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Consumption and time use responses to unemployment: Implications for the lifecycle model

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Abstract

In this study, we analyse the effects of unemployment on consumption and time use. To do so, we employ a micro panel dataset for the Netherlands containing a large set of expenditure and time use categories. Our results show a small negative effect of unemployment on expenditures, and large positive effects on time spent on home production and leisure activities. We do not find evidence for complementarity between leisure and consumption or for substitution between home production and expenditures. We use our results to estimate a ratio of relevant lifecycle parameters, and show that the point estimates and their precision depend strongly on the expenditure and time use categories considered.

1 | INTRODUCTION

Unemployment can occur at any time during the working career of individuals, often having a detrimental effect on income and consumption (Stevens 1997; Burdett *et al.* 2020). In addition, it can have permanent effects on income and consumption through potential scarring effects (Arulampalam 2001) and foregone human capital accumulation (Burdett *et al.* 2020). Households are often insured against consumption drops through formal risk sharing—for example, unemployment insurance (UI) benefits—and/or informal risk sharing—for example, spousal labour supply and private savings (Hayashi *et al.* 1996; Lise and Yamada 2019).[1] In the present study, we contribute towards a more complete understanding of the effects of unemployment on consumption by paying attention to the role that time use decisions play in this relationship. In particular, we are interested in two different aspects: first, the extent to which home production is used as a substitute for consumption expenditure; and second, the extent to which leisure time during unemployment is complementary to consumption.

Considering the role of time use is relevant because, in addition to a decrease in income, unemployment typically implies an increase in free time, which has implications for how households adjust consumption. According to the theory on the allocation of time by Becker (1965), potentially decreases in consumption expenditure can be substituted by increasing time dedicated to home production. For instance, Stephens (2004) finds substantial drops in food expenditure due

to unemployment, while Aguiar and Hurst (2005) find that much of this decrease is compensated by an increase in time spent cooking. The latter results indicate that home production is used as a self-insurance mechanism to alleviate income losses. In addition, Aguiar *et al.* (2013) find that every hour decrease in working time due to unemployment increases home production by 20 minutes. Although these results suggest that expenditure and home production are substitutes, Been *et al.* (2020) argue that several expenditure categories are clearly not substitutable. This makes one-to-one substitution between total expenditure and home production unlikely to hold, and calls for an analysis disaggregated by expenditure category.

The second mechanism through which time use plays a role in the effect of unemployment on consumption is potential complementarity between consumption and leisure/working time (Laitner and Silverman 2005; Aguiar and Hurst 2013). For instance, work-related expenditures such as commuting are reduced automatically upon job loss. Furthermore, households may redirect resources towards leisure-related expenditures if the additional free time increases the marginal utility of these expenditures. Krueger and Mueller (2012) find substantial increases in time spent on leisure activities during unemployment. However, Aguiar *et al.* (2013) show that this additional leisure time consists mostly of watching TV and sleeping. Therefore it is unclear to what extent leisure time due to unemployment actually increases leisure-related expenditures. This calls also for a more detailed analysis using disaggregated time use and expenditure categories.

In the present study, we investigate the effects of unemployment on consumption and time use by using data representative of the Dutch population from the Longitudinal Internet Studies for the Social Sciences (LISS). We contribute to the existing literature in three main ways.

First, this is the first study to investigate the effects of unemployment by exploiting longitudinal micro data on comprehensive categories of both expenditure and time use. Previous studies using expenditure data use either food expenditure (Stephens 2004; Aguiar and Hurst 2005) or a wider but still limited range of categories (Gruber 1998; Gerard and Naritomi 2021). Other studies use detailed information on time use but lack data on expenditures (Krueger and Mueller 2012; Aguiar *et al.* 2013; Griffith *et al.* 2016).[2] The data from the LISS have the advantage of providing a wide range of expenditure and time use categories, which is necessary to study accurately substitution between consumption expenditure and home production as well as complementarity between consumption and leisure/working time. In addition, having all these categories integrated in one longitudinal dataset makes the time use and the consumption results easily and reliably comparable with each other since they all originate from the same sample.

Second, we explore the implications of our empirical results for the calculation of relevant elasticity parameters usually employed in the lifecycle model. For that purpose, we extend a theoretical framework proposed by Rogerson and Wallenius (2016) to study how expenditures and home production change when individuals retire. We extend their model to consider unemployment instead of retirement. Unemployment has the advantages of involving a broader age range, being easier to treat as a discrete change from work to non-work, and being more likely to be unplanned than retirement is. Following Stephens (2004), we include job loss expectations both in the empirical analysis and in the theoretical discussion to differentiate between expected and unexpected job loss. The model yields an expression for the ratio between the intertemporal elasticity of substitution for leisure and the elasticity of substitution between expenditure and home production. Following Rogerson and Wallenius (2016), we use our empirical estimates as input to compute this ratio, and compare the results with the values for these parameters usually employed in the literature. An important addition with respect to Rogerson and Wallenius (2016), is that we estimate block-bootstrap standard errors and confidence intervals for this ratio.

Last, but not least, whereas most related literature is based on US[3] or Canadian[4] data, this is the first paper to present evidence for the Netherlands. Characteristics of the labour market as well as the design of UI benefits are important factors in determining how individuals respond to unemployment. Therefore, it is important to study the effects on consumption and time use in different settings, and examine the extent to which results can be generalized across countries.

Compared to the USA and Canada, the Dutch labour market is less flexible, unemployment is more persistent, and the UI benefit system is considerably more generous. These are important differences that make the Netherlands a relevant case in point to be considered.

The results that we obtain show that, controlling for observable characteristics, unemployment leads to a decrease of about 10% in total expenditures. However, the effect is reduced to 5% when also controlling for unobserved heterogeneity using fixed effects. In addition, in line with Stephens (2004), the results do not appear to change significantly when adding job loss expectations to the fixed effects specification. The effects that we estimate are rather small compared to what the literature typically estimates. This may be due partially to the generous Dutch UI benefit and/or due to the fact that a large share of expenditures fall into categories that are not easily adjustable (e.g. mortgages, rent and utilities). Most remarkably, we do not find significant effects on expenditure categories that could be replaced by home production (i.e. house cleaning and gardening, food outside the home, and daycare), and we do not find an increase in leisure-related expenditures. This contrasts with the fact that we do estimate strong and statistically significant increases in time spent on household chores and on leisure activities. The analysis using time use subcategories reveals that the increase in time spent on household chores is due mostly to house repairs, gardening and cooking, while the increase in time spent on leisure activities consists mostly of time spent watching TV.

These results indicate that the estimated increase in time spent on household chores is not due to substitution of expenditures for home production. They contrast with those typically found using US data. In that context, several studies estimate substantial negative effects of unemployment on expenditures, while others find evidence for substitution between expenditures and home production. For instance, Gruber (1998), Stephens (2004), Michelacci and Ruffo (2015), Kroft and Notowidigdo (2016), and Hendren (2017) all find substantial drops in expenditures upon job loss, while Aguiar and Hurst (2005, 2007), Gelber and Mitchell (2012), and Been *et al.* (2020) all find evidence of substitution between expenditures and home production. It must be noted that none of the latter papers use transitions to unemployment to measure substitution between expenditures and home production. The lack of substitution in our results suggests—in line with previous work by Pollak and Watcher (1975), and Kerkhofs and Kooreman (2003)—that there may be a leisure component in home production activities. In addition, our results indicate that there is no complementarity between expenditures and leisure time during unemployment. This is in line with the findings by Krueger and Mueller (2012), who argue that leisure time is less enjoyable during unemployment due to a decline in emotional wellbeing.

As mentioned above, we put our results in a theoretical perspective by exploring their implications for two important parameters of the lifecycle model: the intertemporal elasticity of substitution for leisure, and the elasticity of substitution between home production and expenditure. These parameters are crucial for the understanding of household behaviour, since they determine, respectively, the preference for intertemporal smoothing and the role of home production in mitigating decreases in expenditure. We consider the lifecycle model proposed by Rogerson and Wallenius (2016), who develop a model to study how retirement affects consumption and home production. We adapt this model to the case of unemployment.

Our results for the ratio of elasticities show that the point estimates for the ratio, as well as the precision with which they are estimated, depend strongly on the expenditure and time use categories considered. When using only expenditure categories that are substitutable for home production and time use categories related to home production activities, the point estimate that we obtain is compatible with an intertemporal elasticity of substitution for leisure at the upper end estimates in the literature, that is, around 0.8, and an elasticity of substitution between expenditure and home production that is rather low, that is, exactly at or just above the lower bound 1. This would imply that Dutch households have a preference for smoothing leisure over time while they do not substitute between expenditure and home production. These results have broader implications since the elasticity parameters that we consider are of great importance for studying decisions such as saving, labour supply and retirement.

The remainder of the paper is structured as follows. Section 2 explains how the UI benefit system works in the Netherlands. Section 3 explains the empirical strategy, and Section 4 presents the data. Section 5 provides the estimation results, and Section 6 discusses their theoretical implications. Section VI rounds up the paper with a conclusion.

2 | INSTITUTIONAL CONTEXT

As described by the OECD (2019b), the Netherlands has a relatively generous UI benefit system. However, the system is also equipped with a series of rewards and punishments meant to provide individuals with the incentive to search actively for employment while receiving benefits. In this section, we explain briefly how the system works, since it is relevant to understand the consumption behaviour of unemployed individuals.

Employees in the Netherlands have the right to claim UI benefits if they worked at least 26 of the last 36 weeks and are not considered culpable for the job loss. The duration of UI benefits depends on work history. The minimum duration is three months and it is extended by one month for each year worked up to a maximum of 38 months for those who worked at least four out of the last five years. As from 2016, the maximum of 38 months has been reduced to 24 months. The accumulation of months has also become less generous: one month for each of the first 10 years of work, and half a month for each year of work beyond 10 years. In all cases, receipt of UI benefits is conditional on strict mandatory job search requirements, the fulfilment of which is monitored weekly by the unemployment service.

In the first two months of unemployment, the UI benefits replace 75% of the last earnings with an absolute maximum of 3100 euros.[5] After that, the replacement rate is reduced to 70% of the last earnings, and the maximum is 2900 euros. Prior to 2016, replacement rates were 70% for the total duration of UI benefits. Upon job loss, contributions to occupational pensions are automatically stopped or reduced, depending on the sector's collective agreement.[6] When UI benefits are exhausted, individuals can claim asset- and income-based means-tested welfare benefits that guarantee a minimum standard of living. In addition, older individuals can apply for additional benefits that are only income-dependent.

