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Title: Finland's great depression of the 1990s : Lessons about financial reform based on econometric macro evidence

Year: 2020

Version: Accepted version (Final draft)

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Please cite the original version:

Ahtiala, P., & Junttila, J. (2020). Finland's great depression of the 1990s : Lessons about financial reform based on econometric macro evidence. *Review of Financial Economics*, 38(S1), 188-209.
<https://doi.org/10.1002/rfe.1077>

**FINLAND'S GREAT DEPRESSION OF THE 1990'S:
LESSONS ABOUT FINANCIAL REFORM BASED ON
ECONOMETRIC MACRO EVIDENCE**

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July 12, 2019

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** Acknowledgements: We wish to thank the anonymous referee and the guest editor Mary Rodgers for useful comments that helped to improve the quality of our paper significantly.

Finland's Great Depression of the 1990's: Lessons About Financial Reform Based on Econometric Macro Evidence

Abstract

The paper re-examines the Finnish Great Depression of the 1990's, based on an open macro model, with specific dummy variables to identify the initial effects of liberalized financial markets and capital mobility, and of the Russian trade collapse. It is shown that the explosive credit expansion resulting from the simultaneous liberalization of the financial markets and international capital movements in 1986 has played the most important role in explaining the uncontrolled growth and the subsequent depression in 1989 in real economic activity in Finland. Their effects were strengthened by a vicious circle between the financial and asset markets. The Russian trade collapse in 1991 had a smaller partial effect on economic activity than did any other explanatory variable. The results suggest that some of the present day problems in the euro area, especially those occurring post-2008 in the 'Club Med' countries, are very alarming. In many cases, they are results of expansionary policies based on unsustainable capital imports, made possible by the introduction of the euro, and the consequences resemble in many ways those during the 1990's Great Depression period in Finland.

Keywords: Depression, Finland, Russian trade collapse, financial markets.

JEL Classifications: F41, F47, E37, E44

1. Introduction

During much of the 1990's, Finland was in the deepest depression in its history. In the words of Currie (1993) and Bordes *et al.* (1993), 'the Finnish economy has gone through an economic cycle, with boom and bust, of unusual ferocity.....' '.... in almost no other country has the amplitude of the cycle been so large.' Not only did its growth come to a halt, but the level of its GDP declined by 13%, and unemployment increased to 18 - 40%, depending on the definition. Twenty-one percent of the total number of firms failed and 23% of households faced debt delinquencies. The country was plunged into a serious banking crisis. The savings bank sector, with a loan market share of 25% in 1989, was all but wiped out, only a handful of banks with a share of 4% surviving. Eventually, all the banks resorted to state support. The banking sector's nonperforming loans were transferred to a junk loan institution, the cost of bank support amounting to 10% of the GDP (see Drees & Pazabasioglu 1998, and Nyberg & Vihriälä 1994). This 'unusual ferocity' makes the Finnish Depression 'unusually interesting', in offering potentially useful lessons to the governments contemplating financial reforms.

To understand the depression and learn from it, one must examine it in its proper context of the decisions and circumstances that led to it. Then one is led to events half a decade earlier, or to 1986, when Finland's domestic financial markets and international capital movements were liberalized almost simultaneously. This led to an uncontrolled monetary expansion in 1986. A boom followed, whose imbalances forced to a drastic monetary contraction and a bust in 1989. It was followed by an unanticipated collapse of Soviet trade as of the beginning of 1991, which hit the country in a vulnerable if not desperate state, determined by the consequences of the first two episodes. Consequently, the depression should be seen as the outcome of three, rather than one, major events.

Most of the models used to analyze the Finnish depression and similar disturbances have been based on the conventional Mundell-Fleming (M-F) macro model, which includes also the monetary and financial sectors. It focuses on a variety of aspects, including institutional and policy causes for the depression. For the Finnish economy, Ahtiala (1997, 2006) concluded that economic policy actions mainly in 1986-1989 and after, overlooked in most studies, were mainly responsible for the events that followed. Indeed, the consequences of the policy actions were of an entirely different order of magnitude than those of the Russian trade collapse after them. For other studies covering various aspects of the Finnish depression, see Jonung *et al.* (1996), Pazarbasioglu (1997), Vihriälä (1997), Honkapohja & Koskela (1999), and Jonung *et al.* (2009). All these papers are predominantly theoretical, accompanied by qualitative assessments regarding orders of magnitude and sometimes some mainly partial equilibrium or *ad hoc* -type econometrics. While looking reasonable, they are not the same as econometric testing based on a macroeconomic model.

The other approach is the fashionable Dynamic Stochastic General Equilibrium (DSGE) approach, which Gorodnichenko *et al.* (2012) use to analyze the effects of the third shock, i.e., the Soviet trade collapse in 1991 on the Finnish economy. It is built on explicit microfoundations.^{1 2}

[Table 1 about here]

While some of the above papers cover both the domestic policy and Russian trade-originated aspects, we are not aware of econometric studies of Finland's crisis based on a macroeconomic model covering the goods and money markets, and the balance of payments. In such a model, the effects of domestic policies and the Russian trade collapse interact to generate their effects on Finnish output in response to the changing institutional settings of the

period.

The purpose of this paper is to provide an econometric assessment of the quantitative effects of the partly overlapping domestic policies and Soviet trade collapse on Finland's output within the framework of a macroeconomic model. This is in fact necessary for a consistent assessment of the quantitative effects of the major exogenous factors, including their relative importance, along with a number of other possible forces. The story, which we will confront with the data and thus provide quantitative understanding is the following. In the initial conditions, or the situation before the boom years and the Soviet trade collapse, Finland's financial system was heavily regulated and bank-centered still in the first half of the 1980s. Nominal interest rates were kept low and stable by means of general interest rate ceilings, of the order of 7%, mandated by the central bank. This implied sharply negative real after-tax interest rates and a chronic excess demand for credit. International capital flows were strictly controlled by means of licensing (see Drees and Pazarbasioglu, 1998). Thus, there was no continuous market clearing up till 1986, and thereafter interest rates fluctuated over a range of some ten percentage points.

As argued by Ahtiala (1997, 2006), a fatal move was made in 1986, when the general interest rate ceilings were abolished almost simultaneously with the liberalization of international capital movements. The two liberalizations caused a massive capital inflow, leading almost to a doubling of the monetary base and the stock of domestic credit in three years. The outcome was the 'crazy years' in the words of the central bank governor, during which housing and equity prices nearly doubled and general inflation accelerated, causing a serious erosion of international price competitiveness. The boom turned into bust when the current account deficit and international indebtedness reached alarming levels at the end of the 'eighties and led to a drastic tightening of fiscal and monetary policies in 1989. Moreover, Soviet trade (the third factor) collapsed as of the beginning of 1991. Consequently, it coincided with the hangover from the boom that had started five years earlier.

To pursue our objective, we will employ a version of the Ahtiala (2006) macroeconomic model to obtain parameter estimates and their effects. This makes it possible to get a prediction on the partial marginal effect of each exogenous variable on output, as well as on those of their effects relative to each other. This enables focusing on how important a variable is relative to another, and how much it should change in order to neutralize the output effect of other variables both during and outside the collapse years. We will solve our model for a semi-reduced form and estimate the parameters on its explanatory variables. Specific control variables are employed for regime changes due to the liberalization of the credit markets

and international capital movements from 1987:I – 1998:IV , and the Russian trade collapse from 1991:I – 1992:IV, to account for the effects of these institutional constraints on the above variables.

The theory will be tested with a model explaining the changes in real economic activity in Finland based on the quarterly data from the period from 1980:I to 2005:IV. Based on the theoretical model, we will use variables capturing the monetary and fiscal policy actions, international price competitiveness, the import demand of industrial countries, and a proxy for real (housing) wealth³, along with exports to Russia, as the explanatory variables in our regression analyses^{4 5}.

It will be shown that the model's a priori propositions provide a credible explanation for the data, both controlling for the above collapse of the Soviet (Russian) trade, and for those of monetary and fiscal policy actions, as well as without the controls. Indeed, fiscal and monetary policy actions will turn out to be the strongest explanatory variables for Finnish output during the period in both cases. In addition, domestic credit and real wealth, and changes in industrial country imports will also be revealed to have been important. And the process was set in motion in 1986, sparking off an uncontrolled boom. The 1990's saw only the bust side of the development.

The interaction between domestic credit and real wealth (proxied in our analysis by housing wealth) will turn out to constitute a potentially dangerous accelerator mechanism. The chronic excess demand for credit in the initial situation meant that there was considerable unsatisfied potential demand particularly in the asset markets due to the poor availability of credit. The two liberalizations led to a sudden drastic increase in domestic credit and turned potential buyers into actual buyers. Given that the annual additions to the physical housing stock are a low percentage of the existing stock (i.e., our proxy for the real assets), this led to a rise in the prices, and hence, in the real value of the housing stock, which in turn led to an increase in expected future house prices. This led yet to another increase in prices, continuing the spiral of self-fulfilling expectations, until either the bubble burst, ran out of steam, or credit dried up. The increase in perceived wealth also fed back to the aggregate demand, and strengthened the effect of the original disturbance on total output. The converse worked in response to a sudden drastic tightening of credit later, because agents' balance sheets were stretched due to asset purchases at inflated prices during the boom. The tightening led to a decline in the prices, causing collateral problems, fire sales, defaults, and bankruptcies, feeding on itself. In short, the liberalization of the financial markets simultaneously with capital flows emerged as an important culprit of the boom and the depression, magnified by the financial

accelerator.

The effects of the Russian trade collapse will turn out to have been relatively modest in comparison. It lasted a relatively short time, the decline for two years, growth starting around the end of the second year, and the pre-collapse level being reached again after another four years. While it hit hard the industries heavily dependent on the Russian market, its effect on the Finnish economy as a whole was limited. Accordingly, a change in exports to Russia by one standard deviation will be found to have had a smaller partial effect on economic activity than did that of any other explanatory variable in all the models examined. The same holds when shocking the explanatory variables by one percentage point change. Thus, the effects of the liberalization, strengthened by the accelerator, were much stronger by this measure than those of the Russian trade collapse. Furthermore, the real exchange rate will turn out not to have been a statistically significant argument.

In the following, we will interpret the working of the economy before, during, and after the reform. Our paper is structured as follows. Section 2 outlines a view of the effects of the “big picture” in terms of our macroeconomic model, deriving the general theoretical propositions of the output effects of the disturbances of our main interest. A brief account of the events in Finland during the period is given in Section 3. The predictions of the theory are empirically tested in Section 4, and the results discussed in Section 5. Finally, Section 6 gives the conclusions, extending them to the discussions on economic reform policies in general. In the online Appendix 1a, the theoretical policy effects behind the quasi-reduced-form model of Sections 2 and 4 are derived in greater detail. The financial accelerator is formally derived in online Appendix 1b. Finally, online Appendix 2 reports some of our empirical results not reported in the main text.

