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Household Behaviour in Ireland, Sweden, the US and the UK under Rationing

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TEP Working Paper No. 1221

October 2021

Trinity Economics Papers
Department of Economics

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Abstract

The pandemic-induced economic crisis has seen a massive build up in savings across Europe and North America as households could not spend their income as they normally would. The last time that consumers were seriously rationed was during the Second World War. This paper models the behaviour of households during the War years and its immediate aftermath in Ireland, Sweden, the US and the UK. We first estimate overall consumption and then consider how total consumption was allocated over different categories of goods, including rationed goods. The model shows that consumers saved rather than spend on available unrationed goods and services. These savings were held in liquid form and, once the War was over and rationing eased, a consumption boom transpired. However, only some of the savings were spent on previously rationed goods as significant excess savings were also converted into physical assets in the housing market. There is evidence that this pattern is being repeated as the Covid-19 crisis eases.

1. Introduction

During and after the Second World War there was a period of extended rationing in neutral countries, such as Ireland and Sweden, as well as in participants in the conflict, such as the UK and the US. Despite the differences in attitudes of these countries with respect to the War (Harrison, 1998)¹, consumers were affected in similar ways: real household income rose over the war years in three of these countries² but consumers were severely restricted in what they could spend their money on. While this regime was in place, whether for precautionary motives, or to postpone expenditure until the goods that households sought became available, there was a major increase in household saving. As the War came to an end in 1945, the precautionary motive for saving largely disappeared and, as the goods previously rationed gradually became more freely available, the household sector returned to more 'normal' consumption patterns and ran down some, but not all, of its stock of excess savings.

It remains to be seen whether the current crisis will see a similar pattern of behaviour (Romer, 2021). Certainly, the restrictions on consumer behaviour are similar to the Wartime years, though on this occasion it is largely services that have been severely restricted. However, some studies already point to the exceptional savings motivated by the crisis (Ercolani, 2020; Ercolani et al, 2021). As yet, it remains unclear whether households' exceptional level of savings is due to precautionary motives or because the services they would previously have purchased are temporarily unavailable. As populations become fully vaccinated, this could provide a similar cathartic moment to the end of the

¹ Sweden and Ireland remained neutral, but the UK and the US participated actively with different levels of intensity. While the US' territory was far from the actual war arena, Harrison (1998) shows that the level of commitment in terms of industrial production for the war was relatively higher in the US (Table 1.6 page 15).

² Real income in the UK in 1945 was similar to the level in 1938. The devastation of the economies of many other participants in the War, such as Germany, Poland, France and Italy, meant that incomes fell in those countries over the course of the War, and the immediate post-War experience was also very different. While some data are available for Spain, another neutral country, the devastation wreaked by the civil war saw a prolonged period of disruption over many years (see Catalan, 2002), which makes the approach taken in this paper unsuitable for its study.

War in Europe in May 1945. If that is the case, we could witness a similar period of high consumption, with some rundown in exceptional savings.

By applying a two-stage model, we estimate the extent of the “excess” saving and the extent to which rationing constrained consumption in the War years. Subsequently, we measure the extent to which “dissaving” contributed to the post-war consumer boom. Further, we show that some of the excess savings built up during the war years were subsequently channelled into the housing market, resulting in a rapid rise in prices, not only in the UK where some of the housing stock had been damaged by the War, but also in the other countries where no such damage occurred.

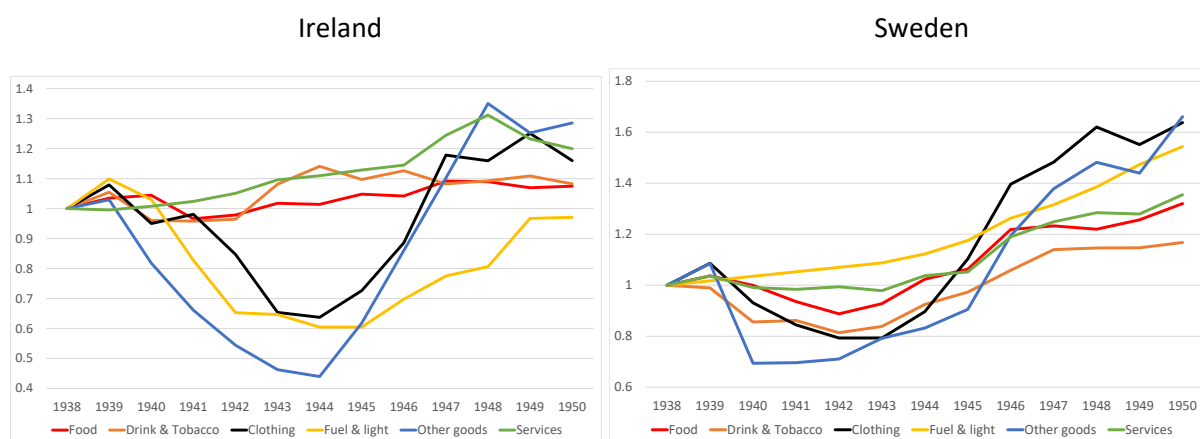
Section 2 of this paper describes the rationing regimes and the development of incomes and consumption during the War years in the four countries. The data sources are set out in Section 3. A model of consumer behaviour is described in Section 4 and this model is estimated in Section 5. Using this model, the effects of the War and rationing on consumer behaviour are quantified in Section 6, and conclusions are reached in Section 7.

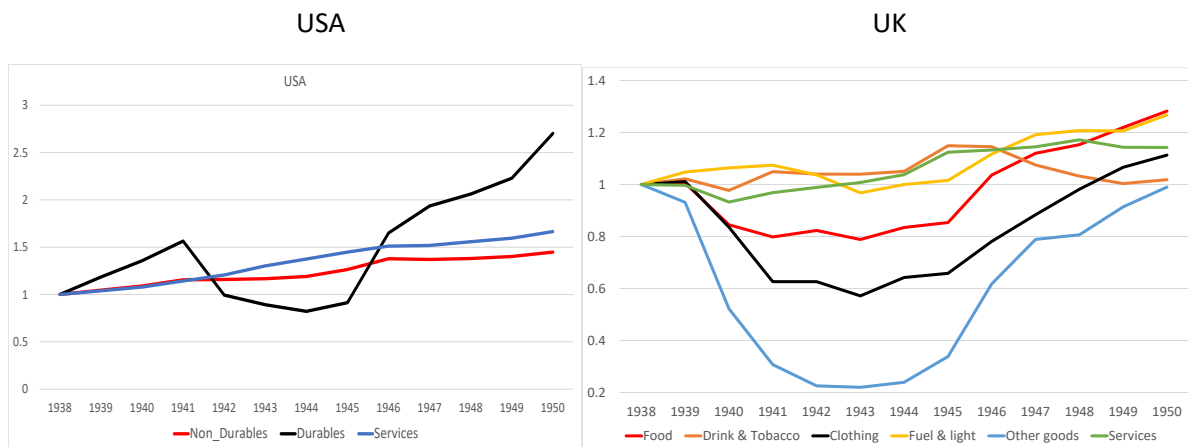
2. Background: War, rationing and consumption

In this paper, we do not consider countries, which endured wartime devastation and suffered a dramatic fall in output and incomes by the end of the War. In such countries, personal savings were wiped out and repairing the physical damage done by the War pre-empted private sector resources in the immediate post-war years. Instead, we consider four countries where the War severely disrupted the supply of consumer goods, both in terms of domestic production and imports, but whose productive structure was still functioning at the end of the War and where real household income in 1945 was at or above its pre-War level. Ireland and Sweden remained neutral while the UK and the US were active participants in the War.

During the War, a wide range of goods were no longer available in both neutral and belligerent countries. Part of the reason for the reduced supply was the reorientation of domestic economies to war-time production: for example, the Industrial Mobilization Plan in the US accounted for substantial economic activity in the national economy between 1940 and 1945. However, this increase in output was primarily focused on material required to prosecute the War (Jaworsky, 2017). Another important factor disrupting the availability of consumer goods was the exceptional difficulties in transport to Europe and within Europe. This is reflected in the dramatic fall in the consumption of affected goods in each country, as illustrated in Figure 1.

Figure 1: Index of volume of Consumption, 1938=100





Source: A detailed description of the sources of the data used is provided in Appendix 2.

Figure 1 shows a steep fall in the volume of consumption in Ireland, Sweden, the UK and the USA across a range of different categories of goods. Although the patterns of consumption differ from country to country, the sharp decrease in consumption of clothing and “other goods” was common to Sweden, Ireland and the UK.³ For the US, there was a sharp decline in the consumption of durable goods. Despite the similarities, each country suffered their own experience of shortages: whereas Ireland shows a major fall in the volume of fuel and power consumed, Sweden’s experience differs due to its vast resources of firewood and mineral products (Kander et al, 2014). In the UK, a food importer, there was also a substantial fall in the volume of food consumption.

The severe restriction of imports was reflected in rationing across a very wide range of consumer goods in all four countries. The most obvious shortage was in motor vehicles (included in the category “other goods” or durables), where production and imports for personal use were suspended for the duration of the War. However, food rationing was also severe in the UK, but less so in Sweden. In the US and Ireland, major food producers, food rationing was also in place, but it imposed significantly fewer constraints than in the case of the UK. Details of the rationing regimes in each of the four economies are outlined in Appendix 1.

