UNSW Business School
Centre for Applied Economic Research

MFP Measurement Using BLADE:
Insights, Challenges and Future Directions

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MFP Calculation using BLADE

- **Collaboration with the ABS (MAVS) (Franklin Soriano, Kay Cao), supported by Treasury and the Economic Data Analysis Network.**

- **Carmit Schwartz has been a partner in this work.**

- **Measurement of capital and Multifactor Productivity using firm level data.**

- **Most studies have so far used labour productivity.**

- **Many challenging problems need to be addressed before the data can be effectively used to answer policy relevant questions.**

MFP Calculation using BLADE

3. **Preliminaries.do to weed out "firms" with all zeros and missing values, GST adjustments, calculation of va etc., and merging with auxiliary data.**

4. **LabourCheck.do: Checks the labour data. Can have case the following problematic cases:**
    - **Case 13: fte missing, wages=0, but revenue positive**
    - **Case 14: fte missing, wages missing, but revenue positive**
    - **Case 15: fte missing, wages positive**
    - **Case 25: fte positive, wages=0**
    - **Case 26: fte positive, wages missing**

    - **(NB: 26 potentially problematic cases were considered, with 5 being found in the data)**

MFP Calculation using BLADE

5. **DivisionCheck.do: Checks if there are ANZSIC code conflicts with the assigned division, and deletes firms for which there is a mismatch.**

6. **MFP.do: Deals with labour problems, calculates capital input, deletes outliers and constructs MFP estimates. Uses the data produced by DivisionCheck.do**

5. **Plots.do: Plots growth and level series from BLADE data and the ABS industry MFP data cube.**

Some Challenges

1. **ANZSIC and Division code mismatches.**

2. **Asset disposals in Gross Output, and hence Value Added**

3. **Negative Value Added and the construction of MFP**

4. **Missing labour data**

5. **Capital measurement**

ANZSIC Code and Division Mismatches

- **In BLADE S15, the ABS has backcast ANZSIC codes when a firm changes industries.**

- **It has (effectively) forward cast Division codes.**

ANZSIC Code and Division Mismatches

- **Made up example: A firm with ANZSIC 3020 should be in Division E Construction. If it started in Division A and shifted to E in 2016, then:**

Year	2002	2003	…	2015	2016
Actual					
ANZSIC	0529	0529	0529	0529	3020
Division	A	A	A	A	E
BLADE S15					
ANZSIC	3020	3020	3020	3020	3020
Division	A	A	A	A	A
BLADE S1617					
ANZSIC	3020	3020	3020	3020	3020
Division	E	E	E	E	E

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ANZSIC Code and Division Mismatches

- **Hence from BLADE S15, we know that there was a change but don't know when the change happened.**

- **Potentially very problematic, especially for frontier analysis, analysis of firm exit and entry.**

- **Only solution given available data is to delete firms with a mismatch of ANZSIC and Division codes**

- **In the latest version of the BLADE (S1617), conscious of the inconsistency, the ABS has applied the same backcasting to both ANZIC and Division codes.**

- **Hence, it's now impossible to identify the firms that have been misallocated to Divisions.**

ANZSIC Code and Division Mismatches

A solution is on its way!

- **The ABS is producing a 'point-in-time' ANZSIC file that can be merged to the existing BLADE Frame.**

- **This file will reflect the actual ANZSIC of the unit in each year of the BLADE time series.**

- **It is expected that this new file will be available in December 2019.**

Asset Disposals

- **The usual output measure is Total Sales from BAS data (TURNOVER).**

- **This includes revenues from all sources including asset disposals. (Same for profit from BIT data.)**

- **One-off large sales of assets may get caught by outlier detection methods, but not a pattern of continuous sales leading up to e.g. a global financial crisis.**

- **BLADE S15 only provides information on "Termination value of intangible depreciating assets", but not "Termination value of other depreciating assets"**

- **Output and capital should be adjusted for asset sales, but this is not possible without information on the disposal of (tangible) assets. Available in S1617 from 9 November!**

Negative Value Added

- **VA= (GO – Intermediates) can be negative. Firms can make losses in any period, and these can be persistent (e.g. Uber).**

- **Deflating, get real VA as negative. A negative real output is an input. Not sensible in the context of a firm producing output (e.g. Uber rides) but making losses.**

- **A common solution is to set negative VA to zero. Not ideal.**

- **Suggests the following:**
  - **VA based MFP only makes sense at some level of aggregation so that aggregate VA is positive.**
  - **GO based MFP (i.e. KLEMS) is the only sensible measure at the firm level.**

Missing Labour Data

wages=total wage bill; fte=full time equivalent; go=gross output; ==. means missing; ==0 means equal to zero

1. **Work out average wage rate at the 4 digit ANZSIC level.**

2. **Some averages are zero, as there are no firms that have positive wages recorded in their ANZSIC code. For these firms, use the division average wage. [Very few cases.]**

3. **For fte==., wages==0 and go>0 (Case 13):**

   Replace average wage rate (0) with division average wage rate

   Replace fte=1, wages=(division av. Wage)*1

4. **For fte==., wages==. and go>0 (Case 14):**

   Replace average wage rate (missing) with division average wage rate

   Replace fte=1, wages=(division av. Wage)*1

Missing Labour Data

5. **For fte==., wages positive, use a regression approach (Case 15):**

    Regress ln(fte) on ln(realwages) and time dummies. Replace the missing fte observations with the predicted values.

6. **For fte positive, wages==0 (Case 25):**

    Replace wages= (division av. wage)*fte

7. **For fte positive, wages==. (Case 26):**

    Replace wages=(division av. wage)*fte

Capital

NB: BIT data has only (historical) book value for some firms. OECD approach a mix of methods, meaning that relative levels and growth rate differences may be determined by the method used.

1. **Starting value: (average investment)/(depreciation rate + investment growth rate).**

2. **Then PIM to get k_stock_real**

3. **uc = capital_def*(intrate - infla + (infla)*delta);**
   infla=cpi rate, delta from the ABS

4. **ucv= uc*k_stock_real**

5. **payts= wages + ucv**

6. **Labour share = wages/payts, Capital share = 1-Labour share**

MFP

1. **Calculate MFP growth using a Törnqvist index for inputs.**

2. **Division aggregates** **by weighting using payts_share=payts/div_payts. That is, the firm's share in total Division payments to labour and capital.** **Weighted geometric mean with two-period arithmetic average share weights.**

3. **Outliers: try the three OECD methods (3sd, Tukey, percentiles). Only using output growth and input growth. Also try the IMF method of doing a split by employment numbers (headcount), then outlier deletion on each employment size class. Also code for two variants of this method is provided.**

Future Directions

Work agenda includes:

1. **Take into account asset disposals now data are available.**

2. **Comparisons of different aggregation methods and levels, and resulting policy insights regarding growth areas of the economy, e.g.:**
   - **By ownership type**
   - **By industry (ANZSIC codes and divisions)**

3. **Gross output versus value added**

4. **Impact on policy implications from using alternative imputation methods.**

5. **Further investigation of implications of use of alternative outlier detection methods.**