From an international perspective, in the Netherlands the net replacement rate for the first month of job loss is one of the highest among OECD countries (about 75%). This makes it 35, 40 and 15 percentage points higher than in the USA, the UK and Germany, respectively (OECD 2019a). After 6 months, it is still relatively generous (it is 70%, 5%, 34% and 59% in the Netherlands, the USA, the UK and Germany, respectively). However, after 24 months, the generosity of UI benefits in the Netherlands drops very substantially (to 49%) compared to other countries. Therefore, despite a relatively generous replacement rate, job loss can have severe consequences for current and future income of households in the Netherlands, especially when accounting for the effect on pension benefits.

3 | EMPIRICAL STRATEGY

To estimate the effects of unemployment on time use and consumption, we follow the previous literature (e.g. Stephens 2004; Aguiar and Hurst 2005; Krueger and Mueller 2012; Aguiar *et al.* 2013) and set up the equation

$$Y_{it} = \beta_0 + \beta_1\ UNEMP_{it} + \boldsymbol{\beta}_2'\mathbf{X}_{it} + \boldsymbol{\beta}_3'\mathbf{t}_t + \alpha_i + \varepsilon_{it}, \tag{1}$$

where Y_{it} denotes a particular expenditure or time use category for individual i at period t, $UNEMP_{it}$ is a dummy variable taking value 1 if the individual is unemployed, $\mathbf{X}_{it}$ is a vector of

control variables including gender, age, presence of a partner, number of children in the household and educational level, $\mathbf{t}_t$ is a vector of year dummies, and $\alpha_i + \varepsilon_{it}$ is the composite error term, with α_i the unobserved individual effect and ε_{it} capturing unobserved variation across individuals and over time. The coefficient of interest is β_1, which—depending on the expenditure or time use category analysed—is expected to be either positive or negative.

We first estimate β_1 by pooled OLS, which exploits variation both between and within individuals. These estimates are comparable to those in Ahn *et al.* (2008) and Burda and Hamermesh (2010) in that they rely on comparing individuals who are unemployed with those who are not. They cannot be interpreted causally since, when applying pooled OLS, α_i remains in the error term, making it very likely to be correlated with unemployment status. However, we provide these results for the purpose of showing how unemployment correlates with the expenditure and time use categories that we analyse. Second, we re-estimate β_1 by including individual fixed effects in our regressions. In this way, we control for unobserved individual heterogeneity that is fixed over time, that is, α_i. These estimates are comparable to those in Krueger and Mueller (2012) in that they rely only on variation within individuals over time. Third, we re-estimate β_1 by fixed effects, including lagged subjective job loss expectations as a control variable in the specification. The effect of unemployment may be dampened if the job loss is expected and there are anticipation effects. Therefore, following Stephens (2004) and Paiella and Pistaferri (2016), by including job loss expectations in our specification, we estimate the effect of unemployment while keeping job loss expectations fixed. In this way, we take into account that unemployment may be (un)expected.

The estimation methods that we employ do not account for health shocks that could correlate both with time use and/or expenditure and with unemployment. It is important to mention this since health shocks could lead to unemployment while also affecting both expenditures and/or time use. However, the institutional context of the Netherlands is such that it is highly unlikely that sick employees get dismissed and receive UI benefits. In the case of sickness, employees receive sickness benefits for two years, after which they can claim disability benefits. Sickness benefits replace 100% of previous earnings and are therefore more generous than UI benefits (70%). As a result, using Dutch administrative data, García-Gómez *et al.* (2013) show that health shocks lead to sick leave or disability insurance instead of unemployment in virtually all cases. The same authors provide a very thorough description of the Dutch disability insurance system, explaining further that flowing into UI benefits when facing a health shock is unappealing. In addition, all results presented in this study appear to be robust to the inclusion of the self-reported health status in the specification. For these reasons, we are confident that our fixed effect specification does not suffer from bias due to omitted health shocks.

When estimating β_1 by fixed effects, note that implicitly we assume symmetry between the effect of transitions into unemployment (job loss) and transitions out of unemployment (job find). To test the validity of this assumption, we estimate the effects of both transitions separately. The results show differences that are not statistically significant for virtually all categories of expenditures and time use that we consider. Therefore we rely on the assumption of symmetry for all results that we present here.[7]

4 | DATA AND DESCRIPTIVE STATISTICS

To implement the empirical strategy, we use data from the LISS, administered by CentERdata at Tilburg University. The LISS Core Study provides information on a wide range of topics for a sample representative of the Dutch population and has been run every year since 2007. The 2009, 2010, 2012, 2015, 2017 and 2019 waves are supplemented with an additional module on time use and expenditure. These data are unique in providing a large list of both time use and expenditure categories integrated in one longitudinal dataset. The variety of categories makes

it possible to draw conclusions about substitution between home production and expenditures by comparing results between the relevant time use and expenditure categories. The same holds for the complementarity between consumption and leisure/working time. Furthermore, the integrated nature of the dataset ensures that the results for the different categories can be compared directly and reliably.

Comparable data for the USA are provided by the CAMS (Consumption and Activities Mail Survey) as a supplement to the HRS (Health and Retirement Study). However, the CAMS provides information on time use and expenditures only for those aged 50 and above. These data are used, for instance, by Been *et al.* (2020) to estimate substitution between home production and expenditures during retirement. Also for the USA, the PSID (Panel Study of Income Dynamics) provides extensive information on time use but only aggregated (or imputed) consumption data. These data are used, for instance, by Michelacci and Ruffo (2015) to estimate the effect of unemployment on expenditures. An additional integrated dataset with detailed information on consumption and time use is the JPSC (Japanese Panel Survey of Consumers). These data are used, for instance, by Lise and Yamada (2019), and Boerma and Karabarbounis (2021), to study, respectively, intra-household allocation of consumption and the role of home production in determining inequality in standards of living. These are relevant data sources that potentially could be used to conduct international comparisons of the effect of unemployment on consumption and time use. In the present study, we focus on exploiting the rich data available for the Netherlands, and leave international comparisons for future work.

We use all six waves from the LISS that provide information on time use and expenditures. We select household heads between the ages of 25 and 64 whose labour market status is either employed or unemployed and who have no missing data on expenditure and time use. In addition, we drop observations that are in the top percentile of any expenditure or time use category. In this way, we exclude a few observations with unreasonably high values. This leaves us with a sample for the total expenditure variable containing 4705 household heads and 12,290 household–year observations. For the time use analysis, the sample is somewhat smaller (approximately 3761 household heads and 9578 household–year observations) due to a larger number of missing values. Tables A1–A6 in the Appendix provide summary statistics for all variables that we employ in the analyses. They also provide the sample size for each consumption and time use category. All summary statistics are provided for employed and unemployed individuals separately.

4.1 | Unemployment

In our sample, we consider an individual to be employed if he reports to be in paid employment, working in the family business or in self-employment. We consider an individual to be unemployed if he reports to be looking for a job after an involuntary job loss. With this definition, we find an average unemployment rate 4.19% for the full sample period, with minimum 3.44% for the year 2009, and maximum 6.58% for the year 2015.[8]

Since the fixed effects analysis relies on variation within individuals over time, it requires that individuals transit from employment to unemployment, and vice versa, during the period for which we observe them. Out of the 4705 household heads included in the sample for the total expenditure analysis, 3120 (66.31%) are observed for at least two periods. Out of these, 217 (6.96%) experience a transition into unemployment during the period of observation, meaning that they lose their job between waves $t-1$ and t while being observed in both waves. In addition, 270 (8.65%) experience a transition from unemployment to employment. For those individuals who are unemployed at some point during the sample period, the average time in unemployment at the moment when we observe them is 17 months (median is 11 months).

An additional interesting feature of the LISS is that they provide information on job loss expectations. For that purpose, they ask respondents: 'What is the probability of losing your job

in the next 12 months on a scale from 0 to 100? 100 is absolutely certain that you lose your job.' We use the answer to this question divided by 100 as a measure of subjective job loss expectations. Table A1 in the Appendix provides the distribution of this variable rounded to the nearest tenth after the decimal point.[9] The distribution is provided for the whole sample as well as separately for those who actually lose their job in the next 12 months and those who do not. When considering the whole sample together, we see that, as is usual with self-reported probabilities, there are peaks around the values 0, 0.5 and 1. Most importantly, we find that individuals who actually experience a job loss report larger job loss expectations in the previous period compared to those who do not experience a job loss. This indicates that, regardless of the rounding observed in Table A1, our measure of subjective job loss expectations contains information about the actual probability of job loss. Following Stephens (2004), we use this variable to control for job loss expectations and thus account for the fact that unemployment may be (un)expected.

4.2 | Expenditures

The data on expenditures are collected by means of retrospective questions about money spent on a number of categories. The LISS distinguish between expenditures at the household level and expenditures at the individual level. The household level categories are house cleaning and gardening, daycare, transport, utilities, holidays, mortgages, rent, insurances, alimony, debts and loans (other than mortgages), food at home, and other. The individual-level categories are food outside the home, leisure, tobacco, clothes, personal care, medical care, schooling, donations, and other. For all categories, respondents are asked to report euros spent on average per month, taking the past 12 months as the period of reference. The LISS expenditure data do not include information on durable goods. Therefore we consider only expenditure on non-durable goods and services.

Since it is actually rather difficult to draw a line separating individual-level from household-level expenditures, we add up all responses to the individual categories within a household, and thus consider them at the household level as well. We deflate all categories using the consumer price index, and add together household and individual categories to obtain a measure of total household expenditure. Unfortunately, the categories reported at the individual level are available only for the 2009, 2010 and 2012 waves. For the remaining waves, namely, 2015, 2017 and 2019, the LISS provide only the total of individual expenditures for each household member without the breakdown by category, which still allows us to calculate total household expenditures for all years that we observe.

Pooling all waves together, average total non-durable household expenditure in the sample is 2122 euros per month. Out of this, 81.08% corresponds to the categories considered at the household level by the LISS. Among these categories, those with the largest share of total expenditure are mortgages (21.46%) and food at home (15.08%), followed by insurances (9.32%), utilities (8.53%), transport (6.22%), holidays (5.30%), rent (5.23%), other (4.40%), house and garden cleaning (1.75%), debts and loans (1.44%), daycare (1.24%) and alimony (0.82%). Pooling the first three waves together, the individual-level category with the largest share of total average expenditure is clothes (4.80%), followed by food outside the home (2.88%), leisure (2.72%), donations (2.19%), personal care (1.93%), medical care (1.10%) tobacco (0.95%), other (0.70%) and schooling (0.51%).

