Harnessing the benefits of innovation: Some current policy issues

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Overview

- Brief review of innovation policy rationale
- Some current issues
- Implications for
  - Corporate tax
  - Antitrust
  - Regulation
  - IP systems

Rationale(s) for innovation support

- Innovative activity generates unpriced spillovers to other firms and to the overall economy
  - Some of these may be local to a region or economy
- Resources for innovation undersupplied because of
  - (relative) ease of imitation
  - Risk and uncertainty that cannot be diversified away or insured against
  - Related: high cost of financing (esp. for SMEs)
  - Exception: well-defined needs may lead to overinvestment where there are also strong appropriability and highly competitive firms.

Composition of innovative activity

- Private sector
  - Research and development
  - Purchase of external IP (patents, knowhow, etc.)
  - Purchase, installation, and use of new (technologically advanced) equipment
  - Training of employees in new processes, or in supporting new products
  - Marketing new goods and services
  - Costs of organizational innovation

The extent of potential spillovers clearly varies across these, as does appropriability/patentability

Composition of innovative activity

- Public sector
  - Education – secondary as well as tertiary
  - Basic research
  - Applied research and development for national needs
    - Defense
    - Energy
    - Health
    - Environment
    - Agriculture

Potential spillovers both inside and outside the country also varies across these activities

Innovation policies

- Education/human capital investment
- R&D tax credits – incremental and volume
- R&D subsidies/cost-sharing
- IP system – patents, copyright, trademarks, design rights, trade secrets
- "IP boxes" – tax reduction for IP income
- Public procurement requiring innovation – e.g., vaccine specification, technical standards
- Regulatory mandates – e.g., increased auto fuel economy, reduced energy consumption for lighting

Current issues with innovation policy

- Globalization
- Increased inequality
- Labor market
- Effectiveness of innovation policy also depends on
  - Product and labor market regulation
  - Financial market development
- Tension between reallocation needed and its disruptive impacts on firms and workers

Globalization

- Knowledge not a respecter of borders
  - So national policies towards innovation have impacts outside their jurisdictions
- Nor are MNEs
- IP systems tend to be national or regional
  - Raises costs for firms
  - Very unequal competencies
- First mover advantages due to market size
  - These have increased and favor the largest and most homogeneous economies (that is, US and China)
- Tax competition

