Reassessing Dynamic Efficiency*

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Last Version

Abstract

What is the marginal return from increasing aggregate saving? Since Abel et al. (1989), it is generally assumed that the net marginal product of capital is higher than the growth rate, a situation called "dynamic efficiency", where increasing aggregate saving is beneficial in the long run. In this paper, I revisit this question methodologically and empirically. I contrast marginal and average returns, accumulation and valuation effects, finite and infinitely-lived assets, realized and expected returns, the returns to produced assets and other components of capital income, such as land and monopoly rents. I show that the net marginal product of capital is everywhere much lower than the growth rate. Using impulse responses from shocks to aggregate saving, I provide suggestive evidence that the gross marginal return to capital might in fact be equal to zero, so that the production function is already satiated with enough capital, a strong form of dynamic inefficiency called "secular stagnation". These results suggest that large accumulated public debts play a useful role. They also suggest that fiscal policy should be more expansionary than it is now, especially in Germany and Japan; and that the costs of mitigating climate change have been greatly overestimated.

Keywords: Dynamic efficiency, savings glut, marginal returns to capital.
JEL classification: E21, E22, E24.

Introduction

Caselli and Feyrer (2007)

Since the neoclassical synthesis, it is usually believed that

I also show that average returns are a very poor way of measuring the marginal returns to capital, as they are very different objects in theor. I first develop some theory which shows that the marginal returns to capital can actually be equal to zero, and yet,

I then interpret Romer and Romer (2010) evidence as a shock to public saving, which according to neoclassical theory should reduce the interest rate and boost investment. Empirically, this is not what jappens - in fgact, investment falls following an increase in public saving.

I then distingish between the expected and realized returns to capital. I argue that the large returns experienced post World War II on the U.S. stock market, and the large returns experienced on real estate assets in many other countries, were not expected and cannot therefore be seen as the marginal return to capital. Another way to say this is that the marginal project which was undertaken during this period was in fact much lower, closer to the risk free rate.

Although the difference in returns between equity and houses and government debt is usually attributed to riskiness, I in contrast connect it to the infinitely lived nature of these assets, which implies that they can

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carry a "rational bubble". Assuming dynamic inefficiency, these rational bubbles are indeed feasible. (Tirole (1985))

I also show that the average return to capital, as measured by the capital share divided by the stock of capital, leads to greatly overstate the marginal return to capital. The reasons are multiple

Finally,

Moreover,

Dynamic efficiency is an important macroeconomic issue. The presumption that increasing saving is always good for the economy relies on the fact that more saving implies more investment adding to the capital stock, that a higher capital stock leads to more output in the long run, and that more output ultimately helps achieve higher consumption. The first fact is mechanical, But the second is not necessarily true, because more capital also means more investment to maintain the same capital/output ratio. Consequently, there are limits as to how much capital should ideally be accumulated. According to the neoclassical theory, the amount of capital such that the flow of consumption is maximized is called the Golden Rule level of capital, which is reached when the interest rate r is equal to the rate of growth of the economy g (Ramsey (1928), Phelps (1961), Phelps (1965), Diamond (1965)). If the capital stock installed is higher than the Golden Rule or r<g, then every agent could be made better off by consuming the capital so that the Golden-Rule level is restored.Note that according to a steady-state welfare criterion, capital underaccumulation (with r>g) is also suboptimal. However the transitional dynamics to this new steady state are costly for the generations who therefore need to consume less and accumulate capital. A competitive equilibrium with optimizing agents, market clearing and price taking can lead to such a situation of over-accumulation, even without assuming any type of inefficiency. All that is needed is that the economy is expected to run forever.

Discussions between

1 Capital and the Production Function

1.1 Much capital is not

The Solow (1956) growth model

2 What is capital?

2.1 Costs of waiting

2.2 Not entrepreneutrial labor

As Piketty (2014) says: "Bear in mind, too, that a portion of what is called *the income of capital* may be remuneration for *entrepreneurial* labor, and this should no doubt be treated as we treat other forms of labor. This classic argument deserves closer scrutiny"

2.3 Rational Bubbles

Tirole (1985)

3 Aggregate Time Series

3.1 Business Cycle Evidence

3.2 (???)

To the extent that tax increases lead to an increase in public saving, they lead to a paradox of thrift:

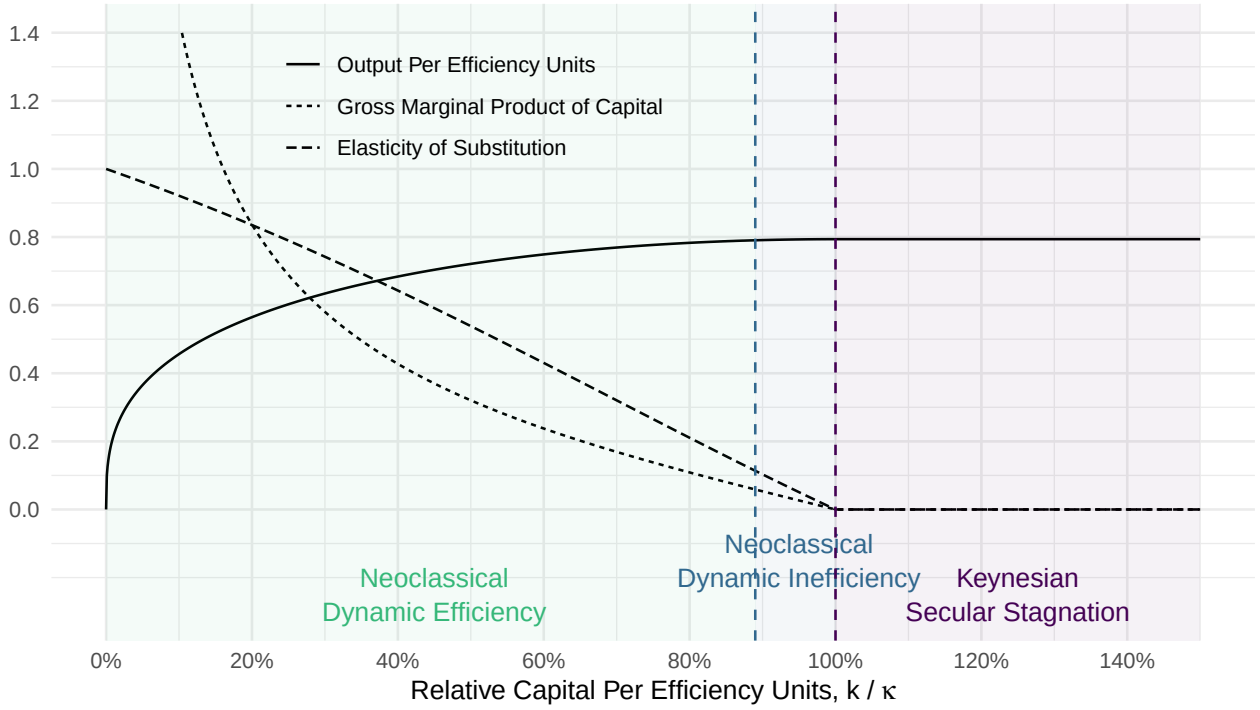

Figure 1: Dynamic Efficiency, Dynamic Inefficiency, Secular Stagnation

If investment is not interest elastic, and the interest elasticity is equal to zero, then there should be no change in investment coming from the change in the cost of capital.

3.3 Event Studies: Pension Reform

Movements from a pay-as-you-go system to a funded syetem, pushed in particular by the Organization for Economic Development (OECD) lead to an increase in the aggregate saving rate. In 2001, then Chancellor of Germany Gerhard Schröder reformed the German Pension system.

4 Macroeconomic Evidence

4.1 Riester Reforms in Germany (2001)

4.2 Pension reform in Spain (2005)

4.3 Does more saving lead to more investment?

Recessions are times where saving increases

4.4 Examples to understand better what capital is

Say that the government were to tax land at some rate, and promise that future land would be taxed.

More generally, future capital taxation destroys stores of values, which implies that there arre actually not enugh stores of value.

In the secular stagnation regime, this leads to dynamic inefficiency potentially, and it potentially helps capital accumulation. Maybe we have too high capital income taxation, which implies that future taxes are not taxed the way that they should. De facto real estate bubbles are not taxed because ineheritances are not taxed. As a consequence,

4.5

5 Cross-sectional Evidence

Do Apple profits correspond to much accumulated capital? The answer is clearly, no.

How do you explain the profits from the financial industry? Does it have anything to do with capital-labor substitution? Rognlie (2015)

6 What is substitutable with labor?

Is IPP capital really substitutable with labor?

In macroeconomics textbook "capital" is said to be substitutable with labor. However are structures really substitutable with labor? Is it not mostly machines that are substitutable with labor?

Howeve

Country	Buildings other than dwellings	Cultivated biological resources	Dwellings	Intellectual property pro
Australia	147.3%	1.4%	112.6%	13.6%
Austria	189.7%	0.4%	138.8%	19.8%
Belgium	88.4%	0%	136%	15.6%
Canada	88.5%		118.8%	11.4%
Czech Republic	205.1%	0.3%	106.2%	11.6%
Denmark	105.4%	0.4%	141.2%	23.9%
Estonia	136.4%	0.4%	94.7%	7%
Finland	120.1%	0.1%	143.3%	17.5%
France	88.1%	1.1%	197.1%	17.5%
Germany	102.1%	0.3%	156.8%	16.4%
Greece	96%	0.3%	157.1%	5.4%
Hungary	207.4%	0.9%	99.9%	9.9%
Israel	60.1%	0.7%	96.1%	17.8%
Italy	123.3%	0.4%	165.8%	10.6%
Japan				
Korea	183.1%	0.8%	79.9%	19.9%
Lithuania	157.6%	0.4%	74.6%	7.4%
Luxembourg	114.6%	0.1%	57.2%	5.7%
Mexico	115.8%	1.4%	121.9%	3%
Netherlands	106.8%	0.3%	120.6%	20.4%
New Zealand	102.5%	0%	128.1%	12%
Portugal	167.6%	4.1%	142.9%	7.3%
Slovak Republic	241.5%	9.9%	95.7%	5.5%
Slovenia	161.9%	1.2%	106.5%	10.8%
Sweden	118.4%	1.7%	123.7%	25.4%
United Kingdom	87.8%	0.4%	90.4%	8.9%
United States	133.6%	0%	110.1%	22.3%

Type of Fixed Asset	France (% of GDP)	United States (% of GDP)
Buildings other than dwellings	88.1%	133.6%
Computer software and database	6.8%	3.8%
Cultivated biological resources	1.1%	0%
Dwellings	197.1%	110.1%
Entertainment, literary or artistic originals	0.2%	2.6%
Fixed assets	332.6%	306%
Fixed assets and inventories	351%	306%
Gross domestic product (expenditure approach)	100%	100%
Intellectual property product	17.5%	22.3%
Inventories	18.4%	13.7%
Machinery and equipment and weapon system	28.9%	40.1%
Mineral exploration and evaluation	0%	0%
Non-residential buildings	33.8%	94.6%
Other Intellectual property product	0%	0%
Other structures	54.4%	39%
Produced assets	357%	319.7%
Research and development	10.5%	15.9%
Tangible fixed assets	315.1%	283.7%

When one thinks about capital and labor substitution

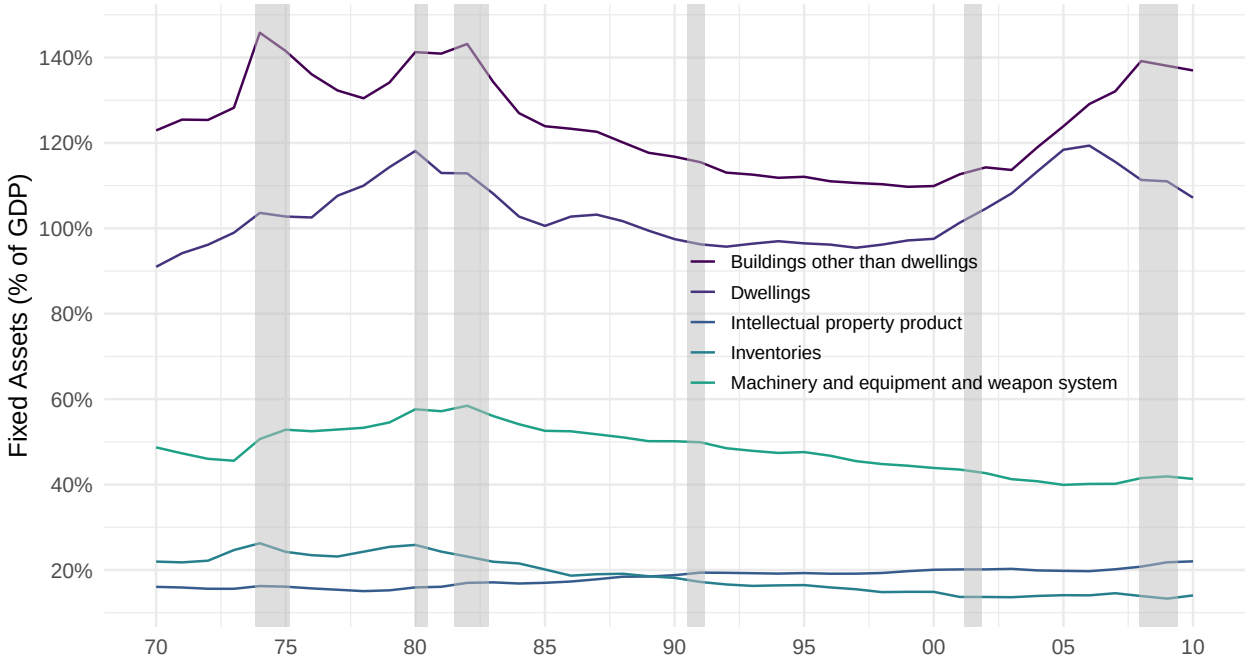

Figure 2: U.S. Fixed Assets (Source: OECD)