Out of all expenditure categories provided by the LISS, we pay special attention to those that allow us to investigate the role of time use in the effect of unemployment on consumption. These are the categories that potentially can be substituted by home production (i.e. house and garden cleaning, daycare, and food outside the home), and categories that have the potential to be complementary to leisure/working time (i.e. transport, utilities, holidays, and leisure).

4.3 | Time use

Regarding the time use data, the LISS module on time use and consumption asks respondents about the amount of hours spent during the last week on a range of activities. These are household chores, activities with children, helping parents, helping other family members, helping non-family members, paid work, commuting to work, leisure activities, schooling, sleeping and resting, personal care, and administrative chores. Activities may take place at the same time. Six categories—activities with children, helping parents, helping other family members, helping non-family members, paid work, and commuting to work—are provided in all waves. The rest are provided only in the first three waves and in the last one, that is, the waves in 2009, 2010 and 2012, and 2019, except for the categories personal care and administrative chores, which are available only in the first three waves.

Pooling all available waves together, the most common activities besides paid work are sleeping and resting (56.86 hours per week, on average) and leisure activities (30.79), followed by household chores (9.93), personal care (8.05), activities with children (4.55), commuting to work (4.34), informal care (2.85),[10] administrative chores (2.82) and schooling (1.30). In addition to the module on time use and consumption, the LISS provide a yearly module on social integration and leisure that contains information on subcategories of home production and leisure. We use these subcategories to expand the baseline analysis that focuses on the more general above-mentioned time use categories.

As with the expenditure categories, out of all time use categories provided by the LISS, we pay special attention to those that allow investigating the role of time use in the effect of unemployment on consumption. These are the categories capturing activities related to home production (i.e. household chores, activities with children, and informal care) and to leisure or work-related activities (i.e. paid work, commuting to work, and leisure activities).

5 | ESTIMATION RESULTS

5.1 | Expenditures

Tables 1 and 2 present the estimates of β_1 in equation (1) for the expenditure categories reported at the household level and the individual level, respectively. In addition, Table 1 provides the results for total expenditure. In both tables, we show the means of the respective spending categories to facilitate the interpretation of the relative size of the effect. Column (1) provides the OLS estimates without any control variables, column (2) provides the OLS estimates when including all control variables and a vector of time dummies, column (3) provides the estimates obtained when including individual fixed effects in the model, and column (4) provides the estimates obtained when including fixed effects and lagged subjective job loss expectations as an additional control variable.[11] The results in column (1) should be interpreted as a simple correlation since they just provide differences between averages for employed and unemployed households, respectively. Even though they cannot be interpreted causally, these simple correlations provide a benchmark against which the more causally interpretable results can be compared.

The first row in Table 1 shows that, regardless of the estimation method, we find a negative effect of unemployment of the household head on total household expenditures. Column (1) shows that households where the household head is unemployed spend 435 euros less a month on average than households where the household head is employed. That is about 20% of average total expenditure. Controlling for observed characteristics lowers the decrease to about 9% of total expenditure, while controlling for unobserved heterogeneity via a fixed effect lowers it to about 5%. This effect is smaller than what the literature typically estimates for the USA.

TABLE 1 Results—Total and Household-level Expenditures

Dependent variable	Mean	OLS-1 (1)	OLS-2 (2)	FE-1 (3)	FE-2 (4)
Total	2122.39	−435.39***	−198.23***	−110.54*	−101.01
		(61.10)	(55.60)	(66.90)	(67.16)
Related to home production					
House cleaning	58.27	−13.92***	−9.70***	−4.68	−4.77
		(2.30)	(2.26)	(3.51)	(3.50)
Daycare	38.62	−31.79***	−8.52**	−7.02	−7.24
		(3.60)	(3.88)	(5.73)	(5.72)
Related to work or leisure time					
Transport	156.34	−44.81***	−29.78***	−20.30***	−19.85***
		(5.87)	(5.35)	(6.90)	(6.92)
Utilities	216.39	−10.50*	−0.11	15.06***	14.55***
		(5.42)	(4.88)	(5.64)	(5.64)
Holidays	135.94	−48.40***	−16.73**	3.04	3.43
		(9.67)	(8.43)	(11.88)	(12.01)
Other categories					
Mortgage	547.34	−269.20***	−144.98***	19.18	16.32
		(25.29)	(22.97)	(19.52)	(19.60)
Rent	122.98	113.92***	84.80***	−14.93	−14.36
		(15.48)	(14.55)	(9.85)	(9.83)
Insurances	244.25	−43.43***	−26.28***	−7.81	−7.30
		(7.61)	(6.57)	(9.27)	(9.31)
Alimony	19.55	−8.76***	−11.36***	−4.42	−4.24
		(2.76)	(2.90)	(3.80)	(3.81)
Debts and loans	34.95	8.31	8.78	−10.41*	−10.28*
		(5.56)	(5.66)	(5.68)	(5.72)
Food in	359.85	−69.33***	−28.88***	−16.36	−15.33
		(11.08)	(9.41)	(10.20)	(10.26)
Other	119.74	−26.91***	−19.28***	−10.95	−11.04
		(7.25)	(7.13)	(9.53)	(9.48)

Notes: Standard errors (clustered at the household level) are reported in parentheses. Column (1) provides OLS estimates without any control variables. Column (2) provides OLS estimates including gender, age, presence of a partner, number of children in the household, educational level, and a set of year dummies. Column (3) provides estimates obtained including control variables and fixed effects. Column (4) additionally controls for individuals' lagged subjective job loss expectation. For the number of observations in each regression, see summary statistics in the Appendix. *, **, *** indicate significant at the 10%, 5%, 1% level, respectively.

Column (4) shows that controlling for individuals' lagged subjective job loss expectation does not change the size of the effect while it becomes no longer statistically significant.[12]

The result in column (4) of Table 1 is line with Stephens (2004), who ,using US data, also finds that the effect of job loss on expenditures is not altered once accounting for job loss expectations. Given that the inclusion of job loss expectations does not influence the estimation results, FE-1 (column (3)) is our preferred specification. Nevertheless, it is still relevant to provide the results of FE-2 (column (4)) given the potential relevance of expectations in relation to the effects of unemployment. Additionally, our results suggest that liquidity constraints do not play a role

TABLE 2 Results—Individual-level Expenditures

Dependent variable	Mean	OLS-1 (1)	OLS-2 (2)	FE-1 (3)	FE-2 (4)
Related to home production					
Food out	66.18	−4.46	−0.31	5.78	5.87
		(7.10)	(7.16)	(9.38)	(9.46)
Related to work or leisure time					
Leisure	62.90	−13.17***	−8.73*	−7.99	−8.55
		(4.72)	(4.71)	(6.60)	(6.72)
Other categories					
Tobacco	21.55	2.55	0.52	−2.90	−2.89
		(3.26)	(3.30)	(3.99)	(4.02)
Clothes	109.42	−19.96**	−6.76	−1.88	−1.25
		(9.08)	(8.67)	(9.83)	(9.87)
Personal care	43.87	−0.76	1.73	2.76	2.86
		(3.53)	(3.35)	(5.32)	(5.31)
Medical care	24.29	3.50	2.73	−6.47	−7.24
		(3.30)	(3.25)	(4.67)	(4.74)
Schooling	11.20	−1.99	−0.10	−0.27	0.62
		(2.74)	(2.77)	(3.94)	(3.99)
Donations	49.38	−7.69*	−4.71	−6.19	−6.54
		(4.48)	(4.38)	(4.79)	(4.84)
Other	15.90	−1.06	−1.03	1.97	1.72
		(2.23)	(2.28)	(3.82)	(3.84)

Notes: See Table 1.

in this particular context. That is because liquidity constraints would exacerbate the effect of job loss on expenditure (Ganong and Noel 2019), while we find a small effect that is barely significant.

Following the logic behind the theory on the allocation of time by Becker (1965), we would expect to find declines in expenditure categories that are most easily substituted by home production. These are house cleaning and gardening, food outside of the home, and daycare. However, the fixed effects estimation yields non-significant effects for these categories. When re-estimating equation (1) using the sum of these three categories as a dependent variable, we estimate an effect of −8.76 (−1.11) using OLS and controlling for observables (fixed effects). This estimate is not significantly different from zero and represents only 5.86% (0.74%) of the mean of the dependent variable.

In addition, if there is complementarity between expenditure and working and/or leisure time, then we would expect to find an effect for expenditure categories such as transport, utilities, holidays and leisure. We do find a clear negative effect on transport expenditures, very likely reflecting the complementarity between working and commuting. Unemployment reduces transportation expenditures on average by about 20 euros (13%) per month. For utilities, we find a positive effect of 15 euros (7%) per month, probably related to spending more time at home. We do not estimate a significant effect for holidays and leisure. The latter result is in line with the findings by Krueger and Mueller (2012), who argue that leisure time is less valued during an unemployment spell due to a decline in emotional wellbeing.

Regarding other expenditure categories, the estimated effects become rather small and (nearly) insignificant in all cases once we control for unobserved heterogeneity. The lack of an effect of unemployment on expenditures contrasts with the results typically found for the USA, where studies such as Gruber (1998), Stephens (2004), Michelacci and Ruffo (2015), Kroft and Notowidigdo (2016), and Hendren (2017) find substantial drops in expenditures upon job loss. When comparing the Netherlands to the USA, it is likely that the discrepancies in the institutional setting play a key role in explaining the different results. In our case, it is striking that we do not find a clear effect even when several of the expenditure categories that we consider—mortgages, rent, and food at home—represent a substantial share of total expenditure. This may also be explained partially by the fact that categories like mortgages and rent are often subject to long-term contractual agreements. This implies that a substantial fraction of households' total expenditure cannot be adjusted flexibly. As suggested by Chetty and Szeidl (2007, 2016), this may be an important factor in explaining the lack of a larger response of expenditures to unemployment. Alternatively, our results could be influenced by the time window used to measure consumption expenditures. That is because these are asked as an average of the last 12 months, while at the time of observation, individuals could have been unemployed for a shorter time than that. For an additional analysis exploring this possibility, see the second subsection of the Appendix.

