Changes in income generation patterns in Poland

Jakub Boratyński

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Purpose of the study

In this study we would like to:

- characterize the late stage of the Polish economic transition from the perspective of incomes of primary factor of production,

- characterize wages as well as profit rates by comodity groups,

- examine how changes in the structure of final demand and in the intermediate input coefficients affected labour and capital incomes.

The data

- Time series of commodity-by-commodity input-output tables for the years 1995-2002, at basic and final prices.

- The number of employed and self-employed.

- Fixed assets, constant prices.

- Basic price indices for different commodity groups.

Labour and capital income in the to SNA

SNA/ESA does not supply us with appropriate measures for labour and capital income:

- wages and salaries (with all social contribution markups) only concern the employed persons.

- incomes from labour of the self-employed constitute a part of the operating surplus.

We assessed the latter under the assumption that average labour costs within a commodity group are identical for both employed and self-employed. Gross operating surplus and wages and sala-ries were adjusted accordingly.

Deflation methods

- For value added elements a single value added deflator were used for all commodities in order to obtain real incomes. Thus, changes in real incomes of primary production factors represent changes in their purchasing power.

- In addition, double deflation method was applied for individual commodities. According to Sato (1976), changes of the double deflated 'real value added' represent changes in the contribution of tangible and intngible primary factors (incl. economies of scale, productivity increases etc.).

Comparing rates of growth of 'real value added' acquired by both methods may perhaps lead to an interesting interpretation.

Diff. between growth rates of income and factor contribution (%)

1. Agriculture		-8,4	21. Electrical machinery		-8,4
2. Fish		-1,5	22. Radio, tv & communication equip.		-14,4
3. Coal		0,1	23. Medical, precision & optical instr.		-2,9
4. Oil, gas & metal res.		0,9	24. Motor vehicles		-24,8
5. Food		-2,8	25. Other transport equipment		-3,1
6. Tobacco		9,4	26. Furniture & other		-7,1
7. Textiles		-6,8	27. Recycling		4,0
8. Clothing		-8,3	28. Electricity, gas & steam		3,7
9. Leather		-0,6	29. Cold water distribution		3,9
10. Wood		-6,4	30. Construction		3,0
11. Paper		-12,8	31. Trade & repair		0,0
12. Prints		0,1	32. Hotels & restaurants		2,3
13. Petroleum and coke		18,4	33. Transport & communication		0,6
14. Chemicals		-10,2	34. Finance & insurance		3,6
15. Rubber & plastic		-12,6	35. Real estate & business activities		7,5
16. Other non-metalic		-6,3	36. Public administration & defence		-0,9
17. Metals		-9,7	37. Education		6,1
18. Metal products		-8,9	38. Health		4,0
19. Machinery and equipment		-4,9	39. Community, culture & sport servies		7,7
20. Computers		-16,7	Total		0,0

- SNA/ESA pimary factors income data include estimated income from the unofficial economy.

- In the Polish case, due to the unofficial economy, the GDP grew by about 13%-14%.

- About one third of that was attributed to the unofficial employment.

- It was necessary to extend the number of workers by the number of those unofficially employed.

'Wages', PLN thousand per year, constant prices (1)

