

The Dutch Disease in Reverse

Iceland's Natural Experiment



29th Villa Mondragone
International Economic Seminar
Rome 21-22 June 2017

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Key points

- Abundant natural resources brought Iceland a systemically overvalued currency, with adverse effects on manufacturing and services
- During 2003-2008 another national treasure, the sovereign's AAA rating, was used to attract foreign capital, elevating the real exchange rate even further
- The financial collapse in 2008 left Iceland with a large foreign debt without the possibility of rollovers in foreign capital markets
- The currency plunged, producing a bout of the Dutch disease in reverse as witnessed, in particular, by a massive expansion of tourism after the crash

Key points

- Insofar as the trouble with abundant natural resources and reputation mining has to do with the appreciation of the currency, the depreciation resulting from a financial crash can be viewed as a case of the Dutch disease in reverse
- Just as currency appreciation weakens the current account, a massive depreciation after a financial crash stifles imports and strengthens exports, paving the way toward economic recovery

Literature

- Recent literature highlights several channels through which natural resource abundance, if not well managed, may retard economic growth
 - Rent seeking
 - Dutch disease
 - Poor governance
 - Political or ethnic conflict
 - Corruption
 - Autocracy
 - Excessive borrowing
 - Low levels of education

Literature

- Our 1999 model showed how a large and volatile primary sector would adversely affect the output of tradable goods by increasing real wages and the real exchange rate, lowering the relative price of tradable goods and hampering investment
- If learning-by-doing occurs mostly in the secondary export sector and not in the primary sector, we also showed that natural resource booms are likely to hamper growth by discouraging employment and investment

Parallels

- Foreign aid inflows share important properties with natural resource discoveries
 - Aid constitutes an unrequited transfer emerging like manna from heaven
 - Aid inflows have about them an aura of ‘other people’s money’ which, like lottery winnings, as well as due to their transitory and often volatile nature, may seem easy to fritter away
 - Just as foreign aid may be diverted from its intended beneficiaries, natural resource abundance tends to attract the wrong sort of people to politics by offering opportunities to divert rents from their right owners

Parallels

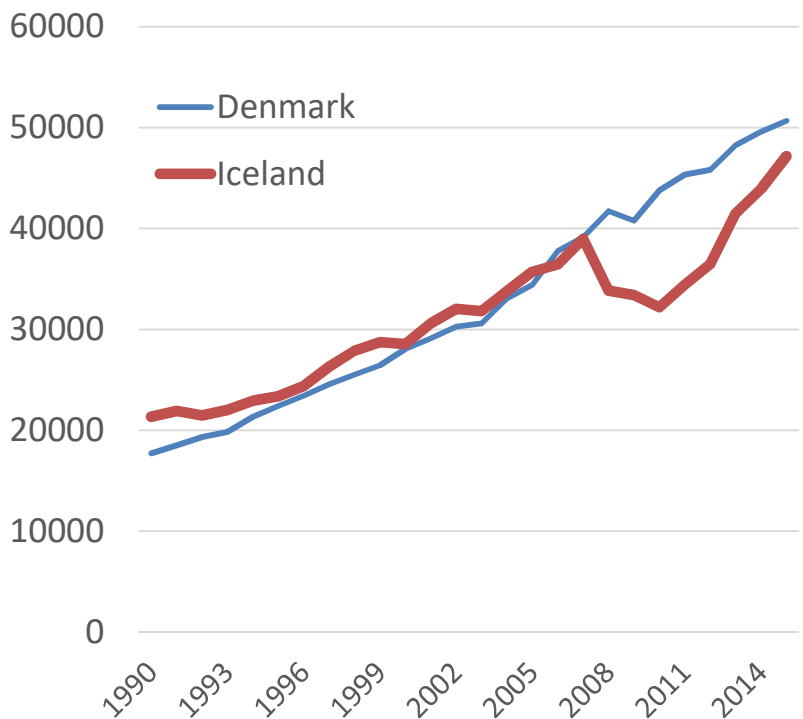
- Inflows of foreign credit can exert a similar manna-from-heaven effect on its recipients as resource windfalls and foreign aid ...
 - ... not least if the borrowing nation behaves as if there is no tomorrow and bankers revel in their role as rentiers
- In some cases, resource windfalls, foreign aid and rapid capital inflows may invite plunder ...
 - ... with royal families, clerics, generals, politicians and bankers sitting in the driver's seat