Agriculture, Forestry and Fishing

Mining
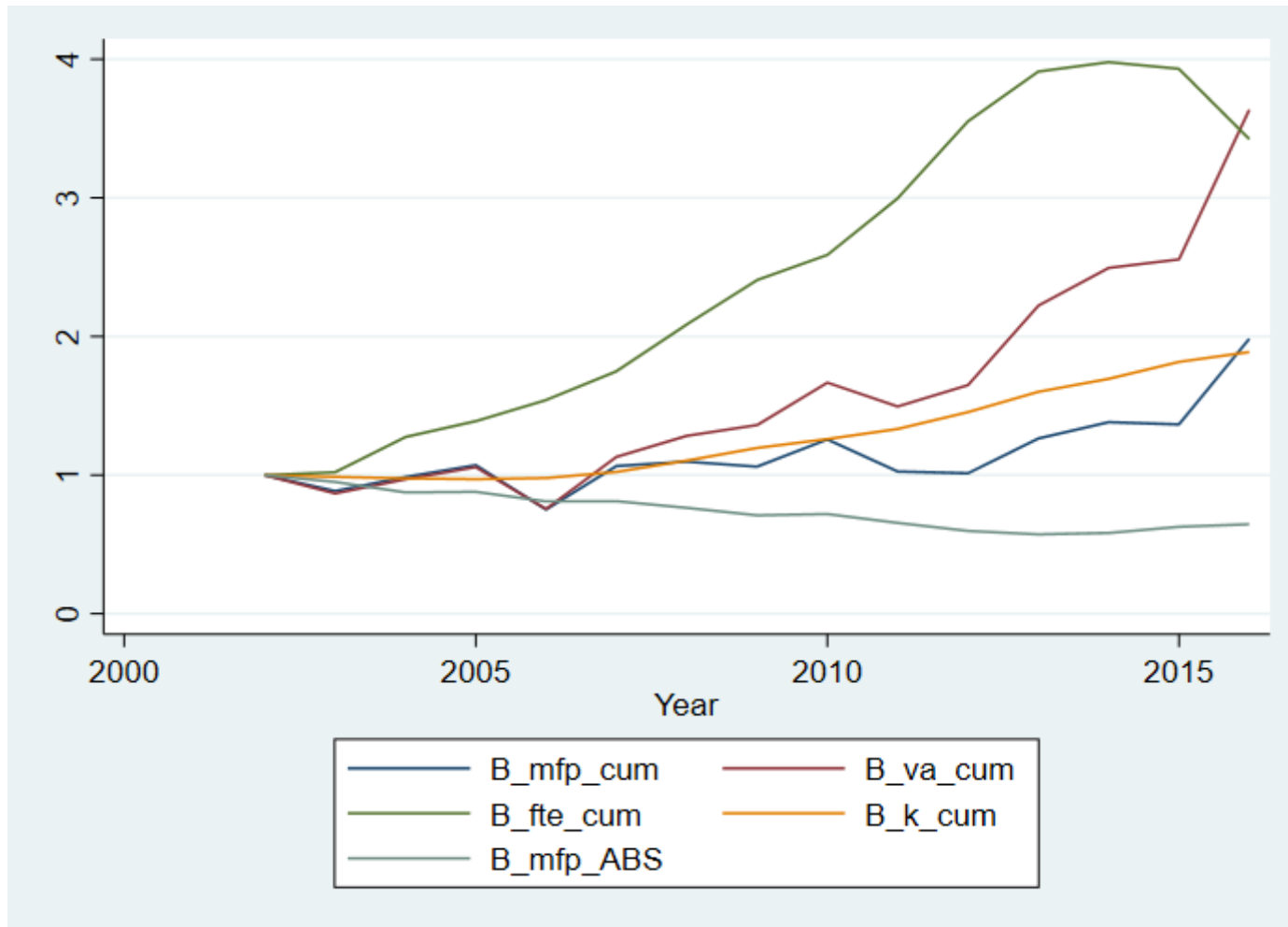
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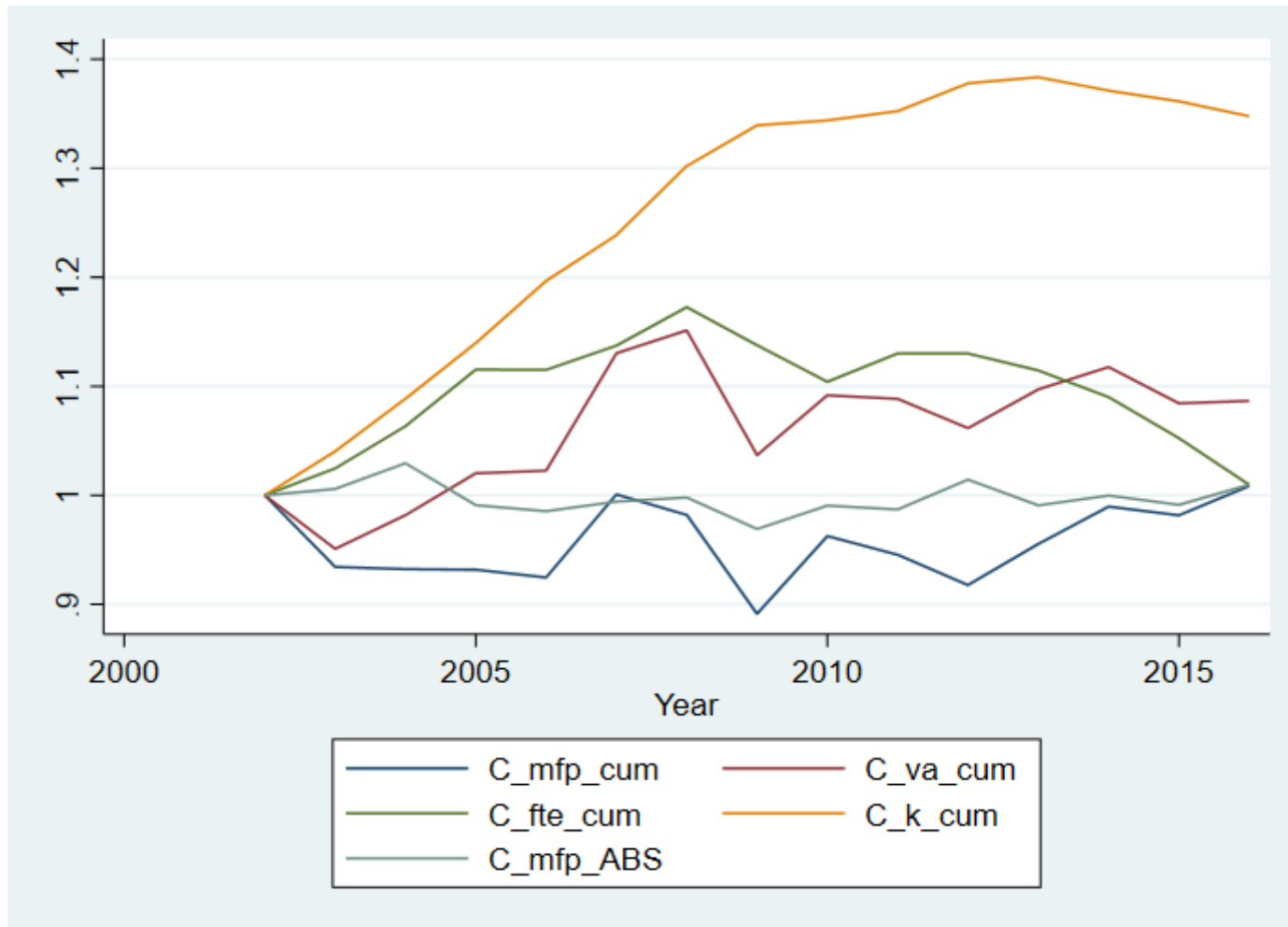
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