Journal of Developmental and Life-Course Criminology (2022) 8:96–123
https://doi.org/10.1007/s40865-022-00191-1

ORIGINAL ARTICLE

Crime, Families and the Economy: Micro-conditions as Moderator of Macro-effects

Ilka van de Werve[1,2,6] · **Arjan Blokland**[2,3,4] · **Frank Weerman**[2,5]

Received: 25 August 2021 / Revised: 30 November 2021 / Accepted: 12 January 2022 /
Published online: 6 April 2022

Abstract

Since the early 1990s, increasing attention is being paid to the impact of life course transitions on criminal behavior. However, individuals' life courses do not evolve in a vacuum but rather in the broad context of societal characteristics and developments. In this paper, we analyze whether there is an effect of macroeconomic circumstances on individuals' criminal careers and whether this effect is conditional on marital status and parenthood. We employ micro-level data from a Dutch large-scale longitudinal study and enrich these with macro-level data. Using logistic panel data models for criminal behavior, we distinguish three types of effects: the macro-effect of experiencing declining economic times, the micro-effect of family composition and the interaction effect, indicating whether the effect of economic decline is differentiated by marital status and parenthood. We quantify economic decline either as an increase in the unemployment rate (objective and backward-looking measure) or as a decrease in consumer confidence (subjective and forward-looking). First, we find that an increase in the unemployment rate has no effect on criminal careers, but a decrease in the consumer confidence is associated with an increase in individual-level crime. Next, we confirm earlier results that marriage has a negative effect on crime, while parenthood has no effect. Finally, our results indicate that the detrimental effect of decreasing consumer confidence on criminal behavior is nullified for married individuals.

Keywords Criminal career · Turning point · Family composition · Macroeconomy · Applied econometrics

✉ Arjan Blokland
ablokland@nscr.nl

Extended author information available on the last page of the article.

Introduction

Studies in the tradition of life course criminology have demonstrated that major events and transitions in individuals' life, such as getting a job and starting a family, are important to understand desistance from criminal careers (e.g., Uggen & Wakefield, 2008; Craig et al., 2014; Skardhamar et al., 2015; Savolainen et al., 2018). Though central to the life course approach, most studies conducted in this field however do not incorporate the notion that people live their lives in the larger context of society where macro-level circumstances change over time (Elder & Giele, 2009). The importance to incorporate both macro-social and micro-social processes in explanations of individual crime was already acknowledged by Short (1998) who, in his American Society of Criminology 1997 Presidential Address, reflected on his 35 years of work on the "level of explanation problem" in criminology. When it comes to the impact of macro-social factors on individual behavior, Short (1998, p. 7) emphasizes the individual's "immediate social milieu" as the situational context in which these macro-social factors influence interactions between individuals, and subsequently individual's choices and behaviors. Unfortunately, only a few studies have begun to investigate the issue since then. As Matsueda (2017) and Laub and Sampson (2020) recently observed, most researchers still neglect the macro-micro problem and the issue has mostly been elaborated in theoretical terms yielding little empirical knowledge on the topic. It is therefore unknown whether changing macro-level circumstances influence individual's criminal behavior and whether these effects are conditional on micro-level contexts.

In this paper, we investigate to what extent declining macroeconomic circumstances have an impact on individual criminal behavior. Combining the Criminal Career and Life Course Study (CCLS) data set with macroeconomic data from Statistics Netherlands, we were able to construct a panel data set in which we observe individuals on a yearly basis between 1972 and 2006. During this period, the Dutch state experienced fluctuating economic times: for example the oil crises in 1973 and 1979, special unemployment policies in the mid 1980s and the dot-com bubble at the end of the 1990s.

Using logistic panel models, we first investigate whether there is a relation between macroeconomic circumstances and the probability that someone is convicted of a crime. We include yearly unemployment rate data in our model as an objective and backward-looking indicator of the state of the economy. As individuals may primarily act on their beliefs about the future, we also employ a more subjective and forward-looking indicator, namely the consumer confidence index. With both measures, we distinguish whether the economy can be perceived as being in decline (unemployment rate increased or consumer confidence decreased compare to the year before) or has improved (vice versa).

Second, we pay attention to the micro-level analysis on the effect of family composition on criminal behavior. And third, to investigate whether the effect of declining macroeconomic circumstances are moderated by family composition outcomes, we also include interaction terms. This allows us to simultaneously investigate how criminal behavior is affected by both macro- and micro-level attributes. Our approach differs from the few available criminological studies incorporating macro-micro

interactions, because those asked whether the effect of micro-level transitions varies over different macro-circumstances, while we distinguish the effects of macro-level attributes, micro-level attributes and their interaction.

Previous Literature

In this study on macroeconomic circumstances and crime we are interested in the effects of (changes in) the unemployment rate and consumer confidence on individual-level criminal careers. Much extant research however, focuses on the effect of the unemployment rate on aggregate crime levels (macro-macro research). The results from this body of research are mixed (Uggen & Wakefield, 2008), and it is therefore still unclear whether unemployment rates are positively related to crime rates (in line with the rational choice theory or economic choice theory by Becker 1968) or negatively (in line with routine activity theory by Cohen & Felson, 1979). Uggen and Wakefield (2008) argue that motivational and opportunity processes could also operate at the same time, such that positive and negative effects would offset each other.

In an effort to solve this conundrum (Cantor & Land, 1985) built a model that allows for both effects at the same time, therefore distinguishing between positive motivation effects and negative opportunity effects. These researchers find a negative overall effect of the unemployment rate on the crime rate, but a small positive effect for property crimes. A recent extension of their work by Ha et al. (2020) however shows that the unemployment-crime relationship is not stable over time, and that more research is needed to explain this phenomenon. In order to establish a causal relationship between unemployment rates and crime, Gould et al. (2002) employ an instrumental variables model. Their main results show that higher unemployment rates lead to more crime. In our study, we have a macro-level explanatory variable for a micro-level outcome variable, so we have no concern about the causal order in this regard.

There are studies that use other macroeconomic variables than the unemployment rate. Cook and Watson (2014) attempt to follow the business cycle by viewing opportunity effects as pro-cyclical (more crime in times of economic improvement) while motivation effects are considered to be counter-cyclical (more crime in times of economic decline). Besides unemployment, they also consider real income, real GDP and real consumption. The weakest results are found for employment, while real consumption gives the strongest results and supports the cyclical approach. Rosenfeld and Fornango (2007) also argue that mixed unemployment-crime results are found because unemployment is not a valid indicator of all economic circumstances. They propose to use aggregate consumer sentiment instead — similar to our other indicator to measure macroeconomic decline — because this is a subjective measure on how individuals perceive the economy. Rosenfeld and Fornango (2007) find negative associations between aggregate consumer sentiment and robbery and property crime rates.

While prior research provides reason to assume that there might be an effect of (changing) macroeconomic circumstances on crime rates, results from macro-macro

research cannot directly be translated to the effect of macroeconomic circumstances on criminal careers on the micro-level that we are interested in. Macro-micro research however did not get much attention yet, in part because criminological life course research has been largely based on cohort studies, limiting the variation in macro-level experiences for the sampled individuals. To the best of our knowledge, Farrall et al. (2020) is the only empirical paper to date that resembles our approach of analyzing the impact of macroeconomic circumstances on individual's crime. These researchers analyzed the effect of macroeconomic policies on micro-level crime using the British Cohort Study. This cohort consists of individuals born in one week of April 1970 and the variation in economic circumstances comes from industrial (un)employment measures per county. The UK experienced challenging economic times during the 1970s and the government of Margaret Thatcher increased the interest rates directly after its establishment in 1979, which substantially harmed the manufacturing output between 1979 and 1981. Farrall et al. (2020) construct an economic change variable comparing 1971 and 1981 and find a nonlinear relationship with offending: no impact for the lowest levels of economic change, an indirect impact (via school alienation and being on the at-risk register) for relative high levels of economic change and a direct impact for the highest level of economic change.

In contrast to macro-micro research, there is an abundance of micro-micro research in the life course criminological tradition. This is also true for research on the effects of family life course transitions, such as marriage and parenthood, on criminal behavior. In a systematic review, Craig et al. (2014) examined more than thirty studies on the effect of marriage on crime. These studies included both US and European data and in two-thirds of the studies, a statistically significant and negative effect of marriage on crime was found. Bersani and van Schellen (2014) found similar inhibiting effects of marriage on crime in their review of Dutch studies. Their summary table includes prior studies based on the data used for the present analysis (Blokland & Nieuwbeerta, 2005; Bersani et al., 2009; McGloin et al., 2011; Van Schellen et al., 2012; van Schellen et al., 2012; Blokland & De Schipper, 2016). Research on the effect of parenthood on criminal behavior is less unequivocal. An overview provided by Huschek and Blokland (2016) shows that most studies find negative or insignificant effects, but there are also some studies finding positive effects. Zoutewelle-Terovan et al. (2014) find the strongest negative effects when the "full family package" (marriage and parenthood) applies.

