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Public Infrastructure and Economic Growth in Pakistan: A Dynamic CGE-microsimulation

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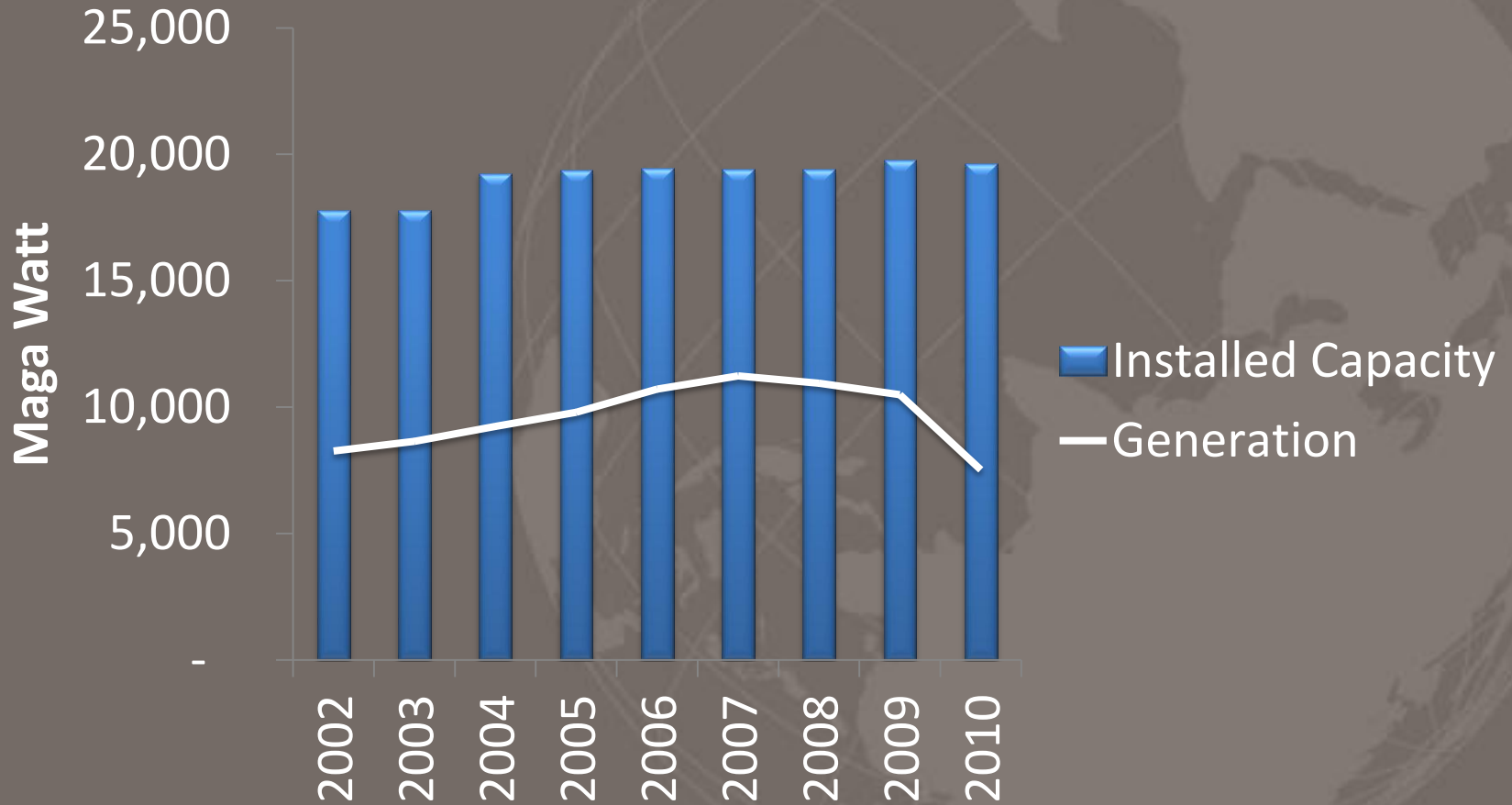
1. Motivation for Study (Cont...)

1.1 Global Infrastructure Ranking

Country	Transport	Electricity & Telephony	ICT	Education	Health	Public Institutions
Malaysia	14	48	57	91	52	32
China	29	69	74	93	71	46
India	35	116	117	109	109	72
Sri Lanka	52	79	100	89	61	49
Pakistan	80	126	111	126	111	111
Philippines	104	101	93	83	97	112
Benin	115	118	120	123	120	91
Bangladesh	117	137	132	118	107	112