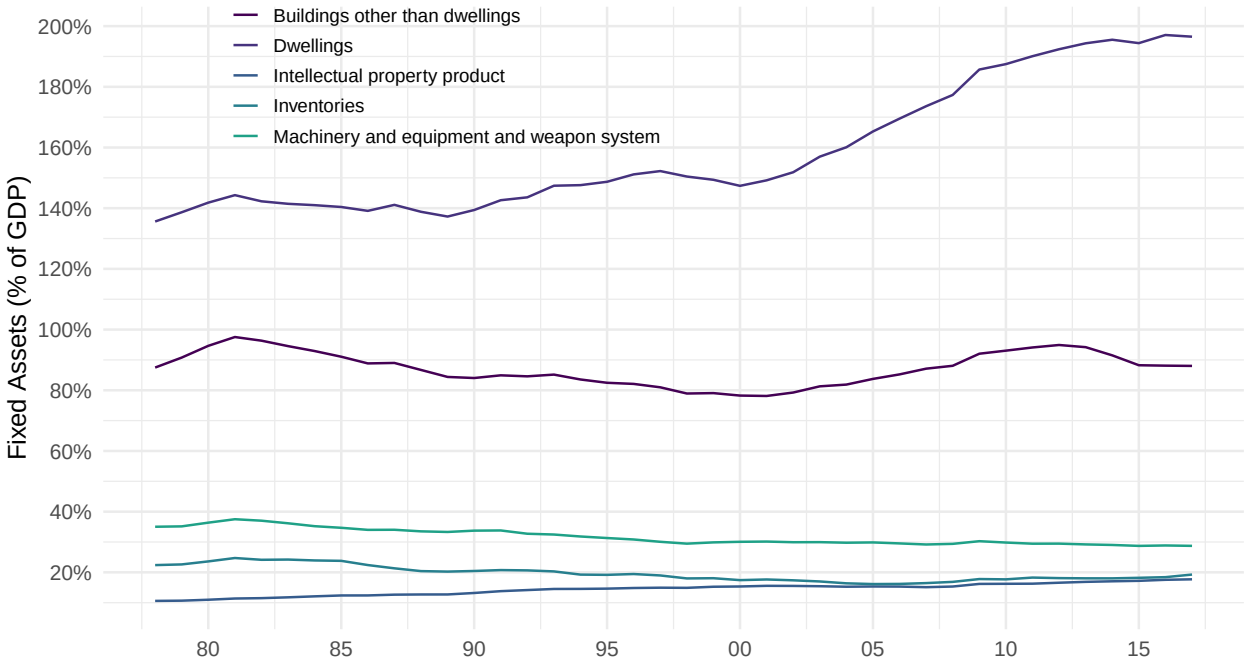

Figure 3: France Fixed Assets (Source: OECD)

The question is whether th

Conclusion

Moreover, market returns are superior to "preferences" for evaluating long run discount rates, unlike in Giglio, Maggiori, and Stroebel (2015).

Cochrane (2017): "But still, general equilibrium poses the central puzzle of macroeconomics since Keynes: If people want to save more, why do prices not adjust somehow so that investment is larger?"

"Corporate investment has very little relationship with real interest rates, despite the preva- lence of this channel in macroeconomic models."

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A Proofs

B Figures

B.1 Government Debt

Figure 4: Japan's Government Debt (Source: IMF).

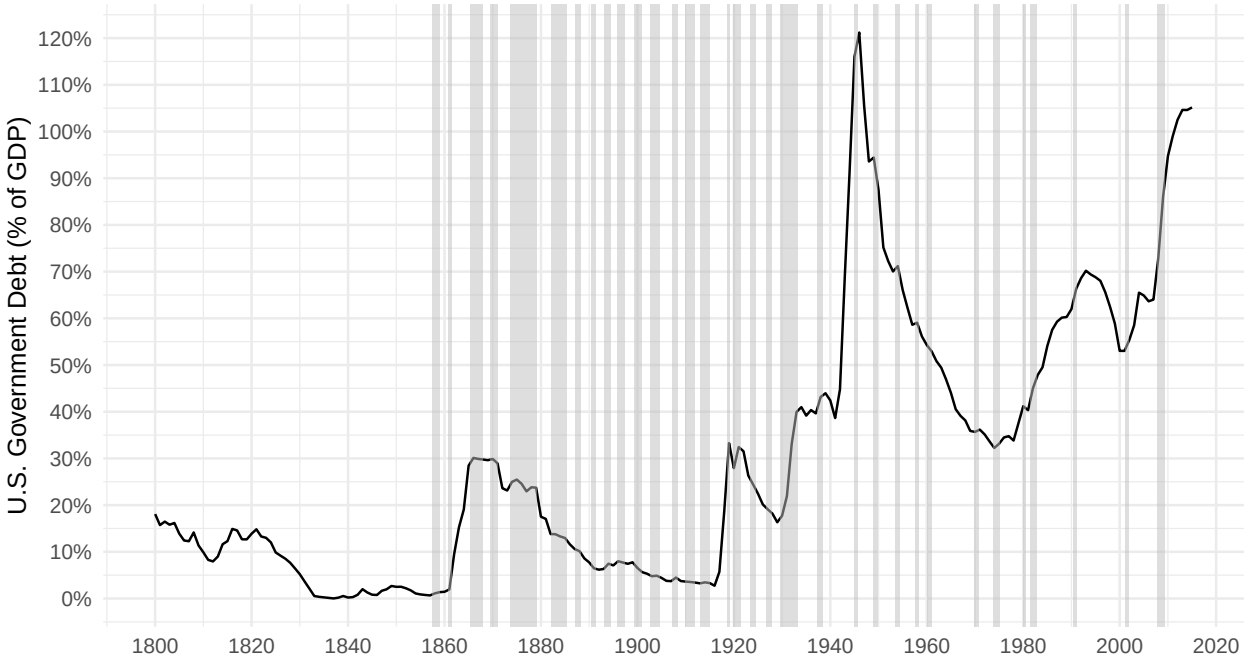

Figure 5: U.S. Government Debt (Source: IMF).

B.2 Capital

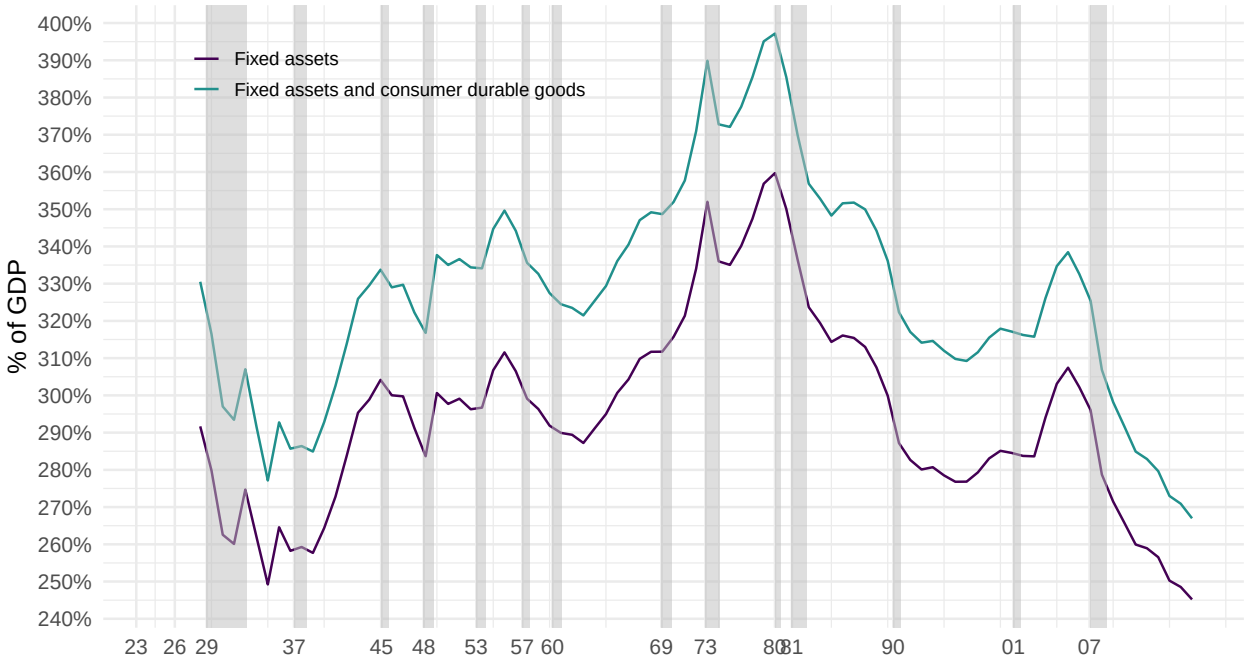

Figure 6: Total Fixed Assets (1929-2017). Source: Fixed Asset Table 1.1 (BEA)

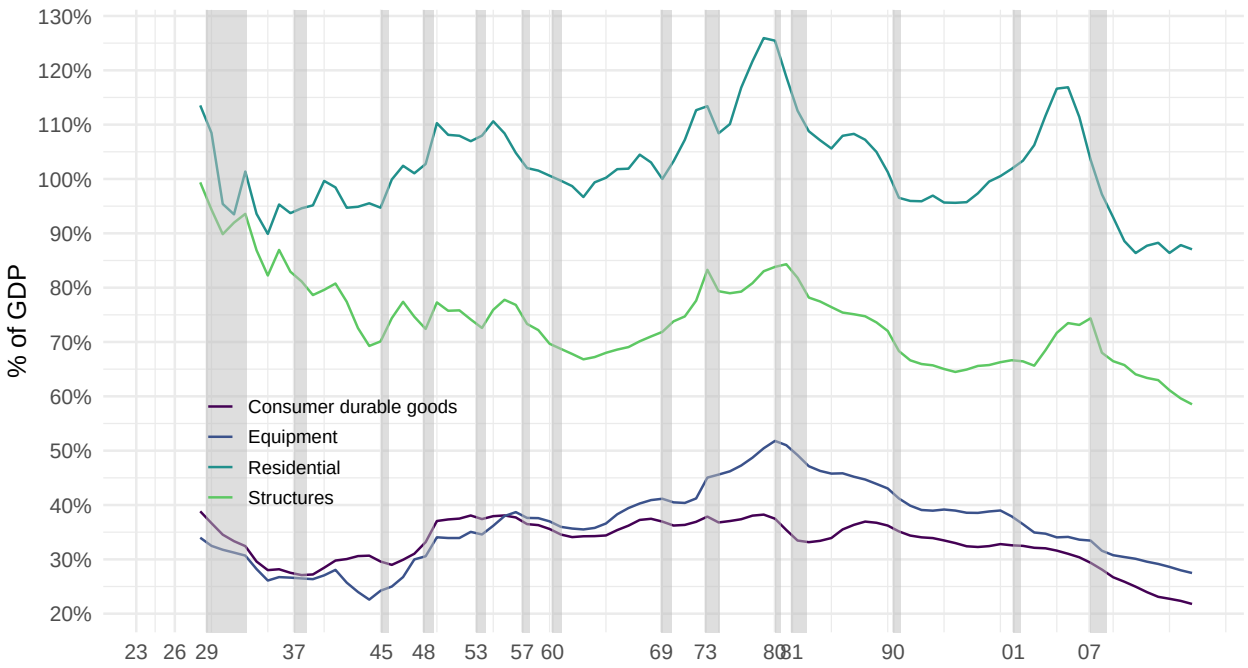

Figure 7: U.S. Main Fixed Asset Components (1929-2017). Source: Fixed Asset Table 1.1 (BEA)

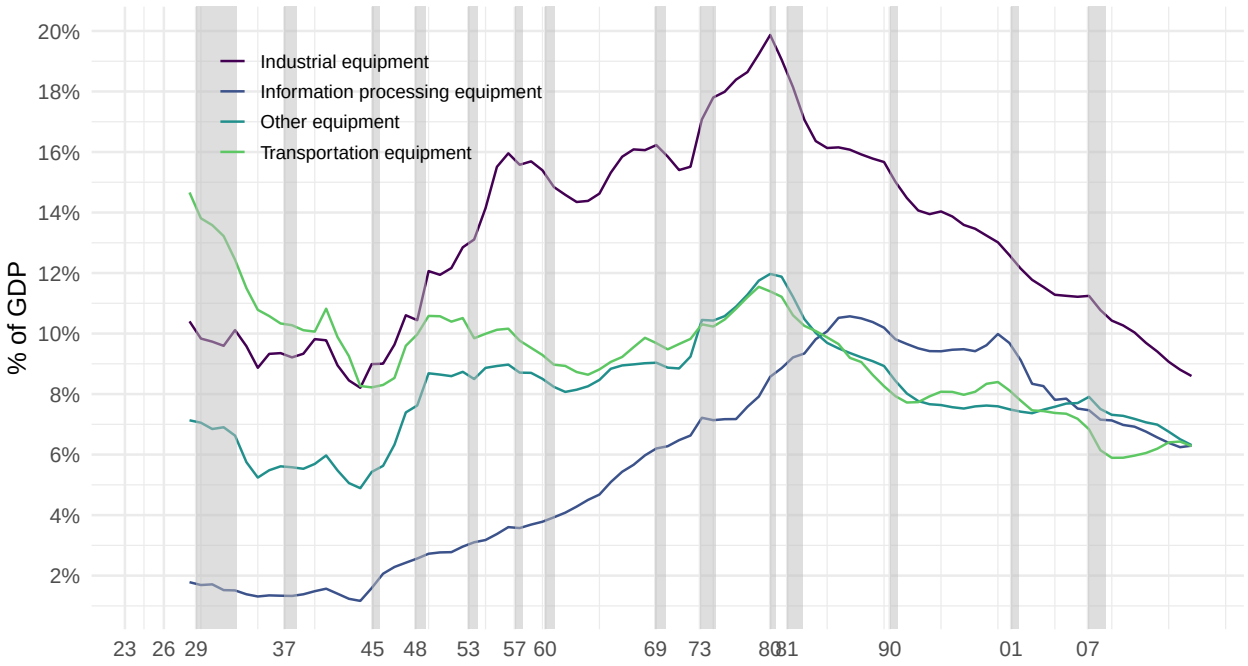

Figure 8: Decomposition of Equipment (% of GDP). Source: Fixed Asset Table 2.1 (BEA)