In Ireland, the goods that were in very short supply and heavily rationed were fuel and power, clothes, and other goods, all of which saw a very big fall in volume during the War years. Initially, in 1939 the government attempted price control measures. However, these measures proved ineffective. As described by Bryan (2014), rationing of petrol began in 1939 and was gradually extended to other goods. Rationing of fuel and power was particularly severe, as Ireland was dependent on imports for all coal and oil. Rationing became particularly restrictive across a wide range of goods in 1942. When the War ended in 1945, the system of rationing was gradually unwound.

Rationing in the UK began in 1939 and was steadily tightened, with the toughest restrictions introduced in 1943 and 1944 (Zweiniger-Bargielowska, 2002). Food was subject to strict rationing from the beginning of the War. The severity of the rationing policy was depicted by Broadberry and Howlett (1998) as the government aiming for victory “at all costs”. While the War ended in 1945, rationing continued across a broad range of goods in the immediate post-War years. The rationing of clothing persisted until 1949⁴ and rationing of a limited range of other goods ceased as late as 1955.

³ Separate national accounting data for clothing are not available for the US.

⁴ Princess Elizabeth married in November 1947, and she was given a special grant of clothing coupons by the government to allow her to have a traditional wedding dress.

This continuation of rationing after the War partly reflected a priority for the UK to manage domestic demand in an economy with an historically high foreign debt burden and a binding balance of payments constraint. It also reflected the Labour government's view that rationing constituted a "fair" mechanism for protecting those on low incomes (Zweiniger-Bargielowska, 2002).

As a neutral country, at the outbreak of World War II, Sweden's policy makers had the precedent of World War I from which they could draw lessons. The searing experience of food shortages in 1917 and 1918, and a changing approach to economic policy meant that the government was expected to take a much more active role in managing crises in the 1940s (Schön 2010, p. 311). Preparations for a conflict had been underway during the mid-1930s, though the first detailed national inventory count was conducted in December 1939, some months before the first rationing was imposed. Thereafter, such reports were produced on a quarterly basis until 1945 (SOU 1952: 49, p. 404).

In stark contrast to World War I, during World War II in Sweden a rationing system was initiated within the first year of hostilities. Clothes and other goods were subject to relatively severe rationing and, while many food products were also rationed, shortages were much less severe than in the First World War. The large fall in the volume of alcohol sales in Sweden during the War was due to a major policy change that raised the price of alcohol. Unlike the case of Ireland, the Swedish energy supply was less constrained, with the exception of oil products. For many products rationing ended in 1945, while rationing of the last restricted item, coffee, concluded on 18 August 1951 (SOU, 1952 :49, p. 403).

The situation in the US was very different. Contemporaries described the economy, which grew at a remarkable rate in the period to 1945, as a 'production miracle', which reversed the downward trends set in motion during the Great Depression (Rockoff, 1988). Despite the huge productivity of the United States, consumers were still affected by restricted supply of consumer goods, as the requirements of the War economy were prioritized over personal consumption. Rationing began early in 1942 and continued until August 1945 (Fishback and Cullen, 2013; Brunet, 2021). Rationing covered many food items, petrol, cars and tyres, and a range of other goods.

Thus, the shortages and rationing affected the four economies over slightly different periods, partly reflecting when they entered the War (the UK in September 1939 and the US in December 1941), as well as the proximity and the severity of the conflict within Europe. Generally, rationing became seriously restrictive in 1941 and 1942, reached a peak in 1943 and 1944 and began easing in late 1945.⁵ While rationing was phased out quite rapidly after the end of the War in the US, Ireland and Sweden, it persisted into the 1950s in the UK.

Across the four countries, the result of the restrictions on imports and the reallocation of domestic production to meet War needs, meant that there was a substantial change in relative prices. Specifically, the price of both imported goods, and those goods for which domestic production was restricted, rose relative to the price of food and services.⁶ This also contributed to a substantial reduction in consumption of non-food goods.

Reflecting on the war-time experience, Tobin (1952) suggested that many of the objectives of the rationing regime could have been met more efficiently by other mechanisms. However, he concluded that:

⁵ Details of the phasing of rationing in the four economies are provided in Appendix 1.

⁶ The price indices suffered from measurement problems where some goods, such as cars, were totally unavailable.

“Finally, the individualistic approach of the theory of consumer choice and of welfare economics may well obscure social effects of rationing of much greater importance than the effects which our atomistic theory discloses. For example, the feeling of sharing equally in an emergency situation may be more important for production and welfare than the individual incentives and choices on which economic analysis has traditionally centered.”

Table 1: Real Personal Disposable Income, 1938=100

	Real personal disposable income, 1938=100				Personal savings rate			
	Sweden	Ireland	USA	UK	Sweden	Ireland	USA	UK
1938	100	100	100	100	1.4	5.5	3.0	6.3
1939	105	101	108	104	2.4	2.0	5.4	9.9
1940	97	95	116	104	3.1	1.7	6.8	21.4
1941	98	93	134	103	6.8	6.0	13.9	23.3
1942	98	93	152	103	9.0	9.4	26.2	22.9
1943	102	95	159	103	11.3	10.9	27.7	23.7
1944	105	97	164	102	6.3	12.6	27.9	20.0
1945	105	102	162	100	1.9	14.0	22.5	12.1
1946	122	105	161	100	2.0	12.1	11.9	4.1
1947	127	105	154	102	1.3	0.2	6.3	1.8
1948	135	111	162	103	5.0	3.1	8.9	0.4
1949	136	120	164	105	5.1	7.1	7.0	0.3

	Household currency and deposits ⁷ % of disposable income			
	Sweden	Ireland	UK	USA
1937	84		58	
1938	85		58	
1939	83	70	56	
1940	81	69	51	
1941	79	70	53	
1942	76	72	55	
1943	79	74	61	
1944	85	81	68	
1945	92	83	78	68
1946	84	88	83	71
1947	85	86	80	69
1948	80	83	78	62
1949	85	81	76	62

Sources: A detailed description of the sources of the data used is provided in Appendix 2.

As shown in Table 1, real personal disposable income at the end of the War was slightly higher in Sweden and Ireland than it had been in 1938, significantly higher in the US and unchanged in the UK. Under normal circumstances the rise in real personal disposable income would have resulted in a

⁷ The data for Ireland are for all sectors, not just households.

rise in consumption of all categories of goods. However, there was also a dramatic rise in the personal savings rate (Table 1). As shown in Figure 1, when the rise in relative prices was combined with the effects of rationing, despite generally higher incomes, there was a dramatic fall in consumption of rationed goods.

With unchanged real incomes, one might have expected that consumers would, nonetheless, have adjusted their patterns of consumption in response to the change in relative prices. This would have materialised as a shift towards consumption of services and goods that remained in relatively abundant supply, away from consumption of other goods where the relative price rose or where there was rationing. While such a change did occur, households only reallocated a portion of their disposable income to more readily available foods and services. As shown in Table 1, they also saved a substantial part of their income. This increase in savings was reflected in a substantial rise in liquid bank deposits. In the US and the UK, investment also took place in War bonds, a less liquid asset.

This rise in savings was, in the first place, driven by the extreme uncertainty that prevailed during the War years. While Ireland and Sweden were neutral coming through the War with minimal damage to life or property, there was a real concern between 1939 and 1945 that they might be dragged into the conflagration. There was an obvious motivation in the US and the UK for precautionary savings due to the War. However, some of the saving appears to have reflected the lack of choice available to consumers. Rather than spend all their income on the goods and services that were available, they chose to save for a future after the war when the full range of goods would, ideally, become available at more reasonable prices (Burnet, 2017).

This would suggest that the traditional assumption of weak separability of consumer preferences between one period and the next did not hold. Saving took place, not just for precautionary motives or to provide for retirement, but also because of an expectation of a better future when scarce or high price goods would be much more freely available (relative prices would change).

The end of the War in May 1945 produced a rapid turnaround in outlook. The precautionary motive for holding the accumulated savings disappeared at the same time as restrictions on imports and rationing began to be eased in 1946. Because much of the excess savings were held in liquid form, they could be spent on consumer goods or used to fund investment in housing.

The easing in rationing occurred earlier in Ireland, Sweden and the US than in the UK. As households ceased to make exceptional savings there was a boom in consumption. Additionally, some of the “excess savings” accumulated over the war years were spent on the newly available goods, adding to the consumer boom. Another destination of these funds was the housing market, which resulted in a substantial real increase in house prices. Thus, some of the excess wartime savings were eventually invested to provide for retirement, even if that had not been the original reason for their accumulation.

3. Data

The data for personal disposable income and personal consumption at current and constant prices come from early national accounts for each of the four countries. Details of the sources are provided in Appendix 2. In the case of the UK and the US, data are available from at least 1930. For Sweden, they begin in 1931 and for Ireland they commence in 1938. In principle, these data are available as continuous series to 2019 but, as described later, the model is estimated to 1970.

The data for personal savings are derived by subtracting personal consumption from personal disposable income. However, because the series for personal income and consumption for each country have been linked at a number of years between 1930 and 2019, over time there is some

drift, which makes the residually determined personal savings data implausible for the earlier years. However, the change in the personal savings rate from year to year within the sample period generally provides a reasonable measure of the trend in the underlying personal savings rate.