Given the present paucity of macro-micro research, it is unsurprising that our extant knowledge on possible interaction effects between macro- and micro-level characteristics and changes in micro-level crime is still limited. A few studies have however examined the effects of family life course transitions over different generations. These studies are relevant for our study, since different generations also experience different macroeconomic circumstances. Bersani et al. (2009) find that marriage reduces crime in several subsequent cohorts, and this effect is strongest in the youngest generation. Beijers et al. (2012) find crime-reducing effects for marriages after 1970, but not before. Both studies however explain these interaction effects from changes in societal perspectives on marriage rather than discussing possible interaction effects with macroeconomic circumstances.

Research outside the field of criminology has considered the effect of macroeconomic conditions on family formation outcomes, like cohabitation and marriage (e.g., Sassler and Goldscheider, 2004, divorce, e.g., Schaller (2013), and having children e.g., Sobotka et al., 2011). We highlight two papers examining the Dutch context that are close to ours in terms of the macroeconomic indicators used. Adsera (2011) uses the unemployment rate to analyze more than 50,000 females in 13 European countries, including the Netherlands. She finds that children are born later in countries where the unemployment rate is high and more persistently so. Fischer and Liefbroer (2006) analyze the impact of consumer confidence on union dissolution (including dissolution of both marriages and unmarried cohabitations) and find that — in line with the "relational stress argument" — for Dutch females divorce is more likely in times of declining consumer confidence.

In sum, the available evidence suggests a relationship between macroeconomic circumstances and national crime rates. Times of economic decline seem associated with more crime, but the results depend on the macroeconomic indicator used and the time period studied. Furthermore, studies on family formation have shown macroeconomic indicators to affect micro-level family transitions. Whether and how macroeconomic circumstances impact individual crime however is still underexplored. Echoing sentiments similar to those of Short (1998) and others (e.g., Matsueda, 2017), Bersani and Doherty (2018) stress it is important for life course research to no longer solely focus on *either* the individual *or* the social context, but rather treat them as intrinsically linked. This includes investigating whether family composition moderates the effect of macroeconomic circumstances on individual crime, a topic that has not been addressed in the literature before.

Hypotheses

Here, we investigate (1) the effects of declining macroeconomic circumstances on criminal behavior, (2) the effects of the micro-social family composition on criminal behavior, and (3) whether the effect of declining macroeconomic circumstances depends on the family composition. These three possible types of effect are visualized in Fig. 1. Parameters were added to the solid arrows enabling us to connect the diagram with the modeling framework in "Analytical Strategy".

The macro-effect β is the effect of a declining economy on individual criminal behavior. The micro-effect γ is the effect of family composition on criminal behavior. The moderating effect of family composition on the effect of macroeconomic circumstances on criminal behavior is denoted by the interaction effect δ.

The lighter dashed arrow indicates that macroeconomic circumstances also potentially influence decisions regarding family formation. Since the decision to marry or at least the "decision" to have a child occurs prior to the actual event, it might be that the macroeconomic circumstances in year $t-1$ play a role in the family formation decision of year $t-1$ but that we only observe the outcome in year t. To control for this, we perform a sensitivity analysis where we lag marital status and parenthood to reflect the decision rather than its outcome.

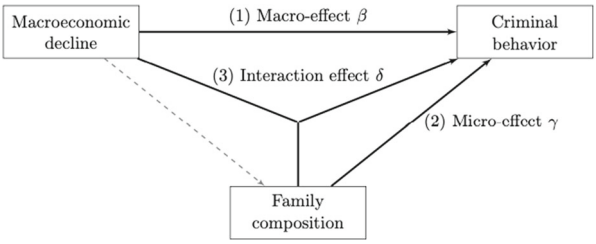

Fig. 1 Visual representation of all possible relations between variables. The parameters are also used in the hypotheses and modeling framework

Our first hypothesis concerns the macro-effect measured by β. We want to investigate whether economic decline has a direct relation with the probability that somebody commits a crime. For indicators of macroeconomic circumstances, we use the yearly unemployment rate as an objectively measured time series and the consumer confidence index as a more subjective indicator of the economy. The consumer confidence index reflects a level of optimism or pessimism towards the expected development of the Dutch economy in the next twelve months, whereas the unemployment rate is a realized value. Economic decline is quantified as either an increase in the unemployment rate or a decrease in the consumer confidence compared to the year before.

The expected direction of the macro-effect β can be derived from various theories. From the rational choice theory or economic choice theory by Becker (1968), we expect that an individual will commit a crime if the expected utility is higher than refraining from it. Times of economic decline lead to a different trade-off between expected costs and benefits, because the expectation of maintaining a certain standard of living in a legal manner will be lower. A decision in favor of committing a crime might be more probable in this situation than in improving economic times (ceteris paribus). The general strain theory by Agnew (1992) also supports that the social environment can create incentives for criminal behavior. Higher unemployment rates or lower consumer confidence may increase both the likelihood and level of different types of strain individuals experience, and therefore increase criminal coping. As positive effects of times of economic decline on crime were also found in macro-macro research (e.g., Gould et al., 2002; Rosenfeld and Fornango, 2007) and in the macro-micro study by Farrall et al. (2020), we formulate the following hypothesis:

H1. *Individuals are more likely to commit crimes in times of economic decline* ($\beta_{decline} > 0$)

Next, we focus on the micro-effect denoted by γ. Criminological life course theories argue that transitions to adult social roles, like marriage and parenthood, may reduce individuals' criminal motivation (Moffit, 1993), increase perceived levels of social control (Sampson & Laub, 1990), or alter individuals' associations (Warr, 1998), which alone or in combination are expected to reduce criminal behavior. From an economic perspective however, marriage, but especially parenthood, can be expected to increase the individual's financial demands, increasing the expected

utility of criminal behavior. The felt need to provide for ones family, may also induce strain and result in criminal coping, offsetting — in part or wholly — the beneficial effects of engaging in these adult roles. This likely applies most to parenthood as young children do not typically contribute to the household income — whereas marital partners may. Earlier research on family formation and the impact on criminal behavior with the CCLS data set seems to support this line of reasoning and finds that marriage reduces offending while parenthood has no significant effect (Bersani & van Schellen, 2014; Huschek & Blokland, 2016). Because of this, we formulate the following hypotheses:

H2a. *Married individuals are less likely to commit crimes* ($\gamma_{marriage} < 0$)
H2b. *Parenthood has no impact on criminal behavior* ($\gamma_{parent} = 0$)

Finally, we look at the interaction effect δ that tells us whether the effect of macroeconomic circumstances on criminal behavior is conditional on the individual's marital status and parenthood. In the absence of empirical evidence, we formulate our hypotheses purely on existing theories. These theories however, leave room for interpretation and it is not always clear whether to expect married individuals and parents to be more or rather less likely to resort to crime during periods of economic decline.

From an economic perspective, the effect of macroeconomic decline on crime may be less pronounced for married individuals compared to singles. First, married individuals may benefit from the financial safety-net provided by the two extended families tied in matrimony thus softening the impact of economic decline. Relatedly, the costs of committing crime may be higher for married individuals compared to singles, as the marriage partner represents an economic asset individuals are not willing to lose by committing crime. Being a parent could also result in criminal behavior being a less desirable alternative during times of economic decline given the costs associated with losing custody.

Strain theory could also be argued to lead to the expectation that experiencing times of economic decline affects married individuals' criminal behavior to a lesser extent than that of singles. Marriage partners and their extended family network may prevent that economic stress leads to negative emotions, increase the individual's choice of alternative goals and behaviors and reduce the risk of criminal coping. On the other hand, being a breadwinner and caretaker may disproportionally increase strain during times of economic decline especially for marital partners and parents. When individuals feel they can not fully live up to expectations in providing for their family, this could increase rather than decrease the likelihood of criminal coping in those married and having children.

Although we expect that married individuals and parents respond differently to experiencing economic decline than singles or non-parents, the theories are not unequivocal whether these effects are more of less strong. Therefore, our final two hypotheses are:

H3a. *The impact of macroeconomic decline on individual criminal behavior is conditional on being married* ($\delta_{decline*married} \neq 0$)
H3b. *The impact of macroeconomic decline on individual criminal behavior is conditional on being a parent* ($\delta_{decline*parent} \neq 0$)

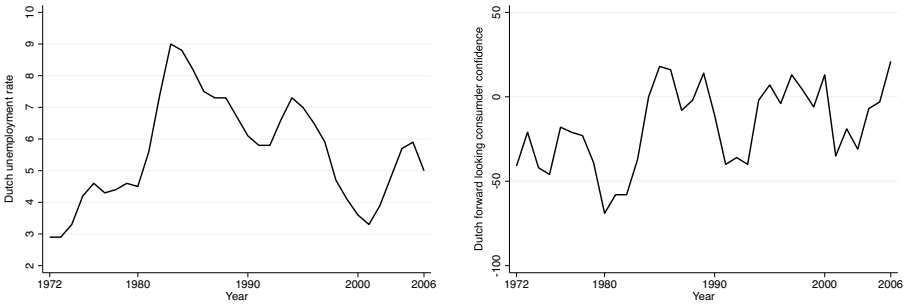

Fig. 2 Dutch macroeconomic variables. The left panel plots the objective and backward-looking unemployment rate, while the right panel plots the subjective and forward-looking consumer confidence index

Data

To test the hypotheses, we analyzed a data set that was constructed from two sources. Our macro-level data comes from the Statline database by Statistics Netherlands. We added these data to the micro-level data from the Criminal Career and Life Course Study (CCLS) conducted by the Netherlands Institute for the Study of Crime and Law Enforcement (NSCR) (Blokland, 2005).