Background

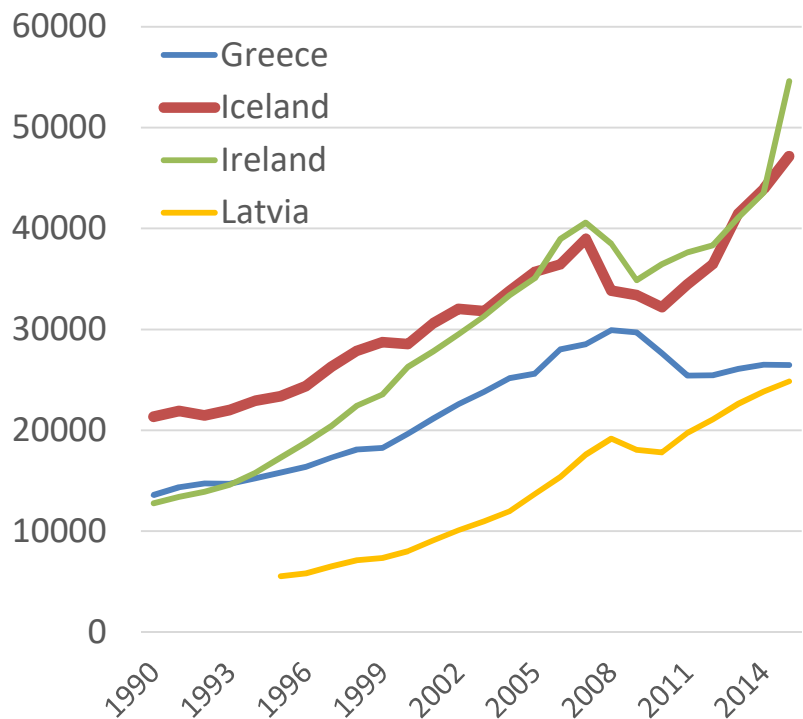
GNI per capita 1990-2015

(Current international dollars, ppp)