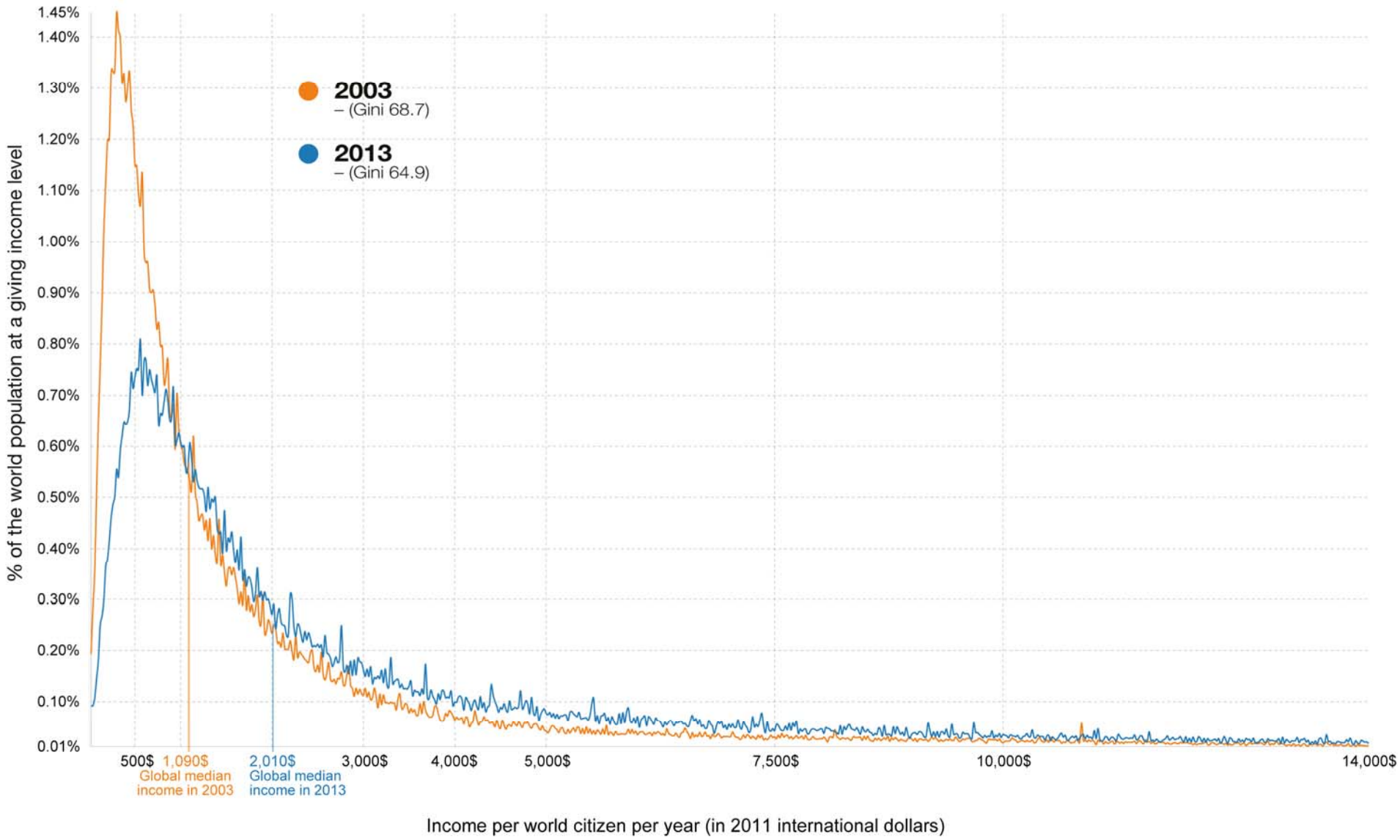
Increased (within country) inequality

- Globally, inequality is falling – see next slide
  - But within most countries, increasing
- Rosen (1981) on superstars
  - increased market size and lower communication/transport costs lead to more skewness in rewards to talent
  - Aghion et al. (2015) – cross-state innovation correlated with 1% income share; also with social mobility
- Superstar firms – wages high, but profits higher, so labor share falls.
  - Andrews et al. (2015, 2017) – increasing dispersion in productivity within industry
  - Autor et al. (2017a,b) – increases in concentration associated with fall in labor share.
  - Decker et al. (2016) – decline in high growth young firms in the US.
  - Guellec & Paunov (2017) on digital innovation and inequality

The global income distribution in 2003 and 2013

Incomes are adjusted for price changes over time and for price differences between countries (purchasing power parity (PPP) adjustment).