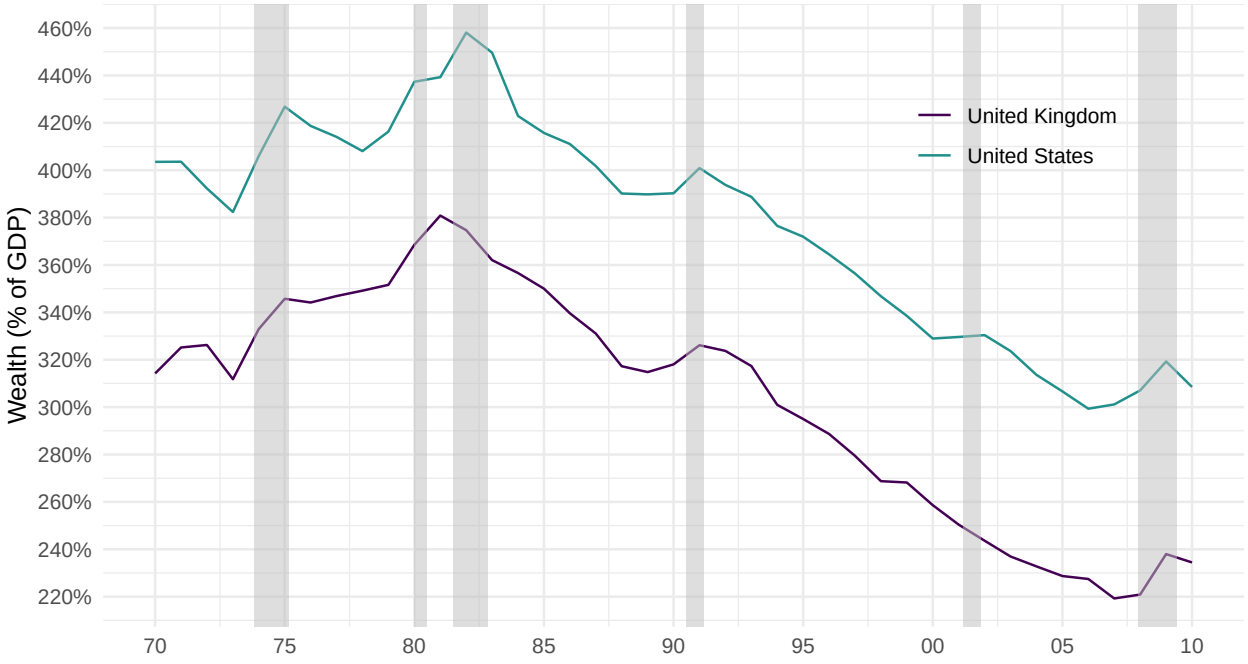

Figure 9: Simulated 1970-2010 national wealth (% of national income) - savings flows

B.3 Investment

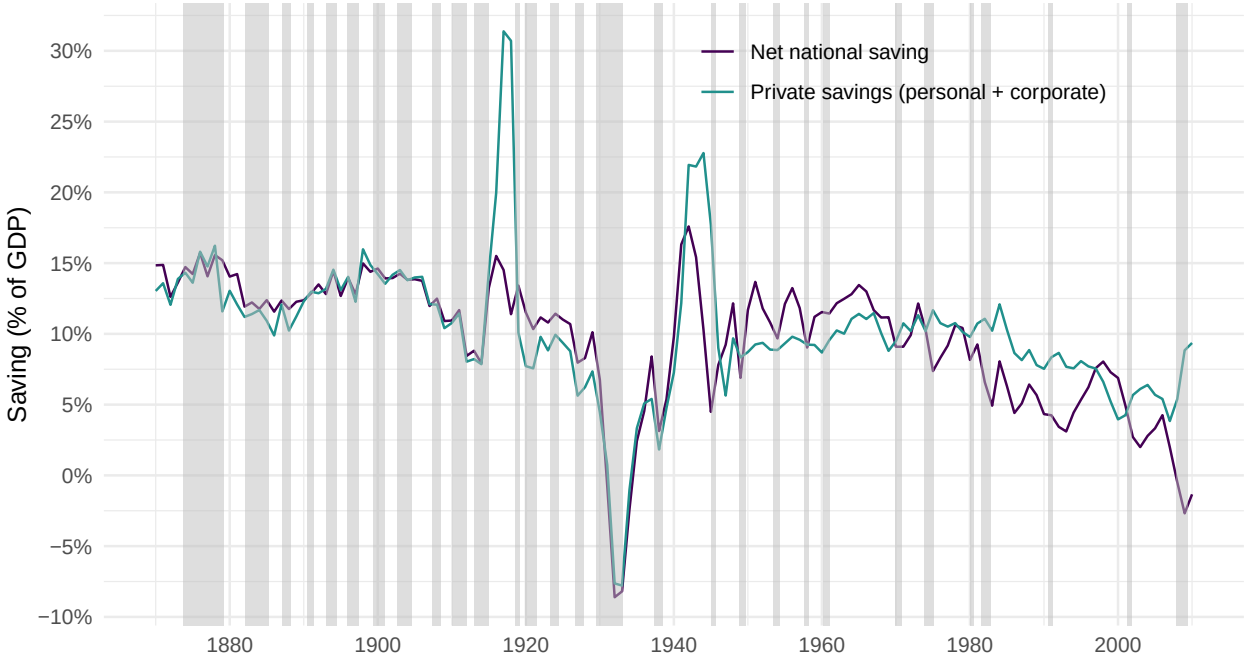

Figure 10: U.S. Saving

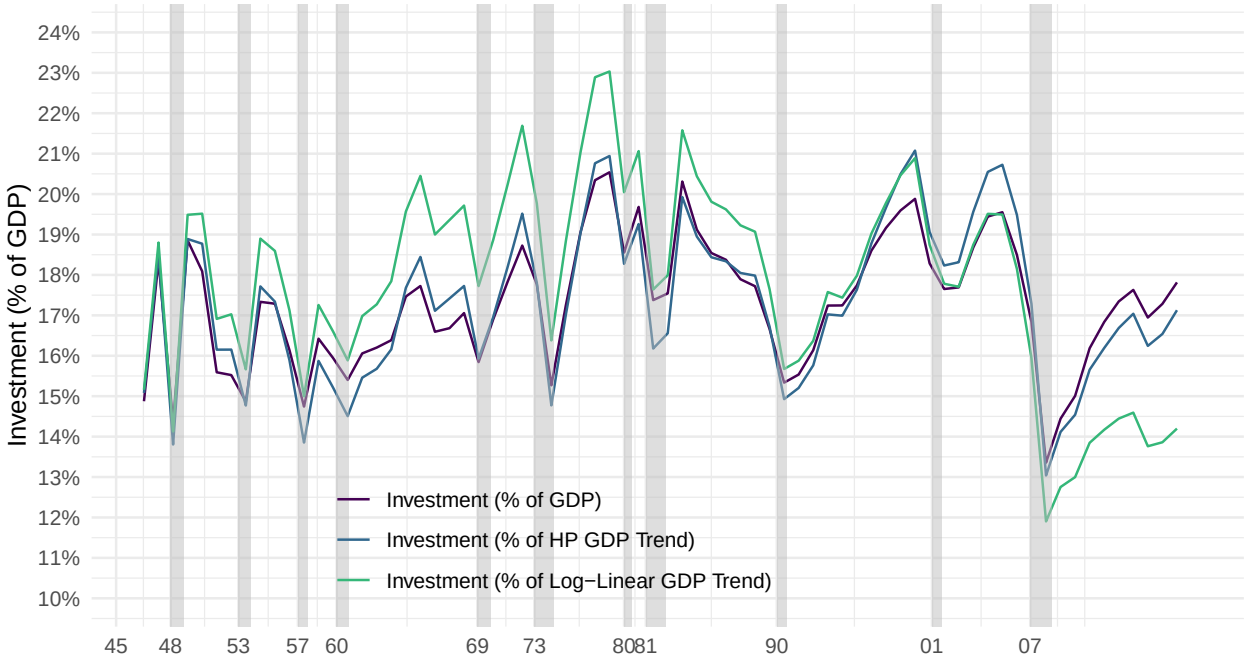

Figure 11: U.S. Investment (% of GDP).

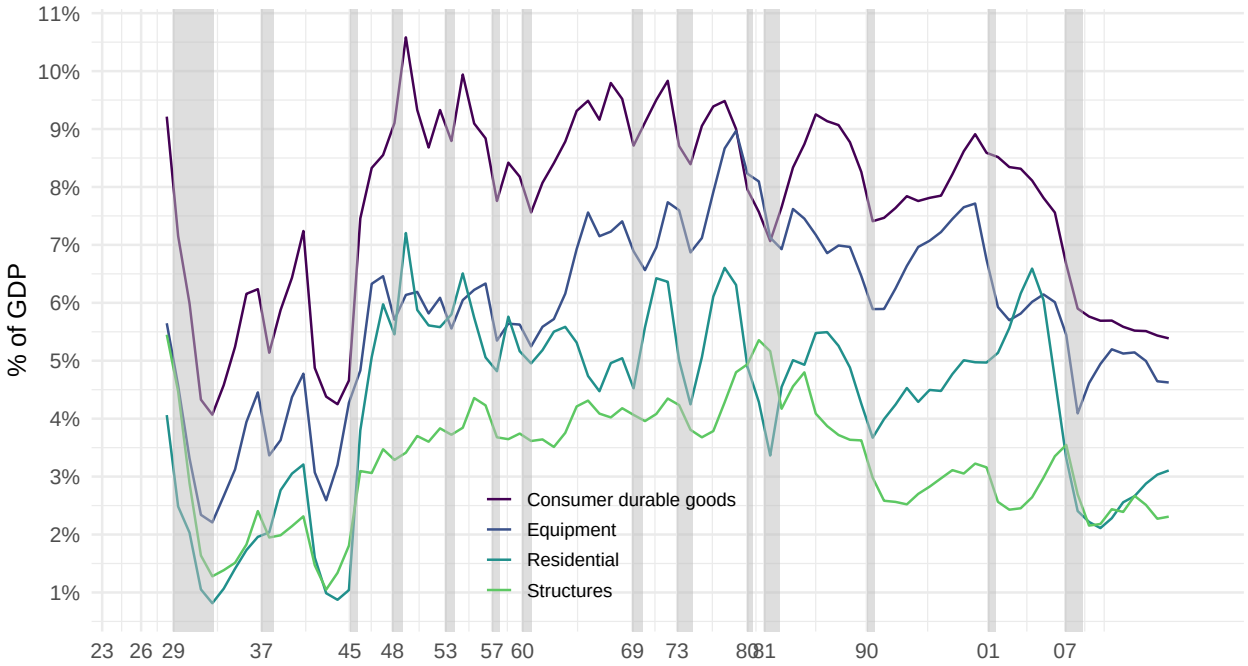

Figure 12: Main Components of Investment (% of GDP) Source: Fixed Asset Table 1.5 (BEA)

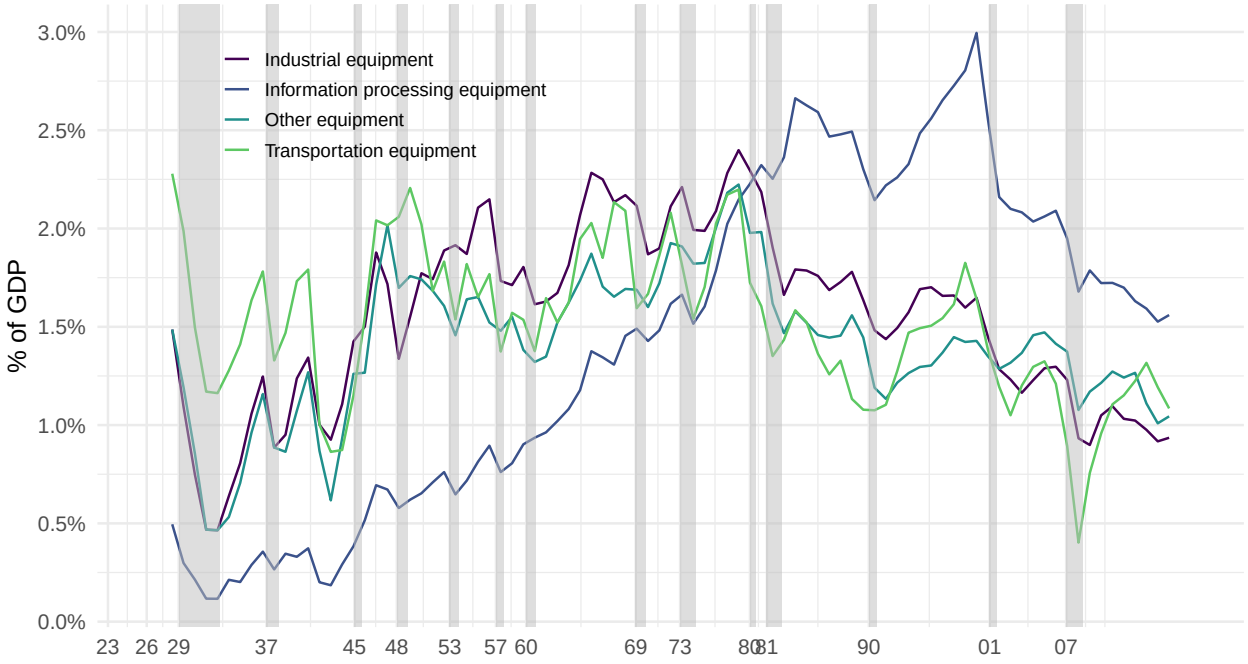

Figure 13: Decomposition of Equipment Investment (% of GDP). Source: Fixed Asset Table 2.7 (BEA)