Macro-level Data

We extracted macroeconomic data from the freely accessible Statline database by Statistics Netherlands. To get an objective indicator of changes in the Dutch economy, we collected the yearly unemployment rates. For the more subjective measure, we collected the Dutch forward-looking consumer confidence index. Both time series are available from 1972 onward and they are plotted in Fig. 2. This figure shows that the Netherlands clearly experienced fluctuating economic times during the sample period.

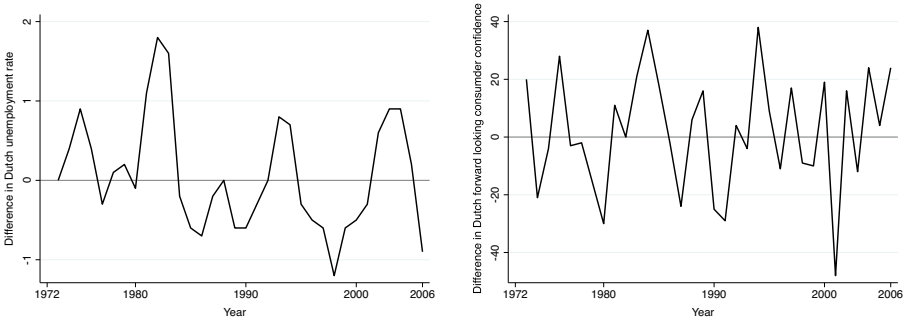

Fig. 3 Yearly changes in Dutch macroeconomic variables. Times of economic decline are indicated by increasing unemployment rates (left panel, years with values above zero-line) or decreasing consumer confidence (right panel, years with values below zero-line)

In the left panel of the figure, we see that the unemployment rate varied a lot, and periods of increases were interchanged with decreases, some more severe than others. Some interesting periods are worth highlighting. The oil crisis of 1973 is clearly associated with a higher unemployment rate in the years afterwards, peaking in 1983/84 after the second oil crisis in 1979. In these times, it was especially difficult for young people to enter the job market. With improved unemployment assistance policies in the second half of the 1980s, the unemployment rate decreased but did not return to the level of before the oil crisis. After an ongoing decrease of the unemployment rate in the 1990s, we see that unemployment started to increase again in the early 2000s, which is a reflection of the dotcom bubble crisis.

In the right panel of Fig. 2 we see that people generally tend to be pessimistic about the Dutch economy as the level of the consumer confidence index was almost always below zero during the period under scrutiny. One would expect that, when the unemployment rate in the left panel increases and the economy is likely in decline, consumer confidence also decreases (or vice versa for economic improvement). This is however not always the case. For example, in the early 1980s when the unemployment rate increased to its peak during the observation window, consumer confidence increased as well.

In our hypotheses concerning the macroeconomic circumstances, we differentiate between times of economic decline and improvement. To do so, we compare the two macroeconomic indicators to the year before. We say that the economy is declining when the unemployment rate strictly increased or the consumer confidence strictly decreased. To that extent, we plotted the yearly changes of the unemployment rate and consumer confidence in Fig. 3. Years with changes in the unemployment rate above zero are considered to be times of economic decline (left panel, above zero-line), as well as years with changes in the consumer confidence below zero (right panel, below zero-line).

Micro-level Data

The CCLS data set consists of a representative sample of 4% of all criminal cases tried in 1977, in which drunk driving is undersampled while less common and "more serious" crimes are oversampled[1]. Their (registered) criminal careers were reconstructed using General Documentation Files of the Criminal Record Office. These data go back to the year the individuals were 12 years old and span the period until their death or the end of the follow-up in 2006. Together these registrations result in a panel data setup of multiple years, with information on whether an individual was "convicted" of a crime or not in a given year, the types of crime, as well as the individuals' gender, age and ethnicity[2]. The researchers who created the CCLS

[1]Sampling weights are available and previous studies show that the results are robust against using or omitting these.

[2]Following previous research using these data, the term "convictions" refers to criminal cases that resulted in a guilty verdict, prosecutorial fine, or prosecutorial waiver due to policy reasons, thus excluding non-guilty verdicts and prosecutorial waivers due to lack of evidence. In the Dutch criminal justice system, the public prosecutor can decide to drop a case if prosecution probably would not lead to conviction, due to

data set enriched it with Dutch administrative data on these individuals (Blokland & Nieuwbeerta, 2005). We refer to Blokland (2005) for a more detailed discussion of the CCLS.

We imposed three restrictions on the CCLS data set for our study. First of all, we limited the sample to males who are born in the Netherlands, because there are no criminal records available for periods in which individuals did not live in the Netherlands. Secondly, although we had records on all life course transitions since the age of 12, we will start our sample period in 1972 because of the limited availability of the macro-level data as discussed in the previous subsection. Lastly, to match the panel data set with the available macro-level data, we include individuals who are observed in all years between 1972 and 2006.

These restrictions lead to a data set of $N = 2,251$ individuals who we follow from 1972 until the end of follow-up in 2006 ($T = 35$ years). In Table 1 we present descriptive statistics, where we distinguish between the sample period (1972–2006) and the pre-1972 period to also take earlier life course transitions into account.

The average age of the individuals is 21.5 years old in 1972. 73% of the sample becomes a parent at some point, and they are 28.9 years old on average when they have their first child. A slightly higher share of the sample, namely 78%, is at some point married, but not all individuals are married during parenthood (67%). The proportion ever married and/or ever a parent is basically equal to the share who is so during the sample period of 1972–2006, while the proportion is much lower before 1972, which is unsurprising given the sample's average age in that year.

By definition, almost everybody of the sample (97%) is convicted of a crime between the age of 12 and the end of follow-up in 2006. This is not 100% because not all criminal cases selected for inclusion in the sample eventually resulted in a conviction for the individuals charged in these cases. In so far these individuals were not convicted at some other point during their lives, though in the sample, these men have no registered criminal career[3]. Slightly fewer individuals (92%) are convicted between 1972 and 2006 which indicates that some of the individuals who had their criminal case brought before a judge in 1977 and were either acquitted or got their case waivered for technical reasons, did have prior convictions at the time. Overall, a substantial portion of the individuals (35%) already had a criminal record before 1972. For the period from the age of 12 until the end of follow-up in 2006, 84% of the sample is convicted more than once and 53% spends some time in prison.

Our outcome variable reflects criminal convictions in any year during the sample period 1972–2006. For our sample, we see that there is at least one criminal conviction in more than 18% of the observations. Property crimes were committed

lack of evidence or technical considerations (procedural or technical waiver). The public prosecutor also has the discretionary power to waive prosecution for reasons of public interest. As the latter do not pertain to the strength of suspision or the available evidence, policy waivers are subsumed under "convictions", whereas technical waivers are not. For each "conviction" we use the date of first registration of the case at the Public Prosecutor's Office to time the criminal event in the life course. In the absence of information on the exact date of commission of the offense, this is the point closest in time to the actual criminal event taking place (see Blokland 2005 and Block et al. 2010).

[3]Since we will use a logistic panel data model with individual fixed effects, individuals with no registered criminal offenses will drop out of the analysis.

Table 1 Descriptive statistics of the sample

	Sample
# Individuals	2,251
Avg. age in 1972	21.5
Avg. age at first child	28.9
	Proportion of individuals from age 12 until year 2006
Ever married	78%
Married 1972–2006	77%
Married pre-1972	27%
Ever parent	73%
Parent 1972–2006	73%
Parent pre-1972	22%
Ever parent while married	67%
Parent while married 1972–2006	66%
Parent while married pre-1972	21%
Ever crime	97%
Crime 1972–2006	92%
Crime pre-1972	35%
Ever recidivate	84%
Ever prison	53%
	Proportion of observations in 1972–2006
Any crime	18.07%
Violent crimes	3.44%
Property crimes	7.18%
Vandalism	3.13%
Drug crimes	0.65%
Gun crime	0.50%
Other criminal law	0.29%
Traffic crimes	4.76%
Other special laws	4.32%

The CCLS data set is based on criminal cases tried in 1977, tracks individuals back to the age of 12 and follows them on a yearly basis until 2006. The sample period in the analytical strategy is limited to 1972–2006 for the inclusion of macroeconomic variables

the most (7.18%), followed by traffic crimes (4.76%), "other special law crimes" (4.32%, which includes violations of economic laws that regulate business activities, including hygiene, environment and employee safety), violent crimes (3.44%) and vandalism (3.13%). There are only minor proportions for drug crimes, gun crimes and "other criminal law crimes" (which includes crimes like "causing general harm or a dangerous situation", "insulting the royal family or foreign heads of state" and other uncommon or hard to classify offenses).

