Kiss Me Deadly:

From Finnish Great Depression to Great Recession

Appendices (For Online Publication)

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A Data

The dataset is of quarterly frequency and spans from 1Q 1986 until 4Q 2012. All series are stationary and, where appropriate, deflated by the GDP deflator. We use year-over-year (YoY) growth rates of the series, unless indicated otherwise.

External variables: To proxy world trade volume, we use the sum of global exports and imports. The deflator is the world GDP deflator. The data are from IFS. Finnish terms of trade is defined as price of exports divided by price of imports. Finally, the indicator of global stress that we use is the Composite Indicator of Systemic Stress (CISS), constructed by Holló, Kremer and Duca (2012). The index is constructed from 15 individual measures of financial stress, which mainly include volatilities of realized asset returns and risk spreads as well as measures of cumulative losses. These measures give rise to five subindices which describe five segments of the financial market: financial (bank and non–bank) intermediaries sector, money market, bond market, as well as equity and exchange rate markets. The CISS index then takes into account correlations between these markets and puts more weight on periods in which the stress prevails on many markets simultaneously to capture the degree to which the stress is systemic. Because of this feature, the series exhibits by far the most pronounced dynamics around the recent financial crisis and the subprime market collapse. Nevertheless, the series also picks up all major international financial events since the mid-1980s, including stock market crashes and crises. However, by construction, they are given much less weight. The indicator is used in levels. The data on CISS are available only from 1Q 1987 onwards. We extrapolate the CISS data backwards to 1Q 1986 using the Financial Stress Index (FSI), which was kindly provided to us by Selim Ali Elekdağ and Subir Lall.

New Keynesian VAR components: We use standard measures, i.e. growth rates of total GDP and of the GDP deflator. For the measure of credit market tightness we use (the level of) the spread between the lending rate on new non-financial loans and the nominal short-term interest rate (3M interbank rate).

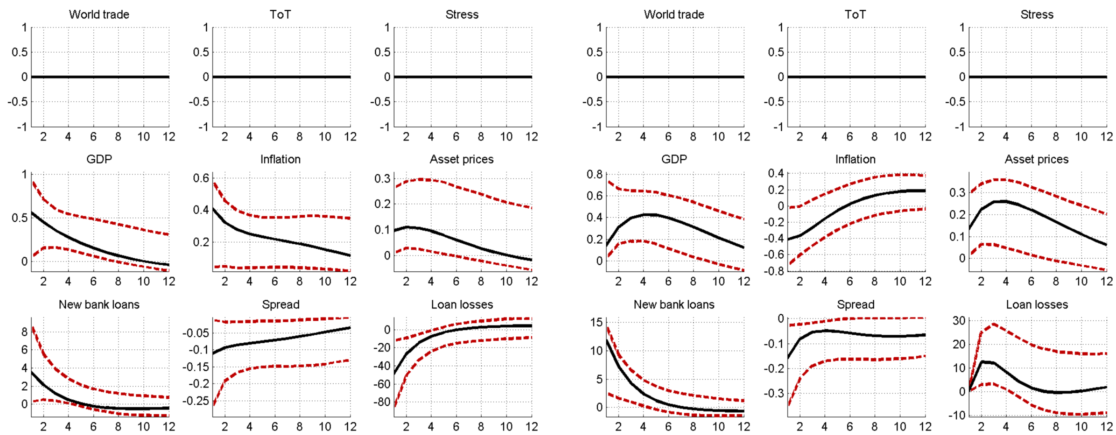
Financial variables: The final set of variables describes the Finnish financial sector. The series on asset prices is constructed for the purpose of this paper. It is the first principal component (PC) of stock– and house–price growth rates. The primary reason why we use the hybrid series is because treating the series separately increases the number of sign restrictions (and hence the computational burden) without helping to identify any of the shocks. Both series are normalized, i.e. divided by their standard deviations, before extracting the PC. This allows us to dampen the effect of the stock price series, which would otherwise dominate the PC due to its very high relative variance. Given that stock prices are more volatile by nature, a one percent increase in house prices may contain more economic information than a corresponding increase in stock prices. The stock market series is the capped OMXH index of the Helsinki Stock Exchange. The index is capped, which means that the capitalization of a single company cannot exceed a 10 percent share in the index. This allows us to mitigate the impact of Nokia and get a broader view of Finnish corporate performance. The house price index tracks the prices of old dwellings in the whole country.

