Economic Effects of Television Exposure, Social Media and Habit Formation

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Abstract

Broadcast media such as television have spread rapidly worldwide in the last century. They provide viewers with access to new information and also represent a source of entertainment that unconsciously exposes them to different social norms and moral values. Although the potential impact of exposure to television content have been studied intensively in economic research in recent years, studies examining the long-term causal effects of media exposure are still rare. Therefore, Chapters 2 to 4 of this thesis contribute to the better understanding of long-term effects of television exposure.

Chapter 2 empirically investigates whether access to reliable environmental information through television can influence individuals' environmental awareness and pro-environmental behavior. Analyzing exogenous variation in Western television reception in the German Democratic Republic shows that access to objective reporting on environmental pollution can enhance concerns regarding pollution and affect the likelihood of being active in environmental interest groups.

Chapter 3 utilizes the same natural experiment and explores the relationship between exposure to foreign mass media content and xenophobia. In contrast to the state television broadcaster in the German Democratic Republic, West German television regularly confronted its viewers with foreign (non-German) broadcasts. By applying multiple measures for xenophobic attitudes, our findings indicate a persistent mitigating impact of foreign media content on xenophobia.

Chapter 4 deals with another unique feature of West German television. In contrast to East German media, Western television programs regularly exposed their audience to unmarried and childless characters. The results suggest that exposure to different gender stereotypes contained in television programs can affect marriage, divorce, and birth rates. However, our findings indicate that mainly women were affected by the exposure to unmarried and childless characters.

Chapter 5 examines the influence of social media marketing on crowd participation in equity crowdfunding. By analyzing 26,883 investment decisions on three German equity crowdfunding platforms, our results show that startups can influence the success of their equity crowdfunding campaign through social media posts on Facebook and Twitter.

In Chapter 6, we incorporate the concept of habit formation into the theoretical literature on trade unions and contribute to a better understanding of how internal habit preferences influence trade union behavior. The results reveal that such internal reference points lead trade unions to raise wages over time, which in turn reduces employment. Conducting a numerical example illustrates that the wage effects and the decline in employment can be substantial.

Deutsche Kurzfassung (German Abstract)

Rundfunkmedien wie das Fernsehen haben sich im letzten Jahrhundert in der ganzen Welt rasch verbreitet. Diese Medienquellen stellen ihren Zuschauern Zugang zu neuen Informationen bereit und dienen zeitgleich als eine Unterhaltungsquelle, die sie unbewusst mit sozialen Normen und andere Lebensweisen konfrontiert. Obwohl die potenziellen Auswirkungen von Fernsehinhalten in den letzten Jahren in der Wirtschaftsforschung intensiv untersucht wurden, sind Studien, die sich auf die Analyse langfristiger kausaler Effekte fokussieren, noch eher selten. Aus diesem Grund beschäftigen sich die Kapitel 2 bis 4 dieser Arbeit mit den langfristigen Auswirkungen des Fernsehkonsums.

In Kapitel 2 wird untersucht, ob der Zugang zu verlässlichen Umweltinformationen durch das Fernsehen das Umweltbewusstsein von Personen beeinflussen kann. In diesem Zusammenhang wird ein natürliches Experiment untersucht, bei dem Personen in einigen Regionen Ostdeutschlands aufgrund ihrer geografischen Lage bis 1989 kein westdeutsches Fernsehen empfangen konnten. Die Analyse exogener Variation des Fernsehempfangs zeigt, dass der Zugang zu objektiver Berichterstattung über Umweltverschmutzung sowohl das Umweltbewusstsein verstärken als auch die Wahrscheinlichkeit erhöhen kann, in Umweltinteressengruppen aktiv zu sein.

Kapitel 3 untersucht den Zusammenhang zwischen dem Zugang zu ausländischen Medieninhalten und Fremdenfeindlichkeit. Im Gegensatz zu den staatlichen Fernsehsendern in der Deutschen Demokratischen Republik konfrontierte das westdeutsche Fernsehen seine Zuschauer regelmäßig mit ausländischen (nicht-deutschen) Sendungen. Die Analyse von Umfrage- und Regionaldaten deutet auf eine anhaltende reduzierende Wirkung ausländischer Medieninhalte auf Fremdenfeindlichkeit hin.

Kapitel 4 befasst sich mit einem weiteren Merkmal des westdeutschen Fernsehens. Anders als im ostdeutschen Fernsehen waren in westdeutschen Programmen unverheiratete und kinderlose Serien- und Filmcharaktere deutlich überrepräsentiert. Unsere Ergebnisse zeigen, dass der Empfang dieser Programme einen negativen Einfluss auf Eheschließungs- und Geburtenraten hatte, sich jedoch positiv auf die

Scheidungsraten auswirkte. Die Analyse von Umfragedaten deutet darauf hin, dass insbesondere Frauen von den unterschiedlichen Rollenvorbildern im Fernsehen beeinflusst wurden.

Kapitel 5 untersucht den Einfluss von Social Media Marketing in Equity Crowdfunding-Kampagnen. Durch die Analyse von 26.883 Investitionsentscheidungen auf drei deutschen Equity-Crowdfunding-Plattformen zeigen unsere Ergebnisse, dass Startups den Erfolg ihrer Equity-Crowdfunding-Kampagne durch Social-Media-Posts auf Facebook und Twitter beeinflussen können.

In Kapitel 6 untersuchen wir in einem theoretischen Modell, inwieweit sich vergleichende Präferenzen auf gewerkschaftliche Lohnverhandlungen auswirken und welche Konsequenzen sich hieraus ergeben. Unsere Ergebnisse verdeutlichen, dass solche Präferenzen die Gewerkschaft dazu veranlassen, die Löhne im Laufe der Zeit zu erhöhen, was wiederum zu einem Rückgang der Beschäftigung führt. Anhand eines numerischen Beispiels veranschaulichen wir, dass die Lohneffekte und der Beschäftigungsrückgang erheblich sein können.

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Looking back, my time as a Ph.D. student was much more than a direct path to an academic title. Instead, it was a fascinating period in which I pursued exciting questions, met inspiring people, visited incredible places all around the world, and - most importantly - embarked on a journey where I had many challenges to overcome. Along this trail, however, I was accompanied by some crucial people, without whom I would often have lost my way.

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Trier, September 2022 *Sven A. Hartmann*

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Chapter 1

Introduction

Over the past century, mass media has undergone enormous changes and spread rapidly throughout the entire world. With the emergence of broadcast media and the founding of the first television stations in the first half of the 20th century, the geographical distribution and the variety of content increased constantly. For example, the worldwide number of television sets tripled from 550 million to 1.4 billion sets in just 16 years from 1980 to 1996 (Thomas, 2003). In 2019, the number of households owning a television set was already as high as 1.7 billion, and estimates suggest that this figure will continue to rise (Stoll, 2022a). However, not only have the number of television sets and the range of different content on offer increased expeditiously over time, but media consumption has also risen drastically. In 2020, the average time spent watching television was 235 minutes per day across all European countries, making it one of the most time-consuming leisure activities (Stoll, 2022b). In addition to traditional mass media such as television and radio, digital media is becoming increasingly important. They reinforce the accessibility of media content through the increasing availability of new technologies such as social media networks and the omnipresence of media content on numerous mobile devices. In July 2022, there were 4.7 billion social media users worldwide, on average spending almost 2.5 hours per day on social media. In the previous year, the number of users was 5.1 % lower, corresponding to a growth of more than seven new users per second (DataReportal, 2022).

In today's society, these new technologies play an increasingly important role together with traditional mass media. They enable the exchange of opinions and can spread ideas and social movements rapidly across the globe, as we have seen with *Fridays for Future* or the *MeToo* movement in recent years. In addition, it is even possible that they affect the outcome of elections, which is why in the 2020 U.S. presidential election, the estimated cost of political advertising spending on radio, television, and digital media exceeded $ 1.5 billion (Wesleyan Media Project, 2020). The significance attributed to mass media is also reflected in the fact that their freedom and independence are protected in the constitutions of most modern democracies. At the

same time, however, their autonomy is deliberately undermined in other countries, as they are used for propaganda purposes or to discredit opposition movements.

The issue of mass media is not only of crucial importance for policymakers. In recent years, they have also increasingly become the focus of economic research due to their potential to influence the behavior and economic decisions of individuals in a variety of ways. To comprehensively understand the impact of mass media exposure, it appears essential to consider the existing literature systematically. While most literature reviews categorize existing research contributions according to the particular outcomes (what), the specific medium (which), or the specific countries of investigation (where), it may be useful to differentiate how media content affects individuals instead. In this context, we distinguish two channels of impact: (i) provision of information and (ii) changes in preferences.[1]

First of all, mass media represent the primary source of information for most individuals, and previous studies show that they can influence an individual's decision-making process and, thus, their behavior. For instance, television programs or newspaper outlets can alter a wide range of political outcomes, like the behavior of voters (Gentzkow, 2006, DellaVigna and Kaplan, 2007, Enikolopov et al., 2011), protests (Bernini, 2022), or even government responsiveness (Besley and Burgess, 2002, Strömberg, 2004). Furthermore, these effects are not limited to political outcomes. Media broadcasts may also contain information about desirable or undesirable health behavior, which might educate their audience about HIV prevention options (Kennedy et al., 2004) or raise awareness regarding the negative consequences of smoking (Farrelly et al., 2009). Moreover, providing information through mass media can also positively impact children's knowledge, language acquisition, and interest in topics like entrepreneurship, as several studies have demonstrated (Gentzkow and Shapiro, 2008, Keefer and Khemani, 2014, Kearney and Levine, 2019, Bjorvatn et al., 2020). Finally, an extensive body of literature indicates that product-related information in advertising can influence people's purchasing decisions and even their material aspirations (Bursztyn and Cantoni, 2016, Hyll and Schneider, 2013).

The second channel through which media content can influence people's decision-making processes is by altering their preferences, causing them to proceed (or evaluate) existing information differently. In particular, this influence occurs when individuals are

[1] Regardless of the content, the activity of consuming media alone could impact individuals' behavior, as they have less time available for other activities (substitution effect) (Olken, 2009). However, since this thesis focuses on the consequences of media content, we do not consider this alternative further. La Ferrara (2016) discusses this potential mechanism in more detail.

exposed to role models in the media (e.g., a favorite television character). For example, a person may be sufficiently informed about the importance of cancer screenings, but only decides to go for a screening when influenced by a role model who also opts for a cancer screening (Green, 2006).[2] While individuals tend to consciously choose to watch news programs or documentaries to obtain information, effects related to the second channel might occur subconsciously (DellaVigna and La Ferrara, 2015).[3] Numerous studies have found evidence that role models and modern lifestyles contained in entertainment television can weaken existing social norms and thereby affect fertility decisions (La Ferrara et al., 2012), divorce rates (Chong and La Ferrara, 2009), or tendencies towards domestic violence (Jensen and Oster, 2009).

As illustrated by the articles mentioned, many previous studies have attempted to examine the effects of mass media exposure, focusing on various areas of life (e.g., fertility decisions, voting behavior, or purchasing habits). In many contributions, however, it is only possible to establish a correlation and not a causal relationship. This lack of causality is particularly pronounced in empirical and non-experimental analyses, which might suffer from endogeneity issues, reverse causality, or selection bias (Dahl and DellaVigna, 2009). Outside of a laboratory setting, individuals consciously decide whether they consume content from mass media and, if so, which content to choose. As a result, unobserved characteristics of individuals may influence both their choice of media content and the outcomes that are to be studied (Price and Dahl, 2012). Empirical evidence suggests that individuals tend to select the content that reflects their own opinions and attitudes, causing reverse causality problems (Gentzkow and Shapiro, 2010). As an example, it is not immediately apparent whether watching violent movies leads to more violent behavior or whether more violent individuals are more likely to watch violent movies. For these reasons, similar questions were investigated, primarily in laboratory experiments, since these settings allow the problems stated above to be addressed. While these studies can lead to credible estimates of short-term impacts, long-term effects remain mostly ambiguous (Dahl and DellaVigna, 2009). Therefore, researchers usually face a trade-off. Identifying long-term effects makes it increasingly challenging to ensure a causal relationship and vice versa.

[2]This example also illustrates that, in reality, both channels might occur simultaneously, making it difficult to separate them from each other.

[3]Individuals' demand for media content is mainly driven by their need for entertainment. Influences on their preferences usually occur as a side effect (DellaVigna and La Ferrara, 2015).

The objective of the first part of this thesis is, thus, to improve on existing studies by identifying the long-term causal effects of exposure to media content. To address the potential issue of individuals self-selecting themselves into certain media programs, we exploit the exogenous variation of Western television reception in the German Democratic Republic (GDR). The natural experiment of some GDR regions being able to receive West German television (WGTV) prior to reunification was actually a subset of a far wider experiment. Numerous studies using West Germany as a control group have examined how individuals' preferences and behavior were affected by the establishment of socialism in East Germany following World War II (Alesina and Fuchs-Schündeln, 2007, Heineck and Süssmuth, 2013, Bauernschuster and Rainer, 2012, Friehe and Mechtel, 2014, Campa and Serafinelli, 2019, Friehe and Pannenberg, 2020). Preexisting differences between East and West Germany before World War II and selective migration at the beginning of the GDR period, however, raise doubts about whether German division and reunification represent a natural experiment (Becker et al., 2020). Crucial for our identification strategy is that geographic features, namely the distance to the West German transmission towers and the landscape's topography, were the sole determinants of whether the television signal strength was sufficiently high to allow households to receive these television channels. This fact allows us to interpret the exogenous variation in the reception of WGTV programs as a natural experiment.

In the recent past, several studies have already investigated the consequences of GDR citizen being able to receive Western media. In an early article Kern and Hainmueller (2009) examine whether access to Western media undermined the authoritarian rule of the socialist government. Contrary to their initial assumption, East Germans exposed to WGTV were, on average, more supportive of the SED regime and more satisfied with life in the GDR. Kern (2011) and Crabtree et al. (2015) ascertain that WGTV did not influence the probability of protest events, nor the speed of protest diffusion during the peaceful revolution in 1989. Subsequent studies have delved deeper into the topic by investigating whether the reception of WGTV influenced voting behavior (Friehe et al., 2020), consumer preferences (Bursztyn and Cantoni, 2016), crime (Friehe et al., 2018), material aspirations (Hyll and Schneider, 2013), and locus of control (Hennighausen, 2015) among East Germans. The first part of this thesis, which consists of three stand-alone articles, adds three additional aspects to the existing literature that have not been considered so far: environmental awareness, xenophobia, and preferences regarding

partnership and family planning.[4] In each of the three chapters, the natural experiment is presented with a focus on the particular research question.

Chapter 2 analyzes the role of WGTV in altering environmental awareness and pro-environmental behavior among the East German population. Many East German regions suffered from extremely high pollution during the GDR period. While the ruling party of the GDR, the Socialist Unity Party of Germany (*Sozialistische Einheitspartei Deutschlands*, SED), tried to hide the extent of pollution from the public in order to avoid protests, WGTV represented a reliable source of objective information on the state of the environment. The analysis of survey data conducted by the Central Institute for Youth Research (*Zentralinstitut für Jugendforschung*) before the German reunification shows that access to WGTV enhanced the environmental awareness among GDR citizens and diminished their trust in the SED's environmental policy. By using data from the German Socio-Economic Panel (SOEP), our results also show that the effect of WGTV exposure remains significant after reunification, suggesting a long-term impact over more than two decades. To the best of my knowledge, this is the first study analyzing the causal effect of media exposure on individuals' environmental awareness, thereby identifying this kind of persistent impact. Moreover, the findings reveal a positive association between access to Western media and the likelihood of being involved in environmental interest groups. Finally, the analysis of county-level data shows that East German counties with previous WGTV exposure exhibit higher election results for the Greens (*Bündnis 90/Die Grünen*) in the first two federal elections in reunified Germany. Overall, Chapter 2 ties in with the first channel of impact described above and shows how the provision of information through mass media can influence individuals' environmental attitudes and pro-environmental behavior.

Chapter 3, which is joint work with Lars Hornuf and Marc Oliver Rieger, exploits the fact that WGTV frequently exposed their audience to foreign (non-German) content and investigates whether exposure to foreign media can mitigate xenophobic attitudes. While several studies using laboratory experiments provide evidence that media content is capable of reducing negative attitudes towards foreigners, causal evidence in non-experimental studies still remains rare. This particularly applies to long-term effects. The analysis of survey data from the periods before and after reunification reveals that East Germans with WGTV exposure exhibit more positive attitudes towards foreigners. Furthermore, the recent introduction of the "Living in the former GDR" (*Leben in der*

[4]Since GDR citizens watched WGTV for entertainment value and in addition to gathering uncensored news, their selection into these programs is most likely unrelated to their preferences regarding environmental protection, xenophobia, partnership, or family planning.

ehemaligen DDR) questionnaire conducted by the SOEP allows the investigation of long-term effects. Our estimates show that WGTV exposure not only has a positive effect on East Germans' attitudes toward refugees, but also increases the likelihood of supporting refugees, for example, by increasing their willingness to donate to refugee aid. In this chapter, we again combine survey evidence with the analysis of county-level data. In doing so, we consider two different measures to capture xenophobic attitudes: first, the electoral success of right-wing parties in federal elections from 1990 to 2017, and second, hate crimes against refugees. We document that East German regions with former WGTV reception exhibit lower election outcomes for right-wing parties and fewer hate crimes against refugees. Overall, we provide non-experimental evidence that exposure to foreign media content and television characters can reduce xenophobic attitudes persistently. Thus, Chapter 3 contributes to the literature addressing the second channel of impact (changes in preferences).

Previous studies have shown that attitudes toward gender roles diverged between East and West Germans after the division of Germany, with East Germans exhibiting more egalitarian sex-role attitudes (Bauernschuster and Rainer, 2012, Campa and Serafinelli, 2019, Boelmann et al., 2021). Chapter 4 examines whether the fact that WGTV programs regularly confronted their audience with unmarried and childless characters affected preferences regarding partnership and family planning. In this way, the study contributes to the existing literature showing that exposure to less traditional role models in television programs can increase divorce rates (Chong and La Ferrara, 2009) and reduce fertility rates (La Ferrara et al., 2012). In addition, modern role models can reduce the acceptability of domestic violence against women and enhance women's autonomy (Jensen and Oster, 2009). However, these studies investigate natural experiments that took place in developing countries, while the present study focuses on a developed country, the GDR. The analysis of county-level data shows that East German regions with former access to WGTV exhibit significantly lower marriage and birth rates as well as significantly higher divorce rates. Similarly, the analysis of survey data from the SOEP reveals that East Germans with former access to WGTV exhibit a higher likelihood of being divorced and a lower probability of being married or having children. Finally, by examining survey data from the late 1980s, the estimates suggest that WGTV programs predominantly influenced women's attitudes. Overall, this chapter provides robust evidence that exposure to role models on television can affect an individual's preferences.

While the first part of this thesis focuses on traditional mass media, Chapter 5, which is joint work with Maik Eisenbeiß and Lars Hornuf, deals with social media as a source of information. In recent years, social media has become increasingly important as a

resource of information. Whereas the proportion of the population using social media as a source of information is still relatively low in countries such as Japan (28 %), Germany (32 %), and the UK (38 %); the share is significantly higher in other regions such as Brazil (64 %), Greece (71 %) or Kenya (82 %) (Newman et al., 2022). The reporting of print, broadcast, and online news organizations is usually guided by journalistic ethics and standards, implying that the information provided should be accurate and independent (Society of Professional Journalists, 2014, International Federation of Journalists, 2019). These principles, however, broadly fall away if individuals rely on user-generated content on social media. Nonetheless, social media is also becoming increasingly important in the context of gathering financial information (Jiao et al., 2020). The relationship between social media and the stock market has been studied extensively on this matter in recent years (Yu et al., 2013, Chen et al., 2014, Siikanen et al., 2018). In contrast, the role of social media in equity crowdfunding campaigns has hardly been studied so far.[5] For this reason, we contribute to the existing literature by examining whether startups can influence the success of their crowdfunding campaign by affecting the investment decisions of potential investors through self-generated social media content on Facebook and Twitter. We differentiate between informative posts that provide investors with information on the startup and its crowdfunding campaign and persuasive posts that focus on changing investor preferences without necessarily providing decision-relevant information. In this manner, Chapter 5 examines the two impact channels presented earlier simultaneously (provision of information and changes in preferences). By analyzing 26,883 investment decisions on three large German equity crowdfunding platforms, our results show that both types of posts positively impact the number of investments a startup receives. Furthermore, persuasive posts can also significantly increase the investment volume.

Chapter 6 of this thesis, which is joint work with Laszlo Goerke, analyzes how habit formation affects collective bargaining outcomes in a theoretical framework. In economics, habit formation describes a subconscious routine of comparing wages against a certain reference point, which can either be external or internal (Havranek et al., 2017).[6] In the case of external reference points, individuals compare their current wage with the wage of other individuals, such as their friends, neighbors, or colleagues at the workplace. There is ample evidence showing that labor supply (Blomquist, 1993),

[5]Equity crowdfunding represents a sub-category of crowdfunding in which firms issue financial securities to obtain capital (Hornuf and Schwienbacher, 2018).

[6]The concept of habit formation has also been covered recently in the context of social media consumption (e.g., Goh et al., 2019).

job satisfaction (Clark and Oswald, 1996, Card et al., 2012), and effort provision (Clark et al., 2010, Cohn et al., 2014) depend on a person's own and relative income. Moreover, the concept of external reference points has already been studied in the context of collective bargaining (Oswald, 1979, Raaum, 1986, de la Croix, 1994, Mauleon et al., 2014, Goerke and Hillesheim, 2013, Chang et al., 2018). In contrast, there is a lack of research examining the impact of internal references points for collective bargaining outcomes. In the case of internal reference points, individuals compare their current wages to their own wages from the past and evaluate improvements positively, implying that wages chosen by a union affect the future utility of their members. Our findings indicate that such internal reference points induce the union to increase wages and decrease employment over time. This result applies to various analytical extensions. Furthermore, conducting a numerical example illustrates that the wage and employment effects are not economically negligible. Our results may explain why unions, on the one hand, still try to raise wages even when the economic situation has deteriorated and, on the other hand, do not fully exploit the scope for wage increases in times of economic recovery.

Finally, Chapter 7 summarizes the most important insights inferred in the preceding chapters of the thesis and contains an outlook on future research needs.

Chapter 2

Fog or smog? The impact of uncensored reporting on pollution on individuals' environmental awareness

This paper analyzes the effect of exposure to foreign mass media on environmental awareness and pro-environmental behavior. We exploit a natural experiment occurring in the German Democratic Republic, where the reception of West German television was determined by geographic characteristics. Western media was a reliable source of information about environmental pollution in the German Democratic Republic, a topic that was not covered in the East German state media. Using survey data conducted before the German reunification we find that access to Western media increased the environmental awareness among GDR citizens. The analysis of data from the German Socio-Economic Panel supports this finding and reveals a positive and persistent effect on the probability of being active in environmental organizations. Finally, by examining election data, we show that counties with former West German television reception were more likely to vote for the Greens in the first two federal elections in reunified Germany.

2.1 Introduction

The consequences of environmental pollution and the associated destruction of ecosystems represent one of the main issues of the 21st century. Global impacts include, among others, climate change, ozone depletion, species extinction, as well as marine pollution. However, the consequences are also evident at national levels in the poisoning of soils, the pollution of fresh water, and the increasing contamination of the air with pollutants. In 2019, for instance, 307,000 premature deaths among the 27 EU member states were attributed to chronic fine particulate matter exposure (European Environment Agency, 2021). One of the primary missions of policy and scholars is to create and foster collective environmental awareness among the population and to encourage pro-environmental behavior.[7] Empirical evidence shows that providing specific information on the state of the environment and the health consequences of pollution plays a crucial role in changing individuals' behavior, especially since many of the repercussions linked to a degraded environment are often not immediately perceptible (Madajewicz et al., 2007, Jalan and Somanathan, 2008, Barwick et al., 2019). One way of making this type of information accessible to a larger part of the population is through mass media. With this in mind, researchers and policymakers are increasingly interested in understanding how mass media affects public attitudes and individuals' behavior (Kearney and Levine, 2015).

In this paper, we address the question of whether access to environmental information through mass media can influence individuals' environmental awareness and pro-environmental behavior. To avoid self-selection issues, we analyze a natural experiment that occurred in the German Democratic Republic (GDR). While most GDR citizens had access to West German television (WGTV) over several decades, which represented a reliable source of environmental information, individuals in certain regions of the GDR were not able to receive these programs as their residence was located too far away from the West German transmission masts. We exploit this exogenous variation in television signal reception in our study. First, we analyze survey data from the Central Institute for Youth Research (*Zentralinstitut für Jugendforschung*) conducted before German reunification. Our results reveal that individuals who received WGTV had greater concern for environmental issues and, in turn, were less likely to trust the environmental policies of the GDR government. Second, we examine

[7] Pro-environmental behavior includes private actions such as recycling or buying voluntary carbon offsets or public actions like signing petitions or being active in environmental interest groups (Hunter et al., 2004).

survey data collected after reunification from the German Socio-Economic Panel (SOEP). Our findings show that individuals living in regions with former WGTV access are more concerned about the potential consequences of environmental pollution. In addition, they were more likely to be active in environmentally supportive organizations, which is considered pro-environmental behavior (Hunter et al., 2004). Finally, the analysis of election data shows that regions with former WGTV reception were more likely to vote for the Greens (*Bündnis 90/Die Grünen*), a green political party, in the federal elections after reunification. However, this effect is only visible in the first two federal elections in reunified Germany (1990 and 1994) and vanishes within the first decade after reunification.

With the present study, we contribute to two strands of the literature. First, we relate to the empirical literature examining the influence of media content on public environmental awareness and pro-environmental behavior. Although numerous studies have already examined how the issue of pollution and its consequences are portrayed in the mass media (e.g., Schmidt et al., 2013, Vu et al., 2019, Hase et al., 2021), there is little research that investigates the actual relationship between media coverage and the environmental awareness of individuals. There are, however, some exceptions. In an early article, Shanahan et al. (1997) analyze the relationship between television viewing and environmental concerns. They find evidence for a positive correlation between television consumption and a general apprehension about the environment. In contrast, Mikami et al. (1999) show that the level of exposure to television is negatively correlated with pro-environmental attitudes. By distinguishing between different forms of television content, Holbert et al. (2003) provide evidence that television news and nature documentaries can enhance pro-environmental behaviors (e.g., recycling, purchasing environmentally friendly products, or being more energy efficient). Brulle et al. (2012) construct a media index that quantifies the coverage of climate change in major television networks in the U.S., *The New York Times*, and weekly magazines in the period from 2002 to 2010. They conclude that increased media coverage of climate change leads to a higher level of public concern. Finally, by analyzing Japanese newspaper coverage of global warming from 1998 to 2007, Sampei and Aoyagi-Usui (2009) arrive at similar results.

One potential reason why some of the aforementioned studies arrive at contradictory results is the self-selection of individuals into specific media formats. Individuals make conscious choices about which television programs they consume and which they avoid. In doing so, they usually select the content consistent with their own opinions and beliefs (Gentzkow and Shapiro, 2010). As a result, it is possibly not the viewing of documentaries and news that leads to greater environmental awareness but

rather the fact that people who are already environmentally aware are more likely to consume such content. The associated problem of reverse causality implies that many studies cannot establish a causal relationship between media content and environmental awareness. To avoid endogeneity problems, Jacobsen (2011) exploits regional variation in the release of Al Gore's environmental documentary *An Inconvenient Truth*. By employing a difference-in-difference design, he finds that individuals living within a 10-mile radius around a movie theater, in which the documentary is shown, purchase significantly more voluntary carbon offsets. In a similar study, Tu et al. (2020) analyze the unexpected online release of the Chinese documentary *Under the Dome* in February 2015, which reports on environmental pollution by state-owned energy companies and the adverse health effects of air pollution. Utilizing longitudinal data, they report that the documentary significantly increased public awareness of environmental health risks and the willingness to pay for better air pollution controls. Nevertheless, while Qin et al. (2020) confirm that the documentary *Under the Dome* enhanced public concerns about air pollution, they do not find an impact on public protective behaviors (e.g., wearing face masks or reducing car driving). Overall, the studies of Jacobsen (2011), Tu et al. (2020), and Qin et al. (2020) have shown that media can have positive effects on environmental awareness. While these studies allow for a causal analysis of media effects, they focus on information campaigns that occur only at a specific point in time. Due to this fact, most studies only identify short-term effects on public environmental awareness and pro-environmental behaviors. To the best of our knowledge, the present article is the first to study the impact of access to environmental information through mass media on environmental awareness using a natural experiment with a long-term treatment period (several decades).

The second strand of literature to which we contribute, deals with the reception of WGTV in the GDR. In recent years, several studies have used the exogenous variation in television reception in the GDR, focusing on political outcomes (Kern and Hainmueller, 2009, Kern, 2011, Crabtree et al., 2015, Friehe et al., 2020), consumption behavior (Bursztyn and Cantoni, 2016), material aspirations (Hyll and Schneider, 2013), crime (Friehe et al., 2018), xenophobia (Hornuf et al., 2022), and individual beliefs about what drives success in life (Hennighausen, 2015). We extend this literature by focussing on an outcome that has not been studied so far: environmental awareness.

This paper proceeds as follows: In the next section, we briefly review the history of divided Germany, describe the extent of pollution in the GDR, and highlight the role of WGTV. In Section 2.3, we introduce the identification strategy. While we analyze the effect of WGTV on environmental awareness before reunification in Section 2.4, we examine possible long-term effects in Section 2.5. Finally, Section 2.6 concludes.

2.2 Institutional background

2.2.1 East and West Germany after World War II

In the aftermath of World War II, the former German Reich was divided among the four victorious Allied powers: the United States, Great Britain, France, and the Soviet Union. While the occupation zone of the Soviet Union consisted of the eastern territories, Western Germany was divided among the other three occupying powers. As with the rest of the country, Berlin, the former capital of the German Reich, was also divided into four occupation zones spearheaded by the Allied forces. Consequently, the western areas of Berlin, controlled by the United States, Great Britain and France, were completely surrounded by the Soviet occupation zone. On May 23, 1949, the Federal Republic of Germany was founded, consisting of the three western occupation zones, while only four and a half months later, the GDR emerged from the Soviet occupation zone. While West Germany developed into a parliamentary democracy with a social market economy, the GDR became a socialist state with a one-party system and a state-controlled planned economy. The increasing migration of GDR citizens to the West prompted the GDR government to tighten controls on their western border, which eventually led to the creation of a so-called "restricted zone" (*Sperrzone*) along the inner German border, as well as the construction of the Berlin Wall. At the end of the 1980s, demonstrations for political freedom increased in the GDR, finally leading to the fall of the Berlin Wall on November 9, 1989, and to the German reunification on October 3, 1990.

2.2.2 Environmental pollution in the GDR

The Socialist Unity Party of Germany (*Sozialistische Einheitspartei Deutschlands*, SED), the ruling party in the GDR, emphasized the importance of environmental protection for the well-being of their citizens in Article 15(2) of the GDR Constitution as early as 1974 and thus established the maintenance of clean air and bodies of water as a state objective (Federal Agency for Civic Education, 2017). However, the reality in Eastern Germany was completely different. Due to the dependence of the energy and production system on lignite combined with outdated power plants, the pollution in the air was extremely high in many places in the GDR (Welfens, 1993, Stinglwagner, 1999). Thus, the per capita emissions of sulfur dioxide and particulate matter, for instance, exceeded the values in West Germany by more than 15 times (Buck, 1996). In 1985, the GDR ranked first in Europe in terms of sulfur dioxide and particulate emission (Welfens, 1993). Similarly, bodies of water were also highly polluted, as the chemical industry

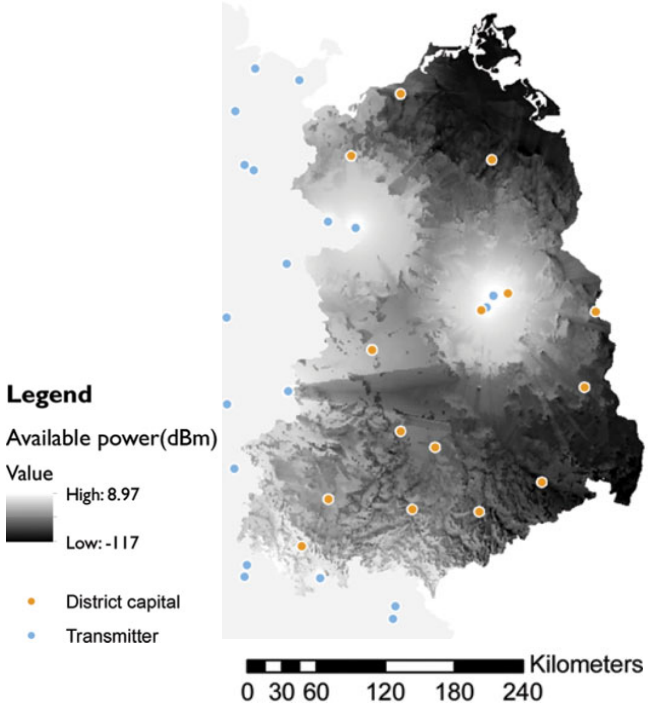
discharged its untreated effluent water into the rivers and lakes (Wensierski, 1986). Due to high levels of pollution, about 86 % of surface waters were classified as unsuitable for animal husbandry, drinking water, or recreational purposes in 1989 (Buck, 1996). Legal environmental regulations were supposed to stop these developments from occurring. However, these regulations were often overridden by the government itself in order not to restrict the production of consumer goods. Since the GDR government saw itself in economic competition with West Germany, it gave priority to economic development over environmental protection (DeBardeleben, 1988).

2.2.3 The role of West German television in the GDR

On February 1, 1987, West Berlin had its first level one smog alert of the year. While the West German government immediately reacted to the high air pollution with driving bans, the government of the GDR concealed the high pollution levels from its citizens and explained the atmospheric conditions with foggy weather (DeBardeleben, 1988). Even though such statements from the government aroused distrust among many East Germans, it was difficult for them to obtain uncensored information about the actual state of the environment, as the government actively tried to hide the true extent of the pollution from the public to prevent the emergence of protest movements (Welfens, 1993, Buck, 1996). For this reason, the SED issued an ordinance in 1983 prohibiting the publication of environmental data by both public institutions and voluntary environmental organizations (Hager, 1992). Moreover, there was no independent reporting in the GDR that could have informed citizens about the state of the environment. The media landscape was characterized by systematic censorship by the SED government, which used newspapers and television broadcasts to support their socialist propaganda (Großmann, 2015). As a result, the work of journalists, authors, and program directors was constantly subject to control and monitoring, and thus violations of environmental regulations, in many cases, went undetected (Kochanowski et al., 2012).

However, the general population was aware of this situation and questioned the credibility of the East German media. Under these circumstances, the inhabitants of the GDR often tried to obtain information from the West. While the government imposed import bans on Western print media and enforced the import bans through strict border controls, the SED was unable to prevent the reception of WGTV programs (Kuschel, 2016). Initial attempts to block the signals from the WGTV towers failed (Boyd, 1983, Kuschel, 2016). Consequently, the only circumstance that prevented the reception of WGTV was the distance from the Western television towers being too great. Since the

FIGURE 2.1: Reception of WGTV in the GDR



Note: This figure shows the WGTV coverage in East Germany in 1989. Each blue dot represents a WGTV transmitter. In bright areas, there was a higher signal strength and thus better television reception. In contrast, there was little to no reception in dark areas. The orange dots represent East Berlin and the 14 district capitals. This map is reproduced and slightly modified from Crabtree et al. (2015).

West German government built numerous television towers along the inner German border, as well as in the exclave of West Berlin, the majority of the GDR population lived close enough to one of these transmitters to gain access to uncensored news via WGTV. As shown in Figure 2.1, only the north-eastern and south-eastern regions of the GDR were not able to receive West German programs. In contrast to the East German media, the broadcasts of the two public WGTV channels, ARD (First German Television) and ZDF (Second German Television), were considered trustworthy by the public (Kern and Hainmueller, 2009). This was one of the reasons why the WGTV stations achieved high audience ratings among the citizens of the GDR. By the end of the 1980s, about 85 % of the East German population received and regularly watched West German programs (Förster, 1995, Müller, 2000), which they perceived as the only "window to the world" (Stiehler, 2001, Hömberg, 2002). Through this window, the citizens of the GDR also

learned about the forest dieback, the extreme air pollution caused by lignite mining, and the pollution of lakes and rivers by the chemical industry (DeBardeleben, 1988).[8]

2.3 Empirical strategy

2.3.1 Treatment definition

To investigate whether individuals' environmental awareness can be influenced by access to uncensored news coverage, we take advantage of the fact that some regions in the GDR were able to receive WGTV programs prior to reunification. Since the reception of WGTV depended exclusively on the geographic features, we can assume that access to these programs was exogenous, which allows us to identify a causal effect. Calculations of the WGTV signal based on signal propagation models and anecdotal evidence indicate that regions without WGTV reception were located in the northeastern and southeastern parts of the GDR (see Figure 2.1).[9] These regions represent the control group in our study, whereas the regions with WGTV reception constitute the treatment group.

2.3.2 Conditions for identification

To conclude causality, three conditions must be met.

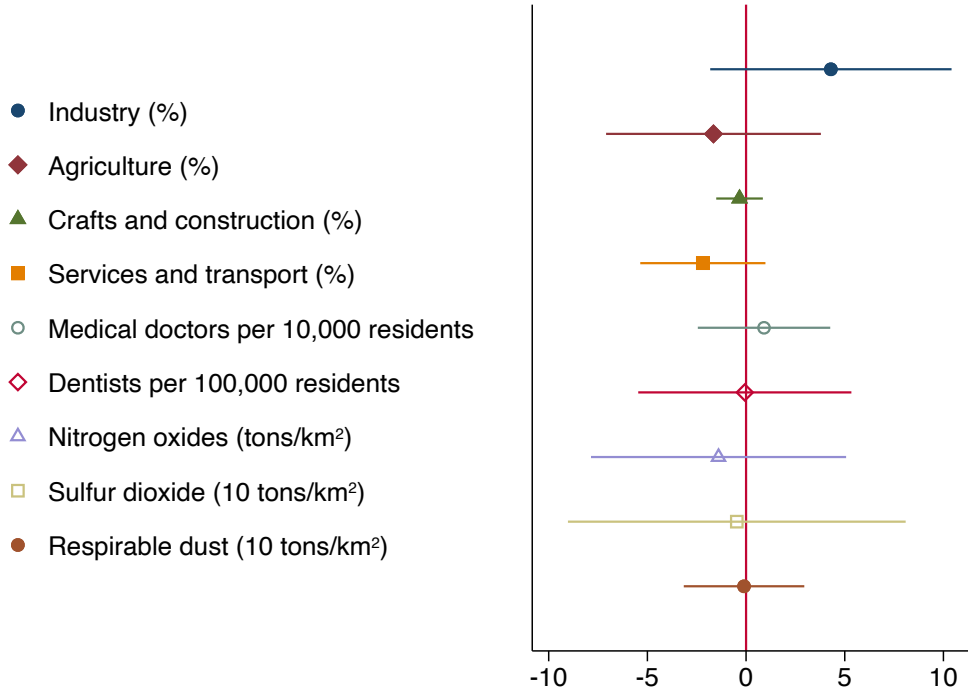
Condition 1: No differences between treatment and control regions
First of all, it is essential that treatment and control regions differ in their access to WGTV, but not in other characteristics. For this reason, we use data from the GDR statistical yearbooks to examine whether such differences exist. Table A.1 in the appendix shows that both regions were comparable in a wide range of demographic and economic conditions in the first recorded year in 1955 (before WGTV became popular) and the last year of the GDR period in 1989.[10] The socio-economic measures include, among

[8] In some cases, violations of environmental regulations were secretly filmed and sent to broadcasters in West Germany. For example, on June 25, 1988, a group of environmental activists made video recordings in the Bitterfeld area, showing the toxic waste dump "*Freiheit III*"(Freedom III) and the *Silbersee* (Silver Lake), which was contaminated with highly sulfurous sludge. Three months later, on September 27, 1988, public television in West Germany reported extensively on these recordings. This made the extent of the environmental disaster in the Bitterfeld area public for both the West German and parts of the East German population (Mitteldeutscher Rundfunk, 2019).

[9] Such calculations were performed by Crabtree et al. (2015) and Bursztyn and Cantoni (2016).

[10] Kern (2011), Hyll and Schneider (2013), and Bursztyn and Cantoni (2016) report similar results, also indicating that there were no significant differences between treatment and control regions.

FIGURE 2.2: Differences in county characteristics between treatment and control regions



Note: The figure presents the estimated coefficients from bivariate regressions in which the treatment indicator is used as independent variable. The confidence intervals shown are set at the 95 % level of statistical significance. Data source: Crabtree et al. (2015).

others, population density, the share of women, suicides per inhabitant, or sales per capita. Overall, these findings seem to be reasonable, given that the SED focused on the equalization of regional differences (Hyll and Schneider, 2013).

In addition to general socioeconomic characteristics, it is also vital to examine whether there were any systematic differences between both regions with respect to environmental pollution. This is crucial as it allows us to rule out the possibility that differences in environmental awareness might be based on the fact that inhabitants in the treatment regions were perhaps more often confronted with or more strongly affected by the negative consequences of environmental pollution. In this (hypothetical) case, differences between the treatment and control group could not be clearly attributed to the reception of Western media. However, as shown in Figure 2.2, we do not find evidence supporting such differences between the two groups. Both regions contain industrialized areas that may have been associated with higher levels of pollution, such as Dresden in the control group and Halle in the treatment group. Similarly, there are areas in both regions that are agriculturally dominated and thus less

densely populated, which is especially true for the northwestern and northeastern regions of the GDR. In this context, we also find that the share of employees working in industry and agriculture, respectively, is similar in both regions. Moreover, the analysis of environmental data, published after reunification, also shows that the two regions do not differ significantly in their nitrogen oxide, sulfur dioxide, or particulate matter pollution. Furthermore, we also find no systematic differences between areas with and without WGTV reception regarding medical care.

Condition 2: Individuals in the treatment area actually watched WGTV
It is also essential to verify that those individuals who could potentially receive WGTV, due to their geographic location, actually watched the corresponding programs. First of all, we can rule out the fact that technical differences between West and East German television systems hindered the access to WGTV programs. From a technical perspective, there were no issues in receiving West German programs with East German television sets (Federal Agency for Civic Education, 2016). Moreover, there were no language barriers, since the broadcast content was in German, and the vast majority of the GDR population had access to television sets. At the end of the 1980s, the proportion of households who owned their own television set was 98 %, with each household owning an average of 1.25 television sets (Staatliche Zentralverwaltung für Statistik, 1990, Müller, 2000). Survey evidence indicates that the majority of East Germans were already consuming WGTV programs in the 1970s. In 1987, 85 % of the GDR residents regularly watched WGTV (Förster, 1995).

Condition 3: No spatial sorting
Another aspect of great importance to our identification strategy is spatial sorting. Here we must distinguish between spatial mobility before and after reunification. To identify causal effects, we first have to rule out the possibility that the reception of WGTV caused GDR citizens to change their residence before reunification. Due to the centrally planned economy and its long-term production plans, the mobility of labor within the GDR was severely restricted (Kern and Hainmueller, 2009). In addition, the shortage of free housing made spatial mobility even more difficult (Hyll and Schneider, 2013). These reasons led to the fact that the number of migrations across county or municipality borders was at a very low level and was in constant decline since the 1950s. For example, the number of migrations across county borders per 100 inhabitants dropped from 4.8 in 1953 to 1.6 in 1970 (Grundmann, 1998, pp. 96–97). In West Germany, the figures were about three times higher in the same period. With this in mind, self-selection of GDR citizens into areas with and without WGTV access seems unlikely.

Finally, we need to consider East-West migration after reunification, since selective out-migration could potentially be a confounder to our estimates. Empirical evidence shows that there was indeed high immigration to West Germany for a short period after reunification from 1989 to 1990. However, this trend quickly eased again from 1991 onwards (Hunt, 2006). More importantly, Bursztyn and Cantoni (2016) report that the East German regions with and without former WGTV reception do not exhibit different migration patterns. Furthermore, they document similar migration flows between the treatment and control regions that are on a relatively small level.[11] Consequently, these migration flows are not expected to dilute a potential television effect.

2.4 The effect of West German television before reunification

In the first part of our empirical analysis, we use the "Living Conditions and Value Orientations of Students 1989" (*Lebensbedinungen und Werteorientierungen von Studenten 1989*) survey conducted by the Central Institute for Youth Research (*Zentralinstitut für Jugendforschung*) in the spring of 1989. Surveys of the Central Institute for Youth Research used to be classified during the GDR period but after reunification, the documents were declassified and made available for public use (Kern and Hainmueller, 2009). Instead of relying on face-to-face interviews, they used unmarked questionnaires that were completed in larger groups and then collected in sealed urns, to ensure the respondents' anonymity (Friedrich, 1990, Kern and Hainmueller, 2009).

The "Living Conditions and Value Orientations of Students 1989" survey was aimed at students from universities, colleges and vocational schools in seven districts of the GDR. A total of 3,918 people aged 18 to 34 participated in this survey.[12] In addition to the respondents' socioeconomic information, the survey also contains a question on how regularly the respondent watched WGTV. The respondents could answer this question on the following scale: *never*, *rarely*, *once a week*, *several times a week*, or *daily*. Furthermore, the survey includes several attitudinal questions about environmental awareness. Specifically, participants were asked the following three questions:

[11] Friehe et al. (2018) arrive at similar results.

[12] We excluded three individuals who were 55, 72, and 89 years old.

(i) *How much do you personally feel threatened by the pollution and poisoning of the natural environment?*
Answer categories: scale ranging from 1 (*not at all*) to 5 (*very strong*)

(ii) *When you think about the period until the year 2000, how confident are you about preserving the natural environment?*
Answer categories: scale ranging from 1 (*not at all*) to 5 (*totally*)

(iii) *To what extent do you have confidence in the SED's environmental policy?*
Answer categories: scale ranging from 1 (*not at all*) to 6 (*very strong*).

In order to analyze whether individuals with and without regular WGTV consumption have differing concerns on environmental issues and to facilitate the interpretation of our results, we pool the response categories to obtain a binary indicator for each question. For each of the first two questions, we combine the two response categories that express a high level of concern about pollution and environmental protection. For the third question, which has one more response category, we group the three levels of agreement and disagreement, respectively, to represent trust and distrust among individuals in the SED's environmental policies. We present descriptive statistics in Table A.2 in the appendix.

Table 2.1 shows the effect of WGTV consumption on the respondents' assessment of the three statements. For each statement, we estimate three probit models. As a first test of the robustness of our results, we include the control variables stepwise. We start by only including a dummy variable that equals one if a respondent watched WGTV at least once a week. In a second step, we add additional individual-level controls, such as the respondent's sex, age, marital status, and whether the individual has children. Finally, we consider district-level controls that we obtain from the statistical yearbook of the GDR.

Our results from probit models in columns (1) to (3) in Table 2.1 show a positive and significant relationship between WGTV consumption and the perception of pollution as a threat. In column (3), for example, we find that individuals who regularly watch WGTV are 4.3 percentage points more likely to perceive environmental pollution as a threat. The coefficient of the WGTV dummy in column (6) indicates that participants who regularly watch WGTV are 5.4 percentage points less likely to be confident that preserving the natural environment is possible until 2000. Finally, our results also indicate that watching WGTV regularly decreases the likelihood of trusting the SED's environmental policies by 4.5 percentage points. Apart from WGTV consumption, we find that respondents with children tend to be more concerned about environmental

TABLE 2.1: The effect of self-reported WGTV consumption before reunification

	Concerns about environmental pollution			Confidence about environmental protection			Trust in the SED's environmental policy		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
WGTV consumption	0.040***	0.040***	0.043***	−0.055***	−0.055***	−0.054***	−0.046***	−0.044***	−0.045***
	(0.013)	(0.013)	(0.014)	(0.017)	(0.017)	(0.018)	(0.016)	(0.016)	(0.017)
Female		−0.017	−0.011		0.031	0.031		0.049**	0.046**
		(0.016)	(0.016)		(0.021)	(0.021)		(0.019)	(0.020)
Age		0.460	0.629		−0.287	−0.312		−0.403	−0.470
		(0.391)	(0.401)		(0.543)	(0.554)		(0.496)	(0.505)
Age^2		−0.018	−0.024		0.011	0.012		0.016	0.019
		(0.017)	(0.017)		(0.023)	(0.023)		(0.021)	(0.021)
Age^3		0.000	0.000		−0.000	−0.000		−0.000	−0.000
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Children-dummy		0.058**	0.054**		−0.073**	−0.073**		0.002	−0.000
		(0.023)	(0.024)		(0.034)	(0.034)		(0.033)	(0.033)
Married		−0.050*	−0.046*		0.125***	0.125***		0.052	0.052
		(0.028)	(0.028)		(0.033)	(0.033)		(0.032)	(0.032)
Cohabitation		0.004	0.010		0.049*	0.049**		−0.006	−0.007
		(0.019)	(0.019)		(0.025)	(0.025)		(0.023)	(0.023)
Divorced		−0.121	−0.121		0.031	0.030		−0.144*	−0.145*
		(0.101)	(0.102)		(0.108)	(0.109)		(0.079)	(0.079)
Population density (log.)			−0.026			0.016			0.020
			(0.019)			(0.025)			(0.023)
Foreigners (%)			0.018			−0.014			−0.031
			(0.046)			(0.060)			(0.056)
Hospital beds per 10,000 people			−0.000			0.001			0.002
			(0.002)			(0.002)			(0.002)
Worker in industry (%)			−0.000			0.001			−0.001
			(0.001)			(0.002)			(0.002)
Pseudo R^2	0.003	0.007	0.011	0.002	0.006	0.006	0.002	0.005	0.006
Observations	3780	3780	3768	3780	3780	3768	3780	3780	3768

Note: The table shows results from probit models and reports average marginal effects. Omitted variable: Single. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

pollution and the conservation of the environment. In contrast, the opposite is true for married respondents, which is in line with previous studies (e.g., García-Valiñas et al., 2012, Pienaar et al., 2015). Moreover, women have on average more trust in the environmental policy of the SED than men. The fact that the size of the WGTV dummy only marginally changes with the gradual addition of the control variables is a first indication of the robustness of our results. To further validate the robustness of our findings, we also employ ordered probit models using all of the response category information. Applying this approach, we obtain similar results, which we present in Table A.3 in the appendix.

The results in Table 2.1 show that WGTV had an impact on whether individuals felt threatened by environmental pollution and how much they trusted the SED's environmental policies. However, we must take into account that the decision to consume specific television programs is most likely not exogenous. For instance, if a person supports the socialist government and its policies, he or she may avoid WGTV broadcasts. If this is the case, our results in Table 2.1 could not be interpreted as a causal effect. To address this potential problem, we follow the approach of Hyll and Schneider (2013), Hennighausen (2015), and Hornuf et al. (2022) and exploit that the WGTV signal in the entire GDR district of Dresden was too weak to transmit WGTV programs.[13] Based on this exogenous variation in WGTV reception, we can now analyze the causal impact of WGTV.[14] In Table 2.2, we consider the same outcome variables again. Instead of self-reported WGTV consumption, we use a dummy variable that takes the value of one if an individual lives in a district where WGTV reception is technically feasible and zero if the person lives in the Dresden district. As shown in Table 2.2, we obtain similar results regarding the treatment indicator using this approach. Once again, we find that respondents with children are more concerned about pollution and environmental preservation, while married respondents are less concerned about these issues. Similar to our results in Table 2.1, we document that women trust the SED more in environmental policy.

[13] Also, parts of the GDR district Rostock were too far from WGTV transmission towers to allow WGTV reception. However, this only affects parts of the district and not the entire area. Nevertheless, our results remain unchanged if we consider the Rostock district as untreated by WGTV.

[14] Since the allocation of study places was based on public demand planning (*staatlicher Bedarfsplanung*), it is unlikely that WGTV reception influenced the students' university choices (Mitteldeutscher Rundfunk, 2022).

TABLE 2.2: The effect of WGTV reception before reunification

	Concerns about environmental pollution		Confidence about environmental protection		Trust in the SED's environmental policy	
	(1)	(2)	(3)	(4)	(5)	(6)
WGTV region	0.028*	0.030*	−0.069***	−0.077***	−0.066***	−0.072***
	(0.016)	(0.016)	(0.021)	(0.021)	(0.019)	(0.019)
Female		−0.020		0.041**		0.057***
		(0.016)		(0.021)		(0.020)
Age		0.512		−0.280		−0.406
		(0.399)		(0.550)		(0.506)
Age^2		−0.020		0.011		0.016
		(0.017)		(0.023)		(0.021)
Age^3		0.000		−0.000		−0.000
		(0.000)		(0.000)		(0.000)
Children-dummy		0.056**		−0.070**		0.004
		(0.024)		(0.034)		(0.033)
Married		−0.048*		0.124***		0.052
		(0.028)		(0.033)		(0.032)
Cohabitation		0.005		0.052**		−0.002
		(0.019)		(0.025)		(0.023)
Divorced		−0.117		0.025		−0.147*
		(0.100)		(0.108)		(0.078)
Pseudo R^2	0.001	0.006	0.002	0.007	0.002	0.007
Observations	3768	3768	3768	3768	3768	3768

Note: The table shows results from probit models and reports average marginal effects. Omitted variable: Single. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

2.5 The effect of West German television after reunification

2.5.1 Survey evidence

In this section, we examine whether the WGTV effect persists after reunification once all areas in East Germany received access to Western television programs. For this purpose, we use data from the SOEP, which is an annual representative panel study for German households (Goebel et al., 2019). In a first step, we utilize the so-called "East sample" of the SOEP to study the effects of WGTV exposure. This sample includes 4,453 individuals from 2,179 households who had already been interviewed in East Germany in 1990, a few months before the official reunification. To analyze the effect of WGTV, we utilize the following three questions:

(i) *How concerned are you about environmental protection?*
Answer categories: scale ranging from 1 (*not concerned at all*) to 3 (*very concerned*)

(ii) *How important is the protection of the natural environment for your well-being and satisfaction?*
Answer categories: scale ranging from 1 (*unimportant*) to 4 (*very important*)

(iii) *Are you a member of an environmental interest group?*
Answer choices: *yes* or *no*

The first two questions are from the 1990 questionnaire and question (iii) is included in the 1998 questionnaire. Similar to Section 2.4, we create dummy variables for the first two statements to facilitate the interpretation of our results. For each question, we estimate the following probit model:

$$Y_{it} = \beta_0 + \beta_1 TV_i + \beta_2 X_{it} + \epsilon_{it}, \tag{2.1}$$

where for question (i) and (ii), Y_{it} takes the value one if a person answered with very worried or very important, respectively. In the case of question (iii), Y_{it} takes the value of one if person i was a member of an organization dedicated to environmental protection in 1998. X_{it} denotes a vector of covariates that includes sex, age, age^2, age^3, marital status, employment status, education level, log. household income, and dummy variables for the presence of children in the household and migration background. Finally, ϵ_{it} indicates the error term. We present summary statistics in Table A.4 in the appendix. Moreover, Figure A.1 illustrates that the individuals in the treatment and the control group hardly differ in their socioeconomic characteristics. We only find that individuals from the control group are slightly more likely to be married and to have children.

TV_i represents our variable of interest and takes the value one if respondent i lived during the GDR period in a region with access to WGTV programs. Since the respondents were interviewed by the SOEP before the official reunification, we can assume that the individuals lived in the same region during the GDR period in which they were interviewed. The fact that the socialist government highly restricted residential and labor mobility in this period supports this assumption (Kern and Hainmueller, 2009, Hyll and Schneider, 2013).[15] This enables us to assign individuals to either the treatment or control group. Applying the WGTV signal simulation by Crabtree et al. (2015) and Bursztyn and Cantoni (2016), we assume that the inhabitants

[15]Nevertheless, we exclude respondents who moved within the last two years before their interview to prevent incorrect assignments.

of the three spatial planning regions, "Dresden", "Oberlausitz", and "Greifswald-Stralsund" had no access to WGTV before reunification.[16]

Table 2.3 shows the results of probit regressions and reports average marginal effects. Again, for each outcome variable, we first estimate a model that only includes the treatment indicator, TV_i. Following this, we add the vector of covariates, X_{it}. Our results in columns (1) and (2) reveal that people living in areas with former WGTV coverage are, on average, seven percentage points more likely to be concerned about environmental protection. In addition, protecting the environment is more important to their well-being. The difference between the treatment and control group is 6.4 percentage points.[17] Lastly, our findings in column (6) reveal a positive and significant relationship between WGTV reception and the likelihood of being a member of an organization dedicated to environmental protection. On average, respondents living in regions with former WGTV reception are 2.8 percentage points more likely to be active in environmental interest groups. While question (iii) first appeared in a SOEP questionnaire in 1998, questions (i) and (ii) are included in several survey waves in the first years after reunification. As a further robustness check, we estimate a random-effects probit model for these two questions. However, we focus here on the first five years after reunification. The reason for this is that our identification strategy relies on the respondents that have been interviewed in 1990. With each additional survey year that we include, there is an increasingly greater attrition bias as people leave the SOEP, but no new individuals are added whom we can clearly assign to the treatment and control group.[18] As shown in Table A.6, we find comparable results. The coefficients of the *WGTV region* variable are somewhat lower in the panel estimates, which is not surprising since we expect the effect to decrease over time.

In the second part of this subsection, we follow the approach of Hornuf et al. (2022) and use information on self-reported WGTV consumption. For this purpose, we utilize a further questionnaire of the SOEP conducted in 2018 with the title: "Living in the former GDR" (*Leben in der ehemaligen DDR*). In total, 2,315 individuals who lived in the GDR before reunification and were born before 1973 are included in this sample. The

[16] In 1990, the former East consisted of 215 NUTS-3-regions that were condensed into 23 spatial planning regions (including Berlin). The size of spatial planning regions is between NUTS-2 and NUTS-3 level. The two spatial planning regions of Rostock and Neubrandenburg are located partly in the treatment and control areas. In our estimations, we assign these areas to the treatment group, which means we tend to underestimate the true effect. However, our results hardly change if we exclude participants interviewed in these two regions.

[17] As shown in Table A.5 in the appendix, employing ordered probit models for questions (i) and (ii), where we make use of all response categories, leads to similar qualitative results.

[18] The number of respondents decreases by 24 % in the period from 1990 to 1994.

TABLE 2.3: The effects of former WGTV reception after reunification

	Concerns about environmental protection		Environmental protection important for own wellbeing		Member of environmental interest group	
	(1)	(2)	(3)	(4)	(5)	(6)
WGTV region	0.071***	0.070***	0.068***	0.064***	0.030*	0.028*
	(0.023)	(0.023)	(0.022)	(0.022)	(0.018)	(0.017)
Female		−0.013		0.032*		−0.028***
		(0.017)		(0.017)		(0.007)
Age		−0.013		−0.024*		0.004
		(0.013)		(0.013)		(0.008)
Age^2		0.000		0.001***		−0.000
		(0.000)		(0.000)		(0.000)
Age^3		−0.000*		−0.000***		0.000
		(0.000)		(0.000)		(0.000)
Marital status						
Single		0.016		−0.013		0.007
		(0.033)		(0.032)		(0.016)
Divorced		−0.059*		−0.024		−0.014*
		(0.035)		(0.034)		(0.008)
Widowed		−0.062		−0.098**		0.027
		(0.042)		(0.042)		(0.022)
Children (yes/no)		−0.003		0.021		−0.002
		(0.022)		(0.021)		(0.009)
Employment status						
Blue-collar		−0.038*		0.006		−0.002
		(0.022)		(0.021)		(0.007)
Apprentice		0.030		0.027		
		(0.047)		(0.044)		
Civil servant						0.052
						(0.036)
Self-employed		−0.001		−0.076		0.016
		(0.052)		(0.051)		(0.015)
Not working		−0.030		−0.023		0.014
		(0.042)		(0.040)		(0.011)
Retired		−0.045		−0.076*		0.008
		(0.040)		(0.039)		(0.012)
Education level						
Medium		0.021		−0.007		0.009
		(0.023)		(0.021)		(0.007)
High		0.006		−0.096***		0.029***
		(0.025)		(0.025)		(0.009)
Log. household income		−0.008		−0.099***		−0.005
		(0.022)		(0.021)		(0.006)
Migration background		−0.030		−0.066		0.010
		(0.044)		(0.043)		(0.014)
Pseudo R^2	0.002	0.009	0.002	0.026	0.010	0.120
Observations	3854	3854	3856	3856	2254	2254
Survey wave	1990	1990	1990	1990	1998	1998

Note: The table shows results from probit models and reports average marginal effects. Omitted variables: Married, white-collar, low level of education. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

questionnaire covers, among other things, a wide range of questions related to the respondents' living conditions in the GDR and their attitudes toward the SED government. What is more, participants were asked how frequently they watch certain television programs before reunification. Among various television programs, respondents were also asked how often they watched the *Tagesschau*, a news program that was broadcast daily on the West German public television station ARD. Potential

TABLE 2.4: The effects of self-reported WGTV consumption after reunification

	Concerns about environmental protection		Concerns about impacts of climate change		Member of environmental interest group	
	(1)	(2)	(3)	(4)	(5)	(6)
WGTV consumption	0.013	0.010	0.020**	0.018*	0.019*	0.016*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)
Covariates	No	Yes	No	Yes	No	Yes
Pseudo R^2	0.001	0.013	0.002	0.012	0.002	0.047
Observations	2188	2188	2186	2186	1918	1918
Survey wave	2018	2018	2018	2018	2019	2019

Note: The table shows results from probit models and reports average marginal effects. The set of covariates includes: sex, age, age^2, age^3, marital status, children-dummy, employment status, education level, log. household income, migration background, and a dummy variable that equals one if an individual is currently living in West Germany. The full regression table is included in Table A.7 in the appendix. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

answers were *never*, *rarely*, *often*, or *almost always*. The unique personal ID allows us to connect this information to the annual questionnaires, in which the respondents were asked questions about their concerns related to environmental protection and the consequences of climate change. More specifically, we make use of the following two questions from the 2018 questionnaire:

(i) *How concerned are you about environmental protection?*

(ii) *How concerned are you about the impacts of climate change?*

For both questions, people could either answer with 1 (*not concerned at all*), 2 (*somewhat concerned*), or 3 (*very concerned*). Similar to Table 2.3, we create a dummy variable for each of the two questions, which equals one if the person answered with *very concerned*. In addition to these two questions, we again utilize the information on whether a person is a member of an organization that works to protect the environment, which is included in the 2019 questionnaire.