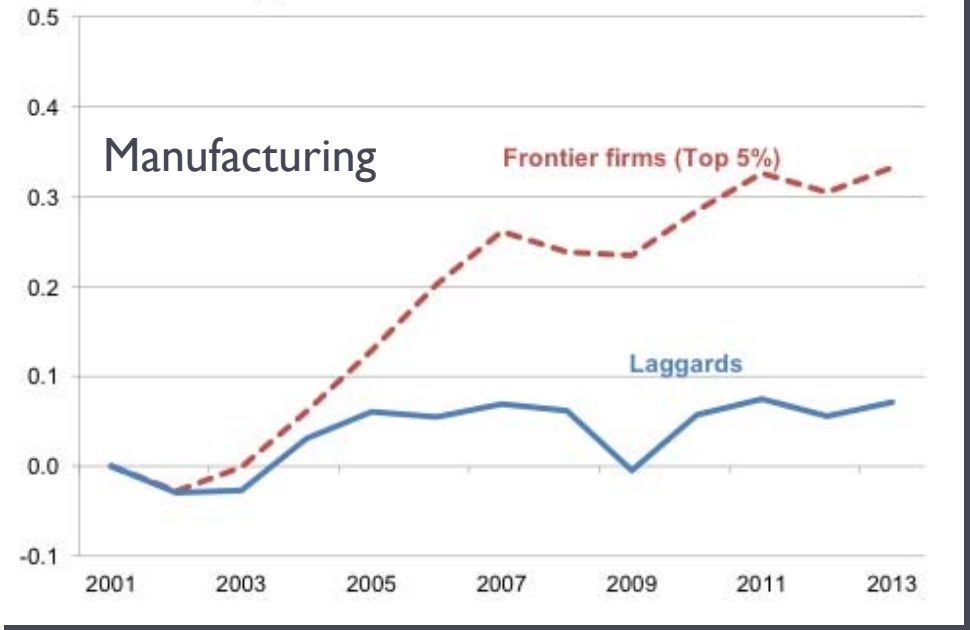
Our World in Data

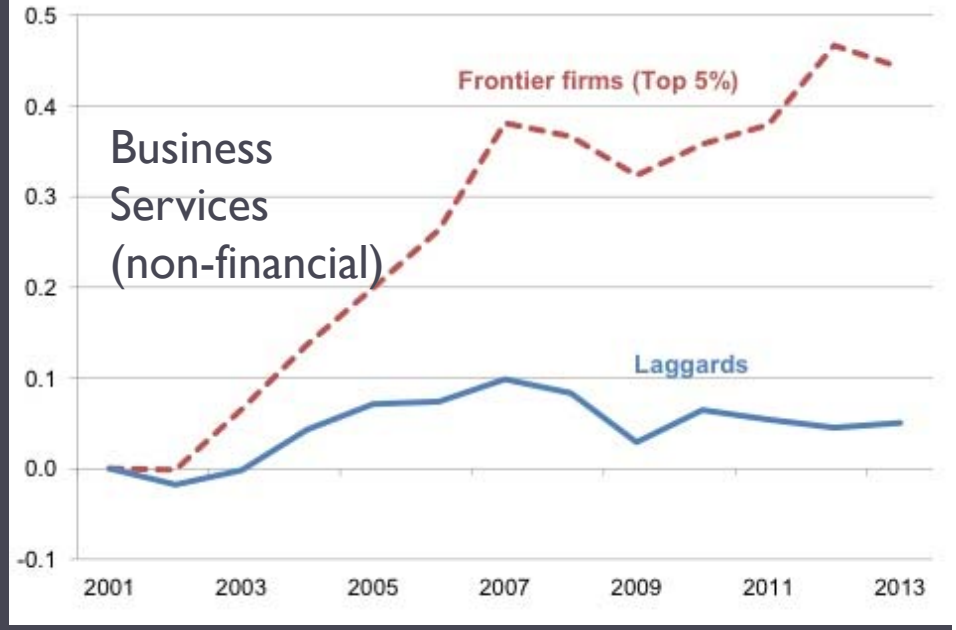


Data Source: Tomáš Hellebrandt and Paolo Mauro (2015) – The Future of Worldwide Income Distribution, working paper.

Andrews, Criscuolo, and Gal (OECD)

- Firms in 24 countries; average labor productivity within 2-digit industry (log differences from 2001)
- Industries with larger divergence have lower productivity growth
- Differences more extreme where market reforms slowest