We plotted the age-crime curve in Fig. 4. It shows a crime participation pattern that is often found in the literature, see for example (Sampson & Laub, 2005). During adolescence, there is a big increase in the number of individuals who commit crimes.

We see a peak around age 20, where 40% of the sample participates in crime. After this age, the involvement rapidly decreases, with 10% still being criminally active at age 56.

Analytical Strategy

To test our hypotheses, we set up a logistic panel data model. Generally, if regressors are exogenous, the estimated parameters can be interpreted as causal effects on the outcome. In our setting, we can safely assume that the macro-level regressors are exogenous because the observed and unobserved individual features have negligible effects on macroeconomic outcomes. That is, the macro-level variables would have the same values if we would have had another sample of the population. However, the micro-level variables are not necessarily exogenous and there are three potential causes of endogeneity that could lead to biased estimates, which we aim to solve as follows.

The first source of endogeneity, and the most challenging one, is reverse causality. It is possible that family composition regressors not only have an impact on the crime outcome, but that there is also a vice versa relationship. For example, van Schellen et al. (2012) found that males are less likely to get married when they commit more crimes, although they are still more likely to marry criminal spouses than to not marry at all. Huschek and Blokland (2016) found similar effects for adult parenthood. These results imply that we should be careful when interpreting the potential direction of associations. We will partially address this by doing a sensitivity analysis, where we lag the family composition indicators.

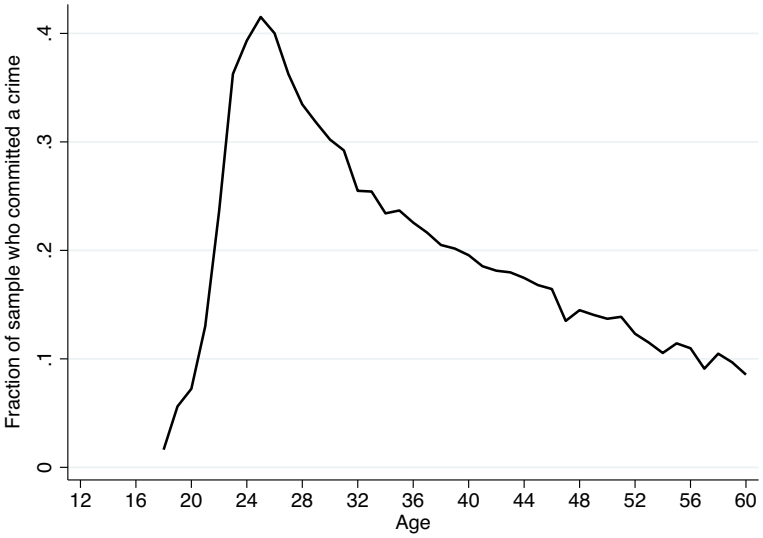

Fig. 4 The age-crime curve plots the fraction of the sample participating in crime against age. Results after age 60 are not shown because sample sizes become too small

The second source of endogeneity is that there are individual characteristics (omitted variables and unobserved heterogeneity) that might impact both the micro-level outcome as well as the micro-level regressors. We can not observe or even potentially measure all these variables, but we partly control for this by introducing individual fixed effects and consequently using within-estimation in a panel data model. This estimation technique transforms t he model in such a way that we can still estimate the original parameters of interest while taking into account unobserved stable differences between individuals (Osgood, 2010). Effectively, all yearly scores are subtracted with the individuals average over time. This means that we look at changes within the individual over time and hence the constant individual fixed effect drops out. That implies that we cannot include stable individual characteristics (for example, if gender is binary coded, then subtracting its mean value leads to value zero at every point in time for all individuals), however, such variables are not of interest in our present study.

The third and last potential source of endogeneity is sample selection. As explained in "Micro-level Data", the CCLS data set origins from a sample of criminal cases tried in 1977. Although this sample is representative for all criminal cases that year, it remains a selection of individuals based on the dependent variable (criminal conviction in a year), so we need to remain careful with interpreting the results as causal. Furthermore, we know that criminal cases tried in 1977 can be first registered at the Public Prosecutors Office between 1972 and 1977 (see footnote 2). This might lead to biased dynamic effects because, by construction, there is a peak in micro-level crime around that period. Therefore, we verify whether our results remain the same in a sensitivity analysis by dropping the conviction on which the individual was sampled.

In the analysis, we set up a logistic panel data model in which the dependent variable is the probability that somebody has a criminal case registered at the Public Prosecutor's Office in a certain year. Our macro-level regressors x_t of interest are declining macroeconomic circumstances, measured by either an increase in the unemployment rate or a decrease in consumer confidence, for which β is the corresponding macro-effect on criminal behavior. The micro-level regressors z_{it} are the family composition indicators marriage and parenthood. We denote by γ its micro-effect on criminal behavior. Most importantly, we include the moderating effect δ of the interaction between macro- and micro-level regressors on criminal behavior. These effects are also depicted in Fig. 1. We denote the control variables by w_{it} and their effects are measured by parameter vector α. As in previous research on the effect of family formation on crime, we include age, age squared and age cubic to capture the age-crime trend as seen in Fig. 4. Finally, the lagged dependent variable is added to the model with parameter ϕ, measuring the dynamic effect of criminal behavior in year $t-1$ on criminal behavior in year t. We denote the unobserved individual-specific effect by μ_i and the idiosyncratic error as ε_{it}. The full logit model specification is given by

$$\begin{aligned}\mathbb{P}(\texttt{crime}_{it} \mid w_{it}, x_t, z_{it}) = &\sum_{k=1}^{3} \alpha_k \texttt{age}_{it}^k + \phi \ \texttt{crime}_{i,t-1} \\ &+ x_t'\beta + z_{it}'\gamma + (x_t z_{it})'\delta + \mu_i + \varepsilon_{it},\end{aligned}$$

where the standard errors are clustered on individual level to account for serial correlation over time.

All our variables of interest, the macro-level regressors x_t and micro-level regressors z_{it}, are categorical variables. To compare criminal behavior in different economic times, we let the macroeconomic variable x_t be a dummy that is equal to 1 if economic circumstances have declined compared to the year before. For the unemployment rate that means that it has increased from year $t-1$ to year t, while for the consumer confidence it means that the index has decreased from year $t-1$ to year t. In a sensitivity analysis, we extend these indicators to capture business cycle dynamics. Regarding family composition indicators z_{it}, we distinguish between whether individual i is single, married, divorced, a single parent, a married parent or a divorced parent in year t.

Results

Hypotheses Testing

The presentation of our results proceeds in a number of steps. We start by presenting results with regard to our hypotheses H2a and H2b about the effect of marriage and parenthood on the probability of committing a crime. In this first step, we omitted the macro-level regressors from the model so that we can verify whether earlier results with the CCLS data set also hold for our present analysis sample. Then we proceed with the results about our main interests concerning the direct effect of macroeconomic circumstances on individual criminal behavior (hypothesis H1), as well as its interaction with household composition (hypotheses H3a and H3b). The estimation results for these subsequent models are presented in Table 2.

In the first model, that includes micro-level variables only, we see a strong positive dynamic effect of criminal behavior on itself. If somebody was convicted of at least one crime last year, then the odds of conviction this year increase by $\exp(0.373)-1 = 45.2\%$. This comes as no surprise: past criminal behavior is known to be a very good predictor of future criminal behavior (e.g., Blokland & Nieuwbeerta, 2010). In the estimations of family composition, we use being single as the reference category because it is the most frequent outcome of the categorical variable. Compared to being single, we find negative results for all other categories but there are only significant effects for marriage and marriage plus parenthood. The odds of crime decrease by $\exp(-0.391) - 1 = 32.4\%$ for married individuals and even $\exp(-0.485)-1 = 38.4\%$ for married parents, compared to being single and no parent. This implies that we can accept hypothesis H2a: marriage reduces criminal behavior.