	1995	1996	1997	1998	1999	2000	2001	2002
1. Agriculture	7,2	6,9	6,6	7,0	7,4	6,8	7,6	6,9
2. Fish	4,9	7,2	7,1	7,6	9,9	10,8	13,4	11,4
3. Coal	25,9	26,5	27,7	28,3	28,7	30,0	30,2	31,4
4. Oil, gas & metal res.	-	21,9	20,6	22,3	25,7	27,4	28,6	28,8
5. Food	14,6	12,3	13,4	14,1	15,8	15,6	17,2	15,7
6. Tobacco	16,4	23,0	26,8	26,5	34,8	35,5	31,0	33,8
7. Textiles	8,2	10,6	10,7	11,1	12,1	13,2	14,4	13,6
8. Clothing	8,2	8,0	8,4	9,6	9,0	11,9	12,3	10,5
9. Leather	7,2	7,9	8,1	9,5	10,7	12,0	13,4	13,6
10. Wood	9,1	9,8	10,6	11,7	13,2	15,5	15,4	14,1
11. Paper	13,7	14,8	15,8	16,6	18,1	18,8	22,4	22,2
12. Prints	16,6	21,3	20,5	22,3	26,6	29,4	30,3	28,1
13. Petroleum and coke	17,8	18,2	19,0	20,9	22,3	36,1	32,7	31,9
14. Chemicals	15,1	18,0	19,5	21,0	22,0	24,8	26,6	25,6
15. Rubber & plastic	13,6	13,7	14,8	14,8	17,5	18,8	19,3	17,8
16. Other non-metalic	12,0	12,7	13,5	14,8	16,6	18,1	18,8	19,0
17. Metals	13,2	16,9	18,1	19,7	19,2	19,8	22,3	24,1
18. Metal products	14,2	14,2	14,2	15,6	16,3	17,9	19,7	18,3
19. Machinery and equipment	11,9	13,7	14,3	14,3	15,5	17,8	19,4	18,1

'Wages', PLN thousand per year, constant prices (2)

	1995	1996	1997	1998	1999	2000	2001	2002
20. Computers	13,1	19,6	18,6	23,8	34,3	53,2	32,6	24,4
21. Electrical machinery	12,7	14,5	14,9	16,1	16,9	18,2	19,5	18,6
22. Radio, tv & communication equip.	14,1	14,7	17,7	16,4	20,2	21,3	27,2	23,8
23. Medical, precision & optical instr.	11,4	15,9	18,7	18,7	23,3	25,1	30,5	21,9
24. Motor vehicles	11,3	14,4	15,1	15,0	16,4	18,7	18,8	17,2
25. Other transport equipment	10,9	14,7	16,1	16,8	19,1	20,5	21,7	19,4
26. Furniture & other	9,2	10,5	10,6	10,9	12,8	14,3	14,5	13,8
27. Recycling	-	17,0	17,4	19,2	22,9	28,2	23,6	21,9
28. Electricity, gas & steam	17,6	21,3	20,7	20,5	23,0	25,1	24,9	26,4
29. Cold water distribution	-	9,8	11,1	12,1	13,9	15,2	17,3	17,4
30. Construction	9,9	12,0	12,3	14,7	15,7	17,1	18,3	16,7
31. Trade & repair	9,2	10,1	11,0	11,9	11,9	12,0	14,3	14,1
32. Hotels & restaurants	8,7	10,0	10,3	10,8	12,7	13,5	13,6	13,0
33. Transport & communication	12,5	13,9	15,4	16,6	18,4	20,0	23,5	22,1
34. Finance & insurance	14,0	13,7	16,8	19,6	19,3	23,8	26,2	28,8
35. Real estate & business activities	17,0	16,6	17,2	17,5	17,2	16,2	21,6	22,4
36. Public administration & defence	20,2	20,6	20,5	22,1	21,7	22,3	23,7	23,8
37. Education	11,1	12,0	13,5	14,0	15,4	16,6	18,8	19,3
38. Health	9,7	10,6	11,4	11,5	12,7	12,5	13,8	14,4
39. Community, culture & sport servies	21,3	21,1	19,8	24,3	20,3	17,0	23,9	24,9

'Wages', PLN thousand per year, constant prices (3)

	1995	1996	1997	1998	1999	2000	2001	2002
Total	11,2	11,8	12,4	13,2	13,9	14,2	15,9	15,5
Total excl. agriculture (1)	12,4	13,4	14,2	15,3	16,0	16,7	18,9	18,6
Variation coefficient %	38,3	38,1	37,7	38,0	36,1	39,8	39,2	42,0
Variation coefficient excl. (1) %	37,4	34,0	31,1	30,9	28,0	30,0	28,0	30,1

Wages, summary (1)

- Systematic growth of real wages (except 2002 - here SNA data are inconsistent with wage surveys).