Table 2.4 reports the regression results. While we do not observe a significant effect of WGTV consumption in columns (1) and (2), our findings indicate that respondents who watched *Tagesschau* more regularly before reunification are more concerned about the impacts of climate change. A one standard deviation increase in the frequency with which a respondent watched the *Tagesschau* is associated with a 1.9 percentage points increase in the likelihood of being concerned about the consequences of climate change. Furthermore, we document that a one standard deviation increase in the television consumption variable increases the likelihood of being a member of an organization that supports environmental protection by 1.7 percentage points. Again, we check the robustness of our results. If we use ordered probit regressions, our results in columns (3)

and (4) remain unchanged. Moreover, we also obtain a positive and significant WGTV effect in columns (1) and (2). Table A.8 in the appendix includes the results.

Overall, our results in Sections 2.4 and 2.5.1 show that individuals exposed to WGTV exhibit greater concerns regarding environmental pollution. However, an alternative explanation for our findings could be that WGTV made individuals more concerned in general and not only more worried about the environment. In the appendix, we demonstrate that respondents who have watched WGTV are not generally more concerned. In a first step, we use the information on whether respondents consider themselves as someone who is frequently concerned. Second, we employ further questions focusing on concerns unrelated to environmental issues. These questions address concerns about the following issues: the economy in general, own economic situation, health, maintaining peace, crime in Germany, or global terrorism. As shown in Table A.9, we find no significant relationship between WGTV consumption and any of these issues.

2.5.2 County-level data on the election results of the Greens

In this subsection, we examine whether exposure to WGTV before reunification affected the electoral success of the Greens in the post-reunification federal elections (*Bundestagswahlen*). Since the results of the previous sections have shown that individuals with WGTV exposure exhibit a higher environmental awareness and are more likely to be active in environmental organizations, we assume that voters living in regions with former access to Western television are more likely to vote for the Greens.[19] To examine this hypothesis, we employ the following linear random-effects model that allows us to identify non-time varying factors such as television reception:

$$GV_{it} = \beta_0 + \beta_1 TV_i + \beta_2 X_{it} + \mu_t + Z_i + \epsilon_{it}, \tag{2.2}$$

where GV_{it} represents the voting outcome for the Greens in county i in the federal election of year t. TV_i represents the treatment indicator and equals one if county i had access to WGTV before the reunification. Consequently, β_1 denotes our coefficient of

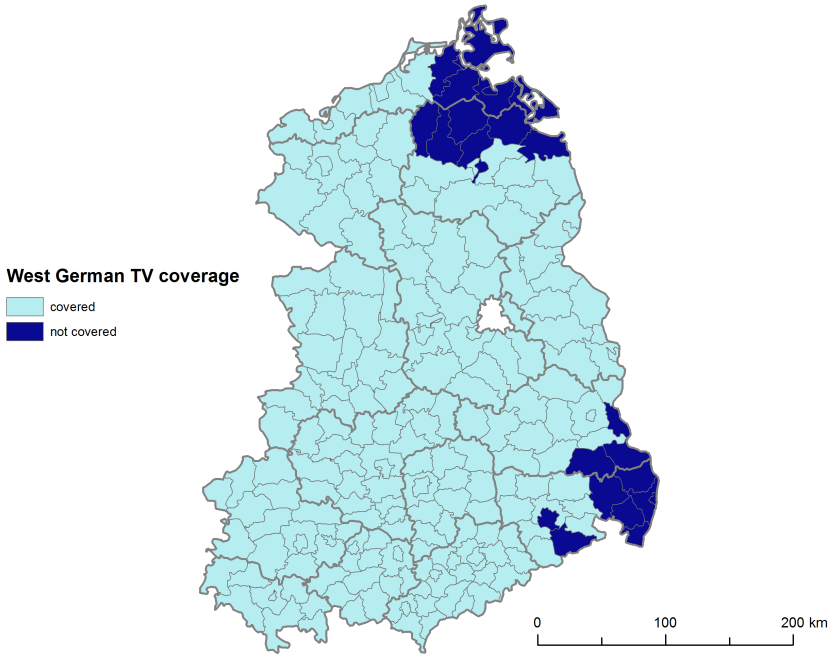
[19]Previous studies already indicate that the reception of West German media influenced the voting behavior of the East German population. In this context, Hornuf et al. (2022) show that right-wing parties received significantly fewer votes in federal elections in East German regions that could receive WGTV during the GDR period. Friehe et al. (2020) also document a negative WGTV effect on votes for right-wing parties. Furthermore, they find a negative relationship between WGTV reception and the electoral success of left-wing extremist parties.

interest. X_{it} is a vector of covariates for county i at time t and μ_t indicates year dummies. Z_i denotes the county-specific random-effect, i.e., the difference between the average election result in county i and the average election result in Eastern Germany. Finally, ϵ_{it} indicates the error term.

County-level data on the election results of the Greens in the federal elections were provided by the Federal Returning Officer (*Bundeswahlleiter*). We focus on the three federal elections that occurred in the first decade after reunification, as potential effects of WGTV reception are likely to attenuate over time (Friehe et al., 2020). These three elections took place in 1990, 1994, and 1998. To assign counties to either the treatment or control group, we use the data for the WGTV signal strength from Crabtree et al. (2015). To simulate the signal strength, they employ a Longley-Rice electromagnetic signal propagation model in combination with terrain data, and data on the location and technical characteristics of each West German transmission mast. They obtained information on all broadcast transmitters operating in West Germany in early 1989 from Northern German Broadcasting (*Norddeutscher Rundfunk*). They then calculated the average WGTV signal strength for each county in East Germany and discretized the continuous measure into four distinct categories: -86.5 dBm, -85 dBm, -82.5 dBm, and -80 dBm. Following Crabtree et al. (2015), we consider a county to be treated by WGTV if the county's average signal strength exceeds the threshold of -86.5 dBm. Figure 2.3 illustrates the treatment and control areas.

Our vector of covariates includes a county's demographic characteristics like the logarithmized population density, the share of women, and the share of foreigners. Since the Greens achieve higher electoral success in cities, we include a dummy variable that takes the value of one if the respective county is an urban county (*kreisfreie Stadt*) and zero otherwise (Stroppe and Jungmann, 2022). In addition, residents in urban areas might be more exposed to the adverse effects of air pollution than residents in more rural areas and are therefore more likely to vote for the Greens. To account for different economic conditions among the East German regions, we include the counties' unemployment rate and GDP per capita. We report descriptive statistics (Table A.10) and the covariate balance for the election year 1990 (Figure A.2) in the appendix. Overall, the counties in the treatment and control group show hardly any significant differences. Only the regions without WGTV reception have a slightly higher unemployment rate (7.19 % in the treatment group and 7.65 % in the control group) and a marginal lower share of women (52.14 % in the treatment group and 51.72 % in the control group). However, these differences are negligible. Nevertheless, we will still follow the geographic regression discontinuity design according to Keele and Titiunik (2015) as an additional robustness test. This approach allows us to compare treated and

FIGURE 2.3: Reception of WGTV: Treatment and control areas



Note: East German counties with and without access to WGTV before reunification based on a -86.5 dBm cutoff. Darker counties represent the control area with no reception (25 counties) and lighter counties the treatment area with sufficient signal strength (192 counties). District boundaries are shown as bold gray lines and county boundaries as thin gray lines.

non-treated counties that are located closer to each other and, therefore, more similar in their characteristics.

Table 2.5 shows the results for the election years from 1990 to 1998. While we only include the treatment indicator and year dummies in column (1), we add the demographic and economic covariates in column (2). In line with our hypothesis, our results reveal a positive and significant effect of WGTV reception on the voting outcome of the Greens. Our estimates in column (2) show that the Greens' vote share is 0.31 percentage points higher on average in counties with access to WGTV before reunification. In addition, we find positive effects for population density and GDP per capita, but negative effects for the share of women. Moreover, urban counties exhibit, on average, higher vote shares for the Greens. As reported in columns (3) to (5), a separate analysis of each federal election shows that the WGTV effect gradually diminishes over time and completely vanishes in the 1998 election.[20] The coefficient in column (3) suggests that access to West German media is associated with a 0.82 percentage point

[20]There is also no significant effect of WGTV in the subsequent federal elections.

TABLE 2.5: WGTV and votes for the Greens

	Panel		Cross-section		
	(1990–1998)		(1990)	(1994)	(1998)
	(1)	(2)	(3)	(4)	(5)
WGTV region	0.394*	0.313**	0.821***	0.229**	0.004
	(0.214)	(0.135)	(0.295)	(0.112)	(0.106)
Log. population density		0.717***	0.458***	0.736***	0.673***
		(0.094)	(0.149)	(0.123)	(0.116)
Women (%)		−0.374***	−0.964***	−0.002	−0.020
		(0.099)	(0.179)	(0.116)	(0.138)
Foreigners (%)		−0.039	0.229	−0.010	0.373***
		(0.145)	(0.316)	(0.130)	(0.095)
Urban county		0.720***	1.993***	0.034	−0.022
		(0.265)	(0.429)	(0.313)	(0.229)
Unemployment rate (%)		−0.016	−0.131	0.143***	−0.098***
		(0.016)	(0.119)	(0.045)	(0.019)
GDP per capita		0.183*	−0.208	0.179	0.068
		(0.101)	(0.217)	(0.208)	(0.112)
Year	Yes	Yes	No	No	No
R^2	0.318	0.572	0.386	0.445	0.752
Observations	651	651	217	217	217

Note: Columns (1) and (2) show results from random effects model, while the estimates in columns (3) to (5) are based on OLS regressions. The dependent variable in all models is the voting outcome for the Greens in the federal election. Standard errors are clustered at the county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

increase in the election result for the Greens in the federal elections in 1990. The fact that the Greens achieved an election result of 6.2 % in East Germany illustrates the influence WGTV had in helping the Greens pass the five-percent threshold in the first federal election in reunified Germany.[21]

To verify the robustness of our results, we conduct several tests focusing on the federal election in 1990. First, we ensure that the treatment effect is not simply a result of the control areas being further away from the inner German border. For this reason, we include the border distance to West Germany as an additional control variable in column (1) of Table 2.6. Our treatment indicator remains highly significant and changes only slightly in magnitude. The fact that the border distance has no explanatory power regarding the election result of the Greens makes us increasingly confident that our results are not affected by spurious correlation with distance from the border. In column (2), we check whether our results are driven by counties immediately adjacent to West Germany. Potential influences from West Germany might have had a stronger and faster impact in these regions after reunification than in areas in the East. For this reason, we

[21]The five-percent threshold is the minimum share of the votes that a political party requires to be represented in the German parliament (*Bundestag*). In the 1990 federal election, it was sufficient for a political party to pass the five-percent hurdle in one of the two electoral areas (West or East Germany) to enter the parliament.

TABLE 2.6: WGTV and votes for the Greens in 1990 (robustness)

	West Germany	Exclusion of counties	Exclusion of	Regression discontinuity design	
	distance	bordering West Germany	Berlin	75km	100km
	(1)	(2)	(3)	(4)	(5)
WGTV region	0.933***	0.787**	0.829***	0.844	0.762*
	(0.317)	(0.309)	(0.309)	(0.520)	(0.417)
Log. population density	0.406***	0.591***	0.457***	0.491***	0.534***
	(0.154)	(0.161)	(0.148)	(0.168)	(0.160)
Women (%)	−0.853***	−1.051***	−0.960***	−1.007***	−1.120***
	(0.189)	(0.207)	(0.172)	(0.232)	(0.199)
Foreigners (%)	0.296	−0.021	0.241	−0.032	−0.174
	(0.331)	(0.357)	(0.354)	(0.402)	(0.346)
Urban county	2.004***	1.911***	1.991***	1.988***	2.023***
	(0.434)	(0.426)	(0.430)	(0.600)	(0.581)
Unemployment rate (%)	−0.064	−0.143	−0.123	−0.044	−0.182
	(0.131)	(0.128)	(0.134)	(0.194)	(0.171)
GDP per capita	−0.284	−0.057	−0.194	−0.223	−0.127
	(0.232)	(0.248)	(0.241)	(0.322)	(0.280)
Log. distance to inner German border	0.115				
	(0.100)				
R^2	0.389	0.404	0.381	0.463	0.428
Observations	217	191	216	73	95

Note: Results are based on OLS regressions. The dependent variable in all models is the voting outcome for the Greens in the federal election in 1990. Standard errors are clustered at the county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

exclude all counties located along the inner German border. Again, our findings remain virtually unchanged. In column (3), we exclude Berlin from our analysis, which also does not alter our results.

The covariate balance in Figure A.2 illustrates that, even though the counties in the treatment and control group are very similar in their characteristics, there are slight differences in the proportion of women and the unemployment rate. Therefore, we follow the idea of a geographic regression discontinuity design and consider only treated counties within a 75 km or 100 km radius of the control region, respectively. Thus, we ensure that we compare counties that are even more similar in their characteristics.[22] While we still find a significant WGTV effect in column (5), the p-value of the treatment indicator in column (4) is 0.109. However, this may also result from excluding 75 % of treatment regions in column (4). Lastly, we check that our results continue to apply when we vary the WGTV signal strength thresholds when defining the treatment indicator. Table A.11 in the appendix shows that our results hold even when we choose a threshold of -85.0 dBm, -82.5 dBm, or -80.0 dBm. The same is true if we utilize historical maps

[22]We represent the two samples in Figure A.3 and show the covariate balance for both cases in Figure A.4 the appendix. In both figures, there are no longer significant differences between the two groups.

(Kern, 2011) instead of signal calculations to divide the counties into treatment and control group. Figures A.5 and A.6 illustrate the respective approach.

2.6 Conclusion

By analyzing exogenous variation in the reception of Western television in the GDR, we examine the relationship between exposure to environmental information through mass media and individuals' environmental awareness and pro-environmental behavior. Survey evidence from the late 1980s and the early 1990s indicates that WGTV not only informed GDR citizens about pollution, caused by the state-owned industry, but also evoked environmental awareness and an understanding of the adverse health consequences of pollution. In addition, the access to WGTV enabled the GDR population to detect misinformation on pollution in the SED government's propaganda. In this regard, our findings reveal that the reception of WGTV led to significantly less trust in the SED's environmental policies among the GDR population. With this finding, we also contribute to the literature on potential backfire effects of censorship (Adena et al., 2015, Gläßel and Paula, 2020). Another important finding of our study is that exposure to WGTV has increased the likelihood of individuals becoming involved in environmental interest groups. In this respect, access to Western media contributed to politicizing parts of the GDR population. This finding is highly relevant in that environmental interest groups strongly influenced the democracy movement from the mid-1980s onward, which eventually contributed to the fall of the Berlin Wall and German reunification (Beleites, 2016). Moreover, our analysis shows that the reception of WGTV had an influence on the Greens' first federal election results.

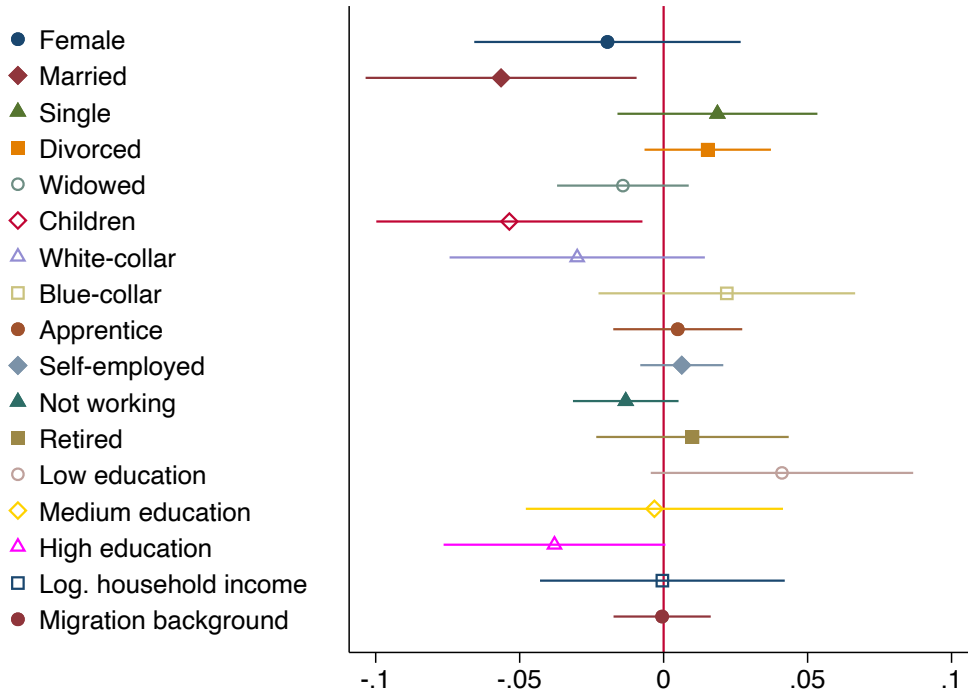
While most studies analyzing the effect of mass media exposure on environmental awareness only identify short-term effects, our findings also partly indicate long-term impacts. This result might be due to the long treatment period, since GDR citizens were exposed to WGTV programs over several decades. In general, long-term effects might also arise from attitudes about environmental issues being passed on from parents to their children. Indeed, numerous studies point to an intergenerational transmission of environmental attitudes (Grønhøj and Thøgersen, 2009, Casaló and Escario, 2016, Katz-Gerro et al., 2020). However, our data sets do not allow us to examine such effects in the present study.

Overall, our findings have important policy implications. To mitigate the impacts of pollution, policymakers around the world depend on creating a collective environmental consciousness. This study provides evidence that mass media can be a means to develop

and strengthen such an awareness. Mass media, therefore, represent a cost-effective method of reaching a broad proportion of the population across all social classes. With the increasing accessibility of information via the Internet and social networks, the usage of mass media is becoming even more essential.

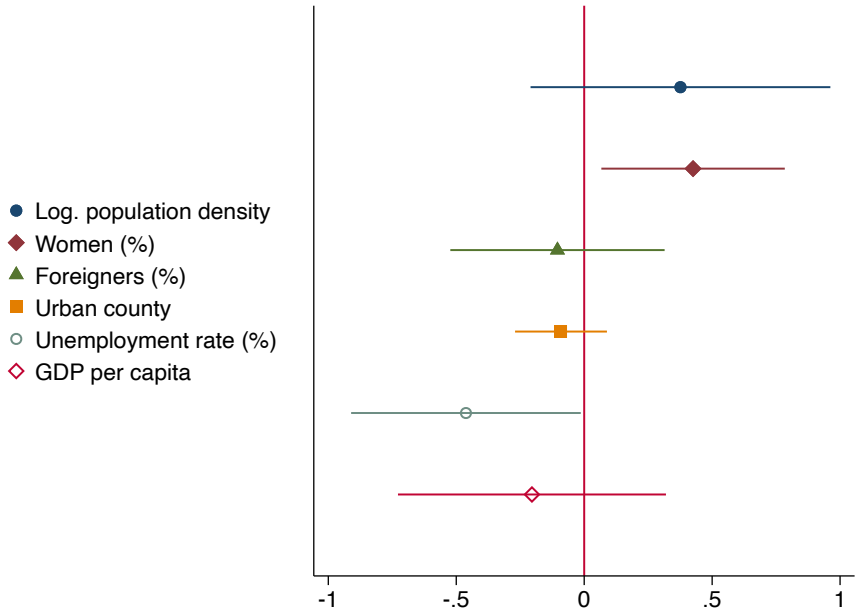
2.7 Appendix A

FIGURE A.1: SOEP data: Covariate balance (1990)



Note: Balance in the values of the covariates in 1990 wave. The figure presents the estimated coefficients from bivariate regressions in which the treatment indicator is used as independent variable. For presentation reasons, the variable age is not included. The age difference between the treatment and control regions is 0.186 years (p-value = 0.807). The confidence intervals shown are set at the 95 % level of statistical significance.

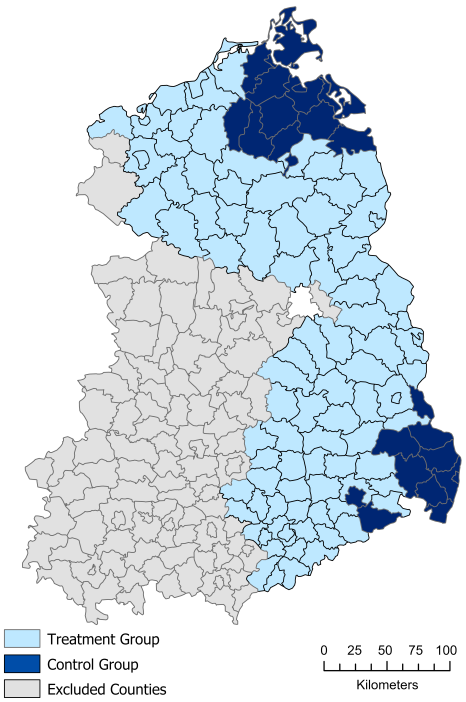
FIGURE A.2: County-level data: Covariate balance (1990)



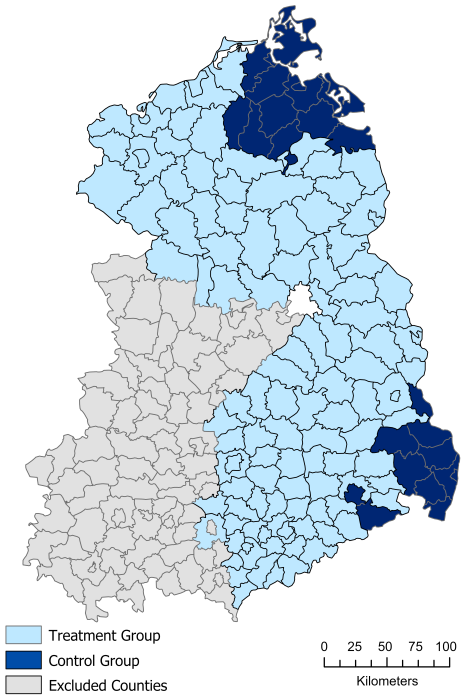
Note: Balance in the values of the covariates in 1990. The figure presents the estimated coefficients from bivariate regressions in which the treatment indicator is used as independent variable. The confidence intervals shown are set at the 95 % level of statistical significance.

FIGURE A.3: Geographic regression discontinuity design: Varying sample

(A) 75 km radius

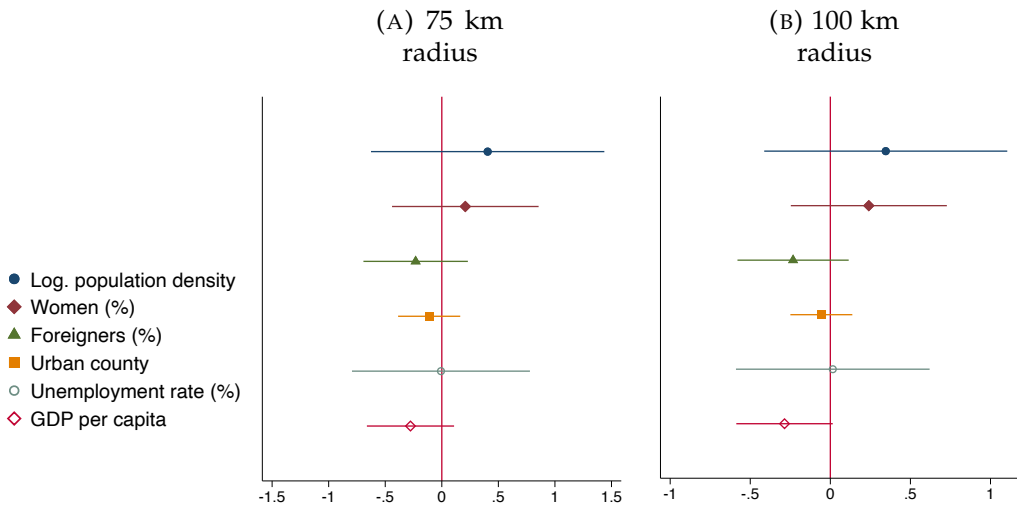


(B) 100 km radius



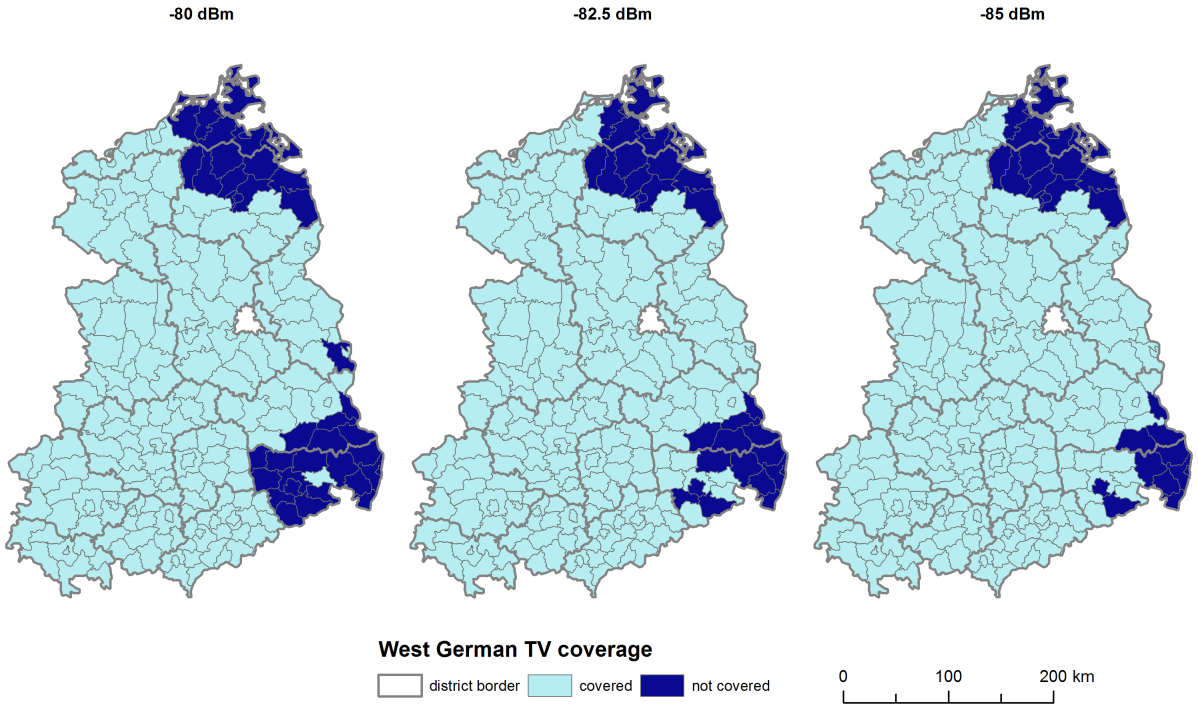
Note: The figure shows East German counties with and without access to WGTV before reunification based on a -86.5 dBm cutoff. Treated counties outside a 75 km (A) and 100 km (B) radius of the control group are shown in gray and are excluded from the analysis.

FIGURE A.4: Geographic regression discontinuity design: Balance of covariates



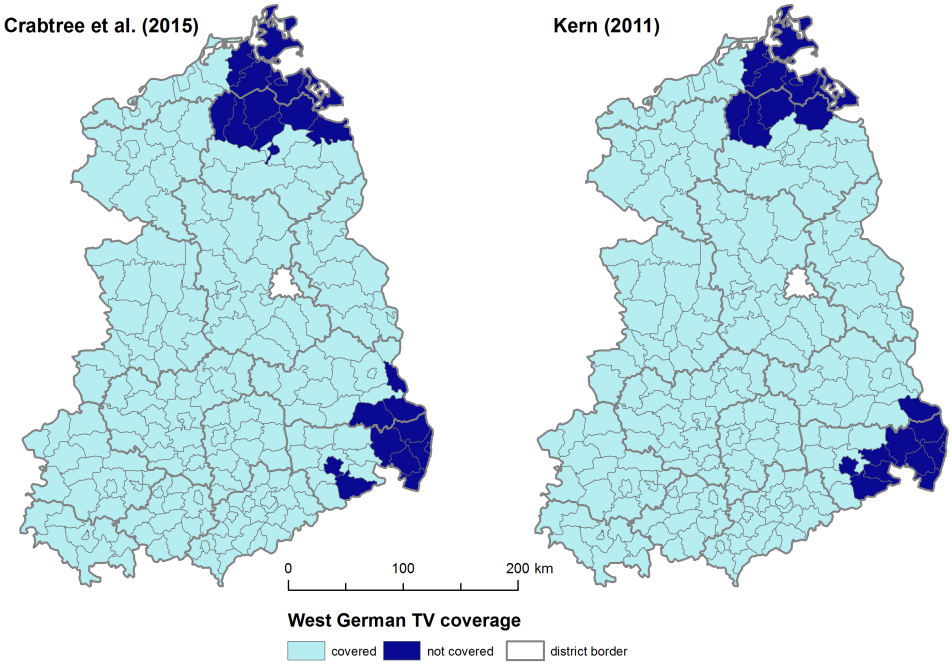
Note: Balance in the values of the covariates in 1990. Figure A (B) includes only counties that are either located in the control region or within a 75 km (100 km) radius of the control region. The figure presents the estimated coefficients from bivariate regressions in which the treatment indicator is used as independent variable. The confidence intervals shown are set at the 95 % level of statistical significance.

FIGURE A.5: WGTV coverage (different cutoff levels)



Note: East German counties with and without access to WGTV prior to reunification. The left map shows the classification based on Longley-Rice radio signal propagation model and a cutoff level of -80 dBm. The classification in the middle and right map are based on a -82.5 dBm and -85 dBm, respectively. District borders are figured as gray lines.

FIGURE A.6: WGTV coverage (different methodologies)



Note: East German counties with and without access to WGTV prior to reunification. The left map shows the classification based on the Longley-Rice radio signal propagation model and a cutoff level of -86.5 dBm used by Crabtree et al. (2015). The left map shows the classification used by Kern (2011), which is based on historical maps. District borders are figured as gray lines.

TABLE A.1: Regional characteristics between treatment and control districts

	Treatment Area	**Control Area**	**Difference**		
	mean	mean	difference	se	p-value
1955					
share of women *(%)*	56.79	56.62	0.17	1.09	0.8819
average household size	2.79	2.90	−0.11	0.16	0.5668
infant mortality	50.09	45.33	4.76	4.73	0.3601
suicides per 100,000 inhabitants	24.72	21.99	2.73	4.56	0.5874
sales per capita	1654.55	1645.00	9.55	119.06	0.9413
1989					
share of women *(%)*	51.97	51.60	0.37	0.53	0.5362
average household size (1981)	2.57	2.70	−0.13	0.10	0.3171
infant mortality	7.95	6.77	1.19	0.56	0.0686
suicides per 100,000 inhabitants	27.06	25.63	1.43	1.14	0.5001
sales per capita	7576.27	7874.33	−298.06	208.48	0.2504
share of foreigners *(%)*	1.06	0.94	0.12	0.33	0.7368
share of foreign tourists in intercamping *(%)*	18.20	25.18	−6.98	14.41	0.6494
share of foreign tourists in youth leisure facilities *(%)*	15.77	16.42	−0.66	4.71	0.8920

Note: District differences between treatment (11) and control area (3). East Berlin is excluded from the analysis. P-values based on two-sided Welch's t-tests of difference in means designed for unequal variances.

TABLE A.2: Summary statistics of GDR survey data

Dependent variables	**Mean**	**Std. dev.**	**Min**	**Max**	**N**
Concerns about environmental pollution (dummy)	0.82	0.39	0.00	1.00	3780
Confidence about environmental protection (dummy)	0.42	0.49	0.00	1.00	3780
Trust in the SED's environmental policy (dummy)	0.31	0.46	0.00	1.00	3780
Concerns about environmental pollution	4.25	0.88	1.00	5.00	3780
Confidence about environmental protection	2.35	0.93	1.00	5.00	3780
Trust in the SED's environmental policy	2.83	1.25	1.00	6.00	3780
Explanatory variables					
Individual level:					
WGTV consumption	0.70	0.46	0.00	1.00	3780
WGTV region	0.82	0.38	0.00	1.00	3768
Female	0.52	0.50	0.00	1.00	3780
Age	21.71	1.79	18.00	34.00	3780
Children-dummy	0.08	0.27	0.00	1.00	3780
Single	0.77	0.42	0.00	1.00	3780
Married	0.09	0.29	0.00	1.00	3780
Cohabitation	0.13	0.33	0.00	1.00	3780
Divorced	0.01	0.08	0.00	1.00	3780
District level:					
Population density (log.)	5.84	1.03	4.48	8.06	3768
Foreigners (%)	1.37	0.26	0.80	1.62	3768
Hospital beds per 10,000 inhabitants	101.45	7.88	88.00	114.00	3768
Worker in industry (%)	36.96	7.83	24.74	47.98	3768

Note: This table shows descriptive statistics of our variables (means, standard deviation, minimum and maximum value over time). N refers to the number of observations.

TABLE A.3: GDR survey data: The effect of self-reported WGTV consumption using ordered probit models

	Concerns about environmental pollution			Confidence about environmental protection			Trust in the SED's environmental policy		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
WGTV consumption	0.091**	0.090**	0.099**	−0.098***	−0.101***	−0.097**	−0.109***	−0.103***	−0.099**
	(0.040)	(0.040)	(0.041)	(0.038)	(0.038)	(0.039)	(0.037)	(0.038)	(0.039)
Female		−0.050	−0.030		0.038	0.037		0.175***	0.166***
		(0.047)	(0.048)		(0.045)	(0.046)		(0.045)	(0.046)
Age		0.509	1.188		−0.739	−0.968		−0.339	−0.938
		(1.036)	(1.063)		(1.106)	(1.133)		(1.084)	(1.075)
Age^2		−0.017	−0.044		0.025	0.034		0.010	0.033
		(0.043)	(0.044)		(0.047)	(0.048)		(0.045)	(0.045)
Age^3		0.000	0.001		−0.000	−0.000		−0.000	−0.000
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
Children-dummy		0.248***	0.242***		−0.151*	−0.147*		0.002	−0.003
		(0.083)	(0.083)		(0.081)	(0.081)		(0.075)	(0.075)
Married		−0.208***	−0.205***		0.262***	0.260***		0.244***	0.246***
		(0.073)	(0.073)		(0.070)	(0.070)		(0.070)	(0.071)
Cohabitation		0.031	0.046		0.087	0.086		0.013	0.012
		(0.057)	(0.057)		(0.055)	(0.055)		(0.053)	(0.053)
Divorced		−0.293	−0.301		−0.004	−0.009		−0.136	−0.144
		(0.233)	(0.237)		(0.257)	(0.259)		(0.187)	(0.187)
Population density (log.)			−0.101*			0.046			0.121**
			(0.057)			(0.053)			(0.053)
Foreigners (%)			0.235*			0.029			−0.169
			(0.136)			(0.134)			(0.130)
Hospital beds per 10,000 people			−0.001			0.005			0.010**
			(0.005)			(0.004)			(0.005)
Worker in industry (%)			−0.003			0.001			0.001
			(0.004)			(0.004)			(0.004)
Pseudo R^2	0.001	0.003	0.004	0.001	0.003	0.003	0.001	0.004	0.006
Observations	3780	3780	3768	3780	3780	3768	3780	3780	3768

Note: Ordered probit models. Omitted variable: Single. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE A.4: Summary statistics of SOEP data (1990)

Dependent variables	**Mean**	**Std. dev.**	**Min**	**Max**	**N**
(i) Concerns about environmental protection	2.56	0.55	1.00	3.00	3822
(ii) Environmental protection important for own wellbeing	3.60	0.56	1.00	4.00	3824
(iii) Concerns about environmental protection (dummy)	0.59	0.49	0.00	1.00	3822
(iv) Environmental protection important for own wellbeing (dummy)	0.64	0.48	0.00	1.00	3824
(v) Member of environmental interest group (dummy)	0.02	0.15	0.00	1.00	2654
Explanatory variables					
WGTV region	0.90	0.31	0.00	1.00	3838
Female	0.53	0.50	0.00	1.00	3838
Age	43.37	16.00	17.00	95.00	3838
Married	0.71	0.45	0.00	1.00	3838
Single	0.16	0.37	0.00	1.00	3838
Divorced	0.06	0.24	0.00	1.00	3838
Widowed	0.07	0.25	0.00	1.00	3838
Children (yes/no)	0.47	0.50	0.00	1.00	3838
White-collar	0.36	0.48	0.00	1.00	3838
Blue-collar	0.37	0.48	0.00	1.00	3838
Apprentice	0.05	0.23	0.00	1.00	3838
Self-employed	0.03	0.16	0.00	1.00	3838
Not working	0.04	0.20	0.00	1.00	3838
Retired	0.15	0.36	0.00	1.00	3838
Low education level	0.41	0.49	0.00	1.00	3838
Medium education level	0.37	0.48	0.00	1.00	3838
High education level	0.22	0.42	0.00	1.00	3838
Log. household income	6.78	0.46	5.04	7.87	3838
Migration background	0.03	0.18	0.00	1.00	3838

Note: This table shows descriptive statistics of our variables for the survey wave 1990 (means, standard deviation, minimum and maximum value over time). Variable (v) is from the 1998 questionnaire. N refers to the number of observations.

TABLE A.5: SOEP data: The effect of WGTV reception using ordered probit models

	Concerns about environmental protection		Environmental protection important for own wellbeing	
	(1)	(2)	(3)	(4)
WGTV region	0.183***	0.184***	0.166***	0.158***
	(0.056)	(0.057)	(0.056)	(0.057)
Female		−0.027		0.104**
		(0.043)		(0.044)
Age		−0.051		−0.086***
		(0.034)		(0.033)
Age^2		0.001**		0.002***
		(0.001)		(0.001)
Age^3		−0.000**		−0.000***
		(0.000)		(0.000)
Marital status				
Single		0.035		−0.084
		(0.083)		(0.084)
Divorced		−0.147*		−0.044
		(0.084)		(0.086)
Widowed		−0.193*		−0.339***
		(0.102)		(0.109)
Children (yes/no)		0.029		0.050
		(0.054)		(0.055)
Employment status				
Blue-collar		−0.092*		0.026
		(0.055)		(0.057)
Apprentice		0.059		0.022
		(0.122)		(0.120)
Self-employed		0.037		−0.109
		(0.125)		(0.115)
Not working		−0.054		−0.013
		(0.102)		(0.098)
Retired		−0.150		−0.227**
		(0.100)		(0.102)
Education level				
Medium education		0.100*		0.006
		(0.057)		(0.058)
High education		0.047		−0.215***
		(0.063)		(0.062)
Log. household income		−0.005		−0.225***
		(0.055)		(0.054)
Migration background		−0.030		−0.136
		(0.102)		(0.107)
Pseudo R^2	0.002	0.012	0.001	0.021
Observations	3854	3854	3856	3856
Survey wave	1990	1990	1990	1990

Note: The table shows results from ordered probit models. Omitted variables: Married, white-collar, low level of education. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

TABLE A.6: SOEP data: The effects of WGTV reception using random-effects probit models

	Concerns about environmental protection		Environmental protection important for own wellbeing	
	(1)	(2)	(3)	(4)
WGTV region	0.060***	0.061***	0.059***	0.056***
	(0.017)	(0.017)	(0.020)	(0.020)
Female		0.020*		0.026*
		(0.012)		(0.014)
Age		−0.026***		−0.032***
		(0.009)		(0.010)
Age^2		0.001***		0.001***
		(0.000)		(0.000)
Age^3		−0.000***		−0.000***
		(0.000)		(0.000)
Marital status				
Single		−0.006		−0.024
		(0.021)		(0.027)
Divorced		−0.007		−0.042
		(0.023)		(0.028)
Widowed		−0.022		−0.084**
		(0.027)		(0.034)
Children (yes/no)		0.000		0.015
		(0.013)		(0.017)
Employment status				
Blue-collar		−0.026**		−0.010
		(0.013)		(0.017)
Apprentice		0.032		0.032
		(0.025)		(0.033)
Civil servant		0.035		−0.094
		(0.053)		(0.085)
Self-employed		0.005		−0.076**
		(0.025)		(0.037)
Not working		−0.022		0.010
		(0.014)		(0.023)
Retired		−0.022		−0.036
		(0.020)		(0.027)
Education level				
Medium education		0.022		−0.017
		(0.015)		(0.018)
High education		0.032*		−0.093***
		(0.017)		(0.020)
Log. household income		−0.009		−0.073***
		(0.011)		(0.016)
Migration background		0.049*		−0.039
		(0.029)		(0.037)
Living in West Germany		0.061*		−0.112
		(0.034)		(0.109)
Year dummies	Yes	Yes	Yes	Yes
Log. pseudolikelihood	-10319.64	-10283.99	-4733.27	-4645.59
Observations	16662	16662	7377	7377

Note: The table shows results from random-effects probit models and reports average marginal effects. Omitted variables: Married, white-collar, low level of education. Columns (1) and (2) include the survey waves from 1990 to 1994, and columns (3) and (4) contain the 1990 and 1991 waves. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

TABLE A.7: SOEP data: The effects of self-reported WGTV consumption (full regression table)

	Concerns about environmental protection		Concerns about impacts of climate change		Member of environmental interest group	
	(1)	(2)	(3)	(4)	(5)	(6)
WGTV consumption	0.013	0.010	0.020**	0.018*	0.019*	0.016*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)
Female		0.046**		0.051**		−0.090***
		(0.020)		(0.020)		(0.020)
Age		−0.067		−0.015		−0.053
		(0.080)		(0.081)		(0.083)
Age^2		0.001		0.000		0.001
		(0.001)		(0.001)		(0.001)
Age^3		−0.000		−0.000		−0.000
		(0.000)		(0.000)		(0.000)
Marital status						
Single		−0.037		−0.019		−0.117***
		(0.038)		(0.039)		(0.035)
Divorced		0.002		0.018		−0.050*
		(0.029)		(0.030)		(0.029)
Widowed		−0.020		−0.014		−0.064*
		(0.031)		(0.031)		(0.033)
Children-dummy		−0.031		0.007		0.027
		(0.041)		(0.041)		(0.042)
Employment status						
Blue-collar		−0.044		−0.053		−0.059*
		(0.035)		(0.036)		(0.034)
Civil servant		−0.010		−0.022		−0.047
		(0.068)		(0.070)		(0.063)
Self-employed		−0.071		−0.113**		0.071
		(0.046)		(0.047)		(0.050)
Not working		0.017		−0.034		−0.030
		(0.051)		(0.051)		(0.047)
Retired		0.011		−0.042		0.031
		(0.042)		(0.042)		(0.043)
Education level						
Medium		−0.000		0.007		0.056**
		(0.028)		(0.028)		(0.027)
High		0.044		0.034		0.164***
		(0.028)		(0.028)		(0.029)
Log. income		0.000		−0.003		0.004
		(0.004)		(0.004)		(0.004)
Migration background		0.081		0.081		−0.010
		(0.093)		(0.091)		(0.104)
Living in West Germany		0.001		0.025		−0.003
		(0.036)		(0.035)		(0.036)
Pseudo R^2	0.001	0.013	0.002	0.012	0.002	0.047
Observations	2188	2188	2186	2186	1918	1918
Survey wave	2018	2018	2018	2018	2019	2019

Note: The table shows results from probit models and reports average marginal effects. Omitted variables: Married, white-collar, low level of education. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

TABLE A.8: SOEP data: The effects of self-reported WGTV consumption using ordered probit models

	Concerns about environmental protection		Concerns about impacts of climate change	
	(1)	(2)	(3)	(4)
WGTV consumption	0.049**	0.048**	0.066***	0.069***
	(0.023)	(0.023)	(0.023)	(0.023)
Female		0.215***		0.235***
		(0.052)		(0.052)
Age		−0.103		−0.112
		(0.196)		(0.202)
Age^2		0.002		0.002
		(0.003)		(0.003)
Age^3		−0.000		−0.000
		(0.000)		(0.000)
Marital status				
Single		0.026		0.027
		(0.090)		(0.092)
Divorced		−0.047		−0.012
		(0.076)		(0.075)
Widowed		−0.066		−0.083
		(0.082)		(0.082)
Children (yes/no)		−0.051		−0.013
		(0.098)		(0.099)
Employment status				
Blue-collar		−0.072		−0.068
		(0.085)		(0.087)
Civil servant		0.003		−0.002
		(0.159)		(0.154)
Self-employed		−0.171		−0.206*
		(0.117)		(0.112)
Not working		0.039		0.027
		(0.123)		(0.119)
Retired		0.029		−0.030
		(0.101)		(0.098)
Education level				
Medium		0.083		0.102
		(0.073)		(0.072)
High		0.268***		0.267***
		(0.073)		(0.072)
Log. household income		0.001		0.001
		(0.009)		(0.009)
Migration background		0.433**		0.476**
		(0.208)		(0.196)
Living in West Germany		0.048		0.153*
		(0.085)		(0.084)
Pseudo R^2	0.001	0.013	0.002	0.015
Observations	2188	2188	2186	2186
Survey wave	2018	2018	2018	2018

Note: The table shows results from ordered probit models. Omitted variables: Married, white-collar, low level of education. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

TABLE A.9: Placebo-test: WGTV and general concerns

Dependent variables:	(1) How often have you felt worried?	(2) Concerns about economy in general	(3) Concerns about own economic situation	(4) Concerns about own health	(5) Concerns about maintaining peace	(6) Concerns about global terrorism
WGTV consumption	0.026	−0.010	−0.009	0.002	0.009	0.008
	(0.030)	(0.010)	(0.010)	(0.010)	(0.009)	(0.013)
Female	0.585***	0.096***	0.062**	0.039+	0.158***	0.099***
	(0.063)	(0.021)	(0.022)	(0.022)	(0.022)	(0.030)
Age	0.422+	0.127+	0.218**	0.254***	0.110	0.152
	(0.240)	(0.071)	(0.084)	(0.073)	(0.069)	(0.113)
Age^2	−0.006+	−0.002+	−0.003**	−0.004***	−0.002	−0.002
	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Age^3	0.000+	0.000	0.000**	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Single	−0.131	−0.015	0.025	0.036	−0.067	−0.072
	(0.120)	(0.043)	(0.044)	(0.043)	(0.042)	(0.056)
Divorced	0.089	0.023	0.129***	0.024	0.009	−0.006
	(0.094)	(0.029)	(0.034)	(0.030)	(0.029)	(0.042)
Widowed	−0.097	0.009	−0.023	0.065+	−0.040	−0.120*
	(0.101)	(0.034)	(0.033)	(0.035)	(0.034)	(0.048)
Children (yes/no)	−0.050	−0.040	−0.027	−0.043	0.002	−0.028
	(0.111)	(0.033)	(0.037)	(0.033)	(0.035)	(0.057)
Blue-collar	0.109	0.077**	0.091**	0.068*	−0.019	0.060
	(0.101)	(0.029)	(0.030)	(0.028)	(0.028)	(0.050)
Apprentice	1.720*	0.113	0.169	0.037	−0.313	
	(0.758)	(0.263)	(0.134)	(0.213)	(0.339)	
Civil servant	−0.371+	−0.036	−0.323***	−0.041	−0.068	−0.104
	(0.190)	(0.054)	(0.061)	(0.062)	(0.056)	(0.080)
Self-employed	0.291*	0.058	0.121**	−0.023	−0.041	−0.079
	(0.136)	(0.044)	(0.047)	(0.045)	(0.045)	(0.073)
Not working	0.635***	0.089*	0.335***	0.140***	−0.012	0.053
	(0.135)	(0.037)	(0.039)	(0.037)	(0.037)	(0.072)
Retired	0.468***	0.088**	0.088**	0.107**	0.034	0.009
	(0.119)	(0.033)	(0.034)	(0.032)	(0.032)	(0.058)
Medium	−0.061	−0.009	−0.106***	−0.143***	0.023	0.075+
	(0.087)	(0.031)	(0.031)	(0.032)	(0.032)	(0.042)
High	−0.192*	−0.036	−0.247***	−0.193***	0.097**	0.014
	(0.089)	(0.030)	(0.031)	(0.032)	(0.031)	(0.041)
Log. household income	0.001	0.000	−0.005+	−0.012***	−0.000	−0.004
	(0.010)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)
Migration background	0.120	0.117	0.002	0.090	0.107	0.215*
	(0.296)	(0.083)	(0.090)	(0.100)	(0.104)	(0.104)
Living in West Germany	0.001	−0.050	−0.042	−0.030	−0.060	0.091*
	(0.116)	(0.034)	(0.039)	(0.038)	(0.037)	(0.047)
Year dummies	Yes	Yes	Yes	Yes	Yes	No
Overall R^2	0.065	0.024	0.124	0.063	0.038	0.025
Observations	4114	8473	8475	8478	8477	2185

Note: While questions (2) to (5) were consistently included in the questionnaire from 2016 through 2019, question (1) was included in 2017 and 2019, and question (6) is only available for 2018. Column (1) to (5) shows results from random effects models and column (6) from an OLS regression. Omitted variables: Married, full-time, and low education. Positive coefficients indicate a higher agreement. Standard errors in parentheses, clustered at individual level. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

TABLE A.10: Summary statistics of county-level data

Dependent variables	**Mean**	**Std. dev.**	**Min**	**Max**	**N**
Share of votes for the Greens	4.21	1.53	2.13	11.43	651
WGTV region	0.88	0.32	0.00	1.00	651
Log. population density	5.02	0.97	3.37	8.27	651
Women (%)	51.58	0.74	50.25	53.91	651
Foreigners (%)	1.37	0.99	0.15	12.70	651
Urban county	0.12	0.32	0.00	1.00	651
Unemployment rate (%)	13.64	4.99	6.20	23.63	651
GDP per capita	12.28	3.67	6.57	25.09	651
Log. distance to Inner German border	4.16	1.01	0.00	5.50	651

Note: This table shows descriptive statistics of our variables (means, standard deviation, minimum and maximum value over time). *N* refers to the number of observations.

TABLE A.11: WGTV and votes for the Greens: Variation of the treatment threshold

Dependent variable:	Voting outcome of the Greens in the federal election in 1990				
	(1)	(2)	(3)	(4)	(5)
	-86.5 dBm	-85.0 dBm	-82.5 dBm	-80.0 dBm	Kern (2011)
WGTV region	0.821^{***}	0.874^{***}	0.798^{***}	0.684^{***}	0.949^{***}
	(0.295)	(0.281)	(0.256)	(0.221)	(0.309)
Log. population density	0.458^{***}	0.455^{***}	0.458^{***}	0.479^{***}	0.468^{***}
	(0.149)	(0.148)	(0.148)	(0.147)	(0.148)
Women (%)	-0.964^{***}	-0.968^{***}	-1.005^{***}	-0.998^{***}	-0.979^{***}
	(0.179)	(0.178)	(0.184)	(0.184)	(0.177)
Foreigners (%)	0.229	0.237	0.264	0.236	0.228
	(0.316)	(0.314)	(0.318)	(0.319)	(0.316)
Urban county	1.993^{***}	1.987^{***}	1.965^{***}	1.937^{***}	1.972^{***}
	(0.429)	(0.429)	(0.430)	(0.422)	(0.415)
Unemployment rate (%)	-0.131	-0.112	-0.142	-0.165	-0.163
	(0.119)	(0.117)	(0.119)	(0.121)	(0.119)
GDP per capita	-0.208	-0.212	-0.223	-0.200	-0.203
	(0.217)	(0.216)	(0.218)	(0.218)	(0.217)
R^2	0.386	0.391	0.389	0.386	0.392
Observations	217	217	217	217	217

Note: The dependent variable in columns (1) to (5) is the voting outcome of the Greens in the federal elections from 1990. In column (1), the cutoff level for constructing the treatment and control group is -86.5 dBm. This represents our main specification. The cutoff level in column (2) is -85.0 dBm, in column (3) -82.5 dBm and in column (4) -80.0 dBm. In column (5), we use the classification from Kern (2011). Standard errors are clustered at the county level and shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

Chapter 3

Can television reduce xenophobia? The case of East Germany*

Can television have a mitigating effect on xenophobia? To explore this question, we investigate a natural experiment in which individuals in some regions of East Germany could not–due to their geographic location–consume West German television until 1989. By analyzing survey data from the periods before and after German reunification, we provide evidence that individuals who received West German television during the GDR period and were thus more frequently exposed to foreign media have developed less xenophobia. We document that West German television programs positively affected individuals' attitudes towards foreigners and led to a higher likelihood of supporting refugees, for example by donating money to refugee aid. In addition to the survey evidence, we show that regions that could receive West German television before reunification were less likely to vote for extreme right-wing parties during the national elections from 1990 to 2017, and experienced fewer criminal offenses against refugees.

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3.1 Introduction

Since at least the beginning of the European migrant crisis in 2015, the world has seen a sharp surge in xenophobia. One way in which this development has manifested is in the rising number of hate crimes. For example, the number of anti-Muslim hate crimes in the U.S. doubled between 2014 and 2016 (Müller and Schwarz, 2020). Parties with anti-migration attitudes are also increasingly finding their way into the parliaments of many European countries. The majority of these political parties use xenophobic rhetoric and support xenophobic attitudes (Jolly and DiGiusto, 2014). It is therefore essential for researchers and policymakers to understand the mechanisms that contribute to the emergence of and the persistence of these attitudes.

This article addresses the question: Can television have a mitigating influence on xenophobia? To explore this possibility, we investigate a natural experiment that occurred in the German Democratic Republic (GDR) during the period of German division. Although West German television (WGTV) reception was generally widespread in the GDR, some regions were located too far away from a WGTV transmitter to enable the reception of these programs. This is the exogenous variation that we exploit in our study. We also make use of the fact that WGTV exposed its audience more frequently to authentic representation of foreigners and foreign countries than East German television. We use several data sources to examine the effect of WGTV on various measures of xenophobia. Unlike previous studies, we combine county-level evidence with individual-level evidence using survey data.

First, we study the responses to the survey "Youth and Right-Wing Extremism 1990," which was conducted by the Central Institute for Youth Research (*Zentralinstitut für Jugendforschung*) before German reunification. This survey contains several attitudinal questions relating to foreigners. Our results indicate that people living in regions with WGTV coverage have more positive attitudes towards foreigners. Subsequently, we analyze survey data from the German Socio-Economic Panel Study (SOEP), in which we make use of a new subsample that was introduced in 2018 and which allows us to use self-reported information on WGTV consumption. To the best of our knowledge, we are the first to study the long-term effects of television exposure on xenophobia. Our results show that WGTV exposure positively affected Germans' attitudes towards refugees. Furthermore, we find a higher likelihood among respondents with previous WGTV exposure to support refugees today, for example through a higher willingness to donate money to refugee aid. Overall, our findings provide evidence that media can have surprisingly broad effects that are generally seen as beneficial for society.

As a further measure of xenophobia, we use the electoral success of right-wing parties in the federal elections from 1990 to 2017, given that several empirical articles have suggested that individuals express their concerns about foreigners and migrants at the ballot box, by voting for right-wing parties (Brunner and Kuhn, 2018). Although right-wing attitudes are not synonymous with negative attitudes towards foreigners, the extreme right-wing political agenda is strongly correlated with negative attitudes towards foreigners (Frindte et al., 2016, Hyll and Schneider, 2018). Analyzing actual voting decisions instead of stated preferences in surveys minimizes the effects of social desirability bias (Brunner and Kuhn, 2018), because not only can individuals cast their vote anonymously, but they are also incentivized to reveal their actual preferences, given that votes have real consequences. We provide evidence that WGTV had a mitigating effect on the electoral success of right-wing parties. Finally, we use data on hate crimes against refugees provided by the Amadeu Antonio Foundation and the non-profit organization PRO ASYL. Our results reveal that exposure to WGTV negatively affected the number of arson attacks against refugee housing and the number of incidents related to anti-refugee demonstrations.

This article contributes to the literature studying the effects of WGTV reception in the GDR. Like Crabtree et al. (2015), Hennighausen (2015), Bursztyn and Cantoni (2016) and others before us, we use the exogenous variation in the geographic features of East Germany that provided citizens with differential access to WGTV as the identification strategy in our empirical analyses. Over the last decade, economists and political scientists have used the historical division of East and West Germany as a natural experiment to explain, for example, policy preferences for state intervention and redistribution (Alesina and Fuchs-Schündeln, 2007), cheating behavior (Ariely et al., 2019), and individuals' attitudes towards social trust, risk, perceived fairness, and cooperativeness (Heineck and Süssmuth, 2013).

More recently, scholars have also exploited the variation in the availability of WGTV within the GDR. In a pioneering article, Kern and Hainmueller (2009) investigate whether WGTV broadcasting undermined the authoritarian regime of the GDR. Using a survey that was conducted by the Central Institute for Youth Research, they find that WGTV increased the life satisfaction of East Germans, who seemed to perceive television broadcasting mostly as a source of personal entertainment. In line with this finding, Hyll and Schneider (2013) find evidence that WGTV exposure is positively correlated with material aspirations, which were previously shown to be associated with happiness and personal well-being (Easterlin, 2001). Hennighausen (2015) has demonstrated that WGTV exposure affected East Germans' beliefs about what drives success in life. Using data from the German SOEP, she finds a long-lasting effect of WGTV exposure on

East Germans' beliefs that effort rather than luck is a crucial determinant of success in life. Crabtree et al. (2015) investigate whether WGTV exposure prompted protest events in 1989, which ultimately led to the collapse of the GDR. Their study finds no evidence that exposure to WGTV had an effect on protest events. Bursztyn and Cantoni (2016) find that WGTV exposure affected the composition of consumption after German reunification, with East Germans who were exposed to WGTV buying more products that were advertised with a higher intensity. Slavtchev and Wyrwich (2017) analyze the influence of WGTV on entrepreneurial decisions of individuals and report that entrepreneurship is higher among residents of East German regions with former WGTV reception. Particularly relevant to our study, Friehe et al. (2020) investigate the effect of WGTV on voting behavior. However, they only focus on the election results of far-right and left-wing parties during a period from 1990 to 1998 and find a negative correlation between television reception and the electoral success of these parties.

The remainder of this article is structured as follows. In the next section, we review the literature on media consumption and attitudes towards foreigners and derive our hypothesis regarding the effect of WGTV exposure on xenophobia. Section 3.3 briefly outlines the history of the divided Germany, the role of East German television and WGTV, and the representation of foreigners in their respective broadcasting programs. In Section 3.4, we outline our identification strategy. Section 3.5 presents the survey evidence. In Section 3.6 we consider the effects of WGTV on other manifestations of xenophobic tendencies, in particular the electoral success of right-wing parties and hate crimes against refugees. The final section presents our conclusions.

3.2 Media consumption and attitudes

Previous academic literature has shown that mass media consumption can affect individuals in a variety of ways. Various studies have demonstrated that media content can influence, for example, voting behavior (Gentzkow, 2006, DellaVigna and Kaplan, 2007, DellaVigna et al., 2014, Enikolopov et al., 2011, Durante et al., 2019), fertility rates (La Ferrara et al., 2012), social capital (Olken, 2009), and domestic violence (Jensen and Oster, 2009).

We contribute to the literature examining the relationship between mass media consumption and attitudes towards foreigners and immigrants. In an early article, Gentzkow and Shapiro (2004) find evidence that attitudes towards the U.S. in Muslim countries are correlated with television consumption. A recent study by Benesch et al. (2019) focuses on the impact of news coverage of migration issues on immigration

worries in Germany, finding that a higher number of media reports dealing with migration issues leads to stronger concerns about immigration. Analyzing articles published in three German daily newspapers for the period 1993 to 2005, Boomgaarden and Vliegenthart (2009) find that the amount of immigration coverage in the news is marginally positively associated with anti-immigration attitudes. One possible reason for a positive relationship between news coverage and anti-immigration attitudes is that immigration is often framed in the context of social problems, such as crime or unemployment (Meltzer et al., 2017). Boomgaarden and Vliegenthart (2009) point out that both the tone of reporting and the visibility of immigrant actors play a crucial role in eliciting anti-immigration attitudes. First, they show that exposure to positive media messages about immigrants leads to more positive attitudes towards immigrants. Second, they document a negative relationship between the frequency with which actors with a migration background appear in the news and anti-immigration attitudes. By using survey panel data and content data of Dutch newspapers, Wojcieszak and Azrout (2016) also find that exposure to Muslim and Polish immigrants in news articles is sufficient to improve attitudes toward immigrants.[23]

Overall, these studies provide mixed evidence on the relationship between media exposure and attitudes toward foreigners. However, they suggest that the tone of the media content and the context in which a topic is presented matter for the direction of the effect. The present study goes beyond this focus on news reports dealing with immigration issues and instead considers the larger scope of television programming, including entertainment television, in which foreigners are often not associated with immigration or social problems that can be related to immigration. Given that a substantial part of WGTV programming came from foreign productions, the representation of foreigners in these programs is rather positive or at least non-threatening. Consequently, exposure to WGTV might have reduced xenophobia among East Germans because, even in the absence of explicitly negative coverage, a

[23]These results are consistent with recent expansions of the intergroup contact hypothesis by Allport (1954), which suggest that indirect contact with out-group members reduces racial as well as ethnic prejudice (Pettigrew and Tropp, 2006, Pettigrew et al., 2011). Several studies using laboratory experiments conclude that indirect contacts, for example via television, can also mitigate negative attitudes towards members of other groups (Schiappa et al., 2005, Ortiz and Harwood, 2007, Dovidio et al., 2011, Joyce and Harwood, 2014, Lienemann and Stopp, 2013, Ioannou et al., 2018).

lack of exposure to foreigners in any context is frequently seen as a precipitant of xenophobia.[24]

3.3 Institutional background

3.3.1 A brief history of the divided Germany

In 1945 after World War II, the former German Reich was occupied by Allied forces who divided the country into four occupation zones led by France, Great Britain, the Soviet Union, and the U.S. The Soviet occupation zone was located in East Germany. The city of Berlin was also divided between all four occupation powers and the Western zones of Berlin became an island within the Soviet occupation zone. A larger part of the Soviet occupation zone became Polish territory and some became territory of the Soviet Union. In 1949, the remainder of the Soviet occupation zone formed the German Democratic Republic (East Germany), while the parts of Germany occupied by France, Great Britain, and the U.S. formed the Federal Republic of Germany (West Germany).