If we reparametrize the model to depict the main effects of marital status and parenthood separately from their combined effect, then we find that there are no significant effects of parenthood, regardless of marital status. Taking being single as the base again, the parameter of marriage is -0.391 and significant at the 1%-level while the parameter of divorce -0.104 is insignificant (by definition equal to the respective parameters in the first model of Table 2). Subsequently taking being no parent as the

Table 2 Results of logistic panel data models

	(1) Micro	(2) Incr. UR	(3) Decr. CC
Age variables	x	x	x
Individual FE	x	x	x
Crime last year	0.373***	0.370***	0.367***
Family composition			
Single	base	base	base
Married	−0.391***	−0.426***	−0.332***
Divorced	−0.104	−0.169**	−0.057
Single parent	−0.066	−0.114	−0.012
Married parent	−0.485***	−0.495***	−0.389***
Divorced parent	−0.091	−0.130*	−0.009
Macroeconomic			
Improvement		base	base
Decline		0.047	0.131***
Interaction			
Married		0.081	−0.113
Divorced		0.204**	−0.091
Single parent		0.145	−0.108
Married parent		0.017	−0.193***
Divorced parent		0.116	−0.167**
# obs. [NT]	82,756	82,756	82,756

All models include individual fixed effects, age up to order three, a dummy for any crime last year and the family composition. Model (1) is purely on micro-level. Models (2) and (3) enrich model (1) with macro-level variables that quantify times of economic decline: the unemployment rate (UR) increased compared to the year before or the consumer confidence (CC) decreased, respectively. "Interaction" gives the moderating effects of the related non-base macroeconomic variable with family composition. Asterisks indicate the level of significance: * is 10%, ** is 5% and *** is 1%

base, the parameter of parenthood is −0.066 and insignificant (by definition equal to the "single parent" parameter in the first model of Table 2). The interaction of married and parent is −0.029 and divorced and parent is 0.079, which are both insignificant. So, we also find that we can accept hypothesis H2b. Together, these results confirm earlier findings that marriage reduces offending while parenthood has no significant effect.

In the following steps, we extend the model by including macro-level regressors, both via main effects as well as via interaction effects with family composition. In the second model we use the unemployment rate as the macroeconomic indicator of interest, while in the third model we use the consumer confidence index. In both models, we use a dummy indicator that is equal to 1 if the economy declined compared to the year before (which is equivalent to an increasing unemployment rate in the second model or a decreasing consumer confidence in the third model). Interestingly, the results are sensitive to which macroeconomic indicator we use.

Although in both models the coefficient of a declining economy (measured by increasing unemployment rates or decreasing consumer confidence) is positive, it is only significantly different from zero when using the consumer confidence. If the forward-looking consumer confidence is lower than the year before, then the odds of crime increase by $\exp(0.131) - 1 = 14.0\%$. Hence, we accept hypothesis H1 that individuals are more likely to commit crimes in times of economic decline, but only based on the consumer confidence index. If we use the unemployment rates instead, we do not find any effect, so we reject the hypothesis in that case. These results indicate that criminal behavior is more responsive to subjective measures of the economy.

When we look at the results for the interaction effects, we also see differences between the unemployment rate and the consumer confidence index. When we define times of economic decline as increasing unemployment rates, we see that its effect is positively and significantly moderated by being divorced compared to being single in such times. This suggests that more so than for single individuals, increasing unemployment rates increase the odds of a criminal conviction for divorced individuals, and we accept hypothesis H3a. When we define times of economic decline as decreasing consumer confidence, we see that it is negatively and significantly moderated by the effects of being a married parent or a divorced parent, compared to being single in such times. This suggests that, while decreasing consumer confidence increases the odds of conviction for singles, this is not the case for married parents or divorced parents and we again accept hypothesis H3a.

To test hypothesis H3b, we need to look at the different states of parenthood within marital status. When we do that, we see that for increasing unemployment rates (economic decline in the second model) and decreases in the consumer confidence (economic decline in the third model), there are no significant differences between singles and single parents. Also if we reformulate the reference category in both models such that we can either compare married individuals with married parents or divorced individuals with divorced parents, we only find insignificant results. Based on the overall tendency, we reject hypothesis H3b for both models.

Total Effects

To get a better understanding of the interaction effects, it is worthwhile to consider total effects of the macro-effect plus the micro-effect plus the interaction effect. To do this, we reparametrize the model by constructing one categorical variable from the macro-level, micro-level and interaction variables. Herein we take times of economic improvement (decreasing unemployment rates or increasing consumer confidence) for singles as the reference category. In Fig. 5 we present the estimated coefficients for the different combinations of economic changes and marital and parenthood status. The differences between the bars of one color (gray for economic improvement or black for economic decline) represent the micro-effects from marriage and parenthood. The average differences between the gray bars (economic improvement) and black bars (economic decline) represent the macro-effect of the state of the economy. The interaction effect is represented by the differences between gray and black bars within one category (differences in differences).

Most prominent in this figure are the strong negative effects associated with marriage. In both models for the unemployment rate and consumer confidence, the total effects of marriage and married parents are negative and significantly different from zero at the 1%-level compared to being single in times of economic improvement. The largest effects are found for the full family package: being married and having children. There are, however, also some differences between the two models. When the unemployment rate decreases (economic improvement), there are also significantly negative total effects found for divorces, either as a parent or not. In the

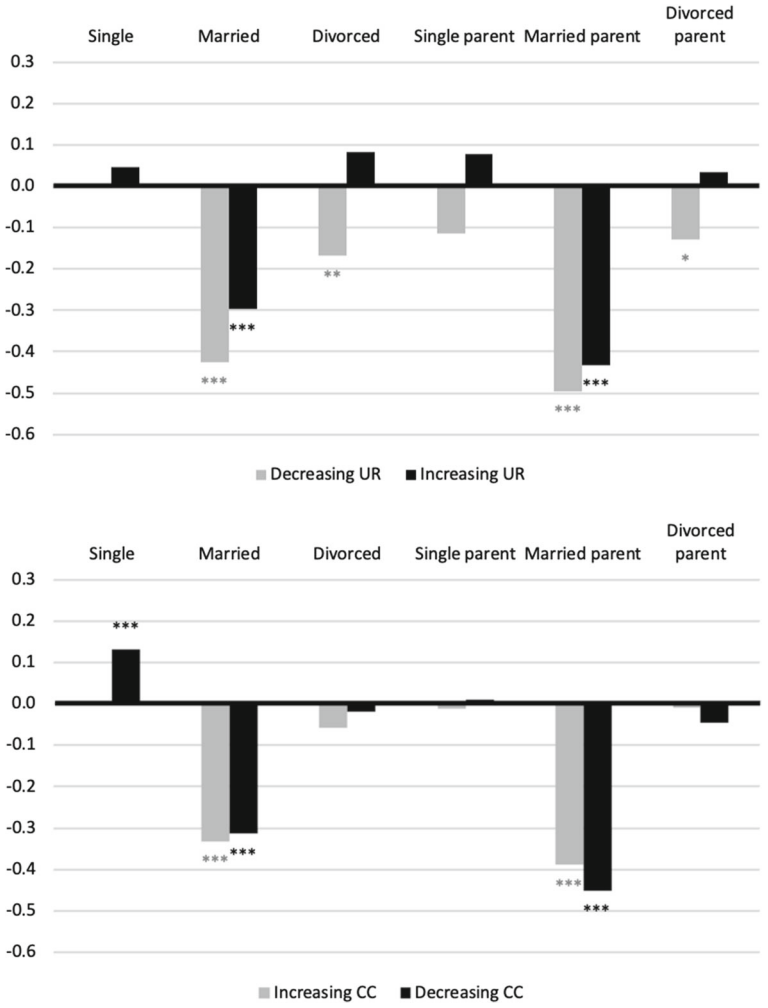

Fig. 5 Total effects, equal to macro-effect plus micro-effect plus interaction effect. Times of economic decline (black, right bars) are experienced when the unemployment rate increased (top panel) or the consumer confidence decreased (bottom panel) compared to the year before. Being single in times of economic improvement is the reference category ("missing" gray bar at the first position). Asterisks indicate the level of significance: * is 10%, ** is 5% and *** is 1%

model using the consumer confidence index, the only significant total effect besides marriage or married parent is the positive effect associated with decreasing consumer confidence (economic decline) and being single. All other total effects in both models are not significantly different from being single in times of economic improvement (decreasing unemployment rates or increasing consumer confidence). Finally, it seems that the negative effect of decreasing consumer confidence (economic decline) for married parents is stronger than increasing consumer confidence (economic improvement), but the difference is not significantly different from zero.

Sensitivity Analyses

We perform three sensitivity analyses. First, we use lagged family composition indicators to reflect the decision of getting married or having children instead of the outcome. We do so because last year's macroeconomic circumstances might have impacted this decision (recall the dashed arrow of Fig. 1) and as an attempt to avoid reverse causality issues (recall the discussion in the second paragraph of "Analytical Strategy"). Second, we omit the conviction on which the offender group was sampled to avoid that our dynamic results are driven by this selection (recall the discussion in the fourth paragraph of "Analytical Strategy").

The results are presented in the Appendix in Tables 3 and 4. Imposing both restrictions leads to basically the same results as in the second table, so we do not report these here. However, the alternative model specifications show that the results are more sensitive to using the unemployment rates than the consumer confidence index. Especially for the second sensitivity analysis, where we drop the conviction on which the offender group was sampled, we see that we now do accept hypothesis H1 but no longer hypothesis H3a, and just barely accept hypothesis H3b for married parents. All other hypotheses remain accepted or rejected as before, so the main conclusions remain valid. We once again see that the consumer confidence index, which is the subjective and forward-looking measure of macroeconomic circumstances, seems to have more explanatory power than the unemployment rate. When individuals are less hopeful about the economic prospects than before, then there is an increased probability of criminal behavior.