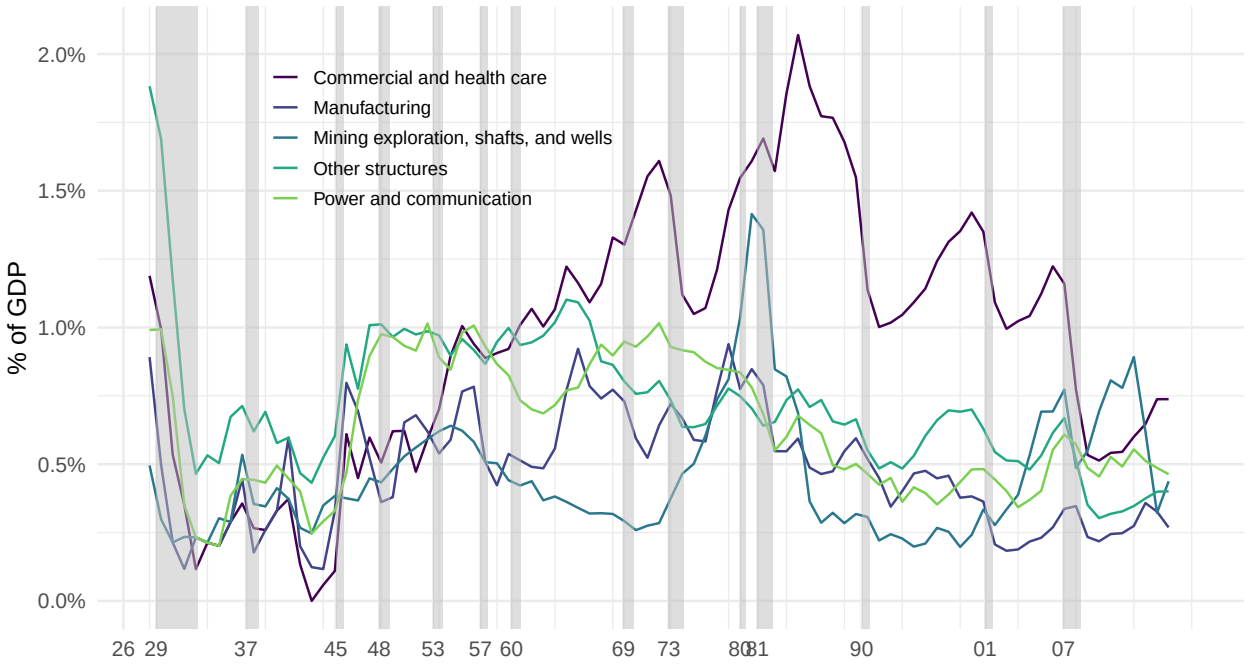

Figure 14: Decomposition of Structures Investment (% of GDP). Source: Fixed Asset Table 2.7 (BEA)

B.4 U.S. Budget Surpluses / Deficits

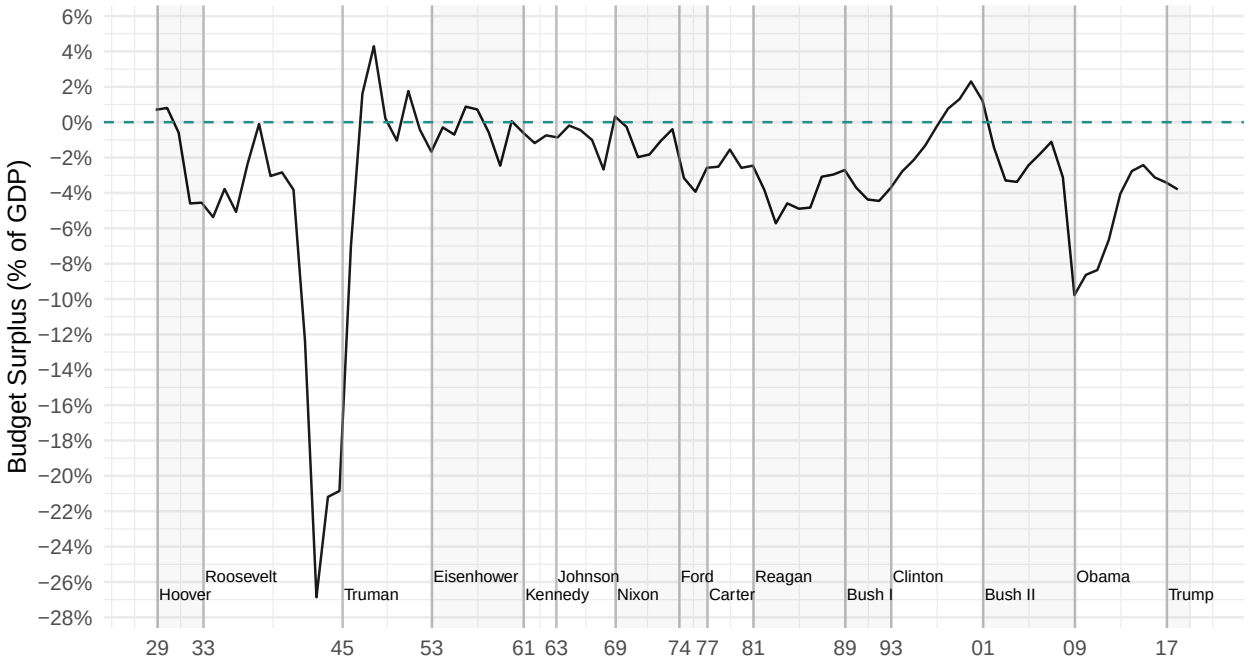

Figure 15: Budget Surplus, 1929-2019 (% of GDP).

B.5 Net Exports

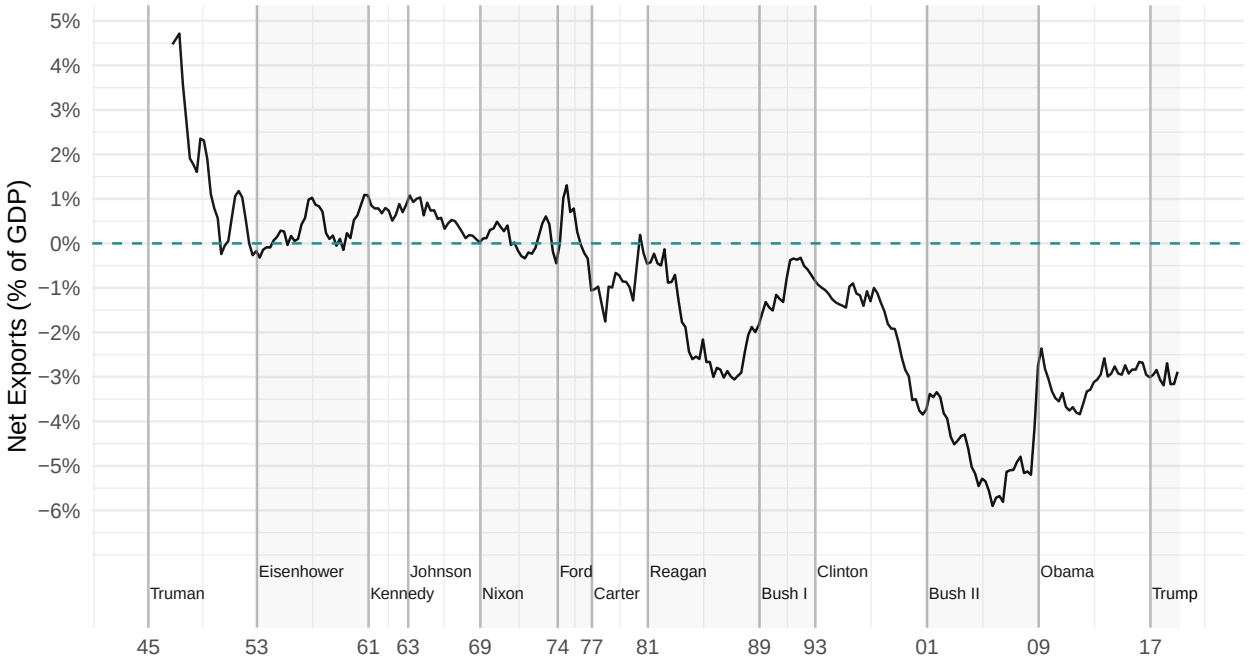

Figure 16: Net Exports (% of GDP).

B.6 Effects of Rise in Public Saving (Romer and Romer (2010))

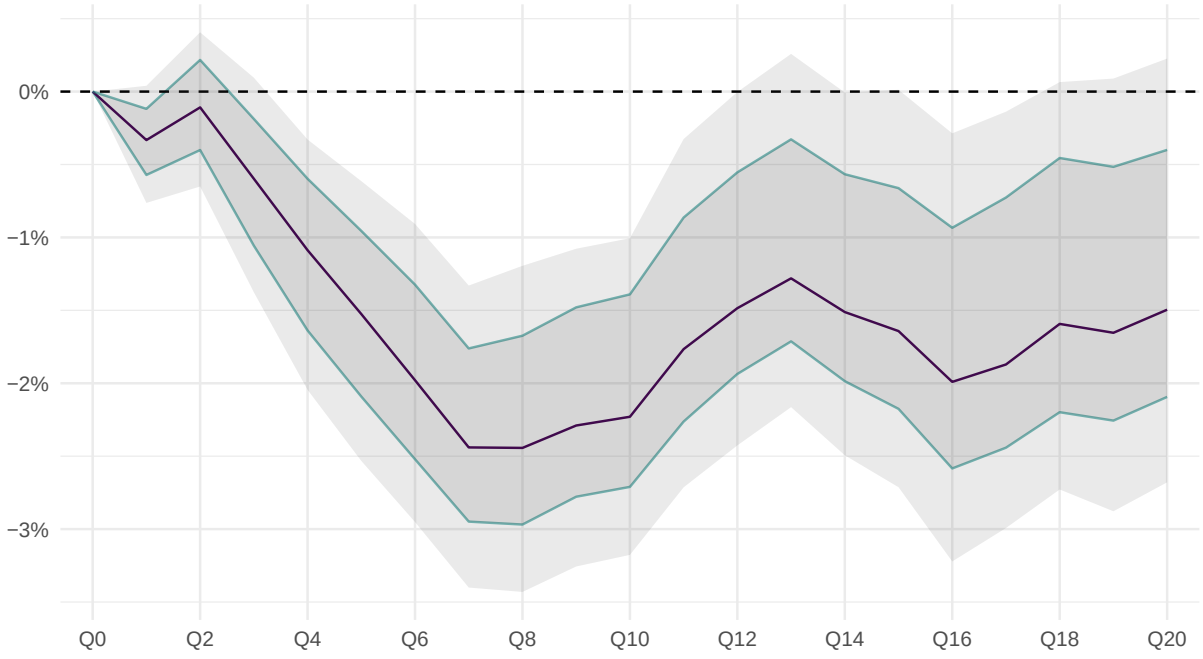

Figure 17: GDP (Real) after a 1% of GDP increase in taxes (Romer and Romer (2010))

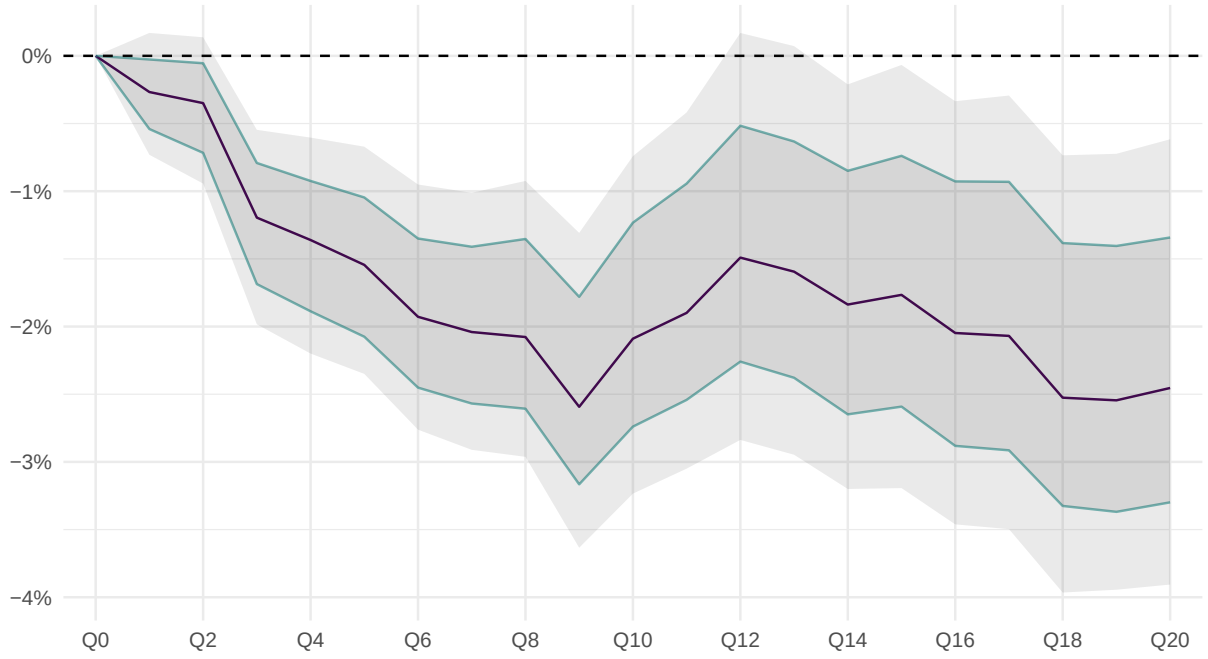

Figure 18: Consumption (Real) after a 1% of GDP increase in taxes (Romer and Romer (2010))