2. The Model

Examine an economy consisting of heterogeneous individuals interacting directly and consciously through mechanisms like trading, the passage of information, the building of reputations, organizing into groups for purposes of bargaining etc., while respecting their budget constraints. This guarantees well-behaving aggregate demand and supply functions, as shown by Grandmont (1991). For parsimony, we will use a static extended Mundell-Fleming (EMF) flow equilibrium (intermediate-term) model of a small open economy, supplemented by the wealth effect, plus a few adjustments required by consistency according to the principles standard in closed-economy macro theory (for an analysis of a dynamic EMF model with perfect foresight rational expectations, see e.g. Ahtiala, 1998). We have:

$$\begin{aligned}
Y &= E^* \left(Y, r, V \right)_{+,-,+} + T_0 + T^* \left(E^*, \frac{P^D}{e} \right)_{-,-} + G(-A) \\
&= E^* \left(Y, r, V \right)_{+,-,+} + T_0 + T^* \left(Y, e \right)_{-,-} + G(-A)
\end{aligned} \tag{1}$$

$$M = M_{-1} + \Delta D + \Delta R = L^* \left(\frac{P^D Y}{P}, r \right)_{+,-} P = L \left(Y, r, e \right)_{+,-,+} \tag{2}$$

$$\begin{aligned}
\Delta R &= \left[T_0 + T^* \left(E^*, \frac{P^D}{e} \right)_{-,-} \right] P^D + K(r - r^F_+ - \dot{e}^\varepsilon) \\
&= \left[T_0 + T(Y, e)_{-,-} \right] P^D + K(r - r^F - \dot{e}^\varepsilon)
\end{aligned} \tag{3}$$

$$P \equiv aP^D + (1-a)e, \tag{4}$$

where the signs below the arguments refer to the assumed signs of the respective partial derivatives.

Equation (1) is the goods market equilibrium condition, where total output (Y) equals aggregate demand for the domestic goods. The latter is the sum of private expenditures (E^*), the trade balance ($T_0 + T^*$), and government expenditures (G), minus the amount of total demand eliminated by credit rationing (A) in the interest rate ceiling case, all in terms of the domestic good prices (P^D). Expenditures are a function of income, the domestic interest rate (r), and real wealth (V). The V is treated as exogenous for simplicity.

The trade balance with industrial countries (T) is specified as a function of expenditures, part of total expenditure being spent on imported goods. This deviates from the conventional specification with only income as an argument. That specification implies that all of an expenditure change, due to a change in the interest rate or real wealth, falls only on domestic goods, whereas that caused by an income change falls on both domestic and imported goods. The other argument in the trade balance function is the real exchange rate, where (e) is the price of foreign currency in terms of domestic currency. Foreign goods prices in terms of foreign currency are fixed at unity⁶. The T_0 in the trade balance is the exogenous bilateral trade with the Soviet Union (T_0).

The amount A is the excess demand for goods at the ceiling rate. When the interest rate ceiling is effective, it is rationed out based on credit rationing by banks. The A is thus the part of ‘credit rationing’ in the general sense, which is due to the interest rate being rationed below its equilibrium value. Then r is exogenous and A is endogenous. When the

interest rate is free, and thus at its market-clearing level, notional demand equals effective demand and A is zero. Finally, we assume that the government purchases only domestic goods. We will later return to their quasi-reduced forms below the equations.

Equation (2) is the money market equilibrium condition. The nominal money supply M equals its value at the end of the previous period M_{-1} , plus the current period's change in the central bank's foreign exchange reserves (ΔR) and in its "bond" portfolio (ΔD). Since cash is held to buy both domestic and imported goods, but not exported goods, real balances (M/P) have to be defined in terms of the expenditure price (P), as is widely accepted. However, then the real activity variable in the money demand function (L^*) has to be expenditures, and in terms of the same goods, since otherwise velocity would not be a pure number, as proposed in Ahtiala (1984). Substituting the expression for expenditures into the money demand function makes the demand for real balances a function of income and the interest rate r . We will abstract from the effect of the excess demand for goods (A) on the demand for real balances under the interest rate ceiling for simplicity. However, in the real wealth argument of the expenditure function, time deposits, which are part of "bonds" (the implicit market), dominate money as an asset to hold. Therefore, wealth does not belong into the demand function of transactions balances. (For empirical evidence, see Goldfeld (1973) and Ando and Shell (1975)).

Equation (3) expresses the balance of payments as the sum of the nominal trade balance and capital flows (K), where the latter are a function of the difference between the domestic interest rate on the one hand, and the sum of the exogenous foreign interest rate and the expected depreciation of the exchange rate (\dot{e}^e), on the other. Of course, the equilibrium condition for the foreign exchange market does not necessarily require it to clear in flow equilibrium, but ΔR can be different from zero, given an exogenous e .

In Eq. (4), the expenditure price is a weighted average of domestic and foreign goods prices. We will leave out the supply side equations for simplicity, and thus treat the domestic goods price (P^D) as exogenous.

The initial values of e , P^D , and thereby P , are set to one by an appropriate choice of units. Since Finland was in a fixed exchange rate regime before 1993, we will analyze this regime for simplicity, its purpose being to provide theoretical predictions for the qualitative effects of the arguments. The policy effects under flexible exchange rates can be solved from Eq. (5) below. It shows that several of the income effects are qualitatively similar to those of a fixed rate regime⁷. (This simplification does not as such, of course, apply to the empirical model.) Substitution of equation (4) into Eqs. (1), (2), and (3) yields their quasi-reduced forms, shown on the right, in Y , r or A , ΔR , and exogenous variables. There, we have simplified the

trade balance equation by ignoring the effects of r on T through expenditures. This leaves the qualitative conclusions unaffected.

Most of the new partial derivatives are unambiguous, as can be seen from Notes iii, and iv of the online Appendix 1a, where the partials have been derived and interpreted (the X_i denoting the partial of variable X with respect to i). The partial derivative E_Y in Eq. (1) is assumed to remain positive and smaller than one, as is customary. The T_Y is negative, and L_Y is positive. The L_e is positive in the real wage model (the supply of labor a function of the real wage). In the money wage model (the supply of labor a function of the money wage), it is positive, zero, or negative depending on whether the income elasticity of the demand for money is smaller than, equal to, or greater than unity.

Total differentiation of the model given in equations (1), (2), and (3) yields an equation of the form of Eq. (5), for the market-determined case, and Eq. (6) for the interest rate ceiling case, observing that $T = 0$ in the initial stationary state equilibrium. In the former (latter), the equilibrium is stable, assuming that, all else equal, excess demand on the goods market leads to a rise in output (excess demand), that on the money market to a rise in the interest rate (fall in output), and a balance of payments surplus to an increase in foreign exchange reserves, as the reader can readily verify. Thus, in the adjustment equations, the first row has signs opposite to those of Eqs. (5) and (6), which makes the trace and the determinant of its endogenous-variable coefficient matrix negative.

$$\begin{bmatrix} z & -E_r & 0 \\ L_Y & L_r & -1 \\ T_Y & K_r & -1 \end{bmatrix} \begin{bmatrix} dY \\ dr \\ d\Delta R \end{bmatrix} = \begin{bmatrix} dG + dT_0 - T_{PD/e}de + (1 + T_E)E_VdV \\ d\Delta D - L_e de \\ -dT_0 + T_{PD/e}de - T_E E_V dV \end{bmatrix} \quad (5)$$

$$\begin{bmatrix} z & 1 & 0 \\ L_Y & 0 & -1 \\ T_Y & 0 & -1 \end{bmatrix} \begin{bmatrix} dY \\ dA \\ d\Delta R \end{bmatrix} = \begin{bmatrix} dG + dT_0 + (E_e + T_e)de + E_r dr + (1 + T_E E)E_V dV \\ d\Delta D - L_e de - L_r d\bar{r} \\ -dT_0 - T_e de - K_r d\bar{r} - T_E E_V dV \end{bmatrix} \quad (6)$$

where $z \equiv 1 - (1 + T_E)E_Y > 0$; $E_r \equiv (1 + T^*_E)E^*_r < 0$; $K_r \equiv T^*_E E^*_r + K^*_r > 0$;

$T_Y \equiv T^*_E E^*_Y < 0$; $T_e \equiv -T_{PD/e} > 0$, $L_e \equiv (1 - a)(L - L_Y Y) > 0$. The asterixed symbols refer to the original model, and the others to their semi-reduced expressions. This yields the effects on output in the market-determined and the interest rate ceiling cases, respectively:

$$dY = \left(\frac{1}{D_2}\right) \{(K_r - L_r + T_E E_r) dG + (K_r - L_r - E_r) dT_0 - (1 + T_E) E_r d\Delta D + [T_e (K_r - L_r - T_E E_r) - E_r (1 + T_E) (T_e + L_e)] de + [(K_r - L_r) (1 + T_E) E_V] dV\},$$

where

$$D_2 \equiv (K_r - L_r)z - E_r((1 + T_E)L_Y - T_E) > 0 \text{ or } Y = Y\left(\underset{+}{G}, \underset{+}{\Delta D}, \underset{?}{e}, \underset{+}{T_0}, \underset{+}{V}\right).$$

The policy effects under market-determined interest rates are displayed in Table 2. There, the determinant D_2 is positive, as implied by the necessary condition for the stability of the equilibrium. The effects of fiscal and monetary expansion are standard: a rise in income and a trade balance deficit, the interest rate rising in response to fiscal, and declining in response to monetary expansion. Monetary expansion also leads to a balance of payments deficit, while fiscal expansion does likewise if the LM curve is flatter than the BP curve ($L_Y K_r - L_r T_Y < 0$) and *vice versa*. As these effects are well known, we can keep the discussion brief. Moreover, T_0 (bilateral trade with the Soviet Union) has a positive effect on Y , and an increase in e (real exchange rate) is expansionary on the sufficient condition of $-T_E < 1$. An increase in V (real wealth, proxied by housing in our empirical analyses) is expansionary. (Note that in Table 1, we have abstracted from the effects of expenditures on the trade balance (T_E) in order to keep the expressions simple and provide an overall view of the effects. The key expressions for output, Eqs. (7) and (8), are displayed with these effects.)

[Table 2 about here]

An exogenous increase in exports to the Soviet Union/Russia (dT_0) leads to an increase in output under market-determined interest rates. The trade balance and the balance of payments improve on the sufficient condition of $z + T_Y > 0$. Its effect on the interest rate depends on the change in output, which increases the demand for money, whereas the possible balance of payments surplus causes the money supply to increase. Hence, the interest rate increases if the former effect dominates, and *vice versa*. We will not discuss these at length, as their interpretations are quite straightforward. It is of interest that the expression for the income effect equals the sum of dY/dG and $dY/d\Delta D$. The reason is the following. An increase in government expenditures (dG) leads to an increase in the interest rate, since it is financed with “bond” issues (causing a consequent crowding out of private expenditures). An increase in exports also leads to an increase in foreign exchange reserves and thereby the money supply.

Compared to the government spending increase, the difference is thus equivalent to a monetary expansion, which is reflected in the expressions for dY/dT_0 and dr/dT_0 .

An increase in real wealth leads to an increase in private expenditures by factor E_V times the following. Aggregate domestic demand (Y) increases by factor $(1+T_E)$ times the effect of any domestic demand component like government expenditures (dG), minus the effect of the monetary tightening due to the increase in import demand, or $T_E dAD$, both leading to an increase in the interest rate. Its effect on the balance of payments consists of two components. The first is positive (negative) on the same condition on which any increase in a domestic demand component like government expenditures leads to a balance of payments surplus (deficit) and reflects the effect of domestic demand on the balance of payments. The second component reflects the effect of the increase in economic activity on domestic import demand. It is a function of the response of the demand for money and expenditures to the increase in the interest rate, and thus has a negative effect on the balance of payments.

Consequently, during the period under study, Finland had two policy regimes. Until the end of 1985, the country had general interest rate ceilings, with capital movements subject to strictly enforced licensing. Early in 1986, both the interest rate ceilings and the restrictions on capital movements were dismantled.