With the political and economic support from the U.S. and the other Western countries, West Germany quickly developed into a market economy and free democracy. East Germany became a communist state with one-party rule and strict censorship of all media, and was under the supervision of the Soviet Union. In 1953, an uprising occurred in East Germany, which the Soviet Union suppressed with military force. Because more and more people fled the GDR, its border controls increasingly tightened, leading to the creation of a "restricted zone" (*Sperrzone*) along the entire border between the GDR and West Germany. Moreover, the Berlin Wall separated East and West Berlin from 1961 to 1989. After the onset of political reforms in the Soviet Union in the late 1980s, demonstrations for political freedom began in many Eastern European countries, including the GDR. They succeeded at the end of 1989, which led to the fall of the Berlin Wall on November 9, 1989; democratic elections in East Germany on March 18, 1990; and ultimately to the reunification of Germany on October 3, 1990.

[24]Several recent studies find evidence for a mitigating influence of intergroup contacts on xenophobic attitudes (see e.g., Schindler and Westcott (2020) and Steinmayr (2021)). Hangartner et al. (2019) and Dinas et al. (2019) find a contrary result by analyzing the impacts of a massive increase in refugee arrivals on xenophobia in Greece.

3.3.2 The role of West German television in East Germany

For citizens of the GDR, gathering independent information about the world outside of East Germany was challenging. Traveling to the West was practically impossible except in very special cases and even traveling to other socialist countries was restricted. Towards the end of the GDR, only one country accepted visitors without visas: the former Czechoslovakia. Furthermore, the government of the GDR imposed tight control over all media. Books and newspapers from the West were not allowed to enter the country, a policy that was strictly enforced through detailed border controls such that the impact of these media on the flow of information was indeed insubstantial (Kuschel, 2016, p. 144 and p. 266). Because the Internet did not exist yet for the general public, the only means of obtaining information from the West was through radio and television–both crossing the border easily via airwaves. In particular, WGTV was considered to be the only "window to the West" by many East Germans (see Hömberg (2002), p. 12) and simply more informative and attractive than the programming on East German television (Wolff, 2002, p. 123). It has even been argued that WGTV was one of the main causes for "preserving the cultural unity of the German nation during the 45 years of separation" (Wolle, 2013).

While initially the government of the GDR tried to enforce a ban on watching WGTV, this turned out to be too difficult in the long run. In the 1970s, the majority of East Germans were already following West German programs and in 1987, 85 % of the population were using WGTV regularly (Förster, 1995). In the 1970s and 1980s, the only impediment to watching WGTV was physics, that is, the limited reach of television signals. Close to the border, watching WGTV programs was relatively easy, but as the distance to aerial masts increased, it became more and more difficult or even impossible. Since the programs were also broadcast from West Berlin, most regions of the GDR had good or at least reasonable WGTV reception. There were, however, differences in quality and two regions of the GDR–the northeastern and southeastern regions–were not able to receive WGTV signals at all. Due to their relative lack of outside information, these regions were made fun of by East Germans; for example, the southeastern region, which included the third largest East German city, Dresden, was nicknamed "the valley of the clueless" (*Tal der Ahnungslosen*; see Figure B.1.1 in the appendix).

3.3.3 Representation of foreigners on East and West German television

The difference between East German television and WGTV was not limited to politics and ideology. While in West Germany, the audience was expecting to see the world on their television screens–with reports from other countries, travelogues, and foreign movies and documentaries–East German television broadcasters featured much less foreign content, but more domestic programs (Stiehler, 1999). The types of foreign programs differed as well. Travelogues were fewer in East Germany–understandable given that travel was restricted–and political reporting from other countries tended to contain more political propaganda than unbiased information (Kuschel, 2016, Oehmig, 2017).

In sum, WGTV frequently exposed its audience to foreign countries and generally to foreigners not only from Europe and America, but from all around the world. The size of this discrepancy can be inferred by comparing the programming of the two main public television stations in the West (ARD and ZDF)[25] with the two East German television stations (DDR1 and DDR2). To quantify this difference, we analyzed the television programming of one arbitrary week in each of the years 1980, 1985, and 1988. While the two main public television stations in West Germany broadcast 36 programs with foreign content out of 141 (25.53 %) in the respective week in 1980, we only found 20 out of 138 (14.49 %) on the two main East German stations. Only five out of these 20 productions originated in non-Eastern Bloc countries.[26] For 1985, we find an even more pronounced difference, with a share of foreign programming of 32.19 % in West Germany and 17.98 % in East Germany. In 1988, we find an almost equal portion in West (19.74 %) and East Germany (20.15 %). The share of productions from non-Eastern Bloc countries, however, was again much lower (7.46 %). The difference between West and East German television became even greater with the introduction of private television in West Germany, which contained a higher proportion of foreign content and by the late 1980s already had substantial viewership (Müller, 1990).

The content of the broadcasts differed markedly. While foreign content on East German television could include a Soviet propaganda movie or a report about the visit of a GDR politician in a "friendly socialist country," in the West this part of the

[25]Prior to the advent of private television in West Germany in 1984, these were the only two stations nationwide. They were still the most frequently watched stations throughout the 1980s.

[26]We excluded news from the analysis because its foreign content could not be determined retrospectively. Table B.1.1 of the appendix provides an overview of the analysis of the television programming.

programming was much more diverse.[27] For instance, on Sunday, August 16, 1981, the programming of ZDF included content about the U.S., Italy, Africa, Russia and Slovakia, starting at noon with the "Sunday Concert" from New Orleans, followed by a report about "Our neighbors, the Italians," and later in the evening even including a documentary about movies and cinemas in sub-Saharan Africa. In all, nine programs had foreign content. On the same day, both East German television stations together had only three (Hörzu, 1981). As can be seen from this example, representation of foreign countries and foreign people on WGTV was comparatively extensive and diverse.

The differences in exposure to WGTV in the GDR, depending on geographic location, provides us with an ideal setup for studying the long-term effects of exposure to foreigners on television on attitudes towards foreigners in general.

3.3.4 Xenophobia in East and West Germany

As in most countries, there exists a certain number of people with xenophobic tendencies in Germany. While before reunification this problem was frequently discussed publicly in West Germany and a lot of political and educational efforts were made to reduce xenophobia, the problem was officially non-existent in East Germany. The communist state was considered by definition to be "anti-fascist." Practically, however, xenophobia was a built-in feature in the GDR: "the German Democratic Republic was a [...] system where foreignness didn't have space" (Klier, 1994). In fact, very few foreigners were allowed to live in the GDR–typically only temporarily and with heavily restricted rights. Exchange students from African countries, for example, were only allowed to eat out in *one* designated restaurant in their city of residence; and female workers from Vietnam and Mozambique who became pregnant during their stay in the GDR were forced to have an abortion and were generally not permitted to marry Germans (Klier, 1994). Due to these manifold restrictions, the small number of foreigners in the GDR–around 1 % of the population in 1989–was much less integrated and therefore much less visible than in West Germany. This situation also gave rise to xenophobia in East Germany. Consequently, hostility and violence against foreigners took place (Klier, 1994), but was often kept secret and was thus not well-known among the general population.

In West Germany, the situation for foreigners differed significantly. West Germany experienced a large influx of foreigners, particularly in the 1960s and 1970s. Interactions with the occupying foreign armies were also closer, especially in the first years after

[27] It should be noted that East German television producers began buying Western television productions with increasing regularity in the late 1980s (Kuschel, 2016, p. 290).

World War II. Later on, West Germany saw a larger number of foreign tourists and exchange students.[28] This meant that contact with foreigners was a familiar experience for West Germans. Even though contact was at first often restricted to culinary adventures into Yugoslavian, Italian, Greek, Turkish or Chinese restaurants, over the long term, most West Germans had personal contact with foreigners, and larger cities in particular became characteristically international. According to data by the Federal Statistical Office of Germany, in 1989, 8 % of the West German population were foreigners, not counting immigrants with German citizenship. Indeed, surveys show that the number of contacts between West Germans and foreigners was much larger than the number of contacts between East Germans and foreigners even four years after reunification (see Figure B.1.2 in the appendix and Schmidt and Weick (1998)).

Although relationships with and the overall situation for foreigners was somewhat better in West Germany, some degree of xenophobia existed in the West as well, with political parties profiting from it. The success of right-wing parties was nevertheless limited to regional elections and was only moderate. In nationwide elections, they never won more than 4.3 % of the votes, which corresponds to the election outcome of the National Party of Germany in the federal election of 1969 (The Federal Returning Officer, 2019). With reunification, the situation changed dramatically, particularly in East Germany. The economic breakdown during the transition into a market economy led to a sudden rise in unemployment rates, up to 20 % on average. At the same time, more foreigners ended up in East Germany, especially because refugees and asylum seekers were distributed among the eastern regions of the country as well. High unemployment and immigration led to violence against foreigners and moderate success among right-wing parties.[29] Although the situation improved considerably in

[28] In 1989, there were 92,000 foreign students studying in West Germany according to the Federal Statistics Bureau of Germany, but only 13,000 in East Germany (Deutsches Historisches Museum Berlin, 2016). In relation to the population size in 1989, we obtain a share of foreign students of 0.15 % for West Germany and 0.03 % for East Germany. Numbers of foreign visitors to East Germany are difficult to obtain. The Statistics Bureau of the GDR only recorded the numbers for the most popular tourist region, on the Baltic Sea (*Bezirk* Rostock). In 1987, there were fewer than 200,000 foreign visitors in this region. The number for the whole of GDR can therefore be estimated as less than 2 million, and many of them would have been West Germans, which counted as foreigners at that time, thus leaving an even smaller number as non-German visitors. In the same year in West Germany, the number was 14 million according to the Federal Statistics Bureau of Germany. The share is, for both students and visitors, much larger in West Germany.

[29] Hyll and Schneider (2018) find that, in the time since reunification, people in East Germany concerned about their own economic status compared with better-off peers are more likely to exhibit negative attitudes towards foreigners.

the mid-1990s, it again deteriorated starting in 2015 with a sharp rise in the number of refugees.

3.4 Identification strategy

In 1989, the GDR was divided into 14 districts and 217 counties.[30] We make use of the fact that the population of some of those counties could previously receive WGTV, and consider all the counties that were able to receive these programs to be part of the treatment region. Consequently, our control region consists of all counties without access to WGTV. In order to investigate the impact of watching WGTV on voting behavior, three assumptions have to be fulfilled.

First, the inhabitants in the treatment and control region would need to be comparable, varying only in terms of their access to WGTV. This assumption seems to be reasonable, because the GDR was a totalitarian socialist system that focused especially on the equalization of regional differences. These efforts commenced with early childhood education through a centralized education system (Hyll and Schneider, 2013). Bursztyn and Cantoni (2016) analyzed whether the inhabitants of the districts of Dresden, Neubrandenburg, and Rostock, which constitute large parts of our control region, were comparable to the other districts in the GDR in terms of demographic and economic conditions. They do not find any significant differences between these regions with respect to population density, retail sales, savings per capita, or the share of workers employed in industry or agriculture. Their results are in line with the findings of Kern and Hainmueller (2009), who show that the district of Dresden was comparable to the other districts in the GDR. We extend the approach of Bursztyn and Cantoni (2016) and focus especially on the percentage of foreigners, the share of foreign visitors, and demographic data. The data was obtained from several issues of the GDR Statistical Yearbook. Table B.1.2 in the appendix shows that these regions do not differ significantly from each other for the first recorded year in 1955 and the last year in 1989.

Additionally, if there had been any differences in voting behavior before the treatment, this would invalidate our analysis. We therefore analyze the results of the Reichstag elections in 1928, 1930, and 1933 for the constituencies that later became part of the GDR area. Table B.1.3 in the appendix shows the vote shares for the largest parties. The "Dresden-Bautzen" constituency coincides geographically with the later

[30] East Berlin was not an official district, but fulfilled the function of a district after an administrative reform in 1961.

GDR district of Dresden, which for the most part had no WGTV reception (Kern and Hainmueller, 2009, Hyll and Schneider, 2013). Parts of the Pomeranian constituency also had no reception. However, only a very small part of this constituency later became part of the GDR, and the significantly larger part was placed under Polish administration. Parts of the constituency of "Frankfurt (Oder)" later also became part of Poland. Overall, we find no systematic differences in the voting behavior of the individual constituencies, with Hennighausen (2015) and Friehe et al. (2020) coming to the same conclusion.

The data of the Reichstag elections unfortunately only allows an analysis at a rather high level of regional aggregation. This is why we also consider the state elections in 1946 during Soviet occupation. These election results are available at the county level. We focus on the state elections of the two states in which our control regions are located, namely Mecklenburg-West Pomerania and Saxony. We compare for both states whether the vote shares for the three major parties "Socialist Unity Party of Germany" (*Sozialistische Einheitspartei Deutschlands*, SED), "Christian Democratic Union of Germany" (*Christlich-Demokratische Union Deutschlands*, CDU), and "Liberal Democratic Party of Germany" (*Liberal-Demokratische Partei Deutschlands*, LDP) differ between the treatment and the control regions. Table B.1.4 in the appendix shows the results of this comparison. We find no significant differences in the vote shares. These findings are in line with Kern and Hainmueller (2009), who report that the vote shares of these three parties in the district of Dresden were similar to those of the other districts. It is important to note, however, that the 1946 elections were influenced by the aftermath of World War II and were not entirely independent. The Soviet Military Administration in Germany sought to influence the election in favor of the SED (Creuzberger, 1999).

The second important aspect for our analysis is that the individuals that had access to WGTV due to their geographical location were not only able to receive WGTV but actually watched it. Given that approximately 98 % of the households in East Germany had a television set by 1989 (Müller, 2000), citizens from the GDR could in principle easily consume WGTV if the signal was strong enough. In addition, the black and white television reception was made considerably easier after the change of the GDR television to the West European system in the 1960s. Most of the modern color television sets produced in the GDR were equipped with a Phase Alternating Line (PAL) color encoding system, which was also used in WGTV sets (Federal Agency for Civic Education, 2016). Against this backdrop, we can rule out that technical differences hindered access to WGTV programs; indeed, we highlight in Section 3.3.2 above the important role of WGTV in the everyday life of East Germans. In the empirical analysis we also use recent data on actual WGTV consumption in the GDR (see Section 3.5.2).

Third, we have to consider internal migration between the treatment and the control regions. In the time before reunification, residential and labor mobility was extremely restricted due to East Germany's centrally planned economy. Mobility across regions was further limited because the GDR faced a large shortage of housing since its foundation in 1949 (Kern and Hainmueller, 2009, Hyll and Schneider, 2013, Bursztyn and Cantoni, 2016). Therefore, selective spatial sorting during the GDR period presents no significant issue for our identification strategy. Selective migration after reunification would present issues in our research design; however, Bursztyn and Cantoni (2016) show that the migration rates to West Germany were similar for the treatment and control region. Furthermore, they provide evidence that the migration rates between the treatment and the control regions were relatively low in the years after reunification. These migration rates also do not show any asymmetric pattern.

3.5 Survey evidence

3.5.1 GDR survey

For the first part of our empirical analysis, we use the survey "Youth and Right-Wing Extremism 1990," which was conducted before German reunification. A total of 1,624 people between the ages of 12 and 26 took part in this survey. The survey included the three GDR districts Chemnitz, Dresden, and Leipzig. In line with previous studies, we take advantage of the fact that the WGTV signal in the Dresden district was too weak to allow reception of WGTV programs (Kern and Hainmueller, 2009, Hyll and Schneider, 2013, Hennighausen, 2015, Friehe et al., 2020). Therefore, respondents living in the Dresden district represent our control group, while participants from the other two districts in which reception was possible represent our treatment group. In addition to the participants' socioeconomic information, the survey also includes several attitudinal questions about foreigners. Among other things, participants were asked about their willingness to (i) have a drink with a foreigner in a pub, (ii) invite a foreigner to their home, or (iii) marry a foreigner. They were able to answer on a scale from "not at all" (1) to "completely" (5).

Panel A of Table 3.1 reports the results of ordered probit models controlling for individual characteristics of the respondents such as sex, age, relationship status, and religious affiliation. We also add a dummy variable that indicates whether the respondent lives in a city. Most importantly, we also include a dummy variable that equals one if the respondent resides in the Chemnitz or Leipzig district and thus had access to WGTV. In contrast, if a respondent lives in the Dresden district where WGTV

TABLE 3.1: WGTV and attitudes towards foreigners before reunification

Survey questions		Coefficient of TV-dummy
Panel A:		
To what extent would you be willing to engage in the following behaviors?		
(i)	Willingness to have a drink with a foreigner in a pub	0.137^{**}
(ii)	Willingness to invite a foreigner to my home	0.163^{**}
(iii)	Willingness to marry a foreigner	0.120^{*}
Panel B:		
To what extent do the following statements agree with your personal opinion?		
(iv)	I am proud to be German	0.088
(v)	Germans have always been the greatest	-0.040
(vi)	I feel contempt for Hitler	0.022
(vii)	Germany should again have a strong *Führer*	-0.079
(viii)	Understanding about antisemitism	0.126

Note: Each row represents a separate ordered probit model. Controls: sex, age, age^2, age^3, relationship status, and religious affiliation, dummy for living in a city. In Panel A (B), positive coefficients of the TV-dummy indicate a higher willingness (agreement). Standard errors clustered at individual level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

was not accessible, the variable takes the value of zero.[31] The results show that participants from regions with WGTV reception have a higher willingness to (i) have a drink together with a foreigner in a pub, (ii) invite a foreigner to their home, or (iii) marry a foreigner. Our results hold even if we control for direct contact with foreigners in the individuals' professional or private lives. We come to the same conclusion if we apply nonparametric Wilcoxon rank-sum tests instead of ordered probit models, which we report in Table B.2.1 in the appendix.

In addition to questions capturing attitudes toward foreigners, the survey also includes information on nationalist, antisemitic, and authoritarian attitudes. Respondents were presented with the following statements and prompted to indicate to what extent they agreed with these statements: (iv) I am proud to be German, (v) Germans have always been the greatest, (vi) I feel contempt for Hitler, and (vii) Germany should again have a strong *Führer*. Furthermore, the participants were asked to what extent they have an understanding of recent antisemitic actions in Germany (viii). The results in Panel B of Table 3.1 indicate that the effect of WGTV on xenophobia is not driven by authoritarian, nationalist, or antisemitic attitudes.

[31]We further support this assumption by analyzing SOEP data on self-reported WGTV consumption during the GDR period. We show in Table B.1.5 in the appendix that survey participants who lived in the Dresden district reported that they consumed significantly less WGTV than East German respondents living elsewhere.

3.5.2 SOEP data

In this subsection, we use data from the SOEP, which is an annual representative panel study for German households (Goebel et al., 2019). Besides the annual personal questionnaire, additional surveys are occasionally carried out. In 2018, 2,315 people received a questionnaire with the title "Living in the former GDR." This questionnaire is aimed exclusively at people who lived on the territory of the GDR before reunification and were born in 1972 or earlier. The questionnaire includes questions about living conditions in the GDR period and personal attitudes towards the government at that time. Among other things, the participants are asked how regularly they have watched certain television broadcasts. One of these broadcasts is *Tagesschau*, a West German news program broadcast daily by one of the two public WGTV channels. The respondents could answer this question on the following scale: "never," "rarely," "often," "almost always."[32] We can link this information to the annual questionnaires via the individual person ID.

In the questionnaires from 2016 and 2018, the respondents were asked several questions about their attitudes towards refugees. These questions cover opinions related to economic, cultural, and social consequences of the immigration of refugees. Respondents were also asked whether they consider an influx of refugees in the short-term and in the long-term more as an opportunity or more as a risk. The exact wording of the questions can be found in Table B.3.1 in the appendix. The respondents had to answer these questions on a Likert-type scale ranging from 1 (negative opinion) to 11 (positive opinion). In line with the results from the previous section, we expect people who watched WGTV to consider refugees as an enrichment rather than a threat to German society. Therefore, we predict that these people select a higher value on the scale. To test this, we estimate the following random-effects model:

$$Y_{it} = \beta_0 + \beta_1 TV_i + \beta_2 X_{it} + \mu_t + Z_i + \epsilon_{it}, \tag{3.1}$$

where Y_{it} represents the answer score of individual i in year t. TV_i is an ordinal variable and takes the value of one if individual i had never watched *Tagesschau* before reunification. The variable equals two if respondent i had rarely seen it, three if he or she had seen it often, and four if he or she almost always saw it. X_{it} denotes a vector of covariates and μ_t indicates year dummies. Z_i represents the individual-specific random

[32] In addition to *Tagesschau*, there is another Western television show included (*Wetten, dass..?*). This show, however, is only broadcast six to seven times a year and is therefore less suitable for measuring regular television consumption. The remaining broadcasts could only be seen on East German television.

effect, while ϵ_{it} indicates the error term. The vector of covariates includes gender, age, marital status, employment status, education level, log. household income, and dummy variables for children in the household, religious affiliation, migration background, and whether the respective individual is currently living in West Germany. We report summary statistics in Table B.3.2 of the appendix.

Table 3.2 reports the regression results. Model 1 shows that the respondents who report having watched *Tagesschau* while living in the GDR are more optimistic about the effects of refugees on the German economy. A one standard deviation increase in the frequency with which a person watched *Tagesschau* is associated with a 0.119 unit increase in the respondent's assessment of seeing the influx of refugees as beneficial for the German economy. As Model 2 shows, respondents who watched *Tagesschau* more frequently also tend to consider refugees to be an enrichment rather than a hindrance to German culture. An increase in the TV variable by one standard deviation leads to a 0.081 unit increase in the respondent's assessment of perceiving refugees as an enrichment to German culture. In addition, we also find a positive and significant television effect in Model 3. As Model 5 shows, respondents who watched *Tagesschau* also perceive refugees as an opportunity rather than a risk, at least in the long term. The effect size of the TV variable in Models 3 and 5 is comparable to that in the first two models. In Model 4, however, we could not find a significant impact of television exposure. Almost all models show that women and people with children in the household have a more positive perception of refugees on average. The same is true for individuals with a religious affiliation and for better-educated individuals. Moreover, we find a positive impact of household income on the perception of refugees.

In addition to the questions above, the participants were also asked whether or not they had supported refugees by donating money or working with them directly, for example by providing support in language learning within the last year or if they planned to do so in the future.[33] We would again assume that individuals who watched WGTV programs are more likely to support refugees. We estimate the following random-effects probit model:

$$Y_{it} = \beta_0 + \beta_1 TV_i + \beta_2 X_{it} + \mu_t + Z_i + \epsilon_{it}, \tag{3.2}$$

[33]Participants were also asked whether they had actively participated in demonstrations related to refugees. In the original German version of the question, however, it is not possible to differentiate whether it is a question of demonstrations or initiatives in support of or against refugees.

TABLE 3.2: WGTV and attitudes towards refugees after reunification

Dependent variables:	(1)	(2)	(3)	(4)	(5)
Respondent's agreement with the following statements:	Refugees are good for the German economy	Refugees enrich cultural life in Germany	Refugees make Germany a better place	An influx of refugees means more opportunities in the	
				short-term	long-term
TV (ordinal)	0.113**	0.081*	0.074*	0.054	0.092*
	(0.046)	(0.049)	(0.044)	(0.039)	(0.049)
Female	0.090	0.445***	0.222**	0.247***	0.266**
	(0.100)	(0.104)	(0.094)	(0.083)	(0.108)
Age	−0.285	0.005	−0.310	−0.088	−0.348
	(0.336)	(0.329)	(0.299)	(0.268)	(0.331)
Age^2	0.005	0.001	0.005	0.002	0.006
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Age^3	−0.000	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital status					
Single	0.029	0.417**	0.171	0.162	0.315
	(0.184)	(0.201)	(0.177)	(0.152)	(0.201)
Divorced	0.144	0.285*	0.262*	0.148	0.204
	(0.156)	(0.160)	(0.141)	(0.128)	(0.164)
Widowed	0.053	−0.065	−0.096	0.036	0.022
	(0.149)	(0.152)	(0.140)	(0.121)	(0.163)
Children in household	0.239	0.435**	0.365**	0.329**	0.400**
	(0.192)	(0.190)	(0.171)	(0.156)	(0.194)
Religious affiliation	0.303***	0.150	0.339***	0.244***	0.348***
	(0.107)	(0.111)	(0.102)	(0.091)	(0.116)
Employment status					
Part-time	0.143	0.231	−0.006	−0.095	0.041
	(0.152)	(0.159)	(0.141)	(0.129)	(0.159)
Not employed	−0.117	0.080	0.135	−0.214*	−0.175
	(0.142)	(0.137)	(0.132)	(0.121)	(0.142)
Education					
Medium	0.354***	0.249*	0.322***	0.232**	0.266*
	(0.132)	(0.135)	(0.123)	(0.110)	(0.139)
High	1.405***	1.336***	1.165***	0.800***	1.388***
	(0.136)	(0.143)	(0.130)	(0.116)	(0.147)
Household income (log.)	0.447***	0.489***	0.465***	0.243***	0.475***
	(0.110)	(0.112)	(0.100)	(0.090)	(0.114)
Migration background	−0.560	−0.674*	−0.699**	−0.113	−0.447
	(0.409)	(0.408)	(0.356)	(0.391)	(0.437)
Living in West Germany	0.309*	0.258	0.284*	0.147	0.375**
	(0.175)	(0.175)	(0.156)	(0.147)	(0.188)
Year	Yes	Yes	Yes	Yes	Yes
Between R^2	0.11	0.10	0.09	0.06	0.10
Observations	4064	4072	4066	4077	4064

Note: Random effects models. Omitted variables: Married, full-time, and low education. Positive coefficients indicate a higher agreement. The different number of observations results from the fact that some people did not give an answer to all five questions. If we exclude people who did not answer all five questions, our results are almost unchanged. Standard errors in parentheses, clustered at individual level. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

The only difference from regression equation (1) is that Y_{it} represents a dummy variable, which equals one if individual i states in t that he or she has donated money in the past year and zero otherwise. The same logic applies to the other outcome variables. Table 3.3 reports the regression results. Our findings in Models 1 and 2 indicate that watching WGTV more regularly is associated with a higher probability of supporting refugees by donating money. For example, a response that was one standard deviation

higher when asked whether someone had watched *Tagesschau* increased the willingness to donate to refugees during the last year by 1.5 percentage points. The effect for future donations was even stronger. A one standard deviation increase in the TV variable increased the willingness to donate to refugees in the future by 2.1 percentage points. We obtain similar results with regard to the intention to work directly with refugees in the future. A one standard deviation increase in the TV variable leads to a 1.2 percentage point higher likelihood that respondents have the intention to support refugees directly. Only in Model 3 do we not find a significant effect. Women, individuals with children in their households, and respondents with a religious affiliation are on average more likely to support refugees. Furthermore, we find a positive relationship between the probability of supporting refugees and household income. These results are very similar to those of Table 3.2.[34]

Overall, our results show that people who have watched WGTV more regularly have more positive attitudes towards refugees, which aligns with our presumption that WGTV exposure reduced xenophobia. An alternative explanation for our results could also be that WGTV made individuals more tolerant in general, not just more tolerant of foreigners. To explore this alternative, we examine whether WGTV exposure affected tolerance in other domains. To test this conjecture, we use attitudinal questions from the SOEP questionnaire in 2018, which capture attitudes regarding homosexuality and transsexuality. Because neither of these topics played a role in either East German television or WGTV before reunification, we do not expect to find an effect for the TV variable. The respondents had to indicate the extent to which they agree with the following three statements on a Likert scale from 1 "disagree completely" to 7 "agree completely": (i) I think it is good that marriages between two women or two men are legally recognized, (ii) A same-sex couple can raise a child just as well as a man and woman, and (iii) It would be good for society if transgender people were recognized as normal. As Table B.3.5 in the appendix shows, we do not find a significant effect of the treatment variable for any of the three statements.

Finally, Table B.3.6 in the appendix shows that respondents with WGTV exposure are not more concerned in general. For this purpose, we first use the information whether a respondent considers himself or herself to be a person who frequently worries. Following that, we analyze other questions that deal with concerns independent of foreigners. We focus on concerns towards the following issues: the economy in general,

[34]Our results from Table 3.2 and 3.3 remain qualitatively unchanged if we use a dummy variable instead of the ordinal television variable. The corresponding regressions are included in Table B.3.3 and B.3.4 in the appendix.

TABLE 3.3: The effect of WGTV on refugee-related activities

Dependent variables:	(1)	(2)	(3)	(4)
Probability that the respondent	donated to help refugees in the past year	intends to donate to help refugees in the next year	supported refugees directly in the past year (e.g., language support)	intends to support refugees directly in the next year (e.g., (language support)
TV (ordinal)	0.014^{**}	0.020^{***}	0.001	0.011^{***}
	(0.006)	(0.007)	(0.003)	(0.004)
Female	0.067^{***}	0.063^{***}	0.010^{*}	0.010
	(0.014)	(0.015)	(0.006)	(0.009)
Age	-0.031	0.002	0.010	-0.020
	(0.052)	(0.053)	(0.028)	(0.046)
Age^2	0.001	0.000	-0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Age^3	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Marital status				
Single	-0.009	-0.011	-0.002	0.009
	(0.027)	(0.028)	(0.011)	(0.017)
Divorced	0.022	0.032	0.009	0.023^{*}
	(0.023)	(0.023)	(0.009)	(0.014)
Widowed	-0.008	0.010	0.014	0.020
	(0.021)	(0.024)	(0.012)	(0.016)
Children in household	0.059^{**}	0.062^{**}	0.020^{*}	0.006
	(0.025)	(0.027)	(0.011)	(0.016)
Religious affiliation	0.050^{***}	0.067^{***}	0.015^{**}	0.013
	(0.015)	(0.016)	(0.006)	(0.009)
Employment status				
Part-time	0.033	0.008	0.008	0.018
	(0.022)	(0.024)	(0.011)	(0.015)
Not employed	0.023	0.004	-0.008	-0.001
	(0.021)	(0.023)	(0.010)	(0.013)
Education				
Medium	0.044^{***}	0.037^{**}	-0.005	-0.002
	(0.016)	(0.017)	(0.007)	(0.009)
High	0.163^{***}	0.188^{***}	0.037^{***}	0.070^{***}
	(0.019)	(0.021)	(0.009)	(0.013)
Household income (log.)	0.112^{***}	0.104^{***}	0.019^{***}	0.031^{***}
	(0.016)	(0.017)	(0.007)	(0.010)
Migration background	0.041	-0.011	0.024	0.003
	(0.061)	(0.076)	(0.023)	(0.036)
Living in West Germany	0.026	0.039	0.003	0.004
	(0.024)	(0.024)	(0.009)	(0.013)
Year	Yes	Yes	Yes	Yes
Log. pseudolikelihood	-1524.57	-1671.64	-458.92	-743.91
Observations	4072	4002	4055	3991

Note: Random effects probit models. All models report probit average marginal effects. Omitted variables: Married, full-time, and low education. The different number of observations results from the fact that some people did not give an answer to all four questions. If we exclude people who did not answer all four questions, our results are almost unchanged. Standard errors in parentheses, clustered at individual level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

own economic situation, health, maintaining peace, crime in Germany, and global terrorism. We do not find any significant influence of WGTV.

3.6 Administrative data set

3.6.1 Data

In this section, we use county-level data and focus on two different measures for xenophobic attitudes: the electoral success of right-wing parties in federal elections and hate crimes against refugees. County-level data for the national elections of the German Federal Parliament (*Bundestag*) were retrieved from the Federal Returning Officer (*Bundeswahlleiter*) for the elections from 1990 to 2017.[35] As there were various right-wing parties running for the elections, we consolidated the votes for the "Alternative for Germany" (*Alternative für Deutschland*, AfD), the "German People's Union" (*Deutsche Volksunion*, DVU), the "National Party of Germany" (*Nationaldemokratische Partei Deutschlands*, NPD), and "The Republicans" (*Die Republikaner*, REP) under the label "Right Parties."[36] The data on hate crimes targeting refugees was provided by the Amadeu Antonio Foundation and the non-profit organization PRO ASYL.[37] Between January 2015 and the end of December 2018, they jointly documented 5,222 incidents for East Germany (including Berlin) and categorized them into the following four groups: arson (120), bodily injuries (1,305), other assaults such as property damage to refugee accommodations and intimidation (3,510), and incidents related to anti-refugee demonstrations (287). In addition, they classified 287 further incidents as suspected cases. Table B.4.2 of the appendix reports examples for each type of anti-refugee activity. All incidents are geo-coded with exact longitude and latitude, which we use to assign them to the respective county. Although the geo-code was missing in 23 cases, we managed to allocate the incidents to the respective county by hand via the statement of the location. The data set also contains a description and the source for each entry such as police reports or inquires by political parties.

The data for the over-the-air WGTV signal strength was retrieved from Crabtree et al. (2015). They use a Longley-Rice electromagnetic signal propagation model, terrain

[35] Federal elections take place every four years. After the acting Chancellor Gerhard Schröder lost a motion of no confidence in 2005, an early federal election took place.

[36] The AfD has positioned itself using platforms that are hostile towards refugees and immigration, but there could also be voters who may have chosen the AfD, for example, because of their critical attitude towards the European Union. In order to show that our results are not dependent on the AfD vote share, Table B.4.1 in the appendix documents that our main results are unaffected by the exclusion of the AfD votes.

[37] The data set is freely available at https://www.mut-gegen-rechte-gewalt.de/service/chronik-vorfaelle.

data, and data on the location and technical characteristics of WGTV transmitters to model signal strength. They collected the information on all broadcast transmitters operating in West Germany at the beginning of 1989 from Northern German Broadcasting (*Norddeutscher Rundfunk*). They discretize the continuous measure of WGTV signal strength and generate four different categories: -86.5 dBm, -85 dBm, -82.5 dBm, and -80 dBm. Following Crabtree et al. (2015), we use a dummy variable for the reception of WGTV at the county level. The dummy variable equals one if the signal strength is above -86.5 dBm, which made WGTV receivable. In the robustness section, we show that our results do not change if we use one of the other signal strengths. Figure B.4.1 in the appendix shows the treatment and control region.

In addition to our variable of interest, we consider a range of control variables. First, we include the logarithmized population density, because people living in cities might be *per se* more open-minded. The data was retrieved from the electoral management body and the regional statistical offices (*Statistische Landesämter*). Furthermore, we include a dummy variable that equals one if the respective county is an urban county (*kreisfreie Stadt*) and zero otherwise. We also control for the share of women, since several studies suggest that males are more prone to xenophobic attitudes (e.g., Watts, 1996). We also adjust for the average age and the total net migration in a county. In addition, we consider the percentage of school-leavers with a university entrance certificate and the percentage of school-leavers without graduation. The information about the percentage of women, the average age, the total net migration, and the information about school-leavers in a county were retrieved from the Federal Institute for Research on Building, Urban Affairs and Spatial Development (2020). Empirical evidence has shown that certain cultural traits are persistent over long periods of time (Voigtländer and Voth, 2012, 2015, Mocan and Raschke, 2016). To account for the historical voting heritage of the counties, we consider the votes for the National Socialist Freedom Movement (*Nationalsozialistische Freiheitspartei*, NSFB) in the German federal election (*Reichstagswahl*) on May 4, 1924, in the respective county.[38] The data was retrieved from www.wahlen-in-deutschland.de and was available for the historical electoral districts, which we subsequently matched to the current counties.

[38]The NSFB was a right-wing extremist party in the Weimar Republic that emerged from a collaboration between the German Völkisch Freedom Party (DVFP) and the NSDAP. After the ban on the NSDAP expired in 1925, the NSFB was reabsorbed by the NSDAP. Our results in Sections 3.6.2 and 3.6.3 do not change if we use the voting shares from 1924 or a later election as a control variable. However, the election results in the 1930s in particular may have been influenced by the Great Depression.

Regions highly populated with largely unskilled individuals suffering from unemployment and low income are associated with anti-immigration sentiment (Scheve and Slaughter, 2001, Mayda, 2006, Faccini and Mayda, 2009).[39] Previous research has also shown that a higher GDP per capita improves attitudes towards immigrants (Brenner and Fertig, 2006) and that welfare concerns are a more significant driver of attitudes towards foreigners than labor market concerns (Dustmann and Preston, 2007). Therefore, we also consider GDP per capita, the average disposable income, and the unemployment rate of the respective counties and the percentage of unemployed foreigners for each election year. The unemployment rate for foreigners was not available for the years 1990 and 1994. Once again, the data stems from the regional statistical offices. According to intergroup contact theory, regular encounters with foreigners should lead to a reduction in xenophobia. Mocan and Raschke (2016), for example, find evidence that increased encounters with foreigners reduce racist feelings. Therefore, we also consider the percentage of foreigners living in the county. For the year 1989, the data is available at the district level (*DDR Bezirke*) and comes from the last Statistical Yearbook of the former GDR. For the respective election years, it was collected from regional statistical offices. To account for potential contacts with foreigners visiting the relevant county during the year of the election, we also consider foreign visitors for the respective election year. The data was again retrieved from regional statistical offices. Table B.4.3 of the appendix includes a definition of all variables and Table B.4.4 presents descriptive statistics.

It is also important to test whether the covariates in the regions with and without former WGTV reception are comparable. If potential differences between regions increase over time, differences should be most pronounced in 2017. Therefore, we report the covariate balance for 2017 in Table B.4.5 of the appendix. While the counties in the treatment and control region are generally rather similar, we find significant differences in the economic conditions. While we find a clearer difference in the unemployment rate, the income difference is rather negligible from an economic perspective. The monthly income in the treated counties is 60 euros higher compared to the counties in the control regions, which corresponds to 3.9 % of the average monthly income. Similar results are also documented in the study by Friehe et al. (2020).

[39] A study by Hainmueller et al. (2015) contradicts these findings and finds no evidence that fears about unemployment and wage reductions drive anti-immigration attitudes.

3.6.2 Election results of right-wing parties

To test whether the exposure to WGTV leads to a lower percentage of votes for right-wing parties, we estimate the following random-effects model[40]:

$$RV_{it} = \beta_0 + \beta_1 TV_i + \beta_2 X_{it} + \mu_t + Z_i + \epsilon_{it}, \tag{3.3}$$

where RV_{it} represents the voting outcome for right-wing parties in county i in the federal election of year t. TV_i takes the value of one if county i had access to WGTV prior to reunification. As a consequence, β_1 is our coefficient of interest. While X_{it} denotes a vector of covariates for county i at time t, we indicate year dummies by μ_t. Z_i represents the county-specific random effect–that is, the difference between the average voting outcome in county i and the average voting outcome in East Germany–while ϵ_{it} indicates the error term.

Table 3.4 reports the results for the election years from 1994 to 2017.[41] In Model 1 we include only the TV-dummy. In Model 2 we also consider demographic characteristics of the respective counties, and in Model 3 we add further controls to account for different economic conditions. In the preferred specification Model 4 we include the voting outcome of the NSFB in 1924. In all models, we find that the exposure to WGTV during the GDR period had a negative and significant effect on election outcomes for right-wing parties, which is in line with the survey results. Our results in Model 4 show that right-wing parties' share of the vote in counties with access to WGTV programs is on average 1.32 percentage points lower. In addition, the regressions show positive effects for population density and GDP per capita on the voting outcome for right-wing parties, but negative effects for the share of women in a county. Furthermore, we find that the percentage of foreigners living in the respective region had a significant and negative effect on election outcomes, which is also consistent with intergroup contact theory. A one standard deviation increase in the share of foreigners leads to a decline in the election outcome for right-wing parties by 0.68 percentage points. Similarly, a one standard deviation increase in foreign visitors reduced the election result for right-wing parties by 0.41 percentage points. In contrast to these findings, the proportion of foreigners living in the GDR in 1989 had a positive and significant impact on the election results of the right-wing parties; a one standard deviation increase in foreigners in 1989

[40] Arguably, the random effects estimator is the only estimator that allows us to identify non-time varying factors such as television reception.

[41] In Table B.4.6 in the appendix, we show the results including the election in 1990. However, once we include the election in 1990, we can only use a reduced set of controls.

TABLE 3.4: The effect of WGTV on right-wing votes (1994–2017)

Dependent variable:	Election outcome of right-wing parties in federal elections			
	(1)	(2)	(3)	(4)
TV-dummy	-1.007^{**}	-1.082^{***}	-1.338^{***}	-1.322^{***}
	(0.393)	(0.297)	(0.243)	(0.242)
Population density (log.)		0.877^{***}	0.839^{***}	0.840^{***}
		(0.144)	(0.138)	(0.138)
Women (%)		-1.561^{***}	-1.529^{***}	-1.531^{***}
		(0.167)	(0.171)	(0.171)
Average age		0.326^{***}	0.276^{***}	0.274^{***}
		(0.114)	(0.094)	(0.095)
Total net migration		0.011	0.011	0.011
		(0.007)	(0.009)	(0.009)
Foreigners (%)		-0.478^{***}	-0.449^{***}	-0.453^{***}
		(0.099)	(0.124)	(0.126)
Foreigners in 1989 (%)		2.069^{***}	2.020^{***}	1.946^{***}
		(0.273)	(0.270)	(0.298)
Urban county		-0.470^{*}	-0.439^{**}	-0.424^{*}
		(0.240)	(0.224)	(0.225)
High school dropout (%)		0.004	0.008	0.008
		(0.023)	(0.023)	(0.023)
High school diploma (%)		0.002	0.003	0.002
		(0.012)	(0.013)	(0.013)
Disposable income (log.)			1.689	1.630
			(1.945)	(1.957)
Unemployment rate total			0.010	0.010
			(0.024)	(0.024)
GDP per capita			0.050^{**}	0.050^{**}
			(0.022)	(0.022)
Foreign visitors			-1.606^{***}	-1.598^{***}
			(0.422)	(0.427)
Votes for NSFB in 1924				-0.017
				(0.033)
Year	Yes	Yes	Yes	Yes
Between R^2	0.05	0.53	0.54	0.54
Observations	1519	1519	1519	1519

Note: Random effects model. The dependent variable in all models is the voting outcome for right-wing parties in the federal elections from 1994 to 2017. Standard errors in parentheses, clustered at the county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

is associated with a 0.69 percentage point increase in right-wing votes. These findings indicate that not every form of direct contact with foreigners will reduce xenophobia. One reason for the negative perception of foreigners among the population who lived in the GDR in 1989 might be the way in which foreigners were officially treated in the GDR. As stated in Section 3.3.4, contact with foreigners was often restricted in the GDR and lacked the chance for personal and positive experiences. The integration of contract workers was not intended by the GDR government due to the temporary nature of the work. Moreover, there are documented cases of regular conflicts between guest

workers and locals in some regions (Federal Agency for Civic Education, 2012).[42] After reunification, many new foreigners who arrived in East Germany were refugees, living in large refugee accommodations. Again, contacts were rare, this time due to language and cultural barriers (Schmidt and Weick, 1998). Moreover, their arrival increased concerns about the already fraught job market (Stone, 1990).

To check the robustness of our results, we perform several additional tests. In contrast to our approach, Kern and Hainmueller (2009) and Kern (2011) classify counties into treatment and control areas based on historical maps and apply a slightly different classification. Table B.4.7 in the appendix shows that our results remain unchanged if we apply their classification. Moreover, if we use a cutoff level of -80.0 dBm, -82.5 dBm, or -85.0 dBm instead of -86.5 dBm for constructing our TV-dummy, our results still remain the same. Figures B.4.2 and B.4.3 show the classifications of the counties into the treatment and control groups, respectively.

In addition, the signal strength in a given county is affected by its location and its topography, such as when the county is surrounded by mountains. There are a number of county characteristics that can be correlated with the geography and topography of the county. We already control for aspects such as population density and economic growth.[43] In addition, the distance to the border could be correlated with unobservable characteristics, which may explain the rise of far-right parties after reunification. To ensure that our TV-dummy is not actually a geographic measure for a close proximity to the closest border, we implement a dummy variable that equals one if the respective county is located in an electoral district which is situated next to the border with Poland or the Czech Republic. Considering the aforementioned points, the results do not change. As an alternative approach to address this issue, we calculate the geodesic between the administrative center of each county and its closest border and use the distance as a further explanatory variable in our panel model. Again, our results regarding the election outcomes for right-wing parties remain unchanged, as shown in Table B.4.8 in the appendix. Furthermore, we also control for the distance to the former inner German border.

[42]For example, the GDR government ended a 10-year international agreement with Algeria due to repeated violent conflicts between Algerian guest workers and GDR citizens (Federal Agency for Civic Education, 2012).

[43]The religious make-up of the county is another example that could be correlated with geography. There are, however, no substantial differences in religious affiliation between the regions in East Germany. Furthermore, the vast majority of the population has no religious affiliation (Federal Statistical Office and the Statistical Offices of the Länder, 2014).

Since the over-the-air signal is not restricted to county borders, it could be that spillover effects exist in the counties in the vicinity of the border between our treatment and control areas (Kern, 2011). Therefore, small areas within counties that generally had no access to WGTV were perhaps able to receive these programs. Conversely, there might also be small areas within counties that generally had access that were unable to watch WGTV because they were, for example, located in a valley. To reduce possible spillover effects between these two groups, at first we exclude all counties of our treatment area that are located next to the control area and run the same regression again. The exclusion affects 18 counties. As a result, our treatment area now consists of 174 counties and the control area of 25. By doing so, our previous results remain unchanged. In a second step, we also exclude the counties of our control area that are situated next to the treatment area. This concerns 14 counties. As a result, our treatment area now consists of 174 counties and the control area of 11. Figure B.4.4 in the appendix illustrates our approach. Again, as shown in Table B.4.9, the results for our panel estimation do not change.

As an additional robustness check, we omit East Berlin from our sample because it served as the capital of the GDR and its demographic composition was very different from the other regions. By doing so, none of our previous results change, see Table B.4.10.

While election results provide an excellent measure for individual preferences–they are by definition incentivized and include a large part of the population–one might argue that the motives for electing extreme right-wing parties are not directly observable in these figures and might be different from xenophobic attitudes. An alternative explanation of election outcomes could be that WGTV broadcasting conveyed a more realistic picture of the West German system. People in East Germany could have had different expectations about the new system they were confronted with in the early 1990s. Those East Germans that received WGTV were consequently less disappointed with the system that replaced the former GDR. If disappointment with the new political system was the primary motivation behind the election results, one would expect East Germans that did not receive WGTV programs to have voted not only for the right-wing parties, but also for the left-wing party (*PDS/Die Linke*).[44] Hence, to investigate whether general dissatisfaction with the political system rather than xenophobia drives our results, we replace the voting outcome for right-wing parties with the voting outcome

[44]Arguably, the old guard of the left is also rather critical towards migration. However, being critical towards migration is not the same as being xenophobic.

for the left-wing party as dependent variable. We find no significant relationship between prior WGTV exposure and the election outcome for the left-wing party. If general dissatisfaction with the political system had been the main motivation behind the election results for the right-wing parties rather than xenophobia, we would have expected to obtain a statistically significant and negative effect of the TV-dummy on the vote shares of the left party as well. Following Weber (2011), abstention can be treated as an alternative expression of protest. Therefore, we run the same model with the voter turnout as dependent variable. Again, the television reception has no significant effect.[45]

One question that has yet to be answered is how long the effects of WGTV will last. One might reasonably expect preferences among East and West Germans gradually to converge after reunification. Alesina and Fuchs-Schündeln (2007), for example, find that East and West Germans' preferences for state intervention converge after two generations. The fact that voters who were born after reunification were only entitled to vote in the more recent federal elections should contribute to such a convergence. By contrast, other studies have shown that once cultural traits and attitudes are formed, they can persist over an extremely long period (Voigtländer and Voth, 2012, Guiso et al., 2016, Mocan and Raschke, 2016). Hennighausen (2015) and Giuliano and Spilimbergo (2013) argue that convictions or moral values which evolved over decades can be long-lasting. By analyzing the influence of WGTV on entrepreneurship, Slavtchev and Wyrwich (2017) also report long-lasting effects, which they describe as being due to an inter-generational transmission of the television effect. In addition, the attitudes of people who grew up watching WGTV might be more persistent. For example, Voigtländer and Voth (2015) find that Germans who grew up under the Nazi regime show stronger antisemitic attitudes today than people who were born before or after this period. Overall, it is unclear whether the WGTV effect will disappear after reunification or whether it will persist.

To investigate this question, we analyze each federal election since 1990 separately, using OLS regressions. The results, which are reported in Tables B.4.12 and B.4.13 of the appendix show that the TV-dummy remains negative and statistically significant for

[45]The results are shown in Table B.4.11 of the appendix.

all periods. These results suggest that the WGTV effect is rather persistent.[46] Several phenomena may contribute to the longevity of the WGTV effect after reunification. One reason could be self-selection regarding the relocation decisions of migrants after reunification (Roupakias and Dimou, 2021). Regions without former WGTV reception may have attracted fewer foreigners, which implies that direct contact with foreigners remained low. As Table B.4.14 in the appendix shows, regions without WGTV reception indeed experienced significantly lower naturalization rates from 2015 to 2018.[47] Another potential reason for a persistent TV effect could be party funding. If right-wing parties receive more votes in non-treated regions, they also receive more party funding, which in turn affects their electoral results in subsequent elections positively (Cox and Thies, 2000, Benoit and Marsh, 2010).

3.6.3 Hate crimes targeting refugees

In this subsection, we employ another measure for xenophobia, namely hate crimes committed against refugees. According to our hypothesis that WGTV reduces xenophobia, we would expect to find fewer hate crime incidents in counties with former WGTV exposure. Table 3.5 shows the results of random-effects poisson regressions, in which we report incident rate ratios that can be interpreted as a multiplicative effect or semi-elasticity. Thus, coefficients less than one represent a negative relationship and values greater than one represent a positive relationship. In addition to the control variables that we used in the previous estimations, we also control for the number of refugees registered in each county.[48]

The results in Table 3.5 reveal a negative and statistically significant relationship between former WGTV exposure and the number of arson attacks, which is in line with our hypothesis. The incident rate ratio of 0.528 suggests that arson attacks on refugee

[46] It is also noticeable that the coefficient of the TV-dummy has increased substantially, particularly in the last two election years. However, this result at least partly stems from the fact that the average right-wing party election outcome also increased from 3.7 % in 2009 to 23.9 % in 2017 due to the presence of the AfD. The same logic also applies to the other time-invariant variables; for example, the share of foreigners in 1989. If we exclude the votes for the AfD, we do not find such a strong increase in the magnitude of the TV-dummy. In this case, the point estimate of the TV-dummy in 2017 is only -0.210 ($p = 0.032$).

[47] In addition, there is empirical evidence suggesting that support from prior migrants typically reduces investment costs of migration; for example, by offering finance for travel costs, hospitality on arrival, or access to networks for job search (Collier and Hoeffler, 2018). In this context, Collier and Hoeffler (2018) show that once cultural or ethnic communities emerge in host countries, they ease subsequent migration.

[48] Because we could not obtain our control variables for the year 2018, we take the information from 2017.

TABLE 3.5: The effect of WGTV on hate crimes targeting refugees (2015–2018)

Dependent variables:	(1) Arson attacks	(2) Bodily injuries	(3) Other assaults	(4) Cases related to anit-refugee demonstrations
TV-dummy	0.528***	0.821	0.945	0.647*
	(0.000)	(0.185)	(0.587)	(0.072)
Refugees in 1,000	1.138***	0.999	1.024**	1.026
	(0.000)	(0.943)	(0.017)	(0.261)
Population density (log.)	1.167	0.927	0.945	1.793***
	(0.244)	(0.478)	(0.475)	(0.000)
Women (%)	1.025	1.008	1.023***	1.087***
	(0.108)	(0.484)	(0.004)	(0.002)
Average age	0.622***	0.844***	0.878**	0.806***
	(0.000)	(0.002)	(0.017)	(0.007)
Total net migration	0.955***	0.992	0.993*	1.015
	(0.001)	(0.180)	(0.079)	(0.185)
Foreigners (%)	0.541***	1.060	0.947	0.815**
	(0.000)	(0.427)	(0.275)	(0.046)
Foreigners in 1989 (%)	0.956	1.897***	3.009***	4.215***
	(0.883)	(0.002)	(0.000)	(0.000)
Urban county	0.672	0.884	0.864	0.815
	(0.119)	(0.422)	(0.322)	(0.257)
High school dropout (%)	1.011	1.001	1.016	1.039
	(0.826)	(0.968)	(0.595)	(0.415)
High school diploma (%)	1.014	0.989	1.018*	0.988
	(0.424)	(0.322)	(0.074)	(0.647)
Disposable income (log.)	0.087	0.462	1.921	0.372
	(0.440)	(0.660)	(0.359)	(0.718)
Unemployment rate total	1.068	1.100**	1.071**	1.039
	(0.311)	(0.038)	(0.019)	(0.548)
GDP per capita	0.996	1.019	1.004	0.921***
	(0.830)	(0.198)	(0.713)	(0.000)
Foreign visitors	0.604**	0.998	1.154	1.362
	(0.023)	(0.989)	(0.304)	(0.194)
Votes for NSFB in 1924	0.912***	1.007	0.986	1.028
	(0.004)	(0.635)	(0.396)	(0.357)
Year	Yes	Yes	Yes	Yes
Log pseudolikelihood	-614.62	-2102.57	-2583.87	-703.18
Observations	868	868	868	868

Note: Random-effects poisson model. In all models, we report incident rate ratios. The dependent variables in Models 1 and 2 are the number of arson attacks and the number of bodily injuries. In Models 3 and 4 the dependent variables are the number of other assaults and the number of cases related to anti-refugee demonstrations. Standard errors in parentheses, clustered at the county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

shelters in regions with prior access to WGTV are only about half as numerous as in the control regions. We also find a negative effect of our TV-dummy on the number of incidents related to anti-refugee demonstrations. The difference in the number of incidents corresponds to approximately 35 %. To ensure that the treatment effect on demonstrations is not only driven by the "Patriotic Europeans Against the Islamicisation of the Occident" (*Patriotische Europäer gegen die Islamisierung des Abendlandes*, Pegida) movement in Dresden, which every Monday organized demonstrations starting in October 2014, we excluded Dresden as a further robustness check. However, none of our results change materially. In the case of bodily injuries and the number of other assaults, we do not find an effect of the TV-dummy. Results from probit estimations

support our findings and can be found in Table B.4.15 of the appendix. Moreover, our results again remain unchanged even if we use different TV signal strengths, control for proximity to the inner German border, or exclude from the treatment group counties that are located at the border of the control group.[49]

3.7 Conclusion

Using the natural experiment of the differences in access to Western television that resulted from the division of Germany, we find robust empirical evidence for a mitigating impact of media on xenophobia. By analyzing survey data before and after reunification, our results show that exposure to Western television programs positively affected individuals' attitudes towards foreigners. We also find a higher likelihood of donating to refugee aid among individuals who watched WGTV regularly. In addition to the survey evidence, we document that regions that could receive WGTV before reunification were less likely to vote for right-wing parties during the national elections from 1990 to 2017. Our results also indicate that WGTV exposure has a negative effect on the number of arson attacks and the number of incidents related to anti-refugee demonstrations. Our results are robust and still visible, even 28 years after the German reunification. Differences between regions with and without Western television cannot be explained by economic circumstances, by differences between urban and non-urban regions, or by a long-lasting "right-wing tradition." Given these results, one might conjecture that it was not by chance that the xenophobic Pegida movement started in 2015 in Dresden. Indeed, the rise of Pegida might be a strange and belated side effect of media censorship in the GDR.

Our results may also be a basis for future research on further media forms and their impacts on xenophobia. Clearly, not only the Internet (Wylie, 2019) but also television content has an impact on people's attitudes. We find that mere exposure to more international programming can reduce xenophobia. Consequently, restrictions on foreign media content such as imposing a minimum percentage of songs from the local country on radio or television could influence attitudes towards foreigners. There could also be advantages in broadcasting foreign original programs and simply dubbing them rather than recreating them as part of domestic programming. Against this background, media localization in state-funded television stations should be critically questioned.

[49]These additional robustness checks are available upon request.

Our findings might also have some broader implications. The recent literature on economic preferences suggests that preferences are affected by experience with markets (Falk and Szech, 2013, Fehr and Hoff, 2011, Henrich et al., 2011). Our results indicate that media provides another channel that has a lasting effect on preferences. Media content may not only reduce xenophobia, but might also, for example, shape preferences in favor of democratization more generally. The easy transfer of information between individuals via social media has led oppressive regimes such as China, Iran, and North Korea to restrict access to internet services out of fear of democratic influences. Television might be another channel to impact people's attitudes towards democratic values.

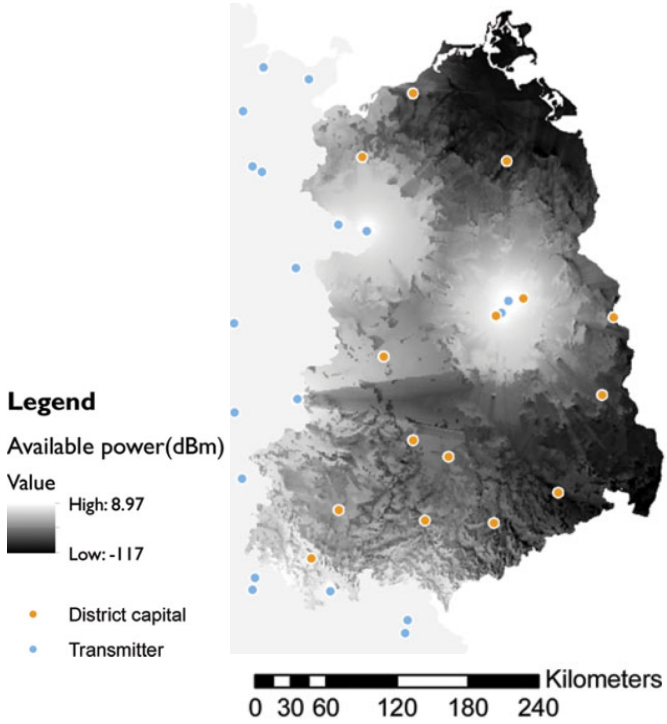
On the other hand, modern media might also contribute to the rise of populism. Conducting a text analysis of politicians using Facebook and Twitter, Engesser et al. (2017) provide evidence that populism manifests itself on social media. With the rise of smart television, social media functionalities have recently been evolving in television as well. Our analysis contributes to this literature by showing that television can have a positive and lasting effect on individual attitudes towards foreigners. However, unlike in the case of social media, television content has traditionally been decided upon by program directors that are elected by semi-public broadcasting councils. The content of social media is largely determined by algorithms creating what has been referred to as a "filter bubble" (Pariser, 2011).

Future scholarship might investigate the channels through which television affects xenophobia more precisely. Was it a familiarity effect, with foreigners becoming "normal" for East Germans who saw them more often on the television screen? Or was it a positive image of foreigners that was established by WGTV, despite widespread suspicion of a negative bias in the depiction of foreigners in movies and shows? And how has this difference been preserved since reunification? To answer such questions, a more in-depth look at surveys regarding attitudes towards foreigners and their demographic distribution would be needed. Such data, however, does not seem to be available in a high geographical and temporal resolution.

3.8 Appendix B

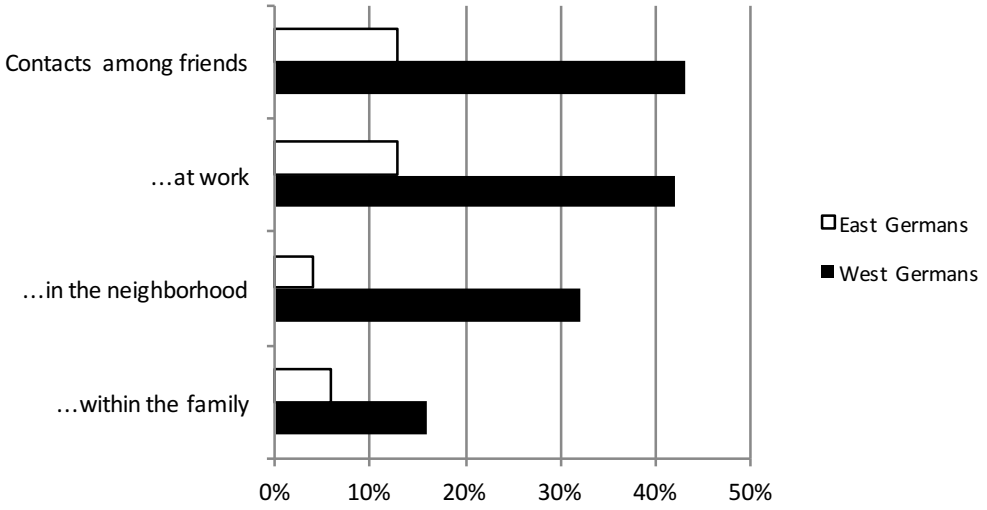
3.8.1 Additional background information

FIGURE B.1.1: Reception of WGTV in the GDR



Note: This figure shows the WGTV coverage in East Germany in 1989. Each blue dot represents a WGTV transmitter. In bright areas, there was a higher signal strength and thus better TV reception. In contrast, there was little to no reception in dark areas. The orange dots represent East Berlin and the 14 district capitals. This map is reproduced and slightly modified from Crabtree et al. (2015).

FIGURE B.1.2: Contact with foreigners in East and West Germany in 1994



Note: Contact with foreigners was rarer in East Germany, even four years after reunification (the earliest data point). This data has been taken from Schmidt and Weick (1998).