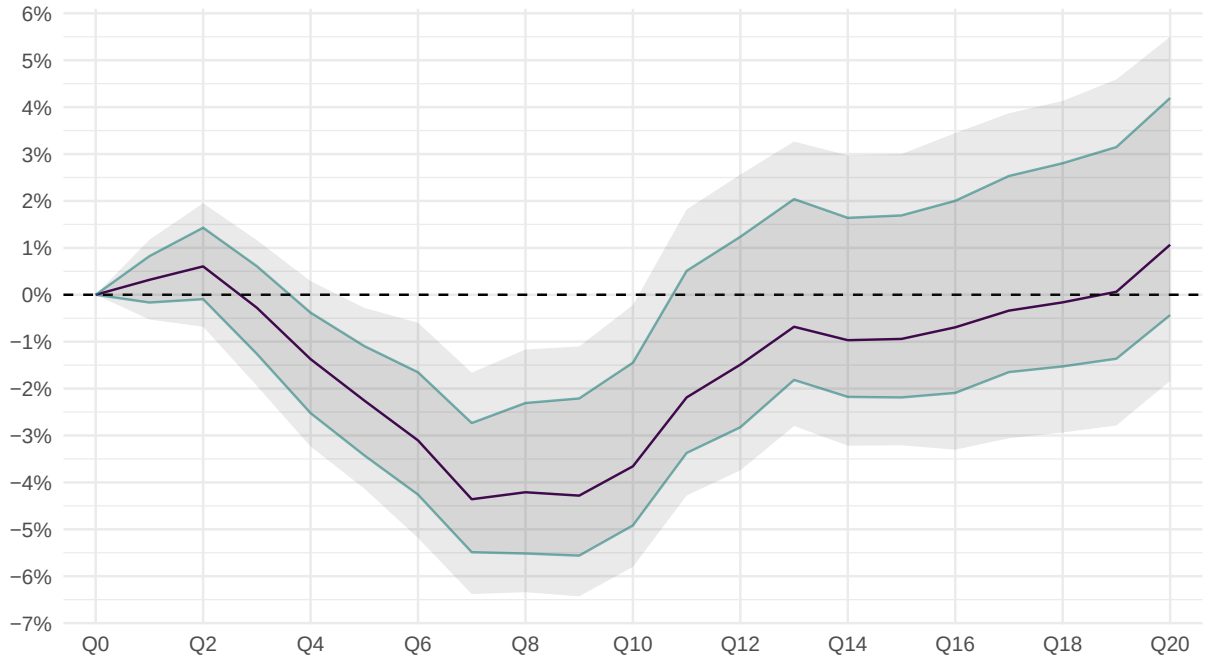

Figure 19: Investment (Real) after a 1% of GDP increase in taxes (Romer and Romer (2010))

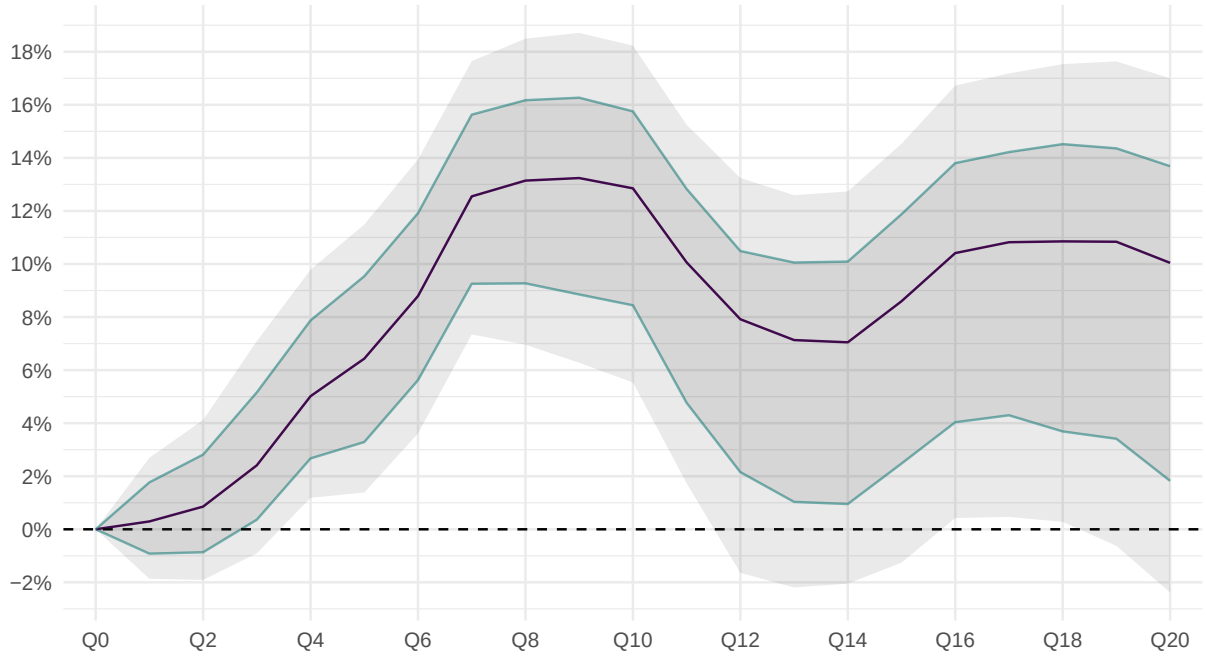

Figure 20: Unemployment after a 1% of GDP increase in taxes (Romer and Romer (2010))

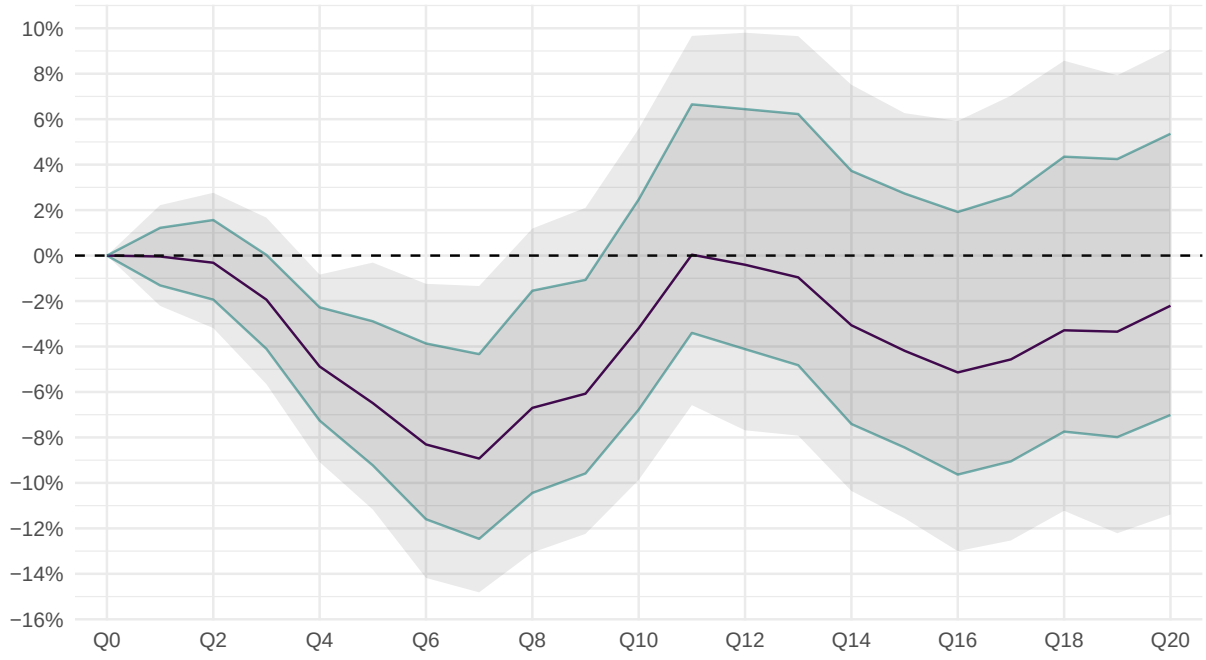

Figure 21: Residential Investment (Real)

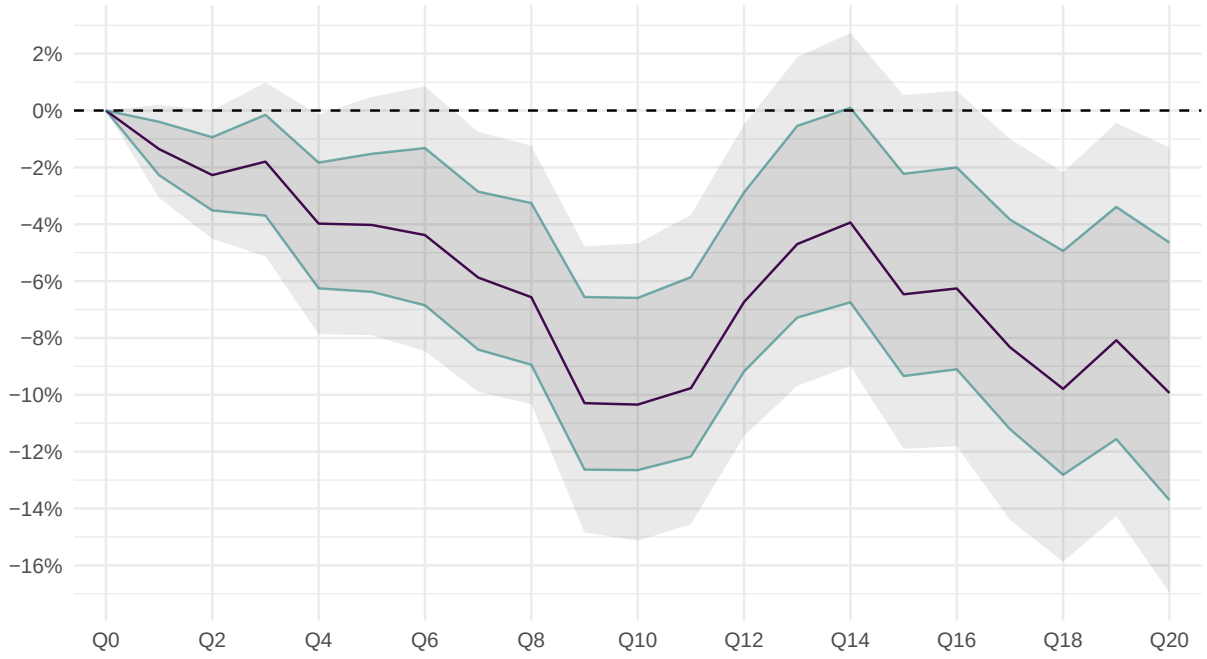

Figure 22: Real Imports

B.7 Real Effects of Monetary Policy Shocks (Romer and Romer (2004))

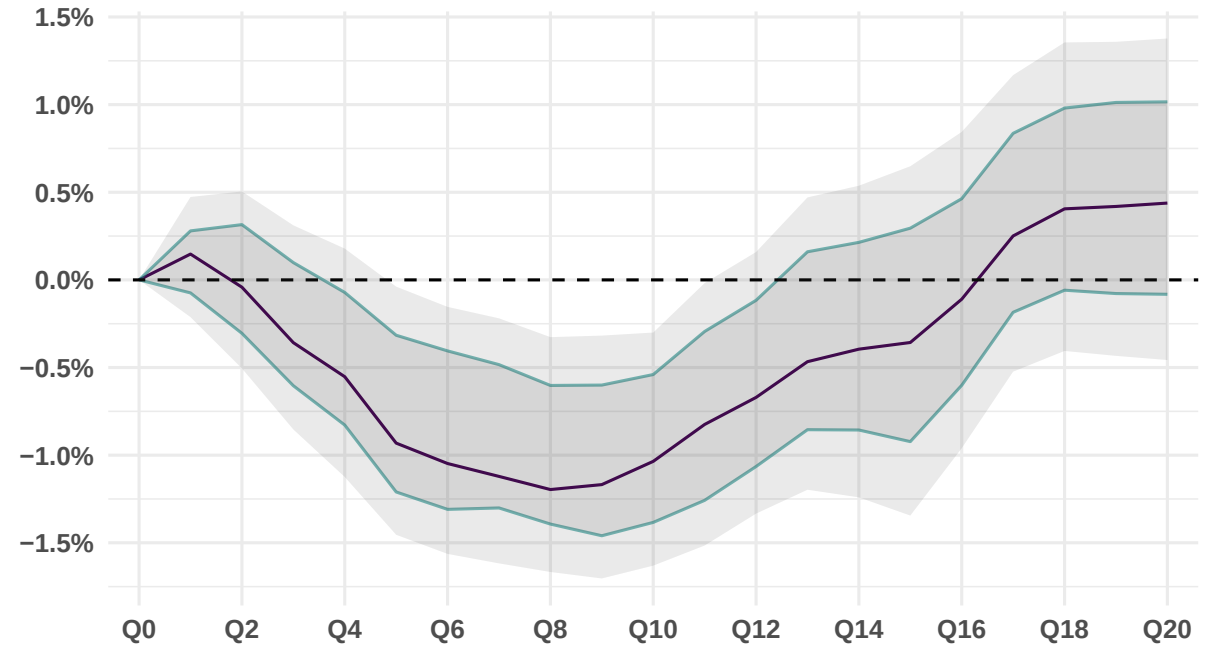

Figure 23: GDP (Real) after a 1% increase in the Fed Funds Rate (Romer and Romer (2004))