The basic features of the model can be illustrated with the familiar IS – LM diagram. As seen from Eq. (5), given the top row of the exogenous-variable matrix, an increase in the interest rate must be accompanied by a decline in income for the top row, or Eq. (1) to hold, giving the *IS* curve a negative slope. Correspondingly, an increase in income must be accompanied by an increase in the interest rate for the second row, or Eq. (2) to hold, giving the *LM* curve a positive slope. Likewise, it can be seen that an increase in government expenditures (G) and real wealth (V) shift the *IS* curve to the right and *vice versa*, while an increase in the central bank bond portfolio (AD) and foreign exchange reserves (AR) shift the *LM* curve to the right.

We have not drawn the balance of payments (BP) curve (third row and Eq. (3)), nor the movements of the curves in the Figure 1 for clarity, since the analysis is a comparative-static flow equilibrium one. We will limit the illustration to the fixed exchange rate case, which was the regime of most of the events studied. The flexible rate case, in effect after the main events from late 1992 to 1998 (as a dirty float, though) can easily be derived from Equation (5).

[Figure 1 about here]

In the absence of interest rate ceilings, the equilibrium point is at the intersection of the IS and LM curves at output Y_1 and interest rate r_1 . To see how the problem situation evolves, first let the central bank stipulate only that the highest legal interest rate is \bar{r} . At this interest rate, the goods market equilibrium at the intercept of the IS and \bar{r} curves would imply a national income at Y_2 , whereas the money market equilibrium at the intercept of the LM and \bar{r} curves would imply an income at Y_0 in Figure 1. Thus, the part $(Y_2 - Y_0)$ of the demand for goods could not be financed. However, if the international interest rate were equal to \bar{r} and the supply of foreign capital perfectly elastic, the gap would be financed with capital imports (K). Alternatively, the central bank could supply the funds by open market operations (ΔD). Both would shift the LM curve to the right. This would be inflationary if the initial situation was optimal. Therefore, effective interest rate ceilings require that these sources of funds be controlled. In this case, the simultaneity of the model breaks down: The goods market equilibrium output Y_2 would be the notional, and the money market equilibrium Y_0 the effective output, the difference being eliminated by credit rationing by banks. This produces a unique equilibrium at Y_0 . The dA is thus the part of ‘credit rationing’ in the general sense of the term that results from the fact that the interest rate is rationed below its equilibrium level (and capital flows exogenous, being subject to licensing.) The shadow interest rate is r_0 . In this regime, \bar{r} , ΔD , K , and e are the central bank’s policy instruments. The policy effects on effective output in the rationed regime are given by Eq. (8).

Under effective interest ceilings, the output effects are:

$$dY = (1/D_3) [d\Delta D + (T_e - L_e)de + (K_r - L_r)d\bar{r} + dT_0 + T_E E_V dV] \quad (8)$$

$$\text{where } D_3 = L_Y - T_Y > 0; \text{ or: } Y = Y \left(G, \Delta D, e, \bar{r}, T_0, V \right).$$

That is, fiscal policy is ineffective and monetary policy effective. Devaluation has an expansionary effect on output if its direct effect through the trade balance dominates that through the demand for money and vice versa. An increase in the ceiling rate has an expansionary effect on output, as does an increase in exports to Russia. That in real wealth (V) has a small contractionary effect on output due to an increase in imports and thereby decline in foreign exchange reserves.

In the regime under an effective general interest rate ceiling, fiscal expansion (or a sterilized increase in the trade balance, including exports to Russia, all else equal) shifts the

IS curve outward to the right. Notional demand increases to the intersection of the new IS curve and the \bar{r} curve, whereas effective demand remains unchanged, since the LM curve remains put: government expenditures fully crowd out private expenditures, because the money supply, and the quantity of money demanded, are unchanged. Monetary expansion (by central bank bond purchases or a balance of payments surplus via capital inflows) shifts the LM curve outward, which expands effective demand to the intersection of the new LM curve and the \bar{r} curve. It is thus particularly effective in affecting the demand for output, as long as the ceiling is effective (see Eq. (A13) in online Appendix D): Finally, an increase in the ceiling rate \bar{r} has an *expansionary* effect on output by reducing the quantity of money demanded.

The removal of the interest rate ceiling (as in 1986 in Finland) makes r a free price so that the equilibrium now moves from the initial output Y_0 to the intersection of the IS and LM curves at Y_1 , as stated. The effects of fiscal and monetary expansion are standard in this regime: a rise in output and a trade balance deficit, the interest rate increasing in response to fiscal, and declining in response to monetary expansion. Monetary expansion leads also to a balance of payments deficit, while fiscal expansion does likewise if the LM curve is flatter than the BP curve (not shown), and *vice versa*. As these effects, save for the last one, are well known, a brief discussion will suffice. As seen, when the general interest rate ceiling is removed, the rules of the game change significantly: not only is there a one-off shift from Y_0 to Y_1 , but the policy effects change, too.

They change even more significantly if international capital movements are liberalized at the same time, with the foreign interest rate at \bar{r} . Now the joint effect of the two liberalizations is to move to an equilibrium at the intersection of the IS and \bar{r} curves at Y_2 : expansionary if the international interest rate is below the domestic shadow rate r_0 , and contractionary if above it. (In the latter case, the output effect of the capital outflow in response to the liberalization of capital movements dominates that of the removal of the interest rate ceiling.) Examining the case of $r_F < r$ (where r_F is the international interest rate) is relevant here, where the two effects strengthen each others' effects. Monetary policy is now ineffective and fiscal policy very effective, capital movements accommodating any excess demand or supply of money at the international interest rate.

The K has now become endogenous. If $K(r - r_F - \dot{e}^e)$ in Eq. (3) is left at a high value, its initial effects can be approximated by taking the limiting values as $K_r \rightarrow \infty$. The policy effects in this regime are displayed in Eq. (9), or at the intersection of the IS and r_F curves in the Figure. The intercept shown at $Y = Y_2$ would be reached if $r_f = \bar{r}$ and $\dot{e}^e = 0$. Hence, at

this point

$$dY/dG = 1/z; \quad d\Delta R/dG = L_Y/z > 0; \quad \text{and} \quad dY/d\Delta D = 0; \quad d\Delta R/d\Delta D = -1. \quad (9)$$

Later, when the actual foreign capital stock approaches its equilibrium value, and/or exchange or credit risk become a factor, $K(r - r_F - \dot{e}^e)$ declines, making the policy effects approach those in Table 2.

3. The Events in Finland: An Interpretation

This section shows the Finnish events in a broad outline. The reader is referred to Ahtiala (2006) for a more detailed account. Finland's price competitiveness eroded throughout the first half of the 1980s. It soon became evident that the country had problems with the current account of its balance of payments: in 1985, at the best point of its current account cycle, it barely attained equilibrium.

The origins of Finland's great depression date back to 1986 (rather than just the 'nineties), when the Bank of Finland abolished the general interest rate ceiling a couple of months before liberalizing international capital movements in the above excess demand situation. In addition, the liberalizations were carried out without the preparatory measures of bank legislation and supervision, which created further opportunities leading to an increase in adverse selection and moral hazard. The two liberalizations caused a massive capital inflow, leading almost to a doubling of the monetary base and the stock of domestic credit in three years. The outcome was the 'crazy years' in the words of the central bank governor, during which housing and equity prices nearly doubled and general inflation accelerated, causing a serious erosion of price competitiveness (see Table 1, and for more details, e.g. Ahtiala 2006, and some of the other writings cited earlier).

In 1989, it was realized that the current account was out of control, which led to a sharp monetary tightening. This situation caused a leftward movement of the LM curve, which had become upward-sloping because of exchange rate and credit risks on account of accelerating inflation and the current account deficit. It caused the overnight interest rate to increase by six percentage points to 16% in three quarters, of which almost four points took place during the last quarter alone. Such an abrupt tightening was particularly harmful in this economic condition, since the preceding 'crazy years' had left the banks and their customers vulnerable with stretched balance sheets. The ensuing decline in aggregate demand (followed

by a tightening of international demand due to the German reunification in 1990; a leftward movement of the IS curve) led to, and was further aggravated by, a sharp fall in asset prices (eventually by almost 40 percent; see the online Appendix 1b), and, later, by the initial impacts of the devaluations.

When the economy was in a "free fall" as a result, fiscal policy was tightened (another leftward movement of the IS curve), which, combined with tight money and an overvalued exchange rate, deepened the decline in the real economy. The two-year collapse of Soviet trade in 1991 and 1992 had a qualitatively similar effect, but it looked modest in comparison, its two-year total being smaller than the smallest annual current account deficit in 1987- 1990 (see Table 1), and the latter did not cause anxiety.

4. The Evidence

We have argued on the basis of a theoretical model and the observations based on the actual data that:

- The liberalization of Finland's domestic credit market (in a sizeable initial excess demand situation due to an effective interest rate ceiling) almost simultaneously with that of international capital flows in early 1986, led to a massive inflow of foreign capital, given that the international interest rates were close to the Finnish ceiling rate. This caused several monetary aggregates and asset prices to almost double in three years, and output, the general price level, and the current account deficits to increase sharply (see Table 1).
- Concern over the current account deficits led the central bank to tighten monetary policy drastically in 1989, causing asset prices to decline by almost 40% by 1992, and economic activity by 14% in 1991. This led to failures of banks (a fifth of the total by market share, the rest resorting to government bailouts) and their clients, and to a rise in unemployment from 3.5% in 1989 to 18% in 1994. Its effects were aggravated by the vulnerability of agents due to their leveraged balance sheets and exposure to interest rate and exchange rate risks accumulated during the crazy years.
- The collapse of exports to the Soviet Union/Russia in 1991 and 1992 added to the misery, but its two-year total was 1.9% of the GDP, or of the same order of magnitude as the smallest annual current account deficit in 1987-1990. Therefore, its impact was limited in comparison to the above effects, had the economy been in

its “normal” condition. Moreover, the Russian trade collapse reversed itself, exports doubling in 1993 and almost reaching its 1990 level in 1996 (see Table 1).

Hence, based on our theoretical macro model and the actual observations from the Finnish economy, we perform our empirical analyses using the following set of variables as the variable vector of interest. The main variable of interest to us is the change in the real economic activity, and we analyze the quarterly change in the log of real GDP (in %). Our theoretical model implies that one of the main explanatory policy variables should be a measure for the fiscal policy actions, and we will use the change in the Blanchard Fiscal Impulse proxy (explained in detail in the next section) for this part. In addition, as also implied by the model, we especially want to reveal the role of domestic credit market expansion that resulted from the liberalization of financial sector, so the change in the log of real domestic credit will be used, too. Third, based on the extended Mundell-Fleming model, the real effective exchange rate should have a role to play in our analysis, too. Furthermore, we have also proposed that the real imports by industrial countries and the Finnish real exports to the Soviet Union should have (separate) roles to play in these analyses, so measures for them are included in the empirical models. Finally, we want especially to pay attention also to the role of housing market boom and monetary policy actions, so the proxies for these variables (i.e., the housing market index and M2) are also included to the basic representation of our empirical model as explanatory variables. Based on the standard open economy macro model discussed above, all these variables have a solid theoretical background to be included to the empirical analysis of the Finnish great depression of the 1990's.