Finally, we include two variables describing the lending market: real new loans to the private sector (households and non-financial firms) and the total loan loss provisions of the banking sector. The latter variable is differenced, not log-differenced, relative to the corresponding quarter of the previous year. This is to eliminate the strong base effect which occurs when the crisis explodes and boosts the growth rates to extremely lofty levels. We focus on new loans (flow) rather than the total loan pool (stock). Here, we acknowledge the argument of Geanakoplos (2010) that given a large existing volume of loans, the latter indicator will be changing very slowly and will not pick up major changes in lending conditions quickly. In that sense, new loans is a much more up-to-date barometer of the loan market, especially when combined with the interest rate spread for new loans. The data on loan losses are from Pesola (2011) and from Vihriälä (1997).

B Impulse responses

We now report the impulse responses for the benchmark model of the paper. Figure 1(a) reports the impact of a positive asset price shock. Black lines denote responses of the median model selected according to the criteria described in the paper. Dashed red lines denote 90 percent bands.[1]

[1] The bands were constructed pointwise (i.e. for every variable, shock and period), across all admissible structural models. The bands reflect both the standard sample uncertainty of the estimates of A and Σ, as well as model uncertainty related to the draws of Q. We generated 2,000 draws of (A, Σ) pairs and 10,000,000 draws of Q for each pair (times the permutations), which gave 3,973 models. As stressed by Fry and Pagan (2011) these bands should not be treated in a probabilistic sense (i.e. they are



(a) Asset price shock

(b) Loan supply shock

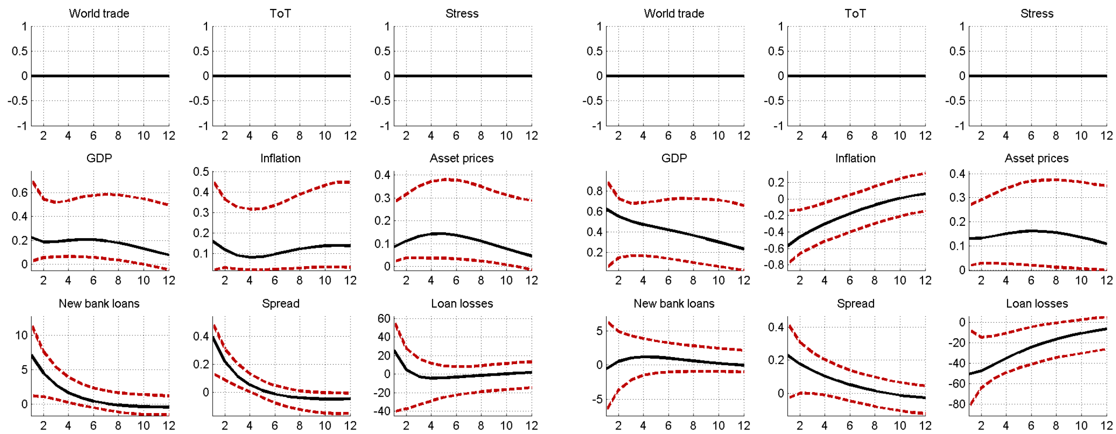
Figure 1: Impulse response functions following domestic financial shocks

Because of the exogeneity assumption, neither stress nor external demand are affected. All domestic variables are affected on impact, as the rotation matrix Q kills the Cholesky triangularity. Given our identification scheme, there's no uncertainty regarding the direction of the reaction on impact and three periods after the shock in any of the domestic variables. Yet, the magnitude of impact, persistence of the responses and the paths in latter periods are all unrestricted. An increase in the first principal component of asset prices of 0.096 percentage point translates into an increase in the stock price dynamics of 8.74 percentage points and in house price dynamics of 2.38 percentage points. Output dynamics (real GDP growth rate) increase by 0.56 percentage point on impact. Inflation goes up by 0.41 percentage point. The quantity of new loans goes up by 3.54 percentage points; however, the effect is relatively short-lived and largely dies out after a 6 quarters. At the same time, loan losses drop on impact by €$_{2000}$ 48.97 million per quarter. The gap between lending rates and policy rates shrinks by almost 11 basis points.