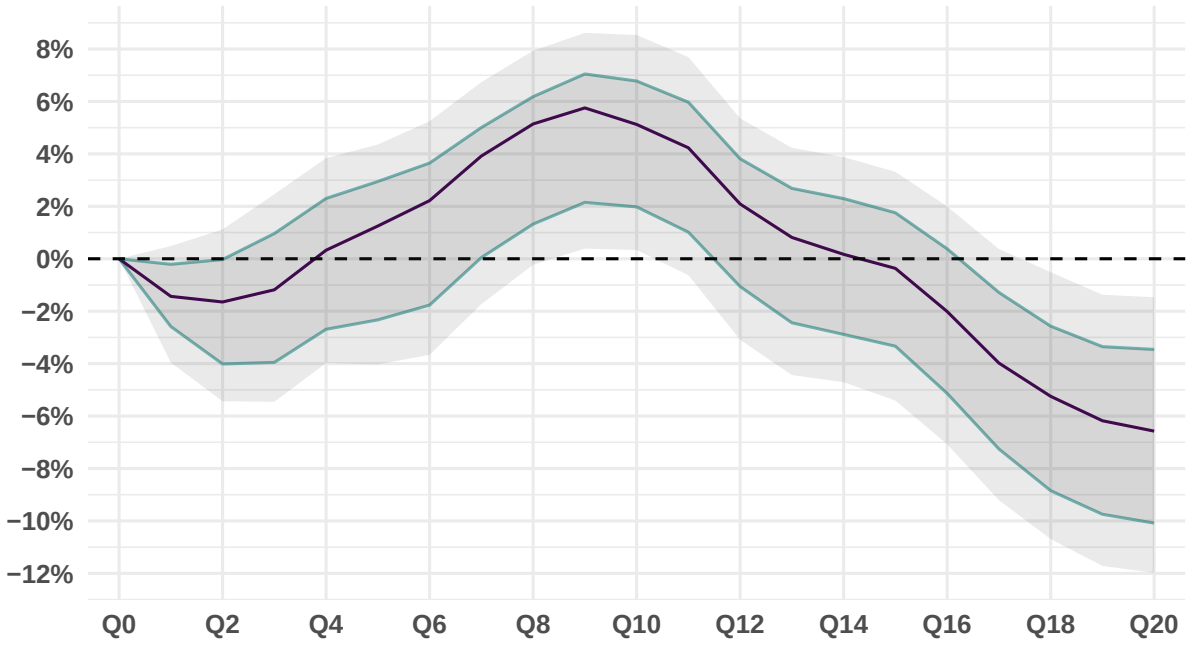

Figure 24: Unemployment

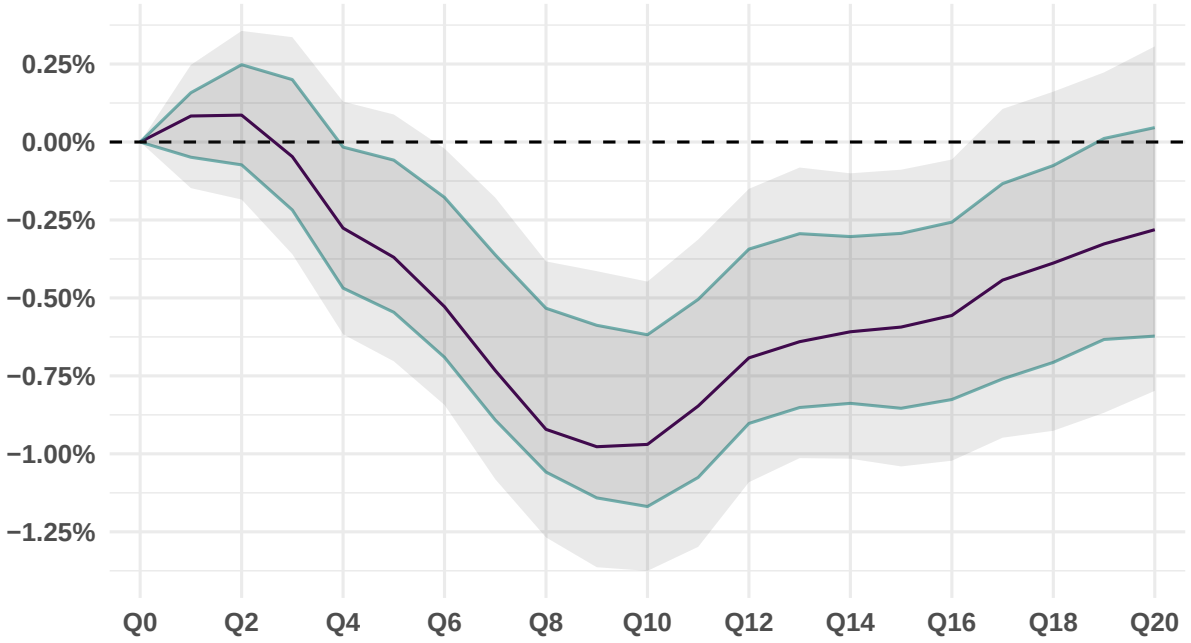

Figure 25: Employment

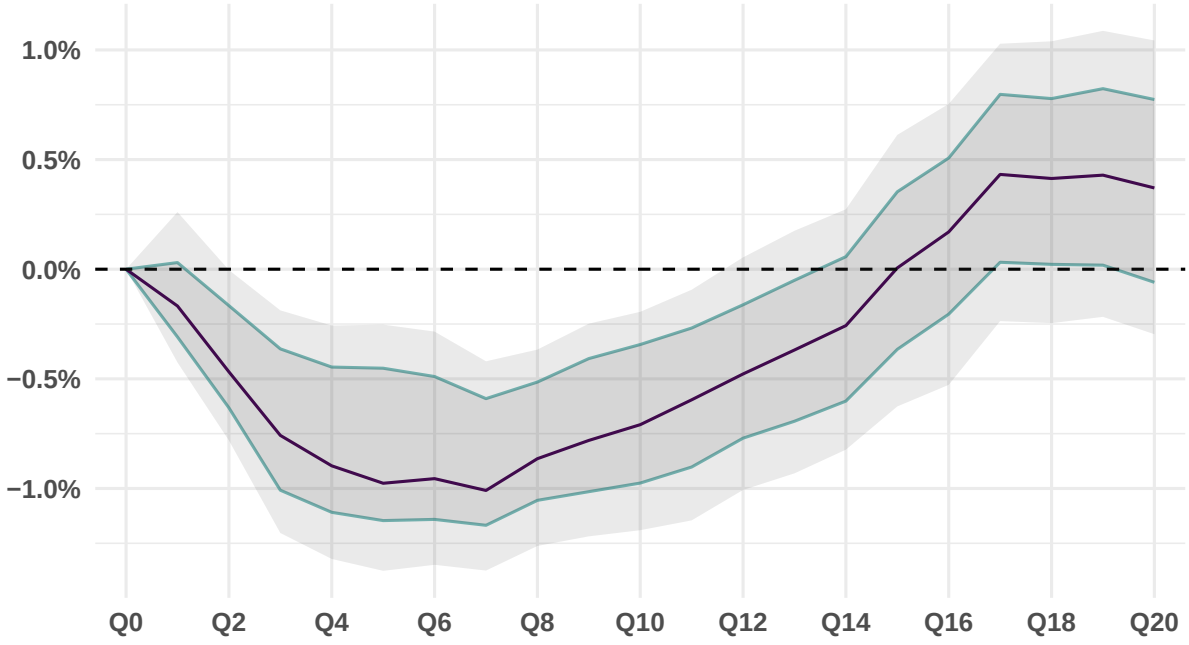

Figure 26: Real Consumption

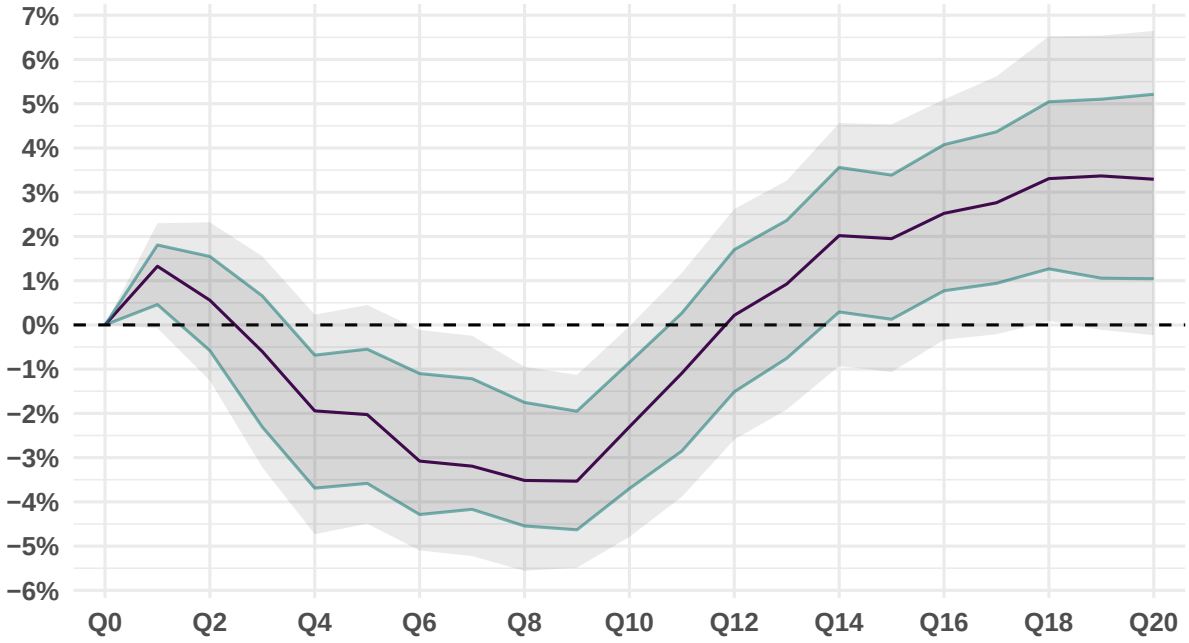

Figure 27: Real Imports

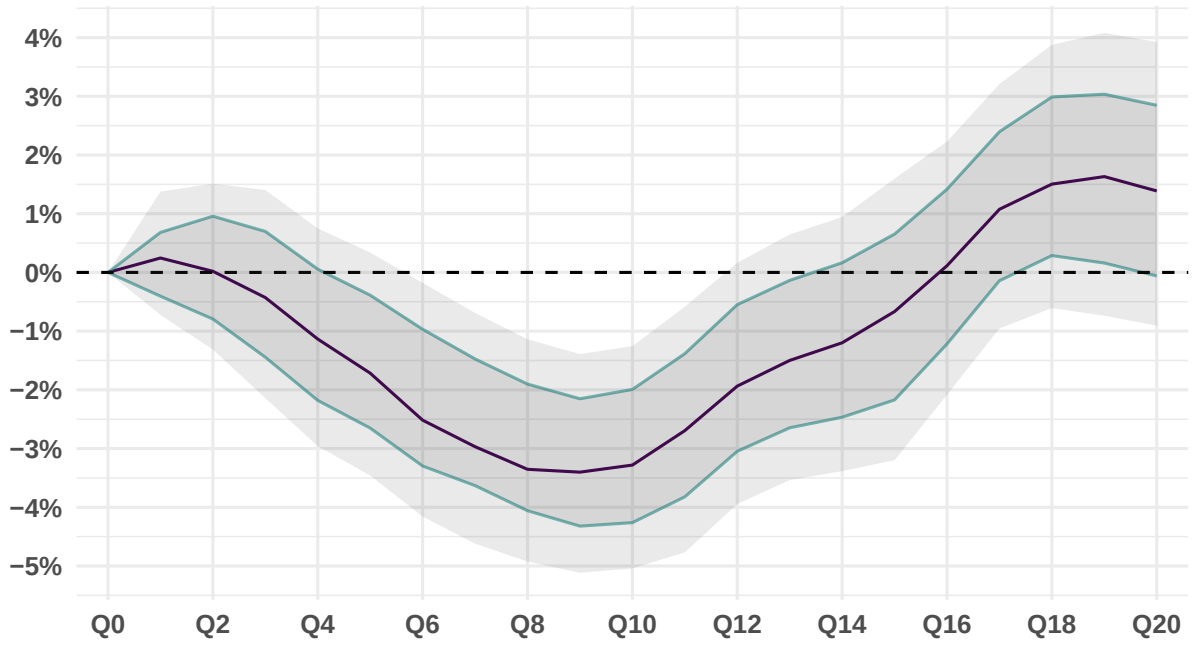

Figure 28: Investment

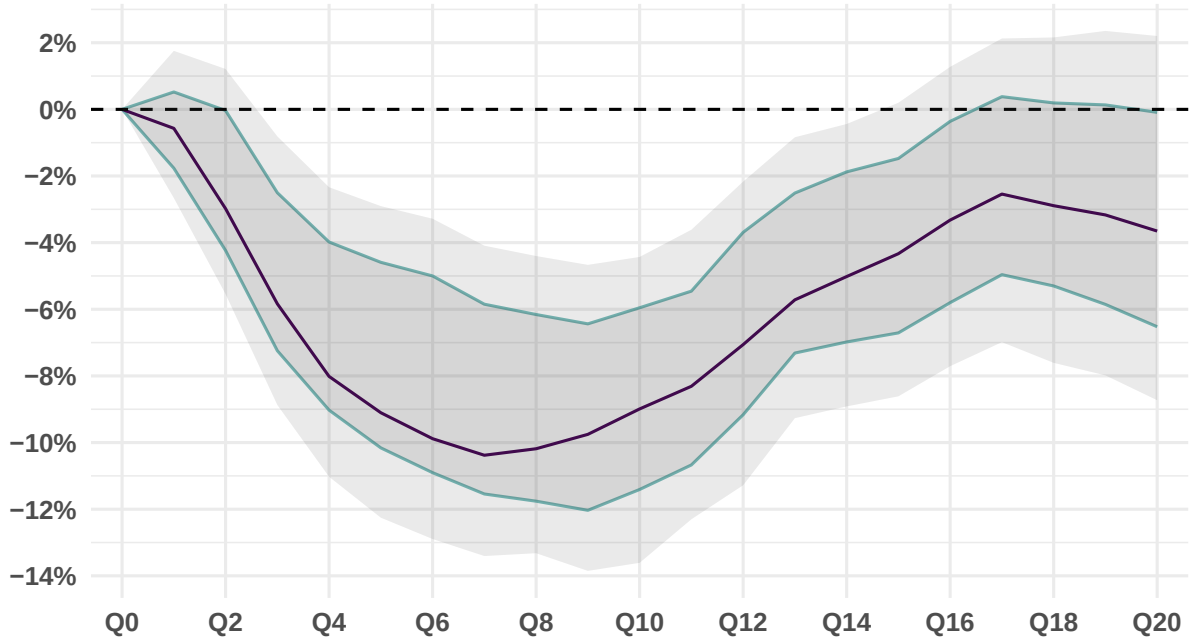

Figure 29: Production of Total Construction

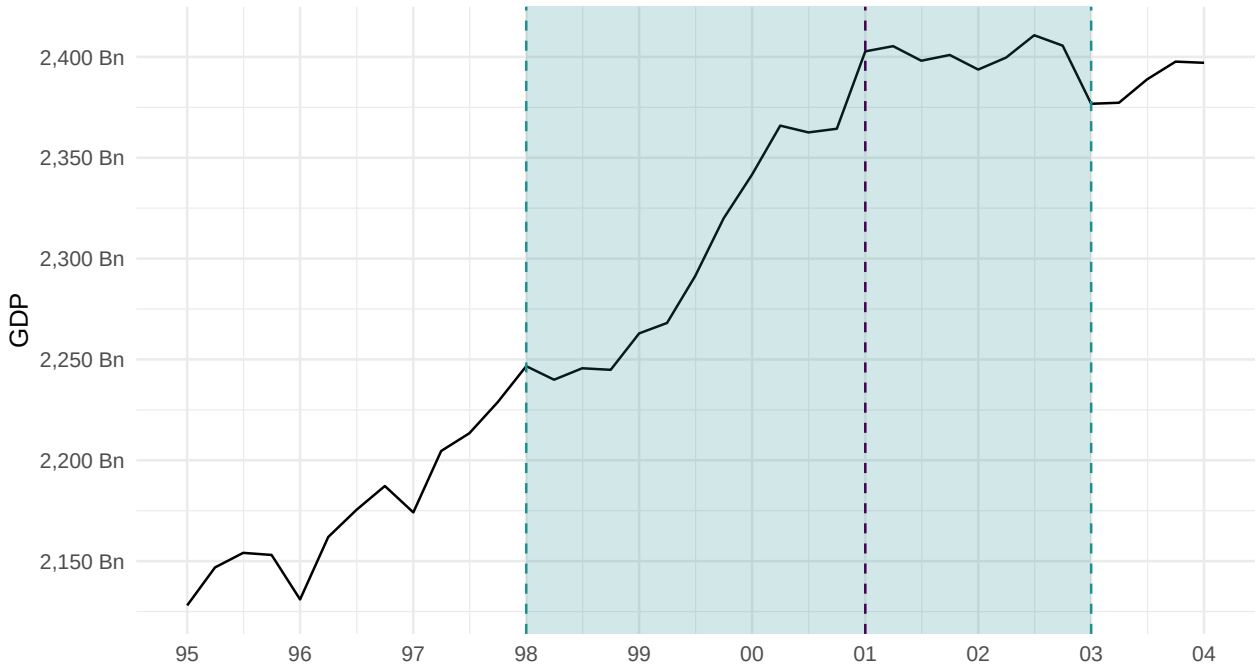

Figure 31: GDP in Germany (1995-2004)