In the main analysis and sensitivity analyses thus far, we only considered the direction of the unemployment rate and consumer confidence index, namely whether it increased or decreased compared to the year before. However, the economy typically develops in a cyclical manner and therefore its current state is also of importance, rather than the actual change. For example, an improvement (in general or of a more specific value x) will be perceived differently when the economy is already in a boom than when it is actually recovering from a burst. In the third and final sensitivity analysis, we extend our macroeconomic indicators to operationalise this idea.

For the unemployment rate, we follow the four phases of the business cycle: slowdown (better than trend but declining)–recession (worse than trend and declining)–recovery (worse than trend but improving)–expansion (better than trend and improving). This concept is visualized by Statistics Netherlands in the Business Cycle Tracer and adopted by OECD and Eurostat as the Business Cycle Clock. We take the sample

average of 5.6 as the unemployment rate trend of our sample period. We need to be careful with the interpretation as the unemployment rate is inversely related to economic performance (in contrast to other macroeconomic indicators such as GDP or consumer confidence). If the unemployment rate is below the trend, then the economy is performing better, so we can either be in a slowdown (if the unemployment rate increased compared to the year before) or in an expansion (if it decreased). Vice versa, if the unemployment rate is above the trend, then the economy is performing worse, so we can either be in a recession (if it increased) or in a recovery (if it decreased).

For the consumer confidence index, we take a slightly different approach to utilize the interpretation of the index. We first recall that an index above zero means that more people are optimistic about the economic future, while below zero means that more people are pessimistic[4]. Next we construct four scenarios: last year optimistic but this year pessimistic (called "pos-neg" as abbreviation of "from a positive to a negative" value of the consumer confidence index, similar to slowdown of business cycle), last year and this year pessimistic (neg-neg, similar to recession), last year pessimistic but this year optimistic (neg-pos, similar to recovery) and last year and this year optimistic (pos-pos, similar to expansion). We break it down further by also adding the direction, which implies an increase or decrease for neg-neg and pos-pos, but only a decrease for pos-neg and increase for neg-pos.

The results are presented in the Appendix in Table 5. For the unemployment rates, we find significant results now. More specifically, we find that the probability of committing a crime reduces during recessions and recoveries compared to being in a slowdown (the base). It seems that in this case, the state is more important than the direction (which we exploited in the main analysis), because both the recession and recovery mean that the unemployment rate is above the trend. While somewhat counterintuitively, these results fit prior macro-level research finding increases in unemployment rates leading to decreases in the crime rate (Cantor & Land, 1985; Uggen & Wakefield, 2008; Ha et al., 2020). Based on the consumer confidence index, we see that consecutive years of pessimism/optimism are associated with a higher/lower probability of committing crimes, as we expected from the main analysis. We also see a difference in the models if we compare the significant interaction terms. The overall tendency is that significant effects are found for married and divorced individuals, as well as married and divorced parents. However, their signs are the opposite between the models, but that also holds for the macro-effects.

To compare the two models better, we again look at the total effects as now visualized in the Appendix in Fig. 6. The two results of the main analysis visualized by Figure 5 remain the same: firstly, the most strong results are shown for married individuals and, secondly, there are only positive significant results for the consumer confidence index, not for the unemployment rate.

[4]The sample average is −17.5, so taking that value as the trend would mean that we just distinguish between more or less pessimism.

Conclusion

In this paper, we combined Dutch micro- and macro-level data to investigate the effect of macroeconomic circumstances on individual criminal behavior and whether that effect is conditional on family composition. We used two measures to distinguish between times of economic decline and improvement: the objective but backward-looking unemployment rates and the subjective and forward-looking consumer confidence indices. We set up logistic panel data models with categorical variables in which we differentiated between macro-level, micro-level and interaction effects, with their sum being equal to the total effect.

With regard to micro-level effects, confirming previous research (Bersani & van Schellen, 2014; Craig et al., 2014; Huschek & Blokland, 2016), we found that there is a strong crime-reducing effect of marriage (hypothesis H2a), while the main effect of parenthood is insignificant (hypothesis H2b). Various criminological theories that explain the marriage effect, like age-graded social control theory (Sampson & Laub, 1993), analogously seem to expect parenthood to be associated with desistance from crime. However, raising children typically is a costly affair, and when it comes to inhibiting criminal behavior, increases in financial motivation may offset the increase in social control associated with the transition to parenthood.

Considering macroeconomic effects on individual criminal behavior (hypothesis H1), we find that increasing unemployment rates do not affect criminal behavior. Individuals are however more likely to commit crimes when consumer confidence is decreasing. One plausible explanation for the difference in effects between the two macroeconomic indicators is that the consumer confidence index is forward-looking, it gives an impression of how individuals at that moment think about how the Dutch economy will develop in the upcoming year. Since consumer confidence is therefore likely a belief to which individuals act, we can incorporate this in the rational choice model by Becker (1968). For example, when consumer confidence decreases, individuals might feel pessimistic about being able to live at a certain standard in the near future. Consequently, they might attach higher expected benefits to a criminal offense while the expected costs remain unchanged, thus changing the incentive structure of committing crimes. Our results are in line with those of Rosenfeld and Fornango (2007), who also find stronger effects using the subjective index of consumer sentiment rather than objective indicators such as the unemployment rate in their macro-macro research. The unemployment rate is a more objective measure of the state of the economy, but it is always backward-looking when published. Although full macro-level analyses find that higher unemployment rates lead to more crime (e.g., Gould et al., 2002), we do not find this effect on micro-level criminal behavior. One of our sensitivity analyses shows that unemployment rates above the trend might actually lead to less crime, which would more fit the routine activity theory by Cohen and Felson (1979) and are in line with the pro-cyclical opportunity effects of Cook and Watson (2014). For individual criminal behavior, it might also be more important what the own employment situation is rather than the nation's average (Uggen & Wakefield, 2008).

Finally, for the first time in criminology, we show that the effect of macro-level context on micro-level criminal behavior is conditional on the individual's local life

circumstances. More specifically, we find that the positive main effect of decreasing consumer confidence on individual-level crime is offset by its negative interaction effects for married individuals (hypothesis H3a). Married individuals appear not to be affected in their criminal behavior by declining consumer confidence (the positive effect of decreasing consumer confidence is offset by a negative interaction effect). We hypothesize that this is because through their partner, married individuals may have access to financial and/or mental safety-nets that buffer the crime enhancing effect of less favorable economic prospects. A hypothesis that, at this point, awaits future testing.

Our study has a number of limitations that are important to highlight. First, we have no micro-level employment data available or other information about the economic situation of the individuals in our sample. It would be valuable to do a similar analysis with more extensive data sources in future research, to see whether the effect of macroeconomic developments are mediated by individual-level economic circumstances. Second, it is still difficult to make causal claims with the data we used for this paper. Although the macro-level regressors can be assumed to be exogenous, it is harder to justify this for the micro-level regressors. This means that reverse causality and sample selection are endogeneity issues worth special attention when interpreting the results. We tried to solve this to some extent by performing two sensitivity analyses, but we remain careful and only address likely directions. Third, by definition of the offender group, we have a peak in crime at the beginning of our sample period (1972–2006) and since most crimes are committed by young males (Sampson & Laub, 2005), this limits variation in experiencing different economic times at the life course transitions of interest. Future research would benefit from using a true random sample of the population. Fourth, only males were included in this analysis. If in future research a similar analysis is conducted for females, we would also advise to use a more recent data set. Especially in the seventies and eighties, it was much more likely for females to stay at home and rely on their partner than to have a job and therefore we would expect less impact from macroeconomic circumstances for females' crime during these decades.

Fifth and last, as this paper is one of the first empirical ones to explore micro-macro effects, we kept the model relatively simple. As a consequence, we made some assumptions about the impact of macroeconomic circumstances that would be worthwhile to relax in future research. When outlining our hypotheses, we already touched upon that macroeconomic circumstances can also play a role in family formation decisions and we controlled for this to some extent in the first sensitivity analysis by lagging the family formation outcomes. Inspired by the work of Fischer and Liefbroer (2006) and Adsera (2011) for females, in future research we opt to also analyze the effects of macroeconomic circumstances on marriage and parenthood for males and possibly integrate this within the modeling framework of micro-, macro- and micro-macro effects. Furthermore, our analysis only allows for a direct effect of macroeconomic circumstances on criminal behavior. There could however also be indirect effects, for example, when the economy is in decline, the government saves on police expenditures and consequently fewer crimes are being detected and prosecuted. This would imply that our measure of individual criminal behavior is less accurate, because less crimes are registered while the actual level of criminal

behavior might remain the same. An alternative would be to use self-reported data or to make an attempt to also model indirect effects.