TABLE B.1.1: Differences between the West and East German television program

			26.01.1980 - 01.02.1980			27.04.1985 - 03.05.1985			07.05.1988 - 13.05.1988		
			Domestic TV productions	Foreign TV productions	Share of foreign broadcastings	Domestic TV productions	Foreign TV productions	Share of foreign broadcastings	Domestic TV productions	Foreign TV productions	Share of foreign broadcastings
	ARD	Number	52	16	23.53 %	50	21	29.58 %	61	15	19.74 %
		Airtime	2359	860	26.72 %	2929	1517	34.12 %	2648	855	24.41 %
WGTV	ZDF	Number	53	20	27.40 %	49	26	34.67 %	53	17	24.29 %
		Airtime	2168	1133	34.32 %	2328	1595	40.66 %	2314	836	26.54 %
	Total	Number	105	36	25.53 %	99	47	32.19 %	114	32	19.74 %
		Airtime	4527	1993	30.57 %	5257	3112	37.18 %	4962	1691	25.42 %
	DDR1	Number	83	14	14.44 %	91	15	14.15 %	69	10	12.66 %
				(4)	(4.12 %)		(9)	(8.49 %)		(4)	(5.06 %)
		Airtime	3325	830	19.98 %	3840	890	18.82 %	2490	970	28.03 %
				(240)	(5.78 %)		(515)	(10.89 %)		(360)	(10.40 %)
EGTV	DDR2	Number	35	6	14.63 %	55	17	23.61 %	38	17	30.91 %
				(1)	(2.44 %)		(6)	(8.33 %)		(6)	(10.91 %)
		Airtime	1597	395	19.83 %	2570	1234	32.44 %	1425	1250	46.73 %
				(90)	(4.52 %)		(415)	(10.91 %)		(520)	(19.44 %)
	Total	Number	118	20	14.49 %	146	32	17.98 %	107	27	20.15 %
				(5)	(3.62 %)		(15)	(8.43 %)		(10)	(7.46 %)
		Airtime	4992	1225	19.93 %	6410	2124	24.89 %	3915	2220	36.19 %
				(330)	(5.37 %)		(930)	(10.90 %)		(880)	(14.34 %)

Note: This table contains a comparison of the television program of three arbitrary weeks between the two main public television stations in West Germany (ARD and ZDF) and the two East German television (EGTV) stations (DDR1 and DDR2). For each week and each television station, we report the number of domestic and foreign productions as well as the aggregated airtime in minutes. We excluded news from the analysis. In the case of foreign productions in the East German program, we further report the number of productions and the total airtime from non-Soviet bloc countries. The numbers in parantheses refer to productions from non-Soviet bloc countries. The television program is available at http://retro-media-tv.de/tvp/show_tage.php?id=1&anf=1980-01-01&ende=1989-12-31. Further information about particular productions in the East German program can be found at http://www.fernsehenderddr.de/index.php?script=index.

TABLE B.1.2: Regional characteristics between treatment and control districts

	Treatment Area	**Control Area**	**Difference**		
	mean	mean	difference	se	p-value
1955					
share of women *(%)*	56.79	56.62	0.17	1.09	0.8819
average household size	2.79	2.90	−0.11	0.16	0.5668
infant mortality	50.09	45.33	4.76	4.73	0.3601
suicides per 100,000 inhabitants	24.72	21.99	2.73	4.56	0.5874
sales per capita	1654.55	1645.00	9.55	119.06	0.9413
1989					
share of women *(%)*	51.97	51.60	0.37	0.53	0.5362
average household size (1981)	2.57	2.70	−0.13	0.10	0.3171
infant mortality	7.95	6.77	1.19	0.56	0.0686
suicides per 100,000 inhabitants	27.06	25.63	1.43	1.14	0.5001
sales per capita	7576.27	7874.33	−298.06	208.48	0.2504
share of foreigners *(%)*	1.06	0.94	0.12	0.33	0.7368
share of foreign tourists in intercamping *(%)*	18.20	25.18	−6.98	14.41	0.6494
share of foreign tourists in youth leisure facilities *(%)*	15.77	16.42	−0.66	4.71	0.8920

Note: District differences between treatment (11) and control area (3). East Berlin is excluded from the analysis. P-values based on two-sided Welch's t-tests of difference in means designed for unequal variances.

TABLE B.1.3: Reichstag elections 1928, 1930, and 1933

	Party vote share						Turnout
	SPD	KPD	Zentrum	DVP	DNVP	NSDAP	
1928							
Berlin	34.0	29.6	3.3	4.3	15.7	1.4	78.9
Chemnitz-Zwickau	33.5	16.2	0.5	11.1	9.1	4.4	77.4
Dresden-Bautzen	39.1	10.3	1.4	10.9	11.5	1.8	79.8
Frankfurt (Oder)	33.1	6.0	6.0	8.4	29.6	1.0	78.7
Leipzig	37.0	16.1	0.6	13.0	6.6	1.9	83.4
Magdeburg	43.0	7.2	1.7	14.1	16.2	1.7	84.4
Mecklenburg	41.7	5.6	0.7	9.4	16.3	2.0	78.3
Merseburg	23.8	24.4	1.4	10.3	21.4	2.7	78.2
Pomerania	30.2	6.1	1.0	5.5	41.6	1.5	77.0
Potsdam I	34.6	17.1	2.1	6.6	22.8	1.7	78.6
Potsdam II	30.6	17.5	3.0	9.2	21.4	1.8	78.0
Thuringa	33.3	12.5	4.1	11.1	8.2	3.7	75.1
Overall (East)	34.3	14.7	2.3	9.3	18.1	2.1	78.8
1930							
Berlin	28.0	33.0	3.6	2.2	11.7	12.8	80.8
Chemnitz-Zwickau	28.3	18.5	0.5	4.1	4.5	23.8	86.1
Dresden-Bautzen	34.7	12.4	1.4	6.4	5.0	16.1	84.2
Frankfurt (Oder)	26.6	9.5	5.8	3.8	13.2	22.7	83.7
Leipzig	34.9	17.2	0.6	9.4	3.7	14.0	88.9
Magdeburg	37.2	10.9	1.8	7.4	7.5	19.5	88.5
Mecklenburg	35.2	8.6	0.7	6.6	10.6	20.1	82.7
Merseburg	19.5	24.9	1.3	6.1	7.9	20.5	85.5
Pomerania	24.7	8.8	1.1	3.3	24.8	24.3	81.3
Potsdam I	28.7	20.0	2.3	3.4	13.9	18.8	83.4
Potsdam II	25.9	19.7	3.4	5.3	14.9	16.7	81.8
Thuringa	28.9	15.2	4.2	5.4	4.3	19.3	83.9
Overall (East)	29.2	17.1	2.4	5.1	10.1	18.9	84.0
1933							
Berlin	22.5	30.1	4.7	0.5	9.1	31.3	85.9
Chemnitz-Zwickau	21.3	19.0	0.6	0.9	5.4	50.0	92.0
Dresden-Bautzen	28.4	13.4	1.9	2.5	7.7	43.6	90.2
Frankfurt (Oder)	18.6	7.4	6.0	0.7	11.1	55.2	89.7
Leipzig	30.1	17.4	1.0	2.0	6.5	40.0	93.0
Magdeburg	27.6	10.5	1.8	1.2	10.7	47.3	91.5
Mecklenburg	26.5	7.4	0.8	1.3	14.9	48.0	88.8
Merseburg	16.4	21.5	1.5	1.2	11.9	46.4	90.0
Pomerania	16.2	7.6	1.1	0.7	17.0	56.3	86.9
Potsdam I	20.8	18.0	2.8	0.8	11.7	44.4	89.2
Potsdam II	20.6	17.8	5.2	1.2	14.0	38.2	87.8
Thuringa	19.2	15.2	4.1	1.5	11.5	47.2	89.8
Overall (East)	22.1	16.0	2.8	1.2	10.8	45.3	89.5

Note: This table shows the results of the Reichstag elections in 1928, 1930 and 1933 in the constituencies that were later part of the GDR. The "overall" figure refers to the average of the eleven constituencies that later became part of the GDR. The constituencies "Dresden-Bautzen" and "Pomerania" represent areas that had no WGTV reception. However, only a very small part of the constituency "Pomerania" became part of the GDR.

TABLE B.1.4: Federal state election in the year 1946

	Treatment	**Control**	**Difference**		
	mean	mean	difference	se	p-value
Mecklenburg-West Pomerania					
SED *(%)*	46.42	48.49	−2.07	3.53	0.5619
CDU *(%)*	32.69	35.89	−3.20	3.11	0.3164
LDP *(%)*	14.07	10.60	3.47	3.66	0.3555
Saxony					
SED *(%)*	49.21	50.19	−0.98	1.68	0.5692
CDU *(%)*	25.30	22.49	2.81	2.31	0.2400
LDP *(%)*	22.25	23.72	−1.48	3.61	0.6887

Note: County differences in the voting outcome of the three main parties in the federal state election in the year 1946 in the states Mecklenburg-West Pomerania and Saxony. Total number of counties 59 (treatment area: 40 and control area: 19). P-values based on two-sided Welch's t-tests of difference in means designed for unequal variances. *Socialist Unity Party of Germany* (SED), *Christian Democratic Union of Germany* (CDU), *Liberal Democratic Party of Germany* (LDP).

TABLE B.1.5: Self-reported WGTV consumption

Panel A (2018)	Self-reported WGTV consumption			
	Never	Rarely	Often	almost always
areas without WGTV	68.48% (176)	18.29% (47)	9.34% (24)	3.89% (10)
areas with WGTV	14.35% (253)	26.49% (467)	35.90% (633)	23.26% (410)
Panel B (1990)	Self-reported WGTV consumption			
	Never	Rarely	Often	almost always
areas without WGTV	67.11% (51)	22.37% (17)	9.21% (7)	1.32% (1)
areas with WGTV	14.99% (94)	22.49% (141)	37.32% (234)	25.20% (158)

Note: This table shows the self-reported frequency with which respondents watched WGTV during the GDR period. We divide the respondents according to their place of residence into regions without WGTV reception in the GDR period and regions with WGTV reception in the GDR period. Panel A includes all respondents interviewed in 2018 minus 295 individuals who reported that they lived in West Germany in 2018. Panel B only includes those individuals who received the questionnaire "Living in the GDR" in 2018 and who have been part of the annual SOEP surveys since 1990. The numbers in brackets show absolute numbers.

3.8.2 GDR survey data: Supplementary statistics and analyses

TABLE B.2.1: WGTV and attitudes towards foreigners (Wilcoxon rank-sum tests)

Survey questions		z-value Wilcoxon
Panel A:		
To what extent would you be willing to engage in the following behaviors?		
(i)	Willingness to have a drink with a foreigner in a pub	-1.884^{*}
(ii)	Willingness to invite a foreigner to my home	-2.371^{**}
(iii)	Willingness to marry a foreigner	-1.997^{**}
Panel B:		
To what extent do the following statements agree with your personal opinion?		
(iv)	I am proud to be German	-1.140
(v)	Germans have always been the greatest	0.033
(vi)	I feel contempt for Hitler	0.342
(vii)	Germany should again have a strong *Führer*	1.596
(viii)	Understanding about antisemitism	-1.639

Note: Each row represents a separate nonparametric Wilcoxon rank-sum test. In Panel A (B), positive z-values indicate a higher willingness (agreement) among the control group, i.e., individuals without access to WGTV. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3.8.3 SOEP data: Supplementary statistics and analyses

TABLE B.3.1: SOEP questionnaire

Variable	Question	Possible answers		
TV (ordinal)	How often have you seen the following TV shows: Tagesschau	☐ never ☐ rarely ☐ often ☐ almost always		
Economy	Is it generally good or bad for the German economy that refugees are coming here?	Bad for the economy	☐☐☐☐☐☐☐☐☐☐	Good for the economy
Culture	Will refugees erode or enrich cultural life in Germany?	Erode	☐☐☐☐☐☐☐☐☐☐	Enrich
Better Place	Will Germany become a better or worse place to live because of the refugees?	A worse place	☐☐☐☐☐☐☐☐☐☐	A better place
Opportunity (short-term)	Does a large influx of refugees mean more risks or more opportunities in the short term?	More risks in the short term	☐☐☐☐☐☐☐☐☐☐	More opportunities in the short term
Opportunity (long-term)	Does a large influx of refugees mean more risks or more opportunities in the long term?	More risks in the long term	☐☐☐☐☐☐☐☐☐☐	More opportunities in the long term
Donating (past)	Donating money or goods to help refugees: Have you done that since last year?	Yes or No		
Donating (future)	Donating money or goods to help refugees: Do you plan to (also) do that in the future?	Yes or No		
Working (past)	Working with refugees directly (e.g., accompanying them to government agencies, providing support in language learning): Have you done that since last year?	Yes or No		
Working (future)	Working with refugees directly (e.g., accompanying them to government agencies, providing support in language learning): Do you plan to (also) do that in future?	Yes or No		

Note: This table shows the questions and corresponding answers of the SOEP questionnaires from 2016 and 2018 used in Section 3.5.2 The entire English version of the questionnaires as well as the original German wording are available at https://www.diw.de/en/diw_02.c.222729.en/questionnaires.html.

TABLE B.3.2: Summary statistics of SOEP data

Dependent variables	**Mean**	**Std. dev.**	**Min**	**Max**	**N**
Economy	5.15	2.56	1.00	11.00	4064
Culture	4.83	2.61	1.00	11.00	4072
Better Place	4.36	2.34	1.00	11.00	4066
Opportunity (short-term)	3.40	2.10	1.00	11.00	4077
Opportunity (long-term)	4.45	2.68	1.00	11.00	4064
Donating (past)	0.17	0.38	0.00	1.00	4072
Donating (future)	0.20	0.40	0.00	1.00	4002
Working (past)	0.03	0.17	0.00	1.00	4055
Working (future)	0.06	0.23	0.00	1.00	3991
Explanatory variables					
TV (ordinal)	2.53	1.05	1.00	4.00	4101
Female	0.55	0.50	0.00	1.00	4101
Age	63.28	11.34	44.00	101.00	4101
Married	0.66	0.47	0.00	1.00	4101
Single	0.08	0.27	0.00	1.00	4101
Divorced	0.13	0.34	0.00	1.00	4101
Widowed	0.13	0.33	0.00	1.00	4101
Children in household	0.11	0.31	0.00	1.00	4101
Religious affiliation	0.27	0.44	0.00	1.00	4101
Full-time	0.35	0.48	0.00	1.00	4101
Part-time	0.11	0.31	0.00	1.00	4101
Not employed	0.54	0.50	0.00	1.00	4101
Low education level	0.24	0.43	0.00	1.00	4101
Medium education level	0.45	0.50	0.00	1.00	4101
High education level	0.31	0.46	0.00	1.00	4101
Household income (log.)	7.76	0.52	5.70	9.43	4101
Migration background	0.01	0.10	0.00	1.00	4101
Living in West Germany	0.09	0.28	0.00	1.00	4101

Note: This table shows descriptive statistics of our variables (means, standard deviation, minimum and maximum value over time). N refers to the number of observations.

TABLE B.3.3: WGTV and attitudes towards refugees using TV-dummy

Dependent variables:	(1)	(2)	(3)	(4)	(5)
Respondent's agreement with the following statements:	Refugees are good for the German economy	Refugees enrich cultural life in Germany	Refugees make Germany a better place	An influx of refugees means more opportunities in the	
				short-term	long-term
TV-dummy	0.266***	0.195**	0.206**	0.170**	0.219**
	(0.096)	(0.099)	(0.090)	(0.079)	(0.102)
Female	0.097	0.449***	0.229**	0.254***	0.271**
	(0.100)	(0.104)	(0.094)	(0.083)	(0.108)
Age	−0.297	−0.003	−0.318	−0.095	−0.357
	(0.336)	(0.329)	(0.298)	(0.268)	(0.331)
Age^2	0.005	0.001	0.005	0.002	0.006
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Age^3	−0.000	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital status					
Single	0.036	0.422**	0.175	0.165	0.321
	(0.184)	(0.201)	(0.177)	(0.152)	(0.201)
Divorced	0.142	0.284*	0.262*	0.147	0.203
	(0.156)	(0.160)	(0.141)	(0.128)	(0.164)
Widowed	0.052	−0.065	−0.097	0.035	0.021
	(0.149)	(0.152)	(0.140)	(0.121)	(0.164)
Children in household	0.237	0.435**	0.365**	0.329**	0.399**
	(0.191)	(0.190)	(0.170)	(0.156)	(0.193)
Religious affiliation	0.298***	0.146	0.332***	0.237***	0.344***
	(0.107)	(0.111)	(0.101)	(0.091)	(0.116)
Employment status					
Part-time	0.140	0.230	−0.008	−0.097	0.039
	(0.152)	(0.159)	(0.141)	(0.129)	(0.158)
Not employed	−0.116	0.080	0.135	−0.214*	−0.175
	(0.143)	(0.137)	(0.132)	(0.121)	(0.143)
Education					
Medium	0.351***	0.246*	0.319***	0.230**	0.263*
	(0.132)	(0.135)	(0.123)	(0.110)	(0.139)
High	1.400***	1.331***	1.161***	0.797***	1.383***
	(0.136)	(0.143)	(0.130)	(0.116)	(0.148)
Household income (log.)	0.441***	0.485***	0.460***	0.238***	0.470***
	(0.110)	(0.112)	(0.100)	(0.090)	(0.114)
Migration background	−0.565	−0.677*	−0.701*	−0.113	−0.451
	(0.410)	(0.410)	(0.359)	(0.393)	(0.436)
Living in West Germany	0.308*	0.257	0.284*	0.146	0.375**
	(0.175)	(0.175)	(0.156)	(0.148)	(0.188)
Year	Yes	Yes	Yes	Yes	Yes
Between R^2	0.11	0.10	0.09	0.06	0.10
Observations	4064	4072	4066	4077	4064

Note: Random effects models. Omitted variables: Married, full-time, and low education. Positive coefficients indicate a higher agreement. The different number of observations results from the fact that some people did not give an answer to all five questions. If we exclude people who did not answer all five questions, our results are almost unchanged. Standard errors in parentheses, clustered at individual level. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

TABLE B.3.4: The effect of WGTV on refugee-related activities using TV-dummy

Dependent variables:	(1)	(2)	(3)	(4)
Probability that the respondent	donated to help refugees in the past year	intends to donate to help refugees in the next year	supported refugees directly in the past year (e.g., language support)	intends to support refugees directly in the next year (e.g., (language support)
TV-dummy	0.040***	0.050***	0.007	0.025***
	(0.013)	(0.014)	(0.006)	(0.008)
Female	0.068***	0.064***	0.011*	0.011
	(0.014)	(0.015)	(0.006)	(0.009)
Age	−0.034	−0.001	0.010	−0.021
	(0.052)	(0.053)	(0.028)	(0.046)
Age^2	0.001	0.000	−0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Age^3	−0.000	−0.000	0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Marital status				
Single	−0.008	−0.010	−0.001	0.010
	(0.027)	(0.028)	(0.011)	(0.017)
Divorced	0.022	0.032	0.009	0.023*
	(0.023)	(0.023)	(0.009)	(0.014)
Widowed	−0.007	0.011	0.014	0.022
	(0.021)	(0.024)	(0.012)	(0.016)
Children in household	0.059**	0.062**	0.020*	0.006
	(0.025)	(0.027)	(0.011)	(0.016)
Religious affiliation	0.049***	0.066***	0.014**	0.013
	(0.015)	(0.016)	(0.006)	(0.009)
Employment status				
Part-time	0.033	0.008	0.008	0.017
	(0.022)	(0.023)	(0.011)	(0.015)
Not employed	0.023	0.004	−0.008	−0.001
	(0.021)	(0.023)	(0.010)	(0.013)
Education				
Medium	0.044***	0.037**	−0.004	−0.002
	(0.016)	(0.017)	(0.007)	(0.010)
High	0.163***	0.187***	0.037***	0.069***
	(0.019)	(0.021)	(0.009)	(0.013)
Household income (log.)	0.111***	0.103***	0.019***	0.030***
	(0.016)	(0.017)	(0.007)	(0.010)
Migration background	0.040	−0.012	0.024	0.001
	(0.061)	(0.076)	(0.023)	(0.036)
Living in West Germany	0.026	0.039	0.004	0.005
	(0.024)	(0.024)	(0.009)	(0.013)
Year	Yes	Yes	Yes	Yes
Log. pseudolikelihood	−1522.73	−1669.86	−458.21	−743.51
Observations	4072	4002	4055	3991

Note: Random effects probit models. All models report probit average marginal effects. Omitted variables: Married, full-time, and low education. Positive coefficients indicate a higher agreement. The different number of observations results from the fact that some people did not give an answer to all five questions. If we exclude people who did not answer all four questions, our results are almost unchanged. Standard errors in parentheses, clustered at individual level. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

TABLE B.3.5: Placebo-test: WGTV and tolerance

	(1)	(2)	(3)
Dependent variables:	Attitudes towards same-sex marriage	Attitudes towards same-sex parents	Attitudes towards transgender people
TV (ordinal)	0.059	0.062	0.054
	(0.047)	(0.043)	(0.042)
Female	0.715***	0.906***	0.861***
	(0.100)	(0.093)	(0.094)
Age	−0.580	0.152	−0.475
	(0.416)	(0.359)	(0.345)
Age^2	0.009	−0.003	0.007
	(0.006)	(0.005)	(0.005)
Age^3	−0.000	0.000	−0.000
	(0.000)	(0.000)	(0.000)
Marital status			
Single	0.409**	0.237	0.256
	(0.196)	(0.172)	(0.176)
Divorced	0.469***	0.227	0.160
	(0.151)	(0.140)	(0.143)
Widowed	−0.248	−0.052	−0.284*
	(0.164)	(0.145)	(0.152)
Children in household	0.292	0.266	0.076
	(0.196)	(0.184)	(0.184)
Religious affiliation	−0.513***	−0.610***	−0.507***
	(0.108)	(0.101)	(0.102)
Employment status			
Part-time	−0.177	−0.279*	−0.153
	(0.171)	(0.160)	(0.157)
Not employed	0.016	0.153	−0.053
	(0.167)	(0.153)	(0.157)
Education			
Medium	0.106	−0.291**	0.080
	(0.140)	(0.129)	(0.136)
High	0.587***	0.005	0.756***
	(0.146)	(0.132)	(0.137)
Log. household income	0.155	−0.168	0.006
	(0.125)	(0.115)	(0.116)
Migration background	−0.637	−0.262	−0.695*
	(0.479)	(0.515)	(0.408)
Living in West Germany	0.166	0.182	0.403***
	(0.167)	(0.155)	(0.147)
R^2	0.10	0.09	0.10
Observations	2038	2020	1991

Note: OLS regressions. Omitted variables: Married, full-time, and low education. The respondents had to indicate the extent to which they agree with the following three statements on a Likert scale from 1 "disagree completely" to 7 "agree completely": (1) I think it is good that marriages between two women or two men are legally recognized, (2) A same-sex couple can raise a child just as well as a man and woman, and (3) It would be good for society if transgender people were recognized as normal. The different number of observations results from the fact that some people did not give an answer to all three questions. If we exclude people who did not answer all four questions, our results are almost unchanged. Standard errors in parentheses, clustered at individual level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

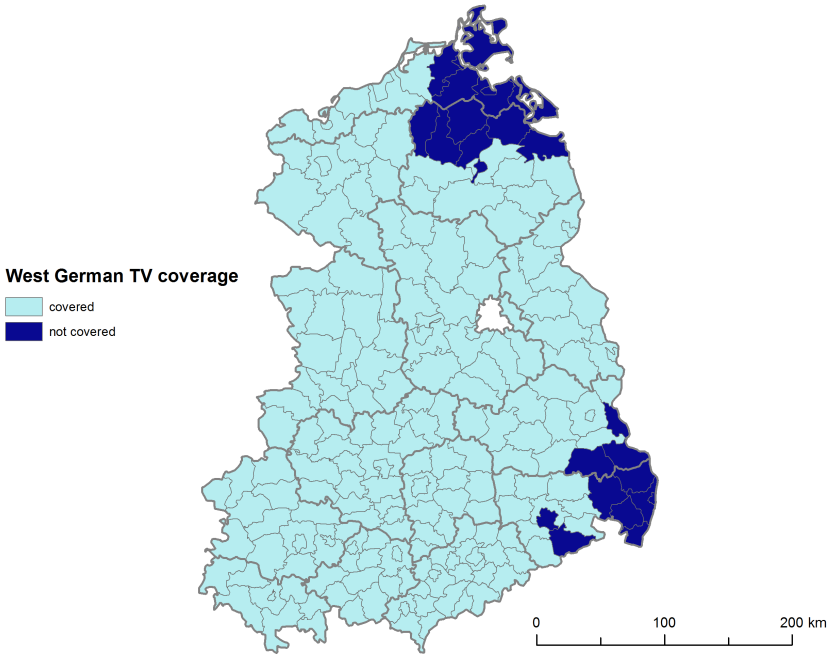
TABLE B.3.6: Placebo-test: WGTV and general concerns

Dependent variables:	(1) How often have you felt worried?	(2) Concerns about economy in general	(3) Concerns about own economic situation	(4) Concerns about own health	(5) Concerns about maintaining peace	(6) Concerns about global terrorism
TV (ordinal)	0.021	−0.010	−0.009	0.002	0.012	0.008
	(0.031)	(0.010)	(0.011)	(0.011)	(0.010)	(0.013)
Female	0.583***	0.084***	0.042+	0.037	0.163***	0.091**
	(0.065)	(0.021)	(0.023)	(0.023)	(0.022)	(0.030)
Age	0.497*	0.119+	0.299***	0.270***	0.094	0.137
	(0.239)	(0.071)	(0.082)	(0.072)	(0.070)	(0.114)
Age^2	−0.008*	−0.002	−0.005***	−0.004***	−0.001	−0.002
	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Age^3	0.000*	0.000	0.000***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital status						
Single	−0.103	−0.019	0.036	0.038	−0.066	−0.075
	(0.121)	(0.043)	(0.045)	(0.043)	(0.042)	(0.057)
Divorced	0.090	0.014	0.132***	0.017	0.005	−0.023
	(0.098)	(0.029)	(0.035)	(0.031)	(0.030)	(0.043)
Widowed	−0.104	0.004	−0.019	0.068*	−0.044	−0.131**
	(0.103)	(0.034)	(0.034)	(0.034)	(0.034)	(0.049)
Children in household	−0.051	−0.044	−0.037	−0.044	0.002	−0.042
	(0.113)	(0.033)	(0.037)	(0.033)	(0.035)	(0.058)
Religious affiliation	0.024	−0.041	−0.045	−0.061*	−0.048+	−0.086*
	(0.075)	(0.026)	(0.027)	(0.027)	(0.027)	(0.037)
Employment status						
Part-time	−0.184+	−0.010	0.035	0.006	−0.002	0.031
	(0.098)	(0.031)	(0.033)	(0.029)	(0.029)	(0.049)
Not employed	0.449***	0.052+	0.193***	0.117***	0.049	0.040
	(0.107)	(0.030)	(0.032)	(0.031)	(0.030)	(0.053)
Education						
Medium	−0.075	−0.004	−0.107***	−0.147***	0.028	0.075+
	(0.088)	(0.031)	(0.032)	(0.032)	(0.032)	(0.043)
High	−0.249**	−0.052+	−0.282***	−0.212***	0.100**	0.006
	(0.089)	(0.030)	(0.032)	(0.031)	(0.031)	(0.041)
Log. household income	0.002	0.000	−0.003	−0.012***	−0.000	−0.002
	(0.010)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)
Migration background	0.040	0.100	−0.074	0.089	0.087	0.197+
	(0.310)	(0.084)	(0.095)	(0.104)	(0.106)	(0.108)
Living in West Germany	0.001	−0.051	−0.028	−0.026	−0.055	0.103*
	(0.118)	(0.034)	(0.041)	(0.039)	(0.037)	(0.048)
Year	Yes	Yes	Yes	Yes	Yes	
Overall R^2	0.06	0.02	0.10	0.07	0.04	0.03
Observations	3978	8189	8192	8194	8193	2112

Note: While questions (2) to (5) were consistently included in the questionnaire from 2016 through 2018, questions (1) and (6) are only available for one year during this period. Column (1) and (6) show results from OLS regressions and (2) to (5) results from random effects models. Omitted variables: Married, full-time, and low education. Positive coefficients indicate a higher agreement. Standard errors in parentheses, clustered at individual level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

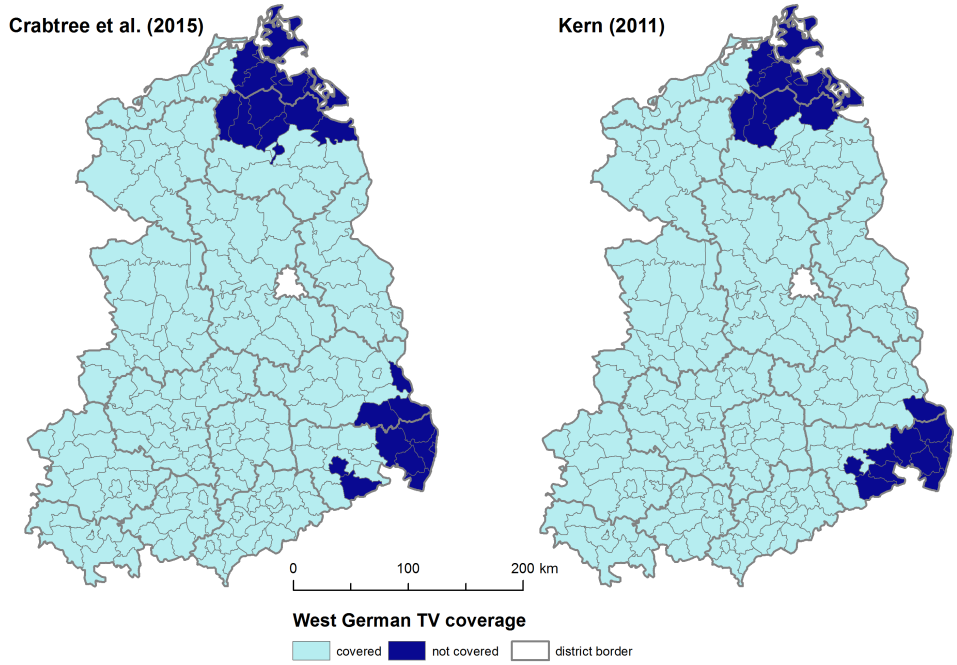
3.8.4 County-level data: Supplementary statistics and analyses

FIGURE B.4.1: WGTV coverage in the GDR: Treatment and control areas



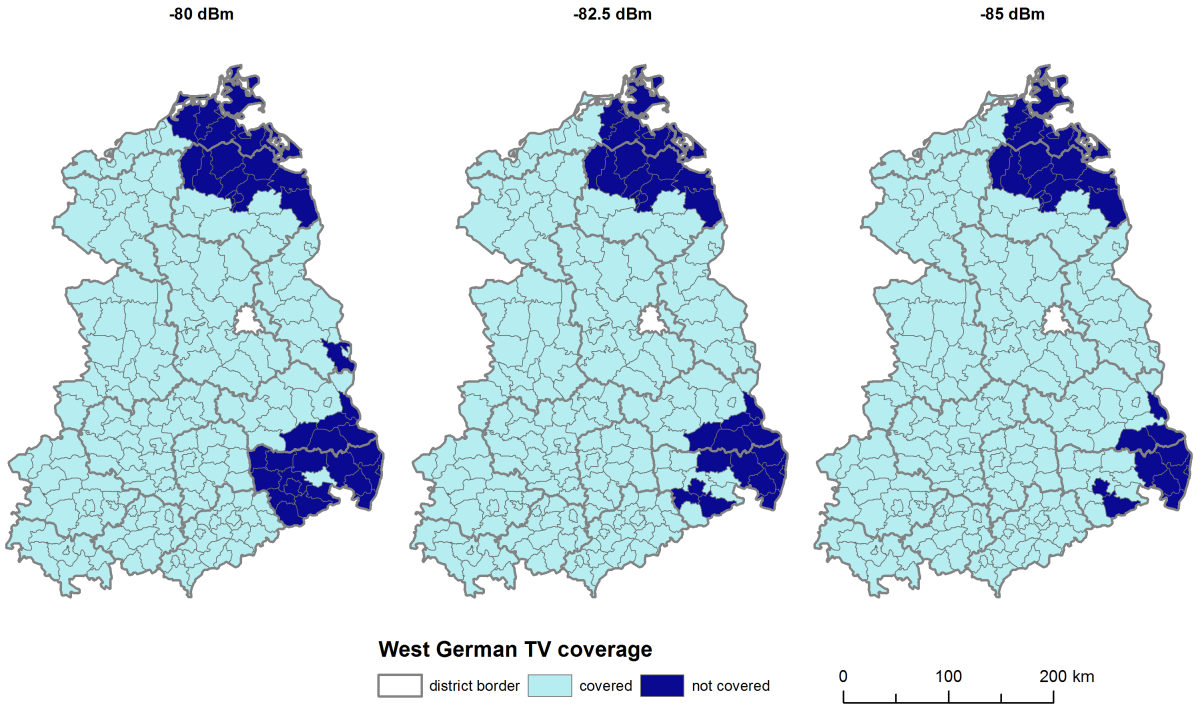
Note: The classification is based on a cutoff level of -86.5 dBm. Darker counties represent the control area with no reception (25 counties) and lighter counties the treatment area with sufficient signal strength (192 counties). District borders are indicated with bold lines. This data has been taken from Crabtree et al. (2015).

FIGURE B.4.2: WGTV coverage (different methodologies)



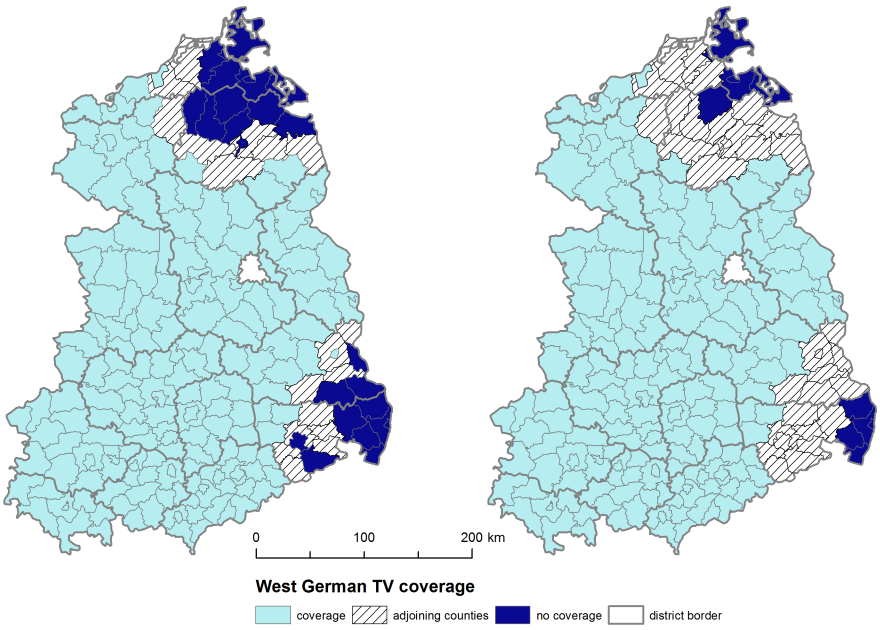
Note: East German counties with and without access to WGTV prior to reunification. The left map shows the classification based on the Longley-Rice radio signal propagation model and a cutoff level of -86.5 dBm used by Crabtree et al. (2015). The left map shows the classification used by Kern (2011), which is based on historical maps. District borders are figured as gray lines.

FIGURE B.4.3: WGTV coverage (different cutoff levels)



Note: East German counties with and without access to WGTV prior to reunification. The left map shows the classification based on Longley-Rice radio signal propagation model and a cutoff level of -80 dBm. The classification in the middle and right map are based on a -82.5 dBm and -85 dBm, respectively. District borders are figured as gray lines.

FIGURE B.4.4: Spillover effects



Note: The classification is based on a cutoff level of -86.5 dBm. Dark blue colored counties represent the control area with no reception and light blue colored counties the treatment area with sufficient signal strength. Shaded counties are excluded from the analysis. District borders are indicated with gray lines. The left map represents our approach in step one, corresponding to Model 1 in Table B.4.9. The right map concerns Model 2 in Table B.4.9.

TABLE B.4.1: Robustness: Exclusion of AfD votes

Dependent variable:	Election outcome of right-wing parties excluding AfD
TV-dummy	-0.776^{***}
	(0.121)
Population density (log.)	-0.194^{***}
	(0.055)
Women (%)	0.140^{***}
	(0.026)
Average age	0.073^{***}
	(0.020)
Total net migration	0.005
	(0.003)
Foreigners (%)	0.138^{***}
	(0.025)
Foreigners in 1989 (%)	1.006^{***}
	(0.161)
Urban county	-0.394^{***}
	(0.116)
High school dropout (%)	-0.036^{***}
	(0.009)
High school diploma (%)	0.009^{**}
	(0.004)
Disposable income (log.)	0.124
	(0.564)
Unemployment rate total	-0.014
	(0.010)
GDP per capita	-0.026^{***}
	(0.008)
Foreign visitors	-0.457^{***}
	(0.077)
Votes for NSFB in 1924	0.017
	(0.015)
Year	Yes
Between R^2	0.43
Observations	1519

Note: Random effects model. The dependent variable in Model 1 is the voting result for right-wing parties with the exception of the AfD in the federal elections from 1994 to 2017. Standard errors in parentheses, clustered at county level. Significance levels: $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE B.4.2: Examples of hate crimes targeting refugees

Type	Place and Date	Description	Source
Arson	Brandenburg an der Havel, 25.07.2015	Unknown persons performed an arson attack on an apartment in which a refugee family from the Caucus Republic Ingushetia lived. The family is, "as far as is known locally" the only refugee family living in the apartment building. The perpetrators taped over the apartment door peephole before setting a gasoline-soaked newspaper a fire in front of the door. The mother of the family was awoken from her sleep with her daughters, aged two and five, by the fire. She informed her man in a nearby garden who hurried to the scene and extinguished the fire. Nobody was injured.	*Tagesspiegel*
Bodily injuries	Bad Doberan, 27.07.2017	According to the police, an unknown perpetrator first verbally attacked two Syrian refugees (aged 15 and 17) before then threatening them with a pistol. The two youths were, at the time, on their way to the residence. Following the verbal aggression, the perpetrator held the pistol to the head of one of the youths. Both were able to flee uninjured.	Police Announcement, Rostock, *Ostsee-Zeitung*
Other assaults	Leipzig, 20.08.2017	In response to a short inquiry, the Federal Government confirmed that the responsible police administration has ordered the investigation of criminal property damage. The incident has been classified as "right-wing politically motivated criminality".	Answer of the Federal Government (printed document 19/146)
Demonstration	Bautzen, 30.01.2016	On the sidelines demonstration for the political party "Die Rechte" (The Right), a group of presumptive demonstrators encircled two asylum seekers and hit both men in the face.	*Sächsische Zeitung*
Suspected case	Dessau-Roßlau, 01.03.2018	In the late evening, objects placed beneath a cellar staircase were lit on fire. A residential group for underaged refugees is housed in the building. Four of the youths along with two other residents of the building were treated for suspected smoke-inhalation. They has used the stairs to escape the building during the fire and inhaled smoke. Update: The Department of Public Prosecution has ordered the arrest of a 27-year-old suspect. He had been sighted in the vicinity of the apartment on the night of the arson attack and has been taken into investigative custody. The man from Dessau admitted to being under the strong influence of alcohol. He is now the subject of an investigation for arson. Whether the suspect's actions were racially motivated must still be examined.	*Mitteldeutsche Zeitung*

Note: Examples of anti-refugee incidents per type. Original descriptions translated by the authors. The dataset is available at https://www.mut-gegen-rechte-gewalt.de/service/chronik-vorfaelle.

TABLE B.4.3: List and definition of variables

Variable name	**Description**
Dependent variables:	
Arson	The variable measures the number of arson attacks and was measured at the county level.
Bodily injuries	The variable measures the number of battery crimes and was measured at the county level.
Demonstration	The variable measures the number of incidents during anti-refugee demonstrations and was measured at the county level.
Left party	The variable measures the percentage of votes the left-wing party "Party of Democratic Socialism" (*Partei des Demokratischen Sozialismus*, PDS) – which was renamed "The Left" (*Die Linke*) in 2007 – received in the national elections to the German Federal Parliament (*Bundestag*) in the years from 1990 to 2017. The variable is measured at the county level.
Naturalization per capita	The variable measures the number of naturalization per capita and was measured at the county level.
Naturalization per foreigners	The variable measures the number of naturalization per foreigners and was measured at the county level.
Other assaults	The variable measures the number of other assaults and was measured at the county level.
Right parties	The variable measures the percentage of votes right-wing parties received in the national elections to the German Federal Parliament (*Bundestag*) during the years from 1990 to 2017. The data is measured at the county level. We consider as right-wing parties the "Alternative for Germany" (*Alternative für Deutschland*, AfD), the "German People's Union" (*Deutsche Volksunion*, DVU), the "National Party of Germany" (*Nationaldemokratische Partei Deutschlands*, NPD), and "The Republicans" (*Die Republikaner*, REP). The variable is measured at the county level.
Voter turnout	The variable measures voter turnout in the national elections to the German Federal Parliament (*Bundestag*) in the years from 1994 to 2017. The variable is measured at the electoral district level.
Variable of interest	
TV-dummy	This dummy variable varies at the county level and equals one if the WGTV signal strength was at least -86.5 dBm.
Control variables	
Average age	The variable measures the average age of the population in years and was measured at the county level.
Border distance (log.)	The variable measures the geodesic line between the administrative center of each GDR county and its closest border (either to Poland or to the Czech Republic). This variable is calculated with the geographic information system ArcGIS.
Border dummy	The dummy variable equals one if the respective county is located in an electoral district which is situated next to the border to Poland or to the Czech Republic.
Disposable income (log.)	The variable measures the average amount of money that households have available for consumption and saving after income taxes have been accounted for. The disposable income was measured at the county level.

table continues on the next page

TABLE B.4.3: List and definition of variables (proceeding)

Foreigners (%)	The variable measures the share of the population that was foreigners in the respective election year and was measured at the county level. Foreigners also include stateless persons and persons with unclear citizenship. In contrast, people who have both German and another nationality are considered German nationals.
Foreigners in 1989 (%)	The variable measures the share of the population that was foreigners in 1989 and was available at the district level (*DDR Bezirke*). Foreigners are included in the residential population if they are permanently resident in the GDR with an unlimited residence permit or if they are staying in the GDR for longer periods for reasons of occupation, vocational training, or study with a temporary residence permit. In contrast, foreigners staying in the GDR for less than six months with a residence permit are not included in the residential population.
Foreign visitors	The variable measures the number of overnight stays by foreigners relative to the total population number in the respective election year and was measured at the county level.
GDP per capita	The variable measures the GDP in 1,000€ per capita in the respective year and was measured at the county level.
High school diploma (%)	The variable measures the percentage of school-leavers that graduated with a university entrance certificate in the respective election year and was measured at the county level.
High school dropout (%)	The variable measures the percentage of high school dropouts in the respective election year and was measured at the county level.
Population density (log.)	Population density measures the population per km^2 living in a certain region in the respective election year and was measured at the county level.
Refugees in 1,000	The variable measures the number of registered refugees in (1,000) in the respective election year and was measured at the county level.
Total net migration	The variable measures the share of total net migration per 1.000 inhabitants and was measured at the county level.
Unemployment rate foreigners	The unemployment rate of foreigners is the percentage of the labor force that are foreigners and jobless. The data was available at the county level for the election years 2005, 2009, 2013 and 2017 and at the federal state level for the election years in 1998 and 2002.
Unemployment rate total	The unemployment rate is the percentage of the labor force that was jobless in the respective election year and was measured at the county level.
Urban county	This dummy variable varies at the county level and equals one if the respective county is an urban district and zero if it is a rural district.
Votes for NSFB in 1924	The variable measures the percentage of people that voted for the "National Socialist Freedom Movement" (*Nationalsozialistische Freiheitspartei*, NSFB) in 1924.
West Germany distance (log.)	The variable measures the closest distance between the administrative center of each GDR county and the inner German border. This variable is calculated with the geographic information system ArcGIS.
West Germany dummy	The dummy variable equals one if the respective county is located in an electoral district situated next to the former inner German border.
Women (%)	The variable measures the share of women in the respective election year and was measured at the county level.

Note: This table includes for each variable a short description.

TABLE B.4.4: Summary statistics of administrative data

Dependent variables	**Mean**	**Min**	**Max**	**N**	**n**	**T**
Voting behavior						
Right parties	6.29%	0.68%	37.33%	1736	217	8
NPD	1.92%	0.00%	7.07%	1519	217	7
REP	0.73%	0.00%	2.74%	1519	217	7
DVU	1.57%	0.00%	4.79%	434	217	2
AfD	14.32%	0.73%	35.46%	434	217	2
Left party	19.63%	2.56%	34.90%	1736	217	8
Turnout	71.40%	57.61%	84.59%	1736	217	8
Hate crimes						
Arson	0.48	0.00	10.00	868	217	4
Bodily injuries	3.95	0.00	30.00	868	217	4
Other assaults	9.72	0.00	211.00	868	217	4
Demonstration	0.94	0.00	45.00	868	217	4
Explanatory variables						
TV-dummy	0.88	0.00	1.00	1736	217	1
Population density (log.)	4.92	3.43	9.32	1736	217	8
Women	50.96%	49.70%	52.80%	1736	217	8
Average age	43.74	36.76	50.21	1519	217	7
Total net migration	−2.99	−56.63	41.79	1736	217	8
Foreigners	1.99%	0.03%	17.65%	1736	217	8
Foreigners in 1989	1.07%	0.41%	1.62%	1736	217	1
Urban county	0.12	0.00	1.00	1736	217	8
High school diploma	29.13%	15.03%	64.23%	1519	217	7
High school dropout	9.99%	3.12%	18.55%	1519	217	7
Disposable income (log.)	9.59	9.19	10.01	1519	217	7
GDP per capita	19.60	12.54	40.90	1519	217	7
Foreign visitors per inhabitant	0.22	0.01	3.87	1519	217	7
Unemployment rate total	15.05%	3.60%	26.80%	1736	217	8
Unemployment rate foreigners	30.58%	7.50%	76.40%	1302	217	6
Votes for NSFB in 1924	4.65%	1.50%	11.90%	1736	217	1

Note: This table shows descriptive statistics of our variables (mean, minimum and maximum value over time). N (n) refers to the number of observations (counties). T indicates the number of years for which we have information about the respective variable.

TABLE B.4.5: Covariate Balance in 2017

	Treatment Area	**Control Area**	**Difference**		
	mean	mean	difference	se	p-value
Population density (log.)	5.28	4.64	0.64	0.39	0.097
Women (%)	50.70	50.79	−0.09	0.07	0.173
Average age	46.79	47.32	−0.53	0.63	0.395
Total net migration	3.60	3.21	0.39	0.86	0.649
Foreigners (%)	5.02	3.72	1.30	1.23	0.288
High school dropouts (%)	8.61	8.41	0.20	0.27	0.474
High school diploma (%)	34.45	32.96	1.49	1.64	0.363
Disposable income per capita (log.)	9.83	9.79	0.06	0.02	0.001
Unemployment rate	7.42	9.33	−1.91	0.37	0.000
GDP per capita	28.64	26.71	1.93	1.49	0.197
Foreign visitors	0.65	0.58	0.07	0.33	0.822

Note: This table shows the covariate balance for our independent variables in the year 2017. Results are based on OLS estimation using population weights.

TABLE B.4.6: The effect of WGTV on right-wing votes (1990-2017)

Dependent variable:	Election outcome of right-wing parties in federal elections			
	(1)	(2)	(3)	(4)
TV-dummy	-0.909^{***}	-0.823^{***}	-0.807^{***}	-0.778^{***}
	(0.347)	(0.280)	(0.273)	(0.270)
Population density (log.)		0.687^{***}	0.694^{***}	0.696^{***}
		(0.104)	(0.106)	(0.105)
Women (%)		-1.296^{***}	-1.301^{***}	-1.307^{***}
		(0.142)	(0.146)	(0.148)
Total net migration		-0.001	-0.001	-0.001
		(0.005)	(0.005)	(0.005)
Foreigners (%)		-0.579^{***}	-0.578^{***}	-0.584^{***}
		(0.075)	(0.075)	(0.075)
Foreigners in 1989 (%)		2.368^{***}	2.371^{***}	2.189^{***}
		(0.215)	(0.216)	(0.258)
Urban county		-0.383	-0.390	-0.358
		(0.248)	(0.247)	(0.244)
Unemployment rate total			0.010	0.010
			(0.018)	(0.018)
Votes for NSFB in 1924				-0.039
				(0.031)
Year	Yes	Yes	Yes	Yes
Between R^2	0.05	0.44	0.44	0.44
Observations	1736	1736	1736	1736

Note: Random effects model. The dependent variable in all models is the voting outcome for right-wing parties in the federal elections from 1990 to 2017. Standard errors in parentheses, clustered at county level. Significance levels: $^{+}$ $p < 0.1$, * $p < 0.05$,** $p < 0.01$, *** $p < 0.001$.

TABLE B.4.7: Robustness: Variation of the treatment threshold

Dependent variable:	Election outcome of right-wing parties in federal elections				
	(1) -86.5 dBm	(2) -85.0 dBm	(3) -82.5 dBm	(4) -80.0 dBm	(5) Kern
TV-dummy	-1.322^{***}	-1.472^{***}	-1.399^{***}	-1.540^{***}	-1.372^{***}
	(0.242)	(0.239)	(0.224)	(0.181)	(0.232)
Population density (log.)	0.840^{***}	0.844^{***}	0.862^{***}	0.849^{***}	0.807^{***}
	(0.138)	(0.137)	(0.139)	(0.137)	(0.140)
Women (%)	-1.531^{***}	-1.526^{***}	-1.519^{***}	-1.497^{***}	-1.531^{***}
	(0.171)	(0.171)	(0.170)	(0.168)	(0.172)
Average age	0.274^{***}	0.281^{***}	0.282^{***}	0.300^{***}	0.274^{***}
	(0.095)	(0.094)	(0.094)	(0.091)	(0.095)
Total net migration	0.011	0.012	0.013	0.013	0.010
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Foreigners (%)	-0.453^{***}	-0.444^{***}	-0.444^{***}	-0.421^{***}	-0.453^{***}
	(0.126)	(0.124)	(0.125)	(0.127)	(0.127)
Foreigners in 1989 (%)	1.946^{***}	2.003^{***}	1.899^{***}	1.762^{***}	1.917^{***}
	(0.298)	(0.290)	(0.289)	(0.278)	(0.299)
Urban county	-0.424^{*}	-0.442^{**}	-0.416^{*}	-0.438^{*}	-0.363
	(0.225)	(0.223)	(0.226)	(0.230)	(0.254)
High school dropout (%)	0.008	0.008	0.008	0.004	0.005
	(0.023)	(0.023)	(0.023)	(0.022)	(0.022)
High school diploma (%)	0.002	0.004	0.002	0.008	0.004
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Disposable income (log.)	1.630	1.768	1.593	1.395	1.674
	(1.957)	(1.910)	(1.924)	(1.924)	(1.975)
GDP per capita	0.050^{**}	0.048^{**}	0.047^{**}	0.045^{**}	0.055^{**}
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Foreign visitors	-1.598^{***}	-1.621^{***}	-1.608^{***}	-1.795^{***}	-1.633^{***}
	(0.427)	(0.430)	(0.430)	(0.424)	(0.424)
Unemployment rate total	0.010	0.002	0.001	-0.003	0.017
	(0.024)	(0.024)	(0.024)	(0.025)	(0.024)
Votes for NSFB in 1924	-0.017	-0.015	-0.013	-0.007	-0.009
	(0.033)	(0.031)	(0.031)	(0.030)	(0.034)
Year	Yes	Yes	Yes	Yes	Yes
Between R^2	0.54	0.56	0.56	0.61	0.53
Observations	1519	1519	1519	1519	1519

Note: Random effects model. The dependent variable in Model 1-5 is the voting outcome of right-wing parties in the federal elections from 1994 to 2017. In Model 1, the cutoff level for constructing the treatment and control group is -86.5 dBm. This represents our main specification. The cutoff level in Model 2 is -85.0 dBm, in Model 3 -82.5 dBm and in Model 4 -80.0 dBm. In Model 5, we use the classification from Kern (2011). The different classifications are illustrated in Figure B.4.2 and B.4.3 in this online appendix. Standard errors in parentheses, are clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B.4.8: Robustness: Controlling for distance

Dependent variable:	Election outcome of right-wing parties in federal elections			
	(1)	(2)	(3)	(4)
	Border Dummy	Border Distance	West Germany Dummy	West Germany Distance
TV dummy	−0.952***	−0.769***	−1.204***	−1.122***
	(0.213)	(0.256)	(0.258)	(0.268)
Border dummy	1.100***			
	(0.165)			
Border distance (log.)		−0.439***		
		(0.087)		
West Germany dummy			−0.432**	
			(0.173)	
West Germany distance (log.)				0.229**
				(0.094)
Population density (log.)	0.924***	0.945***	0.809***	0.879***
	(0.135)	(0.136)	(0.137)	(0.139)
Women (%)	−1.507***	−1.519***	−1.523***	−1.518***
	(0.167)	(0.168)	(0.170)	(0.170)
Average age	0.284***	0.249***	0.293***	0.294***
	(0.092)	(0.093)	(0.095)	(0.094)
Total net migration	0.011	0.012	0.009	0.010
	(0.009)	(0.009)	(0.009)	(0.009)
Foreigners (%)	−0.457***	−0.473***	−0.439***	−0.449***
	(0.123)	(0.127)	(0.126)	(0.127)
Foreigners in 1989 (%)	1.499***	1.263***	1.782***	1.748***
	(0.263)	(0.268)	(0.311)	(0.304)
Urban county	−0.490**	−0.562***	−0.433*	−0.455**
	(0.192)	(0.191)	(0.231)	(0.231)
High school dropout (%)	0.009	0.020	0.005	0.009
	(0.022)	(0.022)	(0.023)	(0.023)
High school diploma (%)	−0.001	−0.005	0.001	−0.001
	(0.012)	(0.012)	(0.013)	(0.012)
Disposable income (log.)	2.229	1.985	1.194	0.899
	(1.876)	(1.921)	(2.018)	(2.048)
GDP per capita	0.049**	0.041*	0.051**	0.047**
	(0.022)	(0.022)	(0.022)	(0.023)
Foreign visitors	−1.318***	−1.380***	−1.611***	−1.612***
	(0.421)	(0.425)	(0.424)	(0.424)
Unemployment rate total	0.014	0.019	−0.010	−0.013
	(0.024)	(0.024)	(0.026)	(0.026)
Votes for NSFB in 1924	0.004	−0.000	−0.020	−0.007
	(0.027)	(0.028)	(0.031)	(0.031)
Year	Yes	Yes	Yes	Yes
Between R^2	0.62	0.62	0.55	0.56
Observations	1519	1519	1519	1519

Note: Random effects models. In both models, the dependent variable is the voting outcome for right-wing parties in the federal elections from 1994 to 2017. Model 1 (3) includes a dummy variable that equals one if the respective county is located in an electoral district which is situated next to the border to Poland or to the Czech Republic (next to West Germany). Model 2 (4) includes a variable that measures the distance between the administrative center of each county and its closest border either to Poland or to the Czech Republic (closest border to West Germany). The distance is measured by a geodesic and stated in kilometers. Standard errors in parentheses, clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B.4.9: Robustness: Spillover effects between treatment and control areas

Dependent variable:	Election outcome of right-wing parties in federal elections	
	(1)	(2)
TV-dummy	-1.571^{***}	-1.879^{***}
	(0.240)	(0.209)
Population density (log.)	0.718^{***}	0.732^{***}
	(0.139)	(0.115)
Women (%)	-1.491^{***}	-1.455^{***}
	(0.170)	(0.173)
Average age	0.374^{***}	0.315^{***}
	(0.094)	(0.057)
Total net migration	0.014	0.008
	(0.009)	(0.008)
Foreigners (%)	-0.334^{***}	-0.376^{***}
	(0.123)	(0.092)
Foreigners in 1989 (%)	2.089^{***}	2.386^{***}
	(0.277)	(0.253)
Urban county	-0.383^{*}	-0.442^{**}
	(0.214)	(0.208)
High school dropout (%)	-0.021	-0.033^{*}
	(0.020)	(0.018)
High school diploma (%)	0.010	0.008
	(0.013)	(0.012)
Disposable income (log.)	1.103	1.192
	(1.722)	(1.716)
Unemployment rate total	-0.021	-0.025
	(0.023)	(0.023)
GDP per capita	0.062^{***}	0.085^{***}
	(0.021)	(0.017)
Foreign visitors	-1.917^{***}	-1.531^{***}
	(0.469)	(0.275)
Votes for NSFB in 1924	0.013	0.024
	(0.028)	(0.028)
Year	Yes	Yes
Between R^2	0.61	0.65
Observations	1393	1295

Note: Random effects models. In both models, the dependent variable is the voting outcome for right-wing parties in the federal elections from 1994 to 2017. In Model 1, the 18 counties of the treatment area that are located next to the control area are excluded. In Model 2, the 14 counties of the control area that are situated next to the treatment area are additionally excluded. Figure B.4.4 illustrates the approach. Standard errors in parentheses, clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B.4.10: Robustness: Exclusion of Berlin

Dependent variables:	Election outcome for right-wing parties
TV dummy	-1.318^{***}
	(0.236)
Population density (log.)	0.843^{***}
	(0.138)
Women (%)	-1.517^{***}
	(0.170)
Average age	0.273^{**}
	(0.097)
Total net migration	0.014
	(0.010)
Foreigners (%)	-0.553^{***}
	(0.127)
Foreigners in 1989 (%)	1.914^{***}
	(0.306)
Urban county	-0.429^{+}
	(0.226)
High school dropout (%)	0.006
	(0.023)
High school diploma (%)	0.008
	(0.013)
Disposable income (log.)	0.019
	(1.843)
Unemployment rate total	-0.005
	(0.024)
GDP per capita	0.056^{**}
	(0.022)
Foreign visitors	-1.620^{**}
	(0.578)
Votes for NSFB in 1924	-0.019
	(0.033)
Year	Yes
Overall R^2	0.54
Observations	1512

Note: Random effects models. The dependent variable is the voting outcome for the right-wing parties in the federal elections from 1994 to 2017. Berlin is excluded from the analysis. Standard errors in parentheses, clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B.4.11: WGTV and voting outcome for left party and turnout

Dependent variables:	Election outcome for left party	Voter turnout
	(1)	(2)
TV-dummy	0.426	−0.213
	(0.298)	(0.224)
Population density (log.)	0.162	1.030***
	(0.206)	(0.210)
Women (%)	−0.214***	−0.043
	(0.079)	(0.081)
Average age	−0.099	−0.530***
	(0.087)	(0.096)
Total net migration	−0.057***	0.020**
	(0.014)	(0.009)
Foreigners (%)	0.396***	−0.170**
	(0.126)	(0.068)
Foreigners in 1989 (%)	−3.020***	2.711***
	(0.327)	(0.412)
Urban county	1.368***	−0.859**
	(0.353)	(0.427)
High school dropout (%)	−0.062*	−0.100***
	(0.035)	(0.031)
High school diploma (%)	−0.044***	0.096***
	(0.016)	(0.017)
Disposable income (log.)	1.935	−1.161
	(4.427)	(2.132)
Unemployment rate total	−0.045	−0.054
	(0.042)	(0.036)
GDP per capita	−0.049	−0.066**
	(0.043)	(0.031)
Foreign visitors	−1.030***	−1.331***
	(0.348)	(0.343)
Votes for NSFB in 1924	−0.063	0.137***
	(0.039)	(0.039)
Year	Yes	Yes
Between R^2	0.32	0.46
Observations	1519	1519

Note: Random effects models. The dependent variable in Model 1 (2) is the voting outcome for the left-wing parties (voting turnout) in the federal elections from 1994 to 2017. Standard errors in parentheses, clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B.4.12: WGTV and right-wing votes using cross-sections (1990–2002)

Dependent variable:	Election outcome of right-wing parties in federal elections			
	(1)	(2)	(3)	(4)
	1990	1994	1998	2002
TV-dummy	−0.172*	−0.161**	−0.572***	−0.320*
	(0.088)	(0.067)	(0.192)	(0.162)
Population density (log.)	−0.100**	−0.039	−0.212*	0.148*
	(0.041)	(0.050)	(0.108)	(0.089)
Women (%)	−0.008	0.189**	0.326	0.068
	(0.055)	(0.074)	(0.219)	(0.130)
Average age	−0.011	−0.010	0.038	0.040
	(0.038)	(0.030)	(0.081)	(0.050)
Total net migration	−0.012***	0.007	0.003	−0.022***
	(0.004)	(0.013)	(0.007)	(0.008)
Foreigners (%)	0.091***	−0.035	0.055	−0.099***
	(0.026)	(0.029)	(0.083)	(0.038)
Foreigners in 1989 (%)	−0.017	0.083	0.625**	0.541***
	(0.115)	(0.074)	(0.245)	(0.126)
Urban county	0.044	−0.083	−0.352**	−0.137
	(0.116)	(0.058)	(0.137)	(0.112)
High school dropout (%)		0.012	−0.032	−0.094***
		(0.012)	(0.020)	(0.017)
High school diploma (%)		−0.003	−0.033*	−0.034***
		(0.008)	(0.017)	(0.012)
Disposable income (log.)		−0.822	−0.364	4.088***
		(0.593)	(1.964)	(1.203)
Unemployment rate total	−0.005	−0.006	0.036	0.004
	(0.011)	(0.021)	(0.022)	(0.013)
Unemployment rate foreigners			−0.110***	−0.054***
			(0.019)	(0.012)
GDP per capita		0.087**	0.131	−0.012
		(0.041)	(0.107)	(0.020)
Foreign visitors		0.875***	0.324	−0.437
		(0.303)	(0.649)	(0.382)
Votes for NSFB in 1924	0.010	0.003	−0.064***	−0.065***
	(0.013)	(0.007)	(0.021)	(0.015)
R^2	0.16	0.26	0.67	0.62
Observations	217	217	217	217

Note: OLS estimations. Each model refers to one specific federal election. The dependent variable on the Model 1-4 is the voting outcome for right-wing parties in the federal elections from 1990 to 2002. Standard errors in parentheses, clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B.4.13: WGTV and right-wing votes using cross-sections (2005–2017)

Dependent variable:	Election outcome of right-wing parties in federal elections			
	(5) 2005	(6) 2009	(7) 2013	(8) 2017
TV-dummy	-1.231^{***}	-1.235^{***}	-2.277^{***}	-2.968^{**}
	(0.233)	(0.184)	(0.369)	(1.257)
Population density (log.)	0.323^{**}	-0.095	0.089	0.759
	(0.149)	(0.089)	(0.196)	(0.629)
Women (%)	-0.288	-0.169	0.211	-1.359^{***}
	(0.214)	(0.147)	(0.334)	(0.400)
Average age	0.284^{***}	0.124^{*}	0.225^{*}	0.954^{***}
	(0.099)	(0.064)	(0.116)	(0.308)
Total net migration	-0.042^{***}	-0.015	0.042	0.107
	(0.015)	(0.021)	(0.036)	(0.096)
Foreigners (%)	-0.066	0.095	0.038	0.187
	(0.081)	(0.090)	(0.105)	(0.456)
Foreigners in 1989 (%)	1.056^{***}	1.125^{***}	2.524^{***}	6.259^{***}
	(0.279)	(0.190)	(0.393)	(0.923)
Urban county	-0.395^{*}	-0.222	-0.431	-2.186^{**}
	(0.208)	(0.137)	(0.316)	(0.925)
High school dropout (%)	-0.196^{***}	-0.045^{*}	-0.078	0.104
	(0.040)	(0.023)	(0.057)	(0.190)
High school diploma (%)	-0.029	0.035^{***}	0.018	0.019
	(0.019)	(0.009)	(0.020)	(0.050)
Disposable income (log.)	3.121	4.952^{***}	-6.427^{**}	4.311
	(2.172)	(1.728)	(3.196)	(6.602)
Unemployment rate total	0.017	0.140^{***}	-0.209^{***}	-0.301
	(0.027)	(0.040)	(0.076)	(0.280)
Unemployment rate foreigners	-0.016^{*}	-0.040^{***}	-0.025	0.005
	(0.008)	(0.010)	(0.026)	(0.059)
GDP per capita	-0.009	-0.053^{***}	-0.070^{**}	-0.025
	(0.030)	(0.019)	(0.034)	(0.078)
Foreign visitors	-0.629	-1.064^{***}	-0.413	-3.336^{**}
	(0.503)	(0.244)	(0.425)	(1.290)
Votes for NSFB in 1924	0.034	0.020	0.081	-0.118
	(0.025)	(0.024)	(0.049)	(0.106)
R^2	0.58	0.56	0.44	0.62
Observations	217	217	217	217

Note: OLS estimations. Each model refers to one specific federal election. The dependent variable in the Model 5-8 is the voting outcome for right-wing parties in the federal elections from 2005 to 2017. Standard errors in parentheses, clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B.4.14: Differences in naturalization between treatment and control group

Dependent variables:	(1) naturalization per foreigner	(2) naturalization per capita
TV-dummy	0.884**	0.075***
	(0.428)	(0.024)
Border Distance (log.)	−0.136	−0.011*
	(0.135)	(0.006)
Population density (log.)	0.324	0.061***
	(0.240)	(0.014)
Women (%)	−0.015	−0.004***
	(0.027)	(0.001)
Average age	−0.691***	−0.033***
	(0.131)	(0.008)
Total net migration	−0.052***	−0.001***
	(0.009)	(0.001)
Foreigners (%)		0.034***
		(0.009)
Foreigners in 1989 (%)	−0.024	−0.036
	(0.585)	(0.030)
Urban county	0.553	0.037
	(0.489)	(0.031)
High school dropout (%)	0.269***	0.011***
	(0.082)	(0.003)
High school diploma (%)	−0.015	−0.001
	(0.028)	(0.001)
Disposable income (log.)	6.643	0.226
	(4.845)	(0.235)
GDP per capita	−0.056	0.002
	(0.043)	(0.002)
Foreign visitors	0.050	0.071*
	(0.404)	(0.040)
Unemployment rate total	0.033	0.009*
	(0.101)	(0.004)
Votes for NSFB in 1924	−0.037	−0.005*
	(0.057)	(0.003)
Year	Yes	Yes
Between R^2	0.16	0.76
Observations	651	651

Note: Random effects models. The dependent variable in Model 1 (2) is the number of naturalizations per foreigner (naturalizations per capita) from 2015 to 2018. Standard errors in parentheses, clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B.4.15: WGTV and hate crimes targeting refugees using probit models

	(1)	(2)	(3)	(4)
Dependent variables:	Arson attacks	Bodily injuries	Other assaults	Cases related to anit-refugee demonstrations
TV-dummy	-0.170^{***}	-0.088^{**}	-0.001	-0.109^{***}
	(0.037)	(0.043)	(0.026)	(0.033)
Refugees in 1,000	0.022^{***}	0.063^{***}	0.044^{***}	-0.002
	(0.003)	(0.019)	(0.009)	(0.002)
Population density (log.)	0.032	-0.016	-0.018	0.047^{**}
	(0.024)	(0.025)	(0.011)	(0.019)
Women (%)	0.008^{***}	0.019^{***}	0.002^{**}	0.008^{***}
	(0.003)	(0.004)	(0.001)	(0.003)
Average age	-0.049^{***}	-0.024	-0.014^{**}	-0.029^{***}
	(0.014)	(0.016)	(0.007)	(0.011)
Total net migration	-0.006^{**}	-0.003	-0.000	0.001
	(0.002)	(0.002)	(0.001)	(0.002)
Foreigners (%)	-0.098^{***}	-0.042^{**}	0.006	-0.014
	(0.019)	(0.017)	(0.005)	(0.011)
Foreigners in 1989 (%)	-0.005	0.008	0.020	0.259^{***}
	(0.052)	(0.051)	(0.018)	(0.047)
Urban county	-0.060	-0.020	-0.020	-0.018
	(0.045)	(0.065)	(0.035)	(0.034)
High school dropout (%)	0.015^{*}	-0.004	0.008^{***}	-0.010
	(0.008)	(0.008)	(0.003)	(0.008)
High school diploma (%)	0.006^{*}	-0.001	-0.002^{**}	0.003
	(0.003)	(0.004)	(0.001)	(0.003)
Disposable income (log.)	0.511	1.166^{***}	-0.451^{***}	0.460
	(0.415)	(0.449)	(0.170)	(0.906)
GDP per capita	0.004	0.012^{**}	0.002^{*}	-0.005^{*}
	(0.004)	(0.005)	(0.001)	(0.003)
Foreign visitors	-0.144^{***}	0.075	-0.026	0.031
	(0.053)	(0.063)	(0.018)	(0.038)
Unemployment rate total	0.008	0.028^{***}	-0.013^{***}	0.036^{***}
	(0.010)	(0.010)	(0.004)	(0.009)
Votes for NSFB in 1924	-0.008	0.010^{*}	-0.009^{***}	0.016^{***}
	(0.006)	(0.006)	(0.003)	(0.004)
Year	Yes	Yes	Yes	Yes
Log pseudolikelihood	-360.47	-310.26	-73.28	-268.82
Observations	868	868	868	868

Note: Random-effects probit models. Table reports average marginal effects. The dependent variable in Model 1 (2) is a dummy variable which equals one if there occurred an arson (battery) attack against refugees in the respective county and year. The dependent variable in Model 3 (4) is a dummy variable which equals one if there occurred at least one other assault against refugees (at least one incident related to anti-refugee demonstrations) in the respective county and year. Incidents are collected in the time between January 2015 and the end of December 2018. Standard errors in parentheses, clustered at county level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Chapter 4

Television and gender stereotypes*

This paper investigates the long-term causal effects of television exposure on attitudes towards marital status and family planning. In particular, we analyze whether different gender stereotypes contained in television programs affect marriage, divorce, and fertility rates. We exploit that individuals in some areas of East Germany could not receive West German television due to the geographical location of their place of residence before reunification in 1989. By analyzing county-level and survey data, our results show that West German television has a significant and negative impact on marriage and birth rates as well as a significant and positive effect on divorce rates. The analysis of survey data from the late 1980s shows that mainly women's attitudes were influenced by West German television programs.