Denmark and Iceland



Greece, Iceland, Ireland, Latvia

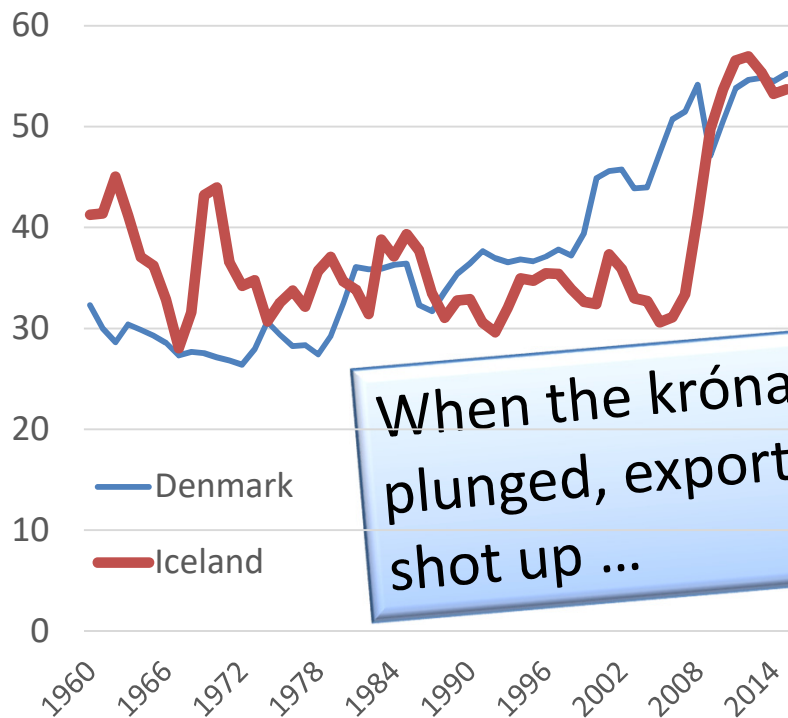


Rapid recovery accompanied by quick return to full employment amid labor unrest

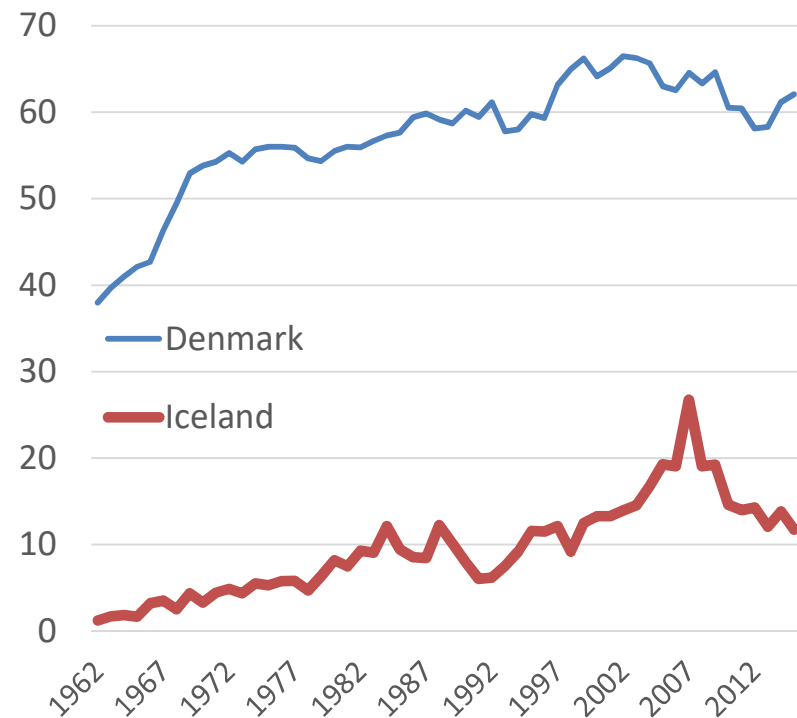
Source: World Bank, World Development Indicators.

Exports of goods and services and manufactures

**Exports 1960-2015
(% of GDP)**



**Manufactures exports 1962-2015
(% of total exports)**

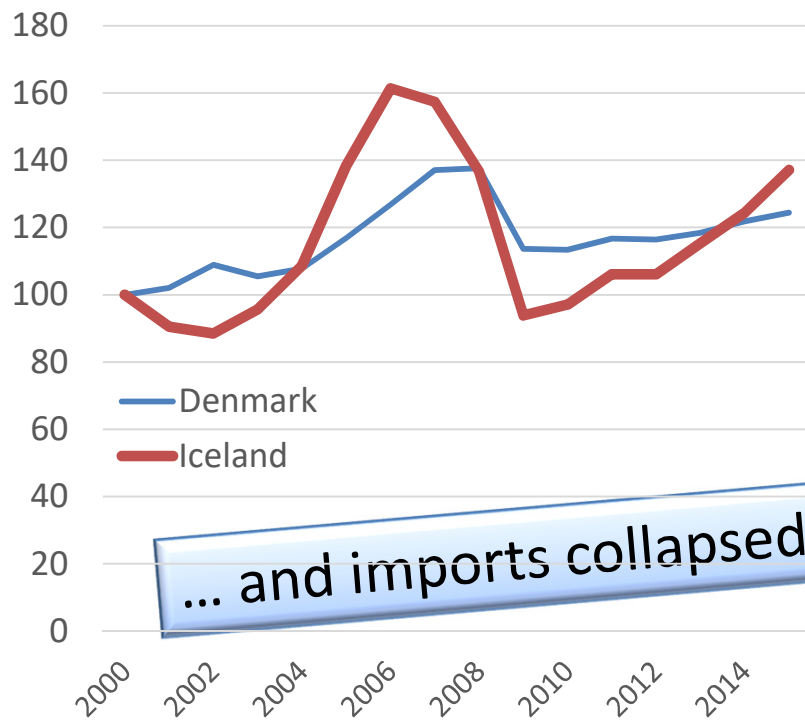


Iceland's export share in GDP was flat 1870-2008

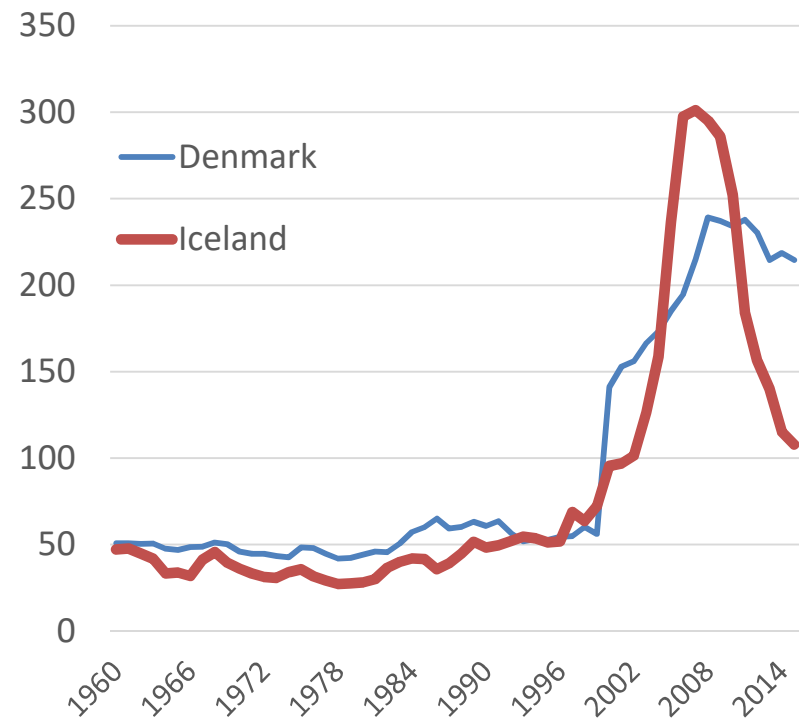
Source: World Bank, World Development Indicators.