5.2 | Time use

Table 3 presents the estimation results of the effect of unemployment on the time use categories provided in the module on time use and consumption within the LISS. As expected, we find that unemployment has substantial negative effects on hours dedicated to paid work. Depending on the empirical specification, the estimated effect on working hours is between 20 and 28 hours per week. This effect is less than the full-time 40 hours per week since our sample includes individuals who work part-time, as well as unemployed individuals who report above zero hours of paid work.[13] In addition, we estimate a substantial drop in time spent commuting due to unemployment. The fixed effects estimate indicates a difference of around 2.5 hours, that is, about 58% of the average in the sample. This result is in line with the reduction in transport expenditures reported in Table 1, and it implies a substantial addition to the amount of hours that are freed up as a result of the reduction in working hours when unemployed. For all the estimations of the effect of unemployment on time use, we find that adding job loss expectations in the specification does not alter the results. That is probably the case because it is difficult to anticipate changes in time use even if the job loss is expected. It is likely that changes in time use will not happen until the job loss actually takes place.

Table 3 reports a substantial increase in time spent on household chores.[14] More specifically, column (3) shows that unemployment increases household chores by about 4.5 hours per week on average (45% of the average in the sample). This implies that home production absorbs about a quarter of average lost working hours. Though slightly smaller, this result is comparable to that reported by Aguiar *et al.* (2013) based on state-level variation in the USA. Categories such as activities with children and informal care (within the household) could also be considered as home production, since there is the possibility to substitute these activities with paid childcare and formal care, respectively. However, even though columns (1) and (2) do report significant effects of unemployment on these categories, accounting for unobserved heterogeneity renders the effects small and statistically insignificant. Even if we find a substantial increase in time spent on home production during unemployment, the lack of a clear effect of unemployment on expenditures indicates that the increase in home production time is not due to substitution for market consumption. This contrasts with results typically found for the USA, where studies such as Aguiar and Hurst (2005, 2007), Gelber and Mitchell (2012), and Been *et al.* (2020) find evidence of substitution between expenditures and home production.

TABLE 3 Results—Time Use

Dependent variable	Mean	OLS-1 (1)	OLS-2 (2)	FE-1 (3)	FE-2 (4)
Related to home production					
Household chores	9.93	5.99***	5.36***	4.49***	4.62***
		(0.78)	(0.76)	(0.99)	(0.99)
Activities with children	4.55	−1.05*	1.06**	0.33	0.31
		(0.56)	(0.44)	(0.33)	(0.33)
Informal care	2.85	1.66***	1.47***	0.49	0.51
		(0.35)	(0.34)	(0.40)	(0.40)
Related to work or leisure time					
Paid work	33.66	−27.65***	−25.53***	−19.86***	−19.82***
		(0.76)	(0.77)	(1.25)	(1.24)
Commuting	4.34	−3.18***	−2.73***	−2.56***	−2.54***
		(0.17)	(0.16)	(0.25)	(0.25)
Leisure activities	30.79	7.94***	5.71***	8.82***	8.47***
		(1.65)	(1.59)	(2.15)	(2.16)
Other categories					
Schooling	1.30	0.22	0.30	0.25	0.28
		(0.26)	(0.26)	(0.34)	(0.34)
Sleeping and resting	56.86	0.31	−0.20	1.51	1.45
		(1.38)	(1.38)	(1.59)	(1.61)
Personal care	8.05	1.85***	1.35***	0.26	0.26
		(0.47)	(0.49)	(0.62)	(0.62)
Administrative chores	2.82	1.22***	1.13***	−0.56	−0.50
		(0.36)	(0.36)	(0.40)	(0.41)

Notes: See Table 1.

Besides the result for home production, Table 3 reports a substantial increase in time allocated to leisure during unemployment. More specifically, column (3) reports an increase of almost 9 hours per week (29% of the average). This implies that leisure accounts for about half of average lost working hours, while leisure and home production together account for about 70% of that. This substantial increase in time devoted to leisure, combined with the lack of increases in leisure-related expenditure categories reported in Tables 1 and 2, suggests that leisure and expenditure are not complementary for the unemployed. This does not necessarily imply that for other types of changes in available leisure time, such as retirement, there is no complementarity between spending and leisure time (Laitner and Silverman 2005).

As mentioned in the final subsection of Section 4, as part of its core study, the LISS provide a module on social integration and leisure that contains subcategories of home production and leisure. This module has been run every year since 2008 up until 2018. Therefore it provides a much larger sample than those used for the analyses in Tables 1–3. The number of household–year observations increases in this case to over 22,000. Out of all the time use categories reported in this module, we provide the results for four categories related to home production (i.e. small jobs in and around the house, caring for plants or animals, cooking, and shopping), seven related to leisure time (i.e. sports, TV watching, radio listening, reading, music listening, going out, and volunteering), plus an additional category adding all other categories

TABLE 4 Results—Time Use (Additional Categories)

Dependent variable	Mean	OLS-1 (1)	OLS-2 (2)	FE-1 (3)	FE-2 (4)
Related to home production					
Small house jobs	3.00	0.47**	0.46**	0.57***	0.57***
		(0.20)	(0.20)	(0.17)	(0.17)
Caring for plants/animals	1.95	0.38**	0.25	0.37**	0.37**
		(0.19)	(0.20)	(0.18)	(0.18)
Cooking	2.84	1.46***	1.08***	0.55***	0.54***
		(0.19)	(0.18)	(0.14)	(0.14)
Shopping	1.12	0.38***	0.29***	0.14*	0.14*
		(0.09)	(0.09)	(0.08)	(0.08)
Related to leisure time					
Sports	1.94	−0.08	0.01	0.22***	0.22***
		(0.12)	(0.12)	(0.09)	(0.09)
TV watching	17.78	5.33***	4.56***	3.33***	3.35***
		(0.67)	(0.65)	(0.44)	(0.44)
Radio listening	18.22	−0.56	−0.87	−0.71	−0.66
		(1.08)	(1.07)	(0.80)	(0.80)
Reading	2.67	0.61***	0.33	0.75***	0.76***
		(0.24)	(0.22)	(0.18)	(0.18)
Music listening	10.33	0.85	0.39	−0.11	−0.09
		(0.73)	(0.72)	(0.55)	(0.55)
Going out	1.32	−0.15*	−0.18**	0.08	0.08
		(0.09)	(0.09)	(0.08)	(0.08)
Volunteering	1.06	0.78***	0.83***	0.74***	0.76***
		(0.18)	(0.17)	(0.15)	(0.15)
Other activities	3.15	0.82***	0.71**	0.91***	0.91***
		(0.29)	(0.29)	(0.27)	(0.27)

Notes: See Table 1.

reported in this module.[15] Just as for the time categories in Table 3, time spent on these categories is provided in hours per week.

Column (3) of Table 4 shows that the increase in home production due to unemployment reported in column (3) of Table 3 comes partially from increases in small jobs in and around the house,[16] caring for plants and animals, and cooking. These three categories together account for an increase of about 1.5 hours a week, which is still only one-third of the increase in household chores reported in Table 3 (4.5). This means that there are other potentially relevant subcategories of home production that the LISS do not measure separately. House cleaning is likely to be the most important missing category. The increase in shopping time is significant but relatively small (0.14 hours, 13%) which suggests that the effect of unemployment on searching for lower prices, as analysed by Aguiar and Hurst (2007), is likely to be limited.

In addition, the results in Table 4 indicate that much of the increase in leisure time corresponds to time spent watching TV. Time dedicated to sports, reading, volunteering and other activities also increases during unemployment.[17] However, together they account for less than one-third of the increase in leisure time reported in Table 3, while watching TV alone accounts for over one-third of that increase. In addition, we find no increase in time spent going out, which is

potentially a more expensive activity. In line with the findings by Krueger and Mueller (2012), this result suggests that individuals do not attach a high value to leisure time during unemployment, and that it is not complementary to activities that increase expenditure. For completeness, it is relevant to study whether changes in hours worked along the intensive margin have different effects compared to changes in the extensive margin. The results for the intensive margin and a discussion of these results are provided in the second subsection of the Appendix.

6 | IMPLICATIONS FOR THE LIFECYCLE MODEL

To put our empirical results on expenditures and home production in a theoretical perspective, we present here a simplified version of the lifecycle model based on Rogerson and Wallenius (2016). The latter build a theoretical framework to study how retirement affects consumption expenditure and home production. Assuming that retirement is expected, they derive an expression for the ratio between the intertemporal elasticity of substitution of leisure and the elasticity of substitution between spending and home production. They compute this ratio using empirical estimates of the effects of retirement on expenditures and home production. These estimates are based partially on previous literature and partially on their own calculations. They compare their results with the values usually employed in the literature for these elasticities.

We extend their model by considering unemployment instead of retirement. This is an interesting extension for several reasons. First, unemployment is better suited for the assumption of discrete changes from work to non-work than retirement, since the latter is often gradual. Second, as argued by Rogerson and Wallenius (2016) themselves, it is relevant to extend their study to cover the case of unemployment since the elasticities that result are representative of a wider age range compared to those resulting from studying retirement. Third, retirement is very likely to be expected and timed simultaneously with expenditure and time use decisions. In contrast, as shown in Table A1 of the Appendix, unemployment is more likely to be unexpected and thus exogenous. It is important therefore to consider unemployment expectations since there can be anticipation effects. However, since the analyses reported in Section 5 show that accounting for expectations in the empirical model does not change the estimation results, we refrain from including expectations in the theoretical model. In this way, we simplify the model and make it more comparable to Rogerson and Wallenius (2016).

Our extension of the model allows us to study theoretically how unemployment affects individuals' decisions on expenditures, leisure and home production. Based on our results in Section 5, we provide several alternative estimations of the ratio between the intertemporal elasticity of substitution of leisure and the elasticity of substitution between spending and home production. As mentioned above, the estimation of this ratio requires empirical estimates of the effects of retirement (in our case unemployment) on expenditures and home production. Due to data limitations, Rogerson and Wallenius (2016) rely on different data sources, sample periods and estimation methods for the estimation of effects on expenditures and on home production, respectively. For the effect on time use categories, they conduct their own analysis using data from the ATUS (American Time Use Survey) for the years between 2003 and 2011, while for the effect on expenditures they rely on the previous work by Aguiar and Hurst (2005), who employ data from the CSFII (Continuing Survey of Food Intake of Individuals) for the years between 1989 and 1996. Differently from Rogerson and Wallenius (2016), and thanks to the LISS providing integrated data on time use and consumption, our estimations of the elasticity ratio rely on a single data source providing a wide range of time use and consumption categories. This allows for a reliable estimation of the ratio of elasticities.