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4.1 Introduction

In recent decades, traditional family relations have undergone a major change. During this period, divorce rates, for instance, have increased in almost all OECD countries. Countries such as Belgium, Greece, Israel, Luxembourg, Korea, Norway, Portugal, and Slovakia have seen their crude divorce rates more than double in comparison to former rates. During the same period, marriage rates have declined overall. While in 1970 the number of marriages per 1000 inhabitants ranged from around 7 to 10, the numbers decreased to around 5 to 7 in 2016 (OECD, 2019a). A similar pattern exists for fertility rates, which have also dropped significantly in these countries during the last few decades (OECD, 2019b). In the long run, such demographic changes can cause high economic costs, especially among industrialized countries. Falling birth rates, especially under the replacement rate, contribute to an inverted population pyramid inducing severe consequences for health care and pension systems, government spending, and tax revenues.

Therefore, it is crucial for researchers as well as policymakers to understand the mechanisms which contribute to these developments. Among other influencing factors, media as a vital determinant of socialization has attracted much attention over recent decades. In this regard, the influence of media is considered to develop and perpetuate social norms and gender stereotypes even over multiple generations (Signorielli, 1990). Several studies have shown that portrayals of women on television, which reflect prevailing gender norms, solidify stereotypes about women and their roles in society by touching on a range of topics such as professional roles, domestic responsibilities, and sexual behaviors (Holbert et al., 2003).

This raises the question: Can television content cause such far-reaching effects that it can even influence our own life plans? With this question in mind, this study investigates whether television content can influence marriage, divorce, and fertility rates. In order to do this, we exploit a natural experiment that took place in the German Democratic Republic (GDR) during the period of German division. In particular, we focus on the fact that parts of the East German population – due to the geographical position of their places of residence – were able to receive West German television (WGTV) programs before reunification. We argue that these programs regularly exposed their audience to characters who were single, unmarried, and were rarely parents. These representations were an apparent contradiction to the social norms prevalent in the GDR at that time. Such content might have created preferences for living alone instead of being in a partnership or a marriage. The same applies to the relatively minor role of

families with children in WGTV programs, which might have led to different decisions regarding family planning.

We use three different data sources to examine these presumptions in our analysis. First, we use county-level data for the period from 1990 to 2017 to determine whether WGTV exposure has an effect that is still present after reunification. Our results show that former WGTV exposure has a significant and negative impact on marriage and birth rates, but a positive effect on divorce rates. For the second part of our analysis, we use the German Socio-Economic Panel study (SOEP). This enables us to investigate the treatment effects for the year 1990 on an individual level, thereby keeping possible distortions caused by internal migration at a minimum. Finally, we consider a survey that was conducted by the Institute for Sociology and Social Policy at the Academy of Sciences of the GDR (*Institut für Soziologie und Sozialpolitik an der Akademie der Wissenschaften der DDR*) in 1987. This survey contains information on a wide range of attitudes towards relationships and the importance of family life. This data set enables us to show that the treatment effects were already present before reunification and that women, in particular, were affected by the treatment.

Over the past two decades, a series of studies have shown that content provided by television programs can affect individuals' attitudes and preferences, as well as their decisions. For example, Gentzkow (2006), DellaVigna and Kaplan (2007), Enikolopov et al. (2011), and Durante et al. (2019) have demonstrated that television reception can influence political attitudes as well as voting behavior. Gentzkow and Shapiro (2004) show in their study that attitudes towards the United States correlate with television consumption in Muslim countries. In addition, Olken (2009) documents a negative relationship between increased television access and participation in social organizations and self-reported trust in Indonesia.

With the present study, however, we are contributing to two specific strands of literature. The first examines how repeated media exposure affects families.[50] Chong and La Ferrara (2009) analyze the link between geographical television expansion and divorce rates in Brazil. They show that the share of women who are separated or divorced increased significantly after access to RedeGlobo (a Brazilian television network) became available. Their results indicate that RedeGlobo broadcast soap operas that exposed their audience to modern lifestyles. These include, among other things, a high proportion of divorced and separated women, which has challenged conservative

[50]For an excellent literature review, see Price and Dahl (2012). In addition, DellaVigna and La Ferrara (2015) provide a lengthy literature review, in which they summarize studies analyzing the impact of media on further outcomes (e.g., education, labor, health, crime, etc.).

values. In addition, these programs commonly portrayed families with a small number of children. In a similar vein, La Ferrara et al. (2012) show that women who live in areas with RedeGlobo coverage have significantly fewer children. By using the variation in the introduction of cable television in India, Jensen and Oster (2009) find that the introduction is associated with decreased preferences for sons and lower rates of domestic violence against women. Along the same lines as La Ferrara et al. (2012), they also document declining fertility rates. However, the studies addressed examine natural experiments in developing countries, whereas the present study focuses on a developed country, the GDR.

In the studies mentioned above, the effects of television consumption result from the fact that the programs include modern portrayals of women that question traditional values and thereby change the role of women. However, Kearney and Levine (2015) provide evidence that television formats can also affect the fertility behavior of women by providing information in regards to pregnancy. They analyze the impact of the introduction of the MTV reality show *16 and Pregnant* on teen pregnancy rates in the United States. This show confronts its audience with the difficulties of being a teen mother, which resulted in a reduction in teenage birth rates. At the same time, the show generated an increased interest in contraception and abortions.

The second strand of literature deals with the impact of WGTV in the GDR. In recent years, scholars have exploited the exogenous variation in the availability of WGTV within the GDR. On this topic, Bursztyn and Cantoni (2016) find evidence that advertisements on Western television have influenced individuals' consumption decisions. Hornuf et al. (2022) document that former WGTV reception has a mitigating effect on xenophobic attitudes, even 25 years after reunification. Further studies have examined the impact of WGTV exposure on crime (Friehe et al., 2018), material aspirations (Hyll and Schneider, 2013), self-reported support of the GDR regime (Kern and Hainmueller, 2009), voting behavior (Friehe et al., 2020) and individual beliefs about what drives success in life (Hennighausen, 2015). Finally, Campa and Serafinelli (2019) focus on East German women and examine the influence of WGTV on the perceived importance of career success. However, they do not find a robust effect.

Most closely related to this paper, however, is the study by Bönisch and Hyll (2022), which analyzes how lifestyles promoted in WGTV affected women's decisions on pregnancy. Nevertheless, there are several crucial differences between their study and the analysis presented in this paper. The first difference is that Bönisch and Hyll (2022) focus only on the effect of WGTV on the topic of fertility. The differences between the stereotypical portrayals of families on Western television and the prevailing image of families in East German society at the time were not only limited to differences in

family planning. That is the reason why, in this study, we also examine the effects on marriages and divorces. Another aim of this study is to investigate the extent to which the effect of Western television continues to have an impact after reunification. This is the motivation behind our examination of a period from 1990 to 2017 with our county-level data. This is not feasible in the study of Bönisch and Hyll (2022) since they use data solely from the period before reunification. Another key difference is that we examine gender differences within the WGTV effect, rather than assuming from the outset that the effect is restricted to women.

The remainder of this paper is structured as follows: Section 4.2 briefly outlines the history of a divided Germany and the role of WGTV regarding family relations. In Section 4.3, we describe the natural experiment, our empirical strategy, and the data. The empirical analysis of the county-level dataset is conducted in Section 4.4, while we analyze the SOEP data in Section 4.5. Furthermore, Section 4.6 focuses on potential gender-specific differences concerning the television effect, while Section 4.7 offers the conclusion to this paper.

4.2 The role of West German television on family relations

4.2.1 Institutional background

After World War II, Allied forces divided Nazi Germany and the city of Berlin into four military occupation zones respectively. In 1949, the western sectors, controlled by the United States, France, and Great Britain, merged to form the Federal Republic of Germany, which has been a parliamentary democracy and a social market economy since its creation. The Soviet occupation zone in the east of Germany developed into a socialist state with a one-party system, namely the GDR, which was controlled militarily and politically by the Soviet Union. The fall of the Berlin Wall on November 9, 1989, represented the beginning of a rather rapid reunification process, which translated first into the economic union in July 1990 and second into the political reunification in October 1990.

Following the German division in 1949, the media landscape in East and West Germany drifted apart in many aspects throughout their development. Strict censorship of all media on behalf of the government characterized the situation in East Germany (Kochanowski et al., 2012). Additionally, the government imposed import bans on print media from the West, enforced by rigorous border controls (Kuschel, 2016, p. 111

ff.). In terms of television stations, only DFF 1 (*German Television Broadcasting 1*) and DFF 2 (*German Television Broadcasting 2*) existed, which started broadcasting in 1952 and 1969, respectively. Both television networks were also controlled by the ruling Socialist Unity Party of Germany and were used mainly as a means of propaganda (Großmann, 2015, p. 53 ff.). As a result, the credibility of the broadcast content was rather low in the eyes of the general population (Hesse, 1990, Kochanowski et al., 2012). Therefore, the East German population was inclined to watch programs provided by WGTV stations, which they considered the only "window to the world" (Stiehler, 2001, p. 13), since they offered the opportunity to obtain uncensored information from outside of the GDR.[51] Since there were no language barriers or different technical reception systems between the two countries, the number of East German viewers increased quickly and significantly. This development was reinforced by the ensuing increase in the number of households with a television set. By the end of the 1980s, about 98 % of the households had a television set, and approximately 85 % of the population watched WGTV regularly (Förster, 1995, Müller, 2000).[52] The socialist government first tried to ban the viewing of these programs, which were strongly affected by Western influence (e.g., from the United States, Great Britain, and France). Since the over-the-air signal could not be interrupted by border authorities, the government abandoned these efforts due to lack of feasibility (Boyd, 1983, Kuschel, 2016, p. 143 ff.).

Due to this fact, the West German government set up numerous television transmitters near the border, including in West Berlin, especially in the 1960s and 1970s. Ultimately, the majority of the East German population was able to receive WGTV. Only the inhabitants in the northeastern part of the GDR and the southeastern area, around the third-largest city Dresden, did not have access to these programs. In particular, the latter was therefore called the "valley of the clueless" by the rest of the East German population. The lack of Western television reception was mainly due to the geographical distance to the WGTV transmitters as depicted in Figure C.1.1 in the appendix. In addition, the topography of the landscape influenced the reception.

[51]The television landscape in the Federal Republic of Germany was also characterized by two television channels at that time. The West German counterparts to DFF1 and DFF2 were the ARD (*First German Television*) founded in 1952 and the ZDF (*Second German Television*), which began broadcasting in 1969. The two public television stations were extended in the mid- to late-1960s by the regional third programs of the ARD. Private broadcasting was permitted in 1981, leading to a further increase in the number of available television channels.

[52]There were also households in West Germany that were able to receive East German television programs, but the number of actual viewers was relatively low (Boyd, 1983).

With the reunification on October 3, 1990, the DFF was no longer the state broadcaster of the GDR. The shutdown of the DFF took place in two steps. After the ARD had already taken over the television station DFF 1 on December 15, 1990, the remaining broadcasting of the DFF was ceased on the basis of Article 36 of the Unification Treaty between the two German states on December 31, 1991.

4.2.2 Perception of families in East and West German television

Instead of being solely restricted to different political ideologies portrayed in the programs, the differences between West and East German television programs were diverse. Due to the strong influence of the socialist government on the program content in East Germany, aspects such as materialistic aspirations and the "Western way of life" in itself were portrayed as something highly negative (Hyll and Schneider, 2013). In addition, there was no advertising on East German television until shortly before reunification (Bursztyn and Cantoni, 2016).

Fundamental differences were also present in the proportion of programming that dealt with the issues of marriage and family planning. These topics were more prominent in East German programs compared to their Western counterparts. After World War II, the integration of women into the workforce was prioritized by the government of the GDR, becoming one of its most important goals (Kranz, 2005). While these efforts were relatively successful, they contributed to declining fertility rates across Eastern Germany, especially in the 1960s (Engelhardt-Wölfler et al., 2002). This was one reason why the socialist government used television programming as a tool to support its family policy.[53] Under these circumstances, the image of women in East German television programs was based precisely on the women's policy propagated by the socialist government (Bühler, 1997). In accordance with the ideological stance of the East German government, the image of women generally followed a predefined path to marriage and then motherhood (Dölling, 1993, Adler, 1997). This representation of women was present in East German media until reunification (Hannover and Birkenstock, 2005, p. 40). In this context, marriage was perceived as the foundation of

[53]The overall goal of the government was population development in the form of birth promotion (Engelhardt-Wölfler et al., 2002). Among other things, the government tried to enforce this by reducing the working hours of mothers and by providing extensive and publicly financed child care (Rosenfeld et al., 2004, Kranz, 2005).

the family and was placed in a position of high priority in the government's considerations (Engelhardt-Wölfler et al., 2002).[54]

Unlike on East German television, topics such as marriage and family planning did not play a decisive role in Western programming. By analyzing the program of the two public television stations in West Germany for six weeks in 1975, Küchenhoff (1975) shows that only 0.2 % of all recorded news broadcasts dealt with the issue of family and children. For news magazines, he finds a share of 2 %. In a similar study conducted in July 1990, Weiderer and Faltenbacher (1994) observe a proportion of 3.6 %. In addition to the smaller number of non-fictional television formats (like documentaries or news magazines) dealing with these topics, there were also differences in the characterization of male and female roles in fictional formats such as movies and series. Küchenhoff (1975) and Hannover and Birkenstock (2005) show that single women and men are significantly overrepresented in WGTV and rank first in terms of marital status.[55] Comparable results also exist for television advertising (Kotelmann and Mikos, 1981). Moreover, both studies indicate that children played a subordinate role in these programs and they even document that more male than female main characters regularly appear with children. Overall, these studies suggest that especially women were, on average, less often portrayed fulfilling the role of mothers on WGTV and that, accordingly, children played a minor role in their life planning (Hannover and Birkenstock, 2005).[56] These representations, however, contradict the family constellation intended at that time in the GDR.

The results of the aforementioned studies by Küchenhoff (1975) and Weiderer and Faltenbacher (1994) relate only to the frequency with which the issues of family and marriage are addressed in WGTV or the frequency in which characters are presented as spouses or parents. Additionally, these studies highlight the fact that characteristics that are commonly viewed as more negative are often ascribed to female characters who are wives and mothers. These characters are frequently depicted as financially

[54]The religious aspect of marriage was irrelevant to the government. In addition to church marriages, so-called socialist marriage also existed in the GDR.

[55]With regard to marital status, Küchenhoff (1975) finds in his study that on average 47 % of the women shown on WGTV programs are single. A comparable number is also confirmed in the study by Weiderer and Faltenbacher (1994). For non-family television shows, they even find a share of single women of 69 %. At the same time, Weiderer and Faltenbacher (1994) note that the proportion of people living in separation has risen continuously since the study by Küchenhoff to about 8.5 %.

[56]In this context, Küchenhoff (1975) finds that only 22.7 % of all women depicted had minors and only 13.3 % had adult children. By comparison, only 7.6 % of women were clearly identified as mothers in the study of Weiderer and Faltenbacher (1994). It is also noteworthy that even characters who were portrayed as mothers, raising children and living together with their children as a family, often did not play an important role.

dependent and even unattractive, while unmarried women are characterized as younger, independent, and more attractive. This paradigm does not exist for male characters (Küchenhoff, 1975).

Overall, this raises the question of whether repeated exposure to WGTV content has influenced people's attitudes towards marriage, divorce, or family planning. The lower relevance of marriage in these programs might have influenced the opinions of men and women, leading to varying decisions about marriage. In addition, regular exposure to divorced characters (fictional or non-fictional) may also have eroded social norms surrounding marriage, which could potentially translate into higher divorce rates. The same applies to the subordinate role of families with children, which may have created different preferences concerning family planning. Taken as a whole, the aforementioned studies document a significant discrepancy between the representation of families in WGTV programs and the prevailing image in East German society. This discrepancy, however, is more pronounced for female characters than for male characters. This fact could result in gender-specific differences relating to the television effect. Furthermore, the stereotypical depictions of female characters might reinforce this argument. These stereotypical images connect female characters in the roles of wives and mothers with more negative traits, while more positive attributes are ascribed to single and childless women. Such content might have created preferences for living alone instead of being married or preferences for remaining childless.

4.3 Empirical strategy and data

4.3.1 Identification strategy

To identify the causal effect of WGTV exposure on preferences regarding family planning and concerning the decision to marry or to divorce, we utilize the fact that the population of some parts of the GDR could receive WGTV programs before reunification. Important for our empirical strategy is that only the geographical distance to the television transmitters determined whether inhabitants were able to receive these programs or not. However, before we examine the differences between regions with and without previous access to WGTV, we have to make sure that our identification strategy is valid.

First of all, it is essential for our analysis that the individuals who potentially had access to WGTV due to their geographical location could actually receive the corresponding programs. In the late 1980s, the proportion of households owning their own television set was 98 %, with each household owning an average of 1.25 television

sets (Staatliche Zentralverwaltung für Statistik, 1990, Müller, 2000). In addition, we mentioned in Section 4.2.1 that there were no significant differences between television sets in West and East Germany that would have prevented the reception of West German programs in the East. Moreover, due to the lack of language barriers, the number of East Germans that watched WGTV programs regularly was substantial (about 85 % of the population (Förster, 1995)).

Secondly, it is crucial to our approach that the only difference between the inhabitants of the treatment and the control group is the reception of WGTV and that there were otherwise no significant differences, for example, in terms of demographic characteristics and economic conditions. To verify this, we use data from the statistical yearbooks of the GDR to see whether the two groups differed from one another before the introduction of the treatment and at the end of the GDR period in 1989. Similar approaches are used by Kern and Hainmueller (2009), Bursztyn and Cantoni (2016), and Hornuf et al. (2022). The results shown in Table C.1.1 in the appendix indicate that there were no significant differences between the districts of our treatment and our control areas in either 1955 or 1989.[57] In particular, the results from 1989 correspond with the remarks made by Hyll and Schneider (2013), who describe how the government of the GDR places a special focus on the reduction of regional differences.[58] Moreover, if there were differences in marriage, divorce, or birth rates between the two areas prior to the introduction of WGTV, this would potentially invalidate our identification strategy. With this in mind, we also test whether there were any differences in terms of these variables in Table C.1.2. Similar to Table C.1.1, we find no significant differences.

Another aspect of great relevance to our approach is migration. Here, we have to distinguish between migration before and after reunification. In the period before 1990, residential as well as labor mobility was severely limited. This had several reasons: one that being spatial mobility conflicted with the state-planned economy, and the other being that the supply of free housing in the GDR was extremely limited (Kern and Hainmueller, 2009, Hyll and Schneider, 2013, Bursztyn and Cantoni, 2016). As a result, the number of migrations across the county or municipal boundaries was very low and had been declining steadily since the 1950s. For instance, the number

[57] 1955 is the first year for which we can use information from the statistical yearbooks of the GDR.

[58] The only exception is the district of East Berlin, which was not officially listed as a district but functioned as one. Nevertheless, due to its role as the capital, East Berlin had a particular position that distinguished it from other districts. Therefore, it is not included in Tables C.1.1 and C.1.2. However, we consider Berlin's unique role in the robustness section.

of migrations across county borders per 100 inhabitants decreased from 4.8 in 1953 to only 1.6 in 1970 (Grundmann, 1998, pp. 96–97). In this regard, selective spatial sorting before reunification should be less of a concern for our procedure. However, as we are particularly interested in the long-term impact of the treatment, we have to consider possible migration flows after reunification as well. In this context, Bursztyn and Cantoni (2016) show that migration rates from East to West Germany were overall relatively low, except for a short period immediately after reunification (Hunt, 2006). More importantly, they document that there were no significant differences in migration rates to West Germany between our treatment and control regions. In line with Friehe et al. (2018), they also report that migration rates between the two groups were relatively low in the first half of the 1990s and did not exhibit a systematic connection.

4.3.2 Data and empirical approach

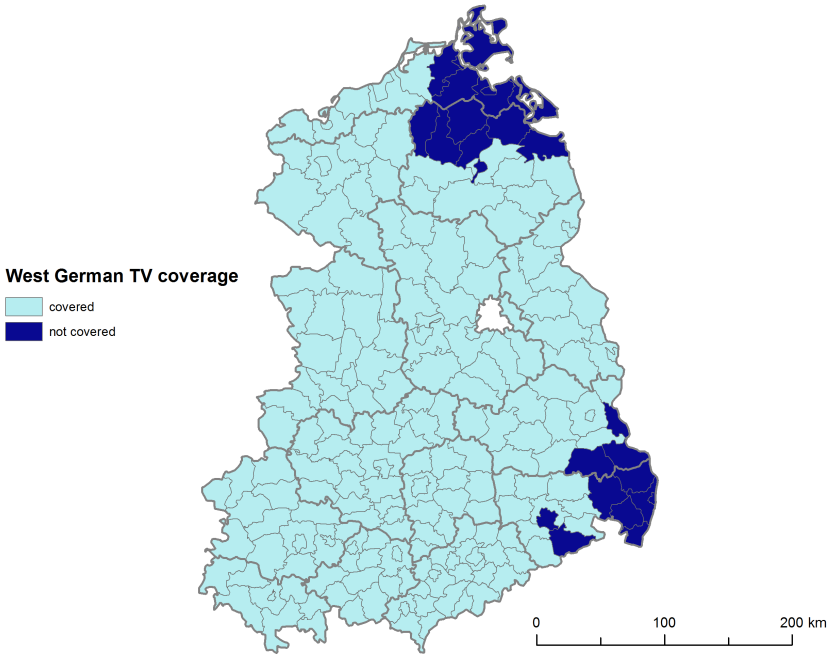
To investigate the effects of WGTV reception and their persistence, we use county-level data from the period of 1990 to 2017 in the first part of the analysis. To test our hypotheses, we employ linear random-effects models allowing us to identify non-time varying factors such as television reception with the following regression equation:

$$Y_{it} = \beta_0 + \beta_1 TV_i + \beta_2 X_{it} + \mu_t + U_i + \epsilon_{it}, \tag{4.1}$$

where Y_{it} represents the crude marriage rate in county i in year t, which is defined as the number of marriages per 1,000 of the population.[59] To examine the influence on divorces, we use both the crude divorce rate, that is measured by the number of divorces per 1,000 inhabitants, and the divorce-to-marriage ratio as dependent variables. The latter is expressed by the number of divorces divided by the number of marriages. Finally, as a measure for fertility, we use the crude birth rate, which displays the number of births per 1,000 of the population. X_{it} denotes a vector of covariates for county i at time t, μ_t represents year-fixed effects, while U_i signifies the county-specific random effect, i.e., it measures the difference between the average marriage rate in county i and the average marriage rate in all East German counties. Finally, ϵ_{it} indicates the error term. TV_i takes the value of one if county i had access to WGTV prior to reunification. Therefore, β_1 is our coefficient of interest.

[59] Our main results in Section 4.4.1 and all robustness tests in Section 4.4.2 remain unchanged if we apply pooled ordinary least squares regressions instead of linear random-effects models. These additional robustness checks are available upon request.

FIGURE 4.1: Reception of WGTV in the GDR: Treatment and control regions



Note: East German counties with and without access to WGTV before reunification based on a -86.5 dBm cutoff. Darker counties represent the control area with no reception (25 counties) and lighter counties the treatment area with sufficient signal strength (192 counties). District boundaries are shown as bold gray lines and county boundaries as thin gray lines.

The data regarding television reception comes from Crabtree et al. (2015).[60] Similar to their approach and the method of Bursztyn and Cantoni (2016), we use a signal strength of -86.5 dBm as the critical threshold. If the average signal strength of a county exceeded this threshold, we assume that WGTV reception was possible in this county. Using this threshold, in about 88.5 % of the 217 GDR counties, the signal strength was sufficient to facilitate WGTV reception. These counties represent our treatment group, whereas the remaining 11.5 % constitute our control group. Figure 4.1 illustrates the treatment and control areas.

In the main analysis, the vector of covariates includes demographic county characteristics such as the population density, the share of women, and the share of foreigners. Furthermore, we include a dummy variable that equals one if the respective county is an urban county (*kreisfreie Stadt*). We also adjust for differences in economic

[60]Crabtree et al. (2015) use a Longley-Rice electromagnetic signal propagation model, terrain data as well as data on the location and technical characteristics of WGTV transmitters to model signal strength. They discretize the continuous measure of WGTV signal strength and generate four different categories: -86.5 dBm, -85 dBm, -82.5 dBm, and -80 dBm. As shown in Section 4.4.2, our results remain unchanged if we use the other signal strengths as the relevant threshold.

conditions, like GDP per capita, and the unemployment rate.[61] All information varies on the county level except for GDP per capita for the years 1990 to 1999 and the unemployment rate for the years 1990 to 1997. The corresponding data varies at state level and is retrieved from the Federal Statistical Office and the Federal Employment Agency. Overall, the data on the characteristics of the counties come from Federal Institute for Research on Building, Urban Affairs and Spatial Development (2020) and the statistical offices in Germany. Table C.2.1 in the appendix shows a description of each variable used in the analysis of the county-level data set, while Table C.2.2 contains descriptive statistics. Finally, to assess whether the covariates are similar among the treatment and control group, we also provide the covariate balance for 2017 in Figure C.2.1. Similar to Table C.1.1, we find that the reception of WGTV is largely unrelated to a county's demographic characteristics. In contrast to the demographic characteristics, we find a significant difference in unemployment rates, which tend to be higher among the control group. Even though there are only a few differences between the counties in the treatment and control regions, we will still follow the idea of a geographic regression discontinuity design by Keele and Titiunik (2015) as an additional robustness test. This approach allows us to compare treated and non-treated counties that are geographically closer and, therefore, more similar in characteristics.

In the second part of the analysis, we use data from the SOEP, an annual representative panel study of German households (Goebel et al., 2019). One advantage of the SOEP is that this study was carried out in the area of the GDR for the first time in June 1990, a few months before the official reunification. In total, 4,453 people in the East were interviewed at that time. To avoid incorrect assignments, we restrict our sample to respondents who claim to have already been living in the GDR in 1989. This approach also ensures that we do not include individuals in the sample who moved from West Germany or from abroad to the East after the border reopened in November 1989. Since residential and labor mobility were highly limited before reunification, as described in Section 4.3.1, it is reasonable to assume that the people lived in the same place during the GDR era as where they were interviewed in 1990. This enables us to divide individuals into treatment and control groups, while keeping possible distortions caused by internal migration to a minimum. After this assignment, we can examine the effect of WGTV on the probability of an individual being married or

[61] We extend our set of covariates in the robustness section.

divorced, and on the likelihood of them having children. To be more specific, we estimate the following equation using a probit model:

$$Y_i = \beta_0 + \beta_1 TV_i + \beta_2 X_i + \epsilon_i, \tag{4.2}$$

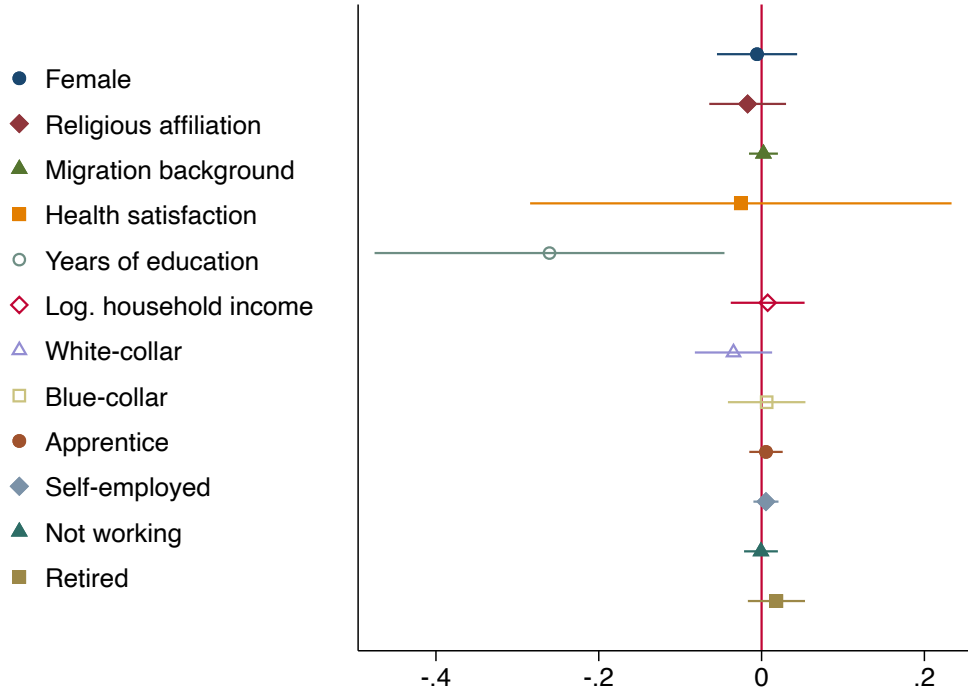
where Y_i represents a dummy variable that equals one if individual i is married in 1990 and zero otherwise. To analyze the effect of WGTV on the likelihood of being divorced, we use the same approach and simply change the dependent variable. For both variables, we only consider individuals older than 18 years.[62] To examine the relationship between the treatment and fertility, we use the fact that the participants were asked whether there were any children in their household who were born between 1974 and 1990. Given this question, we focus solely on participants between 18 and 65 years of age when investigating the treatment effects regarding fertility. However, our results are robust to a wide range of different age restrictions. In addition to the binary indicator characterizing the presence of children, we also analyze the number of children born between 1974 and 1990. Since the unconditional variance of the variable is not characterized by overdispersion, we use a Poisson regression instead of a negative binomial model.[63]

X_i in (4.2) denotes the vector of covariates that includes sex, age, age^2, age^3, health satisfaction, years of education, log. household income, employment status, and dummy variables for religious affiliation and migration background. In addition, ϵ_i represents the error term. TV_i takes the value of one if individual i was interviewed in an area that had access to WGTV before 1990. We report summary statistics in Table C.3.1 in the appendix, while we present the covariate balance in Figure 4.2. Overall, there are hardly any differences between the participants in the treatment and the control group. We only find a significant difference in years of education. This is, however, negligible. On average, participants from the control group have three months more of education.

[62] Moreover, our results remain unchanged if we exclude widowed individuals.

[63] The reason why we focus only on the 1990 wave is that our identification strategy relies on the individuals that have been interviewed in 1990. With each additional survey year that we include, there is an increasingly greater attrition bias as people leave the SOEP, but no new participants are added whom we can assign to the treatment and control group. Another reason is that the marital status of individuals and the presence of children in the household vary very little over time.

FIGURE 4.2: SOEP data: Covariate balance (1990)



Note: Balance in the values of the covariates in 1990 wave. The figure presents the estimated coefficients from bivariate regressions in which the treatment indicator is used as independent variable. For presentation reasons, the variable age is not included. The age difference between the treatment and control regions is 0.146 years (p-value = 0.855). The confidence intervals shown are set at the 95 % level of statistical significance.

4.4 County-level data

4.4.1 Main results

Considering the county-level data, Panel A in Table 4.1 shows the main results for marriage and divorce rates, while Panel B includes the findings for the marriage-to-divorce ratio and birth rates. At first, we only add demographic controls for each outcome variable. In our preferred specification, we also adjust for economic differences between the counties by adding GDP per capita and the unemployment rate.

The results in columns (1) and (2) show that the crude marriage rate is significantly lower among the counties located in regions with former WGTV reception. For a city like Cottbus with 100,000 inhabitants, a coefficient of -0.610 translates into 61 fewer marriages. In addition to the treatment indicator, we find lower marriage rates in more densely populated areas and in counties that exhibit a higher proportion of women. By adding the economic controls, we further notice a negative impact of GDP per capita. Unlike marriage rates, we observe a positive and significant treatment effect for divorce rates and the divorce-to-marriage ratio. Considering again a city of 100,000

TABLE 4.1: County-level data: The effects of WGTV reception

Panel A	Marriage rate		Divorce rate	
	(1)	(2)	(3)	(4)
TV-dummy	-0.629^{*}	-0.610^{*}	0.113^{***}	0.095^{**}
	(0.325)	(0.314)	(0.040)	(0.039)
Log. population density	-0.425^{*}	-0.449^{*}	-0.027	-0.039
	(0.229)	(0.231)	(0.052)	(0.054)
Total net migration	-0.000	0.005	-0.001	-0.001
	(0.004)	(0.004)	(0.002)	(0.002)
Women (%)	0.697^{***}	0.750^{***}	0.091^{*}	0.099^{**}
	(0.177)	(0.184)	(0.048)	(0.050)
Foreigners (%)	-0.077	0.018	0.014	0.010
	(0.058)	(0.059)	(0.015)	(0.016)
Urban county	0.217	0.320	0.269^{***}	0.275^{***}
	(0.297)	(0.305)	(0.075)	(0.077)
Unemployment rate (%)		-0.011		-0.011^{**}
		(0.012)		(0.005)
GDP per capita		-0.066^{***}		0.003
		(0.015)		(0.004)
Year	Yes	Yes	Yes	Yes
Between R^2	0.035	0.043	0.183	0.166
Observations	6076	6076	6076	6076

Panel B	Divorce-to-marriage ratio		Birth rate	
	(5)	(6)	(7)	(8)
TV-dummy	0.056^{***}	0.050^{***}	-0.250^{**}	-0.322^{***}
	(0.013)	(0.013)	(0.115)	(0.115)
Log. population density	0.024^{***}	0.020^{***}	0.132	0.119
	(0.007)	(0.007)	(0.135)	(0.141)
Total net migration	-0.000	-0.001	0.011^{***}	0.007^{**}
	(0.000)	(0.000)	(0.004)	(0.003)
Women (%)	-0.009	-0.009	-0.198	-0.218^{*}
	(0.009)	(0.009)	(0.124)	(0.121)
Foreigners (%)	0.006	0.001	0.245^{***}	0.148^{***}
	(0.004)	(0.004)	(0.052)	(0.042)
Urban county	0.059^{***}	0.059^{***}	0.148	0.083
	(0.022)	(0.023)	(0.186)	(0.195)
Unemployment rate (%)		-0.003^{*}		-0.025^{*}
		(0.002)		(0.013)
GDP per capita		0.004^{***}		0.067^{***}
		(0.001)		(0.015)
Year	Yes	Yes	Yes	Yes
Between R^2	0.379	0.363	0.361	0.360
Observations	6076	6076	6076	6076

Note: Random effects models. Standard errors clustered at county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

inhabitants, the coefficient of the TV-dummy in column (4) indicates a difference of 9.5 divorces between the treatment and control group. Furthermore, our findings suggest that divorces are more likely in urban regions than in rural areas. Moreover, it seems that couples are less likely to divorce in times of greater economic uncertainty, which is in line with the findings of previous studies (Schaller, 2013). Finally, columns (7) and (8) reveal a negative relationship between former WGTV exposure and birth rates. The coefficient in column (8) indicates that the number of births per 1,000 inhabitants in the treatment area is on average -0.322 lower than in the control area due to television reception, which corresponds to a difference of 3.77 % compared to the overall mean. In addition, birth rates are more pronounced in counties that exhibit a higher share of foreigners as well as a higher total net migration. In line with other studies, column (8) shows that birth rates tend to be pro-cyclical to the economic cycle (Sobotka et al., 2011).

4.4.2 Robustness and further results

Overall, the results in Section 4.4.1 suggest that the reception of WGTV programs during the GDR era led to lower numbers of marriages and births but increased the occurrence of divorces. In this section, we subject our findings to a series of validity checks and also present further insights regarding the television effect.

Construction of the TV-dummy

In our main specification, we used a cutoff-level of -86.5 dBm to divide counties into treatment and control areas. The results shown in Section 4.4.1 are broadly robust to several different specifications of the TV-dummy. In Table C.2.3 in the appendix, we show that our results hardly change when we use a signal strength of -80.0 dBm, -82.5 dBm, or -85.0 dBm as a relevant threshold. Other previous studies that examined the influence of Western television used historical maps to construct a dummy variable for WGTV exposure (e.g., Kern and Hainmueller, 2009, Kern, 2011). Again, our results hardly change when we apply their classification.

Further control variables

In our main regressions, we already adjust for several demographic and economic county characteristics. Nevertheless, there are also other characteristics, such as the age distribution, that could play a crucial role. Such information, however, is often unavailable at the county level, especially in the early 1990s. In Table C.2.4 in the appendix, we use a more extensive set of control variables that includes the average age of the population, the disposable income, and the share of school leavers with a higher

education entrance degree. With the latter, we try to capture educational differences between the counties. This additional information is only available from 1995 onward, meaning we have to exclude the period right after reunification in this robustness check. As shown in Table C.2.4, our main results remain.

Distance to the inner German border

One potential concern might be that the treatment effects shown in the previous estimations are just a result of the longer distance of the control regions to the inner German border and not due to WGTV reception. Even though there is no evidence suggesting that marriage, divorce, or family planning preferences depend directly on the distance to the West German border, it is crucial to focus on this alternative explanation. We address this point by including the linear distance between each county and its closest point to the inner German border as an additional control variable. The findings in Panel A in Table 4.2 show that we still find a significant television effect and also that the magnitude of the coefficients changes only slightly. This change is not surprising, since the distance to the West German border is a central component of television reception. Therefore, in this estimation, the TV-dummy only measures the geographic features of the landscape that might have prevented the reception of Western television, e.g., through mountains or forests (Bursztyn and Cantoni, 2016). The fact that the treatment indicator remains significant and changes only slightly in magnitude makes us confident that the measured effects are actually driven by the WGTV reception and are not caused by a spurious correlation between our dependent variables and the border distance.

Another way to address this concern is to examine whether the distance to the West German border explains marriage, divorce, and birth rates if we focus exclusively on the treated counties (Bursztyn and Cantoni, 2016). Therefore, we run the same regressions as in Panel A, but this time only among the counties that have been treated. The results of this placebo test suggest that the distance to the Western border has almost no explanatory power. Only column (8) shows a relationship of slight significance between the linear distance and birth rates.

Varying of the sample

While we focused on the general distance to the inner German border in the last robustness test, it is also necessary to look more closely at the counties in the vicinity of the border with West Germany. The reason behind this is that West German influence might have been more decisive in these areas after reunification. To rule out the possibility that these counties are the driving force behind our results, we exclude those

TABLE 4.2: County-level data: Robustness to distance to the inner German border

Panel A: Including inner German border distance

	Marriage rate	Divorce rate	Divorce-to-marriage ratio	Birth rate
	(1)	(2)	(3)	(4)
TV-dummy	-0.550^{*}	0.094^{**}	0.049^{***}	-0.460^{***}
	(0.315)	(0.039)	(0.014)	(0.112)
Log. distance to	0.059	-0.000	-0.001	-0.138^{**}
inner German border	(0.060)	(0.020)	(0.004)	(0.056)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.044	0.167	0.363	0.398
Observations	6076	6076	6076	6076

Panel B: Placebo test

	Marriage rate	Divorce rate	Divorce-to-marriage ratio	Birth rate
	(5)	(6)	(7)	(8)
Log. distance to	0.082	-0.000	-0.003	-0.121^{*}
inner German border	(0.060)	(0.020)	(0.004)	(0.057)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.005	0.185	0.354	0.360
Observations	5376	5376	5376	5376

Note: Random effects models. In Panel A, we expand our set of control variables to include the linear distance between each county and the inner German border. In Panel B, we restrict our sample to the counties in the treatment region and repeat the estimates from Panel A. All models include the full set of control variables used in Table 4.1. Only the TV-dummy is not included in Panel B. Standard errors clustered at county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

counties of the treatment group that share a joint border with West Germany. We do this in three steps (Table C.2.5). We first exclude the 26 counties that are located directly on the inner German border (Panel A). By doing so, our estimates remain unaffected. In the next step, we omit Berlin and the nine counties that share a border with Berlin (Panel B). As discussed in Section 4.3.1, Berlin is not only an economic, but also a cultural center within East Germany. Potential changes in social norms could spread from here and affect regions in the Berlin catchment area more quickly than regions further away. Columns (5) to (8) indicate that our main findings are not driven by the proximity to Berlin. Finally, we restrict our sample to those areas that are neither located next to the inner German border, nor have a common border with Berlin (Panel C). This, once again, does not change our previously obtained results.

The previous test has shown that our main results are not driven by the counties bordering on West Germany. To expand on this approach, we now focus only on treated counties located within a certain radius of the control areas. As a result, we are now comparing areas that are in close spatial proximity to each other and differ only in the reception of Western television. In a broader sense, this procedure follows the idea of a geographic regression discontinuity design according to Keele and Titiunik (2015). This applies in particular to column (1) in Table C.2.6, where we restrict our sample to those counties located in the control group or within a 25 km radius of the control group. We gradually increase the radius by 25 km to 50 km, 75 km, and finally 100 km. Again, we find no impact on our results. We report the estimations in Table C.2.6, while Figure C.2.2 in the appendix shows which areas are part of the sample at each radius.

Regional differences in denomination

Another possible concern might be that the geographic location of a particular county is related to a person's preferences for marriage, divorce, or family planning. For example, regional differences in religious denomination in Eastern Germany exist. However, the majority of the East German population does not belong to any religious denomination. In all East German states, the share of the population without a denomination exceeds 60 %; in Mecklenburg-Western Pomerania and Saxony-Anhalt even 78 % and 80 %, respectively (Federal Statistical Office and the Statistical Offices of the Länder, 2014). To test whether religious denomination impacts our results (especially regarding marriage and divorce rates), we add the population share without religious affiliation in 2011 as an additional control variable for each county.[64] As indicated in Table C.2.7 in the appendix, our results still remain unchanged in this robustness test.

Additional birth outcomes

In our estimates regarding birth rates, we have so far focused only on the crude birth rate. The reason for this is that the list of potential outcomes in our dataset is limited to the extent that not a lot of county-level data is available in the first few years after reunification. However, restricting our investigation period to the years from 1995 to 2017 allows us to study the effect of WGTV exposure on further outcomes. To begin

[64] Annual data on religious denomination at the county level is only available to a limited extent. Generally, only the number of members of the Roman Catholic or Evangelical Church is shown separately in official statistics. The population share without religious denomination often only appears in combination with other religious affiliations such as the Orthodox Church or Islam under the heading "Other".

TABLE 4.3: County-level data: Additional birth outcomes

	Birth rate (older)	Birth rate (younger)	Fertility rate
	(1)	(2)	(3)
TV-dummy	-0.626^{***}	0.434	-0.025^{*}
	(0.091)	(0.347)	(0.014)
Controls	Yes	Yes	Yes
Between R^2	0.573	0.226	0.238
Observations	4991	4991	4991

Note: Random effects models. The dependent variable in columns (1) to (3) is the birth rate of women aged 40 or older, the birth rate of women younger than 20, and the total fertility rate in the period from 1995 – 2017, respectively. All models include the full set of control variables used in Table 4.1. Table C.2.8 in the appendix includes the full regression results. Standard errors clustered at county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

with, we can now differentiate between the births of mothers in two different age groups, namely mothers aged 15 to 20 years of age and mothers aged over 40 years old. The first variable, *Birth rate (older)*, is defined as the number of births by mothers aged 40 years or older per 1,000 women aged 40 to 45. In contrast, the second variable, *Birth rate (younger)*, indicates the number of births by mothers aged 15 to 20 per 1,000 women aged 15 to 20. Table C.2.2 provides summary statistics.

Table 4.3 presents the regression results for both variables for the period from 1995 to 2017. Similar to our estimations for the crude birth rate shown in Table 4.1, we also find a negative and significant effect of former WGTV exposure on the birth rate of women older than 40. In contrast, we do not observe any significant relationship between the treatment and the birth rate of younger women. This result can be considered a placebo test. The vast majority of women aged 15 to 20 were born after reunification. Thus, young women in treatment and control regions had access to the same television programming. Therefore, the finding in column (2) suggests no intergenerational transmission of the WGTV effect.[65] Moreover, the results indicate that the negative treatment effect on the overall birth rate is not due to WGTV providing, for instance, additional information on contraceptives. Otherwise, we would expect to find a relevant relationship in column (2).

Finally, by restricting our observation period, we can also analyze the total fertility rate, which displays a population's ability to reproduce on its own. It indicates the

[65]However, it is essential to note that pregnancies among women younger than 20 tend to be unintentional. Helfferich et al. (2016) analyze 4,794 reported pregnancies among 4.002 women in Germany and document that only 20.4 % of pregnancies in women under the age of 20 were intended at the time. The comparative value in the group of women over 35 is 72.3 %.

average number of children a hypothetical woman would give birth to in the course of her reproductive period if she were subject to the fertility rates measured in the reporting period and if she were not subject to mortality. Specifically, the total fertility rate is calculated by the sum of age-specific fertility rates as defined over seven five-year intervals from 15 to 19 to 45 to 49 (OECD, 2019c). At a total fertility rate of 2.1, a population remains stable in the long term if migration and mortality rates are constant. As displayed in column (3) in Table 4.3, our estimates suggest a lower total fertility rate among the counties of the treatment group, although this effect is only significant at a 10 % level.

4.5 SOEP data

4.5.1 Main results

In the following section, we focus on the analysis of the SOEP data. Table 4.4 shows the effect of WGTV exposure on the likelihood of being married and of being divorced. In columns (1) and (3), we only include the treatment indicator, while we add a set of individual-level controls in columns (2) and (4). The estimates in column (2) indicate that the likelihood of being married is on average 3.8 % lower for participants living in the treatment areas. In addition to the treatment effect, several other explanatory variables influence the likelihood of being married. In this regard, it appears that respondents with a religious affiliation and a higher household income are more likely to be married. Moreover, our results reveal a significant but non-linear effect of an individual's age. In contrast to columns (1) and (2), we observe a positive treatment effect regarding the probability of being divorced, which is 2.7 % higher in regions with former WGTV reception compared to the control group. Furthermore, the estimates show positive coefficients for females, age, and years of education, while religious affiliation and migration background are negatively associated with the likelihood of being divorced. The latter also applies to household income.

Columns (1) and (2) in Table 4.5 display the results from probit regressions and reveal a negative treatment effect for the respondents' likelihood of having children born between 1974 and 1990. In our preferred specification in column (2), the difference between the treatment and the control group is 6.2 %. We also observe a negative television effect regarding the number of children, which is consistent with our previous results. We report the results of Poisson regressions in columns (3) and (4). The incidence rate ratio of 0.889 indicates that the number of children of a person living in the treatment area is on average 11.1 % lower than that of an individual from the control

TABLE 4.4: SOEP data: WGTV and the likelihood of marriage and divorce

	Married (yes/no)		Divorced (yes/no)	
	(1)	(2)	(3)	(4)
TV-dummy	-0.054^{**}	-0.038^{**}	0.024^{*}	0.027^{**}
	(0.023)	(0.019)	(0.013)	(0.012)
Female		-0.041^{***}		0.037^{***}
		(0.013)		(0.008)
Age		0.112^{***}		0.012^{*}
		(0.008)		(0.007)
Age^2		-0.002^{***}		-0.000
		(0.000)		(0.000)
Age^3		0.000^{***}		0.000
		(0.000)		(0.000)
Religious affiliation		0.024^{*}		-0.025^{***}
		(0.012)		(0.008)
Migration background		0.020		-0.035^{***}
		(0.030)		(0.013)
Health satisfaction		-0.001		0.002
		(0.002)		(0.002)
Years of education		0.004		0.004^{**}
		(0.004)		(0.002)
Log. household income		0.211^{***}		-0.110^{***}
		(0.015)		(0.011)
Employment status				
Blue-collar		-0.035^{**}		0.016
		(0.017)		(0.011)
Apprentice		-0.265^{***}		-0.053^{***}
		(0.048)		(0.014)
Self-employed		0.042		-0.014
		(0.041)		(0.024)
Not working		0.122^{***}		-0.034^{***}
		(0.024)		(0.013)
Retired		0.051^{**}		-0.032^{**}
		(0.026)		(0.013)
Pseudo R^2	0.001	0.291	0.002	0.126
Observations	3999	3999	3999	3999

Note: The table shows results from probit models. All columns report probit average marginal effects. Omitted variable: White-collar. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

group. In addition, we find a positive influence of household income and a non-linear relationship concerning the respondent's age for both dependent variables.

4.5.2 Robustness

Similar to Section 4.4.2, we verify whether the results of our SOEP analysis are driven by respondents living either near the inner German border or in Berlin. Panels A and B in Table C.3.2 show that our results are hardly affected by excluding individuals who

TABLE 4.5: SOEP data: WGTV and the likelihood of having children

	Children (yes/no)		Number of children	
	(1)	(2)	(3)	(4)
TV-dummy	-0.106^{***}	-0.062^{***}	0.801^{***}	0.889^{***}
	(0.027)	(0.022)	(0.041)	(0.037)
Female		0.013		0.985
		(0.014)		(0.031)
Age		0.303^{***}		2.379^{***}
		(0.020)		(0.264)
Age^2		-0.007^{***}		0.982^{***}
		(0.001)		(0.003)
Age^3		0.000^{***}		1.000^{***}
		(0.000)		(0.000)
Religious affiliation		0.017		1.121^{***}
		(0.014)		(0.037)
Migration background		-0.020		0.944
		(0.041)		(0.120)
Health satisfaction		0.004		1.003
		(0.003)		(0.007)
Years of education		0.010^{***}		1.005
		(0.003)		(0.007)
Log. household income		0.076^{***}		1.352^{***}
		(0.020)		(0.072)
Employment status				
Blue-collar		-0.033^{**}		0.988
		(0.016)		(0.037)
Apprentice		0.079^{**}		1.233^{*}
		(0.038)		(0.140)
Self-employed		-0.008		0.977
		(0.041)		(0.099)
Not working		0.108^{***}		1.434^{***}
		(0.029)		(0.076)
Retired		0.018		1.032
		(0.048)		(0.234)
Pseudo R^2	0.003	0.339	0.002	0.204
Observations	3596	3596	3596	3596

Note: Columns (1) to (2) show results from probit models and report average marginal effects, while columns (3) to (4) show the results from poisson regressions and report incident rate ratios. Omitted variable: White-collar. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

live close to the inner German border or in Berlin. In Panel C, we look at what happens if we restrict our analysis to only those spatial planning regions immediately adjacent to the control region. This procedure follows the same intuition as shown in Table C.2.6. We continue to find a significant treatment effect on the likelihood of being divorced or having children. The same applies to the number of children. Only for the likelihood of being married in column (9) do we obtain a coefficient of the TV-dummy that is no longer significant (p-value 0.118). However, this finding could also be due to the fact

that we exclude about 70 % of the sample in this robustness test and therefore have less statistical power. In addition, the magnitude of the TV-dummy changes only slightly.

4.6 Effect heterogeneity

In this subsection, the analysis focuses on two aspects. First of all, we extend our list of robustness tests by showing that the effect of WGTV can already be observed in the period before reunification. Second, based on our considerations in Section 4.2.2, we also examine whether WGTV exposure affects women and men to the same extent. A naïve approach to examining gender differences in the treatment effect would be to conduct the estimations shown in Tables 4.4 and 4.5 for men and women separately. By doing so, we do not find gender differences in the treatment effect. Nevertheless, this does not necessarily mean that the treatment has influenced men and women in the same way. If we assume, for example, that the different content on WGTV has exclusively affected women and has resulted in women having fewer children, there will inevitably be fewer men with children as well. The same argument applies to a similar extent to marriages and divorces. Therefore, in this section, we focus on the treatment effects on subjective attitudes towards marriage, divorce, and family planning. This allows us to study potential effect heterogeneities.

For this purpose, we use survey data that was collected by the *Institut für Soziologie und Sozialpolitik an der Akademie der Wissenschaften der DDR* in the period from March 1987 to September 1987.[66] In total, the written survey includes 2,710 women and 1,425 men aged 18 to 40 years and living in the four GDR districts Berlin, Dresden, Frankfurt, and Neubrandenburg. The survey contains information on a range of attitudes towards family life. In particular, the participants were asked to assess how important the content of five specific statements (shown in Table 4.6) was to them. The first three statements capture attitudes about relationships, with statements I and II referring to characteristics of a relationship that are related to the concept of marriage: long-term partnership and faithfulness. Statement III relates to how important it is for a person to be able to separate again in a non-harmonious relationship. The remaining two statements are related to family planning and concern attitudes about the importance of children. Given the skewed distribution of the answer categories, we generate a dummy

[66]The data set, questionnaire and further information on the selection method are available at https://doi.org/10.4232/1.6869. The data collection was done by Institut für Soziologie und Sozialpolitik an der Akademie der Wissenschaften der DDR (1987).

TABLE 4.6: Questionnaire of GDR survey

No.	Statements	Possible answers		
Please tell us how important the following matters are for you personally:				
I	That you live with your partner all your life.	unimportant	□□□□□	very important
II	That you are faithful to each other.	unimportant	□□□□□	very important
III	That in inharmonious relationships you can also break up again.	unimportant	□□□□□	very important
IV	Living with children.	unimportant	□□□□□	very important
V	Living harmoniously together as a family with children.	unimportant	□□□□□	very important

Note: This table shows the five statements and the possible answers. The original German wording and the entire questionnaire are available at https://search.gesis.org/research_data/ZA6869.

variable for each statement that equals one, if the participant has answered with "very important" and zero otherwise.[67]

In addition to these attitude questions, the data set includes socio-economic characteristics of the respondents as well as the location where the survey took place, which enables us to allocate the survey participants to the treatment and control group. In a similar fashion to the studies by Kern and Hainmueller (2009), Hyll and Schneider (2013), Hennighausen (2015), and Hornuf et al. (2022), we assume that the inhabitants of the Dresden district were unable to receive WGTV and therefore represent our control group. In total, 518 female and 292 male participants come from the Dresden district.[68] Table C.4.1 in the appendix provides summary statistics.

Panel A in Table 4.7 shows the treatment effects on relationship attitudes. For each of the three statements, we estimate two probit models. First of all, we only include the treatment indicator while adding control variables in our preferred specification. Among all statements, we find a significant effect of the TV-dummy. Column (2) reveals that individuals living in the treatment area were 8 % less likely to consider living with a partner all their life as "very important." The same applies to the second statement capturing the importance of faithfulness in a partnership. Here, the probability is 5.8 % lower (column (4)). Both statements contain aspects that are important to the

[67]Our results hardly change if we group the two categories "important" and "very important" together. Furthermore, we arrive at similar results if we employ ordered probit models using all information on the five answer categories. The regression results are included in Table C.4.3 in the appendix.

[68]The northern regions without Western television reception were not part of the investigation area.