Source: Global Competitiveness Report 2011-12

1.2 Power Sector Crisis & Electricity Generation

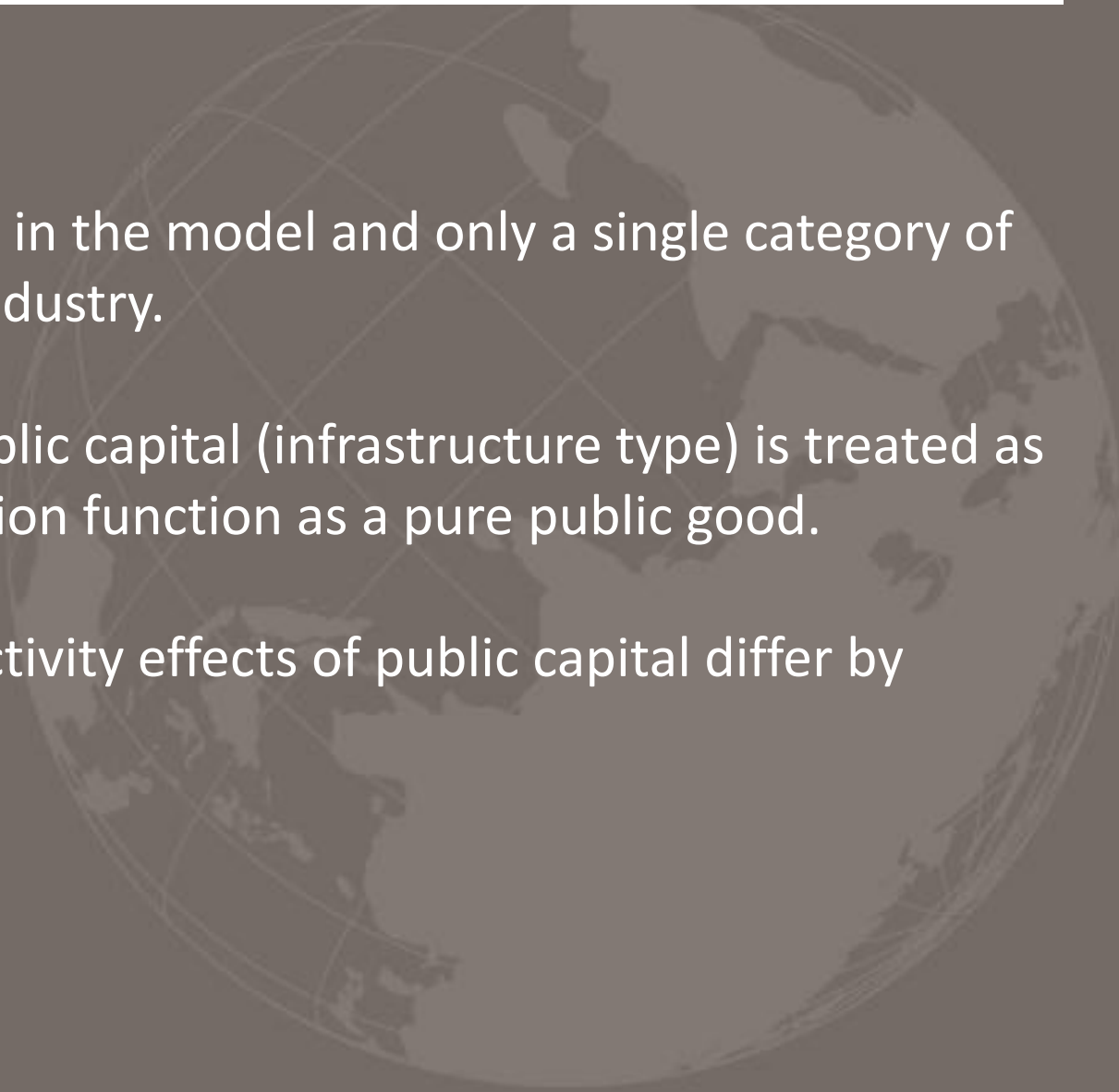


Source: Various Economic Surveys of Pakistan

2. Modeling Infrastructure (Cont....)

- Dynamic Model: small open economy that produces over an infinite horizon (Dissou and Didic 2011)
- Heterogeneity: Myopic & forward looking households and firms
- Myopic: liquidity constraint, save constant fraction of disposable income, own myopic firms → financed through own savings
- Both households are assumed not to value leisure and an inelastic labour supply is assumed which is mobile across industries.

2. Modeling Infrastructure (Cont...)

- There are 12 sectors in the model and only a single category of firm exists in each industry.
 - Only one type of public capital (infrastructure type) is treated as input in the production function as a pure public good.
 - However the productivity effects of public capital differ by industry.
- 

2. Modeling Infrastructure

- The firm sector combines factor inputs for producing a composite output marketed domestically and abroad (exports)
- Constant returns to scale are observed for public and private factors and all variables are expressed in terms of per efficiency unit of labour
- For each period all markets are assumed to clear. The labour market is adjusted through wages and goods market through prices of domestic good
- For ensuring that savings equal investment, the myopic firms will only invest using savings of myopic households and dividends to forward looking firms are net of investment. The total wealth of forward looking households includes stock of foreign assets – which in turn include foreign savings

3. Data and Parameterization (Cont...)

The model is *calibrated* to Social Accounting Matrix given in Dorosh et al. 2006. We use the household budget survey for the same year for the microsimulation model.

3.1 External Parameters

- Substitution elasticity of CES households function (0.7%)
- Substitution elasticity of 1st & 2nd level CES production function (0.5 and 0.4% respectively)
- Rate of depreciation (12%)
- Share of public investment in total investment (28%)
- Population growth rate (1.8%)
- World real interest rate (6%)

3. Data and Parameterization

3.2 Share of Myopic households in:

- Consumption (57%)
- Labour income (71%)
- Income taxes (10%)
- Government transfers (10%)

Most of these external parameters are in line with previous CGE studies on Pakistan (for example Ahmed and O' Donoghue 2010).

4. Modeling Microsimulation Aspects (Cont...)

Step 1

- Logit estimation of probability of being a non-constrained households

Step 2

- The wage information is directly taken from micro level data and if wages are missing then predicted values are obtained.
- The changes in income from self employment are taken from sectoral value added changes observed in CGE model.

4. Modeling Microsimulation Aspects (Cont...)

Step 3

- The consumption values are converted to temporal basis in which the poverty line is expressed
- Self consumption is calculated using consumer prices. Convert the value in real terms
- This implies that any price increase will imply proportional fall in quantity consumed.