Next, consider a shock to the loan supply, reported in Figure 1(b). As implied by sign restrictions, output rises and the growth rate remains higher for at least 12 quarters. Asset prices behave in a very similar fashion. Loan losses are by construction not allowed to increase on impact. Instead, they rise in the following periods and die out within seven quarters after the shock, around the same time as the increase in new bank loans. The spread remains lower for at least three years, initially by around 15 basis points, and later by 5 points. Inflation is the only unrestricted variable in our identification scheme. The fact that it drops suggests that new credit has more of an effect on the supply side of the economy (entrepreneurs) than on the demand side (households).

not genuine confidence intervals). This is because each rotation comes from a uniform distribution and is equally likely. They merely illustrate the diversity of dynamics of admissible models.

Figure 2(a) shows the responses following a domestic aggregate demand shock. Real variables exhibit rather protracted reactions. Financial variables, on the other hand, are shorter lived and largely die out within a year after the shock. Loan losses, the only variable not restricted by sign, rise on impact. This suggests that the volume of new loans climbs enough to deteriorate the overall quality of loans. This effect initially dominates the positive wealth effects of stronger balance sheets and higher asset prices.



(a) Aggregate demand shock

(b) Aggregate supply shock

Figure 2: Impulse response functions following domestic real shocks

Following a positive supply shock, depicted in 2(b), a rise in GDP is accompanied by a decrease in prices. New bank loans actually drop somewhat on impact (although not much, and the 90 percent bands are very wide), but they start to grow in latter periods. This may suggest that firms initially use higher retained earnings to expand their assets but then also take out more loans. However, the interest rate spread widens already on impact.

In Figure 3 we report the reaction of the economy to the external stress shock. Because the stress shock is identified through exogeneity restrictions and Cholesky decomposition rather than by sign restrictions, there is no variation due to different rotations of Q.[2] As expected, domestic output declines following an increase in foreign financial stress. So does world trade, as well as domestic asset and goods prices. Weaker balance sheets raise loan losses. Interest rate spreads go up in total and new bank loans drop, although the initial reaction of these variables is somewhat counterintuitive.

Finally, we report the impulse responses to world trade and Finnish terms of trade shocks. Note that these shocks are only block-identified and their relative ordering is somewhat random.

[2]The construction of the 90 percent bands in Figure 3 reflects the fact that the stress shock is identified via zero rather than inequality restrictions, as was the case with the domestic shocks. Therefore these bands capture only the sampling uncertainty related to estimates of the A and Σ matrices.

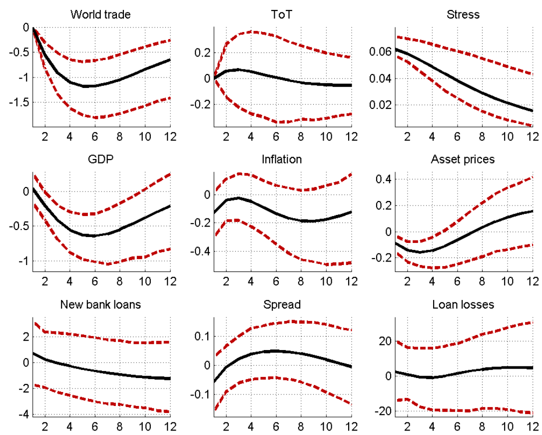
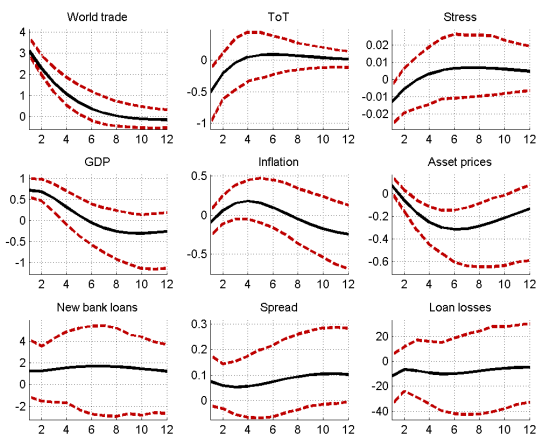
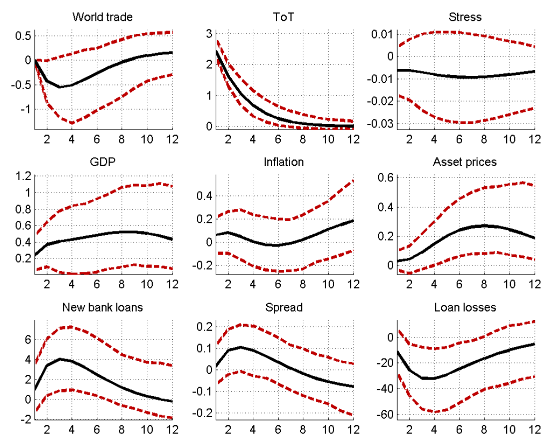


