Centre for the Study of Living Standards
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Firm-level Productivity Research in Canada: Current State and Future Directions

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I. Motivation

- "Research Frame: Excellence in Microeconomic Policy and Business Performance." by the Economic Research and Policy Analysis (ERPA) Branch of Industry Canada in 2011
- Industry Canada further indicated that it was looking to partner with academic colleagues in building and interpreting this research program
- The Productivity Network was established in 2012 at McMaster University
- CSLS was contracted by ISED to set an agenda for firm-level productivity research in Canada

II. Objective

- Review the opportunities and challenges of the use firm-level data for the analysis of productivity trends and determinants
- Identify the research questions related to productivity that firm-level data can shed light on
- Review firm-level data availability in Canada and internationally
- Put forward a research agenda based on firm-level data

III. Statistics Canada Industry-level Productivity Data

- Statistics Canada provides a wealth of detailed labour productivity estimates **at a very detailed industry level** based on establishment data (Table 36-10-0480-01).
  - Output, hours worked, labour compensation, unit labour costs or number of jobs, and labour productivity for Canada and all 10 provinces for 1997-2017 by detailed NAICS industry (up to 4-digit or 5-digit in some cases)
  - Absence of data gaps, no matter how small the jurisdiction, or the industry in the jurisdiction or the number of firms operating in the industry
  - Very granular productivity analysis can be conducted using publically available data at no cost

III. Statistics Canada Industry-level Productivity Data

- An example: the petroleum refining industry (NAICS 32411) in New Brunswick (the Irving refinery)

Table 1: Labour productivity in petroleum refineries in national total and in New Brunswick, 1997-2017

	(1) National total Pet. Ref.	(2) Pet. Ref. in NB	(3) Total business sectors in NB	(2) / (1)	(2) / (3)
1997	828.1	1,565.00	33.7	189.0%	4643.9%
1998	1,129.20	2,146.10	34.6	190.1%	6202.6%
1999	1,048.00	1,300.70	36.4	124.1%	3573.4%
2000	1,146.50	782.8	36.7	68.3%	2133.0%
2001	1,048.60	766.8	38.4	73.1%	1996.9%
2002	1,156.30	970.7	38.9	83.9%	2495.4%
2003	959.4	1,157.40	39.9	120.6%	2900.8%
2004	834.5	876.7	40.3	105.1%	2175.4%
2005	737.8	573.9	41.7	77.8%	1376.3%
2006	643.8	458.1	41.3	71.2%	1109.2%
2007	529.3	370.3	40.6	70.0%	912.1%
2008	504.3	338.9	40.3	67.2%	840.9%
2009	517.6	249.3	39.7	48.2%	628.0%
2010	445.4	254.6	40.7	57.2%	625.6%
2011	401.7	286.6	41.7	71.3%	687.3%
2012	443.7	316.3	40.2	71.3%	786.8%
2013	590.7	274.1	40.5	46.4%	676.8%
2014	632.2	261.8	40.9	41.4%	640.1%
2015	613.4	251.2	41.6	41.0%	603.8%
2016	645.9	318.7	41.9	49.3%	760.6%
2017	687.5	326.2	42.4	47.4%	769.3%
		Average annual growth rate		Change between 1997 and 2017	
1997-2017	-0.93%	-7.54%	1.15%	-141.5% pt.	-3874.6% pt.

Note: Labour productivity is in 2012 chained thousand dollar per hour worked.
Source: Statistics Canada Table 36-10-0480-01.

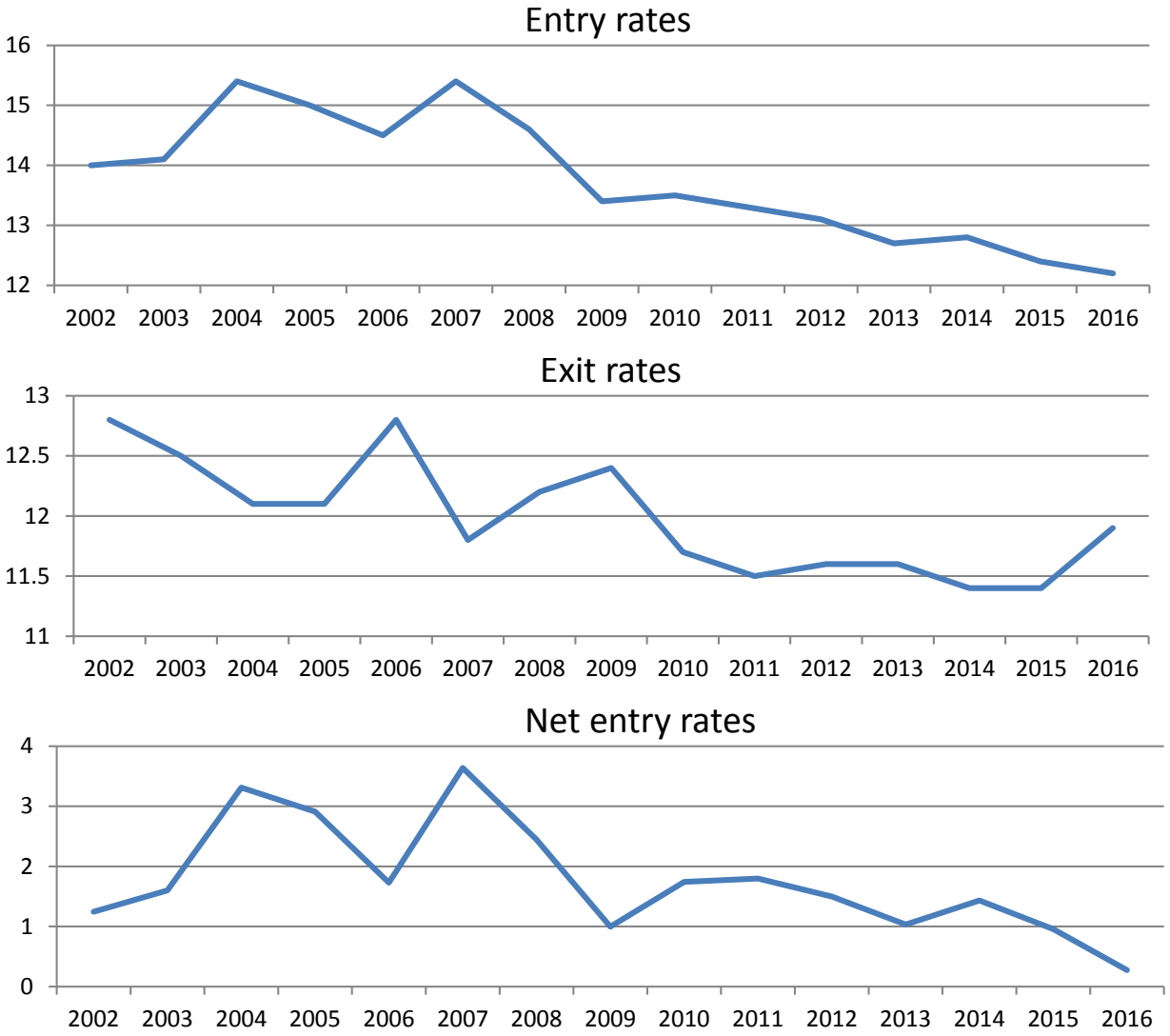
IV. Statistics Canada Firm-level Data on Business Dynamics

- Firm dynamics, defined as the turnover of firms in the economy through exit and entry, can affect productivity
  - Unproductive firms exit
  - More productive firms enter
  - Aggregate productivity increases

- Statistics Canada (Table 33-10-0087-01) makes available data on the number of **incumbent**, **exiting**, and **entering** firms for 17 two-digit industries for Canada and for all ten provinces and an aggregate for the territories (2000-2016)

IV. Statistics Canada Firm-level Data on Business Dynamics

Chart 1: Entry Rates and Exit Rates of Private Sector Employer Businesses, Canada, 2002-2016 (per cent)



IV. Statistics Canada Firm-level Data on Business Dynamics

Chart 2: Net Entry Rates by Industry, Canada, 2016

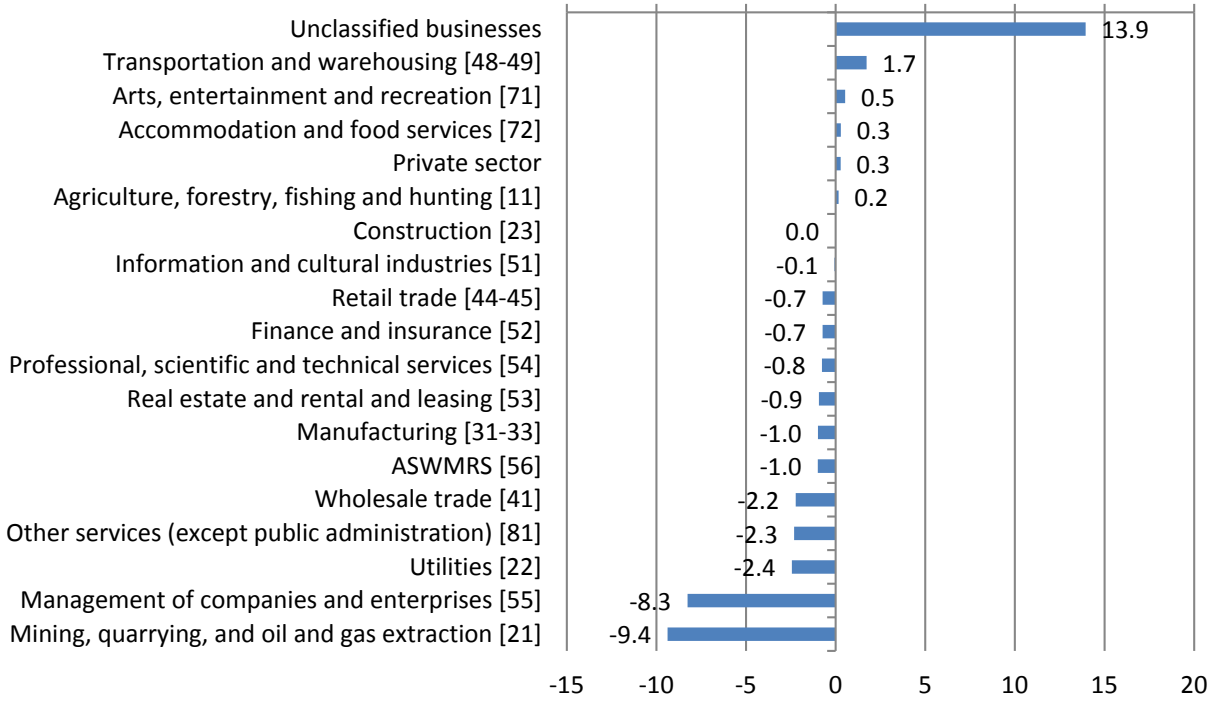
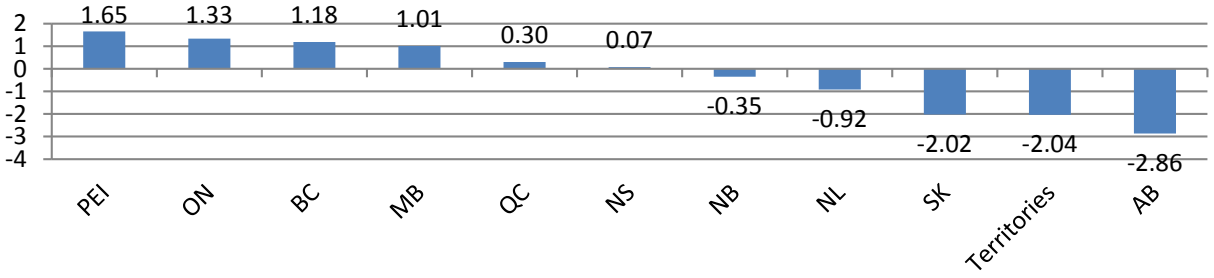


Chart 3: Net Entry Rates of Private Sector Employer Businesses by Province and Territories in Canada, 2016 (per cent)



V. Existing Firm-level Data

- Centre for Economic Studies at U.S. Census Bureau
  - the Longitudinal Research Database (LRD)
  - the Longitudinal Business Database (LBD)
- Centre for Data Development and Economic Research at Statistics Canada
  - the Annual Survey of Manufacturers
  - Canadian Employer-Employee Dynamics Database
  - T2-LEAP
  - Survey of Innovation and Business Strategies
- OECD
  - Multifactor Productivity Project (Multiprod)
  - OECD-Orbis Database
- Eurostat
  - Micro-Moments Dataset
- Competitiveness Research Network
  - the CompNet Competitiveness Dataset

VI. Challenges in Working with Firm-level Data for Productivity Analysis

1. Access Issues

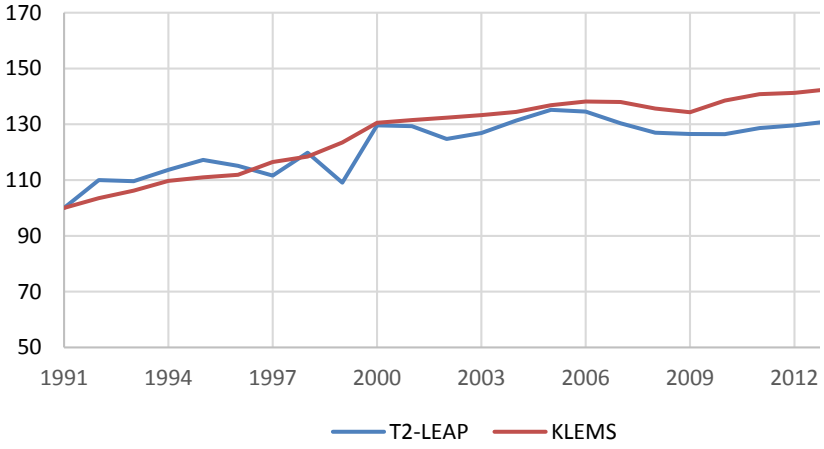
- Citizenship
- Fee (roughly $10,000)
- Access at Statistics Canada in Ottawa
- Security clearance
- Vetting process
- Data preparation
- Learning curve

VI. Challenges in Working with Firm-level Data for Productivity Analysis

2. Data Issues

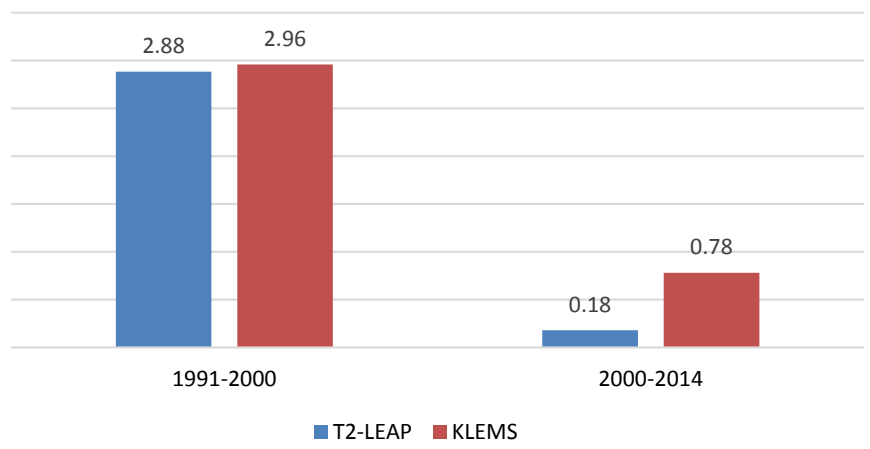
- Lack of consistency between aggregated firm-level productivity estimates and Canadian Productivity Account estimates

Chart 4. Aggregate Labour productivity in Canada, 1991 to 2015, 1991=100



Source: Gu (2018b)

Chart 5. Annual average growth in aggregate labour productivity in Canada (% per year)



Source: Gu (2018b)

VI. Challenges in Working with Firm-level Data for Productivity Analysis

- Lack of firm-level data on human capital
- Long lags in data availability
- Industry allocation of firm output
- Provincial allocation of national totals
- Change in the firms landscape through mergers and acquisitions
- Non-comprehensive nature of firm-level data
- Lack of firm-level deflators
- Lack of controls for capacity utilization

VII. Advantage of Firm-level Data for Productivity Analysis

1. Economic decisions are made at the firm level
   - Greater understanding of why these decisions are made, the outcomes of the decisions, and how public policies can influence these decisions

2. Three areas of productivity research where firm-level data are needed:
   - Firm Dynamics (exit and entry)
   - Productivity Decomposition
   - Dispersion of Productivity

VII. Advantage of Firm-level Data for Productivity Analysis

- CSLS research on firm-level productivity and decomposition
  - Firm-level productivity in Newfoundland and Labrador
    - A particular emphasis on decomposition and dispersion firm heterogeneity, both in terms of levels and growth rates.
  - Decomposing the impact of rising Chinese import competition on TFP growth in Canadian manufacturing
    - *China-driven* TFP growth within firms + TFP growth through reallocation +TPF growth through exit/entry

VI. Advantage of Firm-level Data for Productivity Analysis

3. Productivity Research Questions that Firm-level Data Can Elucidate

A. Contributions to overall productivity growth in the industry by:
- firm size
- age
- type of firm(incumbents, exitors, entrants),
- exporters
- firm dynamism (gazelles vs. lifestyle)

B. Firm heterogeneity in productivity dispersion and its persistence and policies to improve overall performance

VII. Advantage of Firm-level Data for Productivity Analysis

C. Contribution of market structure, prices, product quality and variable mark-ups to measured firm-level productivity performance

D. The link between firms that perform R&D or patent and productivity

E. The importance of resources reallocation effects, including misallocation, among firms for industry productivity growth

F. Firm survival rates and links to productivity

G. Relative productivity levels and growth rates for frontier and non-frontier firms and reasons for these differences

VIII. Agenda for Firm-level Productivity Research in Canada

➢ Canada's productivity performance

- Since 2000 productivity growth in Canada slow from both an historical and international perspective

- Output per hour in the business sector (Sharpe and Tsang, 2018)
  - Rose around **0.9 per cent** per year over the 2000-2016 period
  - **1.7 per cent** in the 1981-2000 period
  - **3.5 per cent** in 1961-1973 period

- Canada ranked **24th out of 33 OECD countries** for aggregate productivity growth over the 2000-2016 period.

- More fundamental drivers of the slowdown are still poorly understood

VIII. Agenda for Firm-level Productivity Research in Canada

1. The Role of Frontier Firms in the Slowdown
    - The OECD study based on OECD-Orbis; Gu (2018b)
2. Changes in the pace of technical change
    - Gordon (2014 and 2016) ; Alexopoulos and Cohen (2018)
3. Falling Business R&D
    - T2-LEAP-SRED (e.g. Kim and Lester, 2019 and Kim, forthcoming)
4. Secular Stagnation
    - Rao and Li, 2013 and Baldwin, Gu and Yan, 2013