- Positive trends identified for alost all commodities. The mainexception is agriculture.

- Very low labour incomes per worker in agriculture products, probably due to large hidden uneployment. Agriculture in Poland should rather be treated in a different way.

- Quite large sectoral disparities.

Wages, summary (2)

- According to the marginal productivity theory, these disparities should result from differences in (marginal) produtivity. Comodities characterized with high capital/labour ratio generally show higher wages (coal, petroleum, chemicals, electricity).

- Some of the high wages can be treated as premiums, being a result of a relatively short supply of qualified labour ('new' services: financial intermediation, real estate & business services).

Wages, summary (3)

- Alternative (complementary?) explanation: disparities in bargainig power - usually lower wages are observed for sectors dominated by small enterprises.

- Important fact: decreasing variation coefficients. Probably at the beginning of transition, structural changes led to extraordinary gains and lossess, which were not at first elimiated, due to poor labour force mobility. Gradual reduction of premiums resulted in the reduction of sectoral disparities.

- Studies on household budgets show genrally a slight increase of income disparities in 1995-2002. Then, either this was due to other incomes than wages or the disparities grow within industries rather then in an interindustry perspective.

Profit rates measurement problem

- To get an actual rate of profit one should divide net operating surplus by capital measured as 'flow'.

- Only stocks of capital (constant price fixed assets) and gross operating surplus are available for the Polish economy.

- Ratios of gross operating surplus (in realterms) over fixed capital were calculated ('gross profits per unit of capital').

- Sectoral disparities of profits per unit of capital can be the result of differences in the actual rates of profit and in the rates of capital depreciation (durability of fixed assets).

Profits per unit of capital (1)

	1995	1996	1997	1998	1999	2000	2001	2002
1. Agriculture	-10,2	-9,8	-10,7	-13,1	-16,5	-15,9	-18,1	-17,1
2. Fish	3,6	1,3	2,4	0,1	2,5	-1,9	1,5	6,2
3. Coal	6,8	4,6	3,2	-0,2	5,5	10,9	13,9	8,4
4. Oil, gas & metal res.	12,7	13,3	21,1	13,6	13,8	19,3	5,3	11,7
5. Food	19,9	20,4	19,9	15,8	14,5	8,9	8,9	11,1
6. Tobacco	55,1	23,4	54,1	58,5	40,8	29,5	9,6	14,5
7. Textiles	14,4	8,2	8,5	7,1	17,5	6,9	7,6	8,9
8. Clothing	15,2	25,5	22,6	14,3	14,0	-15,3	-12,7	-9,2
9. Leather	23,0	35,5	14,0	1,3	40,3	7,6	3,8	5,0
10. Wood	32,5	33,3	28,4	17,7	12,7	13,6	12,4	15,9
11. Paper	25,7	13,6	10,2	10,1	9,9	12,0	14,5	15,9
12. Prints	44,1	76,2	54,1	42,4	33,1	45,1	31,6	35,6
13. Petroleum and coke	29,1	8,1	14,0	15,3	8,7	11,5	9,2	9,2
14. Chemicals	29,6	16,6	15,0	13,5	13,2	12,1	11,3	12,3
15. Rubber & plastic	43,7	32,1	27,6	25,4	20,5	14,9	13,9	18,9
16. Other non-metalic	17,9	17,4	16,0	15,4	12,6	17,6	12,8	13,9
17. Metals	12,1	3,8	5,5	5,1	3,3	8,6	-2,7	-1,5
18. Metal products	42,6	32,8	29,6	24,9	22,5	14,7	12,7	25,1
19. Machinery and equipment	18,0	13,7	12,6	11,5	12,2	12,7	11,5	13,0

Profits per unit of capital (2)