In the case of the Irish data, this problem with the residually determined savings rate was dealt with by linking the personal savings rates from different vintages of national accounts. For both the UK and Sweden, there are discontinuities in the series for personal disposable income, which also affects the savings rate. These discontinuities are treated in estimation using dummies. For Sweden, Ireland, and the UK consumption data are disaggregated into six different categories of goods and services at current and constant prices, derived by linking data for different vintages of national accounts. The six categories are food, drink, clothing, fuel and power, other goods, and services. For the US, continuous series for a three-way breakdown into non-durables, durables and services are available from the Bureau of Economic Analysis. In the case of the UK, the data for consumption and disposable income were taken from a Bank of England spreadsheet of historical data (Thomas and Dimsdale, 2017). Sefton and Weale (1995) provide continuous series for the UK for the components of consumption.

While the categories of consumption used here are not directly aligned with the categories of goods that were rationed in each country during the 1940s, they do allow the identification of the categories of goods where rationing or supply shortages were particularly binding.

4. Modelling Consumer Behaviour

In the standard approach to modelling consumer behaviour, households save to provide for a steady flow of income over their lifetime and to deal with possible future shocks to that income stream (Friedman, 1957; Deaton and Muellbauer, 1980). In addition, individuals' choice of how much to work, and therefore their income, is affected by preferences for consumption and leisure. These factors help determine household income in a given year, how much of that income is spent and how much is saved.

Obviously, the War gave rise to huge uncertainty for households, not just in nations that were at war, but also in neutral countries. This helps explain a major rise in savings for precautionary purposes. However, the wartime restrictions on the availability of a wide range of goods also encouraged households to save so that they could acquire the rationed goods when peacetime supplies resumed.

In the standard approach to modelling the pattern of expenditure of households in any given year, household behaviour is assumed to be affected by their preferred total level of consumption, their tastes and the relative prices of the different goods and services available to them (Deaton and Muellbauer, 1980). This gives rise to a two-stage modelling approach.

First, the overall level of consumption in a year is determined by a consumption function. Subsequently, the consumption of individual commodities and services is a function of total consumption and the relative prices of those goods and services. In such a model, if availability of some goods or services is affected by rationing, then the spending that would have been directed at the rationed good or service is spread over the available goods and services. However, during the War years, and again during the pandemic, such a model does not align with actual behaviour by consumers. In both cases there was a major rise in savings, and only some of the income that could not be spent on rationed goods and services was spent on available goods and services.

The standard approach to modelling consumer behaviour, set out above, assumes weak separability between consumer preferences in individual years: an expected change in relative prices in the

future does not affect households' pattern of consumption in the current year or their total consumption in that year (Deaton and Muellbauer, 1980).

Under normal circumstances, households may not have well-formed expectations about changes in future relative prices. However, in the years of the Second World War, and again during the recent pandemic lockdown, consumers were heavily constrained in what they could buy. When constrained, the shadow price of the rationed good or service was much higher than the prevailing price. In both cases there was the expectation that, when rationing ended, consumers would be able to buy what they wanted at lower prices than the prevailing shadow price of rationed goods and services. Thus, there was an expectation of a future change in relative prices. Under these circumstances, many consumers, instead of spending as they would normally on a range of goods and services, saved to spend on rationed goods and services in the future when their choices would no longer be constrained (Brunet, 2021).

It is difficult to distinguish this type of saving (motivated by providing for future consumption of presently rationed goods) from saving for purely precautionary motives. One indication that some of the saving was due to the prospect of future changes in relative prices is that high savings rates continued into 1945 or 1946, even though the impending end to hostilities reduced the motive for precautionary saving. Furthermore, the fact that the exceptional rise in post War consumption, involved dissaving, accompanied by greater expenditure on previously rationed goods, suggests that wartime savings arose from more than a merely precautionary motive.

The behaviour of consumers through the War years and its aftermath is captured in the following model:

A simple model of consumption:

$$c = \alpha_0 + \theta y + \delta_W D_W + \delta_P D_P \quad (1)$$

Where c is the log of consumption at constant prices, y is the log of real personal disposable income and D_W and D_P are dummies for the War years and the immediate post-War years respectively. The precise timing and definition of the dummies is given in Appendix 2.

Household expenditure on individual goods and services was modelled using an Almost Ideal Demand System (AIDS) model (Deaton and Muellbauer, 1982).

$$S_i = \alpha_i + \sum \beta_{ij} \log\left(\frac{P_i}{P_j}\right) + \beta_i \log\left(\frac{Y}{P}\right) + \delta_i D_W + \gamma_i D_P \quad (2)$$

S_i is the share of expenditure on item i , P_i is the price of item i , Y is real consumption and P is an index of consumer prices. The share of expenditure allocated to each category of consumption is a function of the relative prices of the different commodities, of total expenditure at constant prices, and dummies, D_W , to reflect the constraints on choice of consumer goods and services as a result of shortages and rationing during the war. In addition, after the War there may have been some catch up in expenditure of previously rationed goods, captured by a separate dummy D_P . As suggested in Deaton and Muellbauer (1982), a Stone (1953) index for consumer prices P is used where:

$$\log(P) = \sum S_i \log(P_i) \quad (3)$$

The two-stage model used here treats prices of individual goods and services as exogenous. As relative prices also changed due to wartime shortages, the model here does not capture the full effects of the War on changing consumption patterns, only the direct effects of higher savings and the effects of rationing and reductions in supply.

In the AIDS model, as theory would indicate, symmetry and homogeneity are imposed. Because the shares S_i sum to unity, one of the equations is dropped in estimation. This means that the errors will be correlated across the equations. As a result, the AIDS model is estimated using the Seemingly Unrelated Regressions (SUR) estimator. As set out in Appendix 3, a series of identities are appended to close the model.

As discussed earlier, linking series over longer time horizons poses problems. In addition, tastes and consumer preferences change over time and technical progress has typically resulted in the development of new products and services. Thus, while continuous series are available to 2019, the model is estimated using data that begin before the War, span the War years, and end in 1970. The start date for each country model depends on data availability for the 1930s.

5. Results

The results of estimating the simple consumption function, Equation 1, are shown in Table 2. Except for the US, the log of consumption was regressed on the log of real personal disposable income and a series of dummies. For the US, consumption was regressed on real personal disposable income and dummies.

Table 2: Results for Consumption Function equation 1

	Period	Sweden		Ireland		US		UK	
		Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic
α		0.2955	1.8*	1.3459	7.8***	12.0214	12.6***	1.1986	7.4***
θ		0.9685	58.7***	0.8602	47.8***	0.8322	237.6***	0.9013	70.2***
War dummies									
δ	1940-44	-0.0485	-5.1***					-0.1850	-29.0***
δ	1941-46			-0.0530	-5.1***				
δ	1942-45					-31.1975	-24.1***		
δ	1943	-0.0538	-3.0***						
δ	1941					-9.4027	-3.8***		
δ	1939, 1945							-0.0505	-5.6***
Post-War									
δ	1946-51							0.0250	4.3***
δ	1947-49					3.8618	2.6**		
δ	1947-48			0.0332	2.3**				
Discontinuities									
δ	1950-70	-0.0996	-8.4***						
δ	1930-47							-0.0387	-5.8
Adj. R-squared		0.998		0.992		0.999		0.998	
DW		1.43		1.40		2.45		1.77	
Estimation period		1935 1970		1938 1970		1929 1970		1930 1970	

***= significant at 1% level, ** at 5% and * at 10% level

Because the War affected the different countries over different periods, the dummies are country specific. In choosing the appropriate span of years to include in the dummy, guidance was taken from the DFFITS statistic in the regressions without dummies, which pointed to observations that were exerting a significant leverage on the estimation results. Because the relaxation of constraints on consumption after the War affected each country differently, these dummies are, once again,

country specific. Dummies were included in the equations for Sweden and the UK due to discontinuities in the data for real personal disposable income in 1947 and 1949 respectively.

In the case of each of the four countries, the elasticity⁸ of consumption with respect to personal disposable income was significant with a plausible coefficient close to but significantly different from unity.

In the case of Sweden, the serious impact of the War lasted from 1940 to 1944 and this is covered by one dummy, which is significant indicating that consumption was 5% below normal. Consumption was especially low in 1943 at the height of the war, as reflected in a second significant dummy. Testing for a post-war boom fuelled by dissaving did not prove significant. As discussed earlier, there is a discontinuity in the personal disposable income data at 1949, reflected in the significant dummy covering the period from 1950-70.

For Ireland, the War exerted a strong effect on consumption behaviour from 1941 through to 1946 with consumption also 5% below normal, very similar to the other neutral country we consider, Sweden. However, once rationing was phased out, the significant dummy for the years 1947 and 1948 shows that there was abnormally high level of consumption, reflecting some dissaving.

The US entered the War in December 1941. The dummy for the period 1942-45 is significant implying a major reduction in consumption of over 20%, despite rapidly rising real incomes. A second dummy is included for 1941, as it is clear that expectations of conflict, and the reorientation of the economy towards a wartime footing, was already affecting consumption and savings in that year. The significant dummy for the years 1947-49 suggests that there was some limited dissaving in those years, helping fuel a consumption boom.