However, before proceeding to the empirical analysis, we must remember that the reform of 1986 changed the characteristics of the Finnish economy considerably, which may be reflected in the parameter values of the model. Due to the obvious possibilities of structural changes affecting the empirical parameter estimates of our model, we will start the regression analysis using a recursive OLS estimation procedure, with heteroskedasticity and autocorrelation corrected standard errors. For the sake of robustness, we will also analyze the subsamples of our data set separately, one ending in 1986, and the other starting from 1987, i.e., the beginning of the quotation of the money market (Helibor) interest rates. However, the specific economic policy changes, like the adjustment period to liberalized financial markets and free international capital movements in 1987:I – 1998:IV will be captured by specific separate dummy variables. A similar dummy is used to cover the collapse of the bilateral trade with the Soviet Union in 1991-1992. As of 1999, the third stage of EMU was launched, when euro became the currency of accounting, leading to a full euro standard in 2002. Monetary

policy decisions were now made in Frankfurt. Since this was now a new ball game, we will not extend our sample beyond 2005⁸.

The wide swings in the values and the roles of various price variables lead us to use mainly quantity variables to represent the phenomena of our interest. For parsimony, we will use the exogenous variables as explanatory variables as follows. The reduced-form specification (excluding the time subscripts) of our empirical analysis is of the form:

$$Y = f\left(\frac{M_2}{P^D}, \frac{C^D}{P^D}, BFI, \hat{e}_R, \frac{I_{IND}}{P^D}, T_0, V\right) \quad (I)$$

where the dependent variable is the real output (Y). Of the explanatory variables, the money supply variable M_2/P^D is a monetary aggregate (in real terms). It is based on the conditions in the money market, or the sum of the central bank's bond portfolio (ΔD) and its foreign exchange reserves (ΔR), and the quantity of money demanded (Eq. 2 above). P^D is the price level of domestic goods. This specification can also be used to cover the rationed case, as was described in Figure 1.

We will also use the broader measure of real domestic credit (C^D/P^D) (which includes e.g. claims on non-banking institutions, other companies, and the public sector, in addition to M_2) as an explanatory variable to reflect the fact that these institutions also participated in the credit expansion process. The liberal availability of funding after the liberalization of the credit market and international capital movements gave also these institutions an incentive to compete and innovate, leading many financial institutions to pursue interest earnings, whose price could now be set to reflect the riskiness of the loan and the absence of non-interest earnings. Before the liberalization of markets, the leading variable was these very earnings: expected deposits and commissions for banks and insurance business for insurance companies. These institutions were important especially for small businesses and homebuyers, for whom financing had been a bottleneck, because under interest rate ceilings, they were not the priority borrowers for banks. Moreover, banks were constrained by tighter regulation *i.a.* in regard to their risk exposure, including collateral requirements.⁹ In addition to these important financial market-related variables, the Blanchard fiscal impulse variable, as a percentage of the GDP, (BFI) accounts for discretionary fiscal policy.

The next argument in our empirical specification (I) is Finland's real exports to the Soviet Union/Russia (T_0), observing the bilateral barter nature of the trading arrangements in effect up till the end of 1990. They are basically exogenous, because their overall level was determined in bilateral negotiations, often affected by political considerations. The value of

imports, mainly energy products, was determined by the bilateral trade balance constraint, or *vice versa*. We assume for simplicity that in those days Finland imported all its oil from the Soviet Union and that the substitution elasticity was low in the short run. Then an increase in the world market price of oil leads to a decline in Finland's real GDP.¹⁰ Analogously to monetary and fiscal policies, we will use specific dummy variables to capture the collapse of Soviet/Russian trade in 1991:I – 1992:IV, because exports to Russia resumed growth in 1993.

Finland's trade with industrial countries (T) was an endogenous variable in part 2, and we will go behind it as follows. Since Finland's trade is also a function foreign countries' policy measures, it can be expressed as these countries' total imports, of which Finland's share is a function of its price competitiveness. The former can be conveniently expressed with I_{IND}/P^D , where I_{IND} is the said nominal imports. The latter can be proxied with its (trade-weighted) real exchange rate: $\hat{e}_R \equiv \hat{e}P^D/P^F$, where P^F is the foreign goods price level in terms of foreign currency and \hat{e} the price of domestic currency in terms of foreign currency. Thus, Finland's share of these countries' total imports is a (declining) function of \hat{e}_R . Symmetrically, Finland's imports are an increasing function of its real exchange rate (already accounted for), and its economic activity, as seen from the partial T_Y in the various expressions, including the national income multiplier ($1/D_2$) in Table 2. This yields the two trade arguments in Equation (1).

Finally, we will let the real market price of houses proxy the real wealth (V), since at this price the current housing stock is willingly held each quarter. As was seen already from Table 1, housing and equity prices are highly positively correlated. As with houses, the annual net new equity issues were small relative to the physical stocks outstanding, the latter partly because foreign ownership of Finnish shares was liberalized only in 1993. Thus, changes in the demand for houses in response to variables such as population change, income, financing conditions, and expectations of future house prices, are reflected mainly in the house price series in the short run, until its underlying arguments and new construction carry on or reverse the process. We will treat $V (\equiv P^H V^R / P^D$, where $P^H \equiv$ nominal house prices) as exogenous in the regression analysis for simplicity, but use the above arguments in interpreting the results.

5. Results from the empirical analysis

Our data set covers quarterly observations from the Finnish economy for the period of 1980:I – 2005:IV. In Table 3 we report the descriptive statistics of our data. In addition, Figures 2 – 4 describe the time series behavior of the most interesting variables in terms of our proposed

theoretical model. In Figure 2, the development of (the logs of) the real GDP, real exports to the Soviet Union (Russia), and (as a reflection of our suggested role of financial market variables), the real domestic credit to the public, are plotted. The Figures reflect again the fact that the collapse of the Soviet Union/Russian trade actually lasted a fairly short period of time, and the trade achieved a new more positive trend path already at the beginning of 1993. Moreover, the exploding trend of real domestic credit until 1992 is evident, and its role should obviously be scrutinized much more carefully than has been done before.

[Figure 2 about here]

The behavior of our measure for the Blanchard Fiscal Impulse (BFI) variable in Figure 4 reveals that also fiscal policy actions varied strongly from the beginning of the 1990's until the end of the decade. At the beginning of the 1990's (around 1990-1992), fiscal policy was strongly expansionary, whereas from 1993 until the mid of 1990's and beyond, the policy was clearly contractionary.

[Figure 3 about here]

[Figure 4 about here]

As seen from Table 3, almost all the time series of the variables in our empirical model seem to contain unit roots, so our empirical regression models will be estimated using the differenced values for most of them. However, the domestic credit variable and also the real wealth, i.e., the housing market variable seem to contain as many as two unit roots according to the Augmented Dickey-Fuller statistic, and for the credit variable the test based on the null of stationarity (KPSS) supports this conclusion, too. This suggests an explosive data generating process for the domestic credit market variable. Hence, because the KPSS test suggested only one unit root for the housing market variable, we use the once-differenced values of it in the empirical analysis, but twice-differenced values of the credit market variable. The descriptive statistics for the whole sample data, to be discussed more extensively below, are also worth noting. This holds especially for the differenced values, which describe the average quarterly growth rates of the variables. The change in the real GDP has been weakly positive, but especially the strong growth of the credit market is evident also in these numbers—apparently reflecting, in part, the newly-won freedom of the institutions, along with

the good availability of funds, discussed above. The fact that the Soviet (Russian) trade did not collapse permanently from the beginning of the 1990's is also evident from the descriptive statistics.

[Table 3 about here]

The actual regression analysis of the empirical model (I) consisted of three stages. First, due to our findings from the unit root analysis, we tested for the possibility of cointegration between the variables in the spirit of the Johansen (1995) analysis. However, we were not able to detect a single cointegration vector that would span our data space¹¹. Hence, it would actually seem that there are not very strong dynamic connections between the variables analyzed here, and, for example, error correction representations of the data would not seem to be valid. Hence, the analysis between contemporaneous values of the variables was the second primary step.

Table 4 reports the results from the recursive and whole sample regression results of Model (I) given in Section 4. Versions 1 – 3 refer to recursive estimations, and Versions 4 – 5 to the whole sample analysis of the quarterly data from 1980:I – 2005:IV. The dependent variable is the quarterly change in the log of the real GDP (in %). The independent variables are: $dBFI \equiv$ change in the Blanchard Fiscal Impulse proxy, $d2Cr \equiv$ difference in the change of the log of real domestic credit, $dE_{EFF} \equiv$ change in the log of the real effective exchange rate, $dI_{IND} \equiv$ change in the log of real imports by industrial countries, $dX_{SOV} \equiv$ change in the log of real Finnish exports to the Soviet Union, $dV \equiv$ change in the log of the real housing market price index, and $dM2 \equiv$ change in the log of the real money supply (monetary aggregate measure M2).

Version 2 is our basic specification that contains the basic variables of Model I. However, due to the obviously strong correlation between the domestic credit ($d2Cr$) and the money stock ($dM2$) variables, we exclude the domestic credit variable in Version 1. Correspondingly, we exclude the money supply variable in Version 3¹².

In the extended versions 4, 5, 5# and 5 *, we also control specifically for the collapse of bilateral Soviet Union trade in 1991-1992, as follows. First, in Version 4 we use a multiplicative dummy variable (dX_{SOVCol}) that obtains the value of one times the dX_{SOV} -value within the range 1991-1992, and zero outside of it, in addition to dX_{SOV} itself. In Version 5, we control also for the specific effects of monetary ($DM2Pol$) and fiscal policies ($DBFIPol$) during the early years of free capital markets and free capital mobility, i.e., 1987:I – 1998:IV. For this

we use, accordingly, multiplicative dummies, with respect to dM2 for monetary policy, and dBFI for fiscal policy within the period, and zero outside of it, in agreement with the partial comparative-static effects of Figure 1. Finally, for the purposes of controlling for the possible endogeneity problems in the analysis, Version 5# reports the results from the GMM estimation for the most extensive Version 5 of the regression equation, and Version 5* gives the GMM estimation results of the same model without the money supply variable, dM2.

The control variables can be regarded as acting as admittedly imperfect proxies for the effects of the exogenous regime changes in the economy, discussed above. However, it is very hard to find a ‘normal’ period in Finnish past for use in an out-of-sample analysis, especially one adjacent to the period analyzed, as discussed above.

[Table 4 about here]

As seen from Table 4, first of all, controlling for the collapse of the Soviet Union trade (using the dummy variable dX_{SOVCol}) has an important effect on the effects of several exogenous variables on Finland’s GDP in terms of increasing their statistical significance levels (see especially Versions 4 and 5 in comparison to Versions 1 – 3). Secondly, changes in the fiscal policy stance (i.e., changes in the constructed BFI measure, dBFI) are clearly important in the whole sample, but only after controlling for monetary and fiscal policy actions during the specific time period of financial market liberalization (i.e. 1987:I – 1998:IV; see Version 5 in Table 3, and the parameter on the dummy variable DBFIPol). The composite effect of expansionary fiscal policy, based on summing up the coefficients on dBFI and DBFIPol, seems to be positive, but not statistically significant. The former positive effect has the same sign (*via* dBFI) as the other demand components and needs no further explanation. The latter applies, of course, only to its specified time period. It can be negative, for example, under a persistent (*e.g.* asset market enhanced) recession like the one after 1989 (see Table 1, Columns 1, 3, 8, 9, and 12). In 1991- 1992, it is possible that the underlying fiscal expansion was still expansionary at the margin, all else equal, but it was dominated by the wealth effect, when the unemployment kept increasing, and the GDP was below its 1990 level. This was caused partly by the partial effect, on the GDP, of the decline in asset values in the subsample of this particular period. Similar effects in the opposite direction can be found during the late 1990’s, also resulting in a negative parameter. Yet the parameter on real wealth (dV) was positive, being based on the whole series.