Imports and domestic credit

Import volume 2000-2015 (2000 = 100)



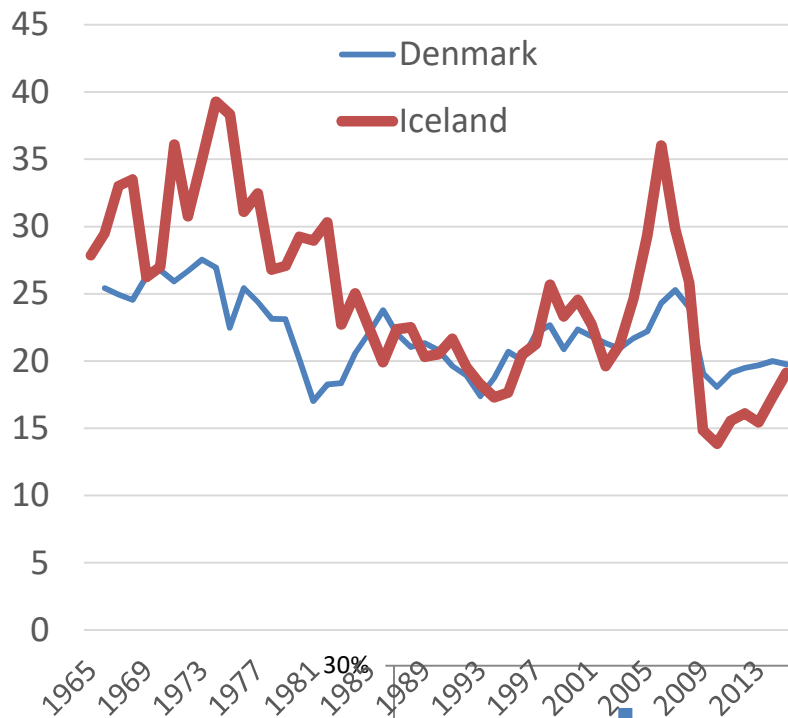
Domestic bank credit 1960-2015 (% of GDP)



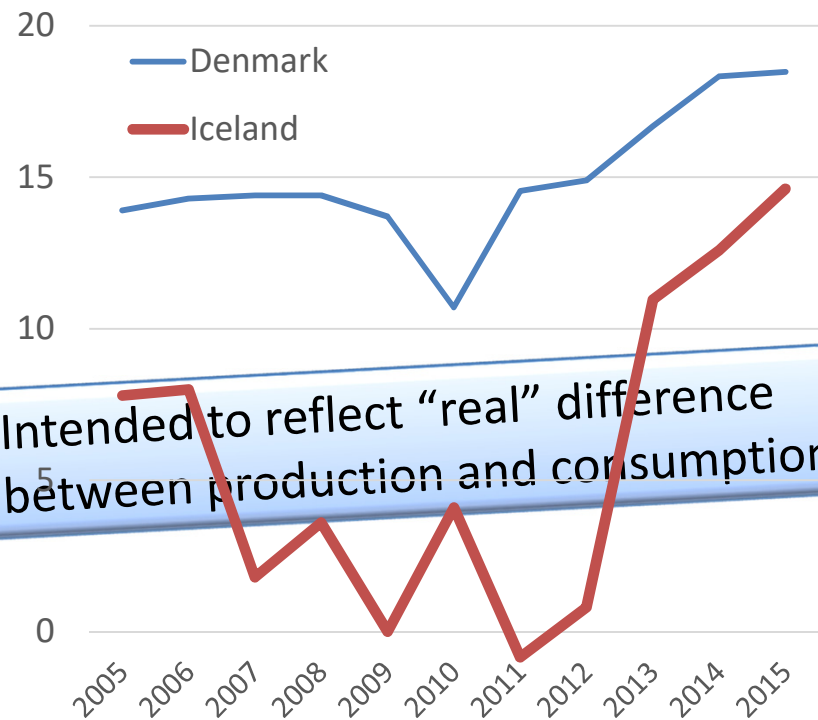
Source: World Bank, World Development Indicators.