Step 4

- The poverty and inequality estimation are based on income based measures

5. Simulation Design

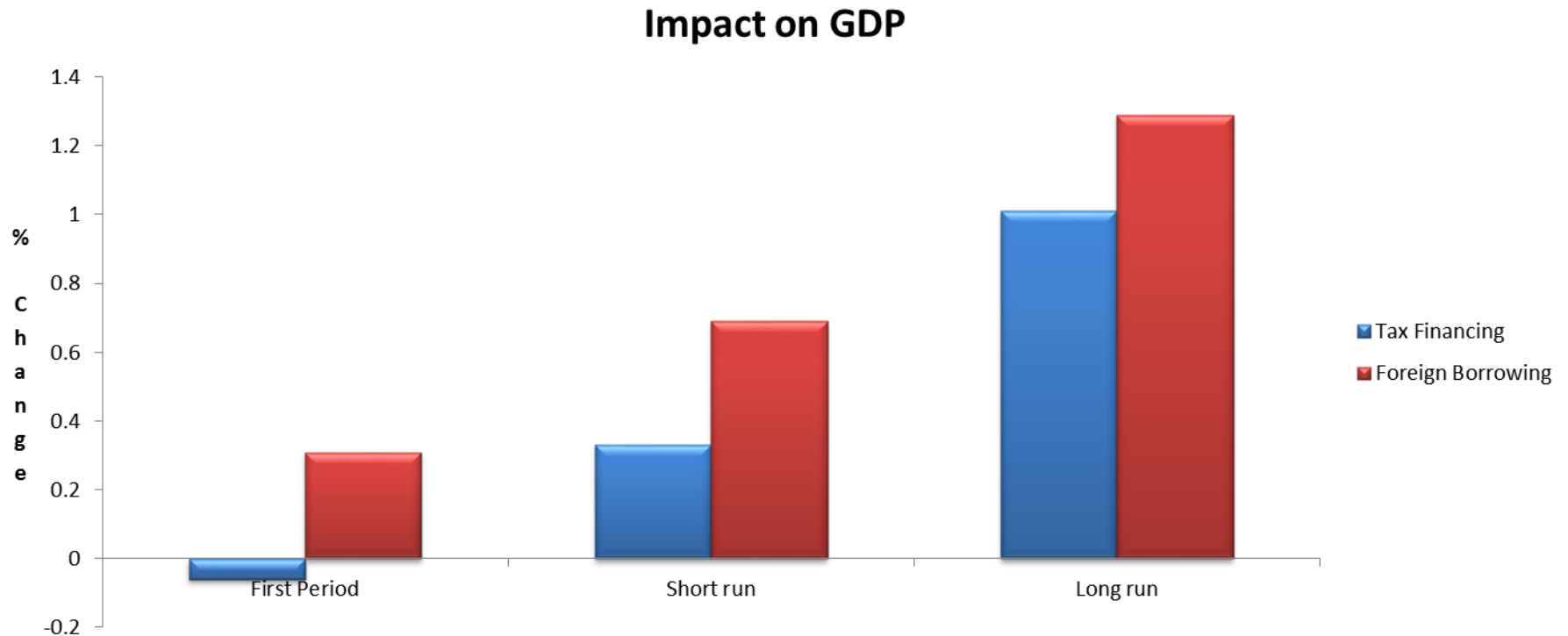
Increasing Public Infrastructure Investment to GDP Ratio by 4 per cent

Financing of infrastructure through:

- Tax Financing
- Foreign Borrowing

6. Results (Cont...)

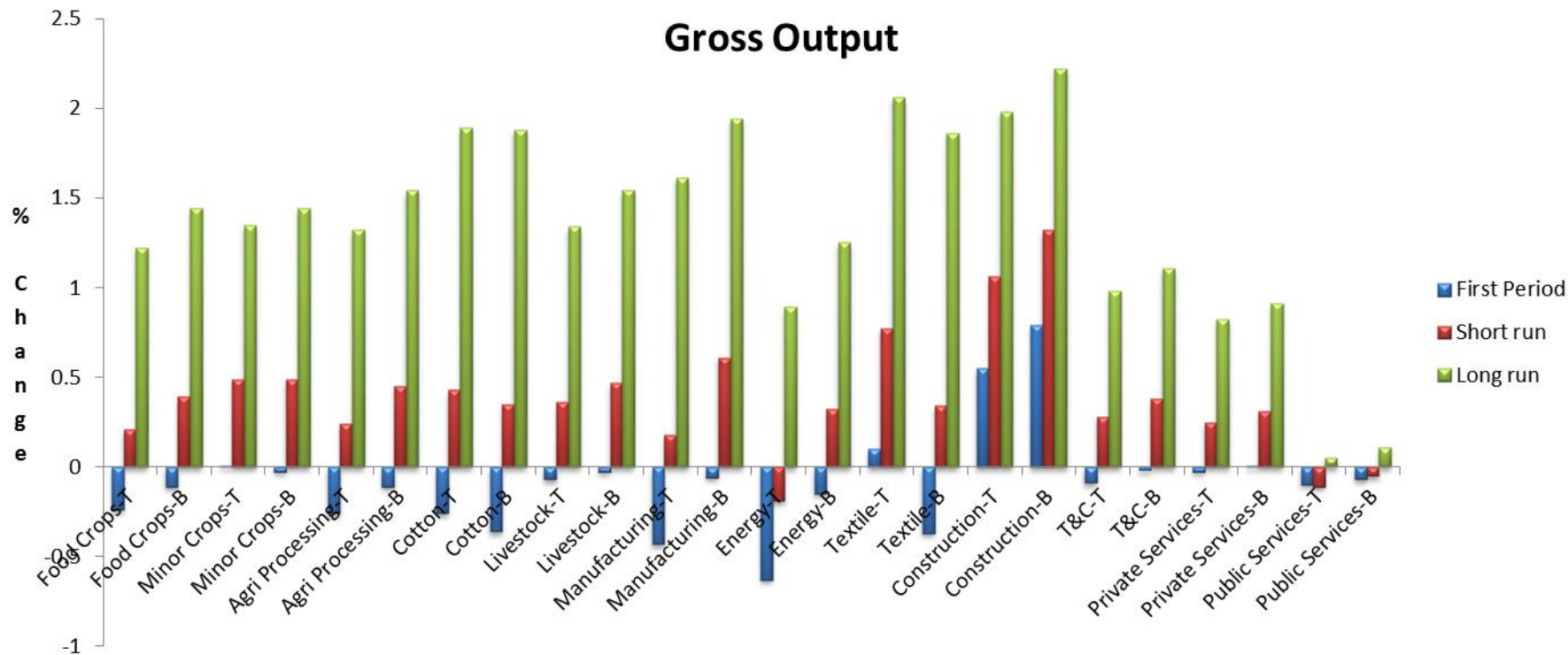
6.1 Impact of Tax and Borrowing Financing on GDP