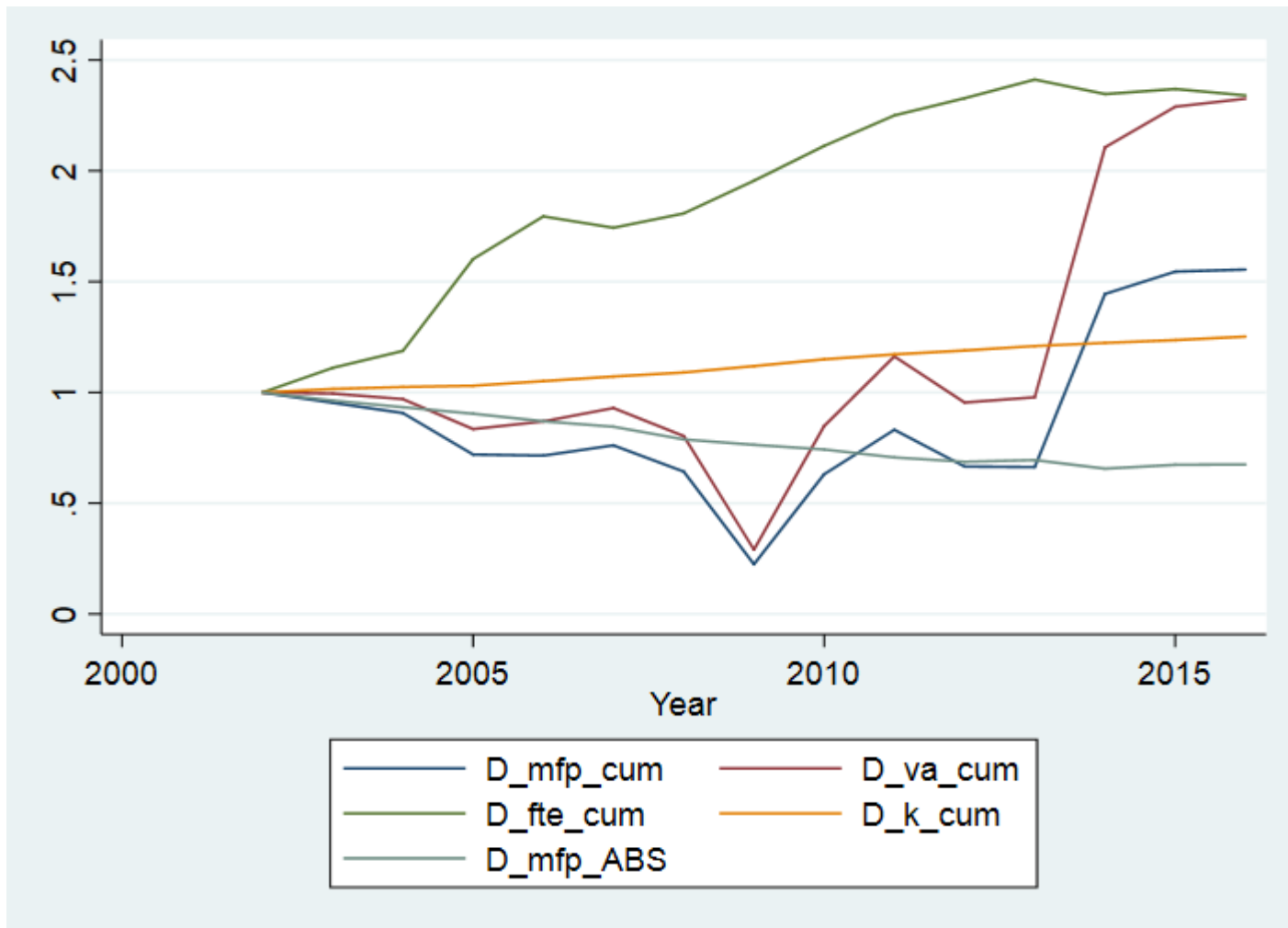
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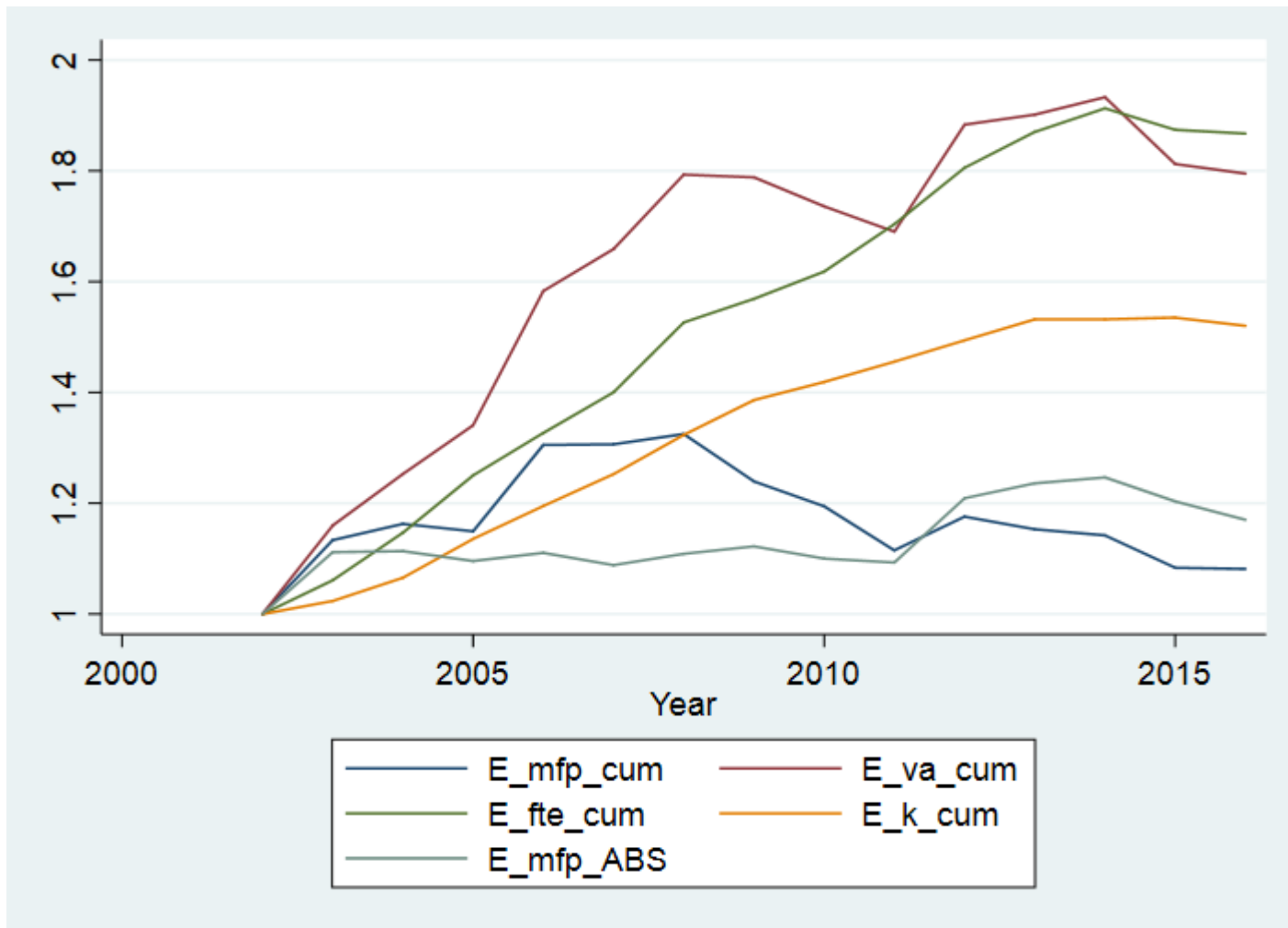
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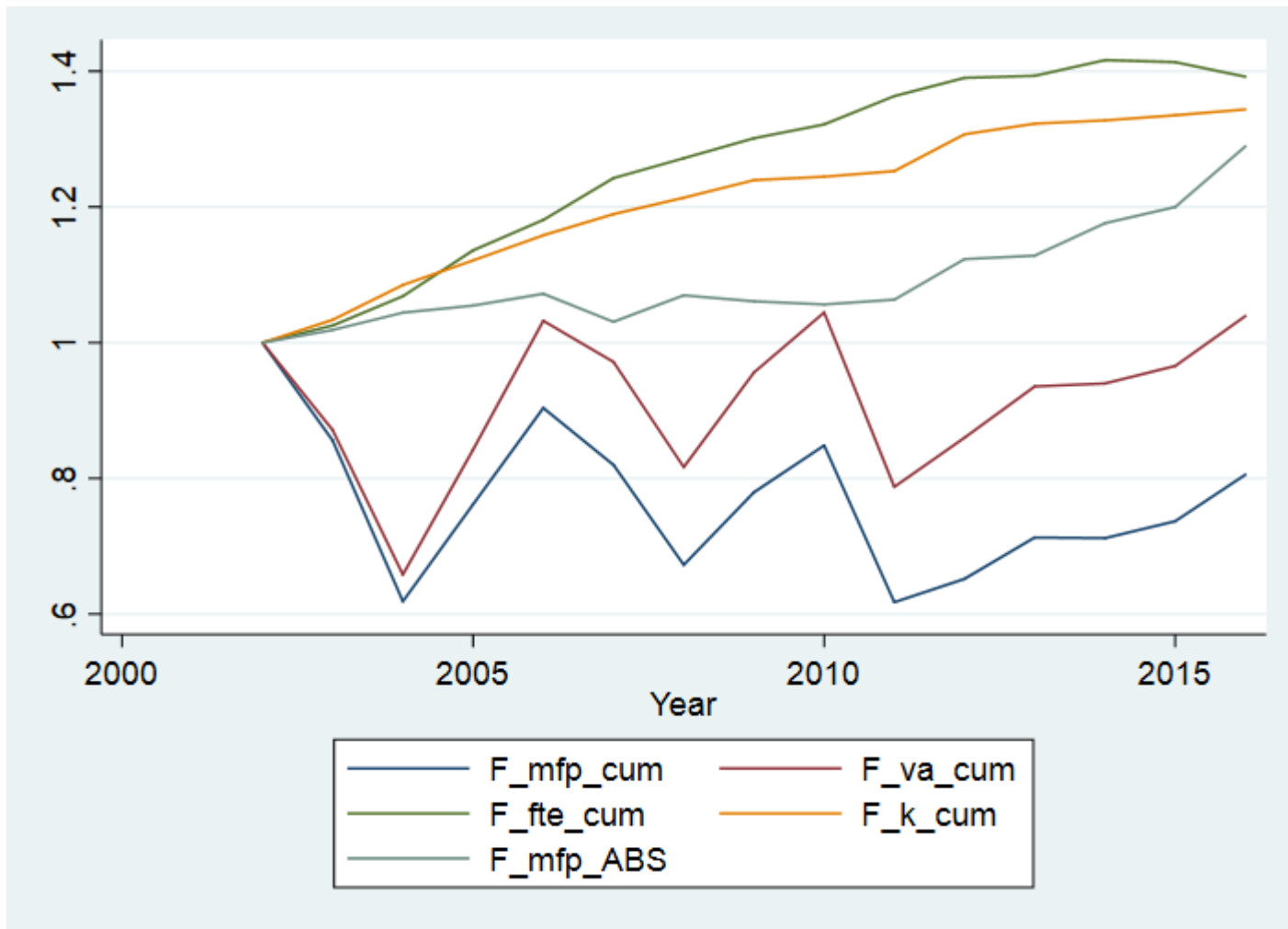