Investment and adjusted net saving

**Gross investment 1965-2015
(% of GDP)**

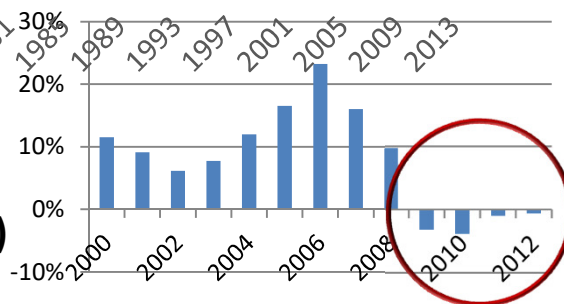


**Adjusted net saving 2005-2015
(% of GNI)**



Intended to reflect "real" difference between production and consumption

**Iceland: Collapse of net investment
(% of GDP)**



Source: World Bank World Development Indicators.

Model

- Primary output is stochastic and follows a Brownian motion subject to random productivity shocks and is independent of the real exchange rate:

- $$dy^P = \eta dt + \sigma dW$$

- dW represents the increment of a Wiener process $dW = \epsilon_t \sqrt{dt}$, ϵ having a zero mean and a unit SD
- The drift term ηdt reflects growth in primary output while the stochastic term represents the vicissitudes of, e.g., commodity prices that make primary output rise or fall at random, creating uncertainty about output in the primary sector

Model

Secondary output is deterministic

$$y^S = \alpha_0 + \alpha_1 \log(\lambda)$$

$$c^T = \beta_0 - \beta_1 \log(\lambda)$$

λ = real exchange rate
(appreciation makes λ fall)
 r = saving that satisfies
intertemporal
budget constraint

$$\log(\lambda) = \frac{\beta_0 - \alpha_0 + r}{\alpha_1 + \beta_1} - \frac{y^P}{\alpha_1 + \beta_1}$$

$$d\log(\lambda) = -\frac{\eta}{\alpha_1 + \beta_1} dt - \frac{\sigma}{\alpha_1 + \beta_1} dW$$

Hence

Model

$$d\lambda = \underbrace{\left(-\frac{\eta}{\alpha_1 + \beta_1} + \frac{1}{2} \left(\frac{\sigma}{\alpha_1 + \beta_1} \right)^2 \right)}_{\theta} \lambda dt - \frac{\sigma}{\alpha_1 + \beta_1} \lambda dW$$

The drift term, with $\theta < 0$ denoting appreciation – a fall in the relative price of tradable goods – signals the Dutch disease

The volatility of the real exchange rate λ via the stochastic term may be no less important in its effect on investment for other export industries and import-competing industries

Derive and play with stochastic equation for Y^s :

$$dY^s = A dt + B dW$$

Specifically

Model

dY^S

$$= \left[\theta \left(\frac{\beta}{1-\beta} \right) \lambda^{\frac{\beta}{1-\beta}} K^{\frac{1}{1-\beta}} w^{-\frac{\beta}{1-\beta}} B \right. \\ \left. + \frac{1}{2} \left(\frac{\beta}{1-\beta} \right) \left(\frac{2\beta-1}{1-\beta} \right) \lambda^{\frac{\beta}{1-\beta}} K^{\frac{1}{1-\beta}} w^{-\frac{\beta}{1-\beta}} B \left(\frac{\sigma}{\alpha_1 + \beta_1} \right)^2 \right] dt \\ - \left(\frac{\beta}{1-\beta} \right) \lambda^{\frac{\beta}{1-\beta}} K^{\frac{1}{1-\beta}} w^{-\frac{\beta}{1-\beta}} B \left(\frac{\sigma}{\alpha_1 + \beta_1} \right) dW$$

Hence

$$dY^S = A(\lambda, K, R, w) dt + B(\lambda, K, R, w) dW$$

Model

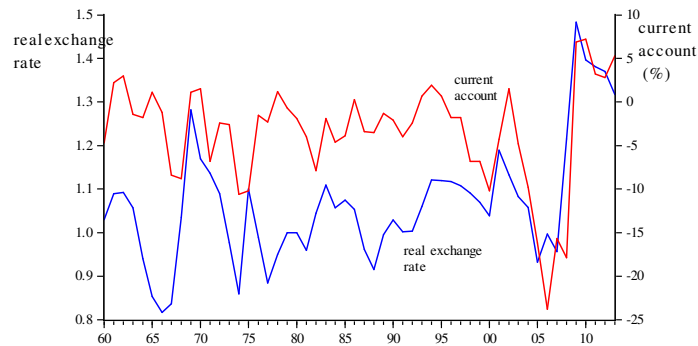
- Primary output is stochastic, and so is, therefore, also the real exchange rate λ and secondary output
 - Employment and output in secondary sector depend on λ , and hence on primary output and external debt as well as primary-sector wages
- A primary-sector boom has an immediate adverse effect on secondary output by reducing λ (i.e., by making the currency appreciate), a key aspect of the Dutch disease