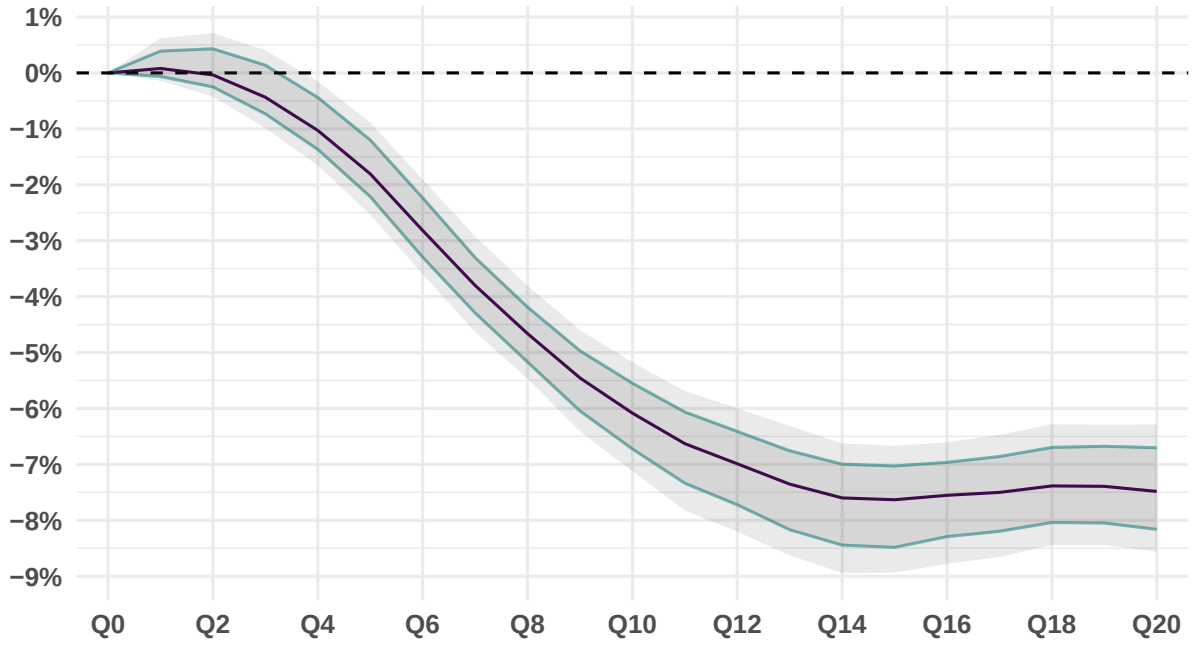

Figure 30: House Prices

B.8 Germany - Gerhard Schröder's restrictive policies (1998-2003)

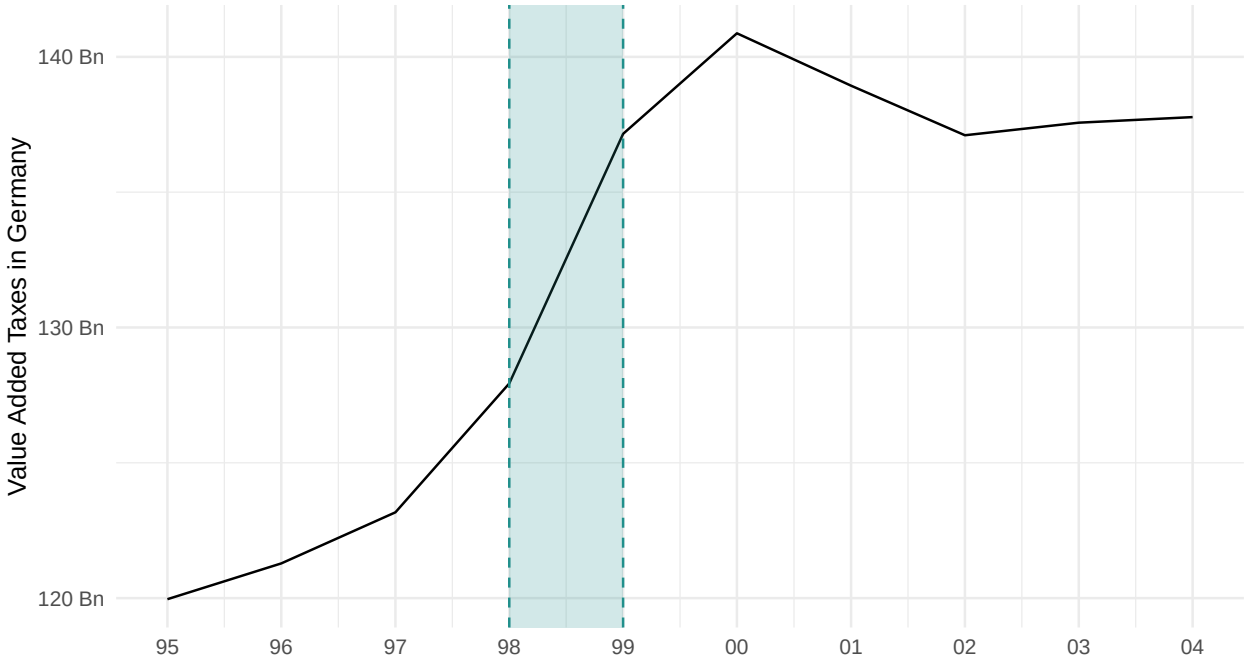

Figure 32: Value Added Taxes in Germany (1995-2004)

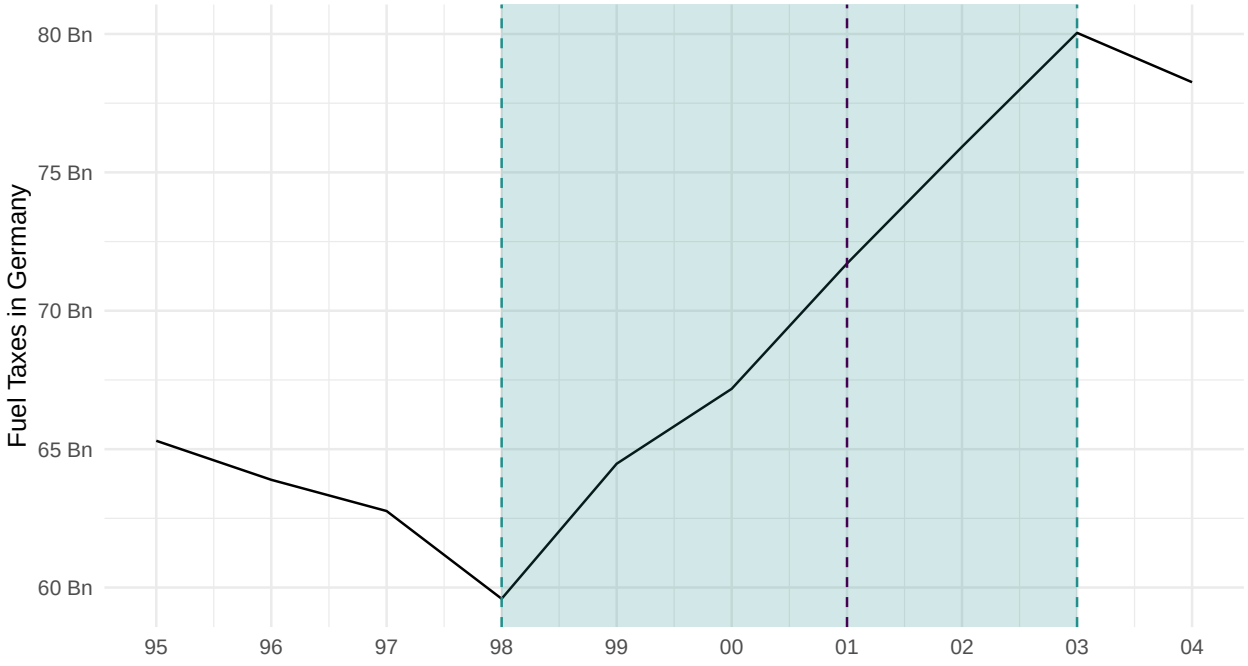

Figure 33: Fuel Taxes in Germany (1995-2004)

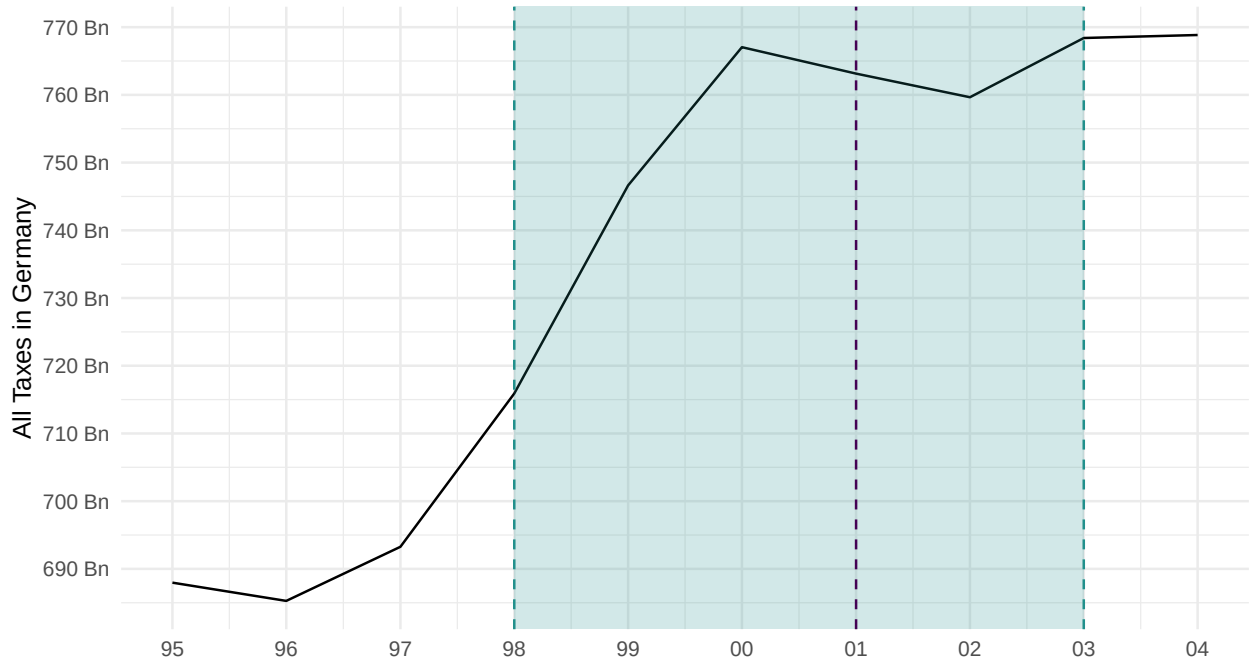

Figure 34: Total Taxes in Germany (1995-2004)

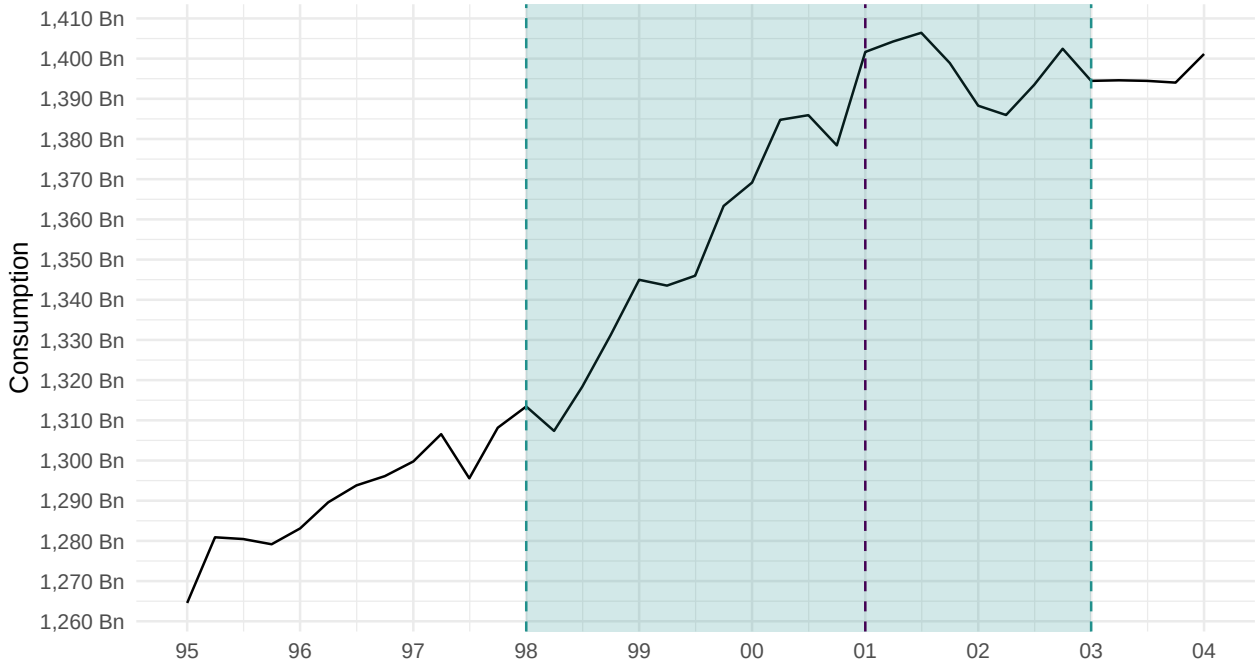

Figure 35: Consumption in Germany (1995-2004)