For the UK, as discussed by Broadberry and Howlett (1998), the model suggests that the war years of 1940-44 saw an exceptional reduction in the volume of consumption of 18%, very similar to that observed in the other combatant, the US. This is not surprising, given that the UK was seriously impacted by the conflict in a way that the neutral countries were not. There is also evidence of a contribution to a post-war rebound in consumption from some dissaving, reflected in the positive dummy for 1946 to 1951.

The AIDS model of consumer demand was estimated for the four countries. For the US, data were only available for a three-way breakdown of consumption. The results of estimating the model for the four countries are shown in Table 3. All the equations have been adjusted for autocorrelation. A Wald test was conducted on the joint significance of the War dummies in each model. It decisively rejected the hypothesis that the coefficients on the wartime dummy were zero – that consumers' behaviour was "normal" in those years. For the UK, a post-war dummy for the years 1949-51, when rationing was largely phased out, is also significant.

In the models for the four countries, the dummies for the war years are significant for quite a number of categories of goods at least at the 5% level: for Ireland for expenditure on drink, clothing and fuel and power; for Sweden for food, fuel and power and clothing; for the UK for food, clothing and fuel and power; for the US for both durables and non-durables. For the UK, the post-war dummy was also significant for clothing, implying that when rationing ended, there was a pent-up demand for replacement clothing.

⁸ In the case of the US, it is the propensity to consume.

Table 3: Estimation Results of AIDS model of consumer demand

	Ireland		Sweden		UK	
	Coefficient	t Stat	Coefficient	t Stat	Coefficient	t Stat
α_F	1.076	5.94***	0.455	1.04	-1.652	-0.09
δ_F	0.003	0.80	0.009	2.34**	-0.017	-3.53***
γ_F					0.006	1.66*
β_{FD}	-0.006	-0.33	0.000	-0.05	-0.025	-2.02**
β_{FC}	0.016	0.69	-0.023	-1.43	-0.002	-0.19
β_{FP}	-0.015	-0.68	0.005	0.70	-0.018	-2.00**
β_{FO}	-0.036	-1.25	-0.017	-0.95	0.019	1.56
β_{FS}	-0.138	6.30***	-0.044	-2.59**	-0.107	-5.44***
β_F	-0.113	3.86***	-0.028	-1.29	0.050	1.85*
ρ^F	0.838	9.69***	0.987	32.00***	0.998	34.88***
α_D	0.223	2.63***	0.245	2.29**	1.318	4.30***
δ_D	0.012	5.97***	0.001	1.05	0.017	3.77***
γ_D					-0.002	-0.60
β_{DC}	-0.018	-1.48	-0.004	-0.57	-0.016	-2.43**
β_{DP}	-0.013	-1.21	-0.006	-2.12**	-0.017	-3.63***
β_{DO}	-0.024	-1.56	-0.002	-0.37	-0.013	-1.16
β_{DS}	-0.012	-1.04	-0.003	-0.39	-0.020	-1.54
β_D	-0.015	-1.12	-0.016	-1.84	-0.099	-4.13***
ρ^D	0.240	1.31	0.967	29.25***	0.967	22.00***
α_C	0.197	1.24	-0.376	-2.13**	0.130	2.05**
δ_C	-0.013	3.24***	-0.007	-2.20**	-0.013	-3.05***
γ_C					0.012	4.82***
β_{CP}	0.002	0.14	0.005	0.73	0.019	2.02**
β_{CO}	0.021	0.96	0.007	0.49	-0.008	-0.80
β_{CS}	-0.025	-1.31	-0.026	-2.11**	-0.040	-4.28***
β_C	-0.011	-0.42	0.054	2.78***	-0.006	-1.14
ρ^C	0.669	5.67***	1.027	34.01***	0.244	1.49
α_P	0.316	2.83***	-0.010	-0.19	0.520	2.54**
δ_P	-0.006	-1.98**	0.005	3.14***	0.001	0.49
γ_P					-0.001	-0.69
β_{PO}	-0.051	2.76***	-0.013	-2.15**	-0.010	-1.83*
β_{PS}	0.052	3.34***	-0.006	-1.44	0.009	0.82
β_P	-0.037	-2.06**	0.005	0.95	-0.035	-3.32***
ρ^P	0.414	2.67***	0.260	1.49	0.988	39.96***
α_O	-0.730	4.84***	-0.968	-5.06***	-2.570	-7.75***
δ_O	-0.005	-1.27	-0.007	-1.66	-0.018	-3.28***
γ_O					0.001	0.37
β_{OS}	0.041	2.14**	-0.035	-2.44**	-0.040	-3.14***
β_O	0.138	5.66***	0.106	5.83***	0.231	8.77***
ρ^O	0.805	5.83***	0.915	20.47***	0.960	29.51***
Equation	Adj. R-squared	DW	Adj. R-squared	DW	Adj. R-squared	DW
Food	0.975	2.10	0.936	1.67	0.961	1.91
Drink	0.897	1.28	0.975	1.30	0.971	1.34
Clothing	0.897	1.83	0.931	1.71	0.863	2.09
Power	0.737	1.86	0.749	1.97	0.738	2.12
Other	0.968	2.12	0.980	1.47	0.975	1.64

	USA	
	Coefficient	t Stat
α_N	0.649	3.41***
δ_N	0.012	3.15***
β_{NU}	-0.007	-0.18
β_{NS}	-0.203	-7.47***
β_N	-0.023	-1.01
ρ^N	1.015	30.51***
α_U	-0.091	-2.70***
δ_U	-0.046	-7.84***
β_{US}	-0.067	-2.97***

β_u	0.044	6.72***
ρ_U	0.551	4.58***
Equation	Adj. R-squared	DW
Non-Durables	0.983	1.916
Durables	0.910	1.723

***= significant at 1% level, ** at 5% and * at 10% level

Note on the suffixes: F = food, D = Drink, C = clothing, P = fuel and power, O = other goods, S = services, N= non-durables, U = durables.

In the model for Ireland, the β_i coefficients, which determine whether the income elasticity of demand is greater or less than unity, were significant for food and fuel and power (less than one) and other goods (greater than one). For Sweden, the β_i coefficients for clothing and other goods were also significant, at least at the 5% level. So too for the UK the coefficients for drink, fuel and power and other goods were significant. The β_{ij} coefficients which determine the cross-price elasticities were significant in a number of cases involving interaction between services prices and other prices.

Finally, for the US model, most of the coefficients were significant. One of two exceptions was the coefficient determining the income elasticity of demand for non-durables, which suggests an income elasticity not-significantly different from one. The wartime dummies suggested that consumption of non-durables was higher than normal while that of non-durables was significantly below normal, reflecting the rationing regime in place and the constraints on supply.

Table 4: Elasticities for different categories of consumption, 1948

	Ireland			Sweden			UK		
	Own elasticity	Compensated own elasticity	Income Elasticity	Own elasticity	Compensated own elasticity	Income Elasticity	Own elasticity	Compensated own elasticity	Income Elasticity
Food	-1.66	-1.37	0.72	-1.16	-0.89	0.91	-0.81	-0.52	1.21
Drink	-1.16	-1.04	0.88	-1.06	-1.01	0.75	-1.69	-1.60	0.46
Clothing	-1.01	-0.88	0.92	-0.89	-0.69	1.37	-1.08	-0.98	0.95
Power	-1.15	-1.09	0.91	-0.99	-0.96	1.02	-1.20	-1.17	0.85
Other	-0.57	-0.31	2.12	-0.59	-0.39	2.06	0.20	0.57	2.64
Services	-0.88	-0.69	1.27	-1.50	-1.27	0.66	-2.22	-2.05	0.55

	USA		
	Own elasticity	Compensated own elasticity	Income Elasticity
Non-Durables	-1.26	-0.81	0.95
Durables	-0.95	-0.77	1.31
Services	-1.35	-0.98	0.94

Table 4 shows the uncompensated and compensated own price elasticities and the income elasticity for each category of consumption for a representative year, 1948. The pattern of the elasticities is rather similar across all four countries implying similar consumer preferences. As is suggested by theory, with one exception, the compensated own price elasticities of demand are negative: higher prices see a fall in demand. The one exception is the UK own price elasticity for other goods which is

positive.⁹ Across the other three countries, the own price elasticity for other goods (durables) is lower than for the other consumption categories. The compensated own price elasticity for clothing is, in all cases, less than unity. For Ireland, the price elasticity for food is greater than unity, whereas for the other economies it is less than unity. In Ireland and Sweden, the income elasticity of demand for food was less than one, reflecting the fact that it was a necessity. Surprisingly for the UK, it is greater than unity and for the US, the income elasticity of demand for non-durables is also less than unity.

These results also indicate that the “other goods” or durables category of consumption, which was heavily rationed in all three countries, had the highest income elasticity of demand, indicating that it was a “luxury” good. As mentioned earlier, it also had a low own price elasticity of demand. Thus, without rationing, prices would have had to have been exceptionally high due to the reduction in supply. In turn, this implies a very high shadow price for other goods during the War years across all four countries. For Sweden, clothing also exhibited a high income elasticity of demand, and the negative war-time dummy reflects the effects of rationing.