Figure 3: Impulse response functions following global stress shock



(a) World trade shock



(b) Finnish terms of trade shock

Figure 4: Impulse response functions following real external shocks

C Robustness checks

C.1 Estimation until 2004

We now report the results from models based on shorter subsamples. In the first check we use the subsample from 1Q 1986 until 4Q 2004. The results are plotted in Figures 5-7. This check assures that our conclusions are not driven by the financial crisis of 2007-2008 and the Great Recession. The historical decomposition is qualitatively very similar to the benchmark case and picks up the key episodes discussed in the paper, although here we see a stronger role for unidentified shocks. Also, the robustness check does not reveal any positive contributions of the stress shock during the early 1990s, as was the case in the benchmark. The sum of the negative shocks to world trade, terms of trade and domestic aggregate supply constitute 42.4 percent of all negative shocks between 4Q 1989 (first quarter of a fall in GDP) and 1Q 1993 (last quarter of a fall in GDP). In this timeframe domestic shocks constitute 29.4 percent of all negative shocks. For the period from 4Q 1989 to 4Q 1996 (when GDP reached the pre-crisis peak level), the shares are 34.5 percent and 35.8 percent, respectively.

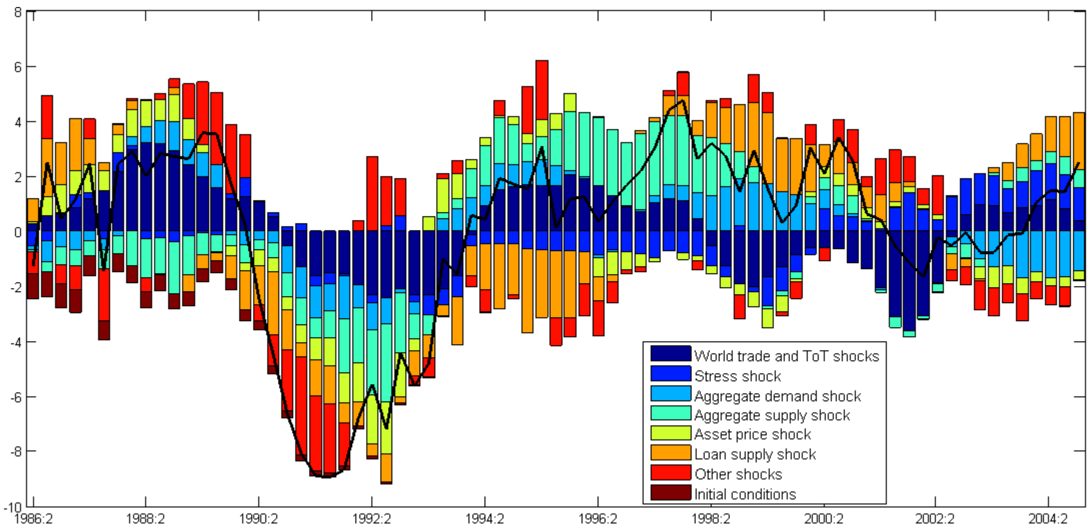


Figure 5: Historical decomposition of Finnish GDP growth rate.

Notes: The decomposition is based on the model estimated on sample 1Q 1986-4Q 2004.

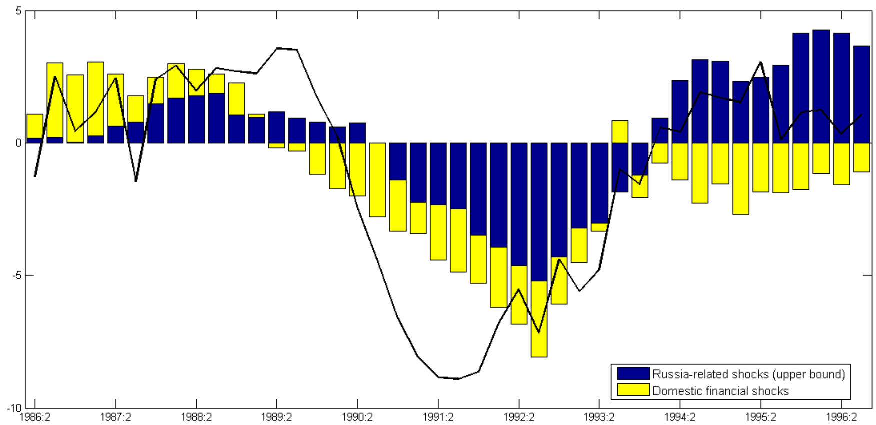


Figure 6: USSR-related versus financial shocks during the Finnish Great Depression.