TABLE 4.7: WGTV and attitudes towards partnership and family life

Panel A: Relationship attitudes

	Statement I		Statement II		Statement III	
	(1)	(2)	(3)	(4)	(5)	(6)
TV-dummy	-0.075***	-0.080***	-0.052***	-0.058***	0.041**	0.045**
	(0.020)	(0.021)	(0.018)	(0.018)	(0.018)	(0.018)
Controls	No	Yes	No	Yes	No	Yes
Pseudo R^2	0.003	0.034	0.002	0.038	0.002	0.018
Observations	3730	3730	3804	3804	3357	3357

Panel B: Attitudes towards family life

	Statement IV		Statement V	
	(7)	(8)	(9)	(10)
TV-dummy	-0.033^{*}	-0.045^{**}	-0.031^{**}	-0.035^{**}
	(0.019)	(0.019)	(0.015)	(0.015)
Controls	No	Yes	No	Yes
Pseudo R^2	0.001	0.032	0.001	0.023
Observations	3787	3787	3784	3784

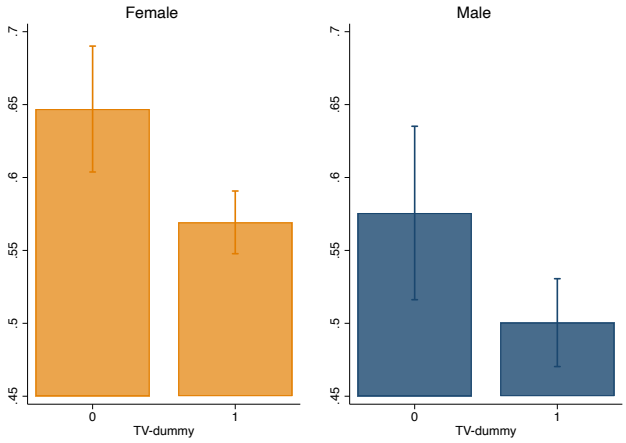
Note: The table reports probit average marginal effects. The dependent variables in column (1) to (10) correspond to the statements I to V in Table 4.6. All models include the following controls: gender, age, age^2, age^3, siblings, level of education, employment status, vocational qualification, and industry. Full regression results are shown in Table C.4.2 in the appendix. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

concept of marriage. We could only find a significantly positive effect for statement III, indicating that participants from the treatment group are 4.5 % more likely to perceive the possibility of separation in an inharmonious partnership as very important. A higher willingness to separate in inharmonious partnerships might contribute to higher divorce rates among the treated counties. Finally, the estimates shown in Panel B in Table 4.7 demonstrate that WGTV exposure reduces the probability that respondents consider living with children as very important.

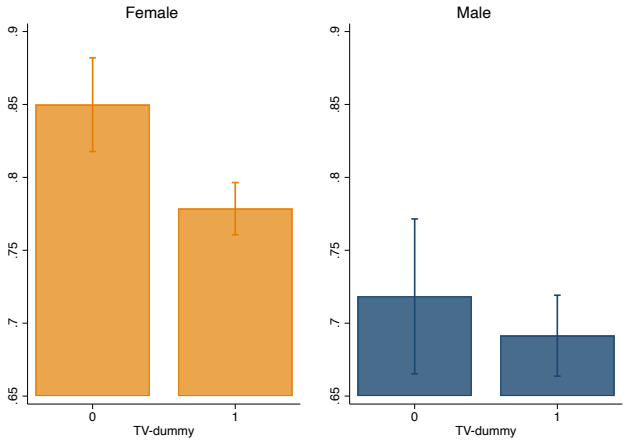
In the next step, we investigate whether the reception of WGTV affects the attitudes of both male and female participants. For this purpose, we divide our sample into a female and a male subsample and repeat the estimations for both. Figures 4.3 and 4.4 visualize the results. For female and male respondents, they show the predictive probability of considering a respective statement as very important, divided into treatment and control group. For all five statements, we find a more pronounced difference between treatment and control group for females. In addition, these differences are significant among the female respondents across all statements, while

FIGURE 4.3: Gender differences in relationship attitudes

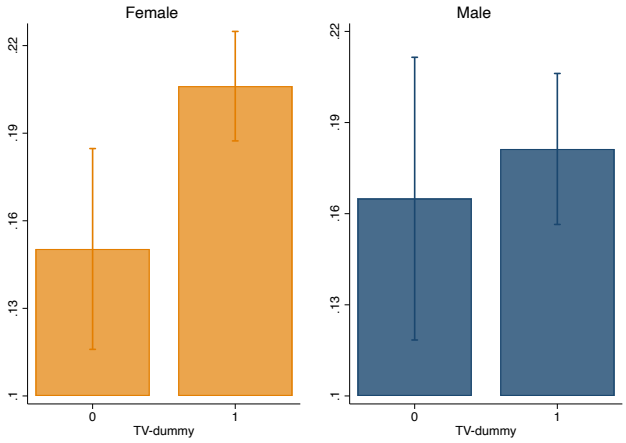
(A) Statement I



(B) Statement II



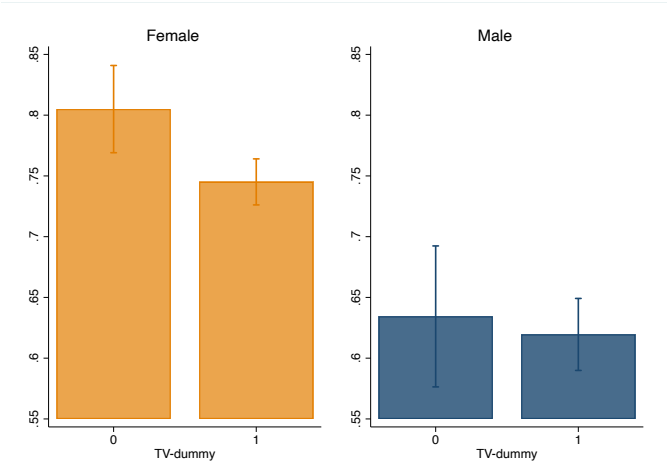
(C) Statement III



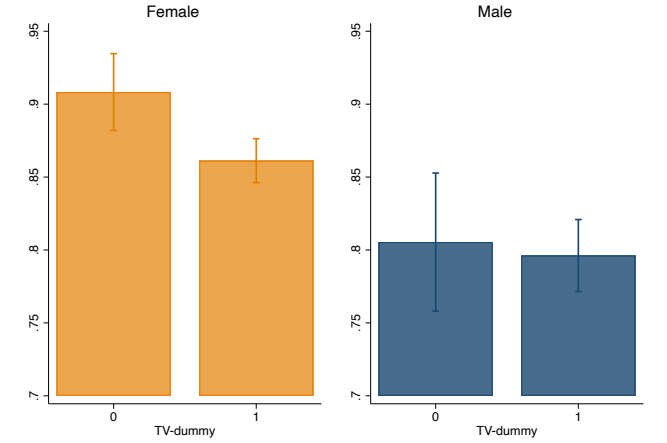
Note: Figures (a), (b), and (c) show the predicted probabilities of considering the statement in question as very important separately for male and female respondents. Within the female and male subsample, we also differentiate between the treatment and control group. The statements I, II, and III are included in Table 4.6.

FIGURE 4.4: Gender differences in attitudes towards family life

(A) Statement IV



(B) Statement V



Note: Figures (a) and (b) show the predicted probabilities of considering the statement in question as very important separately for male and female respondents. Within the female and male subsample, we also differentiate between the treatment and control group. The statements IV and V are included in Table 4.6.

we only find a significant effect for males in Figure 4.3a. Table C.4.4 in the appendix includes the corresponding regression estimates. At this point, however, it is essential to mention that only 1,425 men were interviewed compared to 2,710 women. To ensure that our results were not driven by a different number of observations for men and women, we repeatedly drew random samples of 1,425 women and repeated the estimates. By doing so, we obtain similar results in our main estimations.

Overall, the results presented in this section show that the effects of WGTV reception can already be observed prior to reunification. Moreover, they indicate that mainly

women's attitudes were influenced by the treatment, while hardly any differences between the treatment and control regions can be found among the male participants.

4.7 Conclusion

By utilizing a natural experiment, we investigated whether television content can influence a person's likelihood of marrying or divorcing as well as affecting decisions on family planning. Our analysis, which draws on both county-level and survey data, shows that former WGTV exposure has a significant and negative effect on marriage and birth rates as well as a positive impact on divorce rates. Since we cannot completely rule out the possibility that the observed differences between the treatment and control areas are due solely to Western television reception, we subjected our results to various robustness checks. These tests indicate that our findings are remarkably robust. The analysis of survey data from the SOEP further supports these results. Among respondents who lived in the treatment regions, we find a significantly lower likelihood of being married and having children. Instead, the same group of individuals exhibits a higher probability of being divorced. By analyzing survey data from the 1980s, we provide evidence that the treatment effects can already be observed prior to reunification. Moreover, the results suggest that attitudes towards relationships and family life were unequally influenced by the treatment in women and men. Interestingly, WGTV exposure had a particular impact on women's attitudes. One possible explanation for this effect might be that women spent more time watching television and were, therefore, more exposed to Western television content. However, survey data of the Zentralinstitut für Jugendforschung (1989) shows that, on average, men watched WGTV more frequently than women, while women watched East German programs slightly more regularly.

There are various mechanisms through which television content can influence an individual's preferences. For example, television can affect fertility decisions by providing additional information on family planning or contraceptives (Kearney and Levine, 2015). Since we could not find any effect on the birth rates of the under 20-year-olds, the latter channel seems to be less relevant in our case. However, the fact that family topics were less important on Western television channels and were also broadcast less often could have affected individuals. Another possible reason is that WGTV provided alternative role models that conflicted with existing social norms and in turn, weakened them over time. Therefore, regularly seeing childless or divorced female characters in series and movies might have liberalized attitudes towards

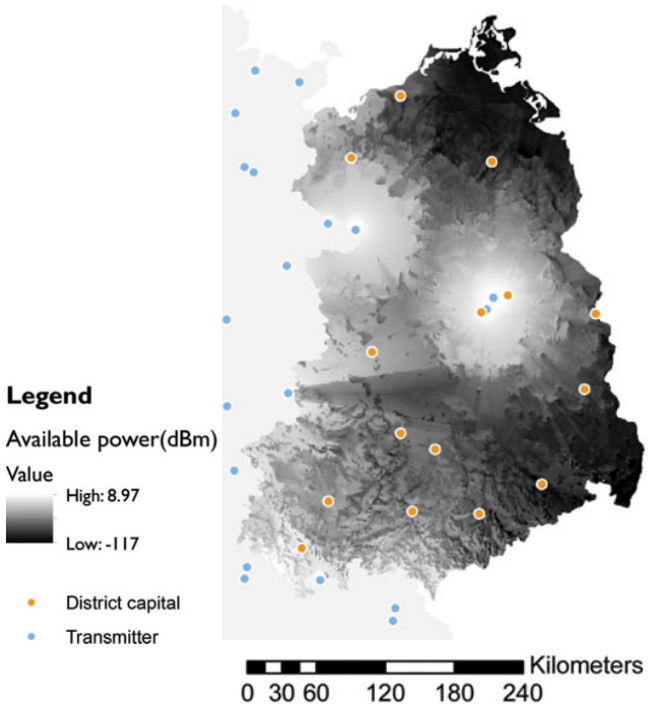
women's roles, leading to questioning traditional values. Finally, psychological studies document that repeated exposure to television over a long period also affects beliefs about the real world, causing individuals to believe that social reality corresponds to the reality shown on television (Gerbner and Gross, 1976). In this regard, the stereotypical portrayal of female characters, which displayed married women and women with children in a rather negative way, could have contributed to this effect as well. Developing a deeper understanding of which mechanisms apply in individual cases is an important topic for future research.

Although we examined a unique scenario, our results are of great relevance beyond the geographical and chronological scope of this study. Overall, our findings indicate that television content can influence the fundamental life decisions of individuals by affecting their attitudes towards family issues. Once formed, such attitudes tend to be stable over time and can even be passed on from one generation to the next, which could potentially explain the persistence of the WGTV effect (Giuliano and Spilimbergo, 2013). Since television is one of the most time-consuming forms of recreational activity in many countries, television programs could be an efficient and inexpensive way to reach a substantial part of society across all social classes. Considering this fact, our results also have important policy implications.

4.8 Appendix C

4.8.1 Additional background information

FIGURE C.1.1: Reception of WGTV in the GDR



Note: Brighter areas indicate regions with a stronger WGTV over-the-air signal and thus a better television reception, while dark areas had weak to no reception. This illustration is taken from Crabtree et al. (2015) with slight modification.

TABLE C.1.1: Differences between treatment and control districts

	Treatment Area	**Control Area**	**Difference**		
	mean	mean	difference	se	p-value
1955					
share of women *(%)*	57.20	57.04	0.16	0.93	0.870
population density	207.17	203.18	3.99	74.20	0.958
infant mortality	49.79	42.72	7.07	4.41	0.135
suicides per 100,000 inhabitants	26.01	24.87	1.14	4.46	0.803
sales per capita	1680.42	1684.31	−3.89	80.86	0.962
employed in agriculture *(%)*	22.79	26.83	−4.04	9.53	0.679
employed in industry *(%)*	23.63	28.91	−5.28	9.16	0.575
employed in trade *(%)*	10.59	10.86	−0.27	0.30	0.384
1989					
share of women *(%)*	52.11	51.90	0.21	0.53	0.695
population density	176.14	181.24	−5.10	58.65	0.932
share of foreigners *(%)*	1.13	1.12	0.01	0.28	0.984
infant mortality	7.78	6.83	0.95	0.50	0.081
suicides per 100,000 inhabitants	27.70	26.37	1.33	1.70	0.449
sales per capita	7544.16	7836.19	−292.03	188.77	0.148
employed in agriculture *(%)*	11.31	13.50	−2.19	4.34	0.623
employed in industry *(%)*	39.47	33.41	6.06	6.90	0.397
employed in trade *(%)*	9.68	10.30	−0.62	0.63	0.345

Note: District differences between the treatment (11) and control area (3). Population-weighted averages. East Berlin is excluded from this analysis. Further tests are shown in Bursztyn and Cantoni (2016).

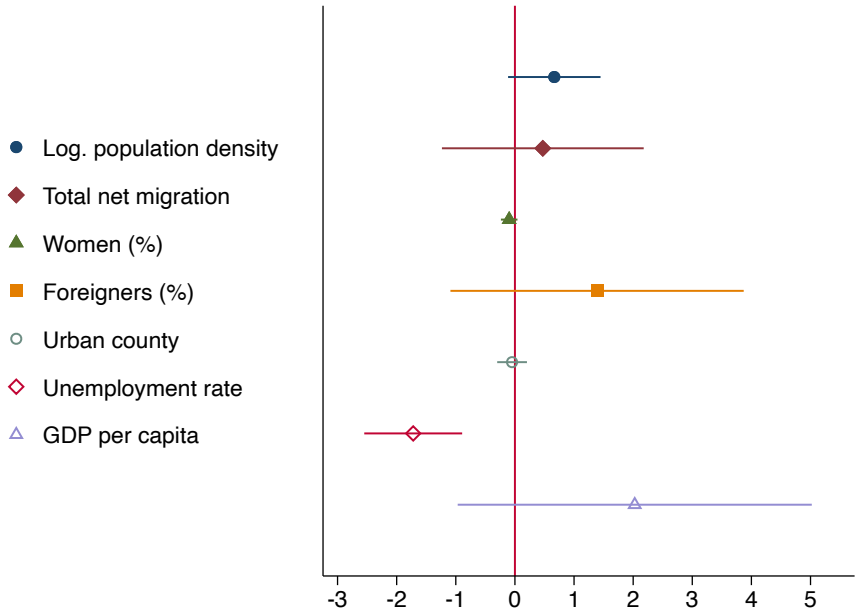
TABLE C.1.2: Marriage, divorce, and birth rates by treatment status in 1955

	Treatment Area	**Control Area**	**Difference**		
	mean	mean	difference	se	p-value
I: District differences					
divorces per 1,000 inhabitants	1.39	1.23	0.16	0.12	0.230
divorce-marriage-ratio	0.16	0.14	0.02	0.02	0.251
II: County differences					
marriages per 1,000 inhabitants	8.63	8.80	−0.17	0.26	0.525
births per 1,000 inhabitants	17.06	17.32	−0.26	1.48	0.863

Note: Part I of this table shows district differences between the treatment (11) and control area (3) in 1955. In contrast to divorce rates, information on marriage rates and birth rates is available even at county level. Part II displays differences on county-level between the treatment (194) and control area (25) in 1955. Population-weighted averages. East Berlin is excluded from this analysis.

4.8.2 County-level data: Supplementary statistics and analyses

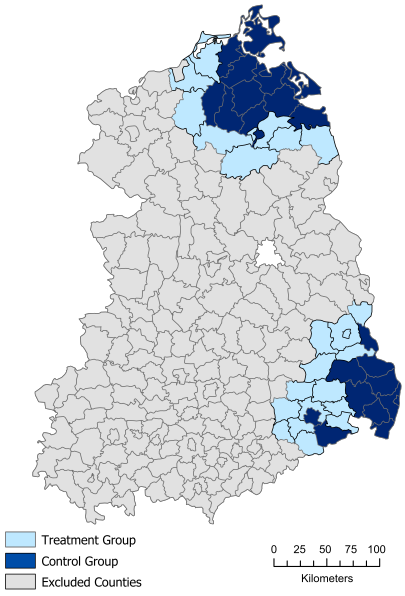
FIGURE C.2.1: County-level data: Covariate balance (2017)



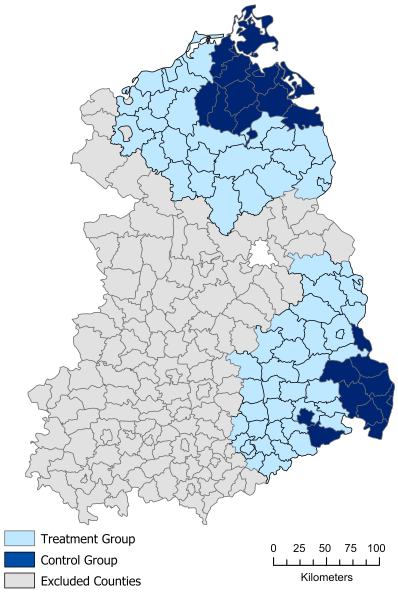
Note: Balance in the values of the covariates in 2017. The figure presents the estimated coefficients from bivariate regressions in which the treatment indicator is used as independent variable. The confidence intervals shown are set at the 95 % level of statistical significance.

FIGURE C.2.2: Geographic regression discontinuity design

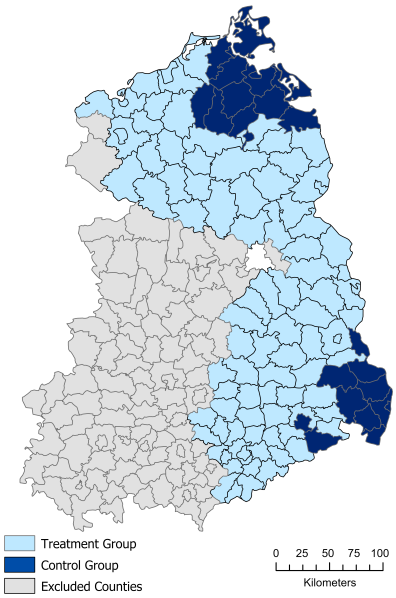
(A) 25 km radius



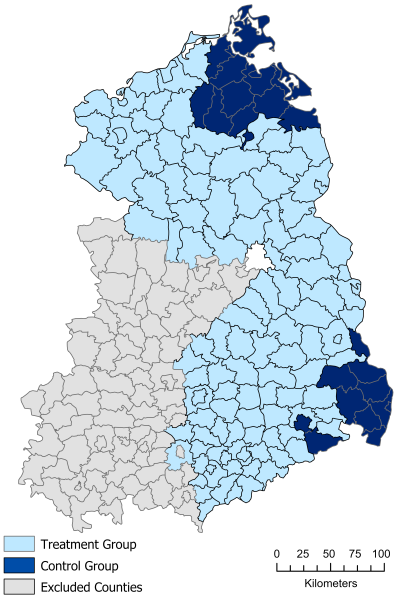
(B) 50 km radius



(C) 75 km radius



(D) 100 km radius



Note: The figure shows East German counties with and without access to WGTV before reunification based on a -86.5 dBm cutoff. Treated counties outside a 25 km (a), 50 km (b), 75 km (c), and 100 km (d) radius of the control group are shown in gray and are excluded from the analysis.

TABLE C.2.1: County-level data: List and definition of variables

Variable	Description
Dependent variables	
Birth rate	The variable measures the total number of live births per 1,000 inhabitants.
Birth rate (older)	The variable measures the total number of live births of women aged over 40 per 1,000 women aged 40 to 45.
Birth rate (younger)	The variable measures the total number of live births of women aged 15 to 20 per 1,000 women aged 15 to 20.
Divorce rate	The variable measures the share of divorces per 1,000 inhabitants at a minimum age of 18.
Divorce-to-marriage ratio	This ratio compares the number of divorces to the number of marriages.
Fertility rate	The variable measures the total fertility rate, which is a measure of the reproductive capacity of a population from within itself. It indicates how many children a woman of a fictitious birth cohort would give birth to in the course of her life.
Marriage rate	The variable measures the share of marriages per 1,000 inhabitants at a minimum age of 18.
Explanatory variables	
Average age	The variable measures the average age of the population in years and was measured at the county level.
Disposable income per capita	The variable measures the average amount of money in 1,000 € that people have available for consumption and saving after income taxes have been accounted for.
Distance to inner German border (log.)	The variable measures the linear distance between the administrative center of each GDR county and its closest point on the inner German border. This variable is calculated with the geographic information system ArcGIS. Own calculation.
Foreigners (%)	The variable denotes the percentage of the population that were foreigners.
GDP per capita	The variable measures the GDP in 1,000 € per inhabitants.
Population density (log.)	Population density measures the population per km^2 living in a certain region.
Population without religious affiliation (%)	The variable measures the percentage of inhabitants without religious affiliation.
School-leavers with higher education entrance qualification (%)	The variable measures the percentage of school-leavers that graduated with a university entrance certificate.
Total net migration	The variable measures the share of total net migration per 1.000 inhabitants.
TV-dummy	This dummy variable varies at the county level and equals one if the WGTV signal strength was at least -86.5 dBm.
Unemployment rate total	The unemployment rate is the percentage of the labor force that was jobless.
Urban county	This dummy variable varies at the county level and equals one if the respective county is an urban district and zero if it is a rural district.
Women (%)	The variable measures the share of women.

Note: This table includes a description for each variable used in the analysis of the county-level data set in Section 4.4.1 and 4.4.2.

TABLE C.2.2: County-level data: Descriptive statistics

	mean	sd	min	max	N	T
Dependent variables						
Marriage rate	4.32	1.43	0.47	19.71	6076	28
Divorce rate	1.82	0.65	0.11	15.21	6076	28
Divorce-to-marriage ratio	0.44	0.16	0.04	3.68	6076	28
Birth rate	8.54	1.67	4.96	20.00	6076	28
Birth rate of Mothers aged 40+	4.48	2.60	0.00	20.08	4991	23
Birth rate of Mothers aged 15–20	12.78	4.59	1.89	35.23	4991	23
Fertility rate	1.35	0.24	0.72	1.98	4991	23
Explanatory variables						
TV-dummy	0.88	0.32	0.00	1.00	6076	28
Log. population density	4.94	0.93	3.35	8.31	6076	28
Total net migration	-2.00	9.28	-43.42	64.89	6076	28
Women (%)	51.05	0.71	46.58	53.91	6076	28
Foreigners (%)	2.03	1.40	0.12	17.65	6076	28
Urban county	0.12	0.32	0.00	1.00	6076	28
Unemployment rate (%)	14.17	4.46	3.60	25.43	6076	28
GDP per capita	18.06	6.24	6.57	40.90	6076	28
Log. distance to inner German border	4.16	1.01	0.00	5.50	6076	28

Note: This table shows descriptive statistics (means, standard deviation, minimum, and maximum over time). N refers to the number of observations. T indicates for how many years the information on a variable is available. 28 (23) corresponds to the period from 1990-2017 (1995-2017).

TABLE C.2.3: County-level data: Variation of the TV-signal threshold

Panel A: Marriage rate

	-85.0 dBm	-82.5 dBm	-80.0 dBm	Kern (2011)
	(1)	(2)	(3)	(4)
TV-dummy	-0.600^{**}	-0.522^{**}	-0.703^{***}	-0.681^{**}
	(0.295)	(0.261)	(0.224)	(0.338)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.044	0.037	0.078	0.050
Observations	6076	6076	6076	6076

Panel B: Divorce rate

	-85.0 dBm	-82.5 dBm	-80.0 dBm	Kern (2011)
	(5)	(6)	(7)	(8)
TV-dummy	0.084^{**}	0.083^{**}	0.080^{***}	0.103^{***}
	(0.038)	(0.033)	(0.028)	(0.039)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.164	0.165	0.170	0.168
Observations	6076	6076	6076	6076

Panel C: Divorce-to-marriage ratio

	-85.0 dBm	-82.5 dBm	-80.0 dBm	Kern (2011)
	(9)	(10)	(11)	(12)
TV-dummy	0.048^{***}	0.044^{***}	0.058^{***}	0.056^{***}
	(0.012)	(0.011)	(0.011)	(0.013)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.362	0.361	0.412	0.373
Observations	6076	6076	6076	6076

Panel D: Birth rate

	-85.0 dBm	-82.5 dBm	-80.0 dBm	Kern (2011)
	(13)	(14)	(15)	(16)
TV-dummy	-0.348^{***}	-0.267^{**}	-0.232^{**}	-0.360^{***}
	(0.113)	(0.114)	(0.103)	(0.090)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.365	0.356	0.356	0.364
Observations	6076	6076	6076	6076

Note: Random effects models. Each panel refers to one dependent variable. In each panel, we replicate our main findings based on different TV signal thresholds. We distinguish between the signal strengths of -85.0 dBm, -82.5 dBm, and -80.0 dBm. In addition, we apply the classification of treatment and control groups used in Kern (2011). All models include the full set of control variables used in Table 4.1. Standard errors clustered at county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE C.2.4: County-level data: Further control variables

	Marriage rate	Divorce rate	Divorce-to-marriage ratio	Birth rate
	(1)	(2)	(3)	(4)
TV-dummy	-0.918^{*}	0.068^{*}	0.052^{***}	-0.216^{*}
	(0.385)	(0.042)	(0.014)	(0.088)
Average age	0.060	0.024^{+}	0.007^{+}	-0.527^{***}
	(0.039)	(0.014)	(0.004)	(0.034)
Log. population density	-0.406^{***}	0.059^{+}	0.062^{***}	0.116
	(0.107)	(0.035)	(0.011)	(0.093)
Total net migration	-0.006	-0.005^{**}	-0.001	0.003
	(0.004)	(0.002)	(0.000)	(0.003)
Women (%)	0.738^{***}	-0.015	-0.034^{**}	0.463^{***}
	(0.108)	(0.037)	(0.013)	(0.094)
Foreigners (%)	0.064	-0.007	-0.005	0.019
	(0.043)	(0.012)	(0.004)	(0.030)
Urban county	-0.132	0.239^{***}	0.053^{*}	-0.011
	(0.296)	(0.073)	(0.024)	(0.133)
School-leavers with higher education entrance qualification (%)	0.018^{***}	-0.003^{+}	-0.001^{***}	-0.004^{+}
	(0.004)	(0.002)	(0.000)	(0.002)
GDP per capita	-0.039^{**}	0.008^{*}	0.003^{*}	0.023^{***}
	(0.013)	(0.003)	(0.001)	(0.006)
Disposable income per capita	0.227^{***}	0.010	-0.017^{*}	0.068
	(0.061)	(0.022)	(0.007)	(0.047)
Unemployment rate (%)	0.035^{**}	-0.014^{*}	-0.007^{***}	-0.000
	(0.012)	(0.005)	(0.002)	(0.007)
Year	Yes	Yes	Yes	Yes
Between R^2	0.036	0.169	0.363	0.754
Observations	4991	4991	4991	4991

Note: Random effects models. Standard errors clustered at county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE C.2.5: County-level data: Proximity to West Germany

Panel A: Exclusion of counties bordering the inner German border

	Marriage rate	Divorce rate	Divorce-to-marriage ratio	Birth rate
	(1)	(2)	(3)	(4)
TV-dummy	-0.726^{**}	0.082^{**}	0.051^{***}	-0.458^{***}
	(0.318)	(0.039)	(0.013)	(0.109)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.021	0.194	0.401	0.425
Observations	5348	5348	5348	5348

Panel B: Exclusion of counties bordering Berlin

	Marriage rate	Divorce rate	Divorce-to-marriage ratio	Birth rate
	(5)	(6)	(7)	(8)
TV-dummy	-0.632^{**}	0.087^{**}	0.049^{***}	-0.289^{**}
	(0.316)	(0.039)	(0.013)	(0.116)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.064	0.162	0.390	0.314
Observations	5796	5796	5796	5796

Panel C: Exclusion of counties bordering the inner German border and Berlin

	Marriage rate	Divorce rate	Divorce-to-marriage ratio	Birth rate
	(9)	(10)	(11)	(12)
TV-dummy	-0.759^{**}	0.072^{*}	0.050^{***}	-0.425^{***}
	(0.322)	(0.039)	(0.013)	(0.108)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.038	0.192	0.427	0.360
Observations	5068	5068	5068	5068

Note: Random effects models. In Panel A, we exclude the 26 counties that are located directly on the inner German border. Panel B omits Berlin and the counties that share a border with Berlin (10). In Panel C, we apply the restrictions from Panel A and B simultaneously. All models include the full set of control variables used in Table 4.1. Standard errors clustered at county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE C.2.6: County-level data: Geographic regression discontinuity design

Panel A: Marriage rate

	25 km	50 km	75 km	100 km
	(1)	(2)	(3)	(4)
TV-dummy	-0.618^{*}	-0.604^{*}	-0.663^{*}	-0.649^{*}
	(0.344)	(0.350)	(0.362)	(0.340)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.012	0.016	0.037	0.051
Observations	1288	1820	2604	3136

Panel B: Divorce rate

	25 km	50 km	75 km	100 km
	(5)	(6)	(7)	(8)
TV-dummy	0.113^{*}	0.117^{**}	0.125^{***}	0.108^{***}
	(0.065)	(0.046)	(0.043)	(0.042)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.241	0.259	0.253	0.179
Observations	1288	1820	2604	3136

Panel C: Divorce-to-marriage ratio

	25 km	50 km	75 km	100 km
	(9)	(10)	(11)	(12)
TV-dummy	0.048^{**}	0.050^{***}	0.057^{***}	0.052^{***}
	(0.019)	(0.014)	(0.013)	(0.013)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.332	0.424	0.455	0.385
Observations	1288	1820	2604	3136

Panel D: Birth rate

	25 km	50 km	75 km	100 km
	(13)	(14)	(15)	(16)
TV-dummy	-0.280^{*}	-0.275^{**}	-0.274^{**}	-0.349^{***}
	(0.162)	(0.125)	(0.139)	(0.127)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.350	0.421	0.362	0.362
Observations	1288	1820	2604	3136

Note: Random effects models. Each panel refers to one dependent variable. In each panel, we replicate our main findings based on different samples. All models include the full set of control variables used in Table 4.1. Standard errors clustered at county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE C.2.7: County-level data: Religious affiliation

	Marriage rate	Divorce rate	Divorce-to-marriage ratio	Birth rate
	(1)	(2)	(3)	(4)
TV-dummy	-0.623^{**}	0.083^{**}	0.049^{***}	-0.301^{***}
	(0.296)	(0.035)	(0.013)	(0.114)
Population without	0.024^{***}	0.010^{***}	0.001^{***}	-0.026^{***}
religious affiliation (%)	(0.008)	(0.002)	(0.000)	(0.004)
Controls	Yes	Yes	Yes	Yes
Between R^2	0.085	0.272	0.375	0.464
Observations	6076	6076	6076	6076

Note: Random effects models. The dependent variable in columns 1 to 4 is the crude marriage rate, crude divorce rate, divorce-to-marriage ratio, and the crude birth rate in the period from 1990 – 2017, respectively. In all models, we include a variable that indicates the share of the population without a religious affiliation. All models include the full set of control variables used in Table 4.1. Standard errors clustered at county level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE C.2.8: County-level data: Additional birth outcomes (full regression table)

	Birth rate (older)	Birth rate (younger)	Fertility rate
	(1)	(2)	(3)
TV-dummy	-0.626^{***}	0.434	-0.025^{*}
	(0.091)	(0.347)	(0.014)
Log. population density	0.590^{***}	-0.793^{***}	-0.016^{*}
	(0.133)	(0.267)	(0.009)
Total net migration	0.024^{***}	0.030^{***}	-0.001^{**}
	(0.005)	(0.010)	(0.000)
Women (%)	-0.105	0.789^{***}	-0.009
	(0.190)	(0.281)	(0.011)
Foreigners (%)	0.137	0.116	-0.020^{***}
	(0.089)	(0.092)	(0.005)
Urban county	-0.330^{*}	2.178^{***}	-0.009
	(0.200)	(0.643)	(0.013)
Unemployment rate (%)	0.004	0.146^{***}	-0.005^{***}
	(0.019)	(0.035)	(0.001)
GDP per capita	0.070^{***}	0.015	0.002
	(0.019)	(0.036)	(0.001)
Year	Yes	Yes	Yes
Between R^2	0.573	0.226	0.238
Observations	4991	4991	4991

Note: Random effects models. The dependent variable in columns 1 to 3 is the birth rate of women aged 40 or older, the birth rate of women younger than 20, and the total fertility rate in the period from 1995 – 2017, respectively. Standard errors clustered at county level and shown in parentheses. Significance levels: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

4.8.3 SOEP data: Supplementary statistics and analyses

TABLE C.3.1: SOEP data: Descriptive statistics

	mean	sd	min	max	N
Dependent variables					
Married (yes/no)	0.72	0.45	0.00	1.00	3999
Divorced (yes/no)	0.06	0.24	0.00	1.00	3999
Children (yes/no)	0.48	0.50	0.00	1.00	3999
Number of children	0.78	0.95	0.00	5.00	3999
Explanatory variables					
TV-dummy	0.89	0.31	0.00	1.00	3999
Female	0.53	0.50	0.00	1.00	3999
Age	42.69	15.95	18.00	95.00	3999
Religious affiliation	0.35	0.48	0.00	1.00	3999
Migration background	0.03	0.18	0.00	1.00	3999
Health satisfaction	6.72	2.63	0.00	10.00	3999
Years of education	11.79	2.18	7.00	18.00	3999
Log. household income	6.76	0.46	5.04	7.87	3999
Employment status					
White-collar	0.36	0.48	0.00	1.00	3999
Blue-collar	0.37	0.48	0.00	1.00	3999
Apprentice	0.05	0.21	0.00	1.00	3999
Self-employed	0.03	0.16	0.00	1.00	3999
Not working	0.05	0.21	0.00	1.00	3999
Retired	0.15	0.36	0.00	1.00	3999

Note: This table shows descriptive statistics (means, standard deviation, minimum, and maximum). N refers to the number of observations.

TABLE C.3.2: SOEP data: Robustness checks

Panel A: Exclusion of spatial planning regions bordering the inner German border

	Married (yes/no)	Divorced (yes/no)	Children (yes/no)	Number of children
	(1)	(2)	(3)	(4)
TV-dummy	-0.058^{***}	0.030^{**}	-0.077^{***}	0.869^{***}
	(0.020)	(0.013)	(0.022)	(0.038)
Controls	Yes	Yes	Yes	Yes
Pseudo R^2	0.313	0.0.117	0.337	0.203
Observations	2577	2577	2334	2334

Panel B: Exclusion of spatial planning regions bordering the inner German border and Berlin

	Married (yes/no)	Divorced (yes/no)	Children (yes/no)	Number of children
	(5)	(6)	(7)	(8)
TV-dummy	-0.045^{**}	0.027^{**}	-0.081^{***}	0.878^{***}
	(0.019)	(0.013)	(0.022)	(0.039)
Controls	Yes	Yes	Yes	Yes
Pseudo R^2	0.315	0.100	0.332	0.205
Observations	2306	2306	2077	2077

Panel C: Control group and adjacent spatial planning regions

	Married (yes/no)	Divorced (yes/no)	Children (yes/no)	Number of children
	(9)	(10)	(11)	(12)
TV-dummy	-0.033	0.022^{*}	-0.091^{***}	0.812^{***}
	(0.021)	(0.013)	(0.024)	(0.043)
Controls	Yes	Yes	Yes	Yes
Pseudo R^2	0.298	0.137	0.351	0.206
Observations	1227	1172	1104	1104

Note: Models (4), (8), and (12) shows incident rate ratios, while the remaining models report probit average marginal effects. In Panel A, we exclude the spatial planning regions that are located directly on the inner German border. Panel B omits Berlin and the spatial planning regions that are located directly on the inner German border. In Panel C, we only consider respondents living in the control group and the adjacent spatial planning regions. All models include the full set of control variables used in Table 4.4. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

4.8.4 GDR survey data: Supplementary statistics and analyses

TABLE C.4.1: GDR survey data: Descriptive statistics

	mean	sd	min	max	N
Dependent variables					
Statement I	0.56	0.50	0	1	3730
Statement II	0.76	0.43	0	1	3804
Statement III	0.19	0.39	0	1	3357
Statement IV	0.71	0.45	0	1	3787
Statement V	0.85	0.36	0	1	3784
Explanatory variables					
TV-dummy	0.80	0.40	0	1	3827
Female	0.65	0.48	0	1	3827
Age	28.61	6.14	18	41	3827
Siblings	0.88	0.32	0	1	3827
Education					
Below 8th grade	0.02	0.14	0	1	3827
8th grade	0.14	0.35	0	1	3827
10th grade	0.70	0.46	0	1	3827
12th grade	0.14	0.35	0	1	3827
Job					
Full time	0.89	0.31	0	1	3827
Short hours	0.07	0.26	0	1	3827
Unemployed	0.00	0.07	0	1	3827
In training	0.04	0.19	0	1	3827
Qualification					
Unskilled	0.03	0.18	0	1	3827
Semi-skilled	0.03	0.18	0	1	3827
Skilled worker	0.60	0.49	0	1	3827
Foreman	0.03	0.18	0	1	3827
Trade/ technical school degree	0.20	0.40	0	1	3827
University degree	0.09	0.29	0	1	3827
Industry					
Industrial/ construction business	0.32	0.47	0	1	3827
Service	0.09	0.28	0	1	3827
Transport/ traffic/ postal/ telecommunication	0.06	0.23	0	1	3827
Healthcare sector	0.09	0.29	0	1	3827
Government bodies/ armed forces	0.09	0.28	0	1	3827
Education	0.08	0.27	0	1	3827
Crafts business	0.02	0.14	0	1	3827
Agriculture/ forestry	0.13	0.34	0	1	3827
University/ technical school/ scientific institution	0.02	0.13	0	1	3827
Still in training	0.03	0.17	0	1	3827
Other	0.07	0.26	0	1	3827

Note: This table shows descriptive statistics (means, standard deviation, minimum, and maximum over time). N refers to the number of observations.

TABLE C.4.2: GDR survey data: Full probit results

	Relationship			Children	
	I	II	III	IV	V
TV-dummy	-0.080***	-0.058***	0.045**	-0.045**	-0.035**
	(0.021)	(0.018)	(0.018)	(0.019)	(0.015)
Female	0.060***	0.077***	0.032**	0.118***	0.063***
	(0.018)	(0.015)	(0.015)	(0.016)	(0.013)
Age	-0.214**	-0.037	-0.010	0.005	0.014
	(0.097)	(0.085)	(0.081)	(0.087)	(0.068)
Age^2	0.007**	0.001	0.000	0.000	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Age^3	-0.000**	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Siblings	0.016	-0.016	-0.016	0.042*	0.002
	(0.025)	(0.021)	(0.020)	(0.022)	(0.018)
Education (omitted: Below 8th grade)					
8th grade	0.029	0.004	0.013	0.067	-0.011
	(0.062)	(0.047)	(0.057)	(0.060)	(0.043)
10th grade	-0.028	-0.055	-0.031	0.099	0.004
	(0.062)	(0.048)	(0.057)	(0.061)	(0.043)
12th grade	-0.127*	-0.146***	-0.029	0.069	-0.022
	(0.070)	(0.056)	(0.062)	(0.067)	(0.049)
Job (omitted: Full time)					
Short hours	-0.009	0.013	-0.021	0.017	0.023
	(0.033)	(0.028)	(0.026)	(0.029)	(0.022)
Unemployed	0.221**	0.087	-0.127**	-0.114	0.059
	(0.103)	(0.090)	(0.059)	(0.123)	(0.067)
In training	-0.083	-0.031	-0.036	-0.022	-0.014
	(0.078)	(0.068)	(0.052)	(0.074)	(0.064)
Qualification (omitted: Unskilled)					
Semi-skilled	-0.076	-0.123**	-0.125**	0.013	-0.021
	(0.062)	(0.058)	(0.053)	(0.056)	(0.049)
Skilled worker	-0.047	-0.014	-0.077*	-0.012	0.004
	(0.046)	(0.040)	(0.046)	(0.043)	(0.035)
Foreman	-0.091	-0.067	-0.065	0.050	0.021
	(0.063)	(0.055)	(0.061)	(0.057)	(0.046)
Trade/ technical school degree	-0.121**	-0.045	-0.092*	0.010	0.028
	(0.049)	(0.043)	(0.048)	(0.046)	(0.037)
University degree	-0.168***	-0.079	-0.106**	0.016	0.070*
	(0.061)	(0.052)	(0.054)	(0.055)	(0.040)

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Table C.4.2 – continued from previous page

	I	II	III	IV	V
Industry (omitted: Industrial business)					
Service	0.013	0.007	-0.035	-0.019	0.014
	(0.031)	(0.027)	(0.025)	(0.029)	(0.022)
Transport/ traffic/ postal/					
telecommunication	0.033	0.004	-0.009	-0.014	-0.020
	(0.036)	(0.032)	(0.030)	(0.034)	(0.027)
Healthcare sector	0.054*	0.060**	-0.022	0.019	0.009
	(0.032)	(0.027)	(0.027)	(0.030)	(0.024)
Government bodies/ armed forces	-0.045	-0.004	-0.027	0.054*	0.016
	(0.031)	(0.027)	(0.025)	(0.028)	(0.022)
Education	0.065*	0.054*	-0.013	0.118***	0.051**
	(0.034)	(0.028)	(0.029)	(0.029)	(0.023)
Crafts business	0.096*	0.056	0.070	-0.010	-0.006
	(0.057)	(0.048)	(0.055)	(0.055)	(0.043)
Agriculture/ forestry	0.042	0.026	-0.048**	0.053**	0.007
	(0.027)	(0.023)	(0.021)	(0.024)	(0.019)
University/ technical school/					
scientific institution	-0.119*	0.045	0.105*	-0.051	0.014
	(0.069)	(0.050)	(0.060)	(0.062)	(0.046)
Still in training	0.008	0.017	0.196**	0.099	-0.000
	(0.082)	(0.070)	(0.086)	(0.066)	(0.065)
Other	0.020	0.076***	-0.025	-0.045	-0.053*
	(0.034)	(0.028)	(0.027)	(0.032)	(0.027)
Pseudo R^2	0.034	0.038	0.018	0.032	0.023
Observations	3730	3804	3357	3787	3784

Note: The table reports probit average marginal effects. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE C.4.3: GDR survey data: Ordered probit results

	Relationship			Children	
	I	II	III	IV	V
TV-dummy	-0.229***	-0.209***	0.243***	-0.143**	-0.140*
	(0.051)	(0.058)	(0.048)	(0.054)	(0.065)
Female	0.170***	0.283***	0.214***	0.361***	0.254***
	(0.044)	(0.049)	(0.043)	(0.046)	(0.054)
Age	-0.438^{+}	-0.069	-0.244	0.000	0.116
	(0.245)	(0.277)	(0.223)	(0.247)	(0.290)
Age^2	0.016^{+}	0.001	0.007	0.002	-0.004
	(0.009)	(0.010)	(0.008)	(0.009)	(0.010)
Age^3	-0.000^{+}	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Siblings	0.003	-0.066	-0.056	0.119^{+}	0.018
	(0.057)	(0.067)	(0.056)	(0.063)	(0.078)
Education (omitted: Below 8th grade)					
8th grade	0.095	-0.001	0.061	0.220	-0.052
	(0.157)	(0.172)	(0.163)	(0.150)	(0.176)
10th grade	-0.074	-0.232	0.004	0.281^{+}	-0.018
	(0.157)	(0.173)	(0.165)	(0.149)	(0.178)
12th grade	-0.303^{+}	-0.493**	0.020	0.201	-0.096
	(0.173)	(0.190)	(0.177)	(0.170)	(0.197)
Job (omitted: Full time)					
Short hours	-0.035	0.053	-0.102	0.036	0.112
	(0.078)	(0.092)	(0.078)	(0.088)	(0.104)
Unemployed	0.556	0.358	-0.390	-0.304	0.321
	(0.401)	(0.375)	(0.267)	(0.292)	(0.377)
In training	-0.131	-0.064	0.014	-0.092	0.037
	(0.179)	(0.201)	(0.154)	(0.219)	(0.254)
Qualification (omitted: Unskilled)					
Semi-skilled	-0.139	-0.312^{+}	-0.333*	0.065	-0.106
	(0.159)	(0.177)	(0.157)	(0.161)	(0.185)
Skilled worker	-0.095	-0.026	-0.167	-0.029	0.038
	(0.125)	(0.143)	(0.122)	(0.124)	(0.140)
Foreman	-0.235	-0.159	-0.164	0.175	0.137
	(0.162)	(0.178)	(0.162)	(0.171)	(0.188)
Trade/ technical school degree	-0.340**	-0.106	-0.208	0.055	0.135
	(0.131)	(0.152)	(0.127)	(0.134)	(0.151)
University degree	-0.411**	-0.246	-0.310*	0.059	0.283
	(0.150)	(0.174)	(0.145)	(0.162)	(0.181)

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Table C.4.3 – continued from previous page

	I	II	III	IV	V
Industry (omitted: Industrial business)					
Service	0.059	0.007	-0.098	-0.075	0.069
	(0.075)	(0.085)	(0.072)	(0.079)	(0.096)
Transport/ traffic/ postal/					
telecommunication	0.099	0.033	-0.072	-0.048	-0.076
	(0.090)	(0.097)	(0.086)	(0.091)	(0.105)
Healthcare sector	0.221**	0.157+	-0.031	0.044	0.034
	(0.079)	(0.092)	(0.073)	(0.087)	(0.103)
Government bodies/ armed forces	-0.022	-0.007	-0.110	0.139+	0.089
	(0.070)	(0.080)	(0.069)	(0.083)	(0.095)
Education	0.207*	0.193*	-0.059	0.363***	0.272*
	(0.082)	(0.093)	(0.080)	(0.100)	(0.117)
Crafts business	0.292+	0.206	0.132	-0.019	-0.018
	(0.152)	(0.163)	(0.142)	(0.148)	(0.171)
Agriculture/ forestry	0.186**	0.090	-0.202**	0.157*	0.046
	(0.064)	(0.073)	(0.063)	(0.070)	(0.079)
University/ technical school/					
scientific institution	-0.184	0.103	0.234	-0.097	-0.005
	(0.141)	(0.172)	(0.144)	(0.159)	(0.214)
Still in training	-0.083	0.011	0.351*	0.328	-0.073
	(0.197)	(0.216)	(0.169)	(0.237)	(0.273)
Other	0.037	0.225*	-0.116	-0.138	-0.200*
	(0.086)	(0.102)	(0.080)	(0.086)	(0.098)
Log likelihood	-3690.54	-2382.96	-4748.98	-2832.58	-1805.81
Observations	3730	3804	3357	3787	3784

Note: The table shows results from ordered probit models. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE C.4.4: GDR survey data: Female and male subsamples

	Relationship			Children	
	I	II	III	IV	V
Female					
TV-dummy	-0.079^{***}	-0.077^{***}	0.059^{***}	-0.063^{***}	-0.051^{***}
	(0.026)	(0.022)	(0.023)	(0.023)	(0.019)
Controls	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.036	0.038	0.019	0.026	0.025
Observations	2443	2493	2199	2486	2481
Male					
TV-dummy	-0.075^{**}	-0.027	0.017	-0.015	-0.009
	(0.035)	(0.032)	(0.028)	(0.034)	(0.028)
Controls	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.038	0.033	0.036	0.012	0.012
Observations	1287	1311	1130	1301	1303

Note: The table reports probit average marginal effects. The dependent variables in column I to V correspond to the five statements in Table 4.6. The upper half of the table includes the results for women and the lower half for men. All models include the following controls: age, age^2, age^3, siblings, education, employment status, vocational qualification, and industry. Standard errors are clustered at the individual level and shown in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Chapter 5

Social media marketing for equity crowdfunding: Which posts trigger investment decisions?*

Based on 26,883 investment decisions, we examine the influence of social media marketing on crowd participation in equity crowdfunding. We distinguish between different types of informative and persuasive posts on Facebook and Twitter. Informative posts provide investors with information about the crowdfunding campaign; persuasive posts do not, but rather aim to directly influence an investor's decision-making process. We find that both types of posts have a positive impact on the number of investments. However, persuasive posts also increase the amount of an investment if they contain a statement about the previous investment success of the campaign and signal to the crowd that they are not investing alone.

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"Now is the time! Our crowdfunding is still open for your investment!"
Post on Twitter during the Fraisr Campaign on Seedmatch

5.1 Introduction

Signaling theory suggests that if information is asymmetrically distributed between entrepreneurs and investors, the entrepreneur can deliberately send effective signals to investors to ensure them that she is of high quality. To be effective, these signals must be observable and costly, because otherwise they could easily be faked or imitated by low-quality competitors. In equity crowdfunding, in which a large group of investors supports a startup over the Internet, information asymmetries are particularly high, given the rarity of on-site screening and due diligence (Hornuf et al., 2022). Thus, entrepreneurs often send effective signals via their project page on the equity crowdfunding platform, which acts as a gatekeeper and creates a trustworthy signaling environment (Block et al., 2018). However, the gatekeeper function largely falls away when startups use social media platforms such as Facebook or Twitter to promote their crowdfunding campaigns.

Assuming that potential investors need credible and diagnostic information before investing in crowdfunding campaigns, the use of social media marketing seems less than promising at first glance. However, startups also target different types of investors; for example, less sophisticated investors who may primarily use intuition in making their investment decisions (Agarwal and Ambrose, 2018, Hornuf et al., 2022). As the Twitter post by Fraisr above suggest, social media posts promoting crowdfunding campaigns do not always entail effective signals in the spirit of Spence (1973). Recent research has shown that even non-informative social media content can–under certain circumstances–have a positive influence on investment decisions (Bertrand et al., 2010, Madsen and Niessner, 2019, Tsai and Honka, 2021). We investigate which content startups post on social media platforms, as well as whether and how their posts impact on crowd participation during an equity crowdfunding campaign.

The marketing literature ascribes two main functions to advertising: an informative function and a persuasive function (Santilli, 1983, Tsai and Honka, 2021). The informative function is to provide consumers with information about products so that they can make reasoned purchase decisions. The persuasive function, on the other hand, pertains to changing consumer preferences without necessarily providing decision-relevant information. Advertising is hence less about appealing to reason and more about an appeal to intuition (Bertrand et al., 2010).

In crowdfunding practice, startups use informative posts and persuasive posts when promoting their campaigns on social media platforms. The content of informative posts is comparable to the content typically published on crowdfunding platforms, such as the funding limit, the development of the campaign, or basic information about the startup's business model. For example: "New sales expert on board: @fraisr strengthens its sales team with Ex-Daily Deal Key Account Manager!" By contrast, persuasive posts do not contain any specific information about the crowdfunding campaign or the startup itself. They are primarily aimed at directly influencing the cognitive stages an investor goes through during the decision processes, such as creating awareness, interest, desire, and purchase intentions for the startup, the campaign, and its products (Lavidge and Steiner, 1961, Tsai and Honka, 2021). The specific configurations of these posts can be quite diverse, ranging from a call to action (e.g., to invest in the startup or to purchase its products) to posts that are primarily intended to build a relationship with potential and existing investors. For example: "Do you want to participate in the success of interactive audio dramas? Then invest in Audiogent now!"

Persuasive posts often contain what are called heuristic cues, which are intended to elicit investment decisions (Grewal et al., 1996). According to the information processing literature (e.g., Chaiken, 1980, Petty and Cacioppo, 1986), these cues operate on the assumption that consumers are not always motivated to process information systematically, but instead rely on heuristics to make inferences about the attractiveness of advertised objects (Eisenbeiss et al., 2015). Heuristic decision behavior is especially likely when the decision period is limited (Coulter and Roggeveen, 2012), as is naturally the case with crowdfunding campaigns. A long stream of research has identified a number of heuristic cues that impact consumer value perceptions. Among those used particularly frequently in social media marketing of crowdfunding campaigns are *selling history* and *time limit*.

The selling history represents a statement about previous demand, for example in terms of previous shares sold or the number of previous investors. The marketing literature argues that consumers tend to use these cues as a heuristic to assess the quality or value of an object (Dean and Lang, 2008, Hellofs and Jacobson, 1999). Thus, the greater the previous demand, the more positive the assessment of an object. This is also why firms like Costco, Amazon, Best Buy, and Circuit City make bestseller information available to consumers. Applied to equity crowdfunding, the presence of a selling history cue in a persuasive post may serve as a form of social validation for the crowdfunding campaign, which signals to regular crowd investors an attractive investment opportunity (Coulter and Roggeveen, 2012). Examples of persuasive posts including a selling history cue include: "422 #microinvestors convinced by @swabr.

Now take the last opportunity for #crowdinvesting on @Companisto" and "Our #crowdinvesting on @Companisto: 326 people invest 45,200 € and 38 days remain. Secure shares now."

A time limit presents a special type of purchase constraint by limiting an offer's availability (Inman et al., 1997). Previous research has argued that consumers use unavailability or limited availability as a heuristic cue that the object is scarce (Coulter and Roggeveen, 2012). Scarcity typically induces action by playing upon consumers' fear of missing out on an attractive offer (Cialdini, 2007, Coulter and Roggeveen, 2012). Accordingly, previous studies have shown that time limits accelerate purchases, decrease the likelihood of searching for better alternatives, and lead to greater willingness to buy (Aggarwal and Vaidyanathan, 2003, Eisenbeiss et al., 2015, Inman et al., 1997). Moreover, psychological research has suggested that "people find objects and opportunities more attractive to the degree that they are scarce, rare, or dwindling in availability" (Cialdini, 1999, p. 92). Examples from equity crowdfunding campaigns include: "The countdown is on - seven days left! Until then, you can still invest in our campaign on Companisto" and "Today last chance - Secure your shares now! Here you can find the auction."

In summary, our theoretical considerations suggest that not only informative but also persuasive social media posts have an impact on investment decisions during an equity crowdfunding campaign. In the context of persuasive posts, the presence of selling history and time limit cues could be of particular importance. Below, we investigate whether and to what extent our expectations can be confirmed empirically through empirical analysis of investment decisions on three large German equity crowdfunding platforms.

5.2 Method

5.2.1 Data

We analyze 26,883 investment decisions representing a funding volume of 18.56 € million, which we hand-collected from November 6, 2011, to August 28, 2014, from the equity crowdfunding platforms Companisto, Innovestment, and Seedmatch. In line with Block et al. (2018) and Hornuf and Schwienbacher (2018), we aggregate the investments that a startup received on a single day. We thus get a panel data structure with the duration of the campaign in days as the time dimension, while the cross-sectional dimension relates to the campaigns. We further collected 2,583 Twitter and

1,816 Facebook posts for the startups in our sample during and seven days before the start of the respective campaign.[69]

5.2.2 Variables

Following Block et al. (2018), we use three distinct but complementary dependent variables to operationalize investment decisions in a relatively broad way: the number of investments per day as a measure of crowd participation (*Investments(#)*), the funding volume on a given day (*Amount(€)*), and the average investment amount per day (*Avg. amount(€)*) to capture the magnitude of an investment.

To investigate which social media posts affect investment decisions, we first classify posts into informative or persuasive posts based on their content. For a more nuanced analysis, we further distinguish between different manifestations of informative and persuasive posts. Within the informative posts, we differentiate between the categories *Startup*, *External Certification*, and *Campaign Development*.[70] While all informative posts provide information that investors might consider relevant for decision-making, they differ in the nature of the information. Within the persuasive posts, we distinguish between *Product Advertising*, *Investment Advertising*, and *Follower Communication*. While all persuasive posts aim to influence investment decisions, the main differences among them are in the way the influence is exercised. Table D.1 in the appendix contains variable definitions and Table D.2 provides coding examples. Figure 5.1 shows the distribution of all posts in our dataset across the six categories. In our dataset, more than 82 % of all posts on social media contain persuasive content. For each of the six categories, we calculate the percentage of posts per startup that fall into the category on a given day. For example, if a startup publishes ten posts in one day and two of them fall into the investment advertising category, the *Investment Advertising* variable takes the value 0.2.

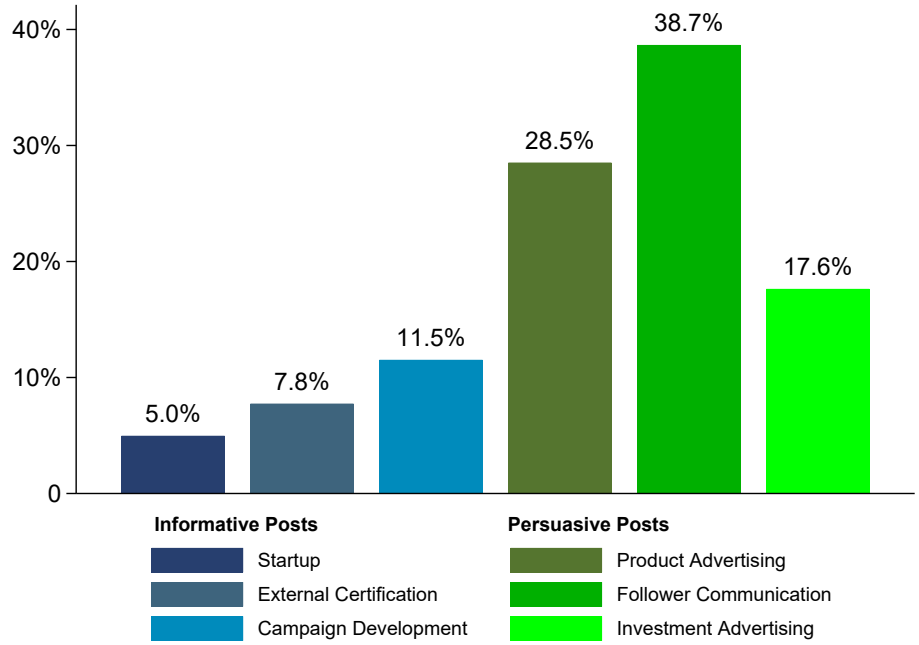
In addition, we document whether startups use selling history and time limit cues in their investment advertising posts. We find that around 15.8 % of all investment advertising posts contain selling history cues and 13.0 % include time limits.[71] To

[69]For simplicity, we pool the information from Facebook and Twitter posts in our empirical analysis.

[70]Note that we also searched for other categories of informative posts as classified by Block et al. (2018). However, these categories are of limited relevance to the posts in our study. Therefore, we consolidated the categories Team (2.2 %), Business Model (0.3 %), Product Development (0.6 %), Cooperation Projects (1.0 %), New Funding (0.05 %), and Business Development (0.9 %) under the label *Startup*.

[71]In addition, we investigated whether startups use quantity limits or sales promotion cues in their investment advertising. However, both cues play a minor role and appear in only 2.4 % (quantity limits) and 1.9 % (sales promotion) of all investment advertising posts.

FIGURE 5.1: Distribution of social media posts across the individual content categories



Note: This figure presents the distribution of the 4,399 social media posts across the individual content categories. Because one post can contain content instantiating multiple categories, the sum of the individual shares is greater than 100 percent.

analyze the impact of cues on investment decisions, we create the two variables *Selling History* and *Time Limit*, each indicating the proportion of investment advertising posts that contain the respective cues.

To control for media weight (Macinnis et al., 2002), we generate the variable #*Posts*, which measures the number of social media posts by a startup on a given day. In addition, we take into account the number of social media posts published by competing campaigns on the same day. We also include the number of active campaigns and the total number of investments across all competing campaigns on the same day. Furthermore, we consider a dummy variable that equals one if the funding goal of the campaign has been reached, and control for the number of investments and the investment amount that a startup obtained up to the previous day. Moreover, we add dummy variables indicating the first and the last seven days of the funding campaign. Finally, we include dummies for two of the three crowdfunding platforms, as well as for day of the week and month of the year. Table 5.1 presents descriptive statistics for the 3,887 campaign-day observations.

TABLE 5.1: Descriptive statistics for campaign-day observations

	mean	sd	min	max	count
Crowdfunding campaign data					
Investments (#)	6.62	21.97	0	579	3887
Amount (€)	4386.85	22622.79	0	869000	3887
Ln(Amount (€))	5.22	3.60	0	14	3887
Avg. Amount(€)	674.23	2065.41	0	50000	3887
Ln(Avg. Amount(€))	4.23	2.91	0	11	3887
Duration	64.82	33.76	2	126	3887
Funding Goal	47834.22	22469.96	25000	150000	3887
$\text{Ln(Amount)}_{0\rightarrow t-1}$	10.82	2.11	0	14	3891
$\text{\# Investments}_{0\rightarrow t-1}$	273.35	346.29	0	1981	3891
Post Funded	0.68	0.47	0	1	3887
Active Campaigns	5.91	2.98	1	12	3887
Competing Investments	36.42	57.55	0	1122	3887
Social media data					
#Posts	0.96	2.09	0	43	3887
Competing posts	2.36	4.35	0	59	3887
Startup	0.02	0.12	0	1	3887
External Certification	0.03	0.16	0	1	3887
Campaign Development	0.04	0.18	0	1	3887
Product Advertising	0.12	0.29	0	1	3887
Investment Advertising	0.05	0.19	0	1	3887
Follower Communication	0.13	0.30	0	1	3887
Time Limit	0.01	0.11	0	1	3887
Selling History	0.02	0.14	0	1	3887

Note: This table presents descriptive statistics (mean, standard deviation, minimum, and maximum) for the 3,887 campaign-day observations.

