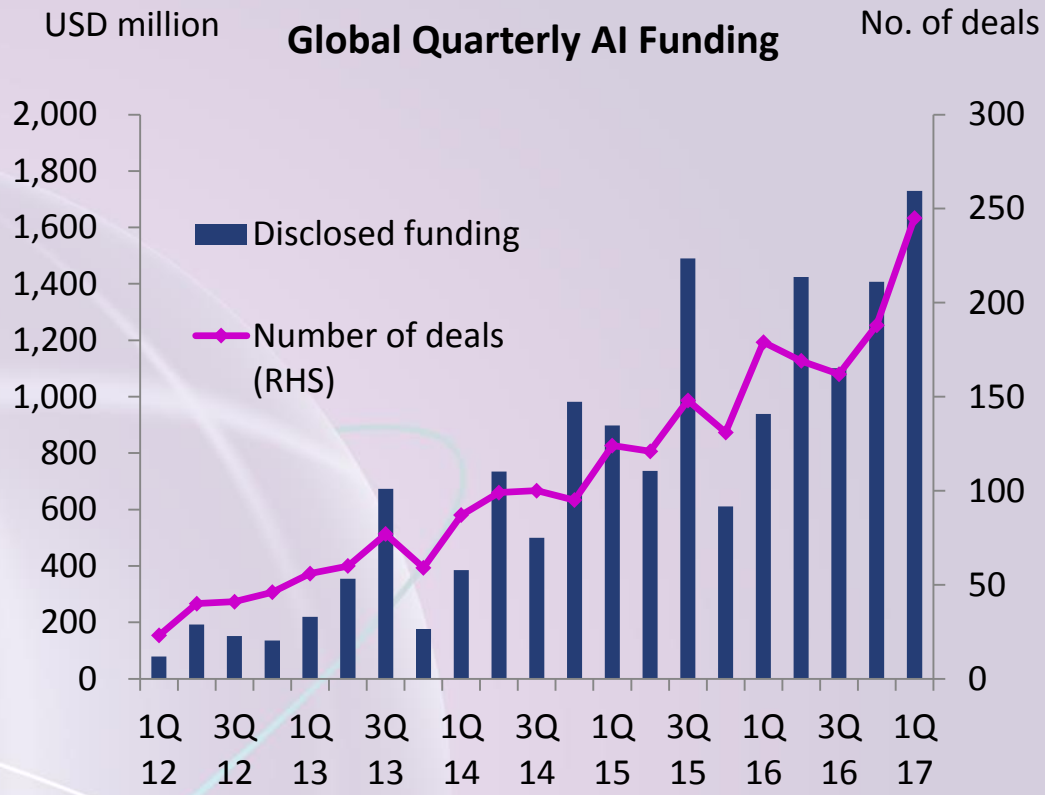
Note: 1999 is the first year in which data is available for all of the countries in this sample. Latest available data for some countries is 2012, 2013 or 2014.

Technology and Informal Sector

- Important gender dimension: women more likely to be engaged in informal labour than men
- ICT can help remove barriers to entering formal labour market (by improving access to information)
- But: effects not always positive
  - Reduced transaction costs for informal businesses make them more attractive