6. Simulation Results

The model outlined above, together with a set of identities to close the model, was simulated as a system for the four economies. First, the model was constrained to track the actual historical outcome by adding a set of fixes for each individual year in each of the endogenous equations. This provided a baseline against which to measure the effects of War-time precautionary saving, rationing and the relaxation of restrictions after the War.

The same model was then simulated setting the wartime and post-war dummies to zero in the equation determining consumption (and savings). The difference between this simulation and the baseline shows the impact on consumption and savings of the uncertainty about the future, giving rise to precautionary savings, and also the effects of saving accumulated to engage in future consumption of presently rationed goods. As well as affecting saving, the higher consumption in an unrationed non-War environment would have resulted in higher consumption of individual categories of goods.

In the final simulation, the War-time dummies (and the post-War dummies for the UK) were set to zero in the model of consumer demand and the difference between that simulation relative to the baseline reveals the direct effect of rationing on consumption patterns during the War years.

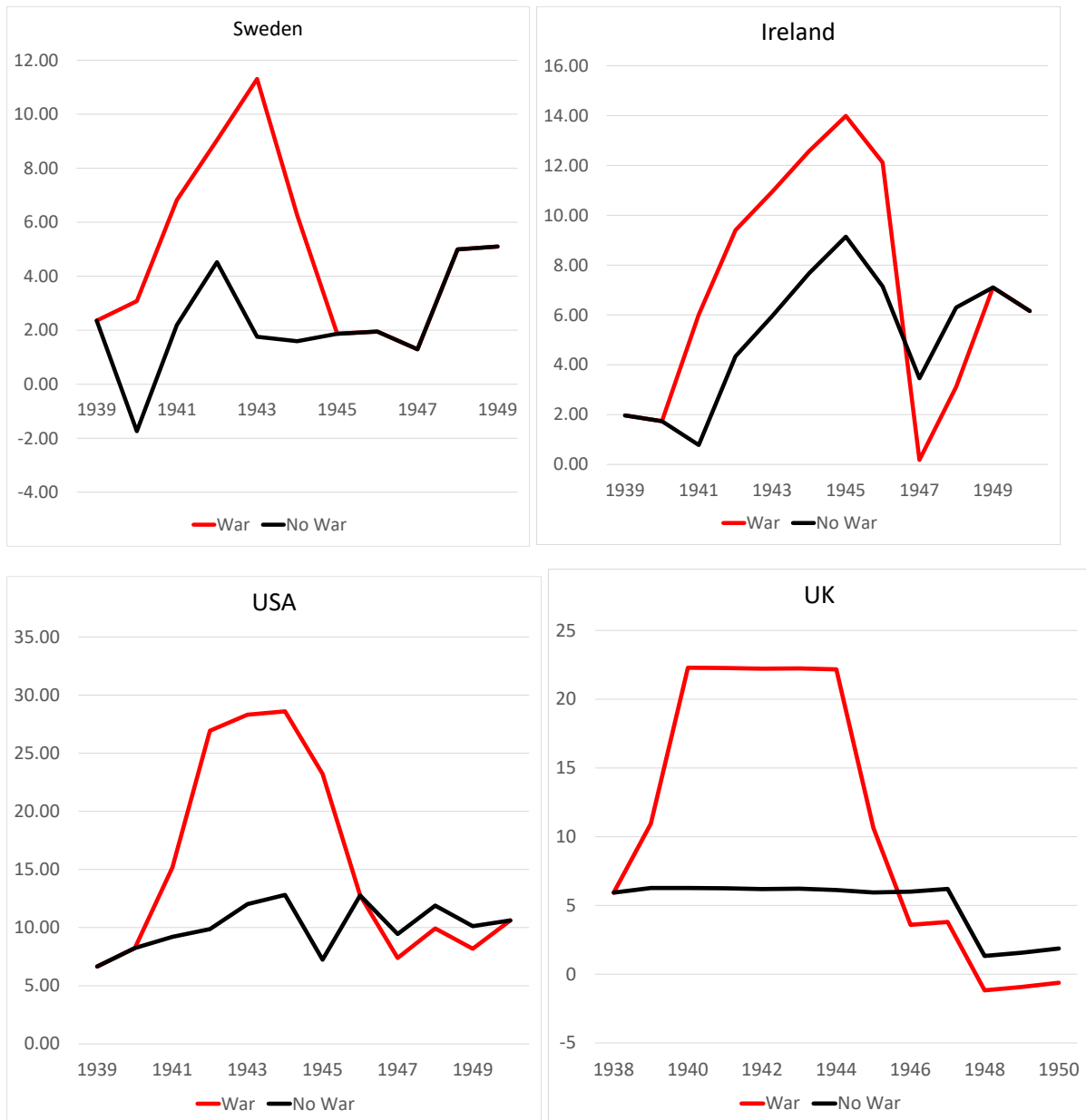
Figure 2 shows the actual savings rate and the counterfactual savings rate if there had been no precautionary savings, and no savings to provide for consumption in the future of currently rationed goods. The area between the red line (War) and the black line (no-War) represents the cumulative excess savings during the war. For neutral Ireland and Sweden, the exceptional personal savings represented a cumulative 30% and 28% of personal disposable income respectively. For the US and the UK, both participants in the War, it represented 71% and 90% of personal disposable income respectively.

If the sole motivation for saving during Wartime had been precautionary in nature, the bulk of the savings might have been spent in the aftermath of the War. As can be seen from Figure 2, the significant post-war dummy in the equations for Ireland, the US and the UK indicates that a limited proportion of the build-up in exceptional savings was used to sustain an above average level of consumption after the War as goods, previously rationed, became available. However, the run-down

⁹ If the post-War years are omitted, when restrictions on supply continued in some form, in estimation the elasticity is close to zero.

in savings comprised only a small proportion of the build-up in household financial assets during the War years.

Figure 2: Effects of War on personal savings rate

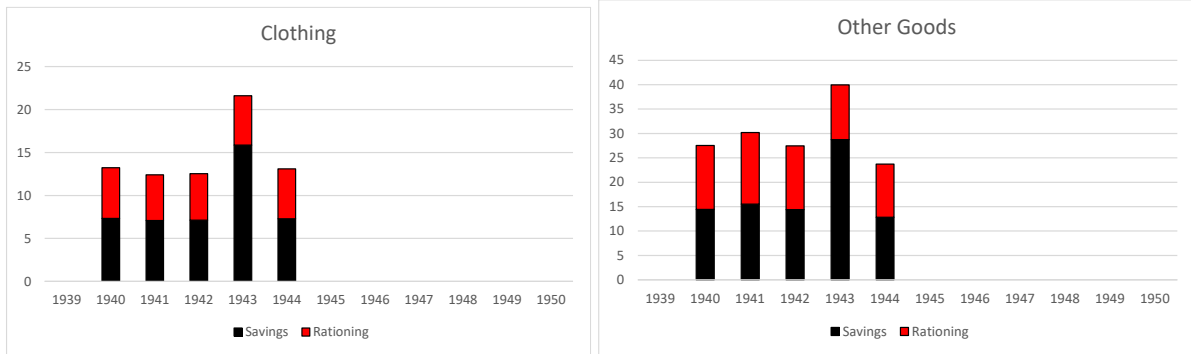


For Ireland and the US, the cumulative dissaving after the war came to between 6% and 7% of personal disposable income. For the UK, the dissaving was spread over a longer period amounting to 15% of personal disposable income. In each case, the cumulative dissaving was only a fraction of the savings actually built up during the War years.

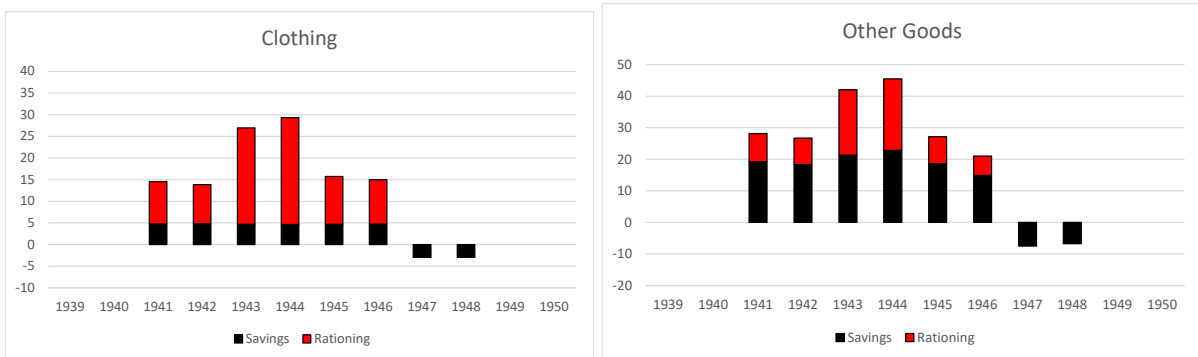
Figure 3 shows the effects of excess wartime savings and rationing upon the consumption of goods in short supply: clothing and other goods for Sweden, Ireland and the UK and durables for the US. It shows how much higher consumption would have been without rationing and excess savings.