5.3 Results

We present our regression results in Table 5.2. Columns (1) and (2) present the results of fixed-effects negative binomial regressions with the number of investments as dependent variable. We report incident rate ratios, which can be interpreted as multiplicative effects. Columns (3) to (6) show the results from OLS fixed effects regressions with the funding volume on a given day and the average investment amount per day as dependent variables, which have been log-transformed, respectively.

Our findings indicate that informative social media posts positively affect the number of investments. While the effect for *Campaign Development* occurs on the same day, social media posts containing external certification or information about the

TABLE 5.2: The effect of social media posts on crowd participation

	Investments (#)		Ln(Amount(€))		Ln(Avg. Amount(€))	
Variable lag	Model 1 None	Model 2 1 day	Model 3 None	Model 4 1 day	Model 5 None	Model 6 1 day
Explanatory variables (lags according to table head)						
Informative content categories:						
Startup	1.103	1.275*	0.363	0.387	0.220	0.187
	(0.104)	(0.169)	(0.295)	(0.359)	(0.262)	(0.342)
External Certification	0.999	1.220**	−0.064	0.340	−0.014	0.310
	(0.064)	(0.120)	(0.261)	(0.229)	(0.234)	(0.205)
Campaign Development	1.220**	1.104	−0.071	0.147	−0.354	0.049
	(0.104)	(0.104)	(0.316)	(0.243)	(0.260)	(0.217)
Persuasive content categories:						
Product Advertising	1.079	1.033	0.295*	0.033	0.243	0.052
	(0.067)	(0.054)	(0.174)	(0.173)	(0.170)	(0.162)
Follower Communication	1.045	1.040	0.018	−0.086	0.025	−0.061
	(0.071)	(0.064)	(0.165)	(0.206)	(0.141)	(0.177)
Investment Advertising	1.356***	1.282**	0.182	0.171	−0.007	0.021
	(0.130)	(0.124)	(0.368)	(0.202)	(0.352)	(0.184)
Investment advertising cues:						
Time Limit (share)	0.949	0.989	0.120	−0.469	0.004	−0.497
	(0.156)	(0.152)	(0.605)	(0.549)	(0.519)	(0.483)
Selling History (share)	1.108	1.026	1.255***	1.200***	1.186***	1.140***
	(0.093)	(0.143)	(0.434)	(0.289)	(0.418)	(0.299)
# Posts	0.997	0.995	−0.069**	−0.007	−0.068**	−0.018
	(0.012)	(0.011)	(0.033)	(0.043)	(0.027)	(0.037)
Control variables (no lags included)						
Ln(Amount$_{0\to t-1}$)	1.229***	1.237***	0.319**	0.336**	0.293**	0.319**
	(0.064)	(0.066)	(0.143)	(0.147)	(0.138)	(0.140)
#Investments$_{0\to t-1}$ / 100	0.883***	0.880***	−0.370***	−0.352***	−0.155***	−0.137***
	(0.039)	(0.038)	(0.075)	(0.074)	(0.051)	(0.051)
Post Funded	1.016	0.988	0.179	0.152	0.223	0.192
	(0.146)	(0.141)	(0.342)	(0.345)	(0.281)	(0.281)
Active Campaigns	1.011	1.013	−0.039	−0.035	−0.036	−0.032
	(0.026)	(0.027)	(0.050)	(0.051)	(0.039)	(0.039)
Competing Investments	1.002***	1.002***	0.003***	0.002**	0.001	0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Competing Posts	0.993	0.994	−0.008	−0.007	−0.004	−0.003
	(0.007)	(0.008)	(0.016)	(0.016)	(0.013)	(0.013)
Fixed effects						
First and last seven days	Yes	Yes	Yes	Yes	Yes	Yes
Day-of-week	Yes	Yes	Yes	Yes	Yes	Yes
Month-of-year	Yes	Yes	Yes	Yes	Yes	Yes
Portal	Yes	Yes	Yes	Yes	Yes	Yes
Log likelihood	-7789.900	-7800.899	-9311.197	-9312.584	-8943.732	-8944.752
Observations	3887	3887	3887	3887	3887	3887

Note: The dependent variable in columns (1) and (2) is the number of investments, in columns (3) and (4) the Ln(Amount) of investments, and in columns (5) and (6) the Ln(Avg. amount) of investments in a specific campaign and day. The data takes a panel data structure. The method of estimation in columns (1) and (2) is the negative binomial fixed effects panel estimator and in columns (3) to (6) the OLS fixed effects panel estimator. Standard errors are shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

startup have an effect with a delay of one day.[72] If the share of campaign development posts increases by 10 percentage points, the number of investments would increase by 2.2 % ($p < 0.05$). In this respect, social media posts also differ from updates on crowdfunding platforms, where no immediate effects have been identified on the same day (Block et al., 2018). Posts on social media platforms apparently offer startups a tool to reach the crowd in a timelier manner. One reason for this is that potential investors might unintentionally obtain information about the equity crowdfunding campaign on social media, while they only receive updates on crowdfunding platforms if they actively search for them on the platforms' websites.

When analyzing the impact of persuasive posts, we find that the two content categories, *Product Advertising* and *Follower Communication*, do not affect investment decisions. However, persuasive posts in the form of investment advertising exert highly significant and positive effects on the number of investments. If the share of investment advertising posts increases by 10 percentage points, the number of investments would increase by 3.6 % ($p < 0.01$) on the same day and 2.8 % on the following day ($p < 0.05$). Thus, *Investment Advertising* has a considerably stronger overall effect on the number of investments than any type of informative posts. In other words, when investors are attracted by social media marketing, it is not so much through information as it is through intentional persuasion.

The results also show highly significant and positive effects of *Selling History* on both the funding volume and the average investment amount per day. If the share of selling history posts increases by 10 percentage points, the funding volume would increase by 25.1 %[73] ($p < 0.01$) on the same day and 23.2 % on the following day ($p < 0.01$); the average investment amount would increase by 22.7 % ($p < 0.01$) on the same day and 21.3 % ($p < 0.01$) on the following day. According to our theoretical considerations, investors use a selling history cue as a form of social validation for investing larger amounts. Interestingly, this is the only post category with a significant effect on the magnitude of investments, while other post categories only increase the number of investments.

Finally, when testing for a non-linear relationship for the variables that turn out to be significant predictors of campaign success, Figure D.1 shows that no such non-linear relationship exists for the number of investments. If anything, a higher number of investment advertising posts increases the number of investments.

[72] Our results in Table D.3 in the appendix show that social media posts have no effect on crowd participation after four days.

[73] Calculated as $e^{1.255} - 1 = 250.8\ \%$ for a 100-percentage-point increase in selling history posts.

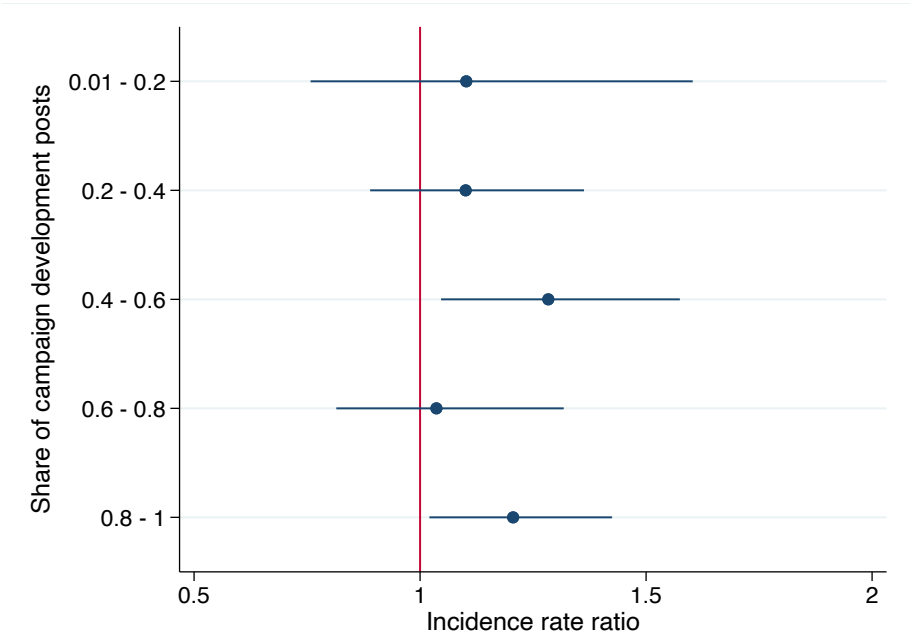
5.4 Conclusion

This article studies the impacts of social media posts on investment decisions in equity crowdfunding. Based on hand-collected investment data from three large German equity crowdfunding platforms, we draw three main conclusions: First, effective signals via informative posts are relatively rare, but trigger the number of investments in a crowdfunding campaign. Particularly effective informational posts are those that provide either information about campaign development or external certifications. Second, persuasive posts are more common, although they are only effective if they also directly promote the crowdfunding campaign through investment advertising. Other manifestations such as product advertising or follower communication remain ineffective. Third, investment advertising works particularly well in social media marketing if it includes a statement about the campaign's previous investment success, signaling to the crowd that they are not investing alone. In these ways, startups can effectively promote the number of investments and investment amounts through social media.

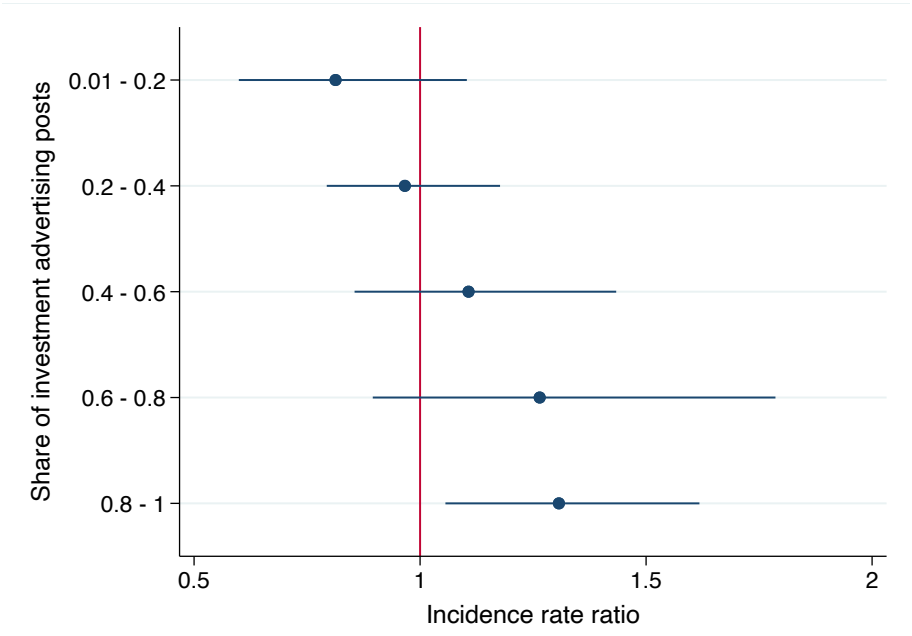
5.5 Appendix D

FIGURE D.1: Impact of social media posts on crowd participation

(A) Campaign Development



(B) Investment Advertising



Note: The estimates are based on Model 1 from Table 5.2.

TABLE D.1: List and definition of variables

Variables	Definition
Investments (#)	The number of investments made by crowd investors on day t in campaign i.
Amount (€)	The amount in € invested by crowd investors on day t in campaign i.
Ln(Amount (€))	The natural logarithm of the amount in € invested by crowd investors on day t in campaign i.
Ln(Avg. Amount (€))	The natural logarithm of the average amount in € invested by crowd investors on day t in campaign i.
Duration	The number of days elapsed from the start until the end of a campaign.
Post Funded	Dummy variable equal to 1 if the campaign has surpassed the Funding Goal, and 0 otherwise.
Funding Goal	The minimum funding goal as defined by the startup and portal at $t = 0$.
Active Campaigns	The total number of campaigns across three major German equity crowdfunding portal (Seedmatch, Companisto, and Innovestment) accepting investments on day t.
Competing Investments	The total number of investments made on day t across all campaigns run on three major German equity crowdfunding portals (Seedmatch, Companisto, and Innovestment) that were not attracted by campaign i.
Ln(Amount)$_{0\rightarrow t-1}$	The natural logarithm of the total amount of money in € invested by the crowd until the previous day in campaign i.
# Investments$_{0\rightarrow t-1}$	The total number of investments made by the crowd until the previous day in a particular campaign.
#Posts	The number of social media posts by the startup on day t in campaign i.
Competing Posts	The number of social media posts on day t made by all startups that ran campaigns on three major German equity crowdfunding portals (Seedmatch, Companisto, and Innovestment) on day t except posts by startup i.
Startup	The share of posts containing information about the startup in relation to the total number of posts in campaign i on day t. These post include information about the entrepreneurial team, the business model, product development, new collaborations, new funding, or business development.
External Certification	The share of posts including external certification in relation to the total number of posts in campaign i on day t. External certification includes, for example, expert opinions, success stories, news about awards received, patent applications, and patent approvals, as well as press and media coverage about the startup.
Campaign Development	The share of posts including information about the crowdfunding campaign and its development in relation to the total number of posts in campaign i on day t.
Product Advertising	The share of posts including product advertising and promotions in relation to the total number of posts in campaign i on day t.
Investment Advertising	The share of posts including investment advertising in relation to the total number of posts in campaign i on day t.
Follower Communication	The share of posts containing other social media content such as invitations for personal meetings, sharing information on related topics, or updated profile pictures in relation to the total number of posts in campaign i on day t.
Time Limit	The share of investment advertising posts that include time limit cues in relation to the total number of investment advertising posts in campaign i on day t. Time limit cues contain information that the purchase of shares is limited in time.
Selling History	The share of investment advertising posts that include selling history cues in relation to the total number of investment advertising posts in campaign i on day t. Selling history cues contain information about previous demand (e.g., shares sold) in the crowdfunding campaign

TABLE D.2: Definition and examples of social media post coding

Coding of posts	Examples
Startup: The post contains information about the startup. These include information about the entrepreneurial team, the business model, product development, new collaborations, new funding, or business development.	a) "New sales expert on board: @fraisr strengthens its sales team with Ex-Daily Deal Key Account Manager!" b) "Business angels invest six-figure sum in *Meine-Spielzeugkiste*! - Check it out!" c) "It is a great pleasure for us to introduce to you today a new, important cooperation partner of ours: Lobetaler Bio. With their fantastic quality and strong social commitment, they have more than convinced us."
External Certification: The post includes external certification such as expert opinions, success stories, news about awards received, patent applications, and patent approvals, as well as press and media coverage about the startup.	a) "BetterTaxi was voted App of the Week at telefon.de!" b) "VentureCapital magazine has now also reported on Companisto in its print edition. I wonder if this has something to do with the fact that the online article about Companisto was the most clicked news item in June..." c) "We are now in the Wall Street Journal Germany! What do you think?"
Campaign Development: The post includes information about campaign updates or announcements that the funding limit has been changed.	a) "Yeah! Thanks to you we have reached the minimum threshold!" b) "Fundinglimit at Seedmatch increased to 300.000 € – join us and invest in the future of nuts" c) "The funding threshold for the @OvulaRing has just been reached: http://t.co/F0WPJdXqdr Congratulations to the team!"
Product Advertising: The post contains product advertising and promotions.	a) "Book a tour with us until 31.03. and save up to 50 %! More info on this at..." b) "Now you can order your best movinary videos as DVD." c) "Are you looking for sportswear that combines the special with the functional? Then take a look at the offers from..."
Investment Advertising: The posts includes investment advertising without providing specific information on the status of the corporate funding campaign.	a) "Now is the time! Our crowdfunding is still open for your investment!" b) "Time to join the other investors! Read more on..." c) "Do you want to participate in the success of interactive audio dramas? Then invest in Audiogent now!"
Follower Communication: The post contains other social media content such as invitations for personal meetings, information on related topics, or updated profile pictures in relation to the total number of posts in campaign i on day t.	a) "In this sense we wish you a good start into the week and a nice evening! ;)" b) "The German women's handball team secured an important victory for the 2014 European Championship qualification! Despite..." c) "Lottohelden.de wishes you a Merry #Christmas!"
Time Limit: The post contains information that the purchase of shares is limited in time.	a) "Today last chance - Secure your shares now! Here you can find the auction: http://t.co/2csGeOVW. Have a nice sunday :)" b) "The countdown is on - seven days left! Until then, you can still invest in our campaign on Companisto. Never before have so many people participated in a cultural medium via crowdinvesting!" c) "Only 4 days left...! Take your chance and participate in the success of #OvulaRing via #Crowdfunding."
Selling History: The post includes information about previous demand (e.g., shares sold) in the crowdfunding campaign.	a) "Crowdfunding already reached 150,000 € ! Thank you for your investment in KERNenergie !" b) "Our #crowdinvesting on @Companisto: 326 people invest 45,200 € and 38 days remain. Secure shares now." c) "422 #microinvestors convinced by @swabr. Now take the last opportunity for #crowdinvesting on @Companisto."

TABLE D.3: The effect of social media posts on crowd participation after four days

	Investments (#)	Ln(Amount(€))	Ln(Avg. Amount(€))
	Model 1	Model 2	Model 3
Variable lag	4 days	4 days	4 days
Explanatory variables (lags according to table head)			
Informative content categories:			
Startup	1.000	0.391	0.328
	(0.130)	(0.366)	(0.322)
External Certification	1.053	−0.152	−0.104
	(0.098)	(0.276)	(0.242)
Campaign Development	1.104	0.138	0.200
	(0.096)	(0.263)	(0.225)
Persuasive content categories:			
Product Advertising	0.964	−0.021	0.025
	(0.068)	(0.201)	(0.172)
Follower Communication	1.013	−0.083	−0.019
	(0.054)	(0.145)	(0.129)
Investment Advertising	1.132	0.126	−0.012
	(0.087)	(0.286)	(0.264)
Investment advertising cues:			
Time Limit (share)	0.918	−0.318	−0.328
	(0.204)	(0.510)	(0.393)
Selling History (share)	0.876	0.064	0.252
	(0.089)	(0.412)	(0.366)
#Posts	0.995	−0.001	−0.007
	(0.011)	(0.026)	(0.022)
Control variables (no lags included)			
Ln(Amount$_{0\to t-1}$)	1.229***	0.349**	0.325**
	(0.066)	(0.148)	(0.142)
#Investments$_{0\to t-1}$ / 100	0.882***	−0.358***	−0.138***
	(0.040)	(0.076)	(0.052)
Post Funded	1.003	0.153	0.193
	(0.151)	(0.355)	(0.289)
Active Campaigns	1.011	−0.042	−0.037
	(0.027)	(0.051)	(0.040)
Competing Investments	1.002***	0.002**	0.001
	(0.000)	(0.001)	(0.001)
Competing Posts	0.993	−0.005	−0.001
	(0.008)	(0.017)	(0.014)
Fixed effects			
First and last seven days	Yes	Yes	Yes
Day-of-week	Yes	Yes	Yes
Month-of-year	Yes	Yes	Yes
Portal	Yes	Yes	Yes
Log likelihood	-7818.088	-9320.998	-8951.350
Observations	3887	3887	3887

Note: The dependent variable in column (1) is the number of investments, in column (2) the Ln(Amount) of investments, and in column (3) the Ln(Avg. amount) of investments in a specific campaign and day. The data takes a panel data structure. The method of estimation in column (1) is the negative binomial fixed effects panel estimator and in columns (2) and (3) the OLS fixed effects panel estimator. Standard errors are shown in parentheses. Significance levels: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

Chapter 6

Habit formation and trade unions*

We analyze how habit formation affects collective bargaining outcomes if a firm-specific trade union determines wages. For a wide variety of alternative analytical settings, such internal reference points induce the union to increase wages over time. A numerical example suggests that the resulting decline in employment can be substantial. Furthermore, policy changes in one period, which are either reversed in the next or anticipated in previous periods, have effects on wage outcomes for multiple periods because they affect the habit stock at times at which they are not yet or no longer in operation.

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6.1 Introduction

The relevance of social comparisons and of interdependencies between individual preferences have long been recognized (e.g., Duesenberry, 1949, Pollak, 1976, Collard, 1978). This recognition connects Adams's (1963) equity theory and Festinger's (1954) theory of social comparison processes, which both assume that an individual not only values the absolute level of consumption, wealth, or even abilities but also the relative position. In this context, social comparisons require the definition of reference points that serve as measures of a person's relative standing (Kahneman and Tversky, 1979). The implications of such reference points have been intensively investigated. Accordingly, numerous studies have analyzed the consequences of relative income and consumption on a wide range of outcomes such as subjective well-being (McBride, 2001, Luttmer, 2005), optimal taxation (Oswald, 1983, Abel, 2005), or public good provision (Ng, 1987).

Social comparisons play a prominent role also in labor economics. For example, Clark and Oswald (1996) document a positive and significant relationship between a worker's relative income and job satisfaction. Card et al. (2012) come to a similar conclusion. By analyzing a field experiment, they document lower pay and job satisfaction among workers earning less than the median wage of their pay unit. In addition, these workers are more likely to look for a new job. In another field experiment, Cohn et al. (2014) provide evidence that social comparisons can substantially affect the effort provision of workers. Combining experimental and survey evidence, Clark et al. (2010) also find that effort provision in the workplace depends on a person's own and relative income. Blomquist (1993) examines the impact of tax changes on labor supply in a setting where the agents' utility is influenced by the average number of hours worked in society and average consumption. Fehr and Schmidt (1999) indicate that the impact of relative income is closely associated to fairness concerns. For example, the fair wage hypothesis proposed by Akerlof and Yellen (1990) assumes that an individual's effort is determined not only by the absolute wage but also by the comparison with the wage, which is perceived as being fair. In this regard, they follow the equity theory by Adams (1963).

A common assumption of many investigations is that individuals compare themselves to others. While external reference points are indeed relevant, there is ample evidence that individuals compare today's payoff to their own achievements in the past and, particularly, evaluate improvements positively (Clark, 1999, Havranek et al., 2017, Diriwaechter and Shvartsman, 2018). The decisive difference between internal and external reference points is that the former can be affected by own behaviour. This is particularly true in the case of collective actors, such as trade unions. While the concept of external reference points has already been studied in this context

(Oswald, 1979, Raaum, 1986, de la Croix, 1994, Mauleon et al., 2014, Goerke and Hillesheim, 2013, Chang et al., 2018), there is a lack of research analyzing the effects of internal reference points for trade union behavior.

Given the empirical importance of internal reference points and the high relevance of collective bargaining (OECD, 2019d), in this paper we study to what extent collective bargaining outcomes change once we allow for internal reference points. Similar to the explanation of the equity premium puzzle (Constantinides, 1990), taking these preferences into account could explain the trade union's incentives to raise wages even in situations in which economic circumstances have deteriorated. Moreover, habit preferences could provide insights into why unions do not fully exploit the scope for wage increases.

To examine the effects of internal reference points, we assume that individual utility increases in today's consumption or income and declines in the amount consumed in the previous period, the habit stock. We inquire how habit concerns or habit formation, terms we use equivalently, affect wage bargaining and alter the union's responses to changes in exogenous parameters. On the one hand, the trade union will prefer increasing wages over time to mitigate the utility loss in later periods, originating from the wages received previously. On the other hand, higher wages translate into lower labor demand. Therefore, fewer members build up a habit stock, and a preference for declining wages over time may arise. Thus, the wage and employment effects of habit formation are a priori ambiguous.

In our basic, two-period analysis, we show that the first effect dominates if habit concerns by employed members have a greater impact on the trade union than such preferences by unemployed individuals. In consequence, a monopoly trade union initially sets lower wages than in the absence of habit concerns, while wages are above that level later on. Additionally, our results suggest that policy changes, which are reversed later on, affect collective bargaining for substantially longer periods as they have an impact on the evaluation of future wage payments via aspects of habit formation. We demonstrate the robustness of our findings for a variety of alterations, namely with regard to a) the two-period setting, b) exogenous increases in productivity, i.e., incorporating growth, c) the specification of individual preferences, and d) the extent of trade union bargaining power.

Anecdotal evidence suggests that trade unions positively value a rise of bargained wages per se, irrespective of the negotiated level. Accordingly, union websites or press releases document extensively the magnitude of wage increases. Our analysis can rationalize such statements and clarify the consequences of such preferences insofar as they are based on habit concerns.

Although habit concerns are ubiquitous, their effects on collective bargaining have rarely been examined. As a partial exception, de la Croix et al. (1996) integrate them into their model by assuming that union utility decreases with previous wages. They show that 'any temporary shock will have permanent effects on the level of wages' (p. 437). Since their focus is mainly an empirical one, de la Croix et al. (1996) do not further analyze the theoretical model. Strifler and Beissinger (2016) assume that the internal reference point is defined as per capita output or profits. They clarify that such a modification can result both in higher or lower wages than in a standard wage bargaining model. In contrast to our setting, their framework does not allow for intertemporal linkages.

Our contribution is also related to dynamic models of collective bargaining (Jones, 1987, Kidd and Oswald, 1987, Jones and McKenna, 1994, Chang and Lai, 1997). In these approaches, union membership is endogenized and adjusts with delay. As a result, today's bargaining outcome will have an impact in future periods. The rationale for this intertemporal linkage is completely different from our set-up. In further related papers, Beissinger and Egger (2004) and Heer and Morgenstern (2005) presume that unemployment benefits are tied to past wage income.[74] Lockwood and Manning (1989), Modesto and Thomas (2001), and Cabo and Martín-Román (2019), for example, incorporate employment adjustment costs. They generally result in intertemporal linkages as well. Finally, Goerke (2021) considers the impact of habit formation on wage outcomes in an efficiency-wage framework and derives the conditions for wages to rise over time due to such preferences.

In the remainder of the paper, we outline the model in Section 6.2. In Section 6.3, we derive the conditions ensuring that habit concerns induce a monopoly trade union to raise wage demands over time. A numerical example resolves some theoretical ambiguities and establishes the quantitative relevance of the basic results. Furthermore, we investigate various extensions of our model. Section 6.4 considers exogenous variations in unemployment benefits and the product price. Section 6.5 concludes our paper.

[74]Other contributions considering earnings-related unemployment benefits, such as by Vijlbrief and van de Wijngaert (1995) and Goerke et al. (2010) do not explicitly allow for intertemporal repercussions.

6.2 Model

To incorporate habit formation into a model of collective wage determination, we presume that individual utility is a function not only of current wages, as in the standard approach (see Oswald (1985) and, for example, Hirsch and Schnabel (2014), Dobbelaere and Luttens (2016), and de Pinto and Lingens (2019) for more recent applications), but also of past income. In the next sub-section, we describe individual preferences and payoffs, the firm's profits, and the union's objective. In Sub-section 6.2.2, we outline a number of assumptions, which enable us to highlight the main mechanisms by which habit formation affects wages. Sub-section 6.2.3 then characterizes wage outcomes.

6.2.1 General set-up

Utility $u(c_t, {H_t}^{\alpha})$ of an employed individual in period t, $t \geq 1$, increases in current consumption, c_t, decreases in the effective habit stock, H_t^{α}, and is strictly concave in both arguments. The parameter α, $\alpha \in [0, 1)$, measures the strength of habit concerns. If $\alpha = 0$, they do not affect utility. The higher α is, the more relevant aspects of habit formation are and the higher the effective habit stock, ${H_t}^{\alpha}$, is, for a given value of H_t, and $H_t > 1$. The habit stock, H_t, is determined by previous period consumption, $H_t = c_{t-1}$. Utility of an individual who is not employed at the union wage in period t, and to whom we refer as unemployed worker, equals $u(c_t, {H_t}^{\mu})$, $\mu \in [0, 1)$. The parameter μ indicates that we allow for differences between employed and unemployed individuals. There appears to be no systematic evidence on the strength of habit concerns of unemployed individuals, and previous contributions do not provide guidance either.[75]

In period t, an employed individual obtains the (real) wage w_t and an unemployed person receives an income $\bar{w}_t, \bar{w}_t > 1$. All individuals instantaneously consume their income. Because there is no need to save in our setting in the absence of habit formation, this assumption allows us to isolate the effects of such preferences. We discuss the implications of this simplification in the concluding section. Moreover, to streamline the exposition, we presume the absence of taxes, such that gross and net wages are the same. Consequently, wage payments and the income of unemployed individuals coincide with consumption levels. Without loss of generality, we normalize the initial value of the habit stock to unity ($H_1 = 1$) (cf. Fuhrer (2000), Koehne and Kuhn (2015)).

[75] de la Croix et al. (1996) assume that the trade union focuses on the difference between the bargained and a reservation wage. The reservation wage consists of a weighted sum of the past wage, i.e., the habit stock, and the alternative wage, that is, unemployment benefits, where the relative weight on the past wage indicates the strength of habit formation. Hence, de la Croix et al. (1996) allow for $\alpha \neq \mu$.

The firm uses labor as the only input. It sells its output on a competitive market and selects employment to maximize the sum of current and discounted future profits. Revenues in period t equal $R(N_t) = p_t f(N_t)$, with p_t being the exogenously given product price. Revenues are increasing in the number of employees, N_t, at a decreasing rate ($R'(N_t) = p_t f'(N_t) > 0 > R''(N_t) = p_t f''(N_t)$ for $N_t > 0$ and $R'(0) \longrightarrow \infty$). Labor costs correspond to the payroll, such that period t profits are:

$$\pi_t = R(N_t) - w_t N_t \tag{6.1}$$

The firm-specific trade union represents all $M, M \geq N_t$ workers. Therefore, issues of union formation (see, for example, Ruiz-Verdú (2007), de Pinto and Lingens (2019), Taschereau-Dumouchel (2020)) and of individual entry and exit behavior (cf. Schnabel (2003)) can be neglected and such decisions do not interact with habit concerns. In each period, the trade union's payoff equals the weighted sum of the utility of all individuals employed at the union wage and the utility of unemployed members. We denote the weight of the latter by τ, $0 \leq \tau \leq 1$. If $\tau = 1$, the trade union is utilitarian: If $\tau < 1$, it attaches a lower weight to unemployed union members. The union's objective is given by the sum of current and discounted future payoffs, where $\delta, 0 < \delta \leq 1$, is the discount factor.

Many of the benefits unions provide relate to employed members. This suggests that the weight of the unemployed in the union's objective is lower than that of employed individuals. The empirically observable lower union density among unemployed is consistent with such a perspective. A value of $\tau < 1$ can also be justified by the feature that membership fees for unemployed individuals are usually much lower in absolute and relative terms than for their employed counterparts. However, this line of reasoning may not be applicable in the so-called Ghent-countries where trade unions are largely responsible for the payment of unemployment benefits.[76]

By attaching a weight, τ, $0 \leq \tau \leq 1$, to the payoff of the unemployed in the union's objective, we incorporate an idea proposed by Chapman and Fisher (1984) in a discussion of the famous paper by McDonald and Solow (1981), and apparently looked in an early version of the published one by the authors themselves (McDonald and Solow, 1984). The basic idea has been explored in a series of papers (see, for example, Nickell and Andrews (1983), Chapman (1986), Lindbeck and Snower (1987), Jones and

[76]The scarce evidence indicates that union membership is much lower among unemployed than employed individuals in OECD countries, with the notable exception of Belgium (cf. Lesch (2004), Visser (2006)).

McKenna (1989), Sanfey (1995), Drakopoulos and Skåtun (1997)), which often focus on the distinction between insiders and outsiders, i.e., unemployed non-union members. Pencavel (1991, p. 66f) clarifies that the distinction relates to the employment status of union members if membership is not tied to the job. Therefore, we subsequently adopt the latter interpretation.[77]

We analyze a model with two periods because this already allows us to isolate the main effects of habit formation (see Cremer et al. (2010), Guo and Krause (2011) and Tuomala and Tenhunen (2013) for similar frameworks). The timing is as follows: In period one, the wage, w_1, is determined, anticipating its impact on the habit stock in period two. Given the wage, w_1, the firm chooses employment, $N(w_1, ..)$, where employment is likely to depend on the price, p_1, as well. This notation indicates that labor demand in period one surely depends on the first-period wage, but allows for the possibility that it also varies with other determinants. At the beginning of period two, the wage for period two, w_2, is determined. In the absence of dismissal costs etc., labor demand in period two depends solely on the second-period wage, w_2, as the maximization of π_2 with respect to N_2 clarifies, and the price p_2. Given the assumptions on the production function, $N_2 = N(w_2)$ and $N'(w_2) < 0$ hold, where we again omit the dependence on p_2 for notational convenience. Moreover, unless stated otherwise we assume $N''(w_2) \leq 0$ to help ensure the second-order conditions for the union's maximization problem. If employment declines over time ($N(w_2) < N(w_1, ..)$), the firm retains the number of required employees and dismisses the rest at no cost. If employment expands ($N(w_2) > N(w_1, ..)$), all employees hired in period one keep their jobs and the firm chooses additional staff among the unemployed. We solve the model by backward induction. Since employment may fall or rise over time, there are two cases, $i = D, R$, where i indicates the direction of the employment change.

If employment weakly declines over time, as indicated by the superscript D, the trade union's payoff (and objective) in period two is given by:

$$V_2^D(w_2, w_1) = N(w_2)u(w_2, w_1^\alpha) + \tau[N(w_1, ..) - N(w_2)]u(\bar{w_2}, w_1^\mu) + \tau[M - N(w_1, ..)]u(\bar{w_2}, \bar{w_1}^\mu) \tag{6.2}$$

[77] The parameter τ could also be viewed as the exogenous probability that unemployed individuals remain union members. Barker et al. (1984), Lewis (1989), and Ebbinghaus and Göbel (2014), for example, provide evidence for the UK and Germany consistent with the assumption of $\tau < 1$. Drakopoulos and Skåtun (1997) interpret the weight placed on employed non-members in the union objective as an indication of the trade union's altruism. Following this line of reasoning, and assuming that only employed individuals belong to the trade union, the parameter τ could be (re-) interpreted as a measure of union altruism, since it describes the importance assigned to non-members.

The first term in (6.2) refers to the utility of those union members who remain employed in the second period, receive the wage w_2 and compare it to their effective habit stock w_1^{α}. The subsequent two terms depict the contribution of those members to the union's payoff who either lost their job at the end of period one or are unemployed for both periods. Their effective habit stock equals w_1^{μ} and $\bar{w_1}^{\mu}$, respectively.

The superscript R indicates the union's period two payoff if employment rises over time:

$$V_2^R(w_2, w_1) = N(w_1)u(w_2, w_1^{\alpha}) + [N(w_2) - N(w_1, ..)]u(w_2, \bar{w_1}^{\alpha}) \\ +\tau[M - N(w_2)]u(\bar{w_2}, \bar{w_1}^{\mu}) \tag{6.3}$$

The first term in (6.3) refers to the utility of continuously employed union members, while the second relates to individuals who have a job only in the second period. They compare their second-period wage to the effective habit stock $\bar{w_1}^{\alpha}$. The last term relates to members who are continuously unemployed and feature an effective habit stock $\bar{w_1}^{\mu}$.

In period one, the trade union maximizes it objective $V_1 + \delta V_2^i$ with respect to the first-period wage w_1, where its first-period payoff V_1 is unaffected by habit considerations:

$$V_1(w_1) = N(w_1, ..)u(w_1) + \tau[M - N(w_1, ..)]u(\bar{w_1}) \tag{6.4}$$

6.2.2 Important assumptions

To succinctly derive a first set of results, we impose further assumptions. We evaluate their implications in Sub-section 6.3.3.

Following Abel (1990), Carroll et al. (2000) and Fuhrer (2000), we assume that utility, u, depends on the ratio of current income to the effective habit stock. Allowing for differences according to the employment status, we summarize this restriction in:
Assumption A: The utility of employed individuals depends on the ratio of current income to the effective habit stock, H_t^{α}, $H_t \geq 1$, $\alpha \in [0, 1)$, while the utility of unemployed individuals depends on the ratio of current income to the effective habit stock, H_t^{μ}, $\mu \in [0, \alpha/\tau)$.

The assumption $0 \leq \mu \leq \alpha/\tau$ implies that habit concerns by unemployed individuals do not affect the trade union's objective more strongly than to those of unemployed members. Moreover, the restriction helps to ensure second-order conditions.

For the general specification of preferences, u, the marginal utility from a higher wage depends on all arguments of the utility function. Therefore, marginal utilities cannot easily be compared, given the existence of habit concerns. To ascertain the wage

effects of habit formation, and in line with Pollak (1970, 1978) and Bover (1991) we postulate:

Assumption B: Individual preferences are logarithmic.

Furthermore, collective bargaining models often assume that the trade union sets the wage, and subsequently analyze whether the findings for a monopoly union carry over to a setting with Nash-bargaining. We proceed in the same manner:

Assumption C: The trade union sets wages (monopoly union).

For the sake of completeness, we formally re-state an assumption made above.

Assumption D: There are two periods.

We will frequently utilize three further assumptions, which we also state at this stage:

Assumption E: Unemployment benefits are constant over time ($\bar{w} = \bar{w_1} = \bar{w_2}$).

Assumption F: Prices are constant over time ($p_1 = p_2$).

Assumption G: The trade union is utilitarian ($\tau = 1$).

6.2.3 Optimal choices

Assumptions A to D apply in this sub-section. When the trade union determines the wage in period two, employment in period one, $N(w_1, ..)$, constitutes a parameter as it has been chosen in the previous period. Initially, we consider the case of declining employment. Maximization of V_2^D yields (for the second-order conditions, see Appendix 6.6.1):

$$Z^D = \frac{\partial V_2^D}{\partial w_2} = N'(w_2)\left[\ln(w_2) - \tau \ln(\bar{w_2}) - (\alpha - \tau\mu)\ln(w_1)\right] + \frac{N(w_2)}{w_2} = 0 \tag{6.5}$$

We denote the wage which satisfies equation (6.5) by $w_2^{H,D}$. No employee will prefer a job at $w_2^{H,D}$ to being unemployed and obtaining an income $\bar{w_2} > 1$ unless $w_2^{H,D}$ exceeds unity.

In the case of increasing employment, the first-order condition in period two is:

$$Z^R = \frac{\partial V_2^R}{\partial w_2} = N'(w_2)\left[\ln(w_2) - \tau \ln(\bar{w_2}) - (\alpha - \tau\mu)\ln(\bar{w_1})\right] + \frac{N(w_2)}{w_2} = 0 \tag{6.6}$$

We refer to the wage implicitly defined by (6.6) as $w_2^{H,R}$. The first-order conditions (6.5) and (6.6) require that the respective terms in square brackets are positive. Therefore, the union trades off the gain due to higher wages for employed members, $N(w_2)/w_2$, with the loss resulting from a wage increase, as captured by the first terms. This

loss occurs because fewer employees obtain the utility resulting from the wage $w_2^{H,i}$, instead of the alternative income $\bar{w_2}$.[78] The marginal utility from increasing the wage is unaffected by habit considerations, owing to the logarithmic specification of preferences. However, the costs of employment reductions are altered by the habit stock. In the case of decreasing employment, the variation in period two employment can affect solely those individuals who were employed in period one. The effective habit stock of those who remain in the firm amounts to w_1^{α}, for those who become unemployed it equals w_1^{μ}. Given the weight τ the union attaches to unemployed members, the net impact of habit concerns on the union's costs of a wage increase in period two is $-N'(w_2)(\alpha - \tau\mu)\ln(w_1)$ if employment declines. If employment rises over time, the variation in period two employment affects those who were unemployed in period one, and the costs of a wage increase are altered by $-N'(w_2)(\alpha - \tau\mu)\ln(\bar{w_1})$.

Equations (6.5) and (6.6) indicate that the optimal second-period wage does not depend on employment in period one, N_1. Consequently, the firm cannot affect the union's wage choice in period two by altering N_1. Moreover, employment in that period is a function of the contemporaneous wage only, in addition to the price p_1, $N_1 = N(w_1)$, where $N'(w_1) < 0$ results from the assumption on the production function. Additionally, we assume $N''(w_1) \leq 0$ to help ensure the second-order conditions for the union's maximization problem. The sole dependence of employment in period one on the contemporaneous wage, w_1, and p_1, implies that the firm's objective in period one, namely maximizing the discounted sum of profits, is equivalent to maximizing π_1 with regard to N_1. Thus, issues of discounting are irrelevant for firm behavior.

Using $\frac{\partial V_2^D}{\partial w_2} = 0$ and $N_1 = N(w_1)$, the first-order condition for the first-period wage, if employment falls over time, is (for the second-order condition, see Appendix 6.6.1):

$$\Omega^D = \frac{\partial V_1}{\partial w_1} + \delta\frac{\partial V_2^D}{\partial w_1} = (1 - \tau\mu\delta)\left\{N'(w_1)\left\{\ln(w_1) - \tau\ln(\bar{w_1})\right\} + \frac{N(w_1)}{w_1}\right\}$$
$$+N'(w_1)\ln(\bar{w_1})\delta\tau\mu(1-\tau) - \frac{\delta(\alpha - \tau\mu)N(w_2)}{w_1} = 0 \qquad (6.7)$$

The wage $w_1^{H,D}$, which guarantees $\Omega^D = 0$, exceeds $\bar{w_1} > 1$ since employees would otherwise prefer being unemployed. It is unaffected by habit concerns for a utilitarian trade union ($\tau = 1$) if they affect employed and unemployed members equally ($\alpha = \mu$).

[78] The optimality conditions for the second-period wage are the same in the presence of earnings-related unemployment benefits, that is, if benefits in period two depend on wages paid in the previous period, such that $\bar{w_2} = \rho w_1, 0 < \rho < 1$.

This is the case because habit concerns alter the gains and costs in period two resulting from a higher period one wage in proportion to the variation in period one payoff changes. If $\tau < 1$ holds and the union is non-utilitarian, the second summand in (6.7) captures an additional effect. Because unemployed individuals have less weight than employed individuals in the union's objective, a job loss reduces the union's payoff by more than if it were utilitarian. Since the payoff gain from more employment remains the same, the costs of a job loss increase. Finally, raising the wage in period one alters the habit stock of employed and unemployed members. The net impact on the union's payoff depends on the relative importance of the two groups, that is the sign of $\alpha - \mu\tau \geq 0$, given Assumption A.[79]

If employment rises over time, the first-order condition for the first-period wage is:

$$\Omega^R = (1 - \delta\alpha)\left[N'(w_1)\left\{ln(w_1) - \tau ln(\bar{w_1})\right\} + \frac{N(w_1)}{w_1}\right] + (1-\tau)\delta\alpha N'(w_1) ln(\bar{w_1}) = 0 \tag{6.8}$$

In this case, the wage set in period one alters the second-period payoff in proportion to the variation in period one if the trade union is utilitarian ($\tau = 1$). Therefore, the gains and costs of raising the wage are qualitatively the same as in a world without habit formation. If $\tau < 1$ holds, the union's loss in utility increases if a member loses the job, and the costs of raising the wage are higher than in a world without habit formation.

In Appendix 6.6.1, we derive a restriction, which ensures that the wages defined by equations (6.5) and (6.7) maximize the union's objective in case of declining employment. If the trade union chooses wages that satisfy equations (6.6) and (6.8), and employment rises over time, the second-order conditions always hold (see Appendix 6.6.1). Therefore, one may surmise that collective wage determination in the presence of habit concerns can result in two equilibria. However, we show below that the trade union will never set wages in such a manner that employment rises if wage changes over time are only due to habit concerns.

6.3 Wage effects of habit formation

In this section, first, we inquire whether wages $w_t^{H,i}$ in the presence of habit formation exceed or fall below the wages w_t^w the union sets in the absence of habit concerns,

[79] Finally, the second-period wage varies with $w_1^{H,D}$. This repercussion has no effect on the optimal value of $w_1^{H,D}$, because the monopoly trade union chooses period two wages optimally.

where we use the superscript w (without) to indicate their absence. Second, we illustrate the quantitative importance of wage and employment changes. Third, we relax Assumptions A to D to evaluate the robustness of our findings.

6.3.1 Analytical results

We commence our analysis with period one and the case of decreasing employment. Suppose, first, that habit concerns are equally strong for employed and unemployed individuals and the trade union is utilitarian ($0 < \alpha = \mu < 1, \tau = 1$). In this case, the second and third terms in (6.7) are zero. The same is true for the first term if evaluated at w_1^w. Thus, habit formation has no impact on the first-period wage. Assume next that the trade union attaches less weight to its unemployed members than to their employed counterparts ($\tau < 1$), while habit concerns are equally strong ($\alpha = \mu$). The first term is zero evaluated at w_1^w, the second summand is negative, and the third term is positive for $\alpha > \mu\tau$ and deducted. We can conclude that (6.7) is negative if evaluated at w_1^w for $\alpha = \mu$ and $\tau < 1$. The same result obtains for $\alpha > \mu$, $\tau = 1$ or, more generally, $\alpha > \mu\tau \geq 0$. If employment rises over time and the trade union is utilitarian ($\tau = 1$), the wage in period one is independent of the value of α, as inspection of (6.8) clarifies. If the trade union attaches less weight to unemployed than to employed members ($\tau < 1$), then the derivative in (6.8) is negative if evaluated at w_1^w. We conclude that the optimal wage in period one in the presence of habit effects never exceeds the monopoly union wage in the absence of such preferences ($w_1^{H,i} \leq w_1^w$), irrespective of the employment change over time.

Turning to period two, and applying the same line of argument to optimality conditions (6.5) and (6.6) for the second-period wage, we can observe that the costs of a wage increase in period two are smaller in the presence of habit formation than in the absence of such effects for $\alpha > \mu\tau$ and the same if $\alpha = \mu\tau$. Furthermore, the gains from raising the wage do not vary with α. We can summarize these insights in:

Proposition 1. *Assume that Assumptions A to D hold.*
a) If the trade union is utilitarian and habit concerns are equally strong for employed and unemployed members ($\tau = 1; \alpha = \mu$), habit concerns affect wages and employment neither in the first nor the second period.
b) If habit concerns by employed union members dominate the effect of such considerations by unemployed individuals on the trade union's objective ($\alpha > \mu\tau$), wages never exceed the level chosen in the absence of habit effects in period one and are greater than the respective level in period two ($w_1^{H,i} \leq w_1^w$; $w_2^w < w_2^{H,i}$). The reverse is true with respect to employment ($N(w_1^{H,i}) \geq N(w_1^w)$; $N(w_2^w) > N(w_2^{H,i})$).

Proof: See above. ■

To explain Proposition 1, observe that the utility of employed and unemployed individuals in period two declines with the habit stock. If the effect for employed union members is more pronounced, because either they have stronger habit concerns ($\alpha > \mu$) or the union attaches greater importance to them ($\tau < 1$), the union's loss from raising the wage falls. Hence, the incentives to raise wages in period two are greater in the presence of habit effects than in their absence for $\alpha > \tau\mu$. They are unaffected if habit considerations of employed and unemployed members alter the trade union's payoff equally ($\alpha = \tau\mu$).[80]

In period one, habit concerns reduce all payoffs proportionally if habit concerns are independent of employment status ($\alpha = \mu$). Therefore, optimal wages are unaffected if $\tau = 1$. If the trade union is non-utilitarian ($\tau < 1$), then it values the utility reduction of unemployed members less than if $\tau = 1$. Therefore, the perceived costs of a job loss rise if employment declines over time and the first-period wage is lower in the case of habit formation than in the absence of such preferences. Finally, if $\alpha > \mu\tau$ and employment declines over time, raising the wage in period one reduces the utility of employed individuals more than of unemployed individuals, and the gains from raising the wage are lowered further.

In the case of increasing employment, the optimal wage remains the same if the trade union is utilitarian, as habit formation changes all payoffs proportionally. If unemployed members are less important for the trade union than their employed counterparts ($\tau < 1$), it attaches a greater weight to the payoff gain of those who become employed in period two than a utilitarian union does. Habit formation lowers this gain, such that employment in period one becomes less desirable, and the gains from raising the period one wage decline.

In sum, habit formation affects wage behavior because a payment in period two is 'discounted' by the habit stock. This effect is stronger for employed workers for $\alpha > \mu$. Therefore, the trade union's payoff reduction declines due to a fall in employment over time. This basic effect is strengthened if the decline in the unemployed's utility due to habit formation affects the trade union to a lesser extent than if it is utilitarian ($\tau < 1$).[81]

[80] For $\alpha < \tau\mu$, and given the second-order condition, habit concerns would reduce the second-period wage.

[81] Goerke (2021) shows that habit concerns may give rise to an increasing wage profile over time in an efficiency wage setting, as well. In contrast to the present framework, dismissal costs play an important role, while the habit concerns of unemployed individuals are without relevance.

The discount factor, δ, does not alter wages in period two, irrespective of the strength of habit concerns. Moreover, the magnitude of δ does not affect the signs of (6.7) or (6.8) evaluated at w_i^w. Accordingly, discounting can have a quantitative but no qualitative impact on the effects of habit formation for $\alpha \geq \tau\mu$. To simplify notation, we subsequently assume that the trade union values current and future outcomes equally ($\delta = 1$) .

Equations (6.5) and (6.7), respectively (6.6) and (6.8), furthermore, clarify that wages and employment do not vary over time in the absence of habit concerns if unemployment benefits and prices are constant ($\bar{w} = \bar{w}_1 = \bar{w}_2$; $p = p_1 = p_2$). Combining this feature with Proposition 1, we can conclude that wages are constant in the presence of habit concerns if $\tau = 1$ and $\alpha = \mu$ and will rise over time if habit concerns by employed union members dominate ($\alpha > \mu\tau$). If wages rise over time, employment will fall. Therefore, there is only one equilibrium. We summarize these insights in Corollary 1.

Corollary 1. *Assume that Assumptions A to F hold.*
In the only feasible equilibrium, wages and employment do not vary over time if the union is utilitarian and habit preferences by employed and unemployed individuals are equally strong ($\tau = 1; \alpha = \mu$). Wages rise over time ($w_1^H < w^w < w_2^H$), while employment declines ($N(w_1^H) > N(w^w) > N(w_2^H)$) if habit concerns by employed members dominate in the trade union's objective ($\alpha > \mu\tau$).

In the remainder of the paper, we will focus on constant benefits, $\bar{w} = \bar{w}_1 = \bar{w}_2$ and constant prices, $p = p_1 = p_2$ (Assumptions E and F, with exceptions in Section 6.4). Moreover, we know from Proposition 1 that habit concerns only affect wage setting if either habit preferences by employed and unemployed individuals differ ($\alpha \neq \mu$) or the trade union is not utilitarian ($\tau < 1$). To simplify the subsequent analysis of the robustness of this finding and of its quantitative importance, we modify Assumption A:
Assumption A': The utility of employed individuals depends on the ratio of their current income to the effective habit stock, H_t^α, $H_t \geq 1$, $\alpha \in [0, 1)$, while the habit stock of unemployed individuals is unity ($\mu = 0$).

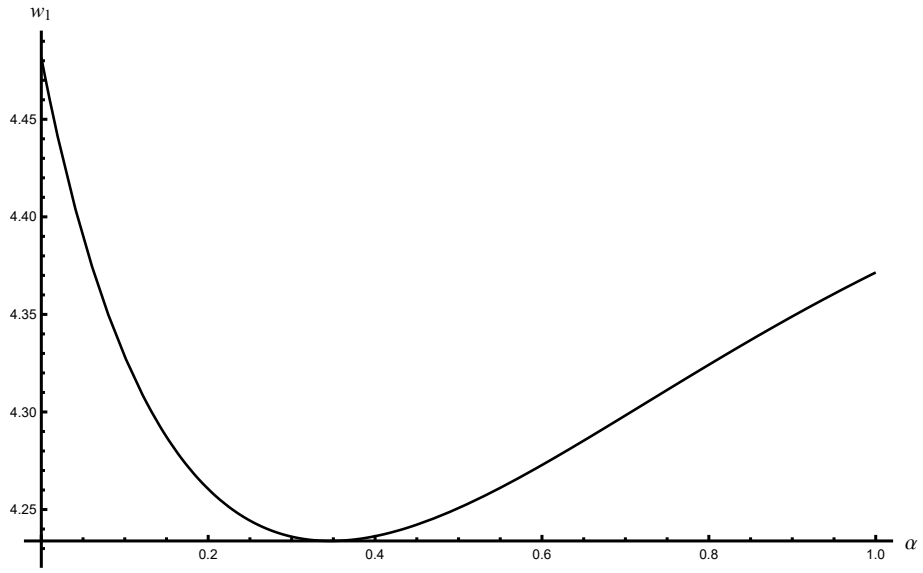
Assumptions A' and G ($\tau = 1$) ensure $\alpha > \mu\tau$ and, consequently, a maximum of comparability with models without habit formation.

6.3.2 Numerical example

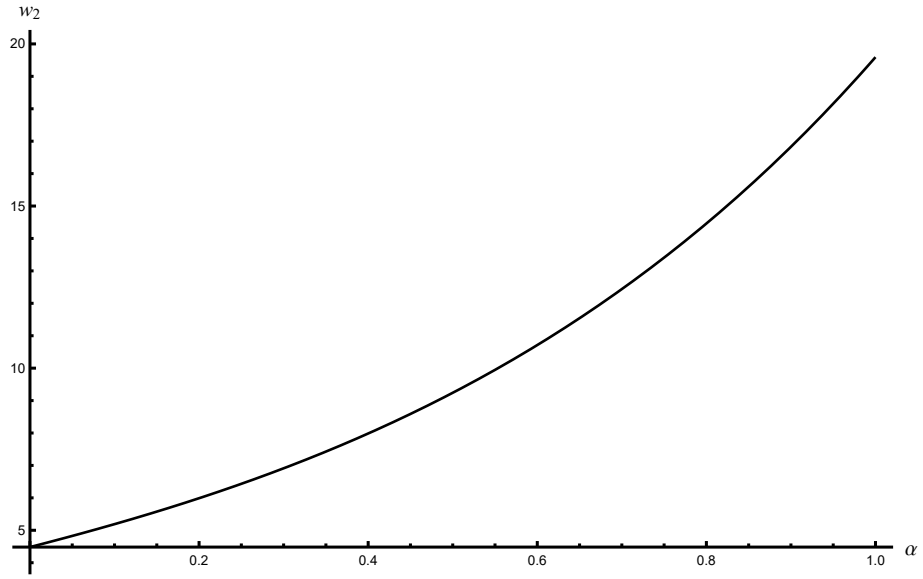
The existence of habit formation results in an increasing wage profile over time for $\bar{w}_1 = \bar{w}_2, p_1 = p_2$, and $\alpha > \mu\tau$. However, it is not possible to analytically establish, first,

FIGURE 6.1: Wage effects of habit formation

(A) First period



(B) Second period



whether wages change monotonously in the intensity, α, of habit concerns and, second, whether the wage variation in period two is stronger than in period one, or vice versa. The first ambiguity arises because of an increase in the strength of habit concerns, α, and the resulting decline in the first-period wage, w_1^H, may actually reduce the effective habit stock, $(w_1^H)^\alpha$. The second ambiguity occurs because the extent of wage changes

depends on the magnitude of the adjustments in labor demand, $N(w_t)$, and its slope, $N'(w_t)$.

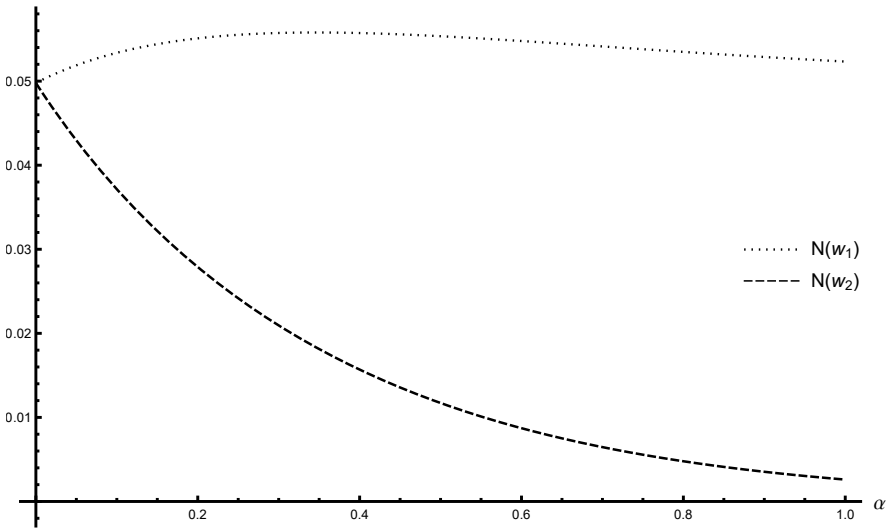
In order to obtain an impression of the magnitudes of the various effects, we subsequently consider a numerical example based on Assumptions A' and B to G. Furthermore, the product price is unity and the firm employs a Cobb-Douglas production technology, with a constant capital stock, normalized to one. Hence, we preserve consistency with the set-up in Sub-section 6.2.1 and can express the production function as $f(N) = (\frac{N}{\kappa})^{\kappa}$, $0 < \kappa < 1$. This simplification enables us to easily compute the labor demand schedule and its slope as $N(w_t) = {w_t}^{\frac{1}{\kappa-1}}$ and $N'(w_t) = \frac{1}{\kappa-1}{w_t}^{\frac{2-\kappa}{\kappa-1}} < 0$, and compare their magnitudes. The income of unemployed individuals is e, $\bar{w} = e$, such that $\ln(e) = 1$. Since κ has no substantial impact on results, we set $\kappa = 0.5$.[82]

Solving equations (6.5) and (6.7) for wages as functions of the intensity of habit formation, α, Figure 6.1 shows that wages are the same for $\alpha = 0$ ($w_1^H = w_2^H \approx 4.48$). The first-period wage initially declines by almost 6 % with α and then rises again, while the second wage monotonously increases and basically quadruples. Therefore, we chose different scales for the y-axes. Figure 6.2 illustrates the impact on employment. In line with Figure 6.1a, it increases in period one for lower levels of α and then starts to decrease, once habit preferences are more distinct, while employment in period two decreases monotonously. Since the wage increase in period two dominates, average employment declines.

Empirical estimates of the strength of habit concerns suggest that a value of $\alpha = 0.4$ may be a reasonable approximation (Alvarez-Cuadrado et al., 2016, Havranek et al., 2017). In our numerical example, such strength raises period two wages to a value of around eight, so that average wages (over both periods) increase by more than 35 %, relative to a situation without habit concerns. Due to the concavity of labor demand, average employment declines by about 28 %. In studies using micro data, the estimated average α is substantially lower at around 0.1 (Havranek et al., 2017). For such a value, average wages increase by more than 5 % while employment decreases by approximately 10 %. In summary, the numerical example indicates the substantial quantitative impact habit concerns may have in the context of collective wage bargaining.

[82]Second-order conditions are fulfilled for our numerical example. Thus, the restriction $N''(w_t) \leq 0$ is not necessary for them to hold.

FIGURE 6.2: Employment effects of habit formation



6.3.3 Extensions

We next investigate the robustness of Proposition 1 with regard to the assumptions of a two-period setting (Assumption D; Sub-section 6.3.3.1), a constant labor productivity (Sub-section 6.3.3.2), the ratio formulation of habit effects, as well as logarithmic preferences (Assumptions A' and B; Sub-section 6.3.3.3), and the ability of the trade union to unilaterally set wages (Assumption C; Sub-section 6.3.3.4). Throughout, we impose $\mu = 0$.

6.3.3.1 A longer time horizon

In our basic analytical framework, the habit stock is built up in period one and can solely affect the utility from a given wage payment in period two. Therefore, in each period there is just one effect on wage formation. If there are more than two periods, habit formation has countervailing consequences in intermediate periods. Accordingly, we consider next a three-period setting. In such a framework, wages may continuously rise or fall, first rise and subsequently decline, or initially decline and then increase.

Within this extended analytical setting, we can demonstrate that wages in period one will always be less than in period three (see Appendix 6.6.2). The intuition is the same as in a two-period world. Moreover, we can derive a condition that ensures that the second-period wage exceeds its first-period level. This condition is more likely to be fulfilled the higher employment, $N(w_2^T)$, in period two is, relative to the level, $N(w_3^T)$, prevailing in period three, where the superscript T indicates the three-period setting. This is the case because a low employment level in period three implies that

the detrimental effect of building up the habit stock in period two applies to fewer individuals. In addition, the condition for the second-period wage to exceed its first-period counterpart is more likely to hold the higher unemployment benefits are and the greater the wage elasticity of labor demand, $\varepsilon(w_2) = -\frac{N'(w_2)w_2}{N(w_2)} > 0$, is. Higher unemployment benefits raise the habit stock of individuals obtaining a job in period two and the strength of this effect on union wage demands in period two rises with the labor demand elasticity. Finally, optimal union behavior is compatible both with continuously rising wages and a hump-shaped relationship. We can summarize the findings for the longer time horizon as follows:

Proposition 2. *Assume that Assumptions A', B, C, and E to G hold.*
In a three-period setting, wages rise from period one to period three ($w_1^{T,H} < w_3^{T,H}$), and from period one to two if $(N(w_3^{T,H})/N(w_2^{T,H})) < \varepsilon(w_2^{T,H})\ln(\bar{w})$. In this case, wages in the presence of habit concerns are lower than in their absence in period one ($w_1^{T,w} > w_1^{T,H}$) and higher in period three ($w_3^{T,w} < w_3^{T,H}$). The reverse holds for employment.

Proof: See Appendix 6.6.2. ■

According to Proposition 2, the main finding of our two-period framework also applies for a longer time horizon: Habit formation provides incentives for a trade union to lower wages when such concerns have not yet had much of an impact and to set higher wages to accommodate the increase in the habit stock. However, the increase does not have to be monotone, since an 'overshooting' of the second-period wage cannot be ruled out.

6.3.3.2 A growing economy

Our analysis thus far is based on the assumption of a stationary economy in which productivity, demand and wages are constant if unemployment benefits and prices are time-invariant and habit concerns absent. If productivity increases over time, the effects of habit concerns may be altered.

In order to investigate this possibility, we assume that labor demand in period two is given by $N_2 = f'^{-1}(w_2) + r$, $r \geq 0$, while the production function and labor demand in period one are unaffected. For $p_t = 1$, this specification implies $N_2 = N(w_2, r)$, $\frac{\partial N(w_2,r)}{\partial w_2} = 1/f''(N(w_2,r)) < 0$, $\frac{\partial N(w_2,r)}{\partial r} = 1$, and $\frac{\partial N(w_2,r)}{\partial w_2 \partial r} = 0$. Therefore, the modification ensures that labor demand in period two is higher than in period one for a given wage (for $r > 0$), while the slope of the labor demand curve does not vary with r. In consequence, wages rise over time ($w_1^{g,w} = w^w < w_2^{g,w}$), where the superscript g, w indicates a setting with productivity growth, but without habit formation.