	1995	1996	1997	1998	1999	2000	2001	2002
20. Computers	43,2	79,0	34,2	38,8	52,1	106,0	13,8	25,1
21. Electrical machinery	27,2	25,3	20,9	19,2	20,4	13,7	12,1	13,1
22. Radio, tv & communication equip.	22,6	27,1	29,5	28,8	38,5	-0,3	21,0	20,8
23. Medical, precision & optical instr.	18,6	30,9	30,3	35,8	54,0	29,3	12,7	27,1
24. Motor vehicles	12,4	16,8	9,8	9,5	0,8	36,9	6,5	9,4
25. Other transport equipment	9,6	5,5	5,1	8,2	10,2	4,1	0,9	11,2
26. Furniture & other	61,6	32,4	49,1	35,8	37,0	5,7	12,0	13,4
27. Recycling	57,2	7,3	11,7	15,1	9,5	18,2	10,6	6,2
28. Electricity, gas & steam	7,9	5,9	5,3	5,1	5,4	4,9	6,4	7,2
29. Cold water distribution	0,7	3,5	2,7	2,6	2,7	3,1	4,4	4,9
30. Construction	121,2	97,4	101,6	104,1	98,8	80,2	57,5	58,5
31. Trade & repair	145,7	145,8	135,6	112,4	101,4	91,2	74,8	77,2
32. Hotels & restaurants	20,5	22,6	24,0	22,7	21,3	16,1	14,3	17,5
33. Transport & communication	4,0	3,5	3,1	2,8	3,1	3,4	3,9	5,0
34. Finance & insurance	-23,7	-11,6	-9,8	-11,1	-4,5	-3,6	-3,6	-21,7
35. Real estate & business activities	6,3	6,5	7,3	9,8	10,1	12,9	11,8	11,6
36. Public administration & defence	16,1	31,7	26,6	23,9	20,2	22,6	21,3	20,7
37. Education	8,6	5,0	3,9	5,2	5,8	5,1	3,6	4,7
38. Health	19,6	15,1	12,2	13,8	11,4	14,1	11,9	9,2
39. Community, culture & sport servies	26,9	24,5	23,2	23,3	28,4	31,5	25,8	24,9

Profits per unit of capital (3)

	1995	1996	1997	1998	1999	2000	2001	2002
Total								
(excl. 1, 8, 34, 36, 37, 38)	14,4	13,4	13,6	13,7	14,1	14,5	12,7	13,9
Variation coefficients								
(excl. 1, 8, 34, 36, 37, 38)	189,7	200,8	193,7	172,7	161,2	140,6	128,9	122,7

Profits per unit of capital, summary (1)

- Their behaviour (accross time) show extensive irregularity for a significant number of commodity groups. Many 'accidental' changes. Profits per unit of capital in the short run are probably much stronger related to demand than to the productivity.

- In the short run changes in profits per unit of capital yield probably mainly from changes in profit rates.

- 11 (out of 39) negative trends were identified. It can be explained as a result of competition, leading to the reduction of extraordinary premiums.

Profits per unit of capital, summary (1)

- Significant positive trend was only found for real estate and business services. These services have almost 25% share in total fixed assets in the economy. This trend levels off negative trends.

- Variation coefficients decreased radically over the analysed period. Thus, there was a tendency towards equalizing profit rates connected with production of different commodities.

The role of final and intermediate demand structures

Taking into account substantial differences in sectoral wages and profit rates, as well as durability of the disparities (mainly wage disparities), the following question arises:

- How did the transitional changes in final and intermediate demand structures, as well as import-intensity changes, affect patterns of income generation?

This question was approached with structural decomposition techniques.

Did structural changes affect average real wage?

$$w = \frac{W}{N} = \frac{\mathbf{w'\hat{n}q}}{\mathbf{n'q}} =$$

$$= \frac{\mathbf{w'\hat{n}} \left(\mathbf{I} - (\mathbf{I} - \hat{\mathbf{m}})\,\mathbf{A}\right)^{-1} \left(\left(\mathbf{I} - \hat{\mathbf{k}}\right)(\mathbf{c} + \mathbf{g} + \mathbf{i}) + \mathbf{e}\right)}{\mathbf{n'} \left(\mathbf{I} - (\mathbf{I} - \hat{\mathbf{m}})\,\mathbf{A}\right)^{-1} \left(\left(\mathbf{I} - \hat{\mathbf{k}}\right)(\mathbf{c} + \mathbf{g} + \mathbf{i}) + \mathbf{e}\right)}$$

$$= f\left(\mathbf{c}, \mathbf{g}, \mathbf{i}, \mathbf{e}, \mathbf{k}, \mathbf{A}, \mathbf{m}, \hat{\mathbf{n}}, \mathbf{w}\right)$$

where: $\mathbf{c}$ - priv. consumption, $\mathbf{g}$ - gov. consumption, $\mathbf{i}$ - investment,