Monetary policy actions (reflected in the coefficient on dM2 and the monetary

policy dummy DM2Pol) have also had a positive effect overall, even though for the specific time period of 1987 – 1998, based on the coefficient on the monetary policy dummy, the effects of changes in the money supply have not been statistically significantly different from zero. This observation is consistent with the well-known theoretical proposition, reiterated in Figure 1 above and Equation (A14) in the online Appendix I, that under high capital mobility, monetary policy is ineffective during liberalized financial markets and fixed exchange rates (although from 1993 on the exchange rate floated, though at times the float was “dirty”).

Third, the explosive behavior of the domestic credit market (variable d2Cr) seems to have been among the key factors in explaining real economic activity in Finland during this time period. This effect is statistically equally important as are the effects of changes in real (housing) wealth (dV) (the other component of the “vicious circle”; see below), and changes in the imports of industrial countries (dIND).

We actually find that changes in the real effective exchange rate (dE_{EFF}) and the (total) actual real exports to the Soviet Union (Russia) ($dX_{SOV} + dX_{SOVCol}$) are clearly statistically not significant in any of the Versions 1 - 3 of Model (I) in Table 3 (i.e. the Versions without the control dummies). In general, given the nominal exchange rate, the real exchange rate can increase due to an increase in the country’s costs (supply shock) or by an increase in the demand for its exports (demand shock), of which the former has a contractionary, and the latter an expansionary effect, on its output. In exports to Russia, a related explanation is an idiosyncrasy of bilateral barter trading relationships, mentioned above. Take the oil price, for example, energy often amounting to over 80% of Russia’s exports to Finland and which we discussed briefly above. A decline in this world market price (as for example in the ‘eighties post-1982) has an expansionary effect on its output *via* the real exchange rate (as observed, Finland does not produce any oil). At the same time, by reducing the Soviet Union’s (Russia’s) export earnings, it reduces its demand for Finland’s exports, which has the opposite partial effect on Finland’s output. Finally, political considerations often affected trade negotiations. Consequently, there are several mechanisms affecting the correlation between the real exchange rate and the GDP, and the net effect at a given point in time depends on which mechanisms dominate.

For the part of Russian trade variables, we will call the parameter for the (dX_{sov}) variable the “pure” effect of exports to the Soviet Union/Russia, (dX_{sovCol}) the “collapse dummy” of this trade, and the sum of these parameter estimates the “total effect” of Soviet/Russian trade on Finnish real activity.

Looking at the effects of Russian trade ($dX_{SOV} + dX_{SOVCol}$) the collapse of

Russia's trade in 1991-1992 was associated with a decline in 1991, and an *increase* in the GDP in Finland in 1992 (see Table 1, columns 1 and 16). This statistical finding, while consistent with some versions of Eq. (I), is actually easily supported by the finding of a more positive trend path in exports to Russia after 1992, reported also already in Figure 2 previously. Our reading of the result on the total macroeconomic effect of the decline in Soviet (Russian) trade is, first, that this effect ($dX_{SOV} + dX_{SOVCol}$) is contractionary (parameter = + 0.014) at the 10 % risk level in Version 4, and also contractionary (+ 0.017) but statistically not significantly different from zero in Version 5¹³. As to its components, the partial effect, over and above the long-run effects, of the trade collapse (dX_{SOVCol}) was thus contractionary in both Versions, in qualitative agreement with Gorodnichenko *et al.* (2012). When taking over a longer time span of observations (dX_{SOV} ; -0.011), Russian trade acted as a weakly stabilizing force during the sample period: it was contractionary during the expansion before 1989, and during the contraction of the later crazy years (1990-1991, when it was destabilizing ($dX_{SOVCol} = 0.025$)). It was stabilizing during the gradual recovery from 1993 on (based on the negative parameter estimate, albeit on a relatively low significance level, for dX_{SOV}). While not a strong result, part of its explanation is the decision lag (in addition to the mechanics of the bilateral barter trading system, discussed above): Trade agreements were typically concluded for five-year periods so that orders placed before the collapse were delivered years later: Especially large capital goods, taking long times to build, constituted a substantial part of Finnish exports during later periods, including some post-Soviet ones.

In particular, our overall empirical findings lend support for our a priori propositions about the role of financial and asset market variables, especially the real domestic credit expansion beginning in 1986, and housing market wealth (turning to a decline in 1990 or 1991), referred to above. These variables appear to have affected real economic activity in Finland profoundly enough so as to dominate (or overshadow) the possibly negative effects of the Soviet Union trade collapse. As suggested, they were of a different order of magnitude compared to that collapse.

Specifically, the “unusual ferocity” of the Finnish boom and bust, referred to at the beginning, can now be inferred from the dominant role of domestic credit and real (housing) wealth. Their strong partial effects appear to reflect the fact that they often interact, since houses are typically financed with credit. Going behind the variable dV , examine the market for housing. The annual changes in the physical housing stock (new construction minus demolition) constitute a very low percentage of the stock so that changes in the demand are reflected mainly in the prices (nominal and real, in terms of P^D) in the short run. Secondly, as

suggested, the expected future price level of houses (or its change) is an increasing function of their current price level (and *ditto* for the respective changes), (except possibly near the extremums of the price cycle, discovered only later). Finally, credit terms are a key argument in the demand function especially when credit is relaxed in an initial situation where tight credit rationing had built a large unsatisfied demand on the market, or credit is suddenly contracted after a credit-enhanced boom when the public has highly leveraged balance sheets. A sudden drastic relaxation of access to credit, as in 1986, led to a considerable increase in the effective demand for housing. This led to an increase in its price level¹⁴, which caused an increase in the expected future price level, further stimulating demand and leading to another increase in the actual price level (given continued easy credit), and so on. A vicious circle followed, continuing until either the bubble burst, ran out of steam (expectations turned negative), or financing dried up. A similar development was likely to take place on other asset markets, as well. The increase in perceived wealth also stimulated other expenditures and thereby total output, feeding back to housing demand (see online Appendix 1b for a formal treatment of this “financial accelerator”).

In this case, the financing dried up in 1989 due to the monetary contraction, but it did it so violently, as a response to anxiety over the Finnish balance of payments, as seen from the interest rates, that it not only stopped the expansionary vicious circle, but actually started a contractionary one. The decline in demand led to a decline in the prices, which caught individuals with overextended balance sheets with declining asset values and turned expected future price changes negative. These led to further sales and another price decline, causing collateral problems, defaults, fire sales, a price collapse (eventually by almost 40 per cent), and failures of banks and their customers¹⁵. Additional support for this interpretation is provided by results from an analysis of the dynamic connections between these variables (VAR analysis, variance decomposition, and impulse response functions), to be presented at the end of this section¹⁶.

Table 4 can also be used to get a rough idea of the implications of the above results for stabilization policy: the policy responses required to offset the partial marginal effects on output of some exogenous variables. (Of course, the following variables refer to the respective growth rates, as in the Table.) Taking the parameter estimates of the most extended Version 5 as an example, a one percent increase in the growth rate of $(dX_{Sov} + dX_{sovCol})$ would call for a decrease of 0.14 percent in that of M_2 :

$$[(dM_2 + DM_2Pol) = (-0.017/0.123) (dX_{Sov} + dX_{sovCol}) = -0.138(dX_{Sov} + dX_{sovCol})].$$

The respective value for fiscal policy is

$$(\text{dBFI} + \text{DBFIPol}) = -2.83(\text{dX}_{\text{Sov}} + \text{dX}_{\text{SovCol}}),$$

which, if statistically significantly different from zero, may be so with a low probability.

The results reported in columns 1 – 5 of Table 4 are, of course, for a strictly static version of our model. Therefore, we analyzed the model using the generalized method of moments (GMM) approach¹⁷, for the sake of robustness of our results, and especially for the purpose of controlling for the possibility of endogeneity among the set of explanatory variables (*e.g.* the strong correlation between the money supply and domestic credit variables; Versions 5# and 5*). In addition to the constant term, the set of instruments was based on using up to four lags of all the right-hand-side variables. However, the actual regression equation still did not include the lagged term of the dependent variable, because it proved not to be statistically significant. Hence, our final results take into account the dynamics especially on the part of the effects stemming from the lagged values of the assumed independent variables in our regression model. Based on the reported Hansen J-test values, the set of chosen instruments in Versions 5# and 5* seemed to be clearly valid. Therefore, the results based on both of these specifications indicate that actually controlling for the specific period of free capital markets and free capital mobility (and excluding the money stock variable in Version 5*) does not change the interpretation of the role of other variables in the model, compared to the case of using the money supply variable for the whole period. Both models are statistically equally valid.

These results give further support for our previous findings on the relevance of the financial and asset market variables in explaining the behavior of the Finnish real economy during the analyzed time period. Compared to the results based on Column 5 of Table 4, the same model estimated using the instrumental variables approach indicates that fiscal policy has not had a role to play in this period, but expansionary monetary policy has had a mild positive direct effect on real activity (at the 5 % risk level). Based on the interpretation of the parameter estimates of these variables, still a dominating result is that the collapse of Russian trade was a major, statistically important event in terms of the parameter value for $\text{dX}_{\text{SovCol}}$ in Table 4. Overall, combining its effect and the pure effect of Russian trade, the effect is mildly *positive* in the sense that a collapse in it has a contractionary effect on Finnish output. And again, the pure effect of Russian trade (dX_{Sov}) itself seems to have been slightly stabilizing. (For its effect relative to those of the other disturbances, see the discussion of Table 5 below.) Also, our most important findings regarding the credit market and housing market effects are again clearly confirmed. They seem to have been the most influential variables in affecting positively the real economic activity in Finland in the time period analyzed (akin to the results of Bernanke

et.al., 1999, who find similar effects from collateral requirements during a recession). Consequently, it is the domestic financial market variables, especially the credit market and asset market variables that seem to have been the prime movers, responding to the liberalization of the domestic financial markets and international capital movements, with exports to Russia strengthening their effects during the trade collapse years.

[Table 5 about here]

To cap our empirical results especially with respect to the quantitative significance of the explanatory variables, Table 5, panel (b) shows the partial marginal effects, of a one standard deviation change in the values of these variables, on the growth rate of the GDP of Table 4. In the Table, three versions of the model are displayed here, to demonstrate the relative effects of the explanatory variables. The basic Version 2 has no dummies, and Versions 5 and 5# have all the dummies. Take Version 2, for example. An increase in the growth rate of government spending by one standard deviation, all else equal, is predicted to increase GDP growth by a factor of 0.589. The respective number for (the second difference of) domestic credit is 0.555, for the real exchange rate 0.500, for OECD country imports 0.808, for exports to Russia 0.401, for real (housing) wealth 0.843, and for M2 0.634. Thus, real wealth and industrial country imports have clearly the strongest effects on output in this Version. In Versions 5, 5#, and 5*, fiscal policy, domestic credit, and M2 are also among the strongest arguments. It is worth noting that a change in (the growth rates of) each of the other explanatory variables by one standard deviation, all else equal, has a stronger effect on growth than do those of exports to Russia in all the versions examined---let alone those by several of the former arguments combined, such as domestic credit financing housing purchases. Panel (a) reveals that the same qualitative conclusion holds if all the arguments are shocked by one percentage point instead of a standard deviation.