Labor market

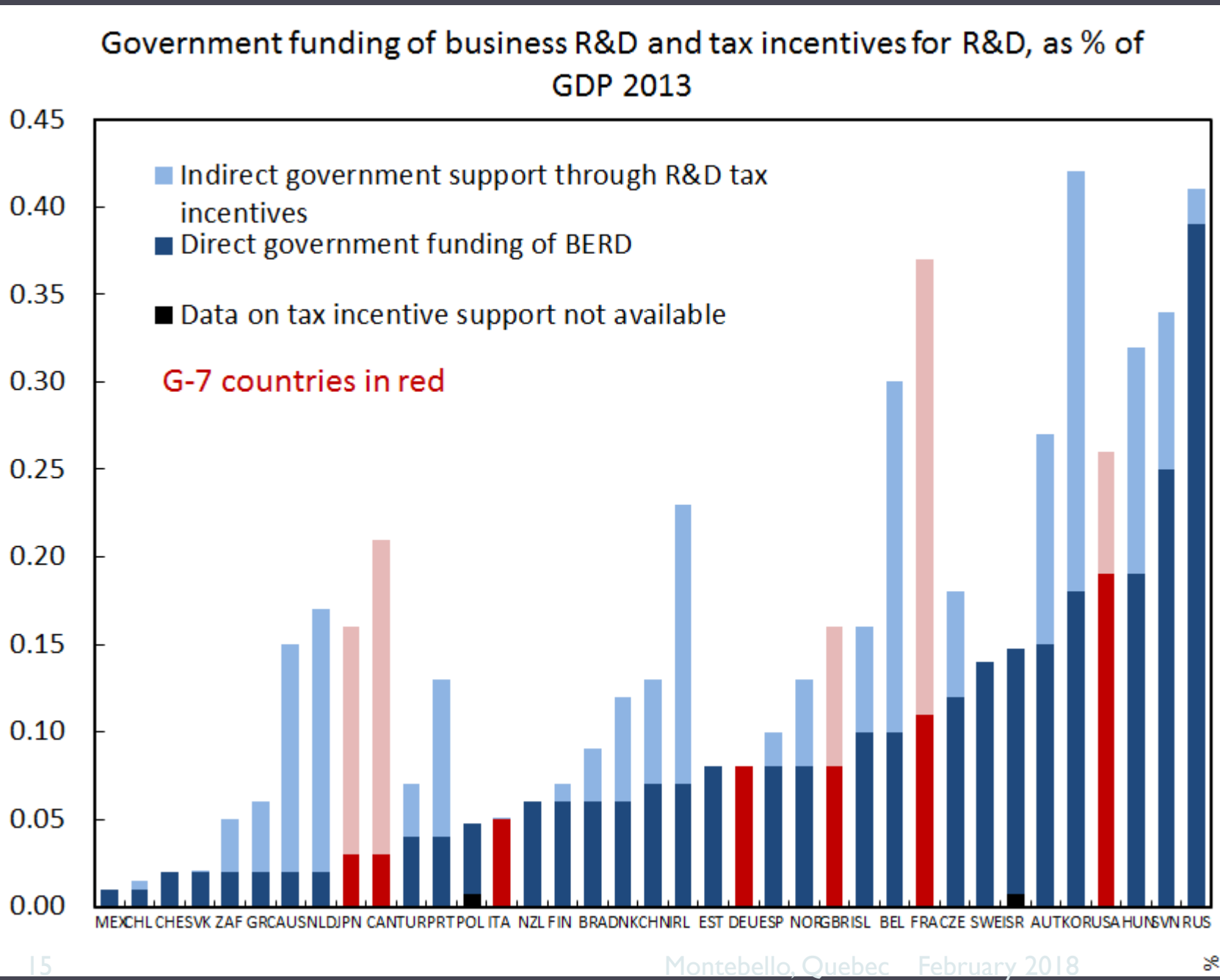
- Increased demand for skilled workers, and for low level service workers - hollowing out of middle management and sales (Brynjolfsson and others)
- Rate of tech change increasing (?) along with lifetimes – increasing mismatch between education completed in early 20s and lifetime job requirements
  - Need more training/retraining possibilities at later ages
  - Some countries need more flexibility in access to post-secondary education – this also benefits historically disadvantaged groups as well as women