$\mathbf{e}$ - exports, $\mathbf{k}$ - import coefficients for final demand, $\mathbf{A}$ - material

input coefficients, $\mathbf{m}$ - import coefficients for intermediate use, $\hat{\mathbf{n}}$ -

labour input coefficients, $\mathbf{w}$ - individual wages.

Structural decomposition (1)

$$\Delta w = \Delta w^{I} + \Delta w^{II} + \cdots + \Delta w^{IX}$$

$$\Delta w^{I} = f\left(\mathbf{c}_1, \mathbf{g}_0, \mathbf{i}_0, \mathbf{e}_0, \mathbf{k}_0, \mathbf{A}_0, \mathbf{m}_0, \hat{\mathbf{n}}_0, \mathbf{w}_0\right)$$

$$-f\left(\mathbf{c}_0, \mathbf{g}_0, \mathbf{i}_0, \mathbf{e}_0, \mathbf{k}_0, \mathbf{A}_0, \mathbf{m}_0, \hat{\mathbf{n}}_0, \mathbf{w}_0\right)$$

$$\Delta w^{II} = f\left(\mathbf{c}_1, \mathbf{g}_1, \mathbf{i}_0, \mathbf{e}_0, \mathbf{k}_0, \mathbf{A}_0, \mathbf{m}_0, \hat{\mathbf{n}}_0, \mathbf{w}_0\right)$$

$$-f\left(\mathbf{c}_1, \mathbf{g}_0, \mathbf{i}_0, \mathbf{e}_0, \mathbf{k}_0, \mathbf{A}_0, \mathbf{m}_0, \hat{\mathbf{n}}_0, \mathbf{w}_0\right)$$

$$\vdots$$

$$\Delta w^{VIII} = f\left(\mathbf{c}_1, \mathbf{g}_1, \mathbf{i}_1, \mathbf{e}_1, \mathbf{k}_1, \mathbf{A}_1, \mathbf{m}_1, \hat{\mathbf{n}}_1, \mathbf{w}_0\right)$$