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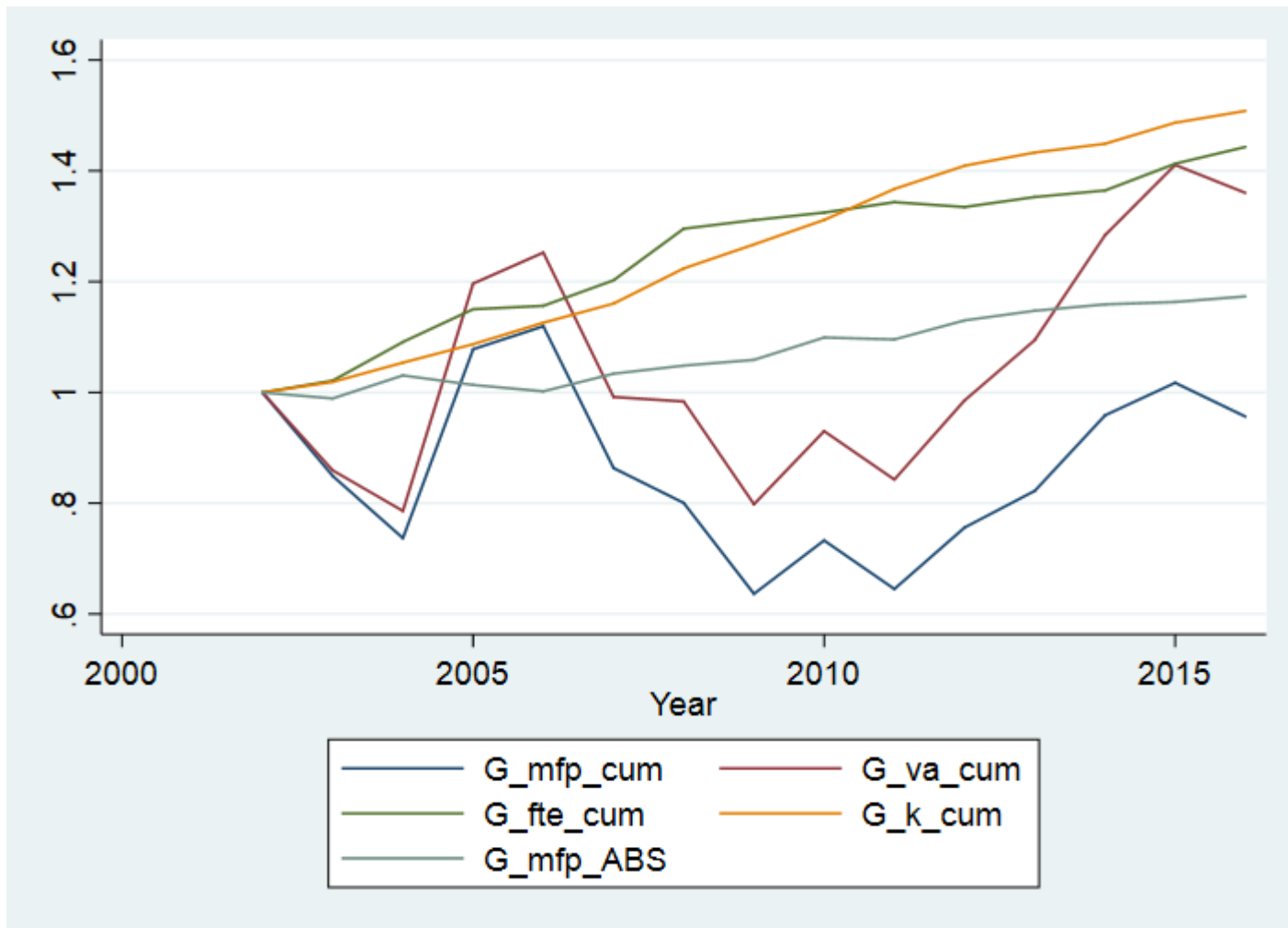
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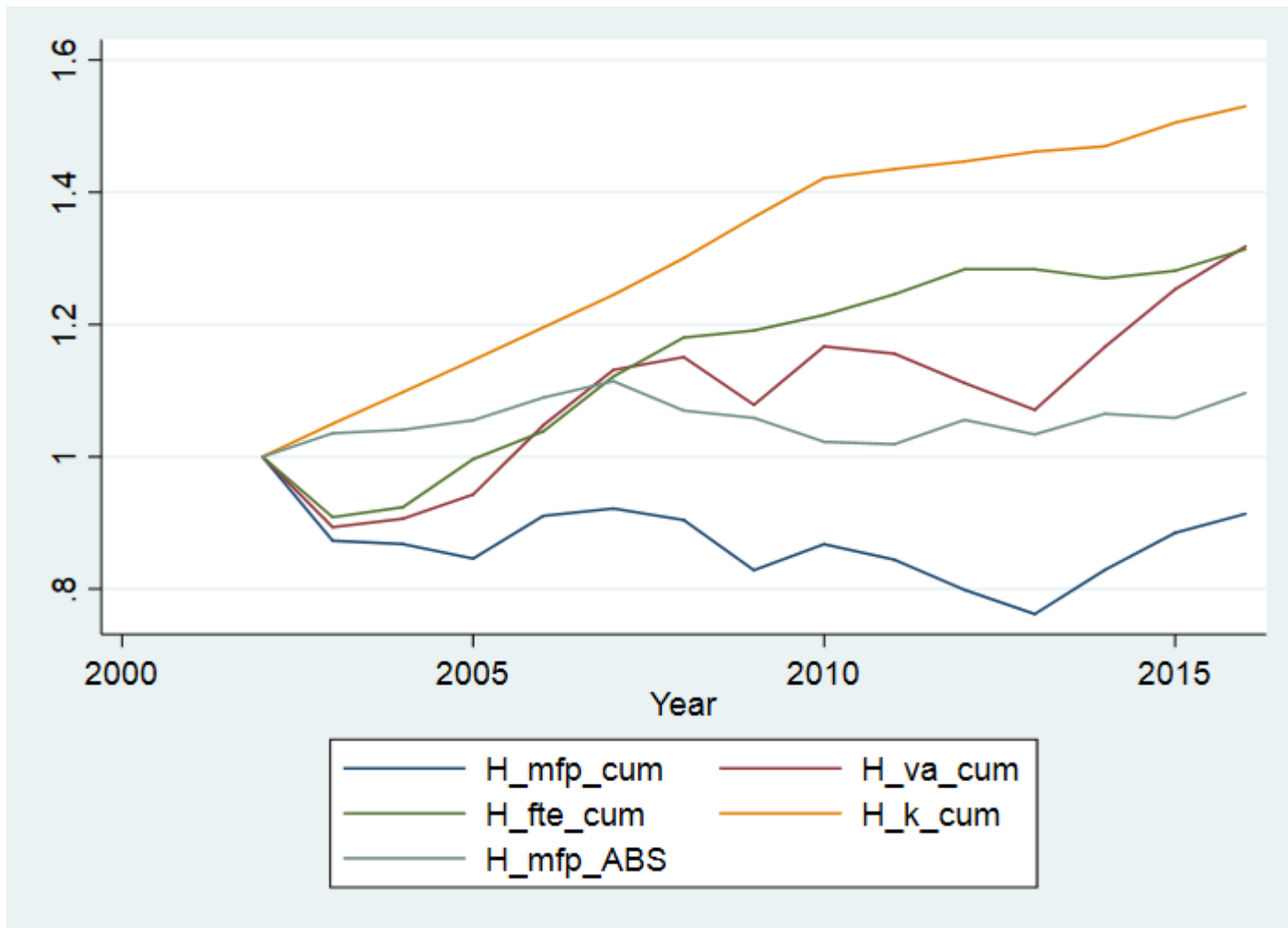