Upshot

- Real exchange rate λ depends on current and lagged shocks to primary output and capital flows
- Secondary output depends on λ
- Consumption of tradable goods also depends on λ
- So, through λ , primary output shocks and volatility, like capital flows, impact secondary output, employment and consumption

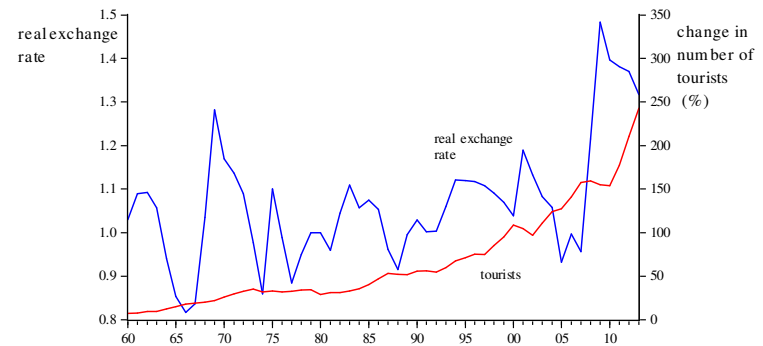
Data: Real exchange rate, current account, tourism and non-primary merchandise exports

Real exchange rate and the current account



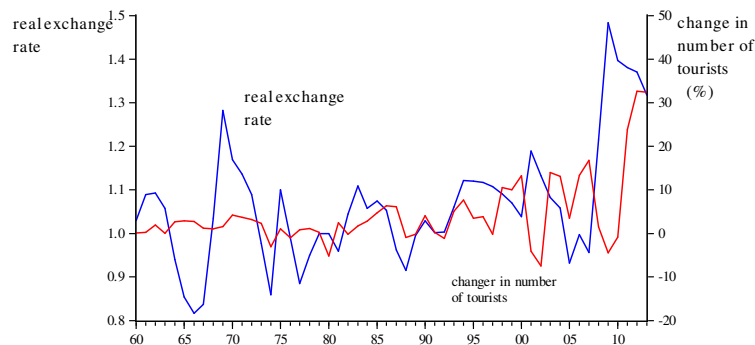
The current account measures the current account surplus as a ratio to GDP. The real exchange rate is defined as the relative price of tradables.

Real exchange rate and tourism



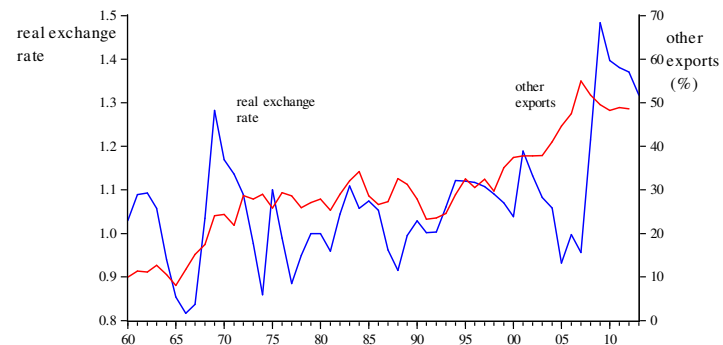
Tourism is calculated as the number of foreign tourists as a proportion of the population of Iceland. The real exchange rate is defined as the relative price of tradables.

Real exchange rate and change in tourism



Tourism is calculated as the number of foreign tourists as a proportion of the population of Iceland. The change is calculated as the change in the proportion between any two years. The real exchange rate is defined as the relative price of tradables.

Real exchange rate and other exports



Other exports are calculated as the ratio of non-primary merchandise exports to total merchandise exports. The real exchange rate is defined as the relative price of tradables.

VAR model

$$\mathbf{y}_t = \boldsymbol{\beta}_0 + \sum_{i=1}^p \boldsymbol{\beta}_i \mathbf{y}_{t-i} + \mathbf{v}_t$$

$$\mathbf{y}'_t = (E, CA, \Delta T, \Delta NP)$$

E, CA: No unit roots
T, NP: Unit roots

E = real exchange rate (i.e., λ)

CA = current account (% of *GDP*)

ΔT = change in tourists (% of population)

ΔNP = change in non-primary exports (% of total exports)