Looking ahead: Technologies

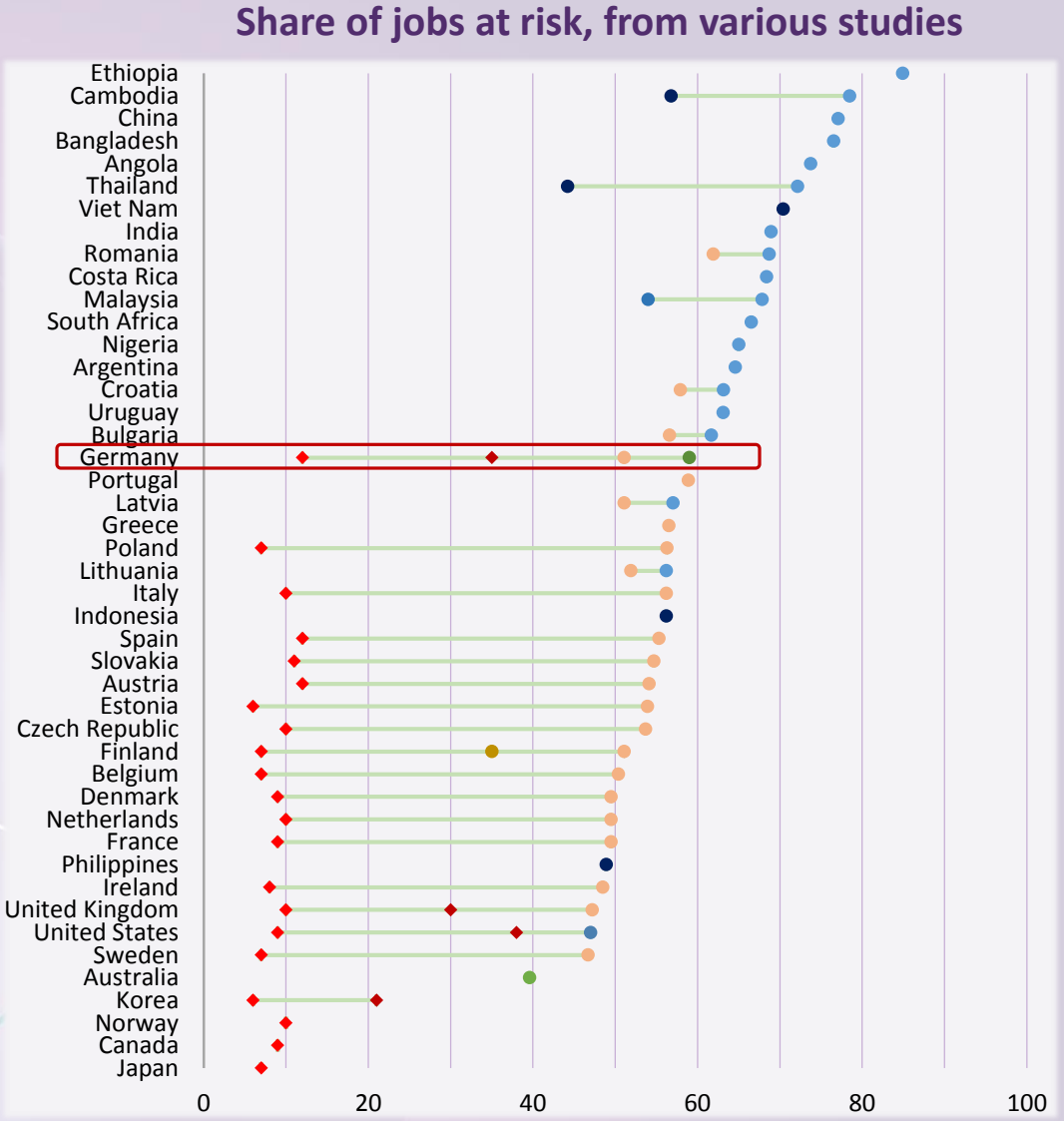
- Progress in new technologies will accelerate
- Such progress always generates anxiety
- Uncertainty over impact on employment, inequality, economy and society



Source: CB Insights, 2017

Looking ahead: Labour markets

- Large number of jobs affected
- High jobs-at-risk estimates
- Change in tasks or job loss?
- Automatable doesn't mean automated
- Jobs are also created
  - where?
  - high or low skill?
- Big impacts, but no need for panic



Looking ahead: The long-term

- Standard view: This time is not different
  - Disruptive progress: job destruction and job creation
  - Increase in productivity, employment, wages
- Alternative I: Lack of true technological progress
  - Productivity slowdown supports argument
    - But similar in past revolutions
    - Diffusion may be temporarily slowed
- Alternative II: Long term productivity boost
  - Technological optimism; high economic growth
  - (Some) wages would increase, but machine owners would reap most proceeds
    - Inequality ↑
    - Political sustainability?
  - 'Economic singularity' not yet in sight

Looking ahead: Globalization

- Technology-driven automation not only happening in developed countries
  - China largest market for robots; Republic of Korea with highest robot concentration
- More automatization in global value chains
- 'Reshoring' emerging as reality
  - Driven by technology, labour costs and demand structure
  - Reshoring of production, not employment
  - But: limits to reshoring

➢ Scope for firms in poorer developing countries to insert into GVCs and transform by technological upgrading may be limited
  - 'Premature deindustrialization' may persist
  - Risk of increased inequality between developing regions

National policies towards new technologies

- Embrace potential of new technologies, but adapt to national development needs
- Government policies key for adoption of general purpose technologies
  - Infrastructure, R&D support, business incubators,…
- Changes in regulations
  - Reduce and help to manage uncertainty
  - Allow for pilot projects to experiment with regulations
  - Liability; privacy; cyber-security
  - Ownership of data
  - Anti-trust measures (old and new)

Labour market policies, social protection and redistributive tax policies

- Education and (re-)training
  - Adapt curricula to new demand for skills
  - New technologies for education
  - Continuous training
- Policies for job creation; avoid dual labour markets
- Ensure labour has sufficient bargaining power to get ‘fair share’
- Social protection
  - Social protection also for non-standard employment
  - Protect workers, not jobs
- Redistributive taxation and measures become more important
  - ‘Taxing robots’ could stifle innovation
  - Universal basic income?
  - Ownership of new technologies?

International cooperation

- More research on impact of new technologies
  - Particular impact on LDCs
  - Share and discuss at international level
- Exchange lessons learned in promoting and managing new technologies
- Address cross-border aspects of data and information
- International access to technologies such as broadband
- International tax coordination
  - Profits associated with new technologies can often easily shifted across borders, limiting scope for redistribution

Thank You

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