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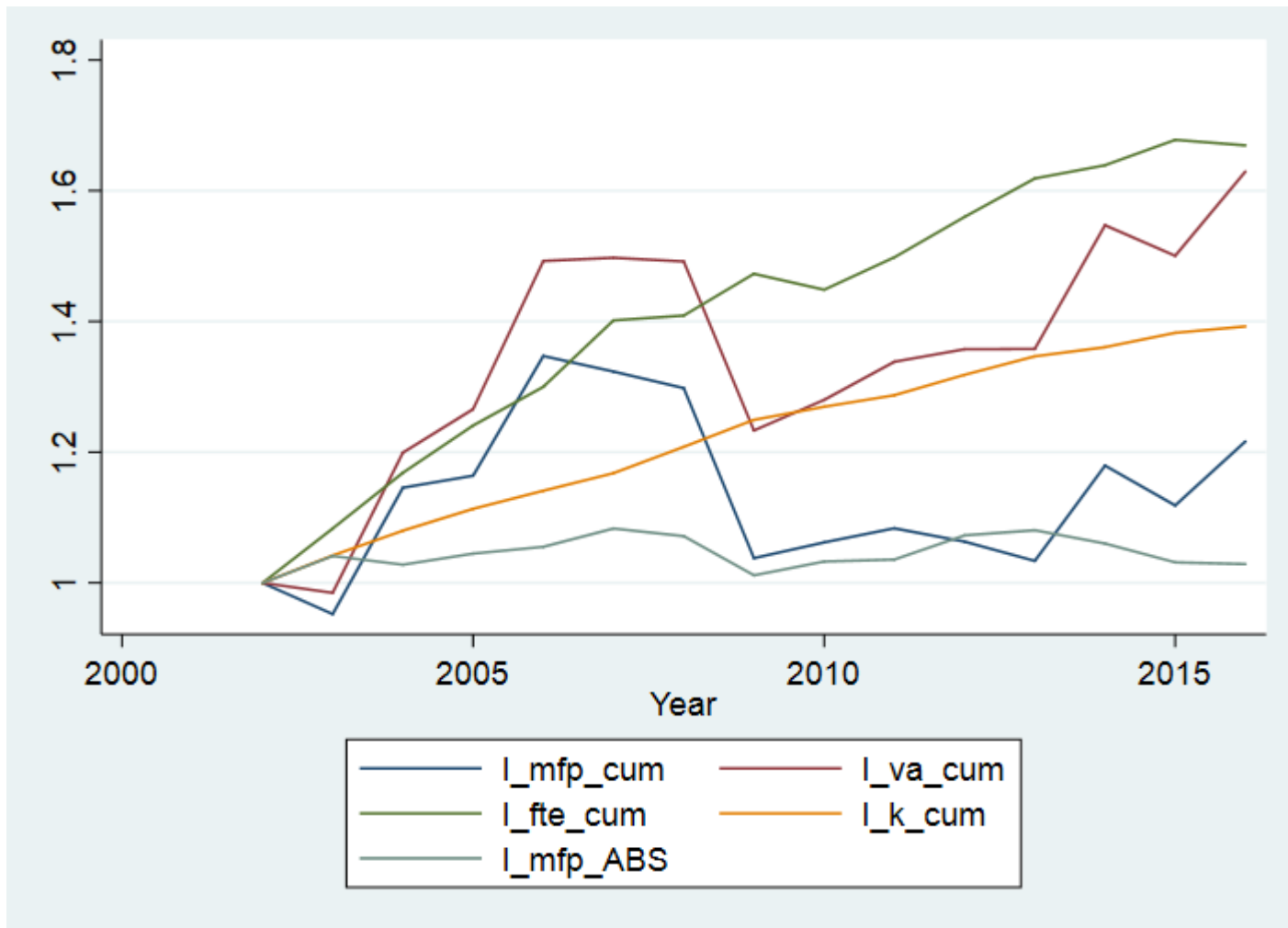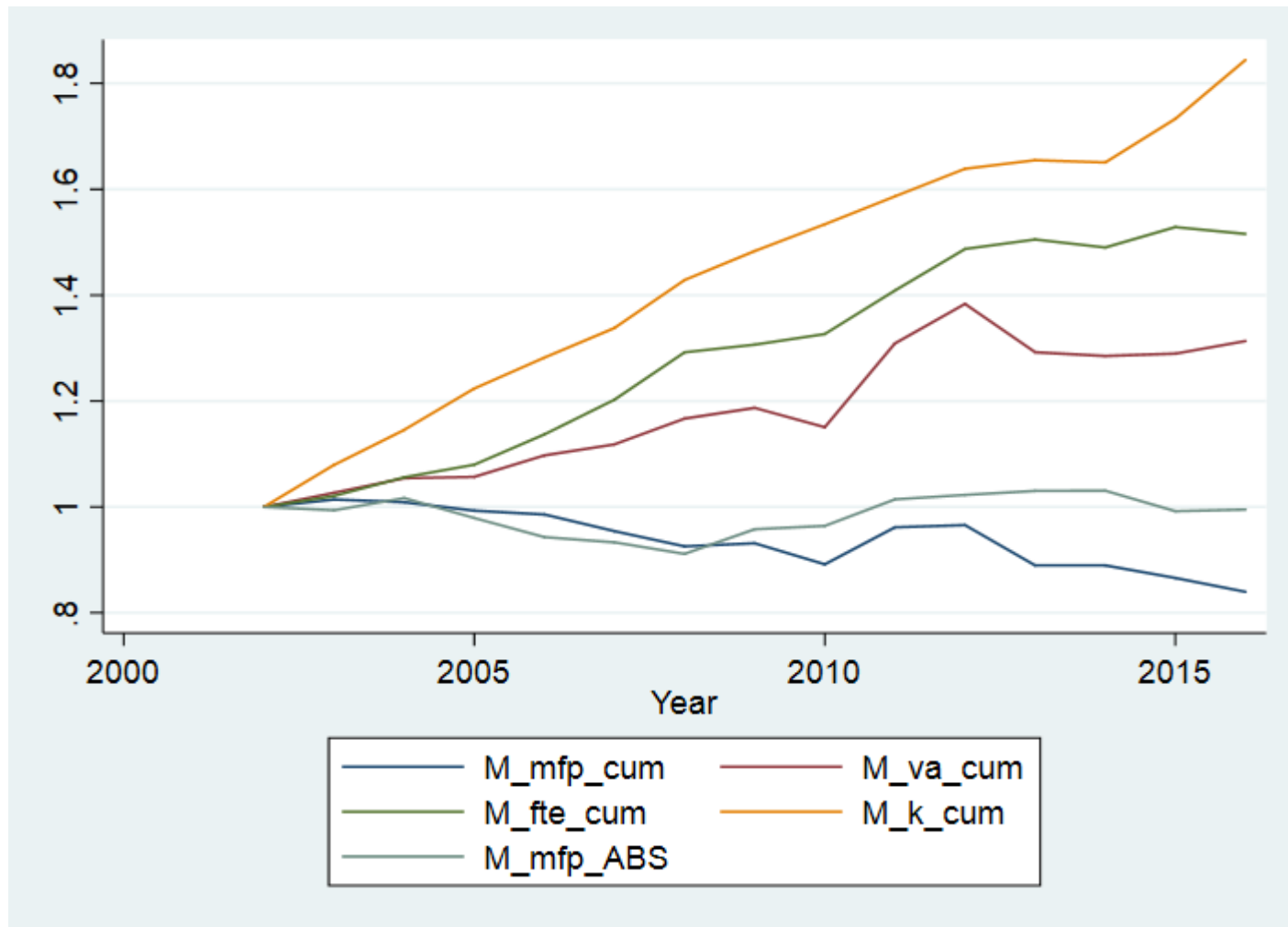
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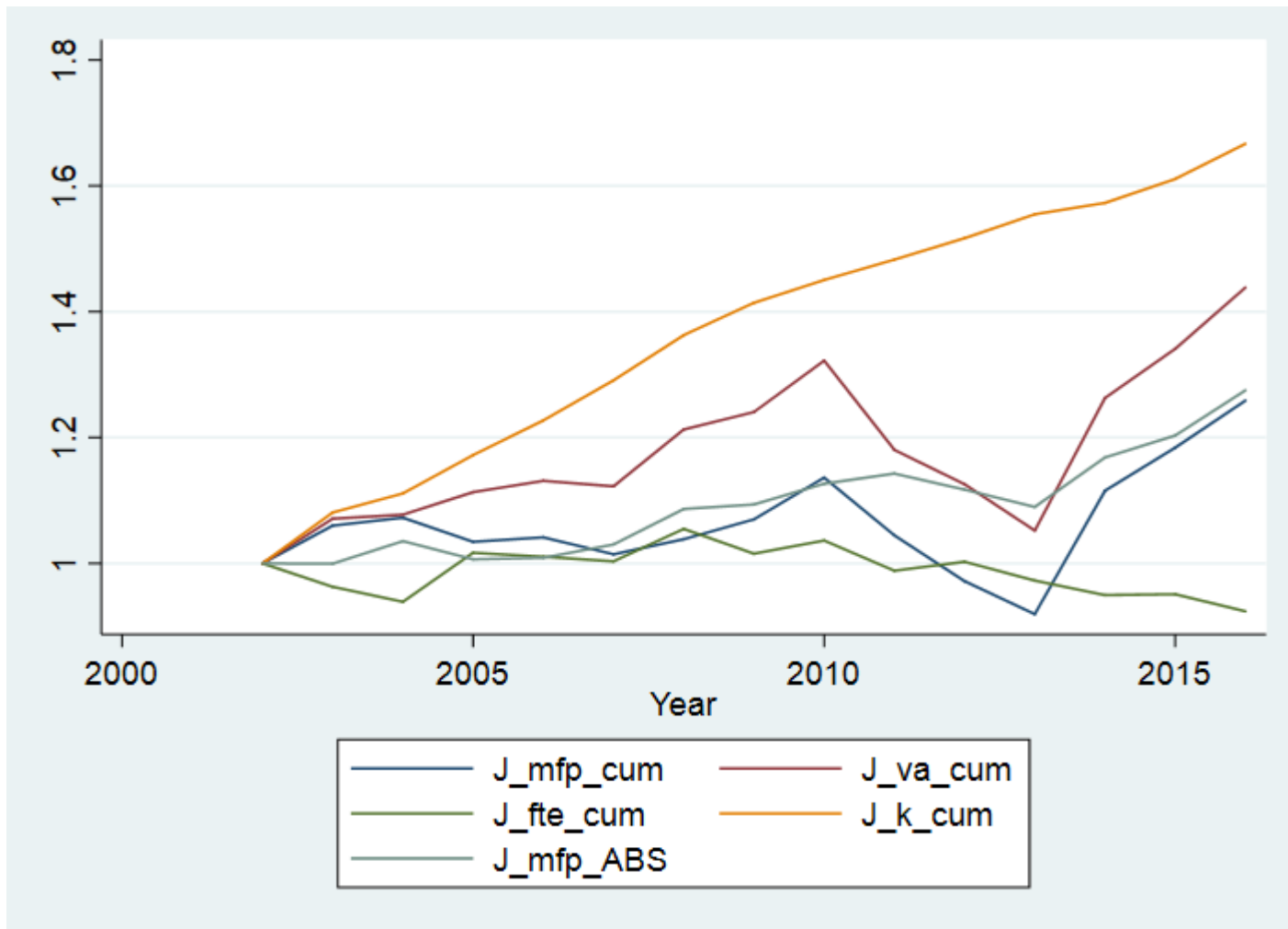