Figure 3: Effects of War on categories of consumption that were rationed

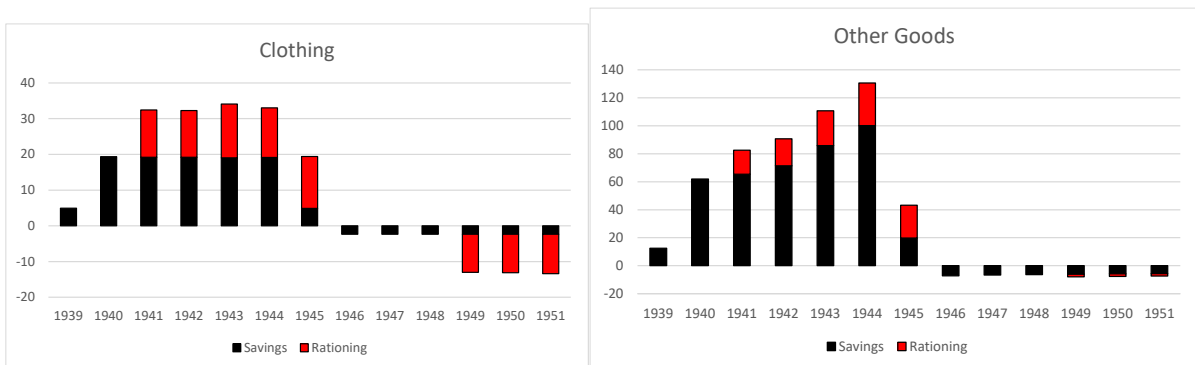
Sweden



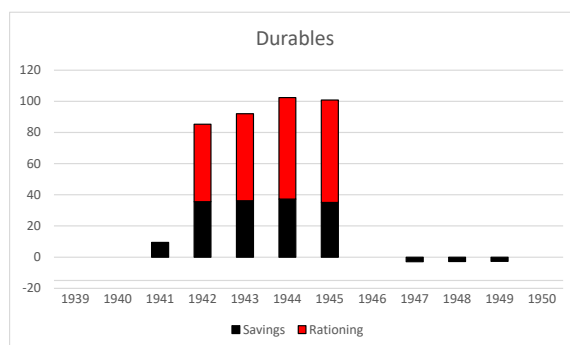
Ireland



United Kingdom



United States



As can be seen for Sweden, without the effects of the War, the consumption of clothing would have been 13% higher in 1940, and over 20% higher in 1943. The effect of the excess savings in reducing consumption of clothing was slightly larger than that of rationing. The reduction in consumption of other goods was even greater at almost 30% in most years and 40% in 1943. With a higher income elasticity of demand, the increased savings rate had a big effect, proving more important than the direct effects of rationing and supply shortages.

By contrast, in Ireland the effect of excess savings in reducing consumption of clothing was dominated by the effect of rationing. In 1943 and 1944, without the War, consumption of clothing would have been more than 25% higher than the War counterfactual scenario. For other goods, as in Sweden, because of the high-income elasticity of demand, the effect of excess savings was greater than the effect of rationing. Without the effects of the War on saving and supply, consumption of other goods would have peaked at around 40% above War-time levels in 1943 and 1944 and would have been around 25% higher in other years. The graphs also show that the exceptional dissaving in 1946 and 1947 meant that consumption of both categories of goods was higher than it would have been without the legacy effects of the War.

For the UK, the effects of the War were much bigger. Consumption of clothing would have been over 30% higher in the early 1940s without the effects of the War. Over half this effect is attributable to the higher savings rate. In the case of other goods, the effects were even more dramatic. Consumption would have been 130% higher in 1944 without the War. The major impact was attributable to the higher savings rate. As in Ireland and Sweden, with a very high income elasticity of demand, the decision to save rather than to spend had a substantial effect on consumption.

The post-war dissaving contributed a small amount to higher consumption of these two categories of goods in the UK. The ending of rationing had a more marked effect on consumption of clothing as people restocked their wardrobes in 1949-51. For the US, consumption of durables would have been 100% higher in the absence of the War. The effects of rationing dominated the effects of the exceptional savings rate. As in the case of Ireland, there is evidence of a small effect after the War from dissaving, adding to consumption in the years 1947 to 1949.

Instead of running down excess savings after the War, households in all four economies used a significant proportion of the exceptional increase in their financial assets to invest in the housing market. Table 5 shows household financial and housing assets as a percentage of personal disposable income. For Sweden and the UK, where data are available back to 1938, financial assets accumulated over the War years, reflecting the high rate of personal savings. However, after the War in Sweden, the UK and the US, financial assets fell as a share of income. In the case of the UK and the US, this was partly offset by an increase in assets held in the form of housing.

The result of this reallocation of financial assets to investment in housing was that in all four countries there was a substantial rise in real house prices (Table 6). The biggest increase was in Sweden where prices had more than doubled by the end of the 1940s. In Ireland, by 1947 house prices were already 50% above their 1945 level (Keely and Lyons, 2020). However, in the Irish case, a return to large-scale emigration quickly reversed the trend. The rise in house prices in the US and the UK was more moderate. In the case of the US, this was attributable to a more rapid supply response in the construction sector.

Table 5: Household Assets as a % of Personal Disposable Income

	Sweden		UK		US	
	Financial assets	Housing assets	Financial assets	Housing assets	Financial assets	Housing assets
1938	189	124	404	80		
1939	181	121	370	80		
1940	172	122	343	75		
1941	165	113	355	73		
1942	163	110	367	75		
1943	166	111	378	81		
1944	179	116	400	91		
1945	196	126	414	99	303	74
1946	183	126	433	103	298	81
1947	185	133	372	110	291	102
1948	171	131	338	114	268	103
1949	179	137	292	111	280	111
1950	165	127	286	108	273	113

Table 6: House prices and the rate of inflation

	Real House Prices, 1945=100				Rate of Inflation			
	Ireland	Sweden	UK	US	Ireland	Sweden	UK	US
1938		88	78	102				
1939		95	76	102	4.6	3.0	-1.0	3.0
1940		90	71	104	13.5	11.7	0.9	17.0
1941		81	70	90	9.9	12.8	6.2	10.8
1942		79	72	83	9.5	9.7	12.4	7.2
1943		82	76	84	8.0	3.5	9.2	3.4
1944		90	86	93	2.3	0.3	5.7	2.7
1945	100	100	100	100	2.5	1.7	4.1	2.6
1946	126	121	117	116	0.8	0.2	6.9	3.4
1947	151	155	141	128	9.4	3.4	10.2	6.8
1948	153	177	152	123	2.7	6.9	5.6	7.2
1949	128	211	143	125	-0.8	1.8	-0.8	2.6
1950	117	242	143	128	2.2	1.7	1.2	2.8

Brunet (2017) reports for the US that:

“Nationally, home construction boomed after World War II (after being strictly limited during the war years). Construction of slightly more than 1 million new housing units began in 1946, compared to just 325,000 housing starts in 1945 and a pre-war high of 620,000 in 1942. “ By 1950 housing starts in the US had reached 1,900,000 units, moderating the pressure on house prices.

Finally, while the wartime economy in Europe and the US gradually reoriented itself to produce the goods and services that post-war consumers desired, this took some time to accomplish. However, consumption patterns adjusted more rapidly and, as discussed by Mandelman (2021), the result was a temporary rise in the inflation rate in the US in 1947 and 1948 (Table 5). A rather similar temporary rise in inflation was observed in Ireland and Sweden in those years. The fact that the UK had

continued with rationing, partly to manage imbalances between supply and demand, did not prevent a similar temporary inflation surge there too. However, in all cases the positive effects on the inflation rate were short-lived.

7. Conclusions

The Second World War saw a substantial build up in personal savings in Sweden, Ireland, the UK and the US. The rise in the savings rate occurred partly because of war-induced fears about the future, but also because consumers could not purchase many of the goods they desired due to rationing or scarcity. Instead of spending their incomes on what was available, households saved to spend in the future when the rationed goods returned to the market (Brunet, 2021). The rise in savings was particularly marked in the two countries that were participants in the War – the US and the UK. As a consequence of the rise in the savings rate, there was a dramatic fall in the volume of consumption during the war years in the four countries considered here (Sweden, Ireland, the UK and the US). This fall occurred despite the fact that real incomes were unchanged or were even higher in 1945 than at the start of the War in 1939.

In addition to the fall in the volume of consumption as savings rose, which would likely have resulted in a major reduction in the consumption of different categories of goods and services, there is clear evidence that rationing further reduced the consumption of key commodities, especially clothing and “other goods” (consumer durables). When the War ended and rationing was gradually phased out, households returned to spending the majority share of their incomes. This inevitably resulted in a consumer boom. There is also evidence that some limited dissaving further fuelled the boom in Ireland, the UK and the US.

Nonetheless, this dissaving absorbed only a small share of the excess savings accumulated over the War years. Instead, a larger component of the excess savings was channelled into the housing market. The result was a rapid rise in real house prices between 1945 and 1948 in all four countries. The increase in house prices in the US was less pronounced than in Ireland and Sweden, due to a rapid supply response.

The Covid pandemic represents the first post-war event of comparable magnitude to World War II in terms of an exogenous shock, which has forced a reduction in consumption, in this case of services. It remains to be seen whether the rebound mirrors the post-War experience. As in the War years, there has been a substantial rise in personal savings across Europe and the US in 2020 and the first half of 2021. These savings are generally held in liquid form. Even with a return to a ‘normal’ savings rate, there will be a very big rise in the volume of consumption. If households behave as they did during the post-War years, some of the excess savings may be used to further expand consumption. However, as in the period 1945 to 1948, more of the savings may find their way into the housing market, with significant implications for house prices.