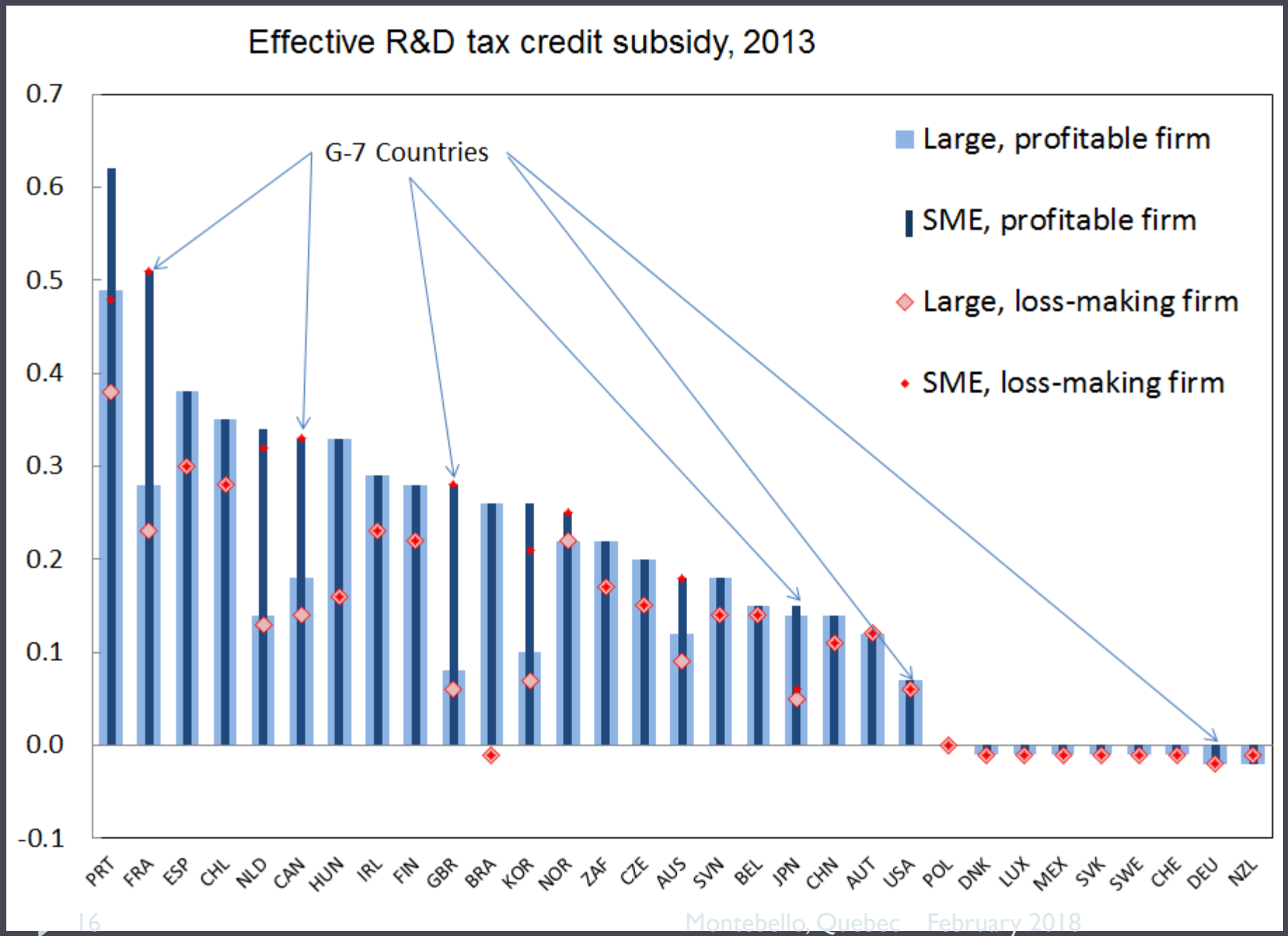
Corporate tax and innovation

- R&D tax credit – widely used
  - Sometimes targetted toward university cooperation, use of PROs, etc.
- Investment tax credits
  - reducing the cost of acquiring new equipment and IT
- Various IP "boxes"
  - Reduced corporate tax rates on income from various kinds of IP (patents, design rights, copyright, trademarks, etc.)
- Relative treatment of debt vs equity finance.
  - If debt favored, cost of intangible non-securable finance relatively more expensive

R&D tax credits

- Reduction in corporate tax
  - Volume - share of all R&D spending
  - Incremental - (larger) share of R&D spending relative to baseline
  - Reduction in social taxes on R&D employees (e.g., NL, NO)
- Pros
  - Firms (better informed) choose projects
  - No specific targeting
  - Lower administratve costs than direct subsidies
- Cons
  - Deadweight loss for volume-based R&D tax credits
  - Incremental far more effective, but hard to design
  - Project choice based on private rate of return, not social
  - S&E wage effect (is this necessarily a bad thing?)


Government funding of business R&D and tax incentives for R&D, as % of GDP 2013
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Indirect government support through R&D tax incentives
Direct government funding of BERD
Data on tax incentive support not available
G-7 countries in red
MEX CHL CHE SVK ZAF GRC AUS NLD JPN CAN TUR PRT POL ITA NZL FIN BRA DNK CHN IRL EST DEU ESP NOR GBR ISL BEL FRA CZE SWE ISR AUT KOR USA HUN SVN RUS
%