Notes: The decomposition is based on the model estimated on sample 1Q 1986-4Q 2004.

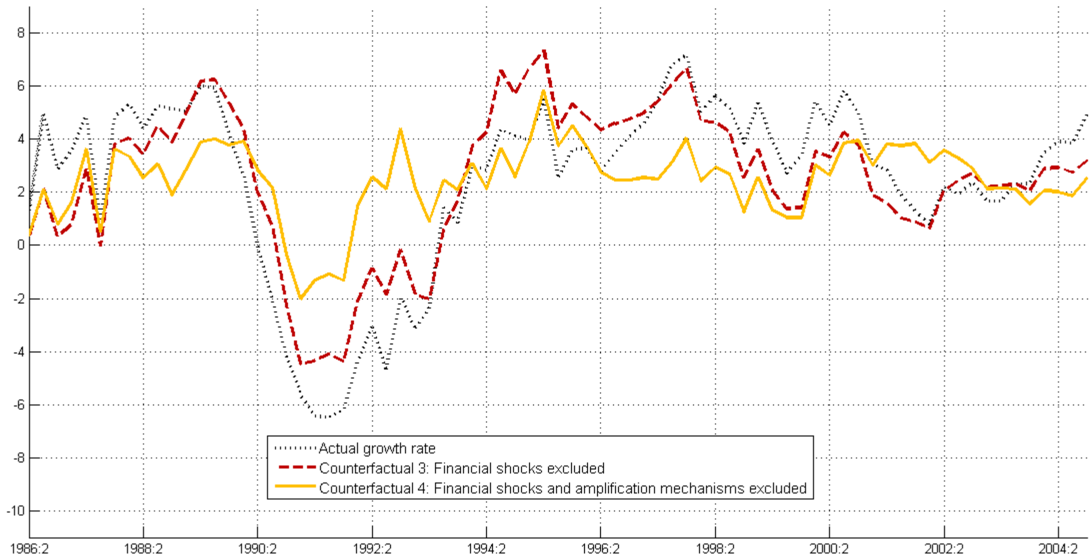


Figure 7: Contributions of different financial factors to the Finnish GDP growth rate.

Notes: The decomposition is based on the model estimated on sample 1Q 1986-4Q 2004.

C.2 Estimation until 1998

In the second robustness check we end the sample at 4Q 1998, to discard the period of membership in the Eurozone. The results are plotted in Figures 8-10. The picture is again qualitatively similar to both the benchmark case and the first robustness check. Between 4Q 1989 and 1Q 1993 the contribution of negative shocks to world trade, terms of trade and aggregate supply is 44.5 percent of all negative shocks, whereas for domestic financial shocks the number is 25.4 percent. Looking wider (from 4Q 1989 until 4Q 1996) the numbers are 40.7 percent and 27.5 percent, respectively.

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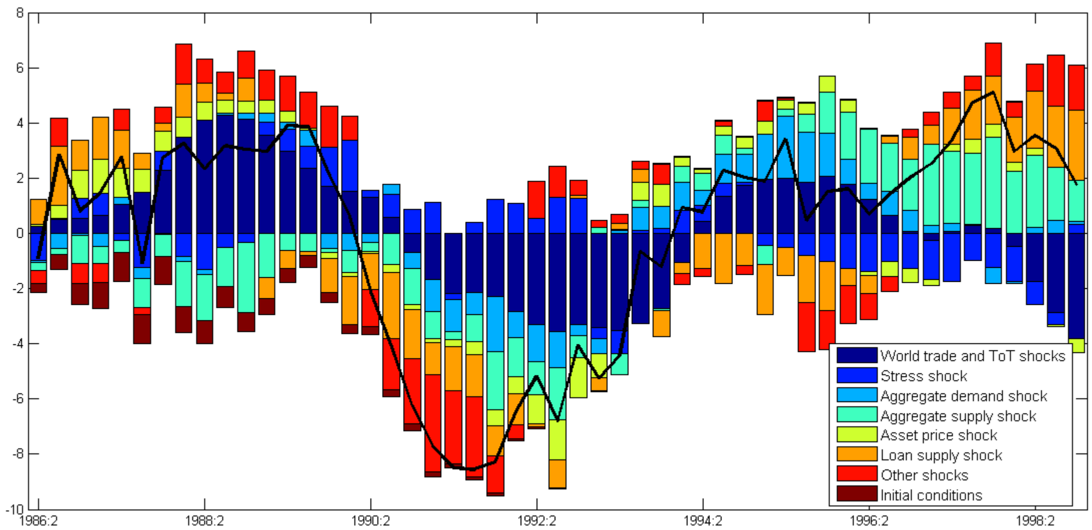

Figure 8: Historical decomposition of Finnish GDP growth rate.