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Appendix 1: Rationing Regimes

Sweden

At the outbreak of World War II, Sweden's policy makers had the precedent of World War I to draw experience from as a neutral country. Indeed, a post-war summary, commissioned in 1952 by the Department of Trade, pointed to World War I as "the point of departure" from which later contemporaries could draw upon to "avoid repeating the same mistakes that were made then."¹⁰

The erroneous expectation that the War of 1914 would be short-lived had led to minimal preparation for ensuring adequate domestic supplies.¹¹ The leading politicians of the 1910s had great confidence in the market and its ability to withstand crises and disturbances. Thus, interventions came late in World War I and were typically provoked by strong public opinion.¹² Sweden was a small open economy and was not self-sufficient, as would become painfully apparent. Acute food shortages in 1917 and 1918 were accompanied by a threefold increase in the price level as staple foods, such as potatoes, bread and sugar, disappeared from the shelves, leaving broad sections of society to suffer a decline in living standards.¹³

Attitudes had changed by the early 1940s. New economic policy emphasised the role of government in managing crises.¹⁴ Preparations for a conflict had been underway during the mid-1930s, though the first detailed national inventory count was conducted in December 1939, some months before rationing was first imposed. Thereafter, such reports were produced on a quarterly basis until

¹⁰ SOU 1952 : 49, p. 26

¹¹ SOU 1952 : 49, p. 132

¹² Schön 2010, p. 311

¹³ Qvarnström 2014.

¹⁴ Schön 2010, p. 311

1945.¹⁵ Industries were required to submit detailed applications to acquire import licences.¹⁶ In stark contrast to World War I, a rationing system was initiated within the first year of the War and it remained in force until 18 August 1951 when the last rationed good, coffee, was removed from the list.¹⁷ However, the wind down of the regime had begun in earnest at the end of the War.

Table A1: Rationed Items and Applicable Dates

Item	Period 1		Period 2		Days
	Start	End	Start	End	
Soda Soaking Agent (Washing)	18/07/1943	16/09/1945			791
Washing and Cleaning Detergent	12/05/1940	21/01/1949			3176
Textiles	01/01/1942	25/11/1945			1424
Footwear	22/04/1943	25/11/1945			948
Tobacco	27/05/1942	20/09/1945			1212
Beans	01/01/1942	16/09/1945			1354
Potato Flour	14/12/1941	21/05/1944	17/01/1945	16/09/1945	1131
Cream	20/11/1941	31/01/1944			802
Peas	19/11/1941	21/05/1944			914
Dried Fruit	10/10/1941	28/02/1946			1602
Eggs	24/09/1941	31/12/1945			1559
Pasta	17/07/1941	16/09/1945	07/04/1946	22/08/1948	2390
Spices	01/07/1941	15/11/1945			1598
Almonds	01/07/1941	16/09/1945			1538
Cheese	01/07/1941	19/07/1946			1844
Beef	01/04/1941	19/06/1949			3001
Barley	15/01/1941	14/08/1944	25/02/1945	01/10/1948	2621
Oatmeal	15/01/1941	14/07/1948			2737
Salt	07/01/1945	16/09/1945			252
Cooking Fat	29/12/1940	24/03/1949			3007
Rice	08/12/1940	28/02/1947			2273
Syrup	03/11/1940	31/08/1949			3223
Pork	06/10/1940	19/06/1949			3178
Flour and Bread	08/09/1940	01/10/1948			2945
Cocoa	08/07/1940	31/10/1945	15/03/1947	04/04/1948	2327
Sugar	10/04/1940	31/08/1949			3430
Tea	27/03/1940	31/10/1945	15/03/1947	04/04/1948	2430
Coffee	27/03/1940	31/10/1945	15/03/1947	18/08/1951	3661
Light	07/01/1941	08/09/1946			2070

¹⁵ SOU 1952 : 49, p. 404

¹⁶ SOU 1952 : 49, p. 404

¹⁷ SOU, 1952 :49, p. 403

Source: Derived from SOU 1952: 49; Note: authors' calculations.

According to a Report Commissioned by the Swedish Department of Trade, the policy controls imposed during World War II resulted in “an efficient, convenient and relatively inexpensive rationing regime”.¹⁸ Table A1 reports the list of rationed items as well as documenting the duration of their official control.

Sweden could choose between two alternative methods of rationing. The first alternative was to ration a good within fixed periods (e.g., monthly) allowing for the quantity of the good to vary, based upon the circumstances. The second option was to ration a good within variable periods, holding the quantity constant. By choosing the latter, Sweden gained the advantage of adapting to the mode of supply as a monopoly. Furthermore, it avoided the logistical difficulties associated with constantly repackaging goods to suit new ration quantities under alternative one.¹⁹ Through the operation of variable rationing periods with fixed coupon values, the system could adjust to the underlying supply situation, on which it was receiving quarterly reports.²⁰

In most cases, the same ration allowance on any good pertained to a variety of goods within that same category according to the rationing list. In that case, the coupon could be used for any good within the same broad heading. So, for example, a coupon for sugar (1kg) could be used instead to purchase syrup (1.4kg), or the coffee ration (300g) might be exchanged for tea (100g) or, depending upon supply, cocoa (300g). Other goods were subject to a point-based system, such as meat, textiles, washing detergents, shoes and tobacco. For example, bone free beef (1kg) could be exchanged for bone free pork (1kg) as both were valued at one point. However, where bones were included, fractional points applied.²¹

With respect to fuel, lessons from the previous war had ostensibly been learned. “Spectacular successes” were achieved in the campaign to increase the supply of wood fuels. The attempt had failed during World War I. During World War II, the use of wood fuels was double what had been used during World War I.

The consumption of food and clothing was restricted, in the former case to avoid the extensive racketeering that occurred in the latter phases of the previous.²² While ration books had existed since 1914 for alcohol, “the pronounced rises in prices in November 1939 (3 kronor for spirits) resulted in an immediate decline in sales.”²³ Alcohol “ration books” might be considered as an individual’s upper limit in a society that was, at that time, comparatively abolitionist in nature.²⁴

Ireland

Details of rationing in Ireland are given in Bryan (2014).

In Ireland rationing of petrol began in 1939 and private motoring ended in 1941. The main fuel used for heating was coal and it was rationed from early in 1941. Rationing of fuel only ended late in 1947.

¹⁸ SOU 1952 : 49, p. 405

¹⁹ SOU 1952 : 49, p. 407

²⁰ SOU 1952 : 49, p. 408

²¹ SOU 1952 : 49, p. 409-10

²² Qvarnström 2014.

²³ SOU 1952: 52, p. 170

²⁴ Tomasson 1998

From 1940 to 1942 rationing regimes were gradually introduced covering a range of goods, including food. The rationing regime became very restrictive from 1942 onwards.

Sugar and tea were rationed from 1941 onwards and butter in 1942. The introduction of sugar rationing in 1941 was hastened by illegal exports of sugar to the UK. Clothing and footwear were rationed from 1942.

At the end of the War the European food shortage impacted on Ireland. In particular in 1945 and 1946 supplies of wheat were affected by poor domestic production and world shortages. Thus rationing of food and fuel was gradually phased out with a significant freeing up in 1947 and 1948.

United Kingdom

Zweiniger-Bargielowska (2002) describes the rationing regime in the UK during and after the War. Food rationing began in January 1940 with a limited number of items. Food shortages became more acute winter 1940-41. Points rationing was extended in December 1941 covering more food items. In summer 1942 it was further extended to cover items such as chocolate.

Clothing and footwear were rationed from 1941 onwards. Restrictions were further tightened in 1942 on a wide range of consumer goods.

Rationing continued throughout the 1940s and was only finally ended in 1955.

The European food shortage of 1945-46 affected the UK resulting in continuing supply shortages. However, the Labour government maintained rationing throughout the 1940s, not just to deal with shortages but because it believed it to be a instrument of redistribution and also because of the severe balance of payments constraint arising from interest payments on its massive War debt.

The Conservative government, which came to power in 1951, had vowed to end rationing, which it did finally in 1955.

United States of America

Fishback and Cullen (201) give a brief description of war-time controls on consumption in the US. By 1942 consumers faced price controls and rationing of consumer goods "The production of consumer durables, like washing machines and electric appliances, was restricted or prohibited altogether." Production of cars for civilian use ended at the beginning of 1942 (Brunet, 2017).

On the 16th of August 1945, the day after Japan's surrender, fuel rationing ended. The remaining rationing, except for sugar, had ended by the end of 1945.

Appendix 2: Data Sources

The data are available from the authors in a separate spreadsheet

Ireland

For Ireland are taken from successive issues of the National Accounts, published first by the Department of Finance, and later by the CSO. The national accounts for the period 1938-44 were done on an experimental basis, with somewhat different definitions than used in later publications. This means that the linking of the data to produce continuous series between 1938 and 1945 is more complex than for the later years.