- A tax financed public infrastructure investment reduces GDP growth a bit in first period. It is positive for short-term and long-term period
- It is positive for all time horizons of foreign borrowing

6. Results (Cont...)

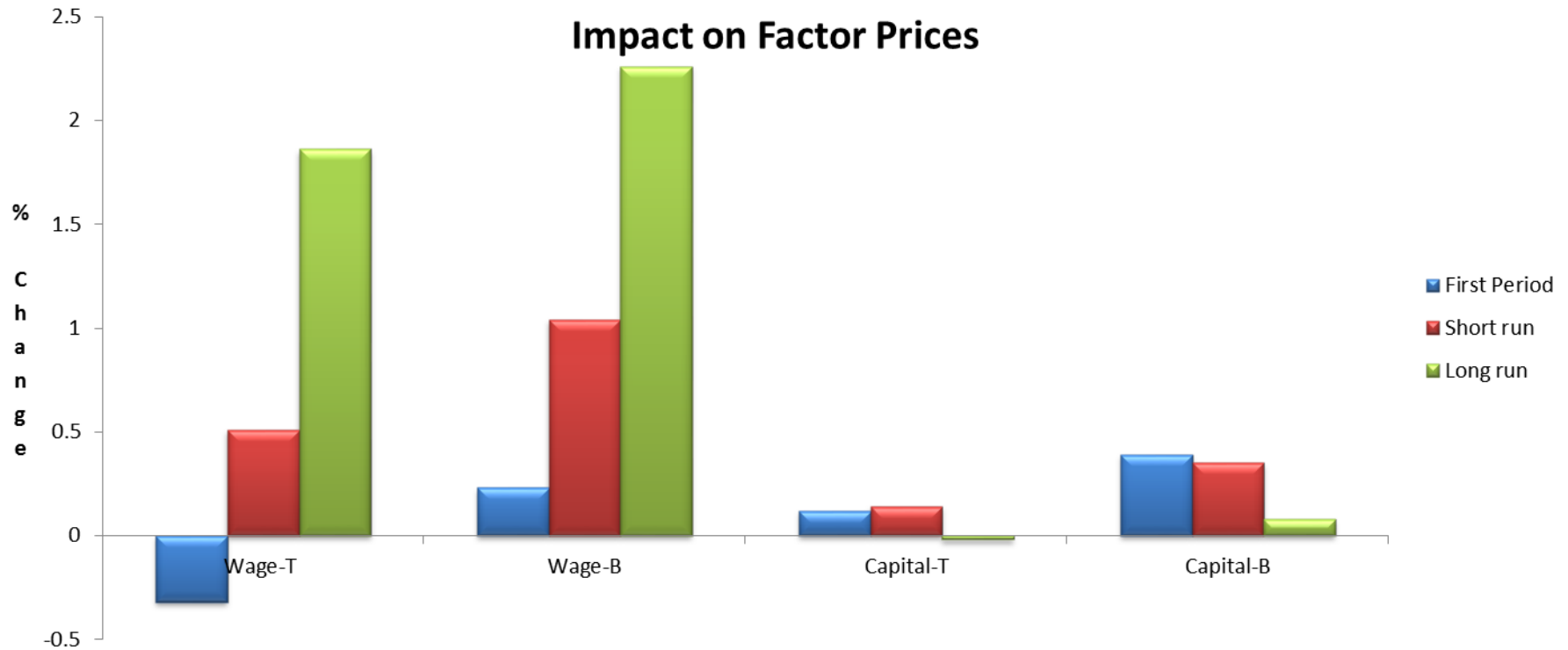
6.2 Impact of Tax and Borrowing Financing on Gross Output



- Gross output in most sectors decreases in the first period but recovers in all sectors in the long run.