As an important additional contribution with respect to Rogerson and Wallenius (2016), we demonstrate how the ratio changes depending on the expenditure and time use categories

employed in the calculation, while they use only food expenditures and a very broad measure of time spent on home production. Furthermore, we provide bootstrap standard errors and confidence intervals for the ratios that we estimate. Our estimates of the elasticity ratio have broad implications since the elasticity parameters considered are of great importance for studying relevant decisions, including saving, labour supply and retirement.

6.1 | Unemployment in a lifecycle model with home production

Consider the utility function

$$U = \sum_{t=0}^{T} \left[u(c_t) + \frac{l_t^{1-1/\gamma}}{1-1/\gamma} \right], \tag{2}$$

where c_t is consumption in period $t = 0, \ldots, T$, l_t is hours of leisure, and $\gamma > 0$ is the elasticity of intertemporal substitution for leisure.[18] We assume the intratemporal utility function for consumption $u(c_t)$ to be strictly increasing, strictly concave and twice continuously differentiable. In addition, we assume that c_t is a constant elasticity of substitution aggregate of consumption expenditure c_{mt} and time spent on home production h_{nt} such that

$$c_t = \left[a c_{mt}^{(\eta-1)/\eta} + (1-a) h_{nt}^{(\eta-1)/\eta} \right]^{\eta/(\eta-1)}, \tag{3}$$

where $\eta > 0$ is the intratemporal elasticity of substitution between c_{mt} and h_{nt}, while $0 \leq a \leq 1$ determines the relative weights given to c_{mt} and h_{nt}.

Consider the intertemporal monetary budget constraint

$$\sum_{t=0}^{T} c_{mt} = \sum_{t=0}^{T} y_t, \tag{4}$$

where y_t is income received at period t. If the individual is employed, then y_t is equal to wage income $w_t h_{mt}$, while if the individual is unemployed, then it equals the UI benefit b_t. Note that in this model, we abstract from liquidity constraints. That is because the characteristics of the Dutch context and our results both indicate that they do not play a role in this particular context.

Consider as well the period-specific time budget constraint

$$l_t = 1 - h_{mt} - h_{nt}, \tag{5}$$

where the total time endowment for period t is normalized to 1. For the sake of simplicity and without loss of generality, we assume that the number of hours of market work is fixed at $h_{mt} = \bar{h}$ if the individual is employed, and $h_{mt} = 0$ if the individual is unemployed. In addition, we consider only interior solutions for l_t and h_{nt}.

The individual chooses c_{mt} and h_{nt} such as to maximize utility subject to equations (3), (4) and (5). The maximization problem yields the first-order conditions

$$u'(c_t)\, c_t^{1/\eta} c_{mt}^{-1/\eta} a = \lambda \tag{6}$$

and

$$u'(c_t)\, c_t^{1/\eta} h_{nt}^{-1/\eta} (1-a) = (1 - \bar{h} - h_{nt})^{-1/\gamma}, \tag{7}$$

where λ is the Lagrangian multiplier. Equations (6) and (7), together with the constraints (4) and (5), determine jointly the optimal choice of c_{mt}, h_{nt} and l_t given that the individual is employed and thus $h_{mt} = \overline{h}$.

Assume now that at period $t = \tau$, the individual suffers a job loss. After the job loss, h_{mt} is no longer equal to $\overline{h}$ and is set to be equal to zero. This implies a relaxation of the time budget constraint since the individual has now an additional amount of time equal to $\overline{h}$ to be divided between extra leisure and/or home production. In addition, the individual experiences an income reduction since labour income $w_t h_{mt}$ is substituted by the lower UI benefit b_t.[19] Therefore the job loss leads to the same first-order conditions for period τ as for the generic period t described in equations (6) and (7), with the only change being that for period τ, it holds that $\overline{h} = 0$.

Dividing the first-order conditions at period τ by the same first-order conditions at period $t = \tau - 1$, which are given by equations (6) and (7), respectively, yields

$$\left[\frac{c_{m\tau-1}}{c_{m\tau}}\right]^{1/\eta} = \frac{u'(c_{\tau-1})}{u'(c_\tau)}\left[\frac{c_{\tau-1}}{c_\tau}\right]^{1/\eta} \tag{8}$$

and

$$\left[\frac{1-h_{n\tau}}{1-\overline{h}-h_{n\tau-1}}\right]^{1/\gamma}\left[\frac{h_{n\tau-1}}{h_{n\tau}}\right]^{1/\eta} = \frac{u'(c_{\tau-1})}{u'(c_\tau)}\left[\frac{c_{\tau-1}}{c_\tau}\right]^{1/\eta}. \tag{9}$$

Dividing (8) by (9), taking the natural log on both sides of the equality, and rearranging allows us to express the ratio between γ and η as

$$\frac{\gamma}{\eta} = \frac{\ln(1-h_{n\tau}) - \ln\left(1-\overline{h}-h_{n\tau-1}\right)}{\ln(c_{m\tau-1}/c_{m\tau}) - \ln(h_{n\tau-1}/h_{n\tau})}. \tag{10}$$

6.2 | Elasticity estimation

Equation (10) provides an expression for the ratio between the intertemporal elasticity of substitution for leisure, γ, and the intratemporal elasticity of substitution between expenditures and home production, η. More specifically, equation (10) shows that the ratio between γ and η equals the relative change in leisure time divided by the difference between the relative change in consumption expenditure and the relative change in time spent on home production. Both γ and η are very important parameters that are usually employed in lifecycle models. They determine, respectively, the curvature of the utility function and the extent to which expenditures can be substituted by home production. Therefore any knowledge about the value that they take based on empirical estimations is crucial for calibrations of the lifecycle model. The empirical analysis that we conduct allows us to compute a value for this ratio, which we compare to the values usually given in the literature.

The literature estimating γ typically finds estimates in the range between 0.4 and 0.8, while the literature estimating η usually reports values in the range 1.7 to 2.5.[20] The values of γ imply a large degree of concavity in the utility function, indicating that individuals have a preference for smoothing leisure over time; while the values for η mean that expenditures and home production can be substituted fairly easily by each other. Rogerson and Wallenius (2016) propose $\gamma = 0.4$ and $\eta = 2$ as the consensus estimates in the literature, which results in $\gamma/\eta = 1/5$.

Following equation (10) and using our preferred specification reported in column (3) of Tables 1 and 3,[21] we substitute in our point estimates for the changes in time spent on leisure

activities, total expenditure and household chores to obtain[22]

$$\frac{\gamma}{\eta} = \frac{\ln(1.286)}{\ln(1.051) - \ln(0.689)} = 0.596, \tag{11}$$

which is much closer to 2/3 than to 1/5. Considering transitions to retirement instead of to unemployment, Rogerson and Wallenius (2016) obtain a ratio that is very close to 1, implying that γ and η are of similar magnitude. Such a result is difficult to reconcile with the existing literature, since it means that either γ is much larger than usually estimated, or η is much lower. The ratio that we estimate is easier to reconcile with the literature since it implies that η is substantially larger than γ. As an addition to Rogerson and Wallenius (2016), we calculate a standard error for the ratio by computing 1000 block-bootstrap replications with replacement. The standard error that we obtain is 0.184, and the boundaries of the 95% bootstrap confidence interval are 0.319 and 1.012.[23] This shows that the result by Rogerson and Wallenius (2016) falls just at the upper bound of the 95% confidence interval, with most bootstrap replications yielding an estimate below 1.

As mentioned above, Rogerson and Wallenius (2016) rely on Aguiar and Hurst (2005) to calibrate the change in total expenditure upon retirement. The estimation by Aguiar and Hurst (2005) is based on results that are obtained using data on only food expenditures. Furthermore, Aguiar and Hurst (2005) use a different dataset, a different method and a different sample period from the one used by Rogerson and Wallenius (2016) for their estimation of the effects of retirement on time use. The richness of the data that we employ allows us to study the sensitivity of the ratio between γ and η to the use of different categories of expenditure and time use. It is very relevant to do so since, as argued by Been *et al.* (2020), there are only a few categories of expenditure than can be substituted by home production. This sensitivity exercise is also facilitated by the fact that, different from Rogerson and Wallenius (2016), we have all categories of expenditure and time use in one single integrated dataset.

If we recalculate the ratio γ/η using only expenditure categories that potentially can be substituted by home production—house cleaning and gardening, food outside the home, and daycare—and add activities with children to the household chores time use category, then we obtain[24]

$$\frac{\gamma}{\eta} = \frac{\ln(1.286)}{\ln(1.007) - \ln(0.731)} = 0.783. \tag{12}$$

In this case, the bootstrap standard error is 1.716 and the bounds of the 95% confidence interval are 0.104 and 1.474. The latter indicates a considerably larger level of uncertainty compared to the result in equation (11). However, comparing the point estimates shows that for a fixed value of γ, the result in equation (12) implies an even lower value of η compared to the result in equation (11). Assuming unity as a lower bound for η, and fixing the ratio at 0.783, the possible values of γ are restricted to the upper-end estimates in the literature, that is, around 0.8.[25] This result would imply an η value 1 or just above 1, indicating very low substitutability between expenditure and home production. This is in accordance with the fact that even though we find a strong increase in time spent on home production after a job loss, we do not find find a drop in expenditures that are substitutable by home production. This suggests that the increases that we find in home production are likely related to a possible leisure component in activities such as cooking, gardening or childcare, rather than just being a substitute for certain categories of expenditure (Pollak and Watcher 1975; Kerkhofs and Kooreman 2003).

Interestingly, using only expenditure on food outside of home and time spent cooking, which are used commonly in the literature as proxies for total consumption and home production due

to data limitations (e.g. Stephens 2004; Aguiar and Hurst 2005), we obtain[26]

$$\frac{\gamma}{\eta} = \frac{\ln(1.286)}{\ln(0.912) - \ln(0.838)} = 2.964, \tag{13}$$

which for every reasonable value of η would imply a very large γ, and for every reasonable value of γ would imply an η well below 1. In addition, in this case the bootstrap procedure yields a standard error that is as large as 7.453, with the bounds of the 95% confidence interval being −5.926 and 7.210. This shows that using only food expenditures and cooking time yields a large level of uncertainty in the estimation of the ratio of elasticity parameters, indicating that it is important to base the calibration of parameters in the lifecycle model on richer data. In addition, given that Rogerson and Wallenius (2016) rely on evidence that uses food expenditures as a proxy for total expenditures, the results in equation (13) may explain partially why they find a value for γ/η that for values of η above 1, implies a γ larger than the literature suggests.