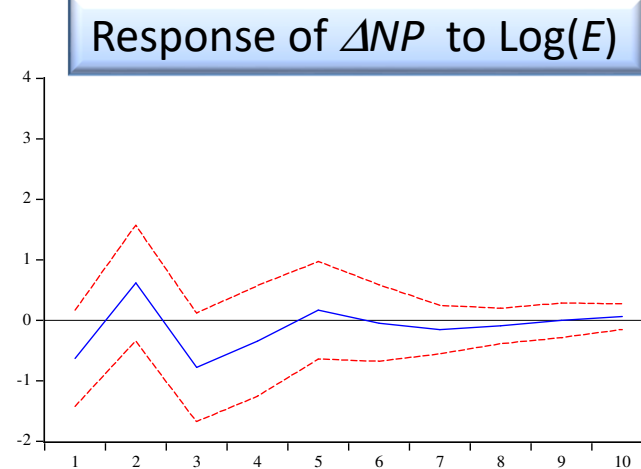
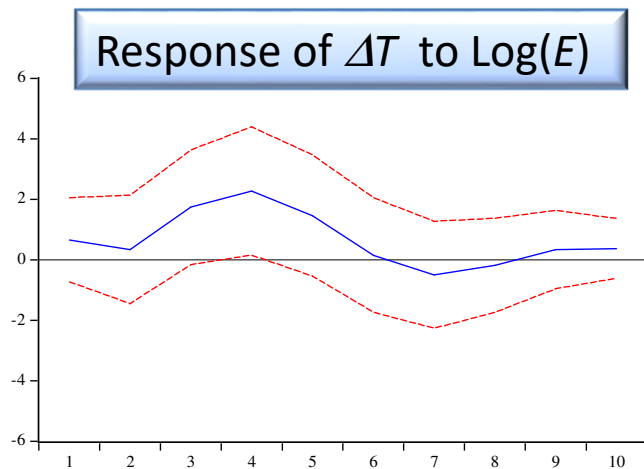
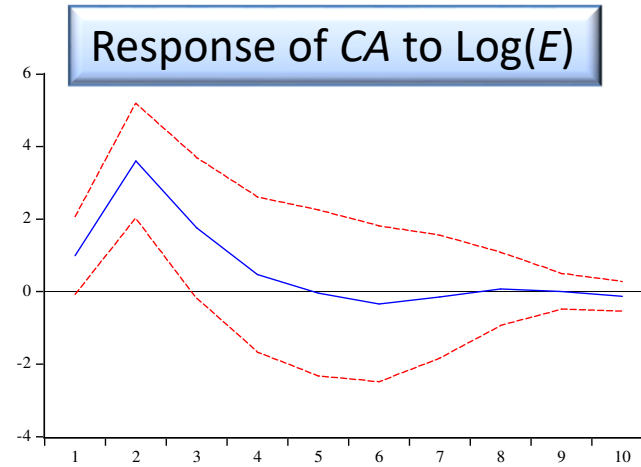
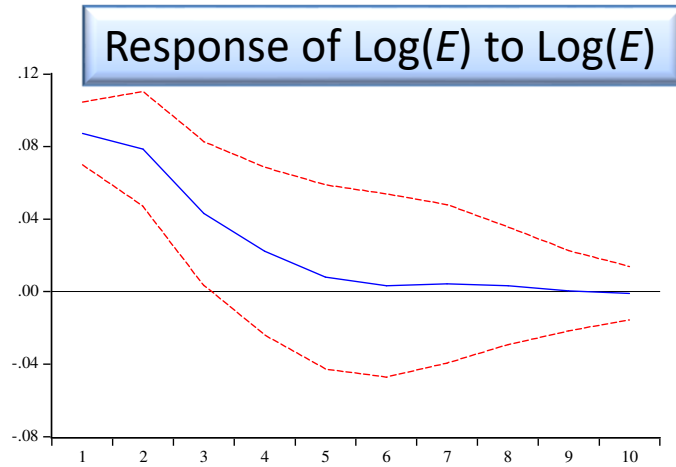
MLE estimation results for VAR(2)

Increase of E from 1 to 1.1 will improve CA by 3.2% next year

1960-2012	$\text{Log}(E)$	CA	ΔT	ΔNP
$\text{Log}(E_{-1})$	1.00*	32.25*	8.13	8.40
$\text{Log}(E_{-2})$	-0.20	-29.12*	27.35*	-10.80
CA_{-1}	-0.00	0.48*	-0.53*	-0.22
CA_{-2}	0.00	0.14	0.21	0.16
ΔT_{-1}	-0.00	-0.12	0.33*	0.13
ΔT_{-2}	0.00	0.10	-0.59*	-0.10
ΔNP_{-1}	0.00	-0.40	0.40	0.04
ΔNP_{-2}	0.01	-0.01	-0.42	-0.24
R^2	0.64	0.65	0.61	0.25