6. Results (Cont...)

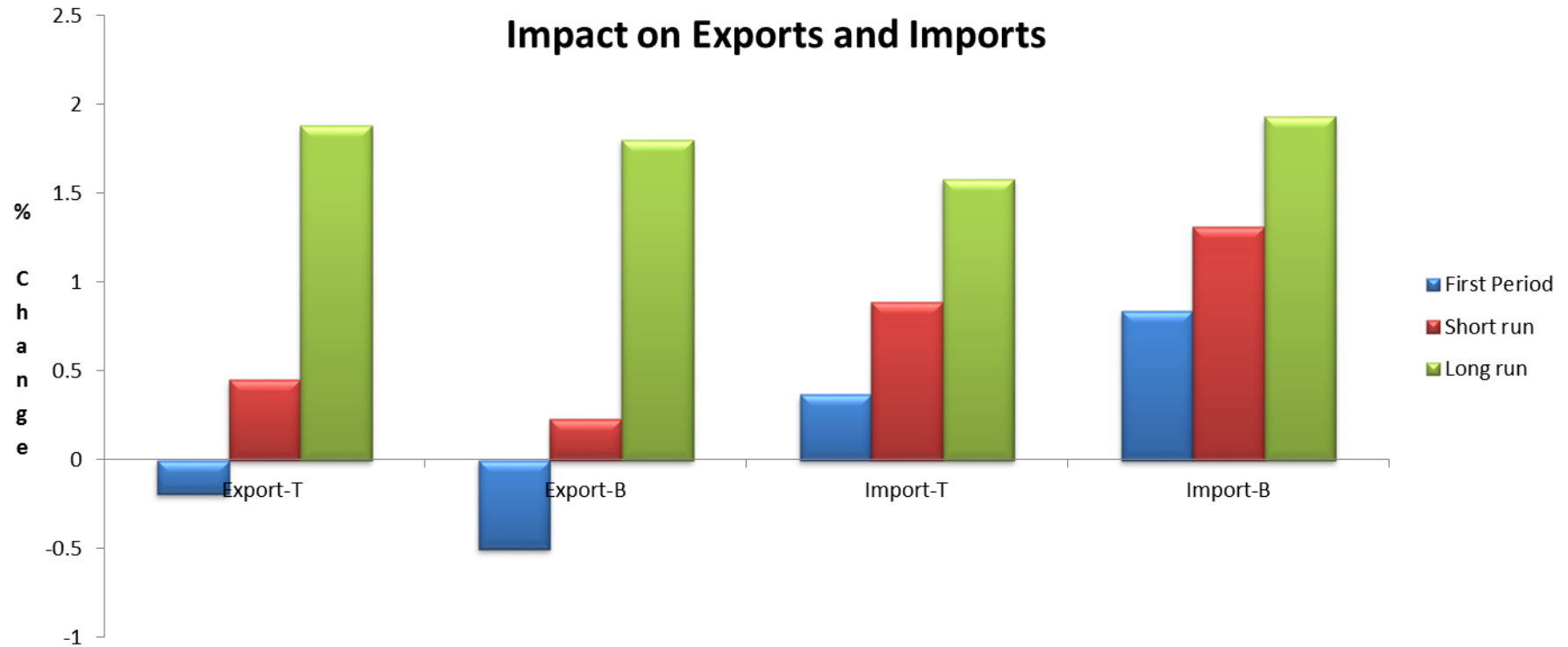
6.3 Impact of Tax and Foreign Borrowing on Factor Prices



- Tax financing reduces wage rate in first period but increased in long-run.
- Foreign Borrowing have positive impact on wage rate.
- The impact of both type of financing is smaller on capital price.

6. Results (Cont...)

6.4 Impact of Tax and Foreign Borrowing on Exports and Imports



- For both sources of financing, exports decrease in first period and increase in the long run.
- Imports increase in all the time horizons for both sources of financing.

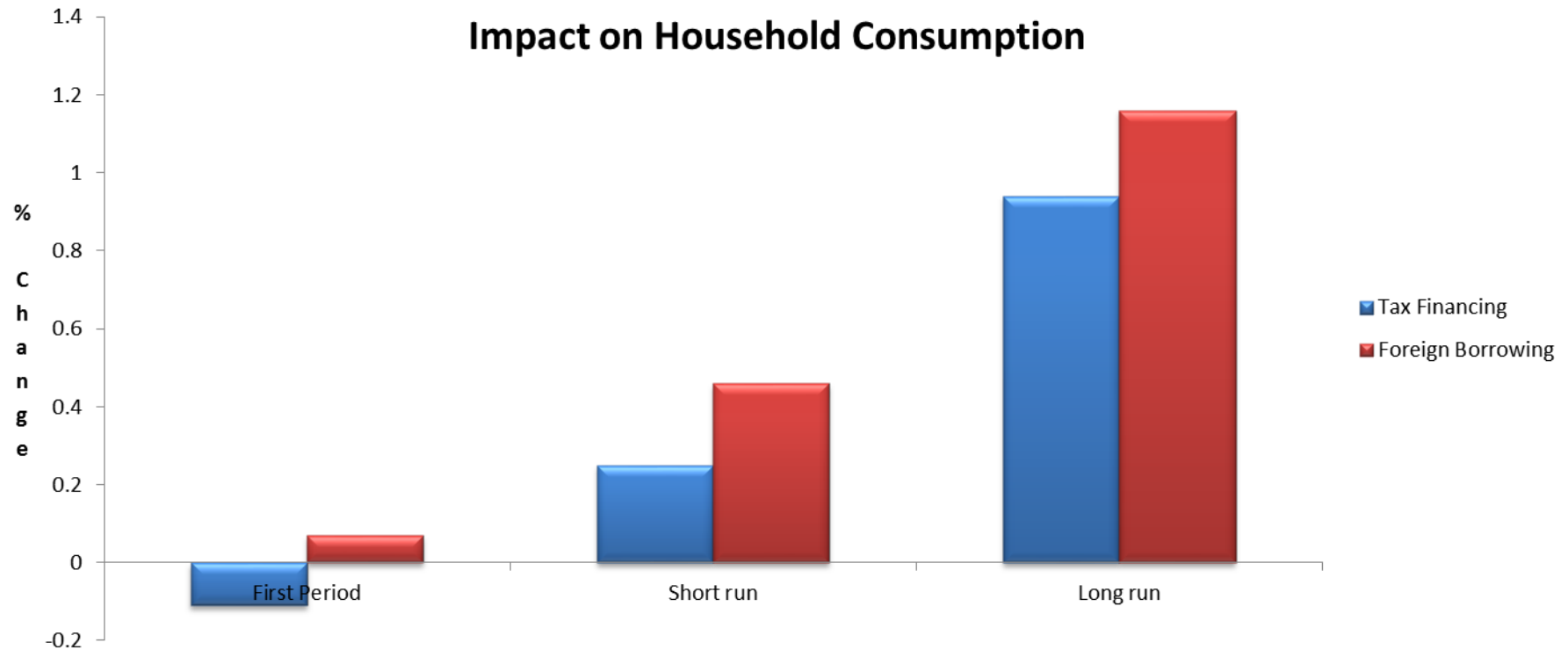
6. Results (Cont...)