7 | CONCLUSION

In this study, we exploit micro panel data with detailed information on a wide variety of expenditure and time use categories to analyse the effects of unemployment on time use and consumption. By doing so, we shed new light on the degree to which home production is used as substitute for consumption expenditures and on the degree of complementarity between leisure and consumption during unemployment. Controlling for unobserved heterogeneity, we find that total household expenditure drops by about 5% due to unemployment of the household head. The statistical significance of this effect is rather low, and it is smaller than what the literature typically estimates for the USA (Stephens 2004; Michelacci and Ruffo 2015; Hendren 2017). In line with Stephens (2004), results do not appear to change once we estimate the effect of unemployment while keeping job loss expectations fixed. The absence of a larger response may be due to the fact that the UI benefit system in the Netherlands described in Section 2 is rather generous compared to that in the USA. It may also be partially because a few categories that represent a large share of expenditures are subject to long-term contractual agreements and thus cannot be easily adjusted, that is, mortgages and rents, as suggested by Chetty and Szeidl (2016).

Interestingly, we do not find that unemployment leads to clear declines in expenditure categories that potentially can be substituted by home production—house cleaning, childcare, and food outside the house—while we do find a clear increase in time dedicated to household chores. The latter increase accounts for about a quarter of average lost working hours. These results indicate that the rise in time dedicated to household chores does not respond to substitution between expenditures and home production. This contrasts with the results of other studies, for example, Aguiar and Hurst (2007), Gelber and Mitchell (2012), and Been *et al.* (2020), who find evidence of substitution using data for the USA. Rather than indicating the presence of substitution, our results point to the fact that, as suggested by Pollak and Watcher (1975), and Kerkhofs and Kooreman (2003), there might be a leisure component to certain home production activities.

In addition, we do not find an effect of unemployment on expenditures related to leisure activities, while we do find a very substantial increase in time spent on leisure activities. In this case, the increase accounts for almost half of average lost working hours. A more detailed analysis reveals that most of this increase is due to time spent watching TV. These results suggest that there is no complementarity between expenditures and leisure time during unemployment, which is in line with Krueger and Mueller (2012), who using US data find evidence showing that individuals do not enjoy free time during unemployment as much as they do when they are working. Nevertheless, we do find a clear complementarity between working and expenditures on transport, which is in line with the negative effect that we estimate of unemployment on

commuting time. Furthermore, we find that unemployment increases expenditures on utilities, which is very likely due to spending more time at home.

To put our results in a theoretical perspective, we plug in our empirical results in a version of the lifecycle model based on Rogerson and Wallenius (2016), and estimate a value of about 0.6 for the ratio between the intertemporal elasticity of substitution for leisure (γ) and the elasticity of substitution between expenditures and home production (η). We show as well that when using in the calculation only information on expenditures that are potentially replaceable by home production, the estimate of the ratio of elasticities increases to 0.8. In this case, the uncertainty with which the ratio is estimated also increases substantially. Taking the point estimate, assuming a lower bound 1 for η, and restricting γ to the values typically estimated in the literature (i.e. values between 0.4 and 0.8), a ratio 0.8 implies γ at the upper-end estimates in the literature, and $\eta = 1$. This would indicate that individuals do have a preference for smoothing leisure over time, and would confirm the low substitution between expenditures and home production. The preference for smoothing leisure over time implies that individuals do not enjoy large utility benefits from the increase in free time caused by unemployment.

When we use only food expenditures and time spent cooking—which are used commonly in the literature as proxies for total consumption and home production due to data limitations—to estimate the ratio, we obtain a ratio that is above unity and that is estimated with a very large level of uncertainty. This shows that using different consumption and time use categories has important consequences for the estimation of these parameters and their associated standard errors. These results have broad implications for future work, since these elasticity parameters are of great importance for the understanding of a variety of lifecycle decisions, including labour supply, saving and retirement.

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ENDNOTES

[1] Prior studies have investigated the roles of UI benefits (Gruber 1997), spousal labour supply (Stephens 2002; Hardoy 2014; Cammeraat *et al.* 2019) and private savings (Gallen 2013; Michelacci and Ruffo 2015; Basten *et al.* 2016) in smoothing consumption around unemployment.

[2] Aguiar and Hurst (2005), Ahn *et al.* (2008) and Burda and Hamermesh (2010) use both expenditure and time use data. However, the data are cross-sectional, allowing us only to draw correlations based on comparing employed and unemployed individuals at a particular point in time.

[3] For instance, see Dynarski and Sheffrin (1987), Gruber (1997), Stephens (2004), Aguiar and Hurst (2005), Krueger and Mueller (2012), Aguiar *et al.* (2013), Michelacci and Ruffo (2015), Kroft and Notowidigdo (2016), and Hendren (2017).

[4] For instance, see Browning and Crossley (2001, 2008, 2009).

[5] In only a few sectors, collective agreements require employers to complement UI benefits to a 100% replacement rate.

[6] As occupational pensions make up about 35% of the retirement income of the median household (Knoef *et al.* 2016), unemployment can have substantial consequences for pension savings.

[7] We test for symmetry by rewriting equation (1) in first differences and substituting the unemployment dummy for two dummies indicating job loss and job find, respectively. The cases for which there is no labour market transition constitute the reference category. Considered in absolute value, the estimates for the job loss and job find dummies are very rarely significantly different from each other. When they are, it is at only low levels of significance.

[8] In this subsection, we report statistics that refer only to the sample for the total expenditure analysis. The statistics for the time use sample are not significantly different.

[9] Frequencies in Table A1 are calculated using the sample for the total expenditure analysis. Due to missing values in self-reported job loss expectations, the sample size is reduced to 6666. When including subjective job loss expectations in the empirical analysis, we replace the missing values with zeros and include in the specification a dummy taking value 1 if the subjective expectations variable has a missing value. An analysis including observations only without missing data on job loss expectations shows that the results are not significantly different.

[10] Informal care is the addition of time spent helping parents, other family members and non-family members.

[11] All results presented in this study are robust to using the Bonferroni correction for multiple hypothesis testing.

[12] These results mean that the decline in total household expenditure in all cases is less than the decline in income imposed by the Dutch UI benefit system, i.e. 30%. For high-income individuals, the replacement rate is lower. Furthermore, at the household level, losses are smaller due to income pooling. There is no evidence for an added worker effect in the Netherlands (De Nardi *et al.* 2021).

[13] The sample average of reported weekly hours of paid work is 35.00 for employed individuals, while it is 7.35 for unemployed individuals. The difference between these two averages is the estimate reported in column (1) of Table 3, i.e. −27.65.

[14] Household chores include several activities usually classified as home production. When answering this question, the LISS respondents are asked to think about cleaning, cooking, laundry, shopping and gardening.

[15] These are 15 other categories related to leisure time, and include activities such as playing an instrument, photography, collecting, playing cards, and fishing. Each of these 15 activities accounts for less than a quarter of an hour a week on average. Therefore we do not report them separately.

[16] It is unclear which activities are captured by this first category. It probably captures home repairs and improvements.

[17] In the Netherlands, unemployed individuals who are disadvantaged in the labour market are exempted for mandatory job search requirements if they are performing voluntary work. Other unemployed individuals are not allowed to be engaged in voluntary work as they should be available for work.

[18] The rate of time preference is assumed to be equal to zero since it does not play a role in our derivations. The same applies to the discount rate in the monetary budget constraint.

[19] In addition to the changes in the monetary and time budget constraints, the optimal choice of c_{mt}, h_{nt} and l_t during unemployment could also be affected by complementarities between consumption and leisure. Such complementarities would imply a multiplicative specification in the utility function. For the sake of simplicity, we abstract from this possibility in the theoretical model.

[20] For the literature estimating γ, see, for instance, Pistaferri (2003), Chetty (2012), Gomes and Ribeiro (2015), Cashin and Unayama (2016), Ameriks *et al.* (2020) and Best *et al.* (2020). For the literature on estimating η, see, for instance, Rupert *et al.* (1995), Aguiar and Hurst (2005, 2007), and Gelber and Mitchell (2012). For a review of both strands of literature, see Rogerson and Wallenius (2016).

[21] In column (4) of Tables 1 and 3, we show that total spending responses to unemployment are similar when we take into account the unexpectancy of job loss, indicating that taking into account expectations in our empirical model does not alter the main conclusions.

[22] The estimates in column (3) of Table 3 show that leisure time increases by 8.820 hours when individuals become unemployed. Given that the average in the sample is 30.785 hours, we set $(1-\overline{h}-h_{n\tau-1}) = 30.785$ and $(1-h_{n\tau}) = 30.785 + 8.820 = 39.604$, which yields $(1-h_{n\tau})/(1-\overline{h}-h_{n\tau-1}) = 1.286$. We conduct the same operation with household chores, using the output from Table 3 and setting $h_{n\tau-1} = 9.933$ and $h_{n\tau} = 9.933 + 4.489 = 14.422$, and total expenditures, using the output from Table 1 and setting $c_{m\tau-1} = 2122.390$ and $c_{m\tau} = 2122.390 - 110.543 = 2011.847$, to obtain the numbers provided in equation (11).

[23] The confidence intervals are calculated by taking the the percentiles 2.5 and 97.5 of the bootstrap distribution. The advantage of this approach is that it does not rely on parametric assumptions. Assuming a normal distribution and using the bootstrap standard error to calculate the confidence intervals yields a similar result. This holds for all ratios presented in this section.

[24] The numerator in equation (12) is calculated in exactly the same way as in equation (11). For the denominator, we combine the variables in Tables 1–3 as explained in the main text, and set $h_{n\tau-1} = 14.143$ and $h_{n\tau} = 14.143 + 5.205 = 19.348$ for home production, and $c_{m\tau-1} = 149.436$ and $c_{m\tau} = 149.436 - 1.112 = 148.324$ for expenditures.

[25] Values of η below 1 would imply that expenditures and home production are actually complements rather than substitutes. With the ratio set at 0.783, values of γ below that value would imply an η below 1, which restricts the values of γ to the upper-end estimates in the literature.

[26] The numerator in equation (13) is calculated in exactly the same way as in equation (11). For the denominator, we use the output in Table 4 related to time spent cooking to set $h_{n\tau-1} = 2.838$ and $h_{n\tau} = 2.838 + 0.548 = 3.386$, and we use the output in Table 2 related to food expenditures outside the household to set $c_{m\tau-1} = 66.185$ and $c_{m\tau} = 66.185 + 5.782 = 71.967$.

[27] Since the months unemployed variable takes only values above zero for those who are unemployed, the interaction in column (2) amounts to including the months unemployed variable alone as a main explanatory variable, while the interaction in column (3) amounts to including two dummies (one indicating being unemployed for 12 or fewer months, and one indicating being unemployed for more than 12 months) as main explanatory variables.