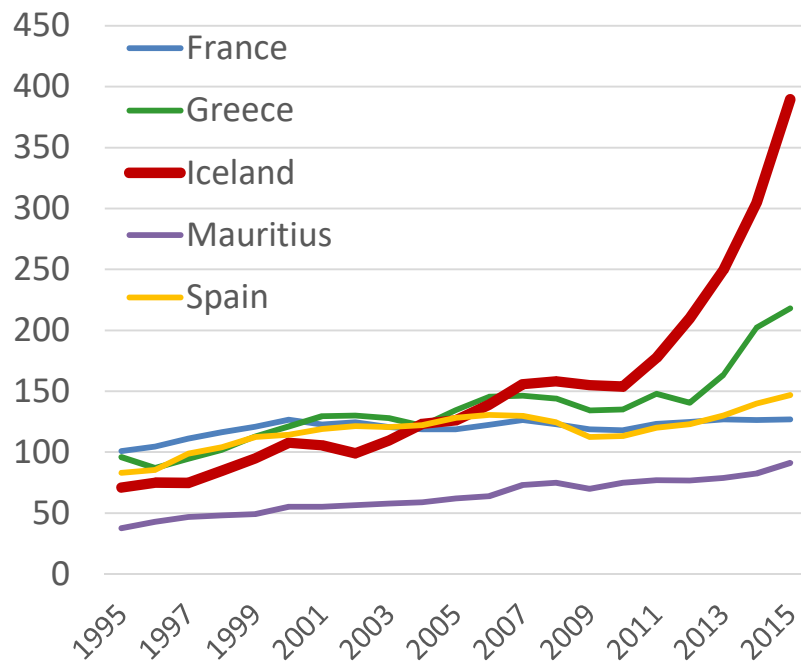
t-values not shown; * denotes statistical significance at the 5% level.

VAR Results: Impulse responses to currency depreciation

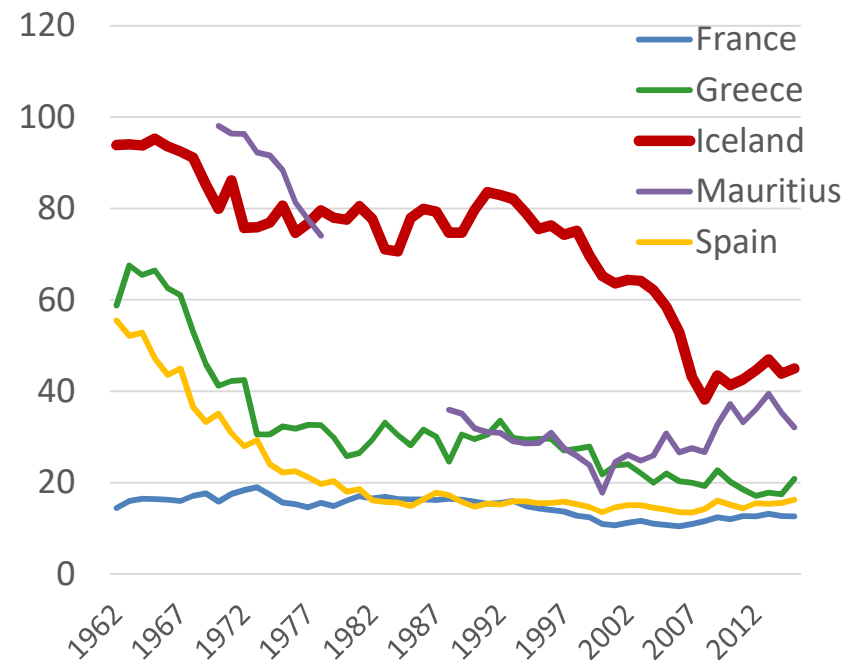


Tourism and food exports

Tourist arrivals 1995-2015 (% of population)



Food exports 1962-2015 (% of merchandise exports)



Source: World Bank *World Development Indicators*.

Discussion

- Capital inflows resemble natural resource windfalls in that both events flood the recipient country with easy money, triggering similar reactions among the natives
 - General euphoria
 - Real appreciation of the currency (Dutch disease)
 - Reckless public policies in the belief that anything goes
 - Rent seeking, even plunder
- Large capital outflows can be viewed as the Dutch disease in reverse, triggering an economic downturn and real depreciation of the currency

Discussion

Fini

- Iceland experience underlines essential complementarity of elasticities and asset market approaches to BOP and exchange rates
- Real depreciation boosts exports and reduces imports
 - In Iceland, no evidence of ‘elasticity pessimism’
- Króna rate rose sharply due to large capital inflows before the crash -- nothing to do with trade flows
- Thereafter, króna collapsed as capital flows were reversed, and tradables, especially tourism, became viable at last
 - Current account deficit turned quickly to surplus