Effective R&D tax credit subsidy, 2013
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
G-7 Countries
Large, profitable firm
SME, profitable firm
Large, loss-making firm
SME, loss-making firm
PRT
FRA
ESP
CHL
NLD
CAN
HUN
IRL
FIN
GBR
BRA
KOR
NOR
ZAF
CZE
AUS
SVN
BEL
JPN
CHN
AUT
USA
POL
DNK
LUX
MEX
SVK
SWE
CHE
DEU
NZL

Evidence on R&D tax credits and subsidies

- Tax credits
  - Hall (1993) - initial US incremental credit
    - Estimated price elasticity about one or higher
    - Increased R&D spending by the amount of lost tax revenue
  - Parsons & Philips (2007) – Canada
    - 11 cents welfare increase for every dollar.
  - Hall and Van Reenen (2000) survey – tax credits generally effective
    - Many other studies for other countries, mostly in agreement, but sometimes weaker impacts on spending
- Subsidies
  - SIMPATIC (2016)
    - R&D participation, investment, spillovers and welfare differ little across current policy regimes, optimal R&D tax credits, and no government support
  - Akcigit et al. (2016)
    - optimal policy IP plus price subsidies/R&D subsidies or prizes – linear R&D subsidies/tax very non-optimal when firms vary in R&D productivity

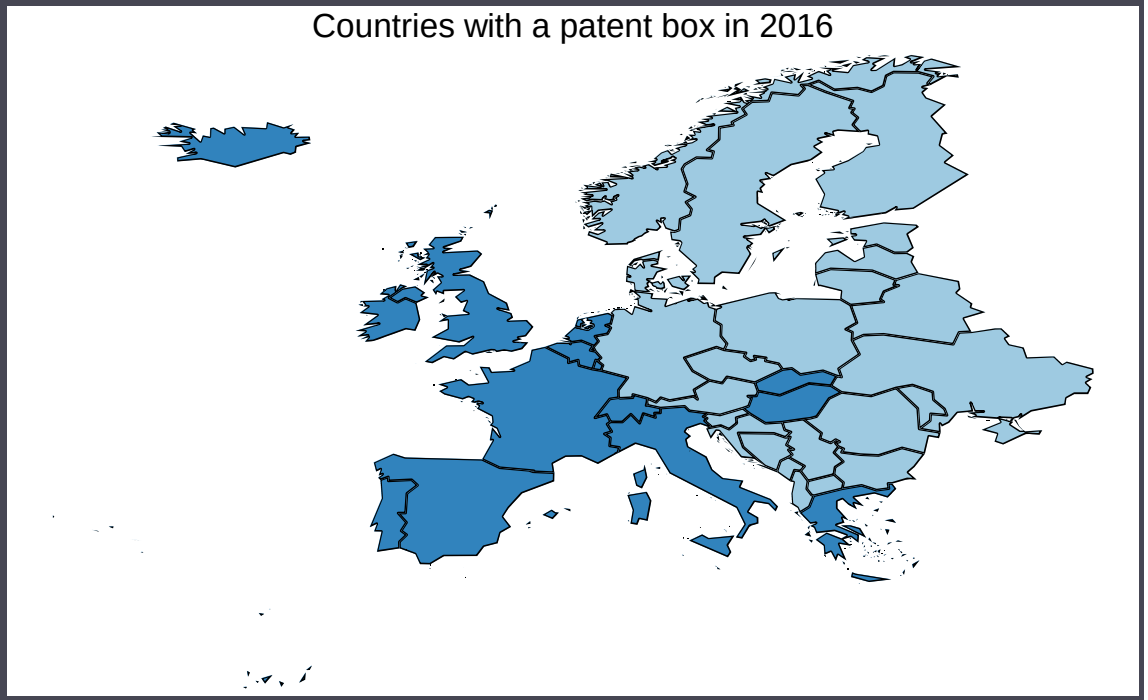
But….

- Acemoglu et al. (2013) – general equilibrium analysis shows best policy to increase aggregate productivity combines
  - Tax on incumbents to encourage exit of low productivity firms
  - R&D subsidies to incumbents
- Impact of tax competition among countries/regions
  - Bloom & Griffith (2001) – elasticity of domestic R&D to foreign cost of R&D above unity (opposite to domestic cost response) – 8 large OECD economies, 1981-1999
  - Corrado et al. (2016) - similar results for 10 EU countries, 1995-2007
  - Wilson (2009) - similar, but even larger, results for US states
- Implication: R&D moves in response to differential incentives
  - Note that equal and opposite elasticities (as in Wilson and Corrado et al.) does not imply a zero-sum R&D impact.