[28] The only exception is the category food inside the household, for which the effect is significantly stronger after 12 months of unemployment. Since this category is not related to home production or leisure, this result does not change our main conclusions.

[29] For this analysis, we use the same sample as in Table 3 but exclude unemployed workers. If we include them, then the change in the results is negligible.

[30] When estimating the effects of the intensive margin on expenditures, the results show virtually no effect of a change in the number of hours of work per week. When controlling for unobserved heterogeneity, the coefficient estimates for all categories become very small, i.e. in all cases within the ±1 interval, and not significantly different from zero. This suggests that households generally maintain their level of expenditure when changing their working hours along the intensive margin. Results are available on request.

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APPENDIX

A.1. Summary statistics

TABLE A1 Distribution of Job Loss Expectations by Job Loss Outcome

Expectation	Full sample	Job loss at $t+1=1$	Job loss at $t+1=0$
0	45.56%	8.77%	46.24%
0.1	22.13%	7.89%	22.39%
0.2	7.64%	4.39%	7.70%
0.3	6.82%	7.89%	6.80%
0.4	1.48%	0.88%	1.49%
0.5	9.68%	23.68%	9.42%
0.6	0.88%	0.88%	0.88%
0.7	0.64%	2.63%	0.60%
0.8	1.58%	7.02%	1.48%
0.9	1.02%	5.26%	0.94%
1	2.58%	30.70%	2.06%

Notes: Self-reported job loss expectations are rounded to the nearest tenth after the decimal point. Frequencies are calculated using the sample for the total expenditure analysis. Due to missing values in self-reported expectations, the sample size becomes 6666. For more details, see the second subsection of Section 4.

TABLE A2 Summary Statistics—Control Variables

	Employed	Unemployed	Total
Female	27.07	35.73	27.44
Partner	70.52	51.46	69.72
Number of children	1.00	0.59	0.98
Age			
25–34	16.76	11.65	16.54
35–44	25.90	18.64	25.60
45–54	31.83	23.11	31.46
55–64	25.51	46.60	26.40
Education			
Primary	1.64	2.33	1.67
Secondary	24.16	32.43	24.51
Professional education	56.50	52.43	56.33
University	14.88	7.96	14.59
No education	0.41	0.58	0.41
Other	2.41	4.27	2.49

Notes: All summary statistics are computed using the sample for the total expenditure analysis containing 12,290 observations. The statistics obtained when using all other samples are very similar. For the number of children, the average is provided.

TABLE A3 Summary Statistics—Household-level Expenditures

		Employed	Unemployed	Total
Total	Mean	2200.93	1765.54	2122.39
	S.D.	1386.08	1202.25	1381.58
	% non-zero	95.65%	93.98%	95.58%
	Observations	11,775	515	12,290
Cleaning	Mean	58.72	45.23	58.28
	S.D.	43.39	29.47	42.80
	% non-zero	70.49%	65.31%	70.27%
	Observations	10,448	467	10,915
Daycare	Mean	39.98	8.19	38.63
	S.D.	149.88	64.61	147.40
	% non-zero	11.12%	3.52%	10.80%
	Observations	10,225	454	10,679
Transport	Mean	158.29	113.48	156.34
	S.D.	137.04	107.80	136.20
	% non-zero	90.80%	86.80%	90.62%
	Observations	10,358	470	10,828
Utilities	Mean	216.85	206.36	216.39
	S.D.	108.10	98.63	107.71
	% non-zero	96.35%	97.41%	81.25%
	Observations	9998	463	10,461
Holiday	Mean	137.97	89.57	135.94
	S.D.	204.26	187.36	203.80
	% non-zero	60.77%	42.95%	60.02%
	Observations	10,346	454	10,800
Mortgage	Mean	559.15	289.96	547.34
	S.D.	512.86	430.31	512.47
	% non-zero	59.09%	35.92%	58.18%
	Observations	10,192	468	10,660
Rent	Mean	118.09	232.01	122.98
	S.D.	231.90	267.50	234.66
	% non-zero	22.84%	46.30%	23.85%
	Observations	10,552	473	11,025
Insurance	Mean	246.16	202.73	244.25
	S.D.	161.72	137.84	160.99
	% non-zero	78.65%	84.45%	78.87%
	Observations	9695	445	10,140
Alimony	Mean	19.92	11.17	19.55
	S.D.	84.75	52.87	83.65
	% non-zero	7.72%	6.00%	7.64%
	Observations	10,808	483	11,291
Debt	Mean	34.59	42.90	34.95
	S.D.	95.10	110.80	95.83
	% non-zero	17.98%	20.62%	18.09%
	Observations	10,725	480	11,205
Food at home	Mean	362.79	293.46	359.85
	S.D.	215.76	201.13	215.61

TABLE A3 (Continued)

		Employed	Unemployed	Total
	% non-zero	97.45%	97.23%	97.44%
	Observations	10,625	470	11,095
Other	Mean	120.91	93.10	119.74
	S.D.	157.94	135.35	157.12
	% non-zero	70.94%	71.14%	70.95%
	Observations	9685	440	10,125

TABLE A4 Summary Statistics—Individual-level Expenditures

		Employed	Unemployed	Total
Food out	Mean	66.33	61.87	66.18
	S.D.	84.32	90.25	84.52
	% non-zero	81.08%	72.45%	83.70%
	Observations	5747	196	5943
Leisure	Mean	63.34	50.17	62.90
	S.D.	74.31	60.06	73.91
	% non-zero	87.59%	77.39%	87.25%
	Observations	5737	199	5936
Tobacco	Mean	21.46	24.01	21.55
	S.D.	47.24	43.64	47.13
	% non-zero	27.84%	35.20%	28.08%
	Observations	5736	196	5932
Clothes	Mean	110.08	90.13	109.42
	S.D.	113.67	105.50	113.46
	% non-zero	93.26%	83.16%	92.93%
	Observations	5729	196	5925
Personal care	Mean	43.90	43.13	43.87
	S.D.	43.55	44.70	43.59
	% non-zero	93.32%	88.21%	93.15%
	Observations	5733	195	5928
Medical care	Mean	24.06	27.56	24.29
	S.D.	38.89	43.94	39.07
	% non-zero	61.84%	61.42%	61.83%
	Observations	5731	197	5928
Schooling	Mean	11.26	9.28	11.20
	S.D.	38.15	35.18	38.05
	% non-zero	16.03%	11.73%	15.89%
	Observations	5732	196	5928
Donations	Mean	49.64	41.95	49.38
	S.D.	52.60	55.13	52.70
	% non-zero	90.56%	78.89%	90.17%
	Observations	5730	199	5929
Other	Mean	15.93	14.87	15.90
	S.D.	33.07	32.65	33.06
	% non-zero	35.58%	36.04%	35.56%
	Observations	5730	197	5927

TABLE A5 Summary Statistics—Time Use

		Employed	Unemployed	Total
Household chores	Mean	9.70	15.70	9.93
	S.D.	7.72	11.14	7.96
	% non-zero	96.21%	96.17%	96.21%
	Observations	5908	235	6143
Activities with children	Mean	4.60	3.55	4.55
	S.D.	8.95	9.44	8.98
	% non-zero	35.08%	21.27%	34.42%
	Observations	9122	456	9578
Informal care	Mean	2.77	4.43	2.85
	S.D.	4.82	6.86	4.95
	% non-zero	48.64%	56.03%	48.74%
	Observations	9158	464	9622
Paid work	Mean	35.00	7.35	33.66
	S.D.	14.70	14.57	15.85
	% non-zero	92.66%	27.59%	89.51%
	Observations	9114	464	9578
Commuting	Mean	4.50	1.32	4.34
	S.D.	4.04	3.19	4.06
	% non-zero	88.51%	28.23%	85.63%
	Observations	9118	457	9575
Leisure activities	Mean	30.48	38.42	30.79
	S.D.	18.01	22.80	18.28
	% non-zero	98.81%	97.91%	98.78%
	Observations	5903	239	6142
Schooling	Mean	1.29	1.51	1.30
	S.D.	3.29	3.79	3.32
	% non-zero	22.88%	22.31%	22.86%
	Observations	5835	242	6077
Sleeping and resting	Mean	56.85	57.17	56.86
	S.D.	13.57	18.23	13.78
	% non-zero	99.44%	99.18%	99.43%
	Observations	5899	244	6143
Personal care	Mean	7.98	9.83	8.05
	S.D.	5.14	6.16	5.19
	% non-zero	99.33%	98.92%	99.32%
	Observations	4659	185	4844
Administrative chores	Mean	2.78	4.00	2.82
	S.D.	2.95	4.34	3.03
	% non-zero	85.20%	90.05%	86.35%
	Observations	4645	191	4836

TABLE A6 Summary Statistics—Time Use (Additional Categories)

		Employed	Unemployed	Total
Small house jobs	Mean	2.98	3.46	3.00
	S.D.	3.79	4.59	3.83
	% non-zero	73.29%	68.45%	73.07%
	Observations	21,160	1027	22,187
Caring for plants and animals	Mean	1.93	2.32	1.95
	S.D.	3.88	4.43	3.91
	% non-zero	52.75%	56.17%	52.91%
	Observations	21,203	1038	22,241
Cooking	Mean	2.77	4.23	2.84
	S.D.	3.16	4.05	3.22
	% non-zero	67.88%	76.65%	68.28%
	Observations	21,149	1028	22,177
Shopping	Mean	1.10	1.48	1.12
	S.D.	1.72	2.06	1.74
	% non-zero	43.79%	50.08%	44.03%
	Observations	21,181	1031	22,212
Sports	Mean	1.94	1.86	1.94
	S.D.	2.29	2.43	2.30
	% non-zero	56.99%	48.60%	56.60%
	Observations	21,194	1035	22,229
TV watching	Mean	17.54	22.86	17.78
	S.D.	10.56	13.34	10.75
	% non-zero	97.81%	97.22%	97.78%
	Observations	21,221	1007	22,228
Radio listening	Mean	18.24	17.68	18.22
	S.D.	19.46	20.96	19.54
	% non-zero	85.67%	74.86%	85.16%
	Observations	21,221	1038	22,259
Reading	Mean	2.64	3.26	2.67
	S.D.	3.92	4.94	3.97
	% non-zero	60.12%	58.80%	60.06%
	Observations	21,170	1017	22,187
Music listening	Mean	10.29	11.14	10.33
	S.D.	15.07	15.29	15.08
	% non-zero	73.13%	72.07%	73.08%
	Observations	21,181	1031	22,212
Going out	Mean	1.32	1.17	1.32
	S.D.	2.20	2.11	2.20
	% non-zero	39.04%	34.39%	38.82%
	Observations	21,185	1038	22,223
Volunteering	Mean	1.03	1.81	1.06
	S.D.	2.60	4.02	2.68
	% non-zero	25.98%	29.38%	26.14%
	Observations	21,294	1028	22,322
Other activities	Mean	3.12	3.94	3.15
	S.D.	5.39	6.52	5.45
	% non-zero	56.41%	58.00%	56.48%
	Observations	21,182	1038	22,220