$$- f\left(\mathbf{c}_1, \mathbf{g}_1, \mathbf{i}_1, \mathbf{e}_1, \mathbf{k}_1, \mathbf{A}_1, \mathbf{m}_1, \hat{\mathbf{n}}_0, \mathbf{w}_0\right)$$
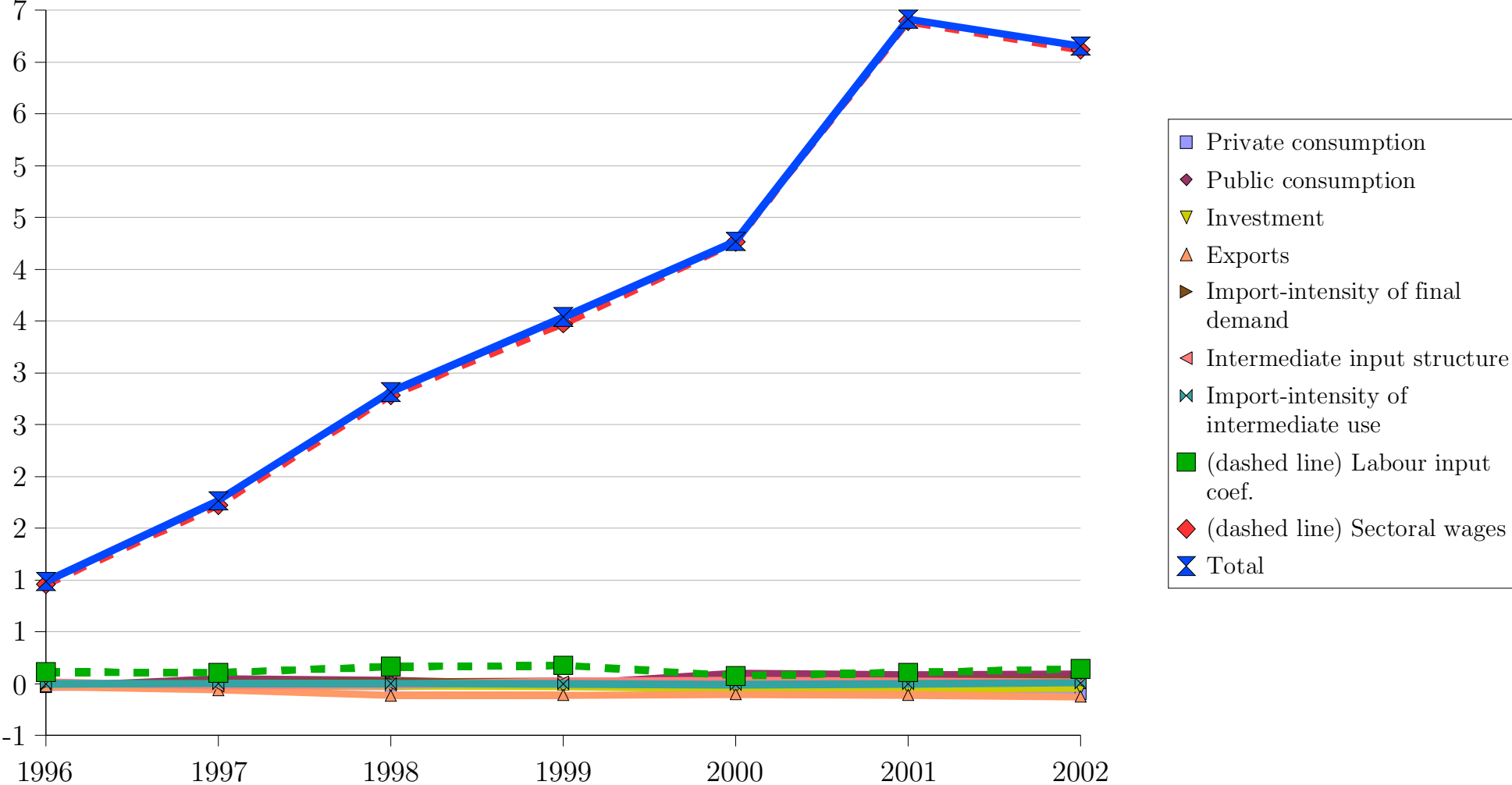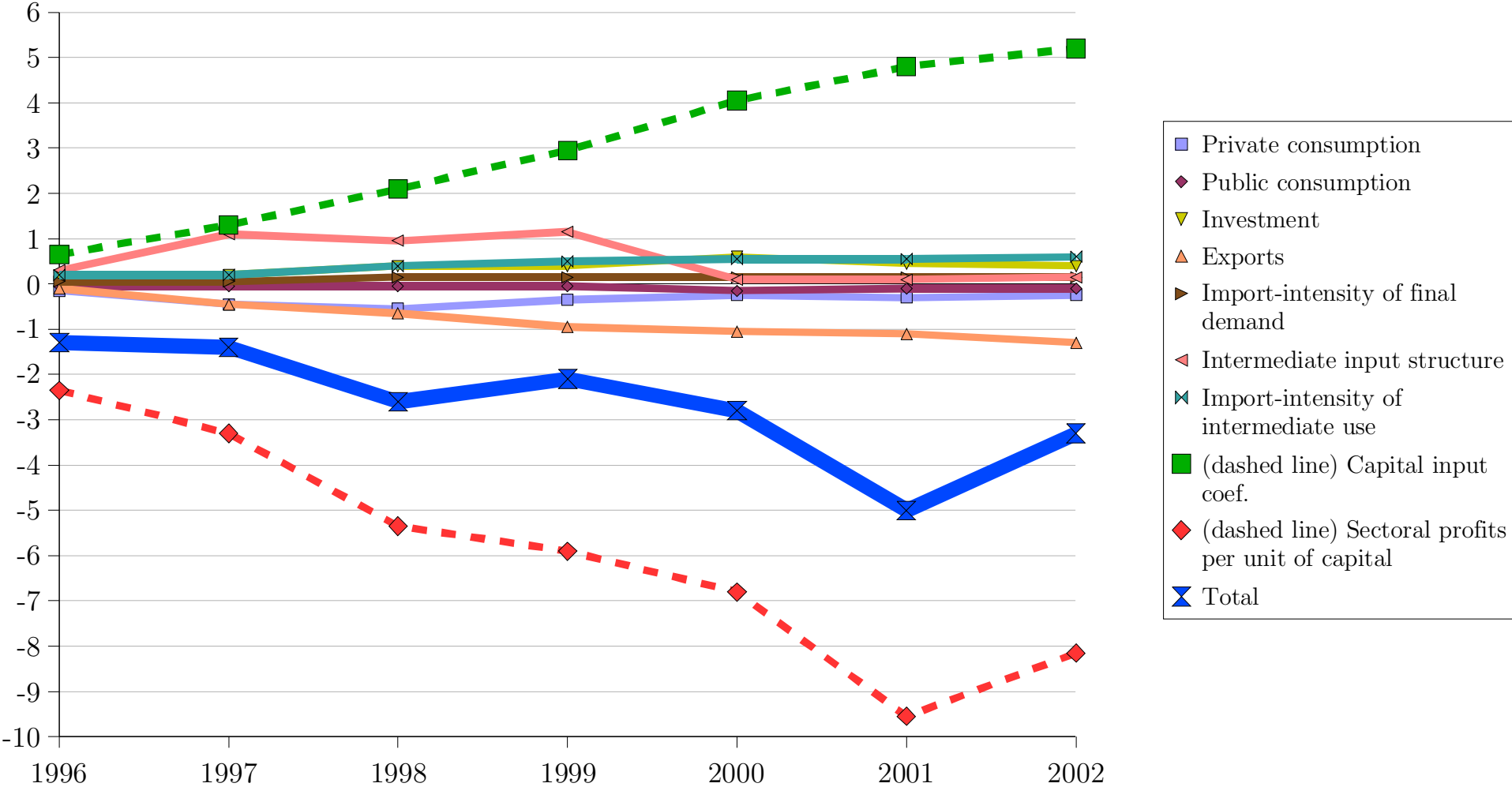
$$\Delta w^{IX} = f\left(\mathbf{c}_1, \mathbf{g}_1, \mathbf{i}_1, \mathbf{e}_1, \mathbf{k}_1, \mathbf{A}_1, \mathbf{m}_1, \hat{\mathbf{n}}_1, \mathbf{w}_1\right)$$

$$- f\left(\mathbf{c}_1, \mathbf{g}_1, \mathbf{i}_1, \mathbf{e}_1, \mathbf{k}_1, \mathbf{A}_1, \mathbf{m}_1, \hat{\mathbf{n}}_1, \mathbf{w}_0\right)$$

Cumulative changes of average real wage, by sources (PLN thous. per year)

Legend:
- Private consumption
- Public consumption
- Investment
- Exports
- Import-intensity of final demand
- Intermediate input structure
- Import-intensity of intermediate use
- (dashed line) Labour input coef.
- (dashed line) Sectoral wages
- Total

Cumulative changes of real profits per unit of capital, by sources (pp.; excl. real estate)

Legend:
- Private consumption
- Public consumption
- Investment
- Exports
- Import-intensity of final demand
- Intermediate input structure
- Import-intensity of intermediate use
- (dashed line) Capital input coef.
- (dashed line) Sectoral profits per unit of capital
- Total

Thank you!