Overall, our results add to life course criminology, in demonstrating that there might be an effect of macroeconomic circumstances that is differentiated by family composition outcomes. More generally, this research speaks to the "level of explanation" problem in criminology (Short, 1998) and again illustrates that research should no longer neglect the macro-micro problem (Bersani & Doherty, 2018; Laub & Sampson, 2020; Matsueda, 2017). Macroeconomic circumstances can impact individual criminal behavior, but at the same time the effects may also depend on micro-circumstances.

Appendix: Sensitivity Analyses

Table 3 Results of logistic panel data models in first sensitivity analysis

	(1) Micro	(2) Incr. UR	(3) Decr. CC
Age variables	x	x	x
Individual FE	x	x	x
Crime last year	0.380***	0.378***	0.374***
Lagged family composition			
Single	base	base	base
Married	−0.302***	−0.357***	−0.230***
Divorced	−0.104	−0.174**	−0.058
Single parent	−0.077	−0.116	−0.003
Married parent	−0.323***	−0.330***	−0.229***
Divorced parent	−0.049	−0.079	0.034
Macroeconomic			
Improvement		base	base
Decline		0.043	0.134***
Interaction			
Married		0.129*	−0.143**
Divorced		0.216**	−0.089
Single parent		0.121	−0.155
Married parent		0.015	−0.189***
Divorced parent		0.100	−0.170**
# obs. [NT]	82,756	82,756	82,756

All models include individual fixed effects, age up to order three, a dummy for any crime last year and lagged family composition. Model (1) is purely on micro-level. Models (2) and (3) enrich model (1) with macro-level variables that quantify times of economic decline: the unemployment rate (UR) increased compared to the year before or the consumer confidence (CC) decreased, respectively. "Interaction" gives the moderating effects of the related non-base macroeconomic variable with family composition. Asterisks indicate the level of significance: * is 10%, ** is 5% and *** is 1%

Table 4 Results of logistic panel data models in second sensitivity analysis, where the conviction on which the offender group was sampled is dropped

	(1) Micro	**(2) Incr. UR**	**(3) Decr. CC**
Age variables	x	x	x
Individual FE	x	x	x
Crime last year	0.436***	0.429***	0.432***
Family composition			
Single	base	base	base
Married	−0.324***	−0.295***	−0.265***
Divorced	−0.091	−0.064	−0.059
Single parent	−0.037	−0.007	0.014
Married parent	−0.446***	−0.399***	−0.347***
Divorced parent	−0.056	−0.018	0.017
Macroeconomic			
Improvement		base	base
Decline		0.237***	0.111***
Interaction			
Married		−0.052	−0.116
Divorced		−0.009	−0.060
Single parent		−0.020	−0.103
Married parent		−0.101*	−0.201***
Divorced parent		−0.057	−0.150**
# obs. [NT]	72,046	72,046	72,046

All models include individual fixed effects, age up to order three, a dummy for any crime last year and family composition. Model (1) is purely on micro-level. Models (2) and (3) enrich model (1) with macro-level variables that quantify times of economic decline: the unemployment rate (UR) increased compared to the year before or the consumer confidence (CC) decreased, respectively. "Interaction" gives the moderating effects of the related non-base macroeconomic variable with family composition. Asterisks indicate the level of significance: * is 10%, ** is 5% and *** is 1%

Table 5 Results of logistic panel data models in third sensitivity analysis, where the macroeconomic indicators are extended to also allow for state besides direction

	(1) UR phases		**(2) CC scenarios**
Age variables	x	Age variables	x
Individual FE	x	Individual FE	x
Crime last year	0.343***		0.354***
Family composition		Family composition	
Single	base	Single	base
Married	−0.424***	Married	−0.367***
Divorced	−0.270**	Divorced	0.153
Single parent	0.163	Single parent	0.025
Married parent	−0.613***	Married parent	−0.299***
Divorced parent	−0.201*	Divorced parent	0.029
Macroeconomic		Macroeconomic	
Slowdown	base	Pos-neg: decr	base
Recession	−0.379***	Neg-neg: decr	0.460***
Recovery	−0.528***	Neg-neg: incr	0.291***
Expansion	0.036	Neg-pos: incr	−0.094
		Pos-pos: decr	−0.185*
		Pos-pos: incr	−0.153
Significant interactions		*Significant interactions*	
Married*Recession	0.185*	Divorced*Neg-neg decr	−0.496***
Divorced*Recession	0.546***	Divorced*Neg-neg incr	−0.219*
Divorced*Recovery	0.470***	Divorced*Neg-pos incr	−0.234**
Divorced*Expansion	−0.319**	Married parent*Neg-neg decr	−0.389***
Married parent*Recession	0.181**	Divorced parent*Neg-neg decr	−0.331***
Married parent*Recovery	0.203**		
Divorced parent*Recession	0.297**		
Divorced parent*Recovery	0.209*		
# obs. [NT]	82,756	# obs. [NT]	82,756

All models include individual fixed effects, age up to order three, a dummy for any crime last year and family composition. Model (1) with the unemployment rate uses the phases of the business cycle and model (2) with the consumer confidence index uses the scenarios of optimism and pessimism. "Significant interactions" give the moderating effects of the related non-base macroeconomic variable with family composition, parameters of interactions with a significance level below 10% are not reported. Asterisks indicate the level of significance: * is 10%, ** is 5% and *** is 1%

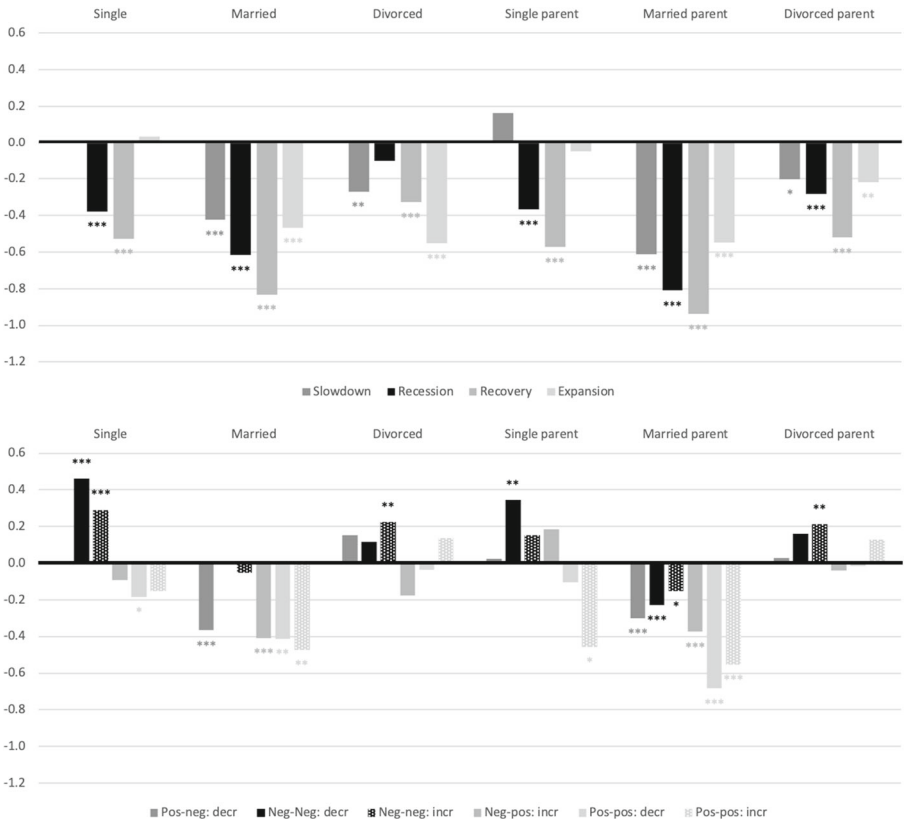

Fig. 6 Total effects, equal to macro-effect plus micro-effect plus interaction effect, for the third sensitivity analysis. Top panel with the unemployment rate uses the phases of the business cycle and bottom panel with the consumer confidence index uses the scenarios of optimism and pessimism. Being single during the slowdown phase of the unemployment rate or the pos-neg: decr scenario of the consumer confidence index are the reference categories ("missing" bars at the first position). Asterisks indicate the level of significance: * is 10%, ** is 5% and *** is 1%

References

Adsera, A. (2011). Where Are the Babies? Labor Market Conditions and Fertility in Europe. *European Journal of Population*, *27*, 1–32.

Agnew, R. (1992). Foundation for a General Strain Theory of Crime and Delinquency. *Criminology*, *30*(1), 47–88.

Becker, G. S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy*, *76*(2), 169–217.

Beijers, J., Bijleveld, C., & van Poppel, F. (2012). 'Man's Best Possession': Period Effects in the Association between Marriage and Offending. *European Journal of Criminology*, *9*(4), 425–441.