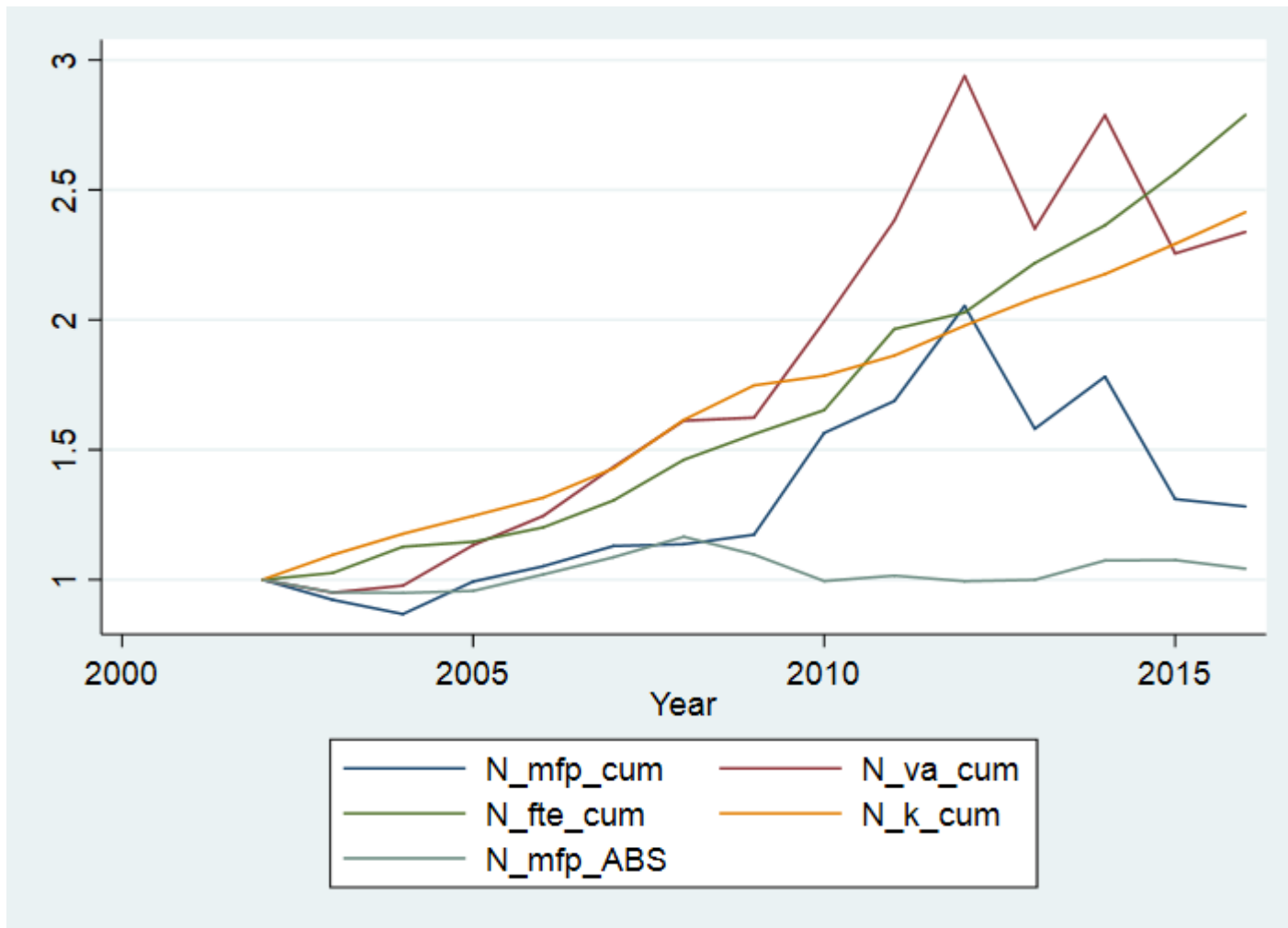
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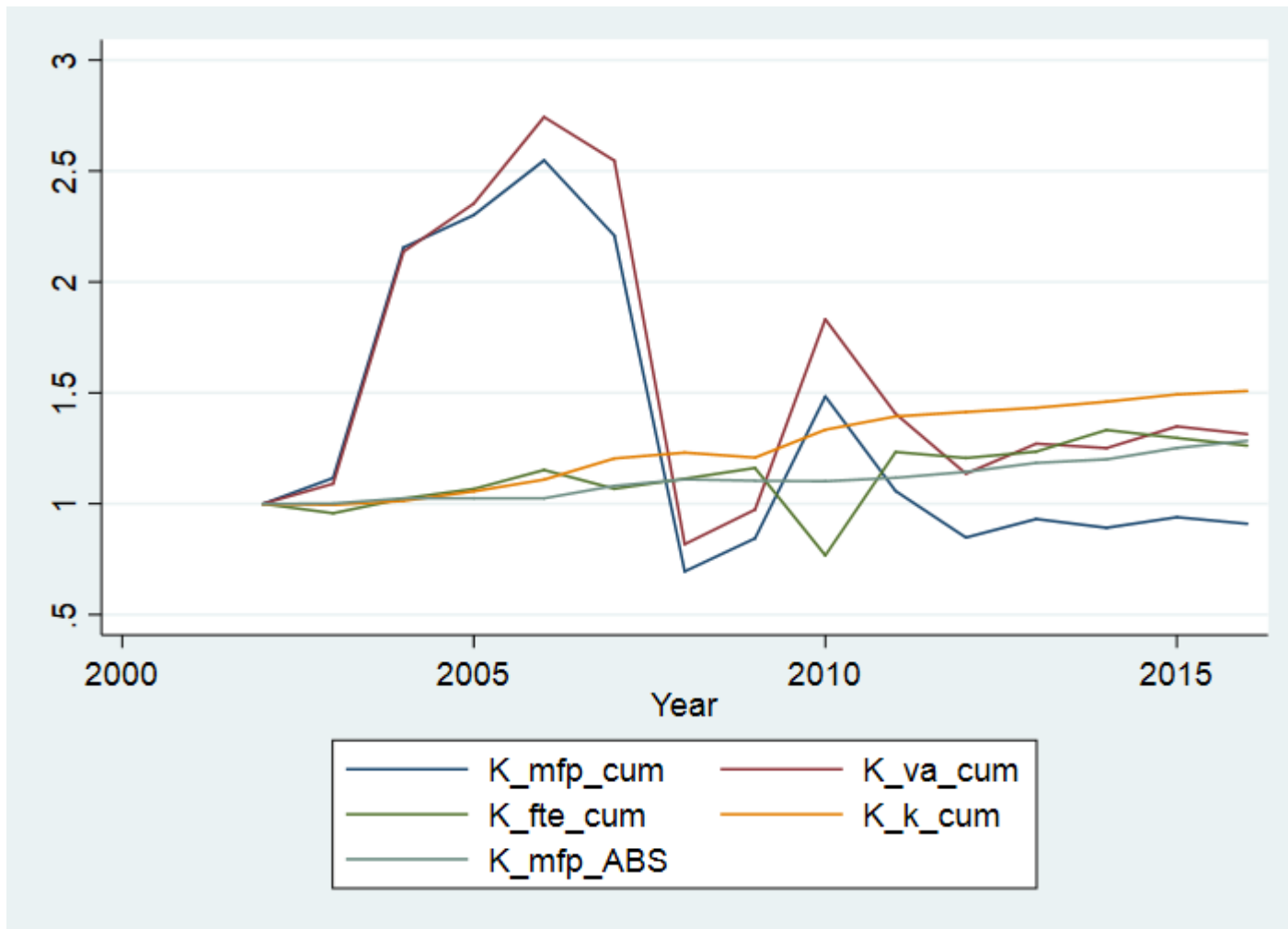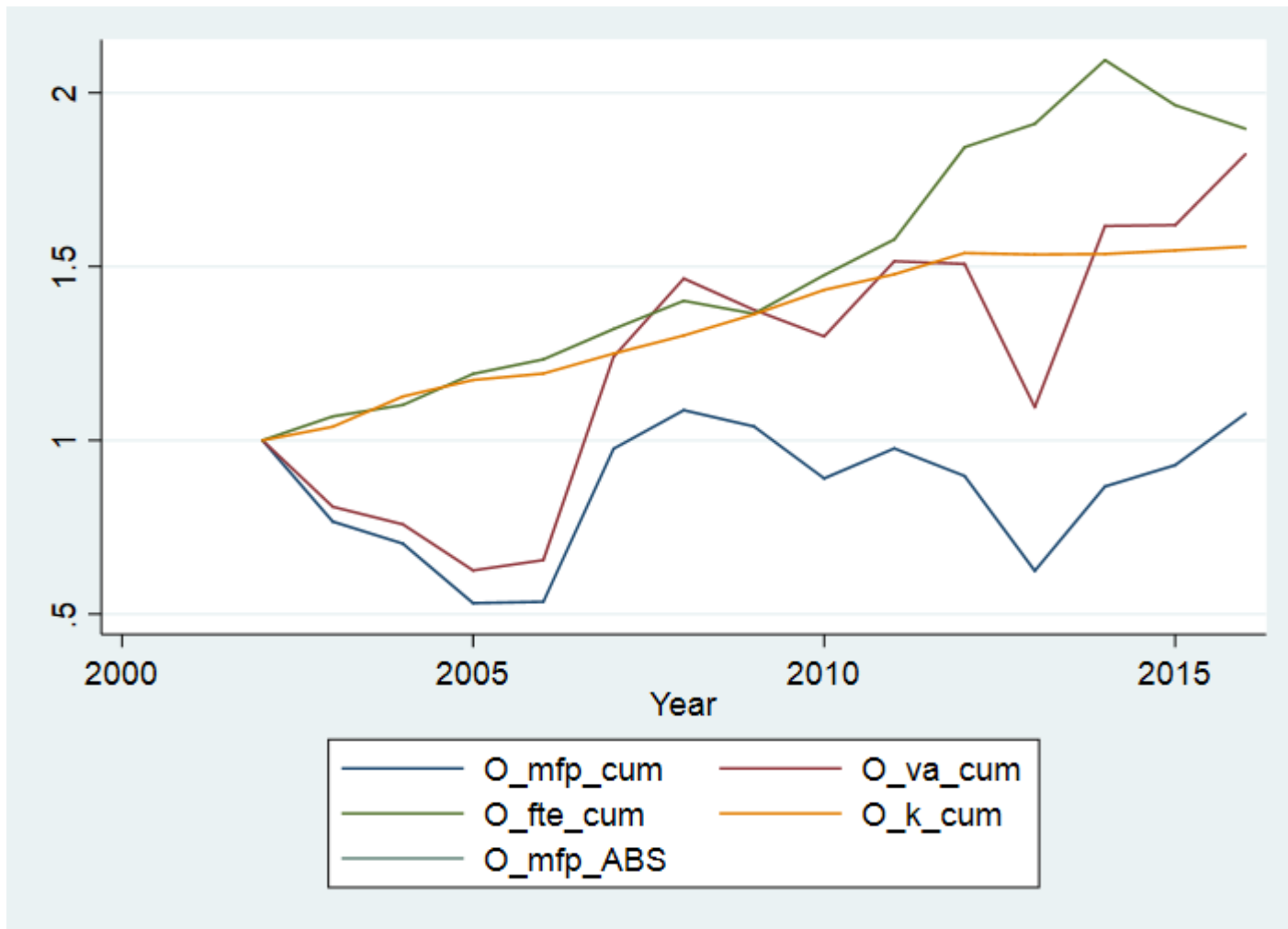