These results provide additional support for the above assessments on the quantitative effects on growth of the Russian trade collapse relative to those of the other arguments of Equation (I). Of course, even these figures serve to indicate only rough relative orders of magnitude, no more. It is worth adding that although the VAR analysis reported in online Appendix 2 shows that $dM2$ and $d2Cr$ are independent enough not to bias the estimates of the parameters, the causal connection remains, and an increase in M2 leads to an increase in domestic credit by the credit expansion process, as suggested in connection with Eq. (I) above. We will address these endogeneity problems below in greater detail.

Consequently, the size and duration of the Russian trade collapse was limited, the total two-year decline being smaller than the smallest annual current account deficit in 1987 – 1990 (see also Table 1), and the pre-collapse trade level was reached within four years after the trough. This, together with the evidence presented leads to the conclusion that while the collapse was a contributing factor in the Finnish depression, that depression process, including the preceding boom, was started by the domestic policies. Moreover, the latter had been in progress for several years before the trade collapse, as can be seen from Table 1. Judging by the evidence from earlier years, the collapse would also seem to have been more manageable, had the economy been in its “normal” condition. Results on the partial marginal effects of the explanatory variables in our model give additional support for the notion that, controlling for both the collapse of Soviet trade *and* the effects of monetary and fiscal policy actions in the model (especially during the early years of liberalized financial markets and free capital mobility in 1987:I – 1998:IV), is relevant, and clearly strengthens the individual effects of each of the explanatory variables.¹⁸

Finally, we conducted a Vector Autoregressive (VAR) analysis for Model (I) as a robustness check of our results, and in order to further control for the possibility of endogeneity problems in the empirical model analyzed, referred to above. The multivariate Akaike and Bayesian Schwarz information criteria suggested that an appropriate lag length for the VAR representation of our data was not higher than 1 (actually, the Akaike criterion suggested 2 lags and the Schwarz and Hannan-Quinn even zero lags). To put the collapse of Soviet trade in specific focus (over fiscal and monetary policies), we finally estimated a VAR model for Versions 2 and 4 reported in Table 4. The latter includes the Soviet Union trade collapse effect (Version 4) and the former excludes it (Version 2), using one lag of each of the analyzed variables. At first, we conducted the Granger causality analysis reported in Table A1 of online Appendix 2.

The results from the VAR analysis of our data set gave additional support for our previous findings. Only the housing market wealth variable seems to be connected to the changes in real GDP, whereas at the 10 % risk level, the credit market, money supply, and housing market variables are all dynamically connected to each other. Interestingly, the Granger causality analysis reveals that changes in the real effective exchange rate are connected to the changes in real exports to the Soviet Union (Russia) (in agreement with the above discussion), but the other variables are not dynamically connected to it. At the 5 % risk level, changes in Soviet trade seem to have Granger-caused the changes in monetary policy, i.e. real dm2 values (According to our theoretical model, an increase in exports leads to an increase in

$d\Delta R$ and thereby $dM2$, all else equal; Eqs. (2) and (3)). The exclusion of the Soviet trade collapse dummy does not seem to have a significant effect on these inferences.

The final step of our empirical analysis utilized the variance decompositions and impulse response functions obtained from the previously executed VAR analysis. Table A2 in Appendix 2 reports the results from the variance decompositions for the domestic variables in Model Version 4, reported in Table 4. In Appendix 2 we also give the impulse response functions regarding the response of the real GDP to the shocks in domestic variables, and to the shocks in foreign trade variables, separately.

As seen from Table A2/1 the dynamic role of the BFI variable is indeed negligible, because it does not seem to be affected by any other variable, based on the results from variance decompositions, lending support for the assessment in Section 3 above. However, our results regarding the dependence of real economic activity (changes in real GDP) on the explanatory variables in our model are supported also on the basis of the information in Table A2/1. About 7 % of the variability in the future values of changes in real GDP is based on the variation in housing market wealth. Moreover, the connection of the credit market to the other variables is even stronger. There, actually also the changes in the Blanchard Fiscal Impulse measure explain about 17 to 11 % of the variation in the real domestic credit (due to the public sector balance sheet constraint), while the variations in the quantity of money ($dM2$) explain about 5 to 9 % with increasing horizon, $M2$ being part of C^D_R . Moreover, the money supply variable ($dM2$) is also somewhat connected to real wealth, because about 5 % of the variations in $dM2$ is explained by variations in dV . The strongest support for our previous results comes from the real wealth variable, because about 20 % of the variation in the real, *i.e.* housing market wealth seems to come from the variation in the changes in real GDP, and at every horizon, in agreement with earlier discussion. These results again give strong support for our previous a priori propositions about the role of housing market effects on real economic activity in Finland during the time period.

6. Concluding Comments

It has been agreed for some time that the major sources of the Finnish Depression of the 1990's were Finnish economic policies and the collapse of Russian trade. However, their relative importance, and the mechanisms by which they affected economic activity has not been subjected to econometric analysis. Our main input has been to examine what the data tell us, grounded on an extended Mundell-Fleming model as a theoretical approach, covering also the

boom and bust of 1986 – 1990, that was responsible for the deep trouble the country was in when the Russian trade collapse hit the country. The empirical regression equation, derived from the above kind of model, explained total output with measures of fiscal and monetary policies, exports to the Soviet Union/Russia, domestic credit, industrial country imports, the real effective exchange rate, and a measure of total wealth. The first three explanatory variables were adjusted for the effects of structural changes by means of specific multiplicative dummy variables to reflect the exceptional features of the initial periods of liberalized financial markets, free capital mobility, and the collapse of Soviet trade.

It was shown that the model's a priori propositions provide a credible explanation for the data, both controlling for the collapse of the Soviet (Russian) trade inside the range of 1991 -1992 and without the controls, as well as those of monetary and fiscal policy actions during free capital markets and international capital movements in 1987 – 1998. Indeed, fiscal and monetary policies turned out to be the strongest explanatory variables for Finnish output during the period. In addition, domestic credit and real wealth, and changes in industrial country imports were also important. The interaction between domestic credit and real wealth (proxied by housing) turned out to constitute a potentially dangerous accelerator mechanism, magnifying the effects of the changes in monetary tightness during the crazy years from 1986, and the depression from 1989. In a nutshell, the fatal policy moves were the simultaneous liberalization of the domestic financial markets and international capital movements in 1986, when a large initial excess demand prevailed in the financial markets, and the forceful monetary contraction in 1989, when the public had highly leveraged balance sheets from the boom. These initial conditions gave extra force to the financial accelerator.

The collapse of Russian trade lasted for two years, after which its growth resumed from its depressed level, reaching its pre-collapse level in another four years. Its two-year decline was smaller than the smallest annual current account deficit in 1987 – 1990, or less than two percent of the GDP. While it hit hard the industries heavily dependent on the Russian market, its effect on the aggregate Finnish economy was limited.

The effects of the Russian trade collapse turned out to be relatively modest also by yet another yardstick, because a change in the growth rate of exports to Russia by one standard deviation was found to have had a smaller partial effect on economic growth than did that of any other explanatory variable in all the models examined. The same holds if the explanatory variables were shocked by one percentage point. Thus, the effects of the liberalization were much stronger also by this measure. According to our results, the real exchange rate was not a statistically significant argument, since the direction of its effect on

output depends on the exogenous variable causing the change in the rate.

A key general lesson from this experience is the following. In the liberalization of economies with initial price controls, an effective interest rate ceiling and rationed capital movements, the (somewhat controversial) Washington consensus (see e.g., Williamson, 1990) advises to proceed in a staggered sequence, that is, to liberalize the less flexible markets before the more flexible ones, and give a liberalized market enough time to settle at an equilibrium before moving on to the next market. Especially financial markets operate on very thin margins so that relatively small unanticipated changes can be damaging. The goods market liberalization calls for a controlled current account and public sector. Thereafter, the domestic interest rate can be brought in line with the foreign interest rate (plus the expected depreciation of the domestic currency) in preparation for the liberalization of international capital movements. It follows that all the markets can be liberalized simultaneously if they can be considered as being in equilibrium. Of course, any liberalization generally requires an appropriate adjustment of the policy mix to maintain activity at the desired level. In general, to avoid the dangerous effects of the financial accelerator, one should be particularly careful in monetary expansion in the presence of excess demand in the financial markets, and with monetary contraction after a boom, especially one with speculative elements in asset prices, or if investors have stretched their balance sheets for other reasons.

The above suggests that the analysis of the Finnish experience is a fruitful avenue for further research. For example the effects of the international financial crisis of 2008 and afterwards constitute a new case for observers. Our results show that one should treat the Finnish experience during the period of the Russian trade collapse with caution when extending it to similar-looking cases in other countries, even allowing for the fact that changes in countries' economic activity affect their trading partners' activity. After all, all financial reforms do not necessarily lead to crises, as witnessed by e.g. the case of New Zealand, whose successful reform spanned over more than a decade (see Evans *et al.*, 1996.).

In general, countries contemplating important reforms like liberalizing their financial systems face dangerous pitfalls. For example, it is somewhat disturbing to note that some of the recent problems in the euro area, especially in the "Club Med" countries, have features similar to the ones discussed here, being in many cases results of expansionary policies based on unsustainable capital imports, associated with the introduction of the euro. Instead of trying to keep aggregate demand, asset markets, and international and government borrowing at sustainable levels (as the international financial community tried to force Finland to do with reasonable success), Club Med politicians and their financiers carried on in their carefree ways.

This was presumably based on the assumption that the euro system provides guarantees covering all risks, until the lenders called a halt: even though the exchange rate risk had been eliminated (in case of most foreseeable events), other kinds of risk, especially credit risk and moral hazard, had not. The debtors and presumably their creditors have now had to accept reform plans involving considerable pain.

Acknowledgements

We are very grateful to the special issue editor, professor Mary Rodgers, and the anonymous referees for their comments and suggestions that greatly improved the quality of our paper.

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Endnotes

¹Moreover, the absence of market failures in many versions of the New Classical (NCE) models leads to the conclusion that external imbalances are of little concern for policy as long as the government budget is balanced. The underlying assumptions often also imply near-Ricardian equivalence, which undoes many of the potential effects of fiscal policy. Since considerations of fiscal and monetary policy measures are central to the events to be analyzed, models with such features are unsuitable for our purposes. Not only was rationing prevalent, but some of the key events are grounded on the presumption that national savings and employment may differ from their optimal levels. Of course, the NCE approach has recently been modified by imposing ad hoc market failures like credit constraints or Blanchard-type non-neutrality. Then, when models are made to account correctly for the critical rigidities and imperfections of the economy, their predictions need not substantially differ from those of the Extended Mundell-Fleming (EMF) model, as Dornbusch (1990) has pointed out. Moreover, Buiter (1990) has argued that if the effects of wealth accumulation are included in the consumption function, which is not forward-looking, results similar to the Blanchard model are obtained. While the EMF-type model is not appropriate for all purposes, we feel that with the wealth effect and supply side it serves as a useful frame of reference for an analysis of events during the present episode. As to expectations, the initial conditions are those of a fixed exchange rate, a relatively rigid interest rate ceiling, and tightly rationed international capital movements. After the liberalization, interest rate and exchange rate expectations consistent with least-squares learning had to be based on no or very few observations on the new regime until 1989, when confidence in the sustainability of the exchange rate began to erode. The statements and behavior of business leaders and others nonetheless suggest that agents believed the assurances of the Central Bank Governor that the exchange rate was being held steady, which is why the devaluation of 1991 caught them off guard. The focus of our interest being on a small number of discrete policy moves that caused a regime change, leading to depression, static expectations can in our view be regarded, under the circumstances, as a reasonable approximation under bounded rationality.