Notes: The decomposition is based on the model estimated on sample 1Q 1986-4Q 1998.

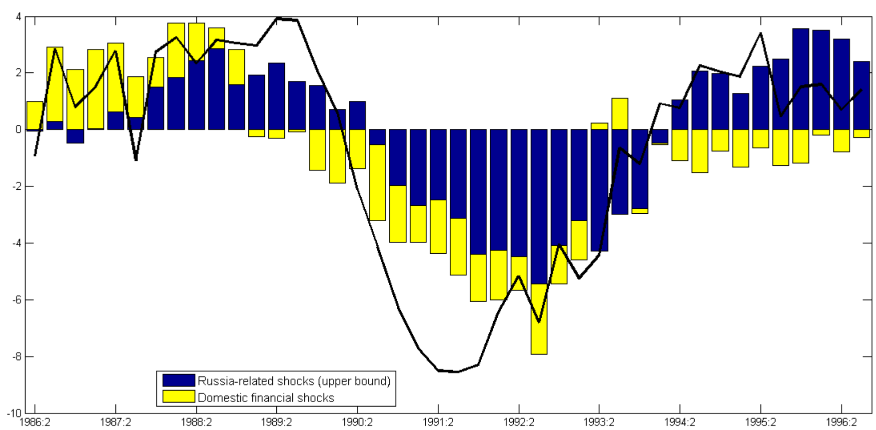

Figure 9: USSR-related versus financial shocks during the Finnish Great Depression.

Notes: The decomposition is based on the model estimated on sample 1Q 1986-4Q 1998.

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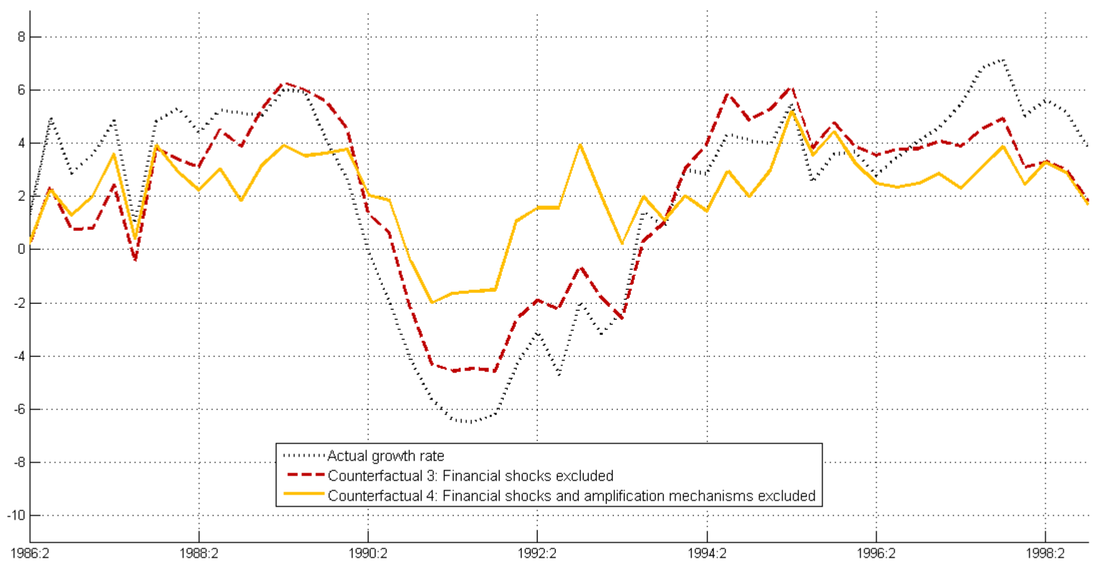

Figure 10: Contributions of different financial factors to the Finnish GDP growth rate.

Notes: The decomposition is based on the model estimated on sample 1Q 1986-4Q 1998.