Which countries have IP boxes?

Mostly European (+ Japan):

Belgium	Luxembourg
Cyprus	Malta
France	Netherlands
Greece	Portugal
Hungary	Slovakia
Iceland	Spain
Ireland	Switzerland
Italy	Turkey
Liechtenstein	UK



R&D tax incentives & patent boxes

- Is the widespread adoption of patent or IP boxes a good development to spur innovation?

  NO

- Why are R&D tax credits preferred?
  - Directly related to cost and location of activity (firm decisions)
  - No incentives to transfer patents to low tax jurisdictions (even more wasteful tax competition)
  - No tax subsidy for patent trolling
  - No incentive to keep zombie patents alive to reduce taxes
  - Patent boxes target the most appropriable part of innovation
  - Much higher audit cost for patent box income; depending on box design,
    - Relative size of non-R&E budget can affect credit
    - Incentive to choose projects with high non-R&E expenses

Some evidence on patent boxes

- Griffith et al. 2014
  - use an empirical model of patent location and taxes to simulate intro of a patent box. Attracts patent income, but lose large amounts of tax revenue
- Alstadsaeter et al. 2015
  - MNEs shift patents more than R&D in response
- Gaessler, Hall, & Harhoff (work in process)
  - All EPO patent transfers – about 12% between countries
  - patent transfer in response to corporate tax differentials/ patent boxes- effects small, confined to boxes without nexus requirement
  - More valuable patents transferred
  - Little or no impact on invention in patent box country
- Lots of evidence that patent location responds to corporate tax rates already (even before the boxes)

Do countries provide enough support for R&D?

- Much evidence that social returns are much higher than private (Kao et al 1999, Keller 1998, Coe and Helpman 1995). Some nuances:
  - Domestic spillovers larger than those from other countries (Branstetter 2001, Peri 2004)
  - Spillovers from foreign R&D more important for smaller open economies than for US, Japan, and Germany (Park 1995, van Pottelsberghe 1997)
  - Absorptive capacity of recipient country important for making use of R&D spillovers (Guellec and van Pottelsberghe 2001)
  - Typical social rates of return are quite large, but imprecise
- Jones and Williams (1998) – using endogenous growth model, argue that socially optimal R&D investment 2-4 times actual in US

IP systems

- TRIPS – minimum standards for regulation of IP rights
  - copyright, including performers, producers of sound recordings and broadcasting organizations, computer programs and databses – 50 years, automatic
  - patents - 20 years, all fields of technhology, superseded by national public health concerns
  - geographical indications, including appellations of origin
  - industrial designs and trade dress
  - integrated circuit layout-designs
  - new plant varieties
  - trademarks
  - trade secrets
- Also specifies enforcement, remedies, dispute resolution, and national treatment

Patents and globalization

- TRIPS an inappropriate one-size-fits-all instrument (In spite of some concessions to developing country needs)
- Evidence that even in middle income countries, patent takeup is miniscule
- Trademark use more pervasive
- Examining patents at a worldclass level requires highly trained scientists and engineers – even if one can find them in a low income country, is it a good use of their time?
- Some partial solutions via the use of international searching authorities (about 25) by WIPO/PCT system

Some challenges

- Regulatory barriers inhibit some of the benefits of innovation, e.g.,
  - Occupational licensing
  - Rent protection by incumbents (e.g., taxi operators)
- How to design antitrust enforcement to mitigate the winner-takes-all pressures that lead to very unequal outcomes?
  - Sacrifice some efficiency gains?
- Do we need higher tax rates on top income, which are mostly rents from winning the talent lottery?

Some challenges

- Trends in R&D
  - Fall in research share of business R&D (Arora, Belenzon et al.)
  - Fall in public research-GDP ratio in OECD from 0.85% (1981) to 0.55% (2013) – Archibugi & Filippetti (2017)
  - Fall in productivity of R&D – Bloom et al. (2017)
- Measurement
  - Welfare from new goods, new delivery of services
  - Increasing consumer input to using new goods & services, raising effective price
  - Output and prices in the service sector