6.5 Impact of Tax and Foreign Borrowing on Foreign Savings

- Impact on Current Account Deficit:
 - Investment through tax financing reduces local production, exports decrease and currency depreciates while the foreign borrowing appreciates the local currency causing Dutch disease.
 - Both financing methods reduce the current account deficit up to 3%.

6. Results (Cont...)

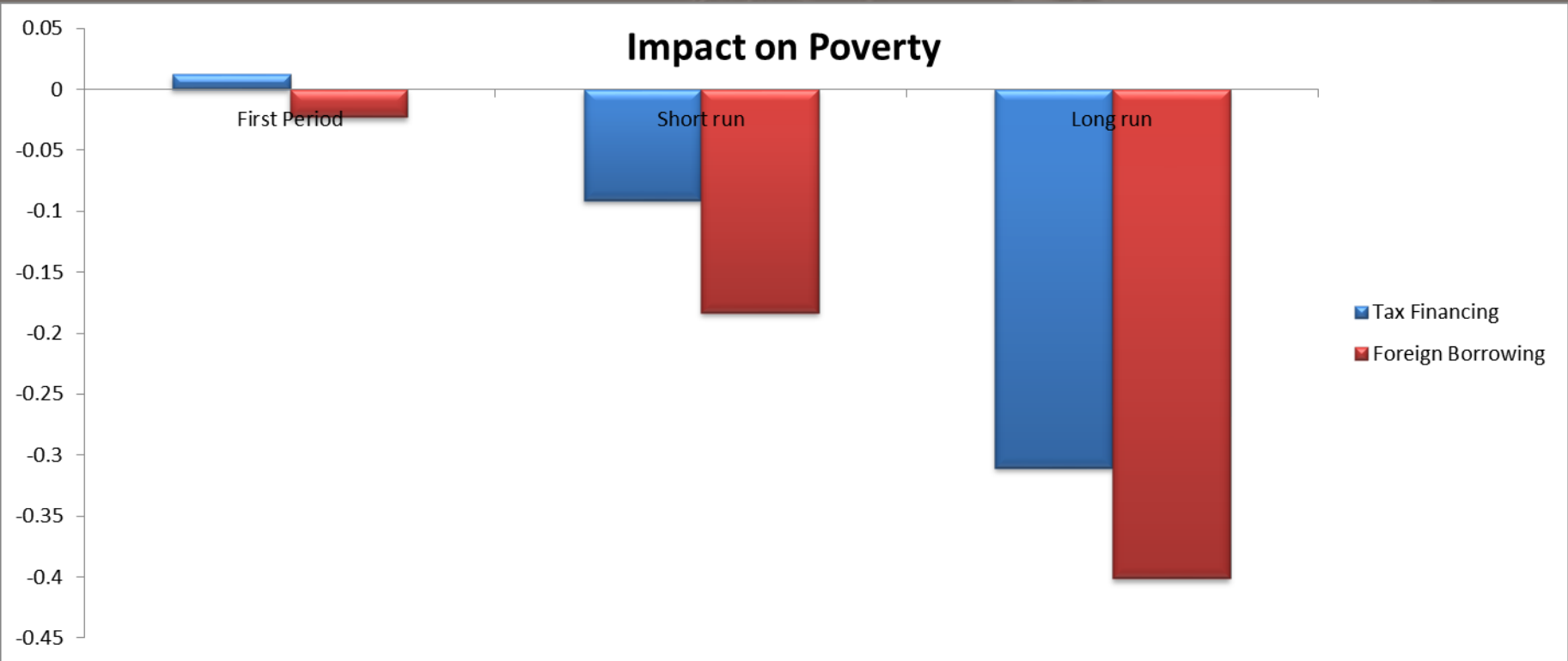
6.6 Impact of Tax and Foreign Borrowing on Household Consumption



- Due to the increased tax burden, total household consumption in the first period declines but increased in the longer run.
- Investment in infrastructure through foreign borrowing increases household consumption in short and long run.