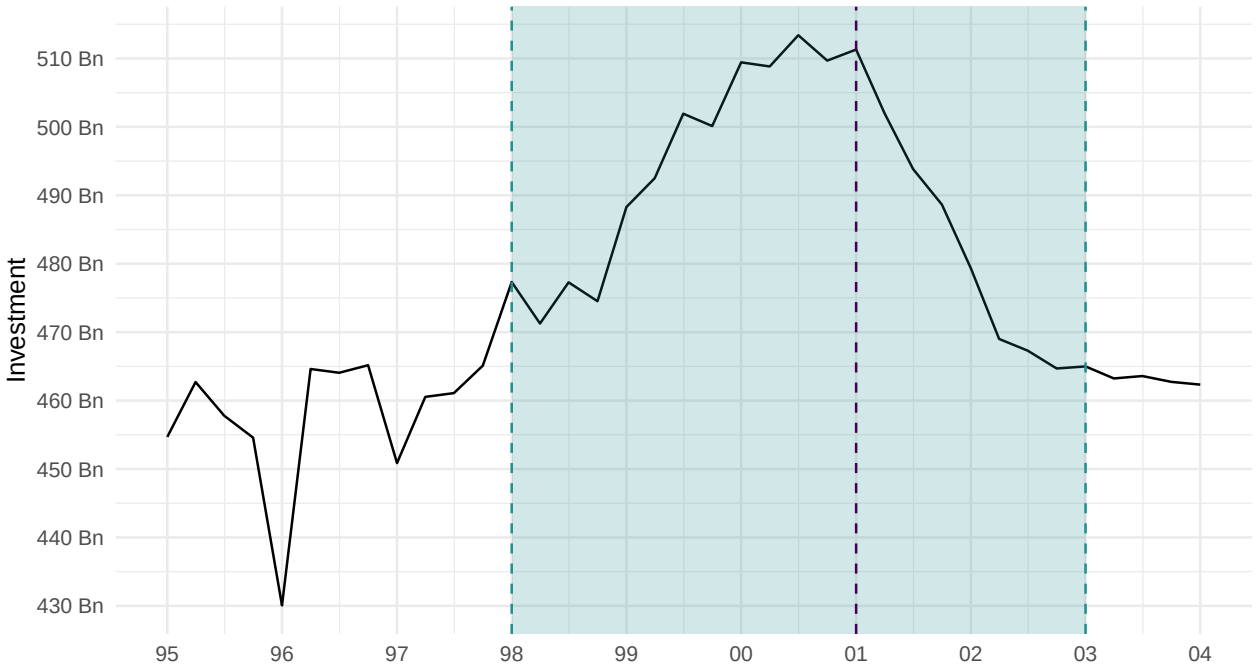

Figure 36: Investment in Germany (1995-2004)

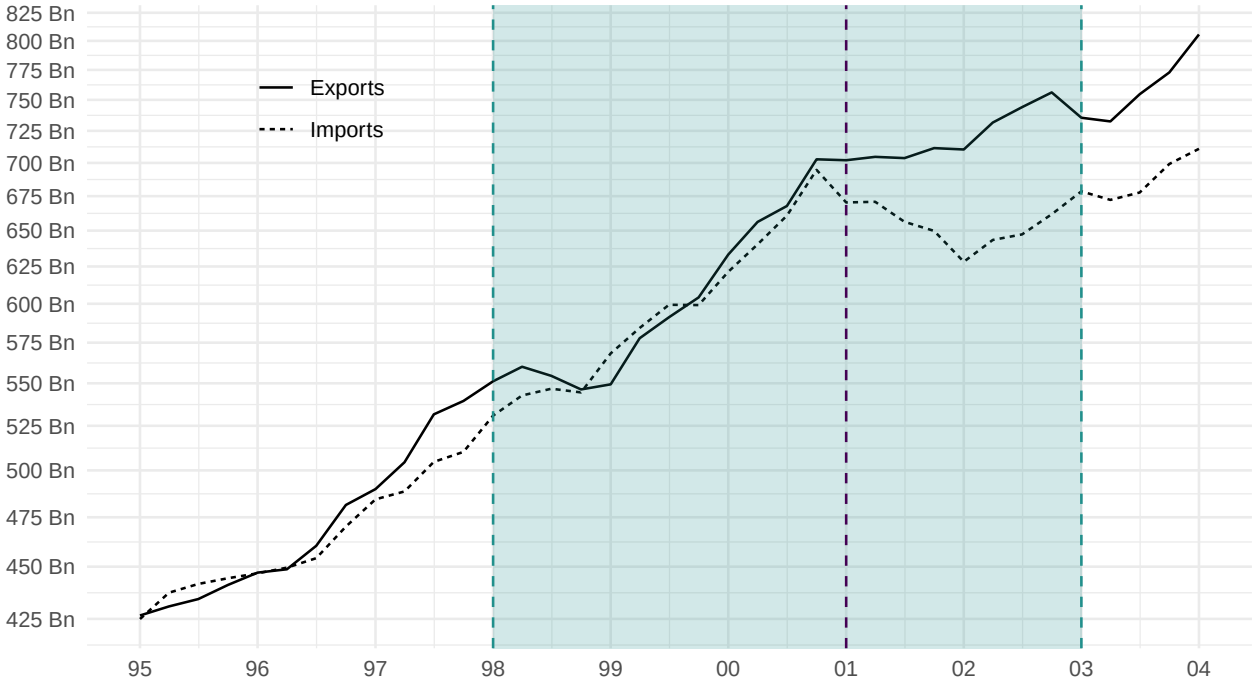

Figure 37: Exports and Imports in Germany (1995-2004)

B.9 Japan's boom-bust

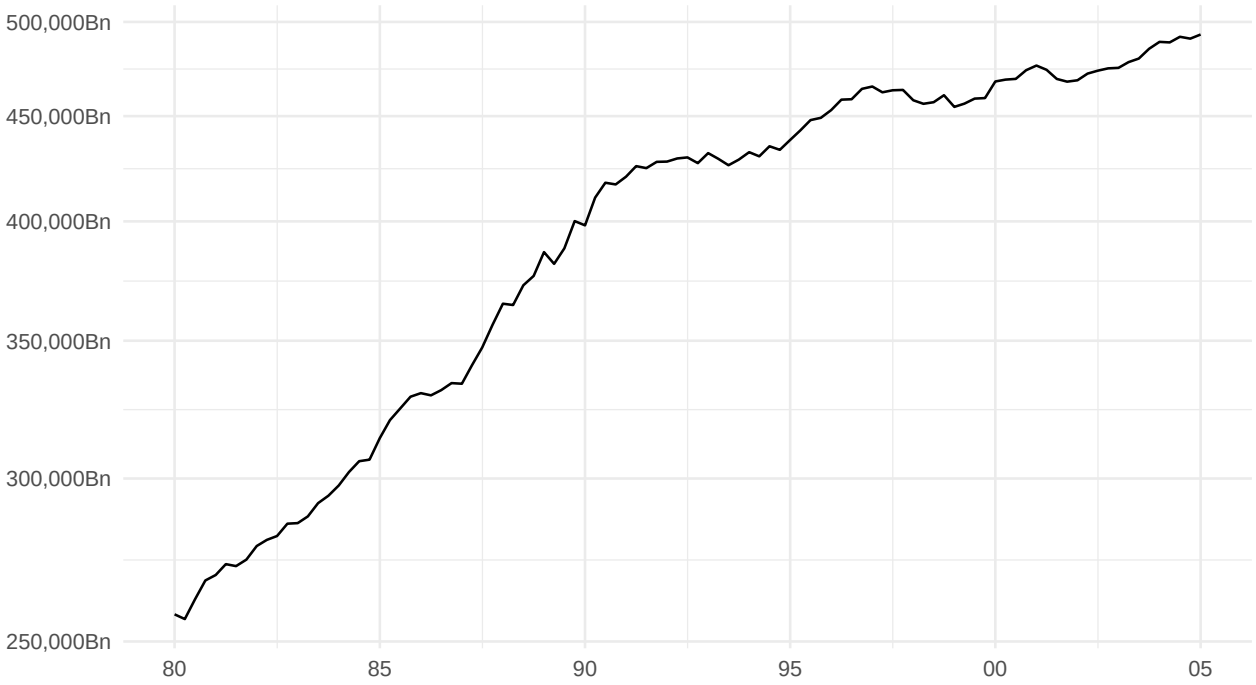

Figure 38: Real GDP

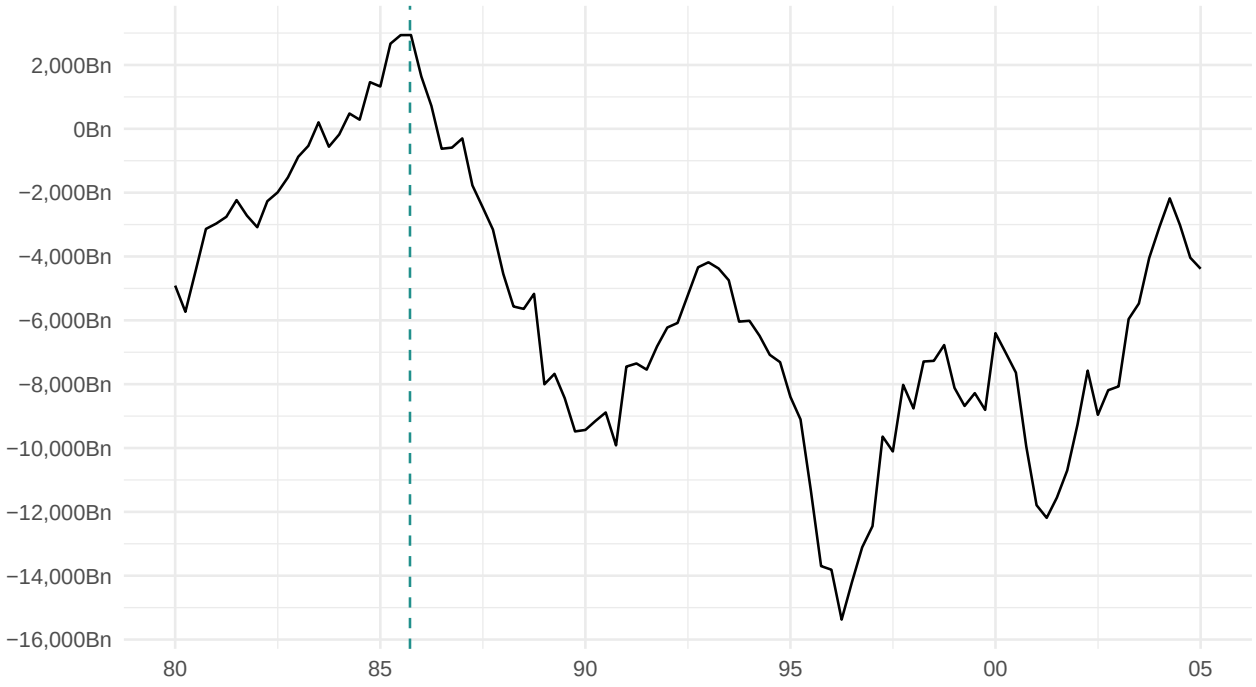

Figure 39: Net Exports (1980-2005); September 22, 1985: Plaza Accords

C Tables

C.1 Capital

Table 1 shows that the book value of capital is mostly composed of structures, and residential structures. This is important for thinking of capital / labor substitution, which is more intuitive for equipment.

Table 1: What is Capital? (% of GDP) Source: Fixed Asset Table 1.1 (BEA)

Description	2017
Fixed assets and consumer durable goods	267%
Fixed assets	245.2%
Private	186.3%
Nonresidential	99.3%
Equipment	27.5%
Structures	58.5%
IPP	13.2%
Residential	87.1%
Government	58.9%
Nonresidential	57.1%
Equipment	4.2%
Structures	48.1%
IPP	4.8%
Residential	1.8%
Consumer durable goods	21.8%

Even among equipment capital, many items do not in fact correspond to capital which can be thought of as being use in replacement for labor, as Table 2 shows.

Table 2: Decomposition of Equipment (% of GDP). Source: Fixed Asset Table 2.1 (BEA)

Description	2017
Private fixed assets	186.3%
Equipment	27.7%
Nonresidential equipment	27.5%
Information processing equipment	6.3%
Computers and peripheral equipment	1%
Communication equipment	2.3%
Medical equipment and instruments	1.8%
Nonmedical instruments	0.9%
Photocopy and related equipment	0.2%
Office and accounting equipment	0%
Industrial equipment	8.6%
Fabricated metal products	0.7%
Engines and turbines	0.6%
Metalworking machinery	1.2%
Special industry machinery, n.e.c.	1.4%
General industrial, including materials handling, equipment	2.7%
Electrical transmission, distribution, and industrial apparatus	2.1%
Transportation equipment	6.3%
Trucks, buses, and truck trailers	2.6%
Light trucks (including utility vehicles)	1.7%
Other trucks, buses, and truck trailers	0.9%
Autos	0.8%
Aircraft	1.8%
Ships and boats	0.4%
Railroad equipment	0.7%
Other equipment	6.3%
Furniture and fixtures	1.4%
Agricultural machinery	0.9%
Construction machinery	1%
Mining and oilfield machinery	0.6%
Service industry machinery	0.8%
Electrical equipment, n.e.c.	0.1%
Other nonresidential equipment	1.5%
Residential equipment	0.2%