Bersani, B. E., Laub, J. H., & Nieuwbeerta, P. (2009). Marriage and Desistance from Crime in the Netherlands: Do Gender and Socio-Historical Context Matter?. *Journal of Quantitative Criminology*, *25*, 3–24.

Bersani, B. E., & Doherty, E. E. (2018). Desistance from Offending in the Twenty-First Century. *Annual Review of Criminology*, *1*(1), 311–334.

Bersani, B. E., & van Schellen, M. (2014). The Effectiveness of Marriage as an "Intervention" in the Life Course: Evidence from the Netherlands. In J. A. Humphrey, & P. Cordella (Eds.) *Effective Interventions in the Lives of Criminal Offenders* (pp. 101–119). Springer.

Block, C. R., Blokland, A. A. J., van der Werff, C., van Os, R., & Nieuwbeerta, P. (2010). Long-Term Patterns of Offending in Women. *Feminist Criminology*, *5*(1), 73–107.

Blokland, A. A. J. (2005). *Crime over the Life Span - Trajectories of Criminal Behavior in Dutch Offenders*. PhD dissertation, Leiden University.

Blokland, A. A. J., & De Schipper, N. (2016). How Important are Life-course Transitions in Explaining Desistance? Examining the Extent to which Marriage, Divorce and Parenthood Account for the Age-crime Relationship in Former Juvenile Delinquents. In J. Shapland, S. Farrall, & A. Bottom (Eds.) *Global Perspectives on Desistance - Reviewing what we know and looking to the future* (pp. 144–169). Routledge.

Blokland, A. A. J., & Nieuwbeerta, P. (2005). The Effects of Life Circumstances on Longitudinal Trajectories of Offending. *Criminology*, *43*(4), 1203–1240.

Blokland, A. A. J., & Nieuwbeerta, P. (2010). Life Course Criminology. International handbook of criminology 51–94.

Cantor, D., & Land, K. C. (1985). Unemployment and Crime Rates in the Post-World War II United States: A Theoretical and Empirical Analysis. *American Sociological Review*, *50*(3), 317–332.

Cohen, L. E., & Felson, M. (1979). Social Change and Crime Rate Trends: A Routine Activity Approach. *American Sociological Review*, *44*(4), 588–608.

Cook, S., & Watson, D. (2014). A Re-examination of the Opportunity and Motivation Effects underlying Criminal Activity. *Criminology & Criminal Justice*, *14*(4), 458–469.

Craig, J. M., Diamond, B., & Piquero, A. R. (2014). Marriage as an Intervention in the Lives of Criminal Offenders. In J. A. Humphrey, & P. Cordella (Eds.) *Effective Interventions in the Lives of Criminal Offenders* (pp. 19–37). Springer.

Elder, G. H., & Giele, J. Z. (2009). Life Course Studies: An Evolving Field. In G. H. Elder, & J. Z. Giele (Eds.) *The Craft of Life Course Research* (pp. 1–24). The Guilford Press.

Farrall, S., Gray, E., & Jones, P. M. (2020). Politics, Social and Economic Change, and Crime: Exploring the Impact of Contextual Effects on Offending Trajectories. *Politics & Society*, *48*(3), 357–388.

Fischer, T., & Liefbroer, A. C. (2006). For Richer, for Poorer: The Impact of Macroeconomic Conditions on Union Dissolution Rates in the Netherlands 19721996. *European Sociological Review*, *22*(5), 519–532.

Gould, E. D., Weinberg, B. A., & Mustard, D. B. (2002). Crime Rates and Local Labor Market Opportunities in the United States: 19791997. *The Review of Economics and Statistics*, *84*(1), 45–61.

Ha, O. K., Andresen, M. A., & Davies, G. (2020). The Temporal (In)Stability of the Unemployment and Crime Relationship. *International Journal of Offender Therapy and Comparative Criminology*, *64*(8), 840–859.

Huschek, D., & Blokland, A. (2016). Crime and parenthood: Age and Gender Differences in the Association between Criminal Careers and Parenthood. *Advances in Life Course Research*, *28*, 65–80.

Laub, J. H., & Sampson, R. J. (2020). Life-Course and Developmental Criminology: Looking Back, Moving Forward. *Journal of Developmental and Life-Course Criminology*, *6*, 158–171.

Matsueda, R. L. (2017). Toward an Analytical Criminology: The Micro-Macro Problem, Causal Mechanisms, and Public Policy. *Criminology*, *55*(3), 493–519.

McGloin, J. M., Sullivan, C. J., Piquero, A. R., Blokland, A., & Nieuwbeerta, P. (2011). Marriage and Offending Specialization: Expanding the Impact of Turning Points and the Process of Desistance. *European Journal of Criminology*, *8*(5), 361–376.

Moffit, T. E. (1993). Adolescent-Limited and Life-Course-Persistent Adolescent Behaviour: A Developmental Taxonomy. *Psychological Review*, *100*(4), 674–701.
Osgood, D. W. (2010). Statistical Models of Life Events and Criminal Behavior. In A. R. Piquero, & D. Weisburd (Eds.) *Handbook of Quantitative Criminology* (pp. 375–396). New York: Springer.
Rosenfeld, R., & Fornango, R. (2007). The Impact of Economic Conditions on Robbery and Property Crime: The Role of Consumer Sentiment. *Criminology*, *45*(4), 735–769.
Sampson, R. J., & Laub, J. H. (1990). Crime and Deviance over the Life Course: The Salience of Adult Social Bonds. *American Sociological Review*, *55*(5), 609–627.
Sampson, R. J., & Laub, J. H. (1993). Structural variations in juvenile court processing: inequality, the underclass, and social control. *Law & Society Review*, *27*(2), 285–311.
Sampson, R. J., & Laub, J. H. (2005). A life-course view of the development of crime. *The ANNALS of the American Academy of Political and Social Science*, *602*(1), 12–45.
Sassler, S., & Goldscheider, F. (2004). Revisiting jane austen's theory of marriage timing: changes in union formation among american men in the late 20th century. *Journal of Family Issues*, *25*(2), 139–166.
Savolainen, J., Aaltonen, M., & Skardhamar, T. (2018). Employment, crime, and the life course. In D. P. Farrington, L. Kazemian, & A. R. Piquero (Eds.) *The Oxford Handbook of Developmental and Life-Course Criminology* (pp. 496–514).
Schaller, J. (2013). For Richer, if not for Poorer? Marriage and Divorce over the Business Cycle. *Journal of Population Economics*, *26*(3), 1007–1033.
Short, J. F. (1998). The Level of Explanation Problem Revisited - The American Society of Criminology 1997 Presidential Address. *Criminology*, *36*(1), 3–36.
Skardhamar, T., Savolainen, J., Aase, K. N., & Lyngstad, T. H. (2015). Does marriage reduce crime?. *Crime and Justice*, *44*(1), 385–446.
Sobotka, T., Skirbekk, V., & Philipov, D. (2011). Economic recession and fertility in the developed world. *Population and Development Review*, *37*(2), 267–306.
Uggen, C., & Wakefield, S. (2008). What have we learned from longitudinal studies of work and crime?. In A.M. Liberman (Ed.) *The Long View of Crime: A Synthesis of Longitudinal Research* (pp. 191–219). Springer.
Van Schellen, M., Apel, R., & Nieuwbeerta, P. (2012). "Because you're mine, i walk the line"? marriage, spousal criminality, and criminal offending over the life course. *Journal of Quantitative Criminology*, *28*(4), 701–723.
van Schellen, M., Poortman, A.-R., & Nieuwbeerta, P. (2012). Partners in crime? criminal offending, marriage formation, and partner selection. *Journal of Research in Crime and Delinquency*, *49*(4), 545–571.
Warr, M. (1998). Life-course transitions and desistance from crime. *Criminology*, *36*(2), 183–216.
Zoutewelle-Terovan, M., van der Geest, V., Liefbroer, A., & Bijleveld, C. (2014). Criminality and family formation: effects of marriage and parenthood on criminal behavior for men and women. *Crime & Delinquency*, *60*(8), 1209–1234.

Affiliations

Ilka van de Werve[1,2,6] · Arjan Blokland[2,3,4] · Frank Weerman[2,5]

Ilka van de Werve
i.vande.werve@vu.nl

Frank Weerman
fweerman@nscr.nl

1 Tinbergen Institute, Gustav Mahlerplein 117, 1082 MS Amsterdam, The Netherlands

2 Netherlands Institute for the Study of Crime and Law Enforcement (NSCR), De Boelelaan 1077, 1081 HV Amsterdam, The Netherlands

3 Institute of Criminal Law and Criminology, Leiden University, Steenschuur 25, 2311 ES Leiden, Netherlands

4 Department of Sociology and Social Work, Aalborg University, Kroghstræde 7, 9220 Aalborg Øst, Denmark

5 Criminology Department, Erasmus University Rotterdam, Burgemeester Oudlaan 50, 3062 PA Rotterdam, The Netherlands

6 Department of Econometrics and Data Science, Vrije Universiteit Amsterdam, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands