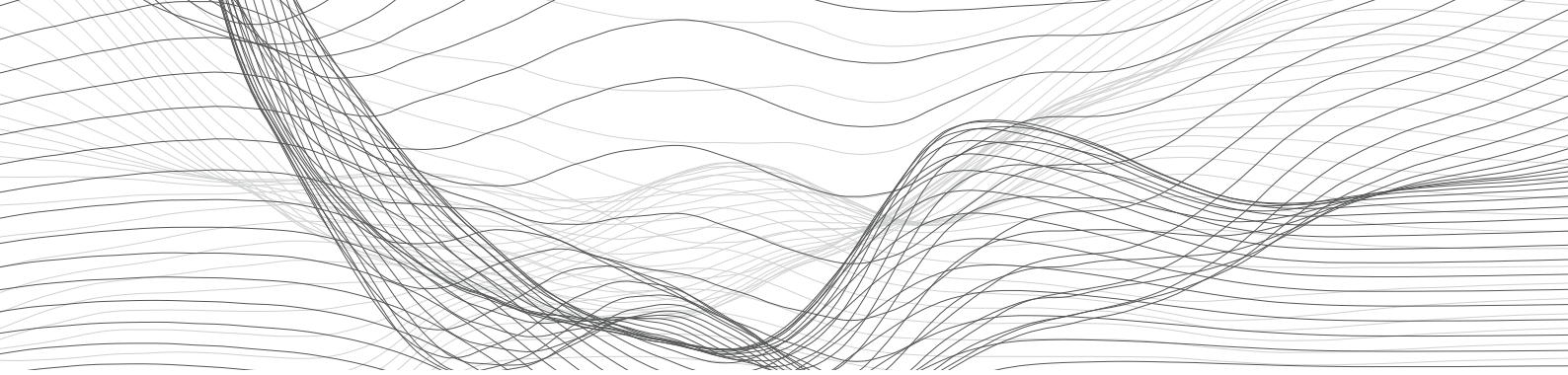


Oil price shocks and household heterogeneity: the income side

Marc-Antoine Ramelet, Anna Zeitz

SNB Working Papers
11/2024

SCHWEIZERISCHE NATIONALBANK
BANQUE NATIONALE SUISSE
BANCA NAZIONALE SVIZZERA
BANCA NAZIUNALA SVIZRA
SWISS NATIONAL BANK

EDITORIAL BOARD SNB WORKING PAPER SERIES

Marc-Antoine Ramelet
Enzo Rossi
Rina Rosenblatt-Wisch
Pascal Towbin
Lukas Frei

DISCLAIMER

The views expressed in this paper are those of the author(s) and do not necessarily represent those of the Swiss National Bank. Working Papers describe research in progress. Their aim is to elicit comments and to further debate.

COPYRIGHT©

The Swiss National Bank (SNB) respects all third-party rights, in particular rights relating to works protected by copyright (information or data, wordings and depictions, to the extent that these are of an individual character).

SNB publications containing a reference to a copyright (© Swiss National Bank/SNB, Zurich/year, or similar) may, under copyright law, only be used (reproduced, used via the internet, etc.) for non-commercial purposes and provided that the source is mentioned. Their use for commercial purposes is only permitted with the prior express consent of the SNB.

General information and data published without reference to a copyright may be used without mentioning the source. To the extent that the information and data clearly derive from outside sources, the users of such information and data are obliged to respect any existing copyrights and to obtain the right of use from the relevant outside source themselves.

LIMITATION OF LIABILITY

The SNB accepts no responsibility for any information it provides. Under no circumstances will it accept any liability for losses or damage which may result from the use of such information. This limitation of liability applies, in particular, to the topicality, accuracy, validity and availability of the information.

ISSN 1660-7716 (printed version)
ISSN 1660-7724 (online version)

© 2024 by Swiss National Bank, Börsenstrasse 15,
P.O. Box, CH-8022 Zurich

Oil price shocks and household heterogeneity: The income side *

Marc-Antoine Ramelet and Anna Zeitz†

October 7, 2024

Abstract

We provide evidence on the transmission of oil price movements to individual incomes for a large oil-importing economy. To do so, we trace the footprint of oil price surprises on the income elements of a representative household panel for Germany. An inflationary oil price shock persistently increases the likelihood of unemployment and leads to a sticky decline in contracted labour incomes even though hours worked remain unaffected. These responses are underlined by marked heterogeneity: more vulnerable household groups (namely, the young, less educated, and those with lower incomes) are more affected overall. Our results also highlight the importance of general equilibrium effects since the responses do not depend on the oil intensity of employment sectors.

Keywords: Oil price shocks, employment, labour income, household heterogeneity
JEL Codes: E32, E24, Q43

*We thank Simon Alder, Christian Hepenstrick, Diego Känzig, Giovanni Lombardo, Enzo Rossi, Christoph Winter, Gabriel Züllig and an anonymous referee of the SNB Working Papers series, as well as participants in the SNB Brown Bag Seminar. We are grateful to Diego Känzig for providing his shock series on his website. The views, opinions, findings, and conclusions or recommendations expressed in this paper are strictly those of the authors. They do not necessarily reflect the views of the Swiss National Bank (SNB). The SNB takes no responsibility for any errors or omissions in, or for the correctness of, the information contained in this paper.

†Corresponding authors: Marc-Antoine Ramelet (marc-antoine.ramelet@snb.ch) and Anna Zeitz (annakristina.zeitz@uzh.ch). Swiss National Bank, Börsenstrasse 15, P.O. Box, 8022 Zurich, Switzerland

1 Introduction

The resurgence of sharp inflation has once again placed energy prices at the centre of policy discussions. Although technological advances have recently given electricity an increasingly important role, fossil fuels (especially oil) remain a major source of energy for economic activity. Movements in oil prices are known to have large economic implications and how the aggregate economy responds to them is extensively documented. The literature overwhelmingly shows that an increase in oil prices is both inflationary and contractionary. Empirical evidence on this cost-push nature can be found in Bruns and Lütkepohl (2023), Känzig (2021), Bodenstein et al. (2012), Hamilton (2008), Kilian (2008), and Blanchard and Gali (2007), among others.

In contrast, the impact of oil prices on individual economic agents remains largely undocumented. We fill this gap by detailing the responses of individual income elements to a series of exogenous variations in oil prices that spans three decades. To do so, we trace the footprint of oil price surprises (identified by Känzig, 2021) via local projections on a representative household panel in Germany, which is a large oil importer. To our knowledge, we are the first to document the effects of a long series of exogenous oil price shocks on the income side of household budget constraints. We consider contracted labour income as well as the corresponding extensive and intensive margins of labour.

We find a meaningful transmission of oil price shocks via labour income and the extensive margin but no effect on the intensive margin. The likelihood of being unemployed increases persistently over two years after an oil price increase. The granularity of the panel reveals that this is driven by individuals who were *already* unemployed, as they become less likely to find employment after the shock. In contrast, the likelihood of *entering* unemployment is left unchanged. Similarly, hours worked do not react to oil price shocks. Instead, contracted labour incomes—and the implied hourly wages—drop with a lag of approximately two years, which is consistent with wage stickiness. In real terms, incomes fall by even more since oil price shocks are shown to be inflationary.

We also uncover the underlying distributional effects that matter in the aggregate, in turn providing further empirical support for the need to model household heterogeneity (like Chan et al., 2023 do to assess the transmission of energy shocks). Although all household groups are impacted by oil price shocks, the income elements of the more vulnerable groups (namely, the young, the less educated and individuals in the bottom income quartile) are hit harder. This is consistent with the existing evidence on aggregate shocks and household heterogeneity. For the US, Del Canto et al. (2023) compute welfare measures based on individual income and consumption responses to the oil shocks of Känzig (2021), documenting the inequality that arises from the shocks. In line with our results for Germany, Del Canto et al. (2023) show that less educated households in the US are more likely to become unemployed after an inflationary oil shock. Känzig (2023) shows that poorer households in the UK face a relatively larger fall in income after an adverse shock to carbon pricing. Similarly, after a monetary policy tightening

shock, non-financial income decreases by relatively more for poorer Norwegian households (Holm et al., 2021).

In addition, our results highlight the importance of general equilibrium effects. We evaluate the employment sectors of individuals along two dimensions: oil intensity and cyclicality. We do not find heterogeneous responses across oil intensities, unlike Davis and Haltiwanger (2001)), who find that energy-intense sectors had a sharper employment response (after a year) to the 1970s oil price shock. According to our analysis, individuals face a marked lagged decline in their labour income regardless of the oil-intensity of their sector of employment. We show that the labour income response instead depends on the procyclicality of the employment sector.

We consider Germany since it provides a well-defined case study to assess the transmission of oil price shocks. Even though Germany is one of the largest oil consumers,[1] in contrast to other large advanced economies, it is not an oil producer. Therefore, oil price movements affect the domestic economy solely through a change in input costs instead of a change in production revenue (as is the case in the US or UK, among others). Our results highlight the cost-push nature of oil price movements. An oil price increase is inflationary and has adverse effects on the labour market both at the aggregate and individual levels (as shown in Sections 2 and 4, respectively). By the same token, aggregate supply in Germany did not face the structural changes brought by the oil sector (i.e., fracking in the US) and their corresponding potential time-varying effects (as documented in Baumeister and Peersman, 2013 or Bruns and Lütkepohl, 2023). In line with this, Hutchison (1991) finds that the response of economic activity to an oil price increase is less time-varying in Germany than in the US over the years 1975–1989.

The transmission of shocks to individuals can also be adequately measured via the German Socio-Economic Panel (SOEP), a representative panel of households that surveys incomes and demographics over a long time period. Our final sample contains approximately 70,000 individuals who were interviewed repeatedly over the period 1991–2019, totalling more than 450,000 unique observations. The richness of the panel allows the estimation of heterogeneous effects. We can also recover the flows between employment and unemployment since individuals stay for sufficiently long spells (6.5 years on average) in the panel.

By considering oil price shocks, we contribute to the growing body of literature on the transmission of aggregate shocks to heterogeneous agents. Macroeconomic movements are better understood in the presence of household heterogeneity (i.e., Kaplan et al., 2018). The effectiveness of policies can be more precisely assessed, which is relevant to both aggregate-level and distributional concerns. To date, studies on oil prices have focused mostly on heterogeneity on the supply side. Dedola et al. (2021) and Lee and Ni (2002) provide evidence on how oil prices affect heterogeneous firms and sectors. Känzig (2021) showed that US stock prices in the utility sector benefit from an increase in oil prices, whereas those in the automobile, retail, and transportation sectors are adversely affected. Davis and Haltiwanger (2001) document

[1] Germany used around two million barrels per day in 2022, which represents approximately 2% of total world oil consumption (EIA, 2024). This makes it the tenth largest oil consumer, with a similar share as countries such as Japan, Brazil, South Korea, and Canada.

adverse effects on job creation (coupled with job reallocation) in the US manufacturing sector after the 1970s oil shock. We complement these findings by instead examining how oil price shocks affect individuals. We do so for an economy that does not produce oil, in turn adding to the adjacent literature that documents how oil price movements affect household inequality in oil-exporting economies (see Animashaun and Wossink, 2024 or Fenske and Zurimendi, 2017 for the case of Nigeria).

Focusing on the transmission to income elements also serves to complement the established literature that investigates the ensuing spending responses. We do not cover consumption responses since the SOEP does not provide adequate information on spending. The responses of individual spending are instead better captured in surveys of other economies.[2] Individuals with lower incomes and less liquid wealth are known to have a greater marginal propensity to consume (e.g., Kaplan et al., 2018). The sharper spending sensitivity of poorer households to shocks is extensively documented in empirical studies on the transmission of monetary policy (see, e.g., Cloyne et al., 2020, Holm et al., 2021 or Wong, 2021). The response of spending items to price changes in energy (which typically includes oil, gas, and electricity) also varies across households. Less well-off individuals are more adversely affected by consumer price increases via their consumption baskets (Hobijn and Lagakos, 2005). This is also the case for higher energy inflation since poor households spend relatively more on energy; for example, Hagemann (1982) and Michael (1979) provide evidence for the US. Unsurprisingly, similar distributional effects are found in Germany (see Bachmann et al., 2022). Similarly, Känzig (2023) finds that poorer households in the UK adjust their consumption relatively more after an adverse shock to carbon pricing. In the same vein, Peersman and Wauters (2024) show that low-income households in Belgium exhibit a greater marginal propensity to consume out of a hypothetical shock to energy bills. We add to this literature by showing how individuals are affected by oil price shocks via their incomes, from which spending decisions then (partly) result.

The paper is structured as follows. In Section 2, we discuss the oil price shocks identified by Känzig (2021) and show their footprint at the aggregate level. Section 3 describes the household panel and our specification. We show the panel responses to an oil price shock in Section 4, and the underlying heterogeneity is then documented in Section 5. Section 6 concludes.

2 Oil price shocks

Finding exogenous oil price variations is of central importance when estimating their transmission. One influential identification approach is to impose restrictions on structural VARs, such as in Kilian (2009) or, more recently, in Antolin-Diaz and Rubio-Ramirez (2018) and Baumeister and Hamilton (2019). In a recent landmark contribution, Känzig (2021) instead applies the

[2] Examples include the Consumer Expenditure Survey (CEX) in the US and the Living Costs and Food Survey (LCFS) in the UK (i.e., Cloyne et al., 2020). The Household Finance and Consumption Survey (HFCS) covers euro area countries in more recent years (see Ampudia et al., 2023). Holm et al. (2021) use administrative data in Norway.

high-frequency surprise approach that is by now standard in the monetary policy literature.[3] We rely on the series of oil price shocks provided by Känzig (2021). He considers oil price surprises on announcement days of the leading oil production body, namely, the Organization of the Petroleum Exporting Countries (OPEC). The unexpected part of production announcements is measured by looking at changes in Futures' prices (on oil pricing) on those days. The changes correspond to revisions in expectations, which are exogenous in the sense that they are orthogonal to the information set of market participants. The resulting series of surprises have convincing properties, which are detailed in Känzig (2021). The surprises satisfy a thorough batch of tests and are unrelated to other established shock series (i.e., monetary policy). They also appear to match the narrative of important oil production events. They generate intuitive estimated responses of US aggregates and can also explain most of the historical oil price variations.[4]

We use the updated series of Känzig (2021), which in our case covers 100 OPEC announcements over the period January 1991–December 2019. We employ the benchmark series proposed by Känzig (2021), which consists of the first principal component constructed from oil futures contracts with several maturities (covering one month to one year). This series mimics the simple average of the shocks extracted from the next 12 monthly maturities; the correlation coefficient between the two series is 0.99. The corresponding oil price shocks are shown in Figure 1; they provide adequate variations since they are spread over time and cover a wide range of magnitudes for both positive and negative signs.

Importantly, the identified oil price shocks have a clear footprint on the German economy. To see this, we estimate the response of the aggregate-level variable y_{t+h} in month $t+h$ (with $h \geq 0$) to the shock x_t via local projections:

$$y_{t+h} = \alpha_h + \beta_h x_t + \gamma_h' z_t + \epsilon_{t+h}, \tag{1}$$

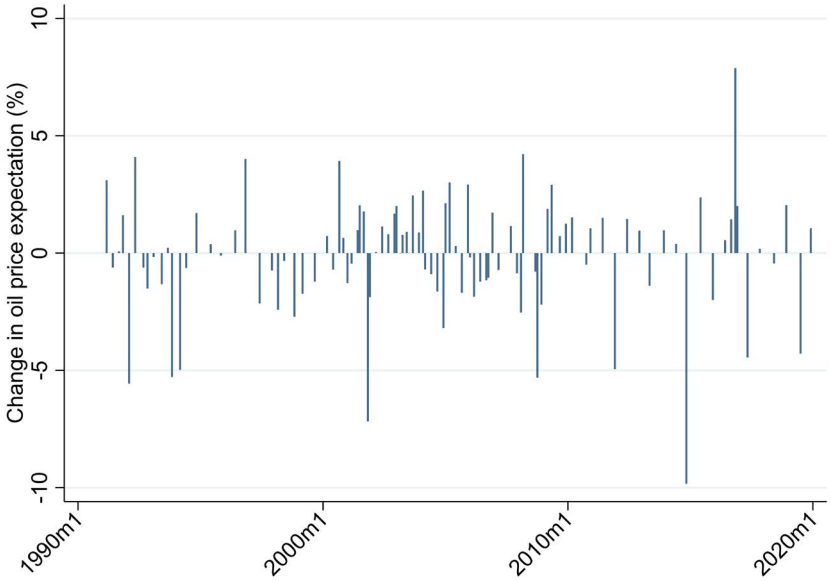
in which y_{t+h} is logged (except for the unemployment rate). The estimated coefficients β_h provide an impulse response function. The controls z_t include the lagged value y_{t-1} and three lags of monthly variables that account for the state of the economy prior to the shock. The controls also include lags of the oil price shocks. Comparable with the panel specification that will be presented in Section 3, the lags span the shocks over a year; i.e., 12 lags for the monthly variables and four lags for the quarterly variables. These controls will be further detailed in Section 3.

An adverse oil price shock is inflationary and has a marked effect on the labour market. These aggregate effects will be confirmed and further dissected when using the household panel in Sections 4 and 5. In line with much of the literature, the cost-push nature of the shocks is visible. To see this, Figure 2 shows the responses of consumer prices, the unemployment rate, and

[3] See, for instance, Nakamura and Steinsson (2018) or Jarociński and Karadi (2020). In further work, Känzig (2023) also applied the high-frequency approach to carbon pricing.

[4] The shocks' contribution to overall oil price movements is shown in Figure 5 on page 1111 in Känzig (2021).

Figure 1: Oil price shocks



Notes: The shocks are changes in oil price expectations (derived from Futures' contracts) on OPEC announcement days. The chart shows the Känzig (2021) shocks cumulated by month, with a value of zero when there were no announcements. See the main text for details.

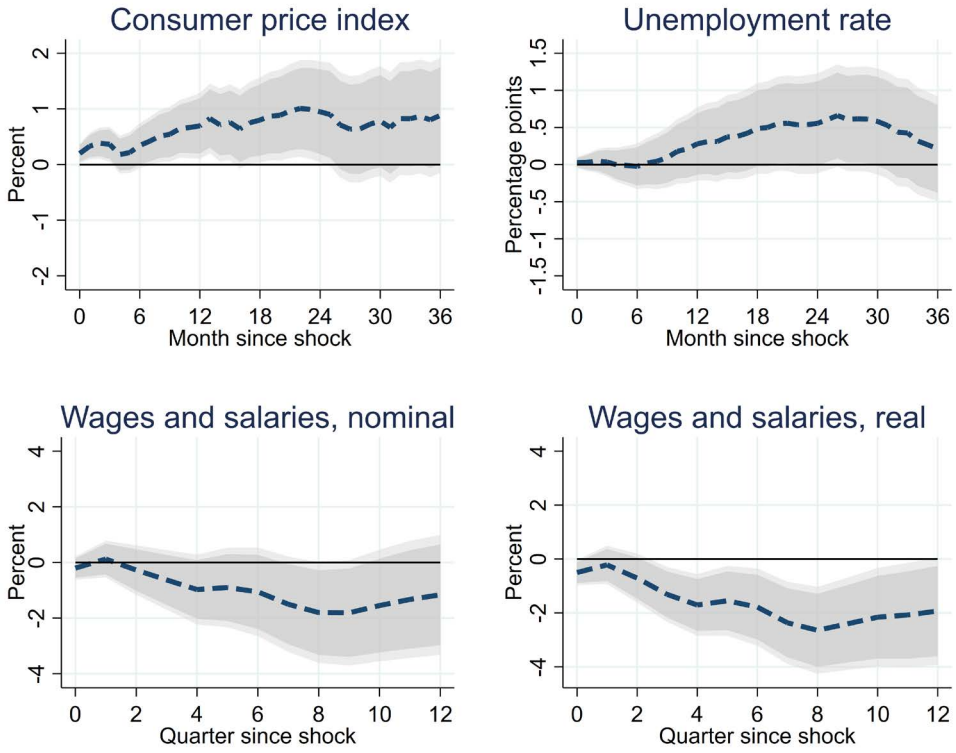
wages in Germany to a 10% oil price surprise. We compare our aggregate responses to Känzig (2021) since we employ the same identification.[5] We find very similar timing dynamics for Germany as Känzig (2021) found in the US with the same shock series. The estimated responses are larger in magnitude, which is not surprising since Germany, unlike the US, does not produce oil. An oil price increase benefits sectors related to oil production; Känzig (2021) provides evidence via the sectoral responses of stock prices. This effect dampens the otherwise adverse response observed at the aggregate level.

Unsurprisingly, consumer prices persistently increase after an adverse oil price shock. The immediate response displayed in Figure 2 is significant and builds up over the next months. The full pass-through is reached after two years, with a cumulative response of approximately 1.0 pp. These timings are akin to those found for the US by Känzig (2021), but our results appear to be twice as large in magnitude. The peak price reaction in the US is approximately 0.5 pp after 24 months (see Figure 4, panel B on page 1109 in Känzig, 2021).

The oil price shock is also contractionary, with visible adverse effects on the labour market at the aggregate level. Figure 2 shows that the unemployment rate remains unaffected for approximately six months after the shock. It then persistently increases, reaching a peak (up by 0.6 pp) after 24 months. The magnitude is again larger than that found in the US by Känzig (2021). He finds a peak effect on the unemployment rate of approximately 0.2 pp after 36 months (see Figure 9 on page 1115 in Känzig, 2021). Nominal wages and salaries are also adversely affected by the oil price shock. They persistently decrease over time, ending 2% lower after two years. Con-

[5] Our contribution is instead to document individual-level responses. For a comprehensive literature review on aggregate responses, see Känzig (2021).

Figure 2: Footprint of an oil price shock on the aggregate economy

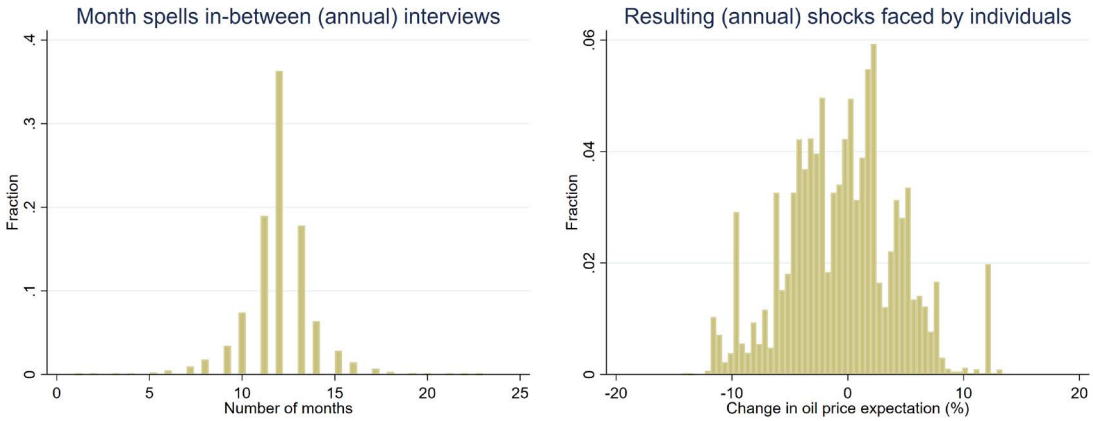


Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 1 with the displayed measures as dependent variables (see Section 3 for further details on the controls and the data). The responses show the cumulative effect.

tracted nominal wages thus exhibit stickiness since their response takes at least two quarters to be significant. In real terms, the fall in wages and salaries is even more marked since consumer prices have increased.

In addition to the exogenous nature of the shocks' series, our household panel provides an additional source of variation for the shocks. Individuals are interviewed annually in the SOEP but at a different (and random) date every year. The (cumulative) oil price shocks that have taken place in-between interviews are therefore different *across* households in a given interview year. The aggregate shocks can hence be assigned timely across individuals. The left-hand chart in Figure 3 shows the distribution across individuals of the number of months between interview dates. The normal shape of the distribution highlights the randomness of the spells. The corresponding (cumulative) oil price shocks faced by surveyed individuals are plotted on the right-hand chart. As the chart shows, meaningful cross-sectional variations for the shocks are additionally generated by in-between interview time spans. Our estimation accordingly benefits from both time and cross-sectional variations. Our results are instead not driven by *when* the interview takes place in a given year, as Figure 15 in Appendix B.4 shows.

Figure 3: Distributions across interviewed individuals



Notes: The left-hand chart shows the distribution of the number of months between (annual) individual interviews. The right-hand chart shows the resulting cumulative shocks faced by individuals in-between (annual) interviews. See Figure 1 and the main text for more details on the shocks.

3 Household panel and specification

We document the responses of several income elements to oil price movements by using a household panel for a large advanced economy. The German Socio-Economic Panel (SOEP) surveys households annually across Germany since its reunification in 1991. The panel contains extensive information on employment, labour incomes, and demographics. Our final sample consists of approximately 70,000 individuals who were interviewed repeatedly over the years 1991–2019, totalling more than 450,000 unique observations. An individual is, on average, interviewed for 6.5 years, yielding approximately 15,000 observations in a given year. The dataset thus provides adequate variation for our analysis, both over time and across individuals. The interviewed individuals are in the active population (aged 18–65); the panel definitions and sample selection are further detailed in Appendix A.2.[6]

Importantly, the survey is designed to be representative of the resident population. The responses we estimate with the panel therefore have meaningful implications at the aggregate level. In line with this, the panel-level results detailed in Section 4 are consistent with the aggregate-level footprint of an oil price shock discussed in the previous section (see Figure 2).

We estimate the effects of an oil price shock on individuals using local projections (see Jordà, 2005). We document the response of several elements of individual income. The extensive margin is measured by the (binary) employment status, whereas the intensive margin is captured by hours worked. The hourly wage is constructed by dividing the reported gross labour income by hours worked. We do not express gross labour income and the constructed hourly wage on an adult-equivalent scale (i.e., Fernandez-Villaverde and Krueger, 2007) since they are already measured at the individual level. The response of the income element $y_{i,t+h}$ for individual i in year $t+h$ (with $h \geq 0$) to the shock $x_{i,t}$ faced by the individual in-between interviews in t and

[6] See Goebel et al. (2018) for detailed descriptions of the SOEP data.

$t-1$ is given by:

$$y_{i,t+h} = \alpha_h + \beta_h x_{i,t} + \gamma_h' z_{i,t} + \epsilon_{i,t+h}, \tag{2}$$

in which $y_{i,t+h}$ is logged (bar the employment status). The estimated coefficients β_h thus provide an impulse response function to the oil price shock faced by individuals. In Section 5, we document the heterogeneity of this response by further interacting β_h with group dummies.

The controls $z_{i,t}$ include individual characteristics, the lagged variable of interest ($y_{i,t-1}$), and the aggregate controls. The individual characteristics control for age (via age group dummies), education level (via years of education and its square, as well as a dummy for college education), region, work status (via the employment status the year before the interview) and household structure (via a set of dummy variables for household size, civil status, partnership status, interviewee gender, and domestic nationality). The variables' definitions are listed in Appendix A.2 (see Table 2).

The aggregate controls account for the state of the economy prior to a shock. Having lagged aggregate controls is common practice when using local projections (see Ramey (2016) for a discussion). Our chosen aggregate control variables are akin to Cloyne et al. (2022), who estimate the effect of monetary policy shocks for Germany using local projections. Namely, we use three lags of (monthly) industrial production, total employment, the unemployment rate, the real effective exchange rate, and the consumer price index (Appendix A.1 provides the series definitions). The aggregate controls vary across individuals in a given year (like the oil price shocks) since interview months differ. Our benchmark specification does not include lagged shocks as controls since the previous monthly shocks are contained in the cumulative annual shock $z_{i,t}$ faced by an individual. Figure 16 in Appendix B.4 shows that the results are invariant when further controlling for the lagged (annual) shock $z_{i,t-1}$.

By using aggregate measures as dependent variables (and absent individual controls), equation 1 was applied in the previous section (see Figure 2) to trace the effects of an oil price shock on the aggregate economy. The aggregate-level sample that we used spans the same period as the panel (January 1991–December 2019).

4 Responses of income elements to oil price shocks

We first document the reaction of individual income measures to an oil price shock via the unconditional responses of the household panel. Section 5 then dissects those responses along the dimensions of age, education, income, work model, and sector of employment.

Figure 4 depicts the panel responses of unemployment status, gross labour income, hours worked, and the hourly gross wage to a 10% oil price increase (as graphed in Känzig, 2021). The responses comfortably resemble the aggregate-level footprint shown earlier in Figure 2, confirming the representability of the SOEP and its adequacy for drawing broader implications. Hours worked and the resulting hourly wage are those of the initially employed individuals. We

Figure 4: Panel responses to an oil price increase

Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The responses show the cumulative effect.

discuss the responses in nominal terms since they reveal how *contracted* wages are affected. The responses in real terms mechanically capture the additional inflationary effect that are shown in Figure 2. They are shown in Appendix B.1 (Figure 12) for completeness.

Overall, we find an adjustment of the unemployment status in the same year as the oil price shock, whereas labour income and the hourly wage display stickiness. In Figure 4, the unemployment rate increases instantly, and significantly so, by 0.5 pp in response to the shock. It then remains elevated for two years before reverting back. As previously detailed in Section 2, the magnitude of the response is larger than that reported by Känzig (2021) for the US. In contrast, gross labour income only drops after two years by 0.8%. Our local projections thus reveal that the reaction of contracted *nominal* labour incomes comes with a substantial lag, providing evidence of sticky wages. The observed wage stickiness aligns well with the aggregate-level response shown earlier in Figure 2. Since oil price surprises are inflationary, real wages decrease by even more (see Figure 12 in Appendix B.1). These results provide empirical support for the TANK model of Chan et al. (2023), in which firms pass on an increase in energy prices to consumers, in turn reducing real wages.

Interestingly, we find that the intensive margin of labour does not adjust. In Figure 4, the response of individual hours worked gravitates around zero and is not significant. Hours worked are known to be procyclical and empirically react to aggregate shocks (as in Holm et al., 2021

Figure 5: Response of unemployment status, by initial status

Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The responses show the cumulative effect. The flows from employment to unemployment (left) and unemployment to employment (right) are obtained by interacting the shock with the previous unemployment status of individuals.

after a monetary policy tightening). Using data from the three decades (1960s-1980s) that preceded our sample period, Keane and Prasad (1996) document a fall in hours worked in the US after an oil price increase.[7] Consistent with this, Keane and Prasad (1996) and Chan et al. (2023) discuss how energy can be substituted by labour as a production input. Our results do not support such a substitution; our specification for Germany instead points to an absence of reaction of hours worked. This result proves robust; Figure 13 in Appendix shows that the nonsignificant responses of hours worked are also visible across the household groups that we will use later. Accordingly, the response of our constructed hourly wages mirrors that of labour income. For brevity, we thus focus on how the (observable) labour incomes respond for the rest of the text.

These unconditional responses appear to be robust. They are not driven by *when* the individuals are interviewed in a given year. To see this, Figure 15 in Appendix B.4 shows that the main responses are unchanged when further imposing fixed effects that absorb any variations at the monthly and quarterly frequencies. Likewise, our estimated responses are not altered when controlling for the lagged oil price shock $z_{i,t-1}$ that individuals faced the year prior to the household interview (see Figure 16 in Appendix B.4). Including the lagged shock covers OPEC announcements up to 24 months before the interview since the shocks are cumulated over a year.

Our analysis also reveals that the response of the extensive margin is actually driven by an increased likelihood of remaining unemployed rather than by an increase in employed individuals losing their job. To see this, Figure 5 conditions the response of the unemployment status on the previous status of individuals. Initially employed individuals face the same probability of

[7] Keane and Prasad (1996) mention a homogenous decline in hours worked across industries as well as workers' skill levels.

entering unemployment after an oil price shock. In contrast, the likelihood of an unemployed individual *remaining* unemployed increases significantly. The initial effect is large (approximately 1.4 pp at impact) and persistent. This suggests that employed individuals are equally likely to be dismissed after an oil price shock, whereas already unemployed individuals are more likely to experience difficulties in securing new employment. This response of employment flows is similar to that found on the *firm* side in the model of Patra (2022), in which firm entry strongly decreases after an oil price increase.

Our extensive margin responses contribute to understanding the transmission of oil price shocks to the labour market. Davis and Haltiwanger (2001) found a significant increase in job destruction in the US after the oil price shock of the 1970s.[8] We do not find this effect for Germany in later decades when instead considering a series of oil price shocks from 1991 to 2019.

5 Heterogeneity in responses

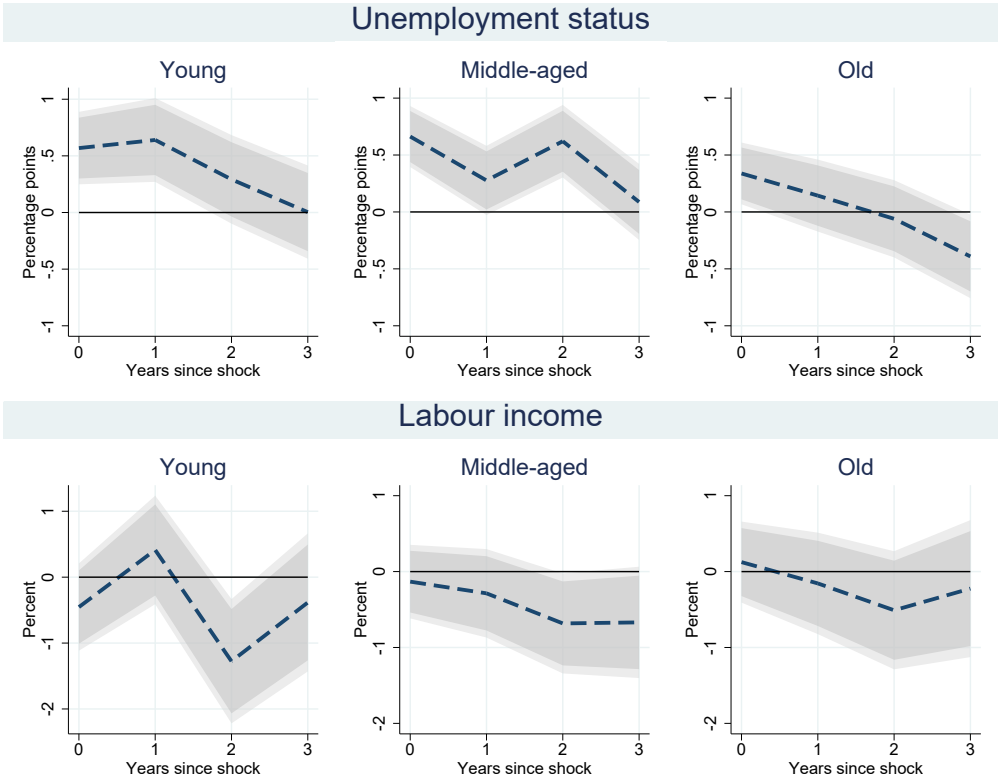
Overall, we find marked heterogeneity in the responses of income elements to oil price shocks across age, education, income groups, and work model. Although all households are impacted by oil price shocks, the typically more vulnerable individualssuch as those who are young, little educated, and have low incomes, are relatively more affected. The income elements of individuals who work full-time (or at least 80%) are adversely affected by an oil price increase, whereas individuals who work part-time (less than 80%) are not impacted. Our results also speak for general equilibrium effects since responses do not seem to differ across sectors of employment, regardless of how oil intensive they are. We also document that individuals who are employed in procyclical sectors experience more marked effects.

5.1 Age groups

The impact of oil price shocks depends on age. We divide individuals into three groups: young (ages 18-33), middle-aged (ages 34-49) and old (ages 50-65). As Figure 6 shows, both young and middle-aged individuals are adversely affected by an increase in the oil price via an increase in their unemployment likelihood and a lagged decrease in their labour income. Old individuals are not significantly affected. The unemployment likelihood increases (by approximately 0.5 pp) for both young and middle-aged individuals and remains elevated for two years. The response of labour income also shows a clear pattern for young and middle-aged individuals. Labour income decreases significantly two years after the shock by approximately 1.3% and 0.6% for young and middle-aged individuals, respectively. In this sense, the effects of oil price shocks appear to differ from those of carbon pricing. Using the same high-frequency identification of carbon pricing events, Känzig (2023) does not find heterogeneity in the response of household incomes across age groups in the UK.

[8] They document the response for a particular oil shock episode, covering 1972 to 1988.

Figure 6: Responses, by age



Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The groups are defined in the main text. The responses show the cumulative effect.

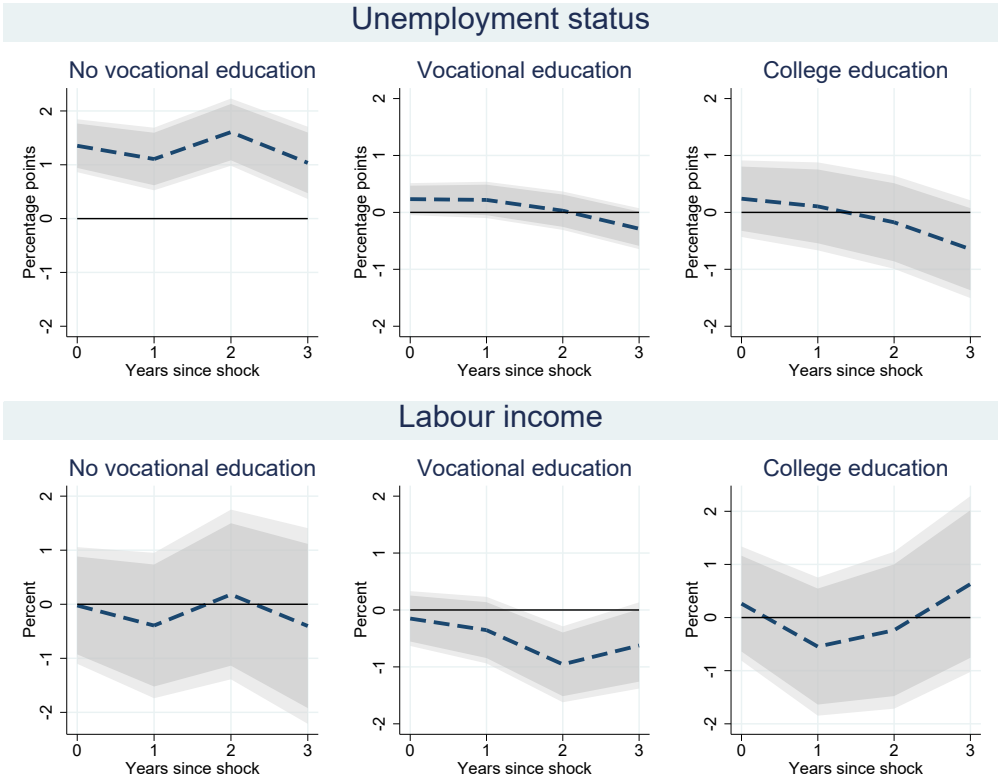
5.2 Education levels

We also document heterogeneity in responses across educational qualifications. The SOEP contains information on the highest educational attainment, which we use to group individuals into those without or with vocational education or with college education.[9] Figure 7 shows the responses to an increase in the oil price by education level. Individuals without vocational education are adversely affected via their unemployment status, whereas individuals with vocational education are instead affected via their labour income. In contrast, the income elements of those with a college education are not affected by the increase in the oil prices. For UK households, Känzig (2023) also does not find an effect on highly educated individuals in response to carbon pricing shocks, whereas little- and moderately-educated individuals experience a slight drop in their disposable income (see Figure B.15 in Appendix B.3 in Känzig, 2023).

In Figure 7, the unemployment likelihood for those without vocational education increases by 1.4 pp in the same year as the shock and remains elevated for several years. In contrast, we find no effect on the unemployment status for the two groups of higher educational levels. These unemployment responses corroborate those obtained in the US by Del Canto et al. (2023), who

[9] In Germany, vocational education consists of an apprenticeship that typically spans three years and entails coursework.

Figure 7: Responses, by education level

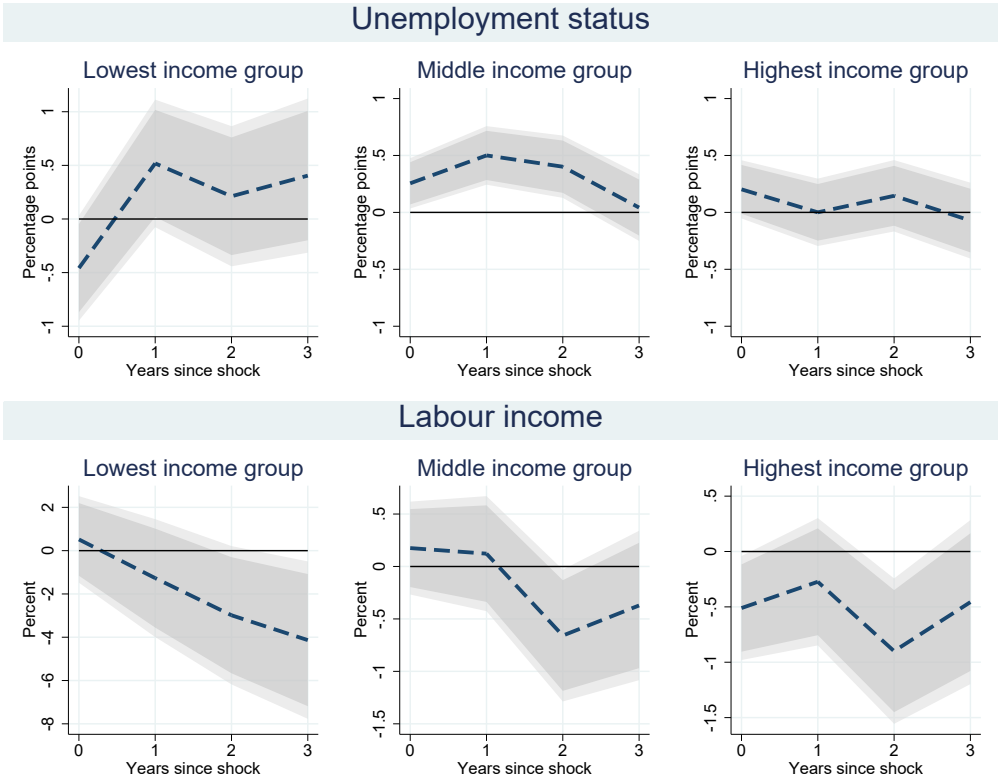


Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The groups are defined in the main text. The responses show the cumulative effect.

also employ the oil shocks from Känzig (2021). Del Canto et al. (2023) also find that an inflationary oil shock increases the likelihood of unemployment by more for individuals with relatively less education.

In terms of labour income, individuals without vocational education remain unaffected. This is different for individuals with vocational education. Their labour income drops with a lag, reaching a trough of minus 1.0% two years after the shock. Again, the labour income of individuals with a college education appears invariant to the shock. These results are consistent with Keane and Prasad (1996), who find that an oil price increase reduces the wages of workers but relatively less so for skilled workers. They argue that skilled labour is a better substitute for energy as a production input than unskilled workers. Distributional effects across skill levels are also found in the model of Kehrig and Ziebarth (2017), who instead investigate the relocation effects of an oil supply shock. The labour income responses across educational qualifications that we obtain for Germany seem to differ from those obtained in the US by Del Canto et al. (2023). Conditional on remaining employed after the oil price shock (as we report), they show that wages appear to decrease by a similar magnitude regardless of the educational qualification attained.

Figure 8: Responses, by income



Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The groups are defined in the main text. The responses show the cumulative effect.

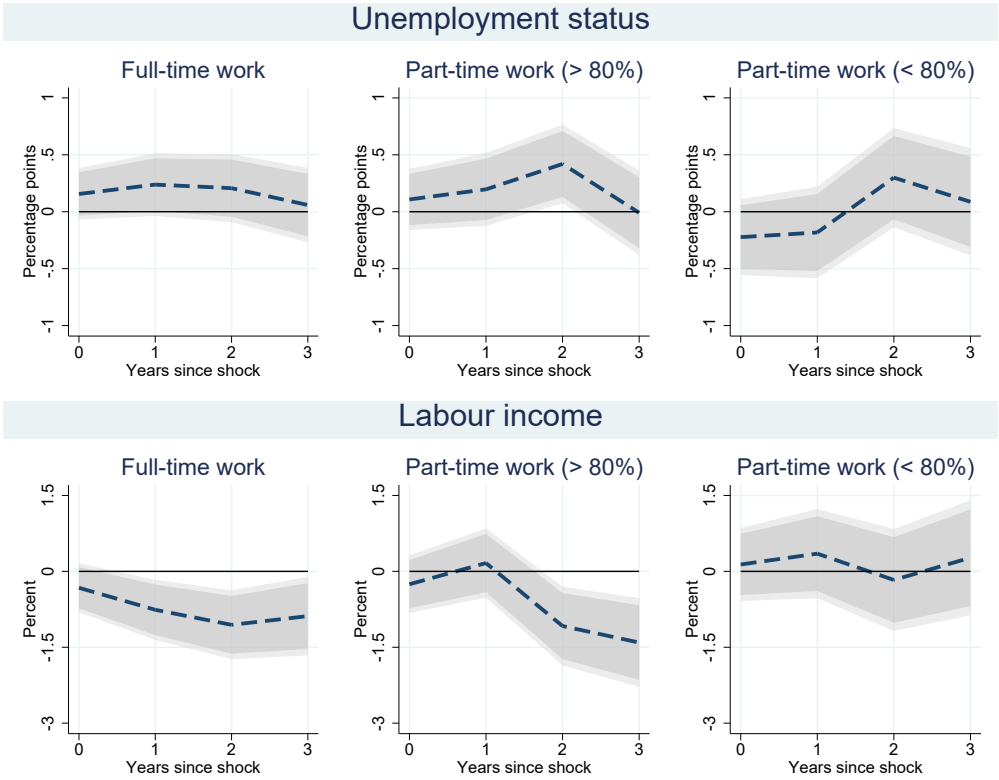
5.3 Income groups

The response to an oil price shock also varies across the income distribution. We group individuals based on their previous household gross income to obtain three groups: low income (bottom quartile), middle income (which consists of the interquartile range), and high income (top quartile). We lag household gross income by one year to mitigate endogeneity, and quartiles are computed in a given year.

Figure 8 shows the responses to an increase in oil prices by income group. The likelihood of unemployment significantly increases for the middle-income group, whereas that of individuals at the top and bottom of the income distribution does not react. Although a persistent decline in labour income is observed for all income groups, its magnitude differs across groups. Individuals in the bottom income quartile experience a much sharper fall, reaching minus 4.0% three years after the shock compared with just minus 0.5%–1.0% for the two higher income groups.

Our labour income responses are consistent with the empirical literature in the sense that they underline the importance of general equilibrium effects for the transmission of aggregate shocks to individuals. Holm et al. (2021) investigate the effects of monetary policy on household income in Norway. The *nonfinancial* income of low-income households is negatively

Figure 9: Responses, by working model

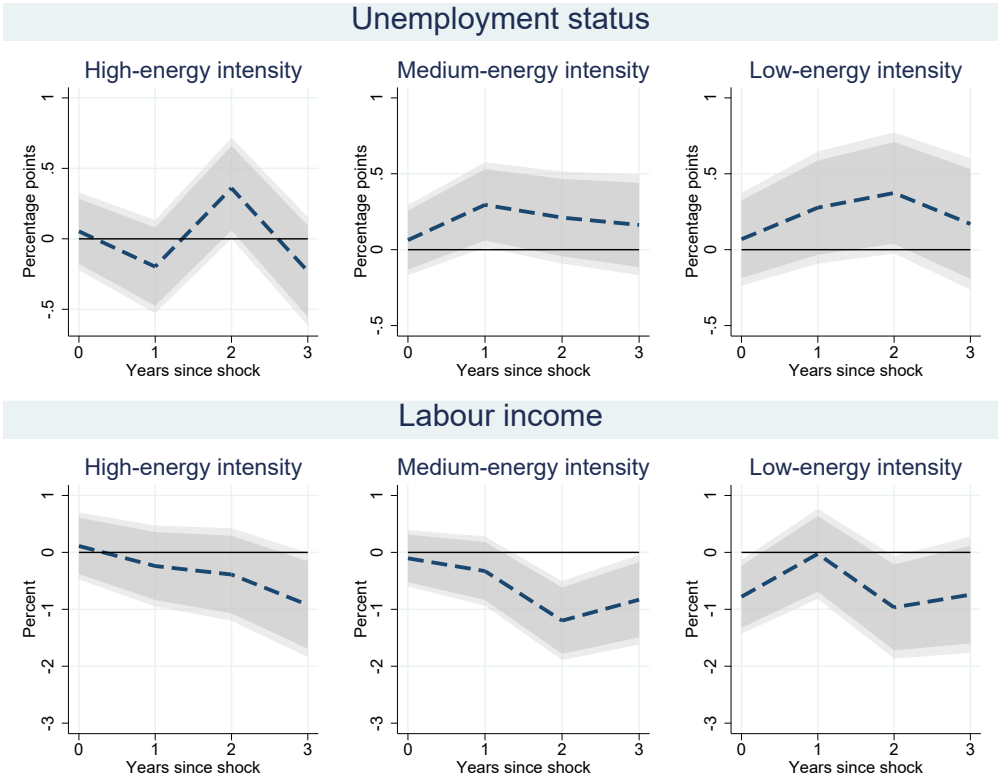


Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The groups are defined in the main text. The responses show the cumulative effect.

affected by a policy tightening, and displays stickiness. In contrast, that of median-income households reacts by less.[10] Similarly, Känzig (2023) finds that the disposable income of low-income households declines persistently after an adverse carbon pricing shock, whereas that of middle- and high-income households reacts little (and not persistently).

We also show that income responses display heterogeneity depending on the work model of individuals. In Figure 9, we distinguish the responses for individuals in full-time and part-time work (further splitting between a workload of above or below 80%). Appendix A.2 details the construction of the three groups.[11] Both individuals engaged in full-time employment and those working at least 80% face a notable and persistent drop in labour income. This is not the case for individuals who work less than 80% as they appear to be unaffected by the oil price shocks. As before, the likelihood of losing the job does not appear to be affected by the shocks (as shown in Figure 5 at the aggregate level).

Figure 10: Responses, by oil-intensity of employment sector



Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The groups are defined in the main text. The responses show the cumulative effect.

5.4 Sectors of employment

The prevailing general equilibrium effects of an oil price shock are further confirmed by how homogenous the responses are across sectors of employment, regardless of their oil intensity. We categorise the economic sectors in which individuals work into low-, medium-, and high-oil intensity based on Input-Output Tables. We do so by using the ratio of the production input *oil* to the value added for each sector reported in the household panel.[12] Our approach is motivated by Lee and Ni (2002), who find that an oil price increase is akin to an adverse supply shock for oil-intensive industries.

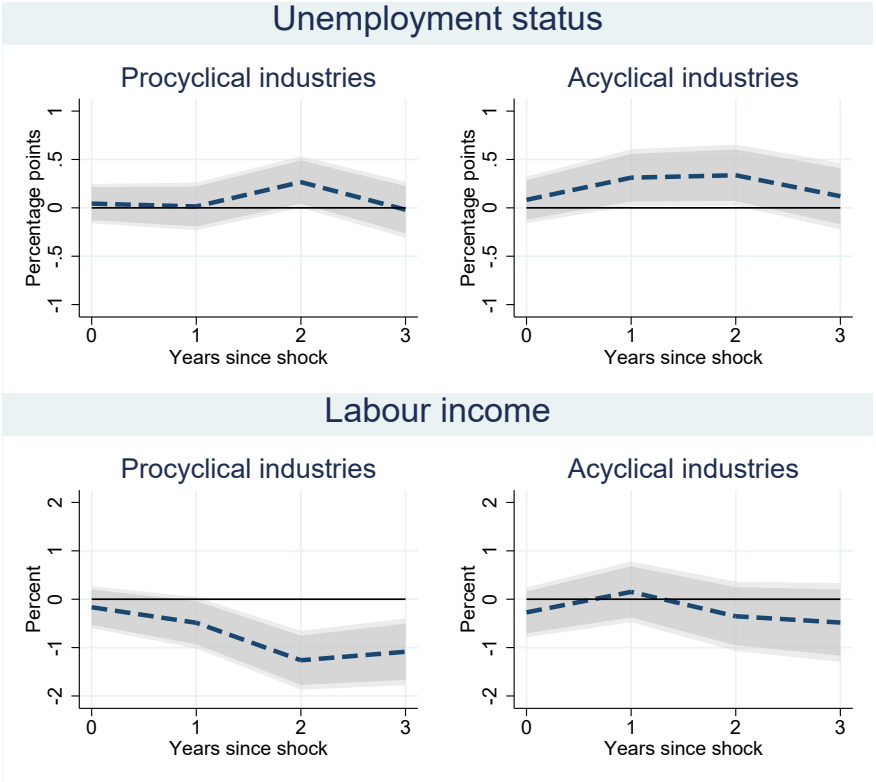
Figure 10 reveals that our estimated responses are fairly homogenous across sectors. The probability of entering unemployment is not significantly affected by an oil price increase, regardless of how oil intensive the employment sector is. The absence of response of the flow from

[10] High-income households are mainly affected via financial income.

[11] The proportion of individuals engaged in full-time work is stable in our sample for Germany. This differs from Borowczyk-Martins and Lalé (2019), who find that fluctuations in hours worked are driven by flows between full-time and part-time employment in the US and the UK.

[12] We use NACE sectoral data from the OECD in 2018, but the resulting groupings are stable over time. We divide the production input *coke and refined petroleum products* by the value added (at basic prices) of the sector considered and then categorise the sectors into three groups; see Appendix A.3 for the sectoral list and further details. For the UK, Känzig (2023) finds that only few low-income households are employed in highly oil-intensive sectors. In contrast, income groups are broadly dispersed across oil-intensity sectors in our sample.

Figure 11: Responses, by cyclicality of employment sector



Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The groups are defined in the main text. The responses show the cumulative effect.

employed to unemployed shown in Figure 5 in Section 4 therefore turns out to hold broadly across sectors of employment. Only employed individuals report on the sector of employment; the resulting unemployment response hence corresponds to the response of the initially employed individuals in Figure 5 in Section 4. The lack of response is also observed when only looking at the unemployment status for individuals who report on sectoral employment (see Figure 14 in Appendix B.3). The response of labour income also appears homogenous, since it decreases persistently by a similar magnitude across the three oil-intensity groups (reaching a trough of approximately minus 1.0% after three years).

Our homogenous responses across sectors of employment are consistent with the findings of Dedola et al. (2021), who observe that an energy cost shock eventually propagates to the costs of sectors of all oil intensities. Dedola et al. (2021) use the same approach as us to build a measure of oil intensity in Denmark.[13] Similarly, the labour income homogeneity we find across sectoral employment corroborates what Känzig (2023) obtained from a carbon pricing shock. He finds little heterogeneity in household income and consumption responses across sectors of employment with different energy intensities.

In contrast, the *cyclicality* of the employment sector matters. We define sectors as either pro-

[13] They compute the share of oil in total inputs per sector. The median share is then used to define sectors into low- and high-level intensity.

cyclical or acyclical in accordance with the categorisation of Coskun and Dalgic (2024) and consider the sectoral employment of individuals in the previous year. The sectoral groupings are listed in Table 4 of Appendix A.3. The corresponding responses to an oil price increase are shown in Figure 11. Intuitively, the effect of the shock depends on sectoral cyclicality. Individuals in procyclical sectors experience a delayed and persistent drop in labour income, reaching approximately minus 1.0% after two years.[14] The income of individuals employed in acyclical sectors is, instead, not affected. This finding complements Känzig (2021), who shows for the US that procyclical sectors—namely, the automobile industry, retail, and transportation—are adversely affected by an oil price increase.[15] Conversely, Känzig (2021) finds that the utility sector experiences a transitory boom, which is unsurprising given that the US is an oil producer (see Figure A.8 in Appendix A.3 of Känzig, 2021). A more marked response for cyclical sectors may also be linked to firm characteristics. Davis and Haltiwanger (2001) find that younger and smaller firms in the US exhibit a stronger reaction (in terms of job destruction and creation) to oil price shocks, suggesting that this may be due to more limited access to capital markets.

Since we condition on the employment sector, the unemployment status responses shown in Figure 5 correspond to the likelihood of losing the job. The likelihood remains broadly unchanged by the shock, which is again consistent with the absence of response previously documented in Figure 5. In oil-*producing* countries, namely, the Gulf Cooperation Council (GCC), Cologni and Manera (2013) find a reallocation in employment from the private sector to the public sector after an oil price increase. Since the public sector accounts for approximately 40% of the aggregate demand in the GCC, an oil price increase triggers large public investment.

6 Conclusion

We have shown that oil price movements have sizeable effects on individual incomes in a large oil-importing economy. To do so, we used oil price surprises derived from Futures' contracts and traced their footprint on a representative household panel for Germany. Our analysis highlights a transmission via the extensive margin of labour and contracted wages. An inflationary oil price shock leads to a persistent increase in the unemployment rate and to a sticky decline in nominal labour incomes. In contrast, the intensive margin does not react; hours worked are left unchanged by the shock.

We uncover the marked heterogeneity that underlies the aggregate-level responses of these income elements. The more vulnerable household groups (e.g., younger individuals, those with less education and individuals with low incomes) experience sharper adverse effects from an increase in oil prices. Additionally, individuals working in procyclical industries are negatively affected. We also show the relevance of general equilibrium effects since the responses are

[14] Känzig (2023) shows that poorer households have a more cyclical income in the UK. This is not the case in our sample since individuals from all of our income groups can be found in the procyclical and acyclical employment sectors.

[15] Similarly, Cloyne et al. (2020) show for the US and the UK that an expansionary monetary policy shock raises household income because of greater demand in the private sector rather than in the public sector.

homogenous across employment sectors, regardless of their oil intensity. Overall, our results support the importance of incorporating agent heterogeneity in economic modelling and contribute to the understanding of how aggregate shocks transmit to individuals.

A Data

A.1 Aggregate data

We use the following aggregate series from the Deutsche Bundesbank (Eurosystem) database. The monthly series of:

- Industrial production[16] ($BBDE1.M.DE.Y.BAA1.A2P000000.G.C.I21.A$),
- the consumer price index ($BBDP1.M.DE.Y.VPI.C.A00000.I20.A$),
- total employment ($BBDL1.M.DE.Y.EMP.EAA000.A0000.A00.D10.0.ABA.A$), and
- the unemployment rate ($BBDL1.M.DE.Y.UNE.UBA000.A0000.A01.D00.0.ABA.A$)

are all seasonally adjusted. The quarterly series of gross wages and salaries, at current prices ($BBNZ1.Q.DE.S.G.0034.A$), is also seasonally adjusted. The real effective exchange rate comes from the BIS data portal. We use the monthly average of the narrow definition (of 27 countries), which is CPI-based.

A.2 Socio-economic panel

The Socio-Economic Panel (SOEP) is a household panel study conducted on an annual basis in Germany by the German Institute for Economic Research (DIW). The first interviews were conducted in 1984, and the panel covers both East Germany and West Germany since 1990. Approximately 15,000 individuals are interviewed each year on demographic, socioeconomic and economic dimensions such as labour market outcomes and housing. Our sample selection retains households who are of working age (18–65 years old) and reports on the variables of interest. Our analysis is based on the SOEP-Core data (see Goebel et al. (2018) for an overview of the panel).

The interviews are conducted with a household head who responds to questions at both the individual (e.g., gender, political orientation) and household levels (e.g., household income, number of children). The other household members are also interviewed on their individual outcomes. Individual-level data can be matched with data at the household level. When an individual leaves a household, for example, when a child moves out, the panel makes an effort to follow the person. Individuals stay on average 6.5 years in the panel.

[16] Including construction.

Table 1: Dependent variables and variables for heterogeneity from the SOEP

Number	Dataset	Name	Label
(1)	pgen	pglfs	Labor force status
(2)	pgen	pglabgro	Current gross labour income (in Euros)
(3)	pl	plb0186	Actual working hours including overtime (hours per week)
(4)	pequiv	d11101	Age
(5)	pgen	pgpbbil01, pgpbbil02, pgpbbil03	Vocational degree received, college degree, no vocational degree
(6)	pequiv	i11101	Household pre-government income
(7)	pl	p_nace	two-digit NACE industry, Sector
(8)	pl	plb0176_h	Contracted working hours (hours per week)

Notes: List of variables with the variable-ID from the SOEP that were used as dependent variables and variables to estimate the heterogeneity responses in Sections 4 and 5.

Our analysis focuses on labour market outcomes at the individual level. An overview of the dependent variables and the variables used for the heterogeneity estimations can be found in Table 1. The unemployment status (1) of an individual equals the response "non-working and registered unemployed". The individual gross labour income (2) is based on the current gross labour income in nominal terms. The hours worked are based on the actual working hours (3) since the variable current labour income explicitly asks to include overtime compensation. Using the former two, we construct the hourly gross wage.

For our heterogeneity measures, we use the age (4) of all individuals of working age (18-65). We aggregate them into age groups from 18–33, 34–49, and 50–65. We differentiate between the highest obtained educational qualification (5), with *no vocational education* corresponding to an individual who only completed mandatory schooling and *college education* being equivalent to a university degree. To assess the heterogeneity across the income distribution, we use the nominal household gross income (6). We use the classification by the NACE industry (7) to identify the sector of employment. Appendix A.3 further explains the sectoral decomposition. Finally, (8) covers the contracted working hours based on which we calculate the work models, namely, full-time ($\geq 100\%$), and part-time ($\geq 80\%$ and $< 80\%$).

The individual- and household-level control variables mentioned in Section 3 are listed in Table 2.

A.3 Sectoral classification by NACE

The European Commission classifies economic activities within the European constituency into NACE sectors.[17] The responses in the SOEP are largely consistent with the NACE definitions and the Input-Output Tables (IOTs) produced by the OECD, which we use to calculate the oil intensity. To identify sectors that are oil intensive, we use the Input-Output Tables as classified by the NACE. Our base year for the calculation is 2018. We focus on the production input *coke and refined petroleum products* for each sector as a measure of oil intensity. To compute the oil intensity, we divide the oil input by value added (at basic prices). We then assign the sec-

[17] A list of the sectors can be found on the website of the European Commission.

Table 2: Control variables from the SOEP

Number	Dataset	Name	Label
(i)	pl	pla0009_v1, oka0009_v2, pla0009_v3	Gender
(ii)	pl	pld0131_v1, pld0131_v2, pld0131_v3	Marital status
(iii)	hgen	hgtyp1hh	Household typology
(iv)	hgen	hgnuts1	NUTS-systematic-1 (Federal State)
(v)	pgen	pgnation	Nationality
(vi)	pequiv	d11106	Number of persons in household
(vii)	pequiv	d11109	Number of years of education
(viii)	pl	syear	Survey Year

Notes: List of variables with the variable-ID from the SOEP used as control variables in the estimations in Sections 4 and 5.

Table 3: Classification of sectors by oil intensity

Oil-intensity	Sectors
High	Agriculture, forestry and fishing (A), Mining and quarrying (B), Manufacturing (C), Electricity, gas, steam and air conditioning supply (D), Transporting and storage (H).
Medium	Water supply; sewerage; waste management and remediation activities (E), Construction (F), Wholesale and retail trade; repair of motor vehicles and motorcycles (G), Accommodation and food service activities (I), Information and communication (J), Professional, scientific and technical activities (M), Administrative and support service activities (N), Public administration and defence; compulsory social security (O), Arts, entertainment and recreation (R), Other services activities (S).
Low	Financial and insurance activities (K), Real estate activities (L), Education (P), Human health and social work activities (Q), Activities of households as employers; undifferentiated goods and services - producing activities of households for own use (T).

Notes: The table classifies the NACE sectors according to their oil intensity, as described in the text. The letter in brackets corresponds to the classification value in the NACE.

tors from the Input-Output Tables to the highest-level NACE category (based on the glossary of the European Commission). We classify the NACE sectors based on these results as high-, medium- or low-energy intensity, as shown in Table 3. A sector is categorised as *high* when the oil intensity is greater than 2%, as *medium* when the oil intensity is between 0.25% and 2% and as *low* when the oil intensity is less than 0.25%.

In Table 4, NACE sectors are defined as either procyclical or acyclical based on the categorisation of Coskun and Dalgic (2024).[18], who discuss the cyclicality of fertility in the US. They define a sector as procyclical if the correlation of the cyclical component of sectoral employment with GDP is greater than 0.52.

[18] See Table A.5 in Appendix A.4 of Coskun and Dalgic (2024).

Table 4: Classification of sectors by cyclicality

Cyclicality	Sectors
Procyclical	Manufacturing (C), Construction (F), Wholesale and retail trade; repair of motor vehicles and motorcycles (G), Transporting and storage (H), Accommodation and food service activities (I), Financial and insurance activities (K), Real estate activities (L), Professional, scientific and technical activities (M).
Acyclical	Agriculture, forestry and fishing (A), Mining and quarrying (B), Electricity, gas, steam and air conditioning supply (D). Water supply; sewerage; waste management and remediation activities (E), Information and communication (J), Administrative and support service activities (N), Public administration and defence; compulsory social security (O), Education (P), Human health and social work activities (Q), Arts, entertainment and recreation (R), Other services activities (S), Activities of households as employers; undifferentiated goods - and services - producing activities of households for own use (T).

Notes: The table classifies the NACE sectors according to their cyclicality as described in the text. The letter in brackets corresponds to the classification value in the NACE.

B Additional results

B.1 Real income

Figure 12 shows the unconditional response to the oil price shock for real labour income and the real hourly wage. As discussed in Section 4, the two measures capture the effects of a change in both the *contracted* wage and inflation. This leads to an even sharper reaction in real terms.

B.2 Heterogeneity for the hours worked

Figure 13 shows the responses of hours worked for the different groupings.

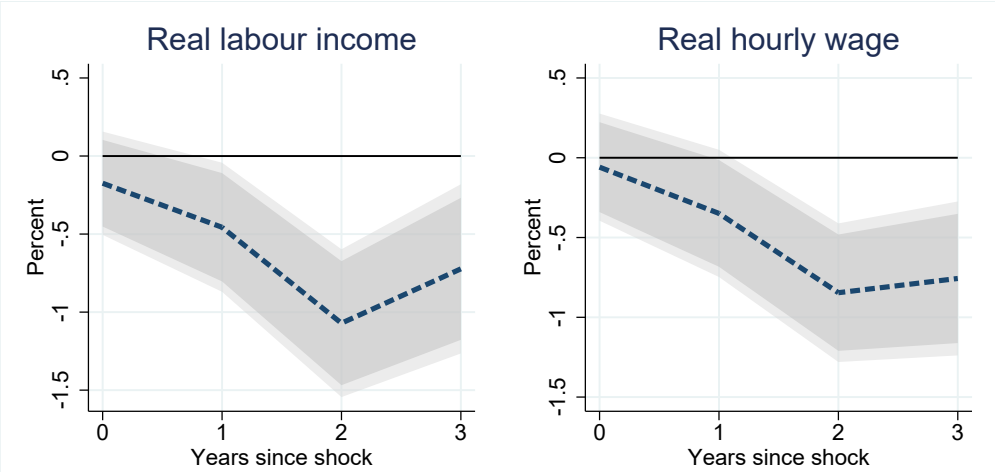
B.3 Unemployment response with sectoral heterogeneity

As discussed in Section 5.4, the response of unemployment to an oil price shock when considering sectoral heterogeneity matches the unemployment response of individuals who were initially employed. Figure 14 is hump shaped with a peak after two years, thus mirroring the response in Figure 5.

B.4 Robustness

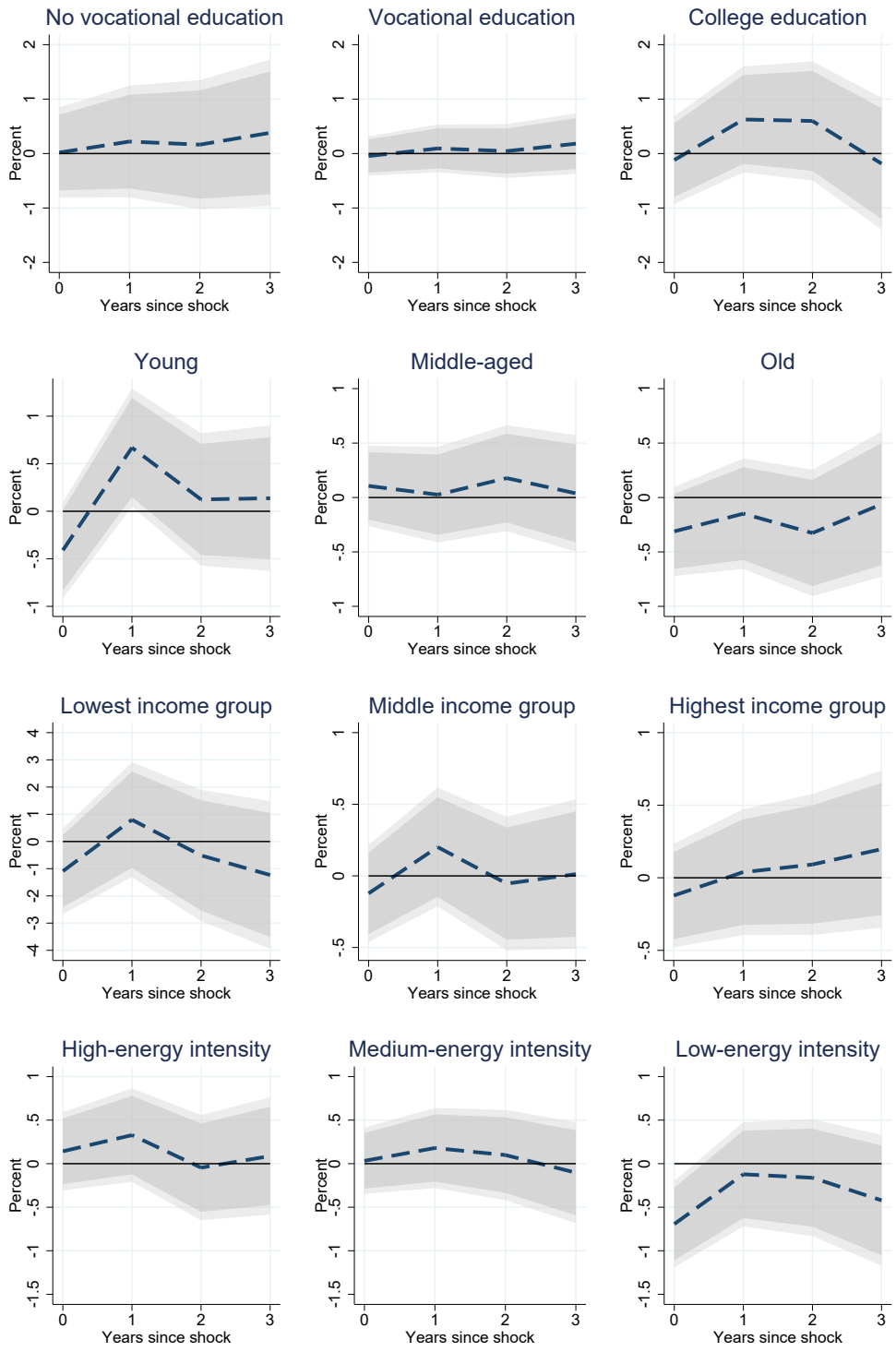
The results are not driven by *when* an individual is interviewed within the year. Figure 15 shows the unconditional responses (as in Figure 4) with monthly and quarterly fixed effects. The unemployment rate increases instantly and remains elevated for two years after the shock, whereas the income response drops with a lag, mirroring the results we found without the additional fixed effects.

Figure 12: Panel response of the real income and real wage



Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures (deflated by the consumer price index) as dependent variables (see Section 3 for details on the specification and the data). The responses show the cumulative effect.

Figure 13: Responses of hours worked, by group



Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The responses show the cumulative effect.

Figure 14: Response of unemployment status, if employment sector is reported

Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data). The responses show the cumulative effect.

Figure 15: Panel responses, with monthly and quarterly fixed effects

Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data), with monthly and quarterly fixed effects. The responses show the cumulative effect.

Figure 16: Panel responses, with lagged shock

Notes: Local projection responses to a 10% oil price surprise (as in Känzig, 2021), with 90% (dark grey) and 95% (light grey) confidence intervals. Using specification 2 with the displayed measures as dependent variables (see Section 3 for details on the specification and the data), controlling for a one-year lagged oil price shock. The responses show the cumulative effect.

References

Ampudia, M., Cooper, R., Le Blanc, J., and Zhu, G. (2023). Mpc heterogeneity and the dynamic response of consumption to monetary policy. *BIS Working Papers*, 1102.

Animashaun, J. and Wossink, A. (2024). How do households cope during aggregate shocks? evidence from the 2009–2015 oil crisis in nigeria. *Resources Policy*, 95:1–12.

Antolin-Diaz, J. and Rubio-Ramirez, J. F. (2018). Narrative sign restrictions for svars. *American Economic Review*, 108(10):2802–2829.

Bachmann, R., Baqaee, D., Bayer, C., Kuhn, M., Löschel, A., Moll, B., Peichl, A., Pittel, K., and Schularick, M. (2022). What if? the economic effects for germany of a stop of energy imports from russia. *ECONtribute Policy Brief No. 28*.

Baumeister, C. and Hamilton, J. D. (2019). Structural interpretation of vector autoregressions with incomplete identification: Revisiting the role of oil supply and demand shocks. *American Economic Review*, 109(5):1873–1910.

Baumeister, C. and Peersman, G. (2013). The role of time-varying price elasticities in accounting for volatility changes in the crude oil market. *Journal of Applied Econometrics*, 28(7):1087–1109.

Blanchard, O. and Gali, J. (2007). The macroeconomic effects of oil shocks: Why are the 2000s so different from the 1970s? *NBER Working Paper Series*, 13368.

Bodenstein, M., Guerrieri, L., and Kilian, L. (2012). Monetary policy responses to oil price fluctuations. *IMF Economic Review*, 60:470–504.

Borowczyk-Martins, D. and Lalé, E. (2019). Employment adjustment and part-time work: Lessons from the united states and the united kingdom. *American Economic Journal: Macroeconomics*, 11(1):389–435.

Bruns, M. and Lütkepohl, H. (2023). Have the effects of shocks to oil price expectations changed? evidence from heteroskedastic proxy vector autoregressions. *DIW Berlin Discussion Papers*, 2036.

Chan, J., Diz, S., and Kanngiesser, D. (2023). Energy prices and household heterogeneity: Monetary policy in a gas-tank. *Bank of England Staff Working Paper*, 1041.

Cloyne, J., Ferreira, C., and Surico, P. (2020). Monetary policy when households have debt: New evidence on the transmission mechanism. *Review of Economic Studies*, 87:102–129.

Cloyne, J., Hürtgen, P., and Taylor, A. M. (2022). Global monetary and financial spillovers: Evidence from a new measure of bundesbank policy shocks. *NBER Working Paper Series*, 30485.

Cologni, A. and Manera, M. (2013). Exogenous oil shocks, fiscal policies and sector reallocations in oil producing countries. *Energy Economics*, 35:42–57.

Coskun, S. and Dalgic, H. C. (2024). The emergence of procyclical fertility: The role of breadwinner women. *Journal of Monetary Economics*, 142:1–21.

Davis, S. J. and Haltiwanger, J. (2001). Sectoral job creation and destruction responses to oil price changes. *Journal of Monetary Economics*, 48:465–512.

Dedola, L., Kristoffersen, M. S., and Züllig, G. (2021). The extensive and intensive margin of price adjustment tocost shocks: Evidence from danish multiproduct firms. *Working Paper*.

Del Canto, F. N., Grigsby, J. R., Qian, E., and Walsh, C. (2023). Are inflationary shocks regressive? a feasible set approach. *NBER Working Paper Series*, 31124.

EIA (2024). International energy statistics (as of april 11, 2024). *U.S. Energy Information Administration*.

Fenske, J. and Zurimendi, I. (2017). Oil and ethnic inequality in nigeria. *Journal of Economic Growth*, 22(4):397–420.

Fernandez-Villaverde, J. and Krueger, D. (2007). Consumption over the life cycle: Facts from consumer expenditure survey data. *The Review of Economics and Statistics*, 89(3):552–565.

Goebel, J., Grabka, M. M., Liebig, S., Kroh, M., Richter, D., Schröder, C., and Schupp, J. (2018). The german socio-economic panel (soep). *Jahrbücher für Nationalökonomie und Statistik*, 239(2):345–360.

Hagemann, R. (1982). The variability of inflation rates across household types. *Journal of Money, Credit and Banking*, 14(4):494–510.

Hamilton, J. D. (2008). Oil and the macroeconomy. *The New Palgrave Dictionary of Economics. London: Palgrave Macmillan*.

Hobijn, B. and Lagakos, D. (2005). Inflation inequality in the united states. *The Review of Income and Wealth*, 51(4):581–606.

Holm, M. B., Paul, P., and Tischbirek, A. (2021). The transmission of monetary policy under the microscope. *Journal of Political Economy*, 129(10):2721–2993.

Hutchison, M. M. (1991). Aggregate demand, uncertainty and oil prices: The 1990 oil shock in comparative perspective. *BIS Economic Papers*, 31.

Jarociński, M. and Karadi, P. (2020). Deconstructing monetary policy surprises: The role ofinformation shocks. *American Economic Journal: Macroeconomics*, 12(2):1–43.

Jordà, Ò. (2005). Estimation and inference of impulse responses by local projections. *American Economic Review*, 95(1):161–182.

Kaplan, G., Moll, B., and Violante, G. L. (2018). Monetary policy according to hank. *American Economic Review*, 108(3):697–743.

Keane, M. P. and Prasad, E. S. (1996). The employment and wage effects of oil price changes: A sectoral analysis. *The Review of Economics and Statistics*.

Kehrig, M. and Ziebarth, N. L. (2017). The effects of the real oil price on regional wage dispersion. *American Economic Journal: Macroeconomics*, 9(2):115–148.

Kilian, L. (2008). Exogenous oil supply shocks: How big are they and how much do they matter for the u.s. economy? *The Review of Economics and Statistics*, 90(2):216–240.

Kilian, L. (2009). Not all oil price shocks are alike: Disentangling demand and supply shocks inthe crude oil market. *American Economic Review*, 99(3):1053–1069.

Känzig, D. (2021). The macroeconomic effects of oil supply news: Evidence from opec announcements. *American Economic Review*, 111(4):1092–1125.

Känzig, D. (2023). The unequal economic consequences of carbon pricing. *American Economic Review (revise and resubmit)*.

Lee, K. and Ni, S. (2002). On the dynamic effects of oil price shocks: a study using industry level data. *Journal of Monetary Economics*, 49(4):823–852.

Michael, R. (1979). Variation across households in the rate of inflation. *Journal of Money, Credit and Banking*, 11(1):32–46.

Nakamura, E. and Steinsson, J. (2018). High-frequency identification of monetary non-neutrality: The information effect. *Quarterly Journal of Economics*, 133(3):1283–1330.

Patra, S. (2022). Oil price shocks, firm entry and exit in a heterogeneous firm model. *Canadian Journal of Economics*, 55(1):349–378.

Peersman, G. and Wauters, J. (2024). Heterogeneous household responses to energy price shocks. *Energy Economics*, 132:1–16.

Ramey, V. A. (2016). Macroeconomic shocks and their propagation. *Handbook of Macroeconomics*, 2:71–162.

Wong, A. (2021). Refinancing and the transmission of monetary policy to consumption. *Working Papers Princeton University Economics Department*, 57.

Recent SNB Working Papers

2024-11 Marc-Antoine Ramelet, Anna Zeitz:
Oil price shocks and household heterogeneity: the income side

2024-10 Jayson Danton, Terhi Jokipii:
A decade of low interest rates: impact on Swiss bank profitability

2024-09 Anders Brownworth, Jon Durfee, Michael Junho Lee, Antoine Martin:
Regulating decentralized systems: evidence from sanctions on Tornado Cash

2024-08 Valentin Grob, Gabriel Züllig:
Corporate leverage and the effects of monetary policy on investment: a reconciliation of micro and macro elasticities

2024-07 Thomas Nitschka:
Evidence on the international financial spillovers of the New York Bankers' Panic of 1907

2024-06 Milen Arro-Cannarsa, Rolf Scheufele:
Nowcasting GDP: what are the gains from machine learning algorithms?

2024-05 Jessica Gentner:
The role of hedge funds in the Swiss franc foreign exchange market

2024-04 Tobias Cwik, Christoph Winter:
FX interventions as a form of unconventional monetary policy

2024-03 Lukas Voellmy:
Decomposing liquidity risk in banking models

2024-02 Elizabeth Steiner:
The impact of exchange rate fluctuations on markups – firm-level evidence for Switzerland

2024-01 Matthias Burgert, Johannes Eugster, Victoria Otten:
The interest rate sensitivity of house prices: international evidence on its state dependence

2023-08 Martin Brown, Laura Felber, Christoph Meyer:
Consumer adoption and use of financial technology: "tap and go" payments

2023-07 Marie-Catherine Bieri:
Assessing economic sentiment with newspaper text indices: evidence from Switzerland

2023-06 Martin Brown, Yves Nacht, Thomas Nellen, Helmut Stix:
Cashless payments and consumer spending

2023-05 Romain Baeriswyl, Alex Oktay, Marc-Antoine Ramelet:
Exchange rate shocks and equity prices: the role of currency denomination

2023-04 Jonas M. Bruhin, Rolf Scheufele, Yannic Stucki:
The economic impact of Russia's invasion of Ukraine on European countries – a SVAR approach

2023-03 Dirk Niepelt:
Payments and prices

2023-02 Andreas M. Fischer, Pınar Yeşin:
The kindness of strangers: Brexit and bilateral financial linkages

2023-01 Laura Felber, Simon Beyeler:
Nowcasting economic activity using transaction payments data

2022-14 Johannes Eugster, Giovanni Donato:
The exchange rate elasticity of the Swiss current account

2022-13 Richard Schmidt, Pınar Yeşin:
The growing importance of investment funds in capital flows

2022-12 Barbara Rudolf, Pascal Seiler:
Price setting before and during the pandemic: evidence from Swiss consumer prices

SCHWEIZERISCHE NATIONALBANK
BANQUE NATIONALE SUISSE
BANCA NAZIONALE SVIZZERA
BANCA NAZIUNALA SVIZRA
SWISS NATIONAL BANK