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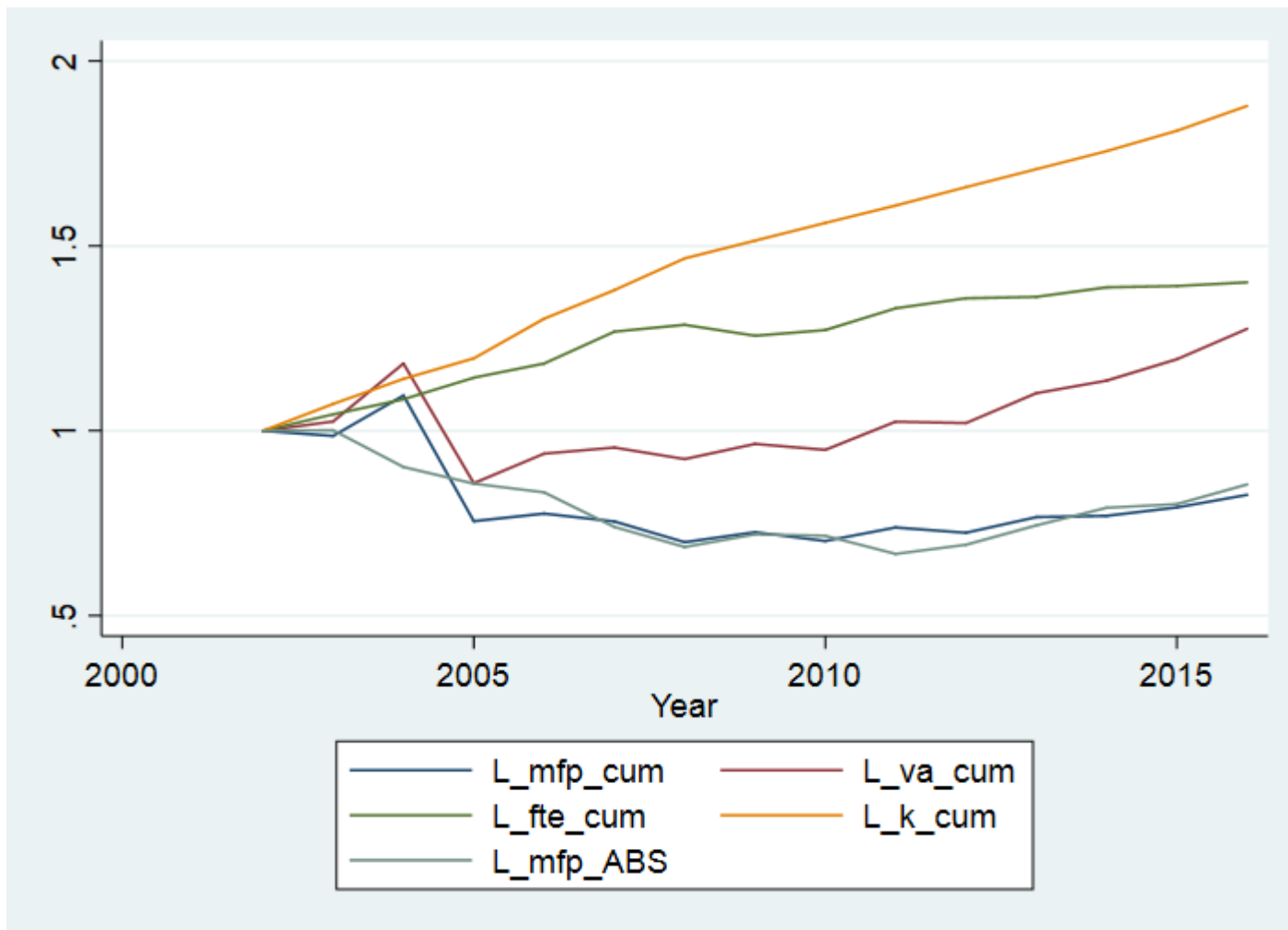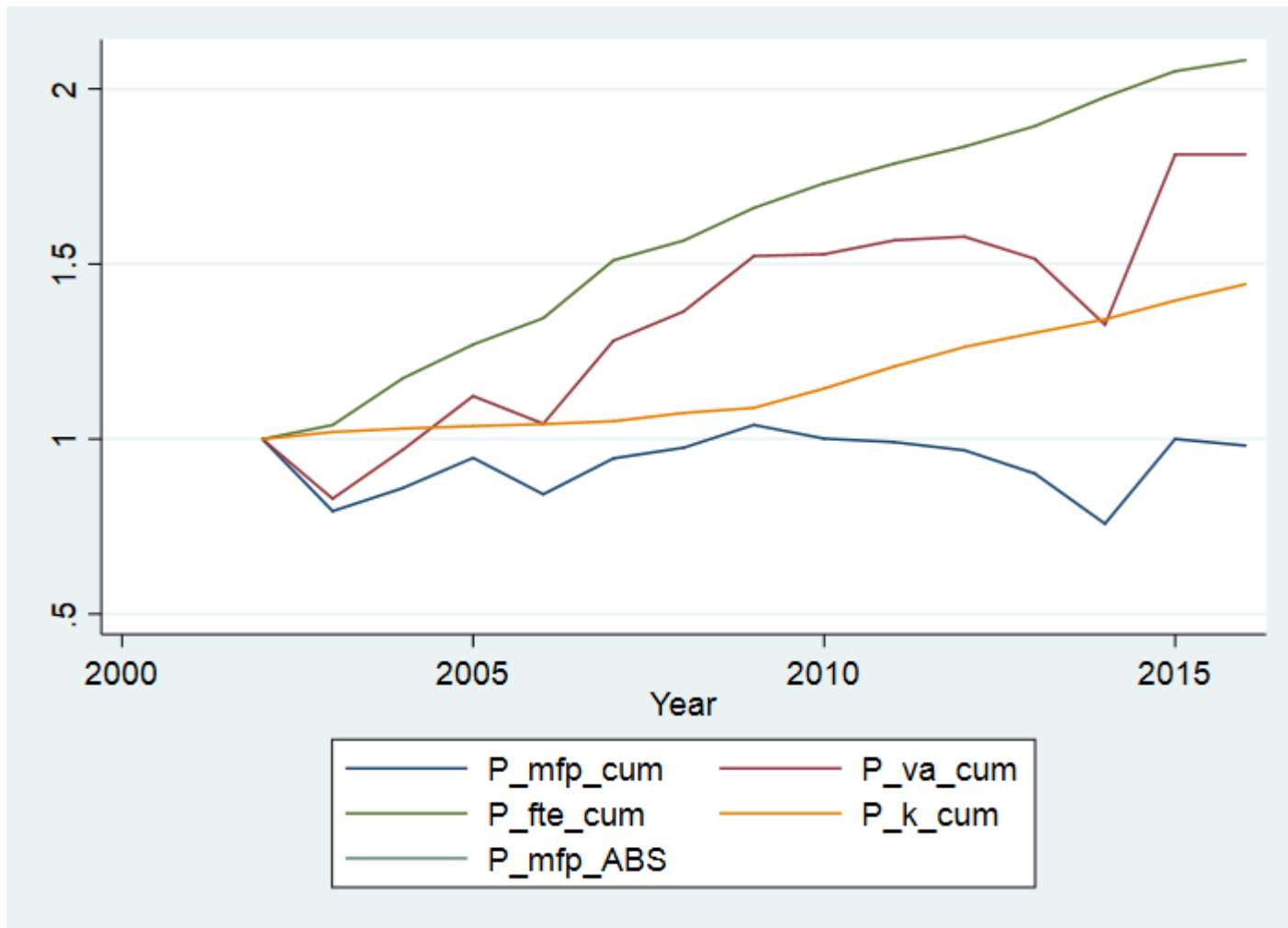
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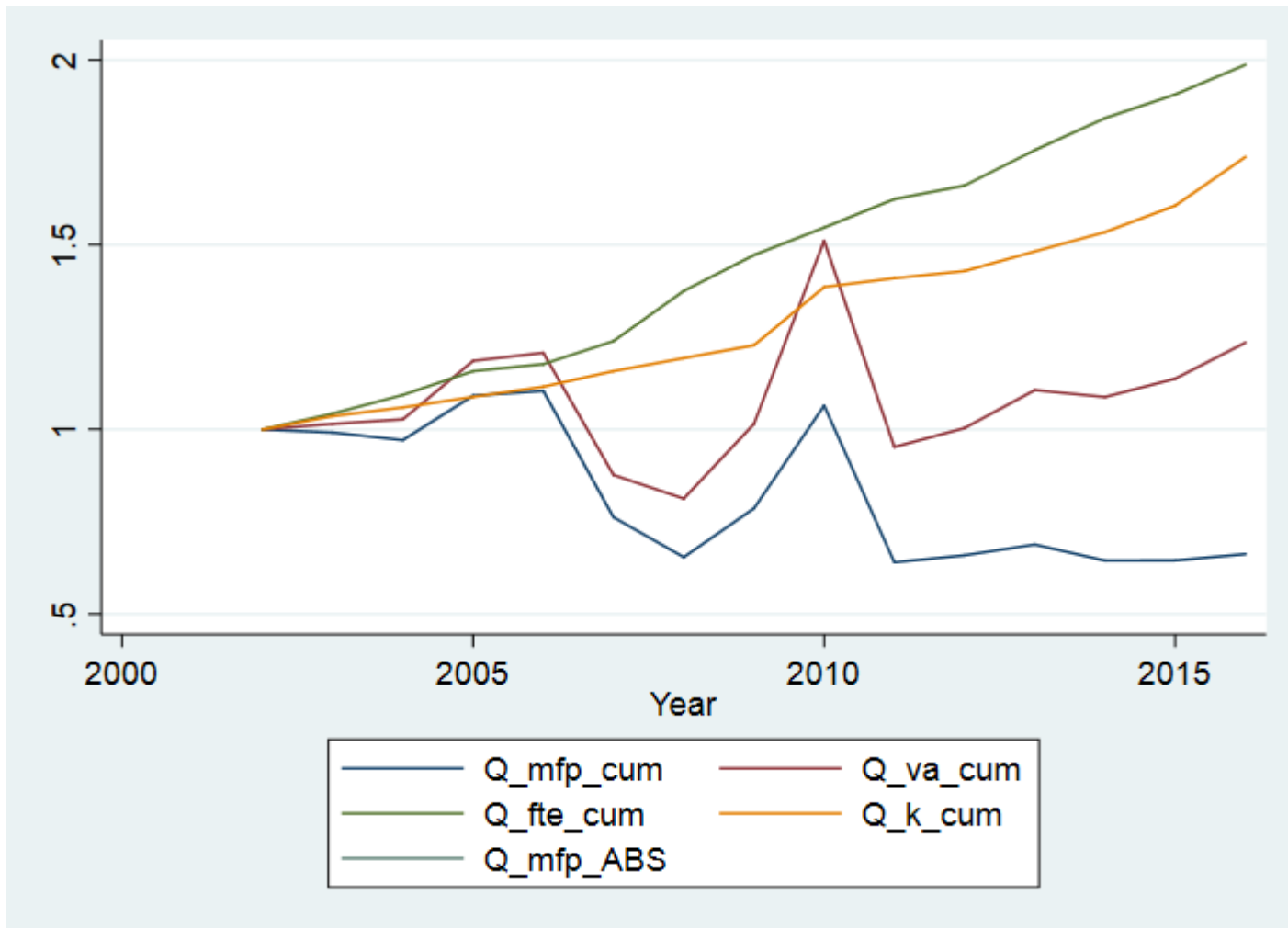