6. Results (Cont...)

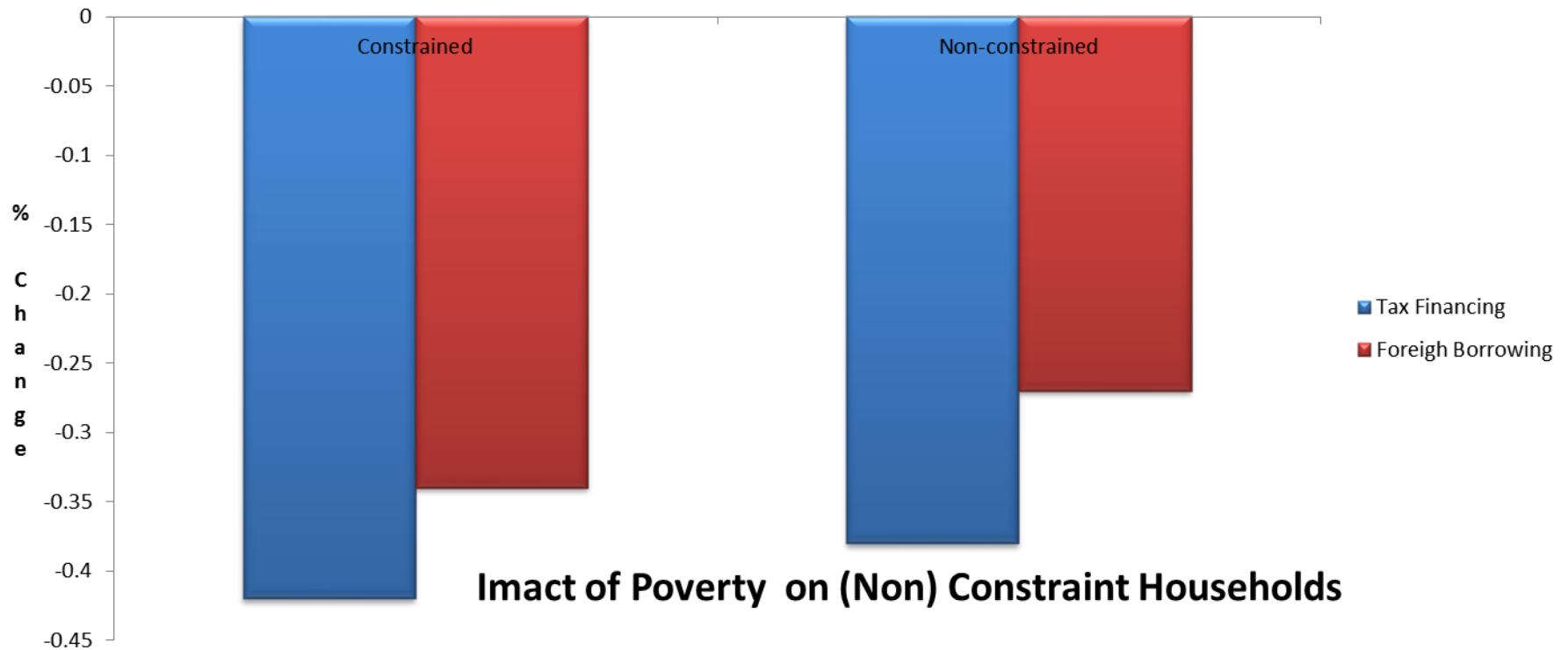
6.7 Impact of Tax and Foreign Borrowing on Poverty



- Tax financing increases the incidence of poverty in the first period while reduces poverty in the long run.
- Foreign borrowing reduces the poverty more in long run.

6. Results (Cont...)

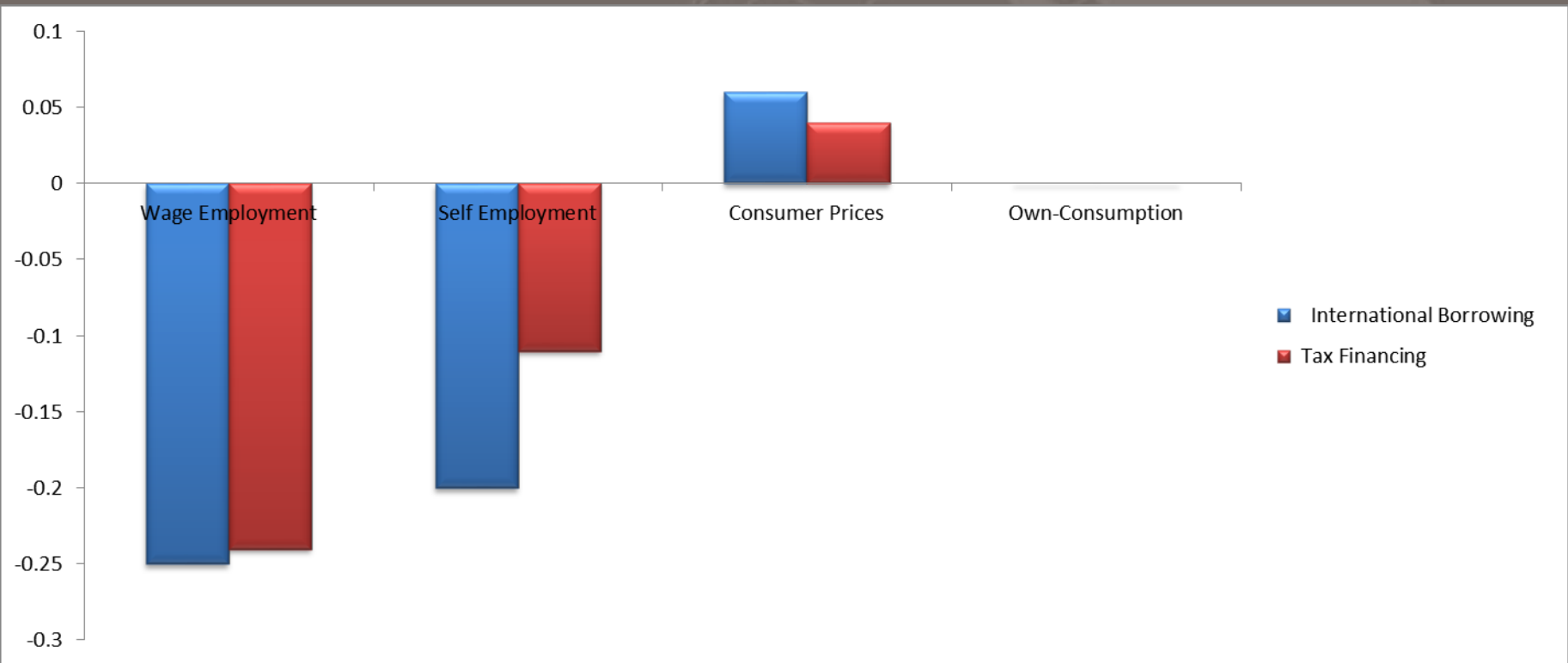
6.7 Impact of Tax and Foreign Borrowing on (Non) Constrained Households