Consistent series for the components of consumption are available for 1938 and from 1947 to 2019 from successive issues of CSO: *National Income and Expenditure*. The data for 1944 to 1947 came from the CSO *Tables of National Income and Expenditure 1938 and 1944-50* and were linked to the data for 1947 onwards. The data for 1939 to 1944 came from the Department of Finance publication

National Income and Expenditure 1938-1944. The observation for 1938 came from later versions of *National Income and Expenditure*. Because the series did not match perfectly, for each series the same constant was added to the growth rate in each year to ensure that the series matched the observations for 1938 and 1944 derived from later publications.

While continuous linked annual series have been produced from 1938 to 2019, the definitions used in the data on the composition of personal consumption underwent significant changes around 1970. Hence it was considered best to estimate the models used in this paper from 1938 to 1970.

Data are available on consumption broken down into Food, Drink & Tobacco, Clothing, Fuel and light, other goods, and services at current and constant prices (and deflators). A series is also derived on personal disposable income from 1938 to 2019. However, as with the data on the components of consumption, there appears to be a discontinuity around 1970. In addition, the linked series for personal disposable income grows slightly more rapidly than that for consumption over the extended period. When the series are based on the latest data for 1995-2019 the result is that personal savings, the difference between personal disposable income and consumption, is negative for the earliest years. For this reason the personal savings rate used here is a linked series of the savings rates in successive issues of the national accounts, rather than a series derived residually. This reflects the approach normally used in the National accounts where each series is linked separately rather than being derived by adding (or subtracting) linked series for the components.

Sweden

For data relevant to national income, investment, balance of payments, public and private savings, this paper drew extensively upon the Swedish National Wealth Database (SNWD) for the relevant figures. Waldenström (2016, 2017) first pioneered the database, which is subject to regular updates, and the version adopted for this project was version 2.4 covering the period 1810-2019.

For consumption data, the first key official source was the annually compiled volumes of national statistics, *Statistisk Årsbok* (1955-71), or *Statistical Yearbooks*. For these years, total consumption was disaggregated across a number of items with broad headings, available in current values. These could be readily deflated when official price indices were available from the same source (SÅ 1960, 1961, 1971) for a selection of appropriate consumption headings, e.g., food, alcohol and tobacco, housing, fuel and light, clothing. However, for other categories of significance to our study, deflators needed to be constructed. For example, public transport consumption was deflated using a constructed price index of bus fares (under 15km), health service consumption was deflated by a price index based upon the number of admissions and motor vehicle consumption was deflated using a price index derived from total vehicles registered.

Prior to 1956, the principal source was *Den privata konsumtionen i Sverige 1931-65*, published in 1957. This was a collaboration of Swedish scholars investigating Swedish consumption patterns over the previous two decades initiated by the Industrial Research centre, (*Industriens Utredningsinstitut*). It contained the main consumption headings for our purposes, though some were subsumed within broader headings. For instance, under the heading of "Food", alcohol and tobacco were also listed. These were removed from the Food volume series, which in turn was reweighted according to the remaining categories in current prices. Alcohol and Tobacco were subsequently combined into a newly constructed volume index, weighted by their respective shares of output in current prices.

The same process was carried out with fuel, gas and electricity which had been submerged under the “Housing” category. These were combined with their respective weights in current prices into a new volume index of “Light and Heat.” Total Services included Household services, transport services, entertainment and healthcare. These were readily available and combined into a volume index according to weights in current prices into “Total Services” for our comparative purposes. It was necessary to remove motor vehicle purchases from the transport category and reclassify them under “other goods” for comparability purposes. “Other Goods” comprised various durable household goods listed as “Household equipment”. While in older versions of national accounts, these included motor vehicles, these later appeared in their own category.

United Kingdom

The data for the UK are taken from the Bank of England spreadsheet “A millenium of macroeconomic data” <https://www.bankofengland.co.uk/statistics/research-datasets>

United States

The series from 1929 onwards for personal disposable income and consumption and its components were taken from the Bureau of Economic Analysis National Accounts Table 2.1. The series for financial assets from 1945 are taken from <https://www.federalreserve.gov/datadownload/Download.aspx?rel=Z1&series=985b736902f88e363534f1c78bf28227&filetype=sheetml&label=include&layout=seriescolumn&from=01/01/1945&to=12/31/2020>

Appendix 3: Detailed Model Identities

Sweden

$y_{pd} = y_{pdv} / pc$ where y_{pd} is real personal disposable income, y_{pdv} , is nominal personal disposable income and pc is the deflator for consumption

$ctv = ct * pc$ where ctv is consumption at current prices, ct is consumption at constant prices

$cfv = scf * ctv$ where cfv is consumption of food at current prices and scf is the share of food in consumption

$cdv = scd * ctv$ where cdv is consumption of drink at current prices and scd is the share of drink in consumption

$ccv = scc * ctv$ where ccv is consumption of clothing at current prices and scc is the share of clothing in consumption

$cov = sco * ctv$ where cov is consumption of other goods at current prices and sco is the share of other goods in consumption

$cpv = scp * ctv$ where cpv is consumption of fuel and power at current prices and scp is the share of fuel and power in consumption

$csv = ctv - cfv - cdv - ccv - cpv - cov$ where csv is consumption of services at current prices

$cf = cfv / pcf$ where cf is consumption of food at constant prices and pcf is the deflator for food

$cd = cdv / pcd$ where cd is consumption of drink at constant prices and pcd is the deflator for drink

$cc = ccv / pcc$ where cc is consumption of clothing at constant prices and pcc is the deflator for clothing

$cp = cpv / pcp$ where cp is consumption of fuel and power at constant prices and pcp is the deflator for fuel and power

$co = cov / pco$ where co is consumption of other goods at constant prices and pco is the deflator for other goods

$cs = csv / pcs$ where cs is consumption of services at constant prices and pcs is the deflator for services

$scs = 1 - scf - scd - scc - scp - sco$ where scs is the share of services in consumption

$savrat = (1 - ctv)/ypdv*100$ where $savrat$ is the personal savings ratio

Ireland

US

$ypd = ypdv / pc$ where ypd is real personal disposable income, $ypdv$, is nominal personal disposable income and pc is the deflator for consumption

$ctv = ct * pc$ where ctv is consumption at current prices, ct is consumption at constant prices

$cnv = scn * ctv$ where cnv is consumption of non-durables at current prices and scn is the share of non-durables in consumption

$cuv = scu * ctv$ where cuv is consumption of durables at current prices and scu is the share of durables in consumption

$csv = ctv - cnv - cuv$ where csv is consumption of services at current prices

$cn = cnv / pcn$ where cn is consumption of non-durables at constant prices and pcn is the deflator for non-durables

$cu = cuv / pcu$ where cu is consumption of durables at constant prices and pcu is the deflator for durables

$cs = csv / pcs$ where cs is consumption of services at constant prices and pcs is the deflator for services

$scs = 1 - scn - scu$ where scs is the share of services in consumption

$savrat = (1 - ctv)/ypdv*100$ where $savrat$ is the personal savings ratio

UK

$ypd = ypdv / pc$ where ypd is real personal disposable income, $ypdv$, is nominal personal disposable income and pc is the deflator for consumption

$consv = cons * pc$ where $consv$ is consumption at current prices, $cons$ is consumption at constant prices

$savrat = (1 - ctv)/ypdv*100$ where $savrat$ is the personal savings ratio

$ctv = consv / ctv_fix$ Where ctv is consumption at current prices from Sefton and Weale, 1995. ctv_fix is the ratio of ctv to $consv$

$ct=cf+cd+cc+cp+co+cs$ where ct is consumption at constant prices, cf , cd , cc , cp , co and cs are consumption at constant prices of food, drink, clothing, power, other goods and services respectively

$pct=ctv/ct$ is the consumption deflator

$cfv=scf*ctv$ defines the value of consumption of food cfv as the share of food consumption scf multiplied by total consumption at current prices

$ccv=scv*ctv$ defines the value of consumption of clothing ccv as the share of clothing consumption scv multiplied by total consumption at current prices

$cdv=scd*ctv$ defines the value of consumption of drink cdv as the share of drink consumption scd multiplied by total consumption at current prices

$cov=sco*ctv$ defines the value of consumption of other goods cov as the share of other goods consumption sco multiplied by total consumption at current prices

$cpv=scp*ctv$ defines the value of consumption of power cpv as the share of power consumption scp multiplied by total consumption at current prices

$csv=scs*ctv$ defines the value of consumption of services csv as the share of services consumption scs multiplied by total consumption at current prices

$cf=cfv/pcf$ Consumption of food at constant prices cf is derived by deflating the constant price series by the relevant price deflator pcf

$cd=cdv/pcd$ Consumption of drink at constant prices cd is derived by deflating the constant price series by the relevant price deflator pcd

$cc=ccv/pcc$ Consumption of clothing at constant prices cc is derived by deflating the constant price series by the relevant price deflator pcc

$cp=cpv/pcp$ Consumption of power at constant prices cp is derived by deflating the constant price series by the relevant price deflator pcp

$co=cov/pco$ Consumption of other goods at constant prices co is derived by deflating the constant price series by the relevant price deflator pco

$cs=csv/pcs$ Consumption of services at constant prices cs is derived by deflating the constant price series by the relevant price deflator pcs

$scs=1-scf-scd-scc-scp-sco$ The share of services in total consumption is determined residually