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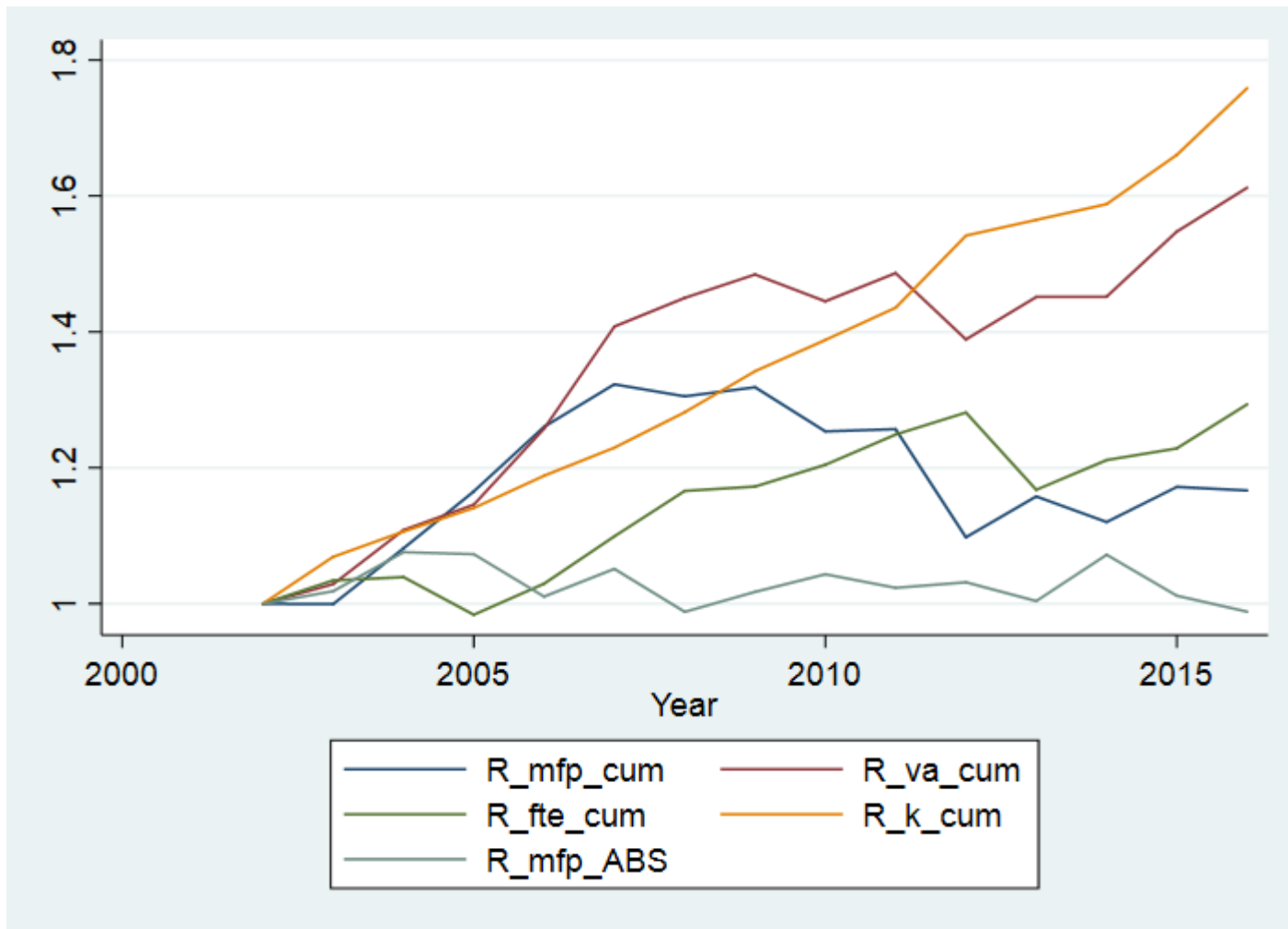
Public Administration and Safety

Education and Training

Health Care and Social Assistance

Arts and Recreation Services

Other Services