- Tax financed investment reduces more poverty in constrained households indicating redistribution of resources.

6. Results (Cont...)

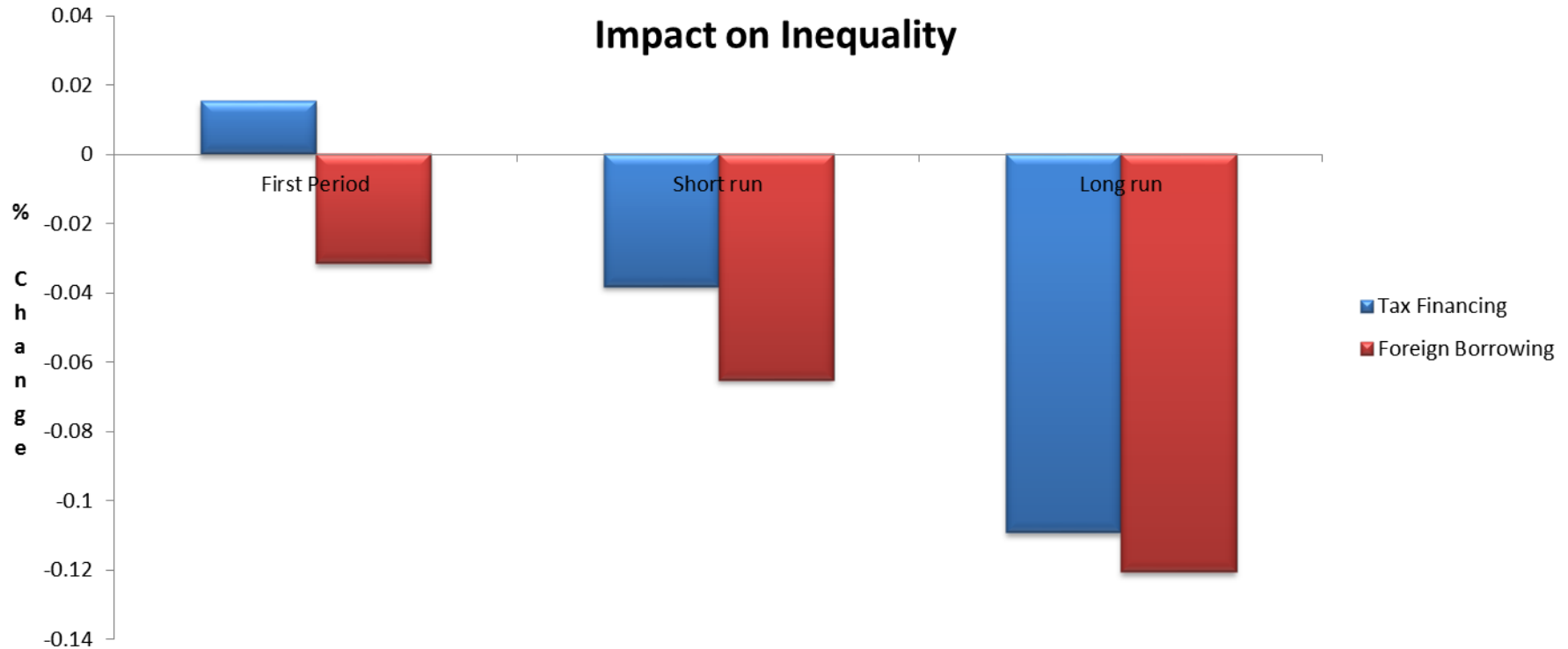
6.7 Role of Various Variables on Poverty Reduction



- Improved wage and self employment both contribute the most in reducing the poverty .

6. Results (Cont...)

6.8 Impact of Tax and Foreign Borrowing on Inequality



- Investment through tax financing increases inequality initially, however reduces it in the long run.
- Investment through the foreign borrowing reduces inequality more than the tax financing.

7. Conclusion

While both simulations lead to an increase in output, investment and consumption, it is important to realize that channels are different:

- The real GDP grows more in the case of foreign borrowing than the tax financing.
- Household consumption increases more with foreign borrowing as compared to tax financing.
- The poverty headcount ratio improves more under foreign borrowing than the tax financing.
- In both cases, the improvement in inequality is small over the longer run.
- Under foreign borrowing there is some evidence of Dutch disease

8. Policy Implications

- Impact of public investment depends not only on the **size** of investment but on the **efficiency** with which this invested sum is utilized and absorbed, as well as on **the sectors** in which the government intervenes.
- It is important for **government expenditures not to compete with the private sector** and rather to focus in areas prompt to market failures.
- Also, when raising revenues through taxation, it will be **important to see which sectors are taxed and to what level**. In order to allow direct taxes to increase, the government will have to take measures that remove market irritants and reduce barriers to entry and exit for the private sector.



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