² The DSGE models in the analysis of the effects of the Russian trade collapse on the Finnish economy (see e.g. Gorodnichenko et al. 2012) are based on the representative individual paradigm, which assumes a given, unresponsive real interest rate (see Hall, 2011). This is possibly appropriate in some cases but hardly in this one, analyzing the three episodes (see Kirman, 1992), where the interest rate fluctuated over a range of nearly ten percentage points. Another assumption drawing forceful criticism from the M-F school is the initial stationary state equilibrium assumption. The 1990 figures for Finnish output growth, M2, the current account balance, the index of unit labor cost, and those of industrial stock and housing prices relative to their preceding and following values (see Table 1), look very different from those of a stationary state equilibrium. Gorodnichenko et al. make elaborate adjustments trying to make their initial year 1990 satisfy the balanced growth assumption. On the other hand, as shown by Grandmont (1992), individual maximizing behavior is unimportant for well-behaved aggregate demand (and supply) functions as long as agents respect their budget constraints, provided these heterogeneous individuals interact directly and consciously through mechanisms like trading, the passage of information, the building of reputations, organizing into groups for purposes of bargaining etc. Of course, our modeling choice, covering all three episodes, also yields analytical propositions about the effects of several exogenous variables

besides the collapse of Soviet trade, and leads to statistically testable predictions of their effects. It thereby provides a measure of their quantitative significance also relative to each other, including episodes when markets do not clear.

³ Note already here, that our sample period is restricted to start only from 1980 based on the availability of the housing market data.

⁴ Such a model needs to be general enough to cover the effects of the preceding Finnish boom and bust years and the subsequent Russian trade collapse, and the empirical sample should be extended beyond the Russian trade collapse years to the euro period. This is based on the following notions. First, since the Finnish economy clearly seemed to be out of equilibrium in 1990 (see Table 1), the empirical analysis should be based on a model and a data set that is free from an obvious a priori initial equilibrium assumption bias. Second, as stated, the Russian trade collapse lasted a relatively short period of time, exports to Russia growing briskly in late 1992, almost reaching the pre-collapse level of trade in 1996. Third, there were major changes in the financial markets, whose effects seem to have extended to and beyond the trade collapse period and affected the GDP along with those of that collapse. In our view, these features are essential for understanding the depression and the role of the Russian trade collapse in it. However, we will not extend the sample past 2005:IV, since the pre-EMU, EMU, and euro periods introduced new elements in terms of policy constraints that may bias the estimates used to evaluate events during the period of our main interest.

⁵ As to the quantitative effect of the Soviet trade collapse for Finland, the Soviet Union's share of Finnish exports declined steadily with the oil price from the high of 22% after the second oil shock in 1982 (Table 1, column 15), reaching almost 11% (or 2.5% of the GDP) in 1990. In 1991, Russia's share declined by 1.6% of the GDP, and in 1992, by 0.3% of the GDP, adding up to the two-year total of 1.9 % of the GDP. Instead of eventually tapering off towards zero in 1992 or later (as assumed in some papers), its absolute level and GDP share recovered to a half of its (pre-collapse) 1990 level in 1993, nearly reaching it in 1996. Thus, the total two-year decline was smaller, relative to the GDP, than the smallest annual current account deficit in 1987 – 1990, which did not cause anxiety at the time (see the Table).

⁶ Note that The International Financial Statistics (IFS) series definition of the nominal exchange rate is the inverse of that of the theoretical model, and thus $\hat{e}_R = \hat{e}P^D/P^F$, where \hat{e} is now the price of domestic currency in terms of foreign currency. Thus devaluation lowers \hat{e} , as in Table 1.

⁷ Note, however, that under flexible exchange rates, fiscal expansion is contractionary in the money wage model if the income elasticity of the demand for money exceeds unity. See Ahtiala and Kanto, 2002. The latter find this to hold for Canada but not for the U.S.

⁸ In addition to lacking the observation for the housing market index before 1980, we will start the sample in 1980:I to get observations from nearly 'normal' years and to avoid a bias in the parameter values caused by the crisis years. The 'seventies were dominated by the first oil shock in 1973, which led to an uncontrolled boom with high inflation, ending with a depression starting in 1975, a current account deficit of 8% of the GNP, and the unemployment rate of nearly 40% (including unemployed workers on special courses). The painfully slow recovery lasted until the 'eighties. The second oil shock took place in 1979, after which oil prices started their long decline in 1980.

⁹ As seen from Table 1, up until the liberalization in 1986, C^D_R grew annually by 10% or less, while in 1987 and 1988, the figure increased to 12.3% and 20.6%, respectively, to return to its earlier range later. From 1992 it moved to a clearly negative territory, to reach the trough of -17% in 1995 and "recover" to the negative single digits later. Consequently, after the reform, the foreign capital flow dominated initially, the nominal foreign interest rate all but determining the domestic nominal interest rate, as long as devaluation expectations remained subdued, as shown in Eq. (A13) in Appendix I and Figure 1. It took several quarters for the economy, especially the stock of foreign capital in the country, as well as the market interest rate, to find their long-term equilibrium levels.

¹⁰ Oil being an input in Finnish products, their real resource cost increases. Correspondingly, all else equal, it led to an increase in Soviet export earnings, making increased purchases from Finland possible. This led to a partially or fully matching increase in Finnish exports to the Soviet Union (subject to negotiations, of course, but the net effect of the price increase is then equivalent to an income transfer to the Soviet Union/Russia, tied to the purchase of Finnish goods.)

¹¹ All the results that have not been reported here are available on request.

¹² Note that we performed a robustness check for the empirical results in Table 4 also using separately the difference between the domestic credit and money supply (M2), and M2, for the purpose of controlling for the fact that the M2 as the money supply measure constitutes part of the domestic credit. However, the results for the explanatory power of this longer-maturity funding series (domestic credit minus M2) were not statistically significant in any of the versions based on the models reported in Table 4, when the credit variable was replaced by the credit minus M2-variable. Furthermore, due to the obvious explosiveness observed during our analyzed period of the credit expansion, we want to have it included to the model as the second difference (because clearly it had two unit roots in levels) and the change in money supply (M2) separately. This enables us to discuss specifically about the role of explosiveness of credit expansion at the longer end of the loan market maturity structure.

¹³ Our theoretical model in Part 2 and Eq. (A13) of the online Appendix 1a predicts that under mandatory interest rate ceilings in effect until early 1986, movements of the IS curve have no effect on economic activity under the stated conditions. This holds for all but the two monetary variables in Eq. (I).

¹⁴ During ceilings, banks' terms were typically 25% down, accumulated on a special house savings account for 2 – 5 years before the planned purchase, the loan covering 50% of the price for 5 – 8 years, the rest typically coming from an insurance company. After liberalization, the terms were eased up to no money down and a loan for the rest for up to 40 years, at approximately the same interest rate.

¹⁵ Of course, the depression was fatal for the construction companies: with one exception, all the major construction companies failed or had to be reorganized.

¹⁶ Applying the brakes in a speculative boom is a very difficult balancing act: If you brake too hard, you cause a depression on both the housing market and elsewhere in the economy, if too little, you risk an even worse situation in the future.

¹⁷ See for example Wooldridge (2001) for a thorough discussion on using the general method of moments estimation e.g. for the purpose of controlling the problems regarding endogeneity in econometric models containing macroeconomic variables like the model in this paper.

¹⁸ As seen by comparing Models 5 and 5# with Model 2 in Table 5, the marginal effect of fiscal policy (in terms of changes in the BFI value) increases by over 62 % in the model with the control variable dummies (the highest "absolute" increase), and by over 48 % when using GMM estimation with the standard deviation as the criterion. The effect of the Russian trade variable declines by 33% in the model with the control variable dummies, and by over 88% when using GMM estimation. The monetary policy variable dM2 has a 17 % stronger effect compared to the model without the control variables and over 35 % stronger based on GMM estimation, while the corresponding changes in the effects of the credit market variable are over 28% and over 53%, respectively.

Table 1. Finland's depression in figures

Table 1 presents annual figures for the key variables describing the state of Finnish economy for a 11-year period covering the deep depression years at the beginning of 1990's. dY = rate of growth of the real GDP; $dCPI$ = percentage change in the CPI; U = unemployment rate; CA/Y = current account balance as a percentage of the GDP; C_L = relative unit labor cost in manufacturing: Finland/OECD; OECD = 100; index; dw = rate of change in the wage rate in manufacturing; r = interbank overnight interest rate; S = index of industrial stock prices; P_H = index of nominal housing prices; X_F / M_O = volume of Finnish exports to OECD in relation to total imports by OECD countries; $\hat{e}_R = \hat{e}P^D / P^F$ = index of real effective exchange rates, where \hat{e} = price of domestic currency in terms of foreign currency; 1990 = 100; BFI = Blanchard Fiscal Impulse, % of GDP; Declining values indicate tightening (Source: Alesina and Perotti (1995)); dM_{2R} = percentage change in the real stock of M_2 ; X_{SU} = Finland's exports to the Soviet Union/Russia, b€; X_F = Finland's total exports, b€; Y_N = nominal GDP; dC^D_R = percentage change in real domestic credit. .

Year	1 dY (%)	2 $dCPI$ (%)	3 U (%)	4 CA/Y (%)	5 C_L index	6 dw (%)	7 r (%)	8 S index	9 P_H index	10 X_F / M_O index	11 \hat{e}_R index	12 BFI (%)	13 dM_{2R} (%)	14 X_{SU} b€	15 X_{SU} / X_F (%)	16 X_{SU} / Y_N (%)	17 dC^D_R (%)
1982	-	-	-	-	-	-	-	-	-	-	99.3	+1.6	-	2.8	22.0	6.9	-
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1986	2.0	2.9	5.4	-1.0	92	6.6	11.9	38.7	492	96	93.6	-0.7	6.9	2.8	17.5	4.7	6.5
1987	6.9	4.2	5.1	-2.1	95	7.4	10.2	59.0	550	95	92.6	+2.7	7.1	2.2	13.0	3.4	12.3
1988	4.7	5.0	4.6	-3.0	103	8.8	10.0	93.4	749	92	95.0	-2.9	14.9	2.3	12.8	3.2	20.6
1989	5.4	6.6	3.5	-6.2	112	9.6	12.6	124.1	915	78	98.7	-1.4	3.3	2.4	12.4	3.0	8.4
1990	0.0	6.1	3.4	-6.7	116	9.1	14.0	132.5	859	86	100.0	+1.0	-0.8	2.2	10.8	2.5	5.7
1991	-14.0	4.3	7.6	-5.6	112	6.1	13.0	100.0	733	81	91.5	+3.8	4.0	0.8	4.1	0.9	6.4
1992	5.0	2.1	13.1	-4.8	95	2.1	13.3	73.1	599	85	75.1	+1.7	-3.6	0.5	2.4	0.6	-7.8
1993	-1.0	1.1	17.9	-1.0	88	1.5	7.8	68.9	556	93	63.5	-4.5	-0.9	1.0	3.8	1.3	-10.1
1994	3.8	0.4	18.4	+1.4	95	4.5	5.4	116.3	592	94	66.6	-1.1	0.2	1.4	4.4	1.6	-9.8
1995	4.6	0.3	17.2	+4.5	105	7.0	5.8	179.5	598	92	73.9	-1.8	3.3	1.4	4.1	1.5	-1.7
1996	3.5	0.4	16.3	+5.3	111	3.3	3.6	199.0	603	88		-1.0	-3.5	1.9	5.2	2.0	-3.4