TABLE A7 Results—Monthly Unemployment (Total and Household-level Expenditures)

Dependent variable	Mean	Control for months unemployed (1)	Interaction with months unemployed (2)	Dummies for ±12 months unemployed (3)	*p*-value test difference ±12 months (4)
Total	2122.39	−113.78	−1.62	−125.91	0.59
		(78.90)	(2.66)	(85.32)	
				−65.56	
				(88.08)	
Related to home production					
House cleaning	58.28	−4.95	−0.10	−2.07	0.24
		(4.12)	(0.12)	(4.68)	
				−8.51**	
				(4.02)	
Daycare	38.63	−6.64	−0.20	−5.26	0.61
		(5.64)	(0.28)	(5.84)	
				−10.21	
				(9.27)	
Related to work or leisure time					
Transport	156.34	−21.29***	−0.38*	−22.67**	0.54
		(8.21)	(0.22)	(8.83)	
				−15.73*	
				(8.87)	
Utilities	216.39	16.81**	0.21	17.29**	0.50
		(6.69)	(0.18)	(7.35)	
				10.74	
				(7.50)	
Holidays	135.94	−15.23	0.98*	−5.78	0.26
		(11.77)	(0.55)	(11.72)	
				16.52	
				(19.62)	
Other categories					
Mortgage	547.34	−1.22	1.21**	7.01	0.45
		(23.77)	(0.50)	(26.71)	
				29.12	
				(20.52)	
Rent	122.98	−23.30*	0.12	−16.95	0.66
		(12.39)	(0.33)	(13.20)	
				−10.73	
				(10.26)	
Insurances	244.25	−10.11	−0.03	−8.37	0.87
		(11.41)	(0.34)	(11.55)	
				−5.80	
				(12.63)	

TABLE A7 (Continued)

Dependent variable	Mean	Control for months unemployed (1)	Interaction with months unemployed (2)	Dummies for ±12 months unemployed (3)	*p*-value test difference ±12 months (4)
Alimony	19.55	−2.62	−0.17	−4.47	0.93
		(4.16)	(0.13)	(4.94)	
				−3.94	
				(4.83)	
Debts and loans	34.95	−11.73*	−0.15	−11.90*	0.61
		(6.68)	(0.16)	(7.01)	
				−8.06	
				(6.60)	
Food in	359.85	−6.63	−0.76*	3.77	0.01
		(12.37)	(0.42)	(12.80)	
				−41.76***	
				(14.64)	
Other	119.74	−9.76	−0.32	−2.38	0.25
		(13.32)	(0.42)	(13.39)	
				−22.87*	
				(12.38)	

Notes: Standard errors (clustered at the household level) are reported in parentheses. Column (1) provides results using fixed effects, including individuals' lagged subjective job loss expectation, while also including months of unemployment as a control variable. Column (2) provides the same results but with months of unemployment as main explanatory variable. Column (3) provides the results obtained when using two dummies (one indicating less than a year since unemployed, and one indicating more than a year) as main explanatory variables. Column (4) provides the *p*-value of a Wald test of equality of the coefficient estimates corresponding to the two dummies in column (3). For the number of observations in each regression, see Tables A1–A6. For further details, see the main text. *, **, *** indicate significant at the 10%, 5%, 1% level, respectively.

A.2. Additional results

A.2.1. Monthly unemployment

As mentioned in the first subsection of Section 5, our baseline results for expenditure could be influenced by the time window used to measure consumption expenditures. That is because these are asked as an average of the last 12 months while, at the time of observation, individuals could have been unemployed for a time shorter than that. If that is the case, then the expenditure response could be muted by the nature of the data. As mentioned in the first subsection of Section 4, the average unemployment spell in the sample is 17 months (median 11). Tables A7 and A8 show, for household-level and individual-level categories, respectively, the results that we obtain when we take the fixed effects model and perform several robustness checks using the monthly unemployment data. Column (1) shows the results that we obtain when including months unemployed as a control variable; column (2) shows the results of interacting unemployment with monthly duration; and column (3) provides the results that we obtain when interacting the unemployment dummy with a dummy indicating whether an individual has been unemployed for more than 12 months at the time of observation.[27] Finally, column (4) provides the *p*-value of a Wald test for which the null hypothesis is that the effects for those below and above 12 months of previous unemployment do not differ from each other. If there is a muting effect, then we should see that an extra month of unemployment increases the estimated effect. In addition, if that is the case, then the effect should be stronger for those who have been unemployed longer than 12 months, since they should not be affected by the muting effect.

TABLE A8 Results—Monthly Unemployment (Individual-level Expenditures)

Dependent variable	Mean	Control for months unemployed (1)	Interaction with months unemployed (2)	Dummies for ±12 months unemployed (3)	*p*-value test difference ±12 months (4)
Related to home production					
Food out	66.18	4.81	0.27	7.10	0.80
		(12.02)	(0.63)	(11.31)	
				2.38	
				(15.11)	
Related to leisure					
Leisure	62.90	−4.18	−0.61**	−6.74	0.54
		(7.69)	(0.28)	(7.71)	
				−13.70	
				(9.92)	
Other categories					
Tobacco	21.55	−2.39	−0.13	−0.77	0.24
		(4.90)	(0.20)	(4.70)	
				−8.96	
				(5.91)	
Clothes	109.42	1.52	−0.25	−2.55	0.77
		(12.35)	(0.68)	(10.51)	
				2.33	
				(16.58)	
Medical care	24.29	−11.94*	0.13	−8.53	0.63
		(6.24)	(0.30)	(5.71)	
				−3.56	
				(8.57)	
Schooling	11.20	1.03	−0.01	0.44	0.88
		(4.58)	(0.13)	(4.47)	
				1.15	
				(4.42)	
Donations	49.38	−5.77	−0.27	−8.23	0.47
		(6.10)	(0.29)	(5.70)	
				−1.74	
				(7.56)	
Other	15.90	2.28	0.01	2.25	0.80
		(4.73)	(0.23)	(4.51)	
				0.23	
				(6.90)	

Notes: See Table A7.

TABLE A9 Results—Intensive Margin Time Use

Dependent variable	Mean	OLS-1 (1)	OLS-2 (2)	FE (3)
Related to home production				
Household chores	9.93	−0.10***	−0.08***	−0.05***
		(0.01)	(0.01)	(0.01)
Activities with children	4.55	0.00	−0.04***	−0.03***
		(0.01)	(0.01)	(0.01)
Informal care	2.85	−0.01***	−0.01	0.01
		(0.00)	(0.00)	(0.01)
Related to work or leisure time				
Commuting	4.34	0.10***	0.09***	0.10***
		(0.00)	(0.00)	(0.00)
Leisure activities	30.79	−0.35***	−0.35***	−0.39***
		(0.02)	(0.02)	(0.03)
Other categories				
Schooling	1.30	0.00	0.00	−0.00
		(0.00)	(0.00)	(0.00)
Sleeping and resting	56.86	−0.10***	−0.08***	−0.05**
		(0.02)	(0.02)	(0.03)
Personal care	8.05	−0.04***	−0.02***	−0.02**
		(0.01)	(0.01)	(0.01)
Administrative chores	2.82	−0.01***	−0.01**	−0.00
		(0.00)	(0.00)	(0.00)

Notes: Standard errors (clustered at the household level) are reported in parentheses. Column (1) provides OLS estimates without any control variables. Column (2) provides OLS estimates including gender, age, presence of a partner, number of children in the household, educational level, and a set of year dummies. Column (3) provides estimates obtained including control variables and fixed effects. For the number of observations in each regression, see Tables A1–A6. *, **, *** indicate significant at the 10%, 5%, 1% level, respectively.

Both Tables A7 and A8 show that when including months of unemployment as a control variable, the resulting estimates for the unemployment effect do not significantly differ from those in column (4) of Tables 1 and 2. Furthermore, it appears that the interaction with months unemployed yields very small coefficients, meaning that an extra month of unemployment has a very small effect on expenditures. Column (2) in both Tables A7 and A8 shows that even if some of the effects are statistically significant, in all cases they are nearly within the ±1 euro interval. Furthermore, columns (3) and (4) show that the effects for those above and below 12 months of unemployment are not significantly different from each other, since in all cases we fail to reject the null hypothesis stating that they are equal.[28] These results suggest that measuring expenditures as an average of the 12 months prior to the interview moment does not have a clear muting effect on our estimates reported in Tables 1 and 2.

A.2.2. Intensive margin results for time use

As mentioned in the second subsection of Section 5, it is relevant for completeness to explore whether changes in hours worked along the intensive margin have different effects compared to changes in the extensive margin. Workers are often subject to part-time employment or other arrangements that may imply variation in weekly hours of work while still being employed. In Table A9, we present the estimation results that we obtain when using effective hours worked as

explanatory variable, conditional on being employed.[29] In this case, it is more difficult to achieve causal identification since working hours may decrease voluntarily and/or as a response to an increase in time spent on other activities. Therefore the results for the intensive margin should be interpreted as descriptive.

As shown in Table A9, we find substantial time reallocations associated with changes in hours worked.[30] Compared to the results in Table 3, we find statistically significant effects for a larger number of time use categories. However, the effects generally point in the same direction as in Table 3. We estimate the strongest effect for leisure activities, which increase by about half an hour for each hour of work reduction, followed by sleeping and resting, and household chores, both of which increase by above 0.1 hours for each hour of work reduction. Similarly to the extensive margin, we find that work reductions lead to a decrease in commuting time. In this case we find a 0.1 hours decrease for each hour of work reduction. Our results are comparable to those obtained by Aguiar *et al.* (2013), who find that leisure time absorbs about 50% of the change in hours worked. However, they find that about 30% of that change is absorbed by home production, while we find a much smaller effect for the household chores category. This difference indicates again that substitution between expenditures and home production may be more important in the USA than in the Netherlands.