Sources: Bank of Finland, Statistics Finland, IMF International Financial Statistics database, Finnish Customs Authority database

Table 2. The policy effects in a market-determined system under fixed exchange rates

	$dY/$	$d\Delta R/$	$d(T-P^D)/$	$dr/$
$/dG$	$\frac{K_r - L_r}{D_2} > 0$	$\frac{(L_Y K_r - L_r T_Y)}{D_2}$	$\frac{(K_r - L_r)T_Y}{D_2} < 0$	$\frac{L_Y - T_Y}{D_2} > 0$
$/d\Delta D$	$\frac{-E_r}{D_2} > 0$	$\frac{-zK_r - E_r T_Y}{D_2} < 0$	$\frac{-E_r T_Y}{D_2} < 0$	$-\frac{z}{D_2} < 0$
$/de$	$\frac{T_e (K_r - L_r - E_r) + E_r L_e}{D_2}$	$\frac{f}{D_2}$	$\frac{d}{D_2}$	$\frac{(L_Y - T_Y - z) T_e + L_e z}{D_2}$
$/dT_o$	$\frac{K_r - L_r - E_r}{D_2} > 0$	$\frac{L_Y (K_r - E_r) - L_r (z + T_Y)}{D_2}$	$\frac{(K_r - L_r)(z + T_Y) - L_Y E_r}{D_2}$	$\frac{L_Y - z - T_Y}{D_2}$
$/dV$	$\frac{(K_r - L_r)(1 + T_E) E_V}{D_2} > 0$	$\frac{g}{D_2}$	$\frac{h}{D_2} < 0$	$\frac{k}{D_2} > 0$

$$D_2 \equiv (K_r - L_r)z + E_r(T_Y - L_Y) > 0$$

$$z \equiv 1 - (1 + T_E^*)E_Y > 0$$

$$f \equiv -[L_Y K_r - L_r(T_Y + z) - L_Y E_r]T_{PD/e} + L_e(K_r z + E_r T_Y)$$

$$d \equiv -T_{PD/e}[K_r - L_r](z + T_Y) - L_Y E_r + L_e E_r T_Y$$

$$g \equiv E_V[(1 + T_E)(L_Y K_r - L_r T_Y) - T_E(L_r z + E_r L_Y)]$$

$$h \equiv E_V[T_Y(1 + T_E)(K_r - L_r) + T_E[(K_r - L_r)z - E_r L_Y]] < 0$$

$$k \equiv E_V[-zT_E + (1 + T_E)(L_Y - T_Y)] > 0$$

Table 3. Descriptive statistics

Table 3 presents descriptive statistics for the variables in the estimated model. We give the sample means, standard deviations and the results from the augmented Dickey-Fuller-tests (ADF, H_0 : unit root), and Kwiatkowski-Phillips-Schmidt-Shin-tests (KPSS, H_0 : stationarity), and the significance levels for both these tests statistics are denoted by * = 10 %, ** = 5 %, and *** = 1 %. The analyzed variables are Y = log of real GDP, G = log of real government expenditures, BFI = Blanchard Fiscal Impulse proxy (see details on the calculation principles in the text), Cr = log of real domestic credit, E_{EFF} = log of real effective exchange rate, I_{IND} = log of real imports by industrial countries, X_{SOV} = log of Finnish real exports to the Soviet Union, V = log of real housing market price index (indicator of real wealth, based on the nominal housing market price index divided by the GDP deflator index), and M2 = log of real money supply (monetary aggregate measure M2).

Stat.\Var.	Y	G or BFI [#]	Cr	E_{EFF}	I_{IND}	X_{SOV}	V	M2
	levels							
Mean	25.84	23.72	26.17	4.71	24.47	22.98	4.16	10.82
Stdev	0.18	0.77	0.84	0.11	0.38	0.59	0.17	0.22
ADF	-0.41	-2.17	-1.41	-1.62	1.06	-1.15	-1.99	-2.19
KPSS	1.97***	2.04***	1.86***	1.28***	2.06***	0.99***	0.44	1.80***
	1st differences (in %)							
Mean	0.63	-0.06	3.10	-0.10	1.15	2.18	0.50	0.83
Stdev	1.19	18.61	4.18	2.30	5.43	17.07	3.02	2.40
ADF	-2.77*	-10.97***	-2.00	-6.97***	-16.35***	-10.09***	-2.21	-11.65***
KPSS	0.14	0.03	0.91***	0.12	0.28	0.10	0.30	0.33

NOTE: For the fiscal policy measures we give the statistics on the log of government real expenditures in levels, but for the 1st differences we use the BFI measure (in %).

Table 4. Results from the recursive and whole sample OLS estimations of the model

Table 4 presents the results from recursive (Versions 1-3) and whole sample (Versions 4-5) OLS estimations with (HAC) Newey-West standard errors from the regression analysis of Model I. We use quarterly observations from 1980:I – 2005:IV. The dependent variable is the quarterly change in the log of real GDP (in %). The independent variables are $d\text{BFI}$ = change in the Blanchard Fiscal Impulse proxy, $d2\text{Cr}$ = difference in the change of the log of real domestic credit, $d\text{E}_{\text{EFF}}$ = change in the log of real effective exchange rate, $d\text{I}_{\text{IND}}$ = change in the log of real imports by industrial countries, $d\text{X}_{\text{SOV}}$ = change in the log of Finnish real exports to the Soviet Union, $d\text{V}$ = change in the log of real housing market price index, and $d\text{M2}$ = change in the log of real money supply (monetary aggregate measure M2). Standard errors of the parameter estimates are given in parentheses. We also report the coefficient of determination (R^2), the Sum of Squared Residuals (SSR), value of the log likelihood function (Log L), and the Durbin-Watson statistics (DW). In Versions 4-5 we have controlled for the collapse of bilateral Soviet Union trade in 1991-1992 using a multiplicative dummy variable ($d\text{X}_{\text{SOVCol}}$) that obtains the value of 1 times the $d\text{X}_{\text{SOV}}$ value inside the range 1991-1992 (Version 4), and zero outside of it, and for the specific effects of monetary (DM2Pol) and fiscal policies (DBFIPol) during the free capital markets and the period of own monetary policy, i.e., 1987:I – 1998:IV (Version 5), using also multiplicative dummies, with respect to $d\text{M2}$ for monetary policy, and $d\text{BFI}$ for fiscal policy. Version 5# reports the results from the GMM estimation for Version (5), and Version 5* for the GMM estimation of the same model without $d\text{M2}$ variable. In addition to the constant term we used 4 lags of each of the regressors as the instruments in the instrumental estimation and report the Hansen J-test value (with degrees of freedom 21 for 5# and 18 for 5*) for the null of validity of the chosen set of instruments and the p-value for the statistic in the parenthesis. ***, ** and * denote significance of the reported parameter estimates at 1, 5 and 10 % risk levels, respectively.

Ind. vars/Version	1	2	3	4	5	5#	5*
Constant	0.368*** (0.105)	0.384*** (0.105)	0.475*** (0.102)	0.449*** (0.095)	0.455*** (0.095)	0.560*** (0.085)	0.646** (0.066)
$d\text{BFI}$	0.007 (0.066)	0.011* (0.006)	0.008 (0.006)	0.013** (0.005)	0.027*** (0.009)	0.017 (0.011)	0.002 (0.009)
$d2\text{Cr}$	-	0.041** (0.020)	0.044** (0.021)	0.059*** (0.017)	0.062*** (0.018)	0.070*** (0.017)	0.061*** (0.021)
$d\text{E}_{\text{EFF}}$	0.047 (0.044)	0.046 (0.043)	0.055 (0.044)	0.028 (0.036)	0.036 (0.035)	0.020 (0.041)	0.007 (0.056)
$d\text{I}_{\text{IND}}$	0.081*** (0.018)	0.078*** (0.018)	0.073*** (0.019)	0.074*** (0.020)	0.071*** (0.020)	0.050*** (0.016)	0.059*** (0.016)
$d\text{X}_{\text{SOV}}$	0.004 (0.006)	0.001 (0.006)	0.002 (0.006)	-0.011* (0.006)	-0.011* (0.006)	-0.030*** (0.009)	-0.025** (0.011)
$d\text{V}$	0.142*** (0.033)	0.152*** (0.033)	0.159*** (0.034)	0.145*** (0.034)	0.144*** (0.034)	0.119*** (0.027)	0.122*** (0.032)
$d\text{M2}$	0.111*** (0.042)	0.104** (0.042)	-	0.108*** (0.039)	0.120** (0.055)	0.124** (0.057)	-
$d\text{X}_{\text{SOVCol}}$	-	-	-	0.025*** (0.009)	0.028*** (0.008)	0.052*** (0.012)	0.047*** (0.013)
DM2Pol	-	-	-	-	0.003 (0.076)	-0.002 (0.059)	0.102 (0.040)
DBFIPol	-	-	-	-	-0.021** (0.010)	-0.012 (0.011)	0.003 (0.009)
Table 4 continues							

Table 4 continues

Statistics	1	2	3	4	5	5#	5*
R ²	0.419	0.440	0.405	0.553	0.571		
SSR	90.152	86.264	92.022	83.004	79.608	75.361	75.934
Log L	-139.290	-136.187	-139.482	-134.222	-132.091	-	-
DW	2.307	2.287	2.503	2.398	2.373	2.169	2.337
J-test	-	-	-	-	-	12.189 (0.934)	12.212 (0.836)

Table 5. Partial effects

Table 5 describes the effects of one percentage point change (panel a) and one standard deviation (panel b) in the value of each of the explanatory variables separately on the dependent variable (growth rate of GDP, dY) based on Models 2 (no dummies) and 5 and 5#, 5* (all dummies) reported in Table 4.

panel a) 1 % point change in X					% difference for the responses between		
X	Model 2	Model 5	Model 5#	Model 5*	Models 5 and 2	Models 5# and 2	Models 5 * and 2
dBFI	0.395	0.482	0.577	0.648	22.23	46.08	64.05
d2Cr	0.425	0.517	0.630	0.707	21.65	48.24	66.35
dE _{EFF}	0.440	0.491	0.580	0.653	11.59	31.82	48.41
dI _{IND}	0.462	0.526	0.610	0.705	13.85	32.03	52.60
dX _{SOV}	0.385	0.444	0.530	0.621	15.32	37.66	61.30
dV	0.536	0.599	0.679	0.768	11.75	26.68	43.28
dM2	0.488	0.575	0.684	-	17.82	40.16	-
panel b) 1 std. dev. change in X							
dBFI	0.589	0.957	0.876	0.683	62.64	48.86	16.05
d2Cr	0.555	0.714	0.853	0.901	28.59	53.52	62.23
dE _{EFF}	0.500	0.438	0.606	0.662	7.60	21.25	32.47
dI _{IND}	0.808	0.841	0.832	0.966	4.09	2.97	19.67
dX _{SOV}	0.401	0.267	0.048	0.197	-33.37	-88.06	-50.94
dV	0.843	0.890	0.919	1.014	5.56	9.06	20.33
dM2	0.634	0.743	0.858	-	17.27	35.35	-