The objectives of the trade union are essentially unaffected and given by equations (6.2) and (6.3), as well as $V_1 + V_2^{g,D}$, with $N(w_2)$ being replaced by $N(w_2, r)$. The first-order condition for the second-period wage in case of declining employment is (second-order conditions are comparable to those of the baseline setting):

$$Z^{g,D} = \frac{\partial V_2^{g,D}}{\partial w_2} = \frac{\partial N(w_2, r)}{\partial w_2} \left[\ln \left(\frac{w_2}{w_1^{\alpha}} \right) - \ln(\bar{w}) \right] + N(w_2, r) \frac{1}{w_2} = 0 \tag{6.9}$$

For a setting with growing employment over time, the first-order condition is defined analogously (see equation (6.5)). The trade union will, ceteris paribus, raise the wage in period two above the level prevailing in the absence of productivity growth. This is the case because labor demand, $N(w_2, r)$, rises with r, such that the gain from increasing the second-period wage rises. Despite the positive direct employment effect of the productivity increase, employment in period two may be less than in period one if the impact of habit formation is sufficiently strong. Therefore, continuing our considerations for both cases, increasing and decreasing employment, the first-order conditions for the first-period wage are given by equations (6.7) or (6.8), with $N(w_2)$ being replaced by $N(w_2, r)$. From the inspection of all four first-order conditions, we can note that $w_1^{g,H} < w_1^{g,w} < w_2^{g,w} < w_2^{g,H}$ holds if employment declines over time, where optimal wages in a world with productivity growth and habit formation are indicated by the superscript g, H. In a situation in which employment rises over time, $w_1^{g,H} = w_1^{g,w} < w_2^{g,w} < w_2^{g,H}$ is the result. In consequence, wages rise in period two due to the existence of habit formation also in an economy in which productivity grows over time and unemployment benefits and prices are time-invariant, while they weakly decline in period one. Since wages rise over time already in the absence of habit concerns, this will surely be true in their presence.

Finally, if productivity rises over time, this may also induce increases in unemployment benefits. As equations (6.5) and (6.7) clarify, such a variation provides additional incentives for the trade union to increase wages over time. Therefore, we have:

Proposition 3. *Assume that Assumptions A', B to D, F and G hold, labor demand rises from period one to period two for a given wage, and unemployment benefits weakly increase over time. Wages are not higher than those in the absence of habit effects in period one and greater than the respective level in period two ($w_1^{g,H} \leq w_1^{g,w} < w_2^{g,w} < w_2^{g,H}$), while employment is not lower in period one and declines in period two, relative to the outcome in the absence of habit formation ($N(w_1^{g,H}) \geq N(w_1^{g,w})$; $N(w_2^{g,w}) > N(w_2^{g,H})$).*

Proof: See above. ■

The intuition is the following: The habit stock is unaffected by productivity growth and so are the union's costs of raising period two wages. Moreover, the gain from a higher period two wage becomes larger on account of the increase in labor demand. In consequence, the effects of habit concerns tend to be more pronounced in a growing economy.

While we conduct a partial equilibrium analysis, the findings for a growing economy may additionally indicate how habit concerns affect collective bargaining outcomes if general equilibrium repercussions are accounted for. For that purpose, we can interpret $\bar{w}$ as the wage paid to individuals who do not obtain a job in the sector under consideration. Changes in $\bar{w}$ may then reflect general equilibrium repercussions. If other sectors of the economy are also characterized by increasing wages over time, such feedback effects strengthen the consequences of habit concerns derived for a partial equilibrium framework.

6.3.3.3 Alternative specifications of preferences

Next, we illustrate that the main findings are basically unaffected by our choice of preferences. We discuss the two aspects - the exact shape of the utility function and its arguments - in turn.

If preferences are given by a power utility function (PU), $u^{PU}(c_t, H_t) = \frac{(c_t/H_t^{\alpha})^{1-\gamma}-1}{1-\gamma}$, $\gamma \geq 0$ (cf. Gómez (2012), Grishchenko (2010) and, for comparable specifications, Carroll et al. (2000) and Fuhrer (2000)), they are iso-elastic and u^{PU} collapses to the logarithmic specification for $\gamma \longrightarrow 1$. The trade union's first-order condition for the wage in period two, assuming employment to decline over time, is:

$$Z^{PU,D} = w_1^{\alpha(\gamma-1)} \left[\frac{N'(w_2)}{1-\gamma} \left(w_2^{1-\gamma} - \bar{w}^{1-\gamma} \right) + \frac{N(w_2)}{w_2^{\gamma}} \right] - \left(1 - w_1^{\alpha(\gamma-1)} \right) N'(w_2) \frac{\bar{w}^{1-\gamma}}{1-\gamma} = 0 \tag{6.10}$$

The term in square brackets is zero in the absence of habit concerns, while the second summand is negative (and deducted) in the presence of such preferences, irrespective of the magnitude of the parameter γ. Therefore, for $\alpha > 0$, the derivative in (6.10) will be positive if evaluated at the union's optimal wage, w^w, in the absence of habit concerns. Moreover, the optimality condition for the first-period wage is positive if evaluated at w^w (see Appendix 6.6.3). In consequence, if preferences are given by a power function, there is an equilibrium in the presence of habit formation for any value of $\gamma, \gamma \geq 0, \gamma \neq 1$,

which is characterized by decreasing employment levels and increasing wages over time.

If we allow for more general preferences (G), $u^G(c_t, H_t) = u^G(\frac{c_t}{H_t^\alpha})$, where $u^{G\prime} > 0 > u^{G\prime\prime}$ holds, the first-order condition for the second-period wage is:

$$Z^{G,D} = N'(w_2)\left[u^G\left(\frac{w_2}{w_1^\alpha}\right) - u^G(\bar{w})\right] + N(w_2)u^{G\prime}\left(\frac{w_2}{w_1^\alpha}\right)\frac{1}{w_1^\alpha} = 0 \tag{6.11}$$

A sufficient condition for habit concerns to raise the second-period wage is $u^{G\prime}\left(\frac{w_2}{w_1^\alpha}\right)\frac{1}{w_1^\alpha} > u^{G\prime}(w_2)$. Once more, the optimality condition for the first-period wage is negative if evaluated at the optimal wage in the absence of habit concerns (cf. Appendix 6.6.3).

We conclude that logarithmic preferences, $u = \ln\left(\frac{c_t}{H_t^\alpha}\right)$, do not determine the prediction that employment decreases over time on account of habit preferences.

Turning to the second aspect, an alternative common specification of habit preferences focuses on the difference between consumption and habit stock. Consequently, utility is $u^{Sum}(c_t, H_t) = u^{Sum}(c_t - \alpha H_t)$ (cf. Aronsson and Schöb (2017, 2022), Campbell and Cochrane (1999), Chen and Ludvigson (2009), Dynan (2000), Loewenstein et al. (2003)). Normalising the habit stock in period one to zero, the first-order condition for the wage in period two, assuming employment to decline over time, can be expressed as:

$$Z^{Sum,D} = N'(w_2)[u^{Sum}(w_2 - \alpha w_1) - u^{Sum}(\bar{w})] + N(w_2)u^{Sum\prime}(w_2 - \alpha w_1) = 0 \tag{6.12}$$

Habit concerns reduce the loss from raising the wage in period two. In addition, they enlarge the gain due to a higher wage, $u^{Sum\prime}(w_2 - \alpha w_1)$. Consequently, the trade union will raise the second-period wage to above the level which is optimal in the absence of habit formation, $w_2^H > w^w$. Moreover, such preferences provide incentives to reduce the first-period wage (see Appendix 6.6.3).

We capture the findings of this sub-section in:

Proposition 4. *Assume that Assumptions C to G hold and the habit stock of unemployed individuals is unity ($\mu = 0$). Individual preferences are given by (i) $u^{PU}(c_t, H_t) = \frac{(c_t/H_t^\alpha)^{1-\gamma}-1}{1-\gamma}$, (ii) $u^G(\frac{c_t}{H_t^\alpha})$, or (iii) $u^{Sum}(c_t - \alpha H_t)$, where u^G and u^{Sum} are increasing in their respective arguments at a strictly decreasing rate.*
There is an equilibrium in which wages fall short of the level chosen in the absence of habit effects in period one and exceed the respective level in period two ($w_1^H < w^w < w_2^H$) for specifications (i) and (iii). For the second specification (ii), such equilibrium exists if $u^{G\prime}\left(\frac{w_2}{w_1^\alpha}\right)\frac{1}{w_1^\alpha} > u^{G\prime}(w_2)$.

If wages rise over time, the reverse is true with respect to employment ($N(w_1^H) > N(w^w) > N(w_2^H)$).

Proof: See equations (6.10), (6.11), and (6.12) above and Appendix 6.6.3. ■

6.3.3.4 Nash bargaining

Empirical evidence suggests that firms have substantial say in the determination of wages (see, for example, Amador and Soares (2017), Boulhol et al. (2011), Dobbelaere (2004), Hirsch and Schnabel (2014), Kraft (2018), Moreno and Rodríguez (2011)). Therefore, we consider Nash-bargaining over wages and assume that the entire bargaining relationship would be dissolved if the union and firm could not agree on a wage in period one. In order to streamline the exposition, the union's fallback payoff in period two (one) equals the utility for all M members obtaining an income $\bar{w}$ (in both periods).[83] The firm's payoff in case of no agreement is zero. The timing is as follows: In period one, trade union and firm bargain over the wage in period one, and the firm subsequently sets employment for that period. At the beginning of period two, once again wage negotiations take place. The trade union's bargaining power, β, $0 \leq \beta \leq 1$, is unchanged. Finally, the firm determines employment.

Assuming that employment declines over time, the Nash-product in period two is:

$$NP_2^D(w_2) = \left(N(w_2) \left[\ln\left(\frac{w_2}{w_1^\alpha} \right) - \ln(\bar{w}) \right] \right)^\beta (R(N(w_2)) - w_2 N(w_2))^{1-\beta} \tag{6.13}$$

The optimal wage in period two depends on the bargaining outcome in period one, such that $w_2(w_1)$ holds. Therefore, the Nash-product in period one can be expressed as:

$$\begin{aligned} NP_1^D(w_1) = & \left(N(w_1)[\ln(w_1) - \ln(\bar{w})] + N(w_2(w_1)) \left[\ln\left(\frac{w_2(w_1)}{w_1^\alpha} \right) - \ln(\bar{w}) \right] \right)^\beta \\ & \times \left(R(N(w_1)) - w_1 N_1(w_1) + R(N(w_2(w_1))) - w_2(w_1) N(w_2(w_1)) \right)^{1-\beta} \end{aligned} \tag{6.14}$$

[83] It could be argued that the trade union's payoff in the case of no agreement is influenced by habit formation because, first, the competitive wage changes over time with habit formation and, second, those union members who had been employed in period one have built up a stock of habit. Both effects can easily be incorporated but make the interpretation less plausible that the Nash-bargaining solution approaches the competitive outcome if the trade union's bargaining power becomes arbitrarily small. This is because the impact of habit formation on the fallback income depends on whether the labor market is competitive or unionized in period one.

In Appendix 6.6.4 we show that the wage bargained in period two rises with the wage agreed upon for period one. Moreover, for any given value of the bargaining power, β, the wage in period two in the presence of habit formation exceeds the respective value resulting in the absence of such preferences, $w_2^{H,N}(\beta) > w^{w,N}(\beta)$. This impact comes about because habit concerns affect the maximization of the Nash-product in two ways: First, the trade union's gain from a higher wage rises because the utility loss due to a decline in employment becomes smaller. This is the same effect as in a monopoly union model. Second, habit formation, ceteris paribus, reduces the union's payoff. Since the Nash solution shares the weighted gains from an agreement, a decline in the union's payoff implies that it has to be compensated by an increase in the wage.

Determining the impact of habit formation on the first-period wage requires further restrictions in comparison to a monopoly union setting. The reason is that the union gains more from an increase in the period one wage in a bargaining framework. We can derive conditions, which ensure that the wage-reducing impact observed in the monopoly-union framework dominates and summarize these insights in:

Proposition 5. *Assume that Assumption A', B, and D to G hold. There is Nash-bargaining over wages, and wages in the absence of trade union bargaining power equal* $w_1^H(\beta = 0) = \bar{w} = w_2^H(\beta = 0)$.
(i) For any positive value of trade union bargaining power ($\beta > 0$)*, there is an equilibrium in the presence of habit formation, which is characterised by a wage in period one that is less than the wage paid in the absence of such preferences* ($w_1^{H,N}(\beta) < w^{w,N}(\beta)$)*, if the increase in period one wages due to higher union bargaining power is weakly less in the presence of habit formation than in their absence* ($\frac{\mathrm{d}w_1^{H,N}(\beta)}{\mathrm{d}\beta} \leq \frac{\mathrm{d}w^{w,N}(\beta)}{\mathrm{d}\beta}$).
(ii) In this equilibrium, period two wages will be higher in the presence of habit formation than in their absence ($w_2^{H,N}(\beta) > w^{w,N}(\beta)$).
(iii) This implies that wages rise over time ($w_1^{H,N}(\beta) < w^{w,N}(\beta) < w_2^{H,N}(\beta)$)*, while the reverse is true with respect to employment* ($N(w_1^{H,N}(\beta)) > N(w^{w,N}(\beta)) > N(w_2^{H,N}(\beta))$).

Proof: See Appendix 6.6.4.

6.4 Consequences of habit formation

In this section, we analyze whether predictions concerning changes in exogenous parameters, which hold for time-separable preferences, continue to apply in the presence of habit concerns. While we focus on parameters already contained in the model, namely unemployment benefits, $\bar{w}_t$, and the product price, p_t, the findings may also broadly

indicate the effects of policy interventions on the input or output market in the presence of habit concerns and collective bargaining.

6.4.1 Variations in unemployment benefits

In one-period models of collective bargaining, higher unemployment benefits raise the wage (Oswald, 1985, Ulph and Ulph, 1989). To examine the consequences of habit formation we, first, assume that unemployment benefits rise in period one and return to their original level in the second period. Moreover, employment declines over time.

The derivatives of the first-order conditions (6.5) and (6.7) with regard to $\bar{w}_1$ are zero and $\frac{\partial \Omega^D}{\partial \bar{w}_1} = -N'(w_1)/\bar{w}_1 > 0$, respectively. The consequences of higher benefits in period one, taking into account $\frac{\partial Z^D}{\partial w_1} > 0$ and $\frac{\partial Z^D}{\partial w_2} < 0$ are, therefore, given by $\frac{\mathrm{d}w_1}{\mathrm{d}\bar{w}_1} = -\frac{1}{D}\frac{\partial \Omega^D}{\partial \bar{w}_1}\frac{\partial Z^D}{\partial w_2} > 0$ and $\frac{\mathrm{d}w_2}{\mathrm{d}\bar{w}_1} = \frac{1}{D}\frac{\partial \Omega^D}{\partial \bar{w}_1}\frac{\partial Z^D}{\partial w_1} > 0$. The positive change in the first-period wage is the standard prediction (Oswald, 1985, Ulph and Ulph, 1989). The second-period wage rises because higher benefits in period one effectively raise the habit stock in period two. As a consequence, the utility loss due to a wage increase falls and the union has an incentive to set a higher wage also in period two. This means that a one-off rise (or reduction) in unemployment benefits will have longer lasting wage effects. Next, we investigate an anticipated increase in unemployment benefits in period two. The derivatives of (6.5) and (6.7) with respect to $\bar{w}_2$ are zero and $\frac{\partial Z^D}{\partial \bar{w}_2} = -N'(w_2)/\bar{w}_2 > 0$. Hence, wages rise in both periods. The reason is that higher period two wages decrease contemporaneous labor demand, such that fewer employees incur a utility loss due to habit formation. Therefore, the costs of an increase in period one wages decline.[84] We can summarize the results in:

Proposition 6. *Assume that the Assumptions A', B to D, F and G hold.*
In a setting with declining employment over time, an increase in unemployment benefits in one period induces the monopoly trade union to raise wages in both periods.

Proof: See above. ■

It is straightforward to show that the signs of the derivatives of the first-order conditions with respect to benefit levels are not affected by incorporating habit formation by the unemployed ($\mu > 0$) or by modifying the assumptions concerning individual preferences. Moreover, the findings hold as well if unemployment benefits in period

[84] If the rise were not anticipated, period one wages would not be affected.

one exceed the respective level in period two to such an extent that employment rises over time.[85]

The insights have important consequences. First, a policy change, such as a variation in unemployment benefits, which is reversed after some time, will continue to affect wage setting even after the reversal, because of the change in the habit stock. Second, if a policy change can be anticipated, the consequences of this policy variation can occur prior to the actual implementation. This has implications also for empirical work because our findings suggest that the policy change will be reflected in pre-reform wages.

Policy makers cannot only affect collectively determined wages by altering the level of unemployment benefits. Wage outcomes also vary, for example, with income taxes, social security contributions, employment protection regulations, and many legal restrictions affecting the (dis-) utility from work. Our findings relating to $\bar{w}_t$ qualitatively carry over to alterations of such policy parameters and, therefore, have a much wider applicability.

6.4.2 Changes of the product price

In a static set-up, the product price does not affect wages if the labor demand elasticity is constant and individual utility is independent of the price (Oswald, 1985, Ulph and Ulph, 1989, Drakopoulos and Skåtun, 1997). Below we analyze whether this finding also holds if there are habit concerns.

The change in employment owing to a higher product price in period t is given by $\frac{\partial N(w_t,p_t)}{\partial p_t} = -\frac{f'(N_t)}{p_t f''(N_t)} > 0$. Furthermore, the price elasticity of labor demand is $\phi_t = \frac{-1}{p_t f''(N_t)} \frac{p_t f'(N_t)}{N(w_t,p_t)}) = \frac{-f'(N_t)}{f''(N_t)N_t} > 0$. The first-order conditions, assuming a time-invariant price elasticity, ϕ, constant unemployment benefits and declining employment are:

$$Z^{P,D} = -\phi \left(\ln \left(\frac{w_2}{w_1^{\alpha}} \right) - \ln(\bar{w}) \right) + 1 = 0 \tag{6.15}$$

$$\Omega^{P,D} = -\phi(\ln(w_1) - \ln(\bar{w})) + 1 - \alpha \frac{N(w_2, p_2)}{N(w_1, p_1)} = 0 \tag{6.16}$$

The derivative of equation (6.15) with respect to p_1, $\frac{\partial Z^{P,D}}{\partial p_1}$, is zero and the respective derivative of (6.16), $\frac{\partial \Omega^{D,P}}{\partial p_1}$, is positive. The wage changes arising from a higher product

[85] A proof is available from the authors upon request.

price in period one, taking into account that $\frac{\partial Z^{P,D}}{\partial w_1} > 0$ and $\frac{\partial Z^{P,D}}{\partial w_2} < 0$, are given by $\frac{\mathrm{d}w_1}{\mathrm{d}p_1} = -\frac{1}{D}\frac{\partial \Omega^{P,D}}{\partial p_1}\frac{\partial Z^{P,D}}{\partial w_2} > 0$ and $\frac{\mathrm{d}w_2}{\mathrm{d}p_1} = \frac{1}{D}\frac{\partial \Omega^{P,D}}{\partial p_1}\frac{\partial Z^{P,D}}{\partial w_1} > 0$. Consequently, a rise in the first-period product price increases wages in both periods.

If individuals exhibit habit formation, the costs of a wage increase do not only arise because of a loss in employment, but also because the habit stock rises for those employees who retain their jobs in period two. Their number, however, is unaffected by the rise in the product price in period one. Accordingly, the costs of a wage increase decline in period one. A higher period one wage makes the habit component more distinct in the second period, which causes the trade union to set a higher wage in the second period, as well.

Next, we assume that the product price only rises in period two, which is anticipated by the union in period one. The price variation has no impact on the second-period wage, for a given wage in period one, as the price elasticity of labor demand is constant. Therefore, the higher output price induces an expansion in period two employment. This raises the trade union's cost of a wage increase in period one because more of those employed in the first period incur a utility reduction in period two due to habit concerns. As a result, the period one wage is lowered. This reduction shrinks the habit stock. Therefore, the trade union can set a lower period two wage than it would have done, had the output price in period two remained the same. Accordingly, an anticipated output price increase in period two induces a wage adjustment in both periods in the presence of habit concerns, which strengthens the immediate, positive employment impact in the second period.

Finally, a price increase in both periods of equal magnitude has no impact on wages if the initial product price is the same.[86] We capture the results of this sub-section in:

Proposition 7. *Assume that Assumptions A' to E, and G hold and, additionally, the price elasticity of labor demand does not vary over time.*
If the product price rises in period one (two), the trade union will raise (reduce) wages in both periods, which changes employment in the opposite direction. Wages are constant if prices vary equally and are initially the same.

Proof: See above. ■

[86]The same is true if the labor demand elasticity is constant and employment rises over time. In such a setting, the optimal second-period wage does not depend on employment in period one and, thereby, the output price in that period (cf. equation (6.6)). Moreover, the first-period wage is independent of employment in period two. Therefore, a change in the product price will have no impact on optimal wages in either period.

Although, strictly speaking, Proposition 7 only applies to a two-period setting and firm-specific price changes, it suggests that habit concerns may give rise to price-wage spirals. If the increase in the product price in period one entails higher wages also in the longer run, firms are likely to increase prices also in subsequent periods in order to counteract the ensuing reduction in profits. The higher product price will again foster wage increases. Conversely, an anticipated future rise in prices which, ceteris paribus, raises employment, may be accompanied by lower wages. Thereby, inflationary effects may be mitigated.

6.5 Conclusion

In this paper, we show that habit preferences can induce a firm-specific trade union to increase wages over time. This occurs in our basic two-period setting, relative to wages chosen in the absence of habit concerns and also in absolute terms, if unemployment benefits and prices are constant and habit concerns by employed union members dominate the effect of such considerations by unemployed individuals on the trade union's objective. Moreover, we clarify that the prediction is not sensitive to particular assumptions. Interestingly, if unemployed union members ascribe the same importance to habit concerns than employed ones, the predicted impact of habit formation requires a non-utilitarian trade union. Furthermore, our analysis suggests that changes in exogenous parameters in one period, such as in unemployment benefits or the product price, can affect collective bargaining outcomes for longer durations due to habit formation.

Our derivations are based on the assumption that individuals do not save in order to smooth disposable income over time. This is basically without impact if habit formation relates to income. If habit concerns focus on consumption, it is straightforward to show that individuals' savings decisions will never be such that the trade union sets constant wages. The reason is that optimal savings would equalise the marginal utility from consumption in both periods if employment were constant. This, however, does not imply that the utility in both periods is the same if there are habit concerns. Since the trade union's incentives to raise wages depend both on the utility level and the marginal utility, they are affected differently in periods one and two. Hence, an outcome in which savings were chosen optimally and wages remained constant over time cannot maximize the trade union's payoff in both periods.[87] Consequently, habit formation

[87] A proof of this assertion is available upon request.

would affect wage setting also in the presence of savings. However, even in our simple setting, it is not straightforward to characterize optimal union behavior because changes in wages over time entail employment variations. Thus, precautionary motives also affect savings, as individuals can use them to insure against income variations due to unemployment. Savings then depend on the position and slope of the labor demand curve and the level of unemployment benefits and cannot easily be determined. Therefore, also the trade union's optimal wage demands can no longer be derived explicitly. In consequence, the impact of savings on the wage profile in the presence of habit formation is a topic for future research.

6.6 Appendix E

6.6.1 Second-order conditions for monopoly union model

Given the feature that first-period employment depends on the first-period but not on the second-period wage, we can express period one employment as $N(w_1)$, simplify notation and the trade union objective as $\Gamma^i(w_1, w_2)$, $i = R, D$. In the case of declining employment, it is given by:

$$\Gamma^D(w_1, w_2) = N(w_1)\ln(w_1) + \tau[M - N(w_1)]\ln(\bar{w_1}) + \delta\Bigg\{N(w_2)\ln\left(\frac{w_2}{w_1^{\alpha}}\right) + \tau[N(w_1) - N(w_2)]\ln\left(\frac{\bar{w_2}}{w_1^{\mu}}\right) + \tau[M - N(w_1)]\ln\left(\frac{\bar{w_2}}{\bar{w_1}^{\mu}}\right)\Bigg\} \tag{6.17}$$

The union objective in case of increasing employment is:

$$\Gamma^R(w_1, w_2) = N(w_1)\ln(w_1) + \tau[M - N(w_1)]\ln(\bar{w_1}) + \delta\Bigg\{N(w_1)\ln\left(\frac{w_2}{w_1^{\alpha}}\right) + [N(w_2) - N(w_1)]\ln\left(\frac{w_2}{\bar{w_1}^{\alpha}}\right) + \tau[M - N(w_2)]\ln\left(\frac{\bar{w_2}}{\bar{w_1}^{\mu}}\right)\Bigg\} \tag{6.18}$$

We denote the partial derivatives of Γ^i with respect to w_t by Γ^i_t, $t = 1, 2$. From (6.5) and (6.6) we have $\Gamma^i_2 = Z^i = 0$, and from (6.7) and (6.8) we obtain $\Gamma^i_2 = \Omega^i = 0$. The second-order sufficient conditions for a maximum are $\Gamma^i_{11}, \Gamma^i_{22} < 0$ and $\Gamma^i_{11}\Gamma^i_{22} - (\Gamma^i_{12})^2 > 0$. For $\alpha \geq \mu\tau$, the respective derivatives are $\Gamma^R_{12} = 0$ and:

$$\Gamma^D_{11} = N''(w_1)A_1 + 2(1 - \tau\mu\delta)\frac{N'(w_1)}{w_1} - \frac{1}{w_1^2}\left[N(w_1)(1 - \tau\mu\delta) - \delta(\alpha - \tau\mu)N(w_2)\right] < 0, \tag{6.19}$$

for $A_1 = (1 - \tau\mu\delta)\left(\ln(w_1) - ln(\bar{w_1})\right) + \ln(\bar{w_1}(1 - \tau))$, and $A_1 > 0$ follows from (6.7),

$$\Gamma^D_{22} = \delta\left\{N''(w_2)A_2 + \frac{2N'(w_2)}{w_2} - \frac{N(w_2)}{w_2^2}\right\} < 0, \tag{6.20}$$

for $A_2 = \ln(w_2) - \tau\ln(\bar{w_2}) - (\alpha - \mu\tau)ln(w_1) > 0$, where $A_2 > 0$ follows from (6.5), and

$$\Gamma^D_{12} = -\delta(\alpha - \tau\mu)\frac{N'(w_2)}{w_1} \geq 0, \tag{6.21}$$

$$\Gamma_{11}^R = (1-\delta\alpha)\left[N''(w_1)\left\{\ln(w_1)-\ln(\bar{w}_1)\right\}+\frac{2N'(w_1)}{w_1}-\frac{N(w_1)}{w_1^2}\right] + (1-\tau)\mu\delta N''(w_1)ln(\bar{w}_1) < 0, \tag{6.22}$$

and

$$\Gamma_{22}^R = \delta\left\{N''(w_2)\left[\ln(w_2)-\tau\ln(\bar{w}_2)-(\alpha-\mu\tau)ln(\bar{w}_1)\right]+\frac{2N'(w_2)}{w_2}-\frac{N(w_2)}{w_2^2}\right\} < 0. \tag{6.23}$$

Therefore, $\Gamma_{11}^R\Gamma_{22}^R-(\Gamma_{12}^R)^2=\Gamma_{11}^R\Gamma_{22}^R>0$. For the case of declining employment, we obtain:

$$\begin{aligned}\Gamma_{11}^D\Gamma_{22}^D-(\Gamma_{12}^D)^2 = {} & N''(w_1)A_1\Gamma_{22}^i+2(1-\tau\mu\delta)\frac{N'(w_1)}{w_1}\delta\left(N''(w_2)A_2-\frac{N(w_2)}{w_2^2}\right)\\ & +\frac{1}{w_1^2}[N(w_2)\delta(\alpha-\tau\mu)-N(w_1)(1-\delta\tau\mu)]\delta\left(N''(w_2)A_2-\frac{N(w_2)}{w_2^2}\right)\\ & +\delta\frac{N'(w_2)}{w_1^2w_2}\tilde{A},\end{aligned} \tag{6.24}$$

where

$$\begin{aligned}\tilde{A} &= 4(1-\delta\tau\mu)N'(w_1)w_1-2N(w_1)(1-\delta\tau\mu)+2N(w_2)\delta(\alpha-\tau\mu)-\delta N'(w_2)w_2(\alpha-\mu\tau)^2\\ &= -N(w_1)(1-\delta\tau\mu)[4\varepsilon(w_1)+2]+N(w_2)\delta(\alpha-\mu\tau)[2+(\alpha-\mu\tau)\varepsilon(w_2)],\end{aligned} \tag{6.25}$$

and $\varepsilon(w_t)=-\frac{N'(w_t)w_t}{N(w_t)}>0$. In the case of declining employment, we have $N(w_1)>N(w_2)$. Moreover, $1-\delta\tau\mu>\delta\alpha-\delta\tau\mu$ holds. Therefore,

$$\begin{aligned}\tilde{A} &< -N(w_2)\delta(\alpha-\mu\tau)[4\varepsilon(w_1)+2]+N(w_2)\delta(\alpha-\mu\tau)[2+(\alpha-\mu\tau)\varepsilon(w_2)]\\ &= N(w_2)\delta(\alpha-\mu\tau)\left\{[-4\varepsilon(w_1)-2]+[2+(\alpha-\mu\tau)\varepsilon(w_2)]\right\}\\ &= N(w_2)\delta(\alpha-\mu\tau)\left\{(\alpha-\mu\tau)\varepsilon(w_2)-4\varepsilon(w_1)\right\}\end{aligned} \tag{6.26}$$

If $4\varepsilon(w_1)\geq(\alpha-\mu\tau)\varepsilon(w_2)$ holds, $\tilde{A}$ is negative. Since the other summands in (6.24) are positive and $\tilde{A}$ is multiplied by a negative factor, $\tilde{A}\leq 0$ ensures $\Gamma_{11}^D\Gamma_{22}^D-(\Gamma_{12}^D)^2>0$.

6.6.2 Three period setting

The union's payoff in period one is given by (6.4), while its payoff in period t, $t > 1$, equals

$$V_t^{T,D}(w_t) = N(w_t)\ln\left(\frac{w_t}{w_{t-1}^{\alpha}}\right) + [M - N(w_t)]\ln(\bar{w}) \tag{6.27}$$

if employment declines from period $t-1$ to t and in the opposite case by:

$$V_t^{T,R}(w_t) = N(w_{t-1})\ln\left(\frac{w_t}{w_{t-1}^{\alpha}}\right) + [N(w_t) - N(w_{t-1})]\ln\left(\frac{w_t}{\bar{w}^{\alpha}}\right) + [M - N(w_t)]\ln(\bar{w}) \tag{6.28}$$

The optimal choice of the wage in period three is determined by

$$\frac{\partial V_t^{T,D}}{\partial w_t} = N'(w_t)\left[\ln\left(\frac{w_t}{w_{t-1}^{\alpha}}\right) - \ln(\bar{w})\right] + N(w_t)\frac{1}{w_t} = 0 \tag{6.29}$$

for $t = 3$, if employment weakly declines from period two to three and otherwise by:

$$\frac{\partial V_t^{T,R}}{\partial w_t} = N'(w_t)\left[\ln\left(\frac{w_t}{\bar{w}^{\alpha}}\right) - \ln(\bar{w}_t)\right] + N(w_t)\frac{1}{w_t} = 0 \tag{6.30}$$

For a three-period setting, four wage combinations can be distinguished:
Case 1: Wages continuously rise (weakly) over time, such that $w_1 \leq w_2 \leq w_3$.
Case 2: Wages continuously decline ($w_1 > w_2 > w_3$).
Case 3: $w_1 \geq w_2 < w_3$.
Case 4: $w_1 < w_2 \geq w_3$.

Next, we derive the first-order conditions for Case 1, show that Case 2 cannot represent an equilibrium, derive a condition which ensures that Case 3 cannot be optimal and finally, consider Case 4. We assume that second-order conditions hold to focus the proof.

Case 1: In period two, the trade union's optimal choice is given by

$$\frac{\partial(V_2^{T,D} + V_3^{T,D})}{\partial w_2} = N'(w_2)\left[\ln\left(\frac{w_2}{w_1^{\alpha}}\right) - \ln(\bar{w})\right] + \frac{N(w_2) - \alpha N(w_3)}{w_2} + \underbrace{\frac{\partial V_3^{D}(w_3)}{\partial w_3}}_{=0}\frac{\partial w_3}{\partial w_2} = 0 \tag{6.31}$$

where $V_2^{T,D}(w_2)$ is defined by (6.27) for $t = 2$. In period one, the union chooses the optimal first-period wage as follows:

$$\frac{\partial(V_1^T + V_2^{T,D} + V_3^{T,D})}{\partial w_1} = N'(w_1)\ln\left(\frac{w_1}{\bar{w}}\right) + \frac{N(w_1)}{w_1} - \alpha\frac{N(w_2)}{w_1} + \underbrace{\frac{\partial(V_3^{T,D} + V_2^{T,D})}{\partial w_2}}_{=0}\frac{\partial w_2}{\partial w_1}$$
$$+ \underbrace{\frac{\partial V_3^{T,D}}{\partial w_3}}_{=0}\frac{\partial w_3}{\partial w_2}\frac{\partial w_2}{\partial w_1} = 0 \tag{6.32}$$

Comparing the first-order conditions, we can note that (6.32) is positive if evaluated at the optimal wage in period three (cf. (6.29)). Hence, $w_1^T < w_3^T$. Proceeding in the same manner, taking into account the above result and evaluating (6.31) at the optimal third-period wage, we observe that the second-period wage has to be less than the third period counterpart. Finally, it can be established that wages rise from period one to two. Hence, Case 1 can depict optimal union behavior.

Case 2: Rearranging the first-order condition, it can be shown that the optimal second-period wage is defined by:

$$N'(w_2)\left[(1-\alpha)ln(w_2) - \ln(\bar{w})\right] + (1-\alpha)\frac{N(w_2)}{w_2} = 0 \tag{6.33}$$

The optimal first-period wage results from (6.8), for $\delta = 1$. Since these first-order conditions imply that $w_2 > w_1$, the assumed wage profile cannot be the union's preferred choice.

Case 3: The optimal wage in period two is defined by (6.31), with w_1 being replaced by $\bar{w}$ and the first-order condition for the first-period wage is defined by (6.8), for $\delta = 1$. Comparing the latter with (6.29) for $t = 3$, shows that the third-period wage has to exceed the wage in period one. Moreover, evaluating the first-order condition for the second-period wage at the optimal wage for period one, we obtain:

$$\left.\frac{\partial(V_2^{T,R} + V_3^{T,D})}{\partial w_2}\right|_{w_2=w_1} = -\alpha\frac{N(w_2)}{w_2}\left[\frac{N(w_3)}{N(w_2)} - \varepsilon(w_2)\ln(\bar{w})\right] \tag{6.34}$$

Case 4: The optimal first-period wage is given by (6.32) and the second-period wage by:

$$\frac{\partial(V_2^{T,D} + V_3^{T,R})}{\partial w_2} = (1-\alpha)\left[N'(w_2)\ln\left(\frac{w_2}{\bar{w}}\right) + \frac{N(w_2)}{w_2}\right] - \alpha N'(w_2)\ln(w_1) = 0 \tag{6.35}$$

A comparison of the first-order conditions for the first- and third-period wage shows that the latter exceeds the former. The assumption that the second-period wage exceeds the wage paid in period three is consistent with the first-order conditions. Moreover, a comparison of the payoff levels resulting in Cases 3 and 4 does not allow to rule out one of the cases as yielding a lower payoff. Consequently, Case 4 can represent an equilibrium.

6.6.3 Section 6.3.3.3 - First-order conditions

If preferences are given by a power utility function (PU), $u^{PU}(c_t, {H_t}^{\alpha}) = \frac{(c_t/H_t^{\alpha})^{1-\gamma}}{1-\gamma}$, the first-order condition for the choice of w_1 in case of declining employment is:

$$\Omega^{PU,D} = N'(w_1)\left[\frac{w_1^{1-\gamma}}{1-\gamma} - \frac{\bar{w}^{1-\gamma}}{1-\gamma}\right] + N(w_1)w_1^{-\gamma} - N(w_2)\left(\frac{w_2}{w_1^{\alpha}}\right)^{-\gamma}\frac{\alpha w_2}{w_1^{\alpha+1}} = 0 \qquad (6.36)$$

Since α affects only the last term $-N(w_2)\left(\frac{w_2}{w_1^{\alpha}}\right)^{-\gamma}\frac{\alpha w_2}{w_1^{\alpha+1}} < 0$, $w_1^{PU,H} < w^{PU,w}$.

If preferences are described by the more general formulation (G) $u^G(\frac{c_t}{H_t^{\alpha}})$, $u^{G\prime} > 0 > u^{G\prime\prime}$, the first-order condition for the choice of the first-period wage is:

$$\Omega^{G,D} = N'(w_1)\left[u^G(w_1) - u^G(\bar{w})\right] + N(w_1)u^{G\prime}(w_1) - N(w_2)u^{G\prime}\left(\frac{w_2}{w_1^{\alpha}}\right)\left(\frac{w_2\alpha}{w_1^{\alpha+1}}\right) = 0 \qquad (6.37)$$

The negative term $-N(w_2)u^{G\prime}\left(\frac{w_2}{w_1^{\alpha}}\right)\left(\frac{w_2\alpha}{w_1^{\alpha+1}}\right)$ vanishes in a setting without habit formation. As a consequence, $w_1^{G,H} < w^{G,w}$.

If the utility function depends on the difference between the current income and the habit stock (as indicated by the superscript Sum), the first-order condition is:

$$\frac{\partial\Omega^{Sum,D}(w_1)}{\partial w_1} = N'(w_1)[u^{Sum}(w_1) - u^{Sum}(\bar{w})] + N(w_1)u^{Sum\prime}(w_1) - N(w_2)u^{Sum\prime}(w_2 - \alpha w_1)\alpha = 0 \qquad (6.38)$$

Since $N(w_2)u^{Sum\prime}(w_2 - \alpha w_1)\alpha > 0$ for $\alpha > 0$, the derivative is negative at $w_1 = w^{Sum,w}$.

6.6.4 Nash bargaining

The derivative of $NP_2^D(w_2)$, defined in equation (6.13), implicitly characterizes the optimal second-period wage, denoted by $w_2^{H,N}$, and is given by:

$$\frac{\partial NP_2^D}{\partial w_2} = X(R(N(w_2^{H,N})) - w_2^{H,N}N(w_2^{H,N}))^{-\beta}\left(N(w_2^{H,N})\left[\ln\left(\frac{w_2^{H,N}}{w_1^{\alpha}}\right) - \ln(\bar{w})\right]\right)^{\beta-1} = 0, \tag{6.39}$$

where

$$\begin{aligned} X = \beta &\left(N'(w_2^{H,N})\left[\ln\left(\frac{w_2^{H,N}}{w_1^{\alpha}}\right) - \ln(\bar{w})\right] + \frac{N(w_2^{H,N})}{w_2^{H,N}}\right)(R(N(w_2^{H,N})) - w_2^{H,N}N(w_2^{H,N})) \\ &- (1-\beta)\left(N(w_2^{H,N})\left[\ln\left(\frac{w_2^{H,N}}{w_1^{\alpha}}\right) - \ln(\bar{w})\right]\right)N(w_2^{H,N}) = 0, \end{aligned} \tag{6.40}$$

because the other two factors in (6.39) are positive. We assume that the solution to (6.39), maximizes $NP_2^D(w_2)$, such that its second derivative and $\partial X/\partial w_2$ are negative.

The second-period wage increases with the wage in period one.

$$\begin{aligned} w_2'(w_1) = \frac{\mathrm{d}w_2^{H,N}}{\mathrm{d}w_1} &= -\frac{\partial^2 NP_2^D/\partial w_2^{H,N}\partial w_1}{\partial^2 NP_2^D/\partial (w_2^{H,N})^2} = -\frac{\partial X/\partial w_1}{\partial X/\partial w_2^{H,N}} \\ &= -\frac{\alpha}{w_1}\frac{(1-\beta)N(w_2^{H,N})^2 - \beta N'(w_2^{H,N})(R(N(w_2^{H,N})) - w_2^H N(w_2^{H,N}))}{\underbrace{\partial X/\partial w_2^{H,N}}_{<0 \text{ required by SOC}}} > 0 \end{aligned} \tag{6.41}$$

Given Assumptions A', B, and D to G (see Corollary 1), a monopoly union ($\beta = 1$) will set wages such that $w_2^H(\beta = 1) > w^w(\beta = 1) > w_1^H(\beta = 1)$. Moreover, X in equation (6.40) is positive if evaluated at $w^{w,N}(\beta)$. Therefore, for any given value of β, the wage in period two in the presence of habit formation exceeds the respective value resulting in the absence of such preferences, $w_2^{H,N}(\beta) > w^{w,N}(\beta)$. This establishes part (ii) of Proposition 5.

We assume that the first-order condition for the first-period wage defines a maximum:

$$\frac{\partial NP_1^D}{\partial w_1} = \beta(U - U^0)'(\pi - \pi^0) + (1-\beta)(\pi - \pi^0)'(U - U^0) = 0 \tag{6.42}$$

where

$$U - U^0 = N(w_1) \ln\left(\frac{w_1}{\bar{w}}\right) + N(w_2^{H,N}(w_1)) \left[\ln\left(\frac{w_2^{H,N}(w_1)}{w_1^{\alpha}}\right) - \ln(\bar{w})\right] \tag{6.43}$$

$$\begin{aligned}(U - U^0)' = N'(w_1) \ln\left(\frac{w_1}{\bar{w}}\right) + \frac{N(w_1)}{w_1} + N'(w_2^{H,N}(w_1)) w_2'(w_1) \left[\ln\left(\frac{w_2^{H,N}(w_1)}{w_1^{\alpha}}\right) - \ln(\bar{w})\right] \\ + N(w_2^{H,N}(w_1)) \left[\frac{w_2'(w_1)}{w_2^{H,N}(w_1)} - \frac{\alpha}{w_1}\right]\end{aligned} \tag{6.44}$$

$$\pi - \pi^0 = R(N(w_1)) - w_1 N(w_1) + R(N(w_2^{H,N}(w_1))) - w_2(w_1) N(w_2^{H,N}(w_1)) \tag{6.45}$$

$$(\pi - \pi^0)' = -N(w_1) - w_2'(w_1) N(w_2^{H,N}(w_1)) \tag{6.46}$$

If there is no habit formation, wages rise with greater union bargaining power, as the derivatives of (6.39) and (6.42) for $\alpha = 0$ with respect to β clarify (cf. Nickell and Andrews (1983)). The condition stated in part (i) of Proposition 5 thus ensures $w_1^{H,N}(\beta) < w^{w,N}(\beta)$. Part (iii) of the proposition follows from (i) and (ii).

Chapter 7

Concluding remarks and outlook

Over the last century, broadcast media such as television has spread rapidly throughout the entire world. Their content not only provides viewers access to new information but also represents a source of entertainment that often unconsciously confronts individuals with different lifestyles, social norms, or behaviors. In this regard, a plethora of studies have already demonstrated that television content can influence the attitudes and behavior of individuals in various ways. Although the potential impacts of television content have received much attention in economic research in recent years, studies examining long-term causal effects of media exposure are still scarce. The reason is that identifying long-run effects requires plausible exogenous variation in access to television content to avoid self-selection bias and reverse causality issues. Therefore, the first part of this thesis contributes to the better understanding of long-term effects of television exposure by utilizing the exogenous variation in WGTV reception in the GDR.

Chapter 2 addresses whether access to reliable environmental information through television can influence individuals' environmental awareness and pro-environmental behavior. We take advantage of the fact that Western media regularly reported on environmental pollution in the GDR, a topic deliberately excluded in East German state media. Analyzing survey data from the late 1980s and the early 1990s reveals that exposure to Western television channels increased environmental awareness among GDR citizens. Western reporting also enabled GDR citizens to identify misinformation about environmental violations by state-owned industry, leading to lower trust in the SED government's environmental policies. In this regard, our findings also reveal that censorship might backfire when individuals have access to alternative sources of information that can disprove misinformation. In addition, our estimations indicate that individuals with prior access to WGTV have a higher likelihood of being a member in an environmental interest group. The great importance that environmental organizations played in the context of the German reunification emphasizes the significance of this finding. Finally, by analyzing election data, we show that the Greens

achieved significantly higher vote shares in East German regions with prior WGTV access in the first two federal elections after reunification.

In Chapter 3, we explore the relationship between exposure to foreign mass media content and xenophobia. In contrast to the state television broadcaster in the GDR, WGTV regularly confronted its viewers with foreign (non-German) broadcasts. The analysis of survey data before and after reunification reveals that exposure to Western television channels positively affected individuals' attitudes towards foreigners. Furthermore, our estimates show a significantly higher likelihood of donating to refugee aid among individuals who regularly watched Western television programs during the GDR period. Finally, by analyzing county-level data, we find that East German regions with former WGTV reception exhibit lower election outcomes for right-wing parties in the federal elections from 1990 to 2017 and fewer hate crimes against refugees in the period from 2015 to 2018. While previous studies using laboratory experiments have primarily identified only short-term effects of media exposure on xenophobic attitudes, our results provide evidence for a persistent mitigating impact of foreign media content on xenophobia. Future research is, however, needed to disentangle the potential mechanisms that derive our results. Does the effect arise from individuals being exposed to foreign lifestyles and values and thus becoming more tolerant of other cultures? Or can our results be explained by the parasocial contact theory (Schiappa et al., 2005) since individuals were accustomed to foreign characters through television? While such a distinction seems possible in the context of an experimental study, we are not aware of a natural experiment that might allow the separation of both mechanisms outside a laboratory setting.

Chapter 4 deals with another unique feature of WGTV. In contrast to East German media, Western television programs regularly exposed their audience to unmarried and childless characters. Similar to Chapters 2 and 3, we again combine survey evidence with the analysis of county-level data. The results show that East German regions with prior access to WGTV exhibit significantly lower marriage and birth rates while they show significantly higher divorce rates after reunification. The analysis of SOEP data supports this finding by showing that respondents with WGTV exposure have a higher likelihood of being divorced and are less likely to be married or to have children. In order to pin down the relevant mechanism, we analyze survey data from the 1980s that include information on attitudes regarding partnership and family life. The estimates show that WGTV primarily affected women's attitudes, while we do not find effects among the male respondents. This finding could result from the stereotypical portrayal of female characters in WGTV, attributing rather negative characteristics to married women and women with children. Similar to other studies (e.g., Chong and La Ferrara,

2009, Jensen and Oster, 2009, La Ferrara et al., 2012), we find evidence that role models on television can have far-reaching effects on individuals by influencing their preferences regarding partnerships and family planning. Despite our results suggesting long-term effects, the question still arises of whether there is intergenerational transmission of the effect. However, our data set does not allow us to test for possible effects in the generation born in reunified Germany, which is thus no longer part of the actual natural experiment. This limitation may be worth addressing in future research.

In the course of the first part of this thesis, we provide arguments and plenty of tests to ensure a valid identification strategy that allows us to investigate the long-term causal effects of exposure to television content. While the natural experiment offers a setting that assures high internal validity, there is the question of the external validity of our results. Therefore, future research should investigate whether our findings also apply in other contexts where, for example, a shorter treatment period is present. The fact that GDR citizens were exposed to different media content over several decades shows the uniqueness of this natural experiment. Furthermore, it is of great interest to investigate whether the results obtained in this part of this thesis are transferable to digital media platforms, which are becoming increasingly important across the entire globe. From an empirical point of view, analyzing the effects of digital media content seems challenging since these platforms provide access to a bundle of content simultaneously. In addition, Internet access in most countries has evolved relatively linearly over time, making it even more difficult to identify potential effects (DellaVigna and La Ferrara, 2015).

Chapter 5 deals with digital media and examines the influence of social media marketing in equity crowdfunding campaigns. Specifically, we study the communication behavior of startups on social media platforms and examine whether startups can influence the success of their equity crowdfunding campaign by publishing voluntary content. Thereby, we distinguish between different types of informative and persuasive posts on Facebook and Twitter. Our results show that both types of posts positively impact the number of investments, while persuasive posts also enhance the investment volume. The fact that startups also target less sophisticated investors in their campaigns might explain why startups use primarily persuasive content on social media and why this content positively impacts their campaign success. However, if startups intentionally post fraudulent content leading to sub-optimal investment decisions by retail investors, there may be a need for new investor communication regulations by securities regulators. So far, equity crowdfunding often does not fall under traditional securities regulations (Dorfleitner et al., 2018). Nevertheless, further empirical evidence is needed to make such recommendations. Although our findings seem transferable to crowdfunding

platforms in other countries, future research should investigate the role of social media marketing in different legal contexts.

Chapter 6 introduces the concept of habit formation into the economic literature on trade unions and contributes to a better understanding of how internal habit preferences affect trade union behavior. Our results show that such internal reference points lead the union to raise wages over time which in turn gradually reduces employment. Conducting a numerical example indicates that the resulting decline in employment is non-negligible. However, the results obtained in this study strongly depend on the ratio of habit preferences between employed and unemployed union members. Although several empirical studies have been conducted to measure the intensity of habit preferences (e.g., Havranek et al., 2017), they generally do not distinguish between different subgroups. Future research should focus on whether habit preferences differ systematically between subgroups, for example, between employed and unemployed individuals. In addition, subsequent studies should examine whether events such as unemployment or employment entry affect not only the (future) habit stock but also the intensity of habit preferences.

Bibliography

Abel, A. B. (1990). Asset prices under habit formation and catching up with the joneses. *American Economic Review 80*(2), 38–42.

Abel, A. B. (2005). Optimal taxation when consumers have endogenous benchmark levels of consumption. *The Review of Economic Studies 72*(1), 21–42.

Adams, J. S. (1963). Towards an understanding of inequity. *The Journal of Abnormal and Social Psychology 67*(5), 422–436.

Adena, M., R. Enikolopov, M. Petrova, V. Santarosa, and E. Zhuravskaya (2015). Radio and the rise of the Nazis in prewar Germany. *The Quarterly Journal of Economics 130*(4), 1885–1939.

Adler, M. A. (1997). Social change and declines in marriage and fertility in Eastern Germany. *Journal of Marriage and Family 59*(1), 37–49.

Agarwal, S. and B. W. Ambrose (2018). The effect of advertising on home equity credit choices. In J. C. Teitelbaum and K. Zeiler (Eds.), *Research handbook on behavioral law and economics*, pp. 122–152. Cheltenham: Edward Elgar Publishing.

Aggarwal, P. and R. Vaidyanathan (2003). Use it or lose it: Purchase acceleration effects of time-limited promotions. *Journal of Consumer Behaviour: An International Research Review 2*(4), 393–403.

Akerlof, G. A. and J. L. Yellen (1990). The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics 105*(2), 255–283.

Alesina, A. and N. Fuchs-Schündeln (2007). Good-bye lenin (or not?): The effect of communism on people's preferences. *American Economic Review 97*(4), 1507–1528.

Allport, G. (1954). *The nature of prejudice*. Reading, MA: Addison-Wesley.

Alvarez-Cuadrado, F., J. M. Casado, and J. M. Labeaga (2016). Envy and habits: Panel data estimates of interdependent preferences. *Oxford Bulletin of Economics and Statistics 78*(4), 443–469.

Amador, J. and A. C. Soares (2017). Markups and bargaining power in tradable and non-tradable sectors. *Empirical Economics 53*(2), 669–694.

Ariely, D., X. Garcia-Rada, K. Gödker, L. Hornuf, and H. Mann (2019). The impact of two different economic systems on dishonesty. *European Journal of Political Economy 59*, 179–195.

Aronsson, T. and R. Schöb (2017). Consumption adaptation, anticipation-bias, and optimal income taxation. *Journal of Public Economic Theory 19*(3), 713–731.

Aronsson, T. and R. Schöb (2022). Habit formation and the pareto-efficient provision of public goods. *Social Choice and Welfare*. https://doi.org/10.1007/s00355-022-01401-x.

Barker, A., P. Lewis, and M. McCann (1984). Trades unions and the organisation of the unemployed. *British Journal of Industrial Relations 22*(3), 391–404.

Barwick, P. J., S. Li, L. Lin, and E. Zou (2019). From fog to smog: The value of pollution information. *NBER Working Paper* No. 26541.

Bauernschuster, S. and H. Rainer (2012). Political regimes and the family: How sex-role attitudes continue to differ in reunified Germany. *Journal of Population Economics 25*(1), 5–27.

Becker, S. O., L. Mergele, and L. Woessmann (2020). The separation and reunification of Germany: Rethinking a natural experiment interpretation of the enduring effects of communism. *Journal of Economic Perspectives 34*(2), 143–171.

Beissinger, T. and H. Egger (2004). Dynamic wage bargaining if benefits are tied to individual wages. *Oxford Economic Papers 56*(3), 437–460.

Beleites, M. (2016). *Dicke Luft: zwischen Ruß und Revolte: die unabhängige Umweltbewegung in der DDR*. Leipzig: Evangelische Verlagsanstalt.

Benesch, C., S. Loretz, D. Stadelmann, and T. Thomas (2019). Media coverage and immigration worries: Econometric evidence. *Journal of Economic Behavior & Organization 160*, 52–67.

Benoit, K. and M. Marsh (2010). Incumbent and challenger campaign spending effects in proportional electoral systems: The Irish elections of 2002. *Political Research Quarterly 63*(1), 159–173.

Bernini, A. (2022). The voice of radio in the battle for equal rights: Evidence from the U.S. South. *Economics & Politics*, forthcoming.

Bertrand, M., D. Karlan, S. Mullainathan, E. Shafir, and J. Zinman (2010). What's advertising content worth? Evidence from a consumer credit marketing field experiment. *The Quarterly Journal of Economics 125*(1), 263–306.

Besley, T. and R. Burgess (2002). The political economy of government responsiveness: Theory and evidence from India. *The Quarterly Journal of Economics 117*(4), 1415–1451.

Bjorvatn, K., A. W. Cappelen, L. H. Sekei, E. O. Sørensen, and B. Tungodden (2020). Teaching through television: Experimental evidence on entrepreneurship education in Tanzania. *Management Science 66*(6), 2308–2325.

Block, J., L. Hornuf, and A. Moritz (2018). Which updates during an equity crowdfunding campaign increase crowd participation? *Small Business Economics 50*(1), 3–27.

Blomquist, N. (1993). Interdependent behavior and the effect of taxes. *Journal of Public Economics 51*(2), 211–218.

Boelmann, B., A. Raute, and U. Schönberg (2021). Wind of change? Cultural determinants of maternal labor supply. *CEPR Discussion Paper* No. DP16149.

Bönisch, P. and W. Hyll (2022). Television and fertility: Evidence from a natural experiment. *Empirical Economics*. https://doi.org/10.1007/s00181-022-02278-6.

Boomgaarden, H. G. and R. Vliegenthart (2009). How news content influences anti-immigration attitudes: Germany, 1993–2005. *European Journal of Political Research 48*(4), 516–542.

Boulhol, H., S. Dobbelaere, and S. Maioli (2011). Imports as product and labour market discipline. *British Journal of Industrial Relations 49*(2), 331–361.

Bover, O. (1991). Relaxing intertemporal separability: A rational habits model of labor supply estimated from panel data. *Journal of Labor Economics 9*(1), 85–100.

Boyd, D. A. (1983). Broadcasting between the two Germanies. *Journalism Quarterly 60*(2), 232–239.

Brenner, J. and M. Fertig (2006). Identifying the determinants of attitudes towards immigrants: A structural cross-country analysis. *IZA Discussion Paper* No. 2306.

Brulle, R. J., J. Carmichael, and J. C. Jenkins (2012). Shifting public opinion on climate change: An empirical assessment of factors influencing concern over climate change in the US, 2002–2010. *Climatic Change 114*(2), 169–188.

Brunner, B. and A. Kuhn (2018). Immigration, cultural distance and natives' attitudes towards immigrants: Evidence from Swiss voting results. *Kyklos 71*(1), 28–58.

Buck, H. F. (1996). Umweltpolitik und Umweltbelastung. In E. Kuhrt, H. F. Buck, and G. Holzweißig (Eds.), *Die wirtschaftliche und ökologische Situation der DDR in den 80er Jahren*, pp. 223–266. Opladen: Leske und Budrich.

Bühler, G. (1997). *Mythos Gleichberechtigung in der DDR: Politische Partizipation von Frauen am Beispiel des Demokratischen Frauenbunds Deutschlands*. Frankfurt am Main: Campus.

Bursztyn, L. and D. Cantoni (2016). A tear in the iron curtain: The impact of Western television on consumption. *The Review of Economics and Statistics 98*(1), 25–41.

Cabo, F. and A. Martín-Román (2019). Dynamic collective bargaining and labor adjustment costs. *Journal of Economics 126*(2), 103–133.

Campa, P. and M. Serafinelli (2019). Politico-economic regimes and attitudes: Female workers under state socialism. *The Review of Economics and Statistics 101*(2), 233–248.

Campbell, J. Y. and J. H. Cochrane (1999). By force of habit: A consumption-based explanation of aggregate stock market behavior. *Journal of Political Economy 107*(2), 205–251.

Card, D., A. Mas, E. Moretti, and E. Saez (2012). Inequality at work: The effect of peer salaries on job satisfaction. *American Economic Review 102*(6), 2981–3003.

Carroll, C. D., J. Overland, and D. N. Weil (2000). Saving and growth with habit formation. *American Economic Review 90*(3), 341–355.

Casaló, L. V. and J.-J. Escario (2016). Intergenerational association of environmental concern: Evidence of parents' and children's concern. *Journal of Environmental Psychology 48*, 65–74.

Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology 39*(5), 752–766.

Chang, J. and C. Lai (1997). Union membership and employment dynamics with endogenous union density. *Economics Letters 57*(1), 119–125.

Chang, J., C. Liu, and W. Wang (2018). Conspicuous consumption and trade unionism. *Journal of Macroeconomics 57*, 350–366.

Chapman, P. G. (1986). Alternative trade union objective functions in the theory of wage bargaining. *The Manchester School of Economic & Social Studies 54*(4), 367–379.

Chapman, P. G. and M. R. Fisher (1984). Union wage policies: Comment. *American Economic Review 74*(4), 755–758.

Chen, H., P. De, Y. J. Hu, and B.-H. Hwang (2014). Wisdom of crowds: The value of stock opinions transmitted through social media. *The Review of Financial Studies 27*(5), 1367–1403.

Chen, X. and S. C. Ludvigson (2009). Land of addicts? An empirical investigation of habit-based asset pricing models. *Journal of Applied Econometrics 24*(7), 1057–1093.

Chong, A. and E. La Ferrara (2009). Television and divorce: Evidence from Brazilian novelas. *Journal of the European Economic Association 7*(2–3), 458–468.

Cialdini, R. B. (1999). Of tricks and tumors: Some little-recognized costs of dishonest use of effective social influence. *Psychology & Marketing 16*(2), 91–98.

Cialdini, R. B. (2007). *Influence: The psychology of persuasion*. New York: Collins.

Clark, A. E. (1999). Are wages habit-forming? Evidence from micro data. *Journal of Economic Behavior & Organization 39*(2), 179–200.

Clark, A. E., D. Masclet, and M. C. Villeval (2010). Effort and comparison income: Experimental and survey evidence. *ILR Review 63*(3), 407–426.

Clark, A. E. and A. J. Oswald (1996). Satisfaction and comparison income. *Journal of Public Economics 61*(3), 359–381.

Cohn, A., E. Fehr, B. Herrmann, and F. Schneider (2014). Social comparison and effort provision: Evidence from a field experiment. *Journal of the European Economic Association 12*(4), 877–898.

Collard, D. A. (1978). *Altruism and economy: A study in non-selfish economics*. New York: Oxford University Press.

Collier, P. and A. Hoeffler (2018). Migration, diasporas and culture: An empirical investigation. *Kyklos 71*(1), 86–109.

Constantinides, G. M. (1990). Habit formation: A resolution of the equity premium puzzle. *Journal of Political Economy 98*(3), 519–543.

Coulter, K. S. and A. Roggeveen (2012). Deal or no deal? How number of buyers, purchase limit, and time-to-expiration impact purchase decisions on group buying websites. *Journal of Research in Interactive Marketing 6*(2), 78–95.

Cox, G. W. and M. F. Thies (2000). How much does money matter? "Buying" votes in Japan, 1967-1990. *Comparative Political Studies 33*(1), 37–57.

Crabtree, C., D. Darmofal, and H. L. Kern (2015). A spatial analysis of the impact of West German television on protest mobilization during the East German revolution. *Journal of Peace Research 52*(2), 269–284.

Cremer, H., P. De Donder, D. Maldonado, and P. Pestieau (2010). Commodity taxation under habit formation and myopia. *The B.E. Journal of Economic Analysis & Policy 10*(1), 1–27.

Creuzberger, S. (1999). The Soviet military administration and East German elections, autumn 1946. *Australian Journal of Politics & History 45*(1), 89–98.

Dahl, G. and S. DellaVigna (2009). Does movie violence increase violent crime? *The Quarterly Journal of Economics 124*(2), 677–734.

DataReportal (2022). Overview of global social media use July 2022. https://datareportal.com/social-media-users. Accessed on September 2, 2022.

de la Croix, D. (1994). Wage interdependence through decentralized bargaining. *Journal of Economic Surveys 8*(4), 371–403.

de la Croix, D., F. C. Palm, and G. A. Pfann (1996). A dynamic contracting model for wages and employment in three European economies. *European Economic Review 40*(2), 429–448.

de Pinto, M. and J. Lingens (2019). The impact of unionization costs when firm-selection matters. *Labour Economics 60*, 50–63.

Dean, D. H. and J. M. Lang (2008). Comparing three signals of service quality. *Journal of Services Marketing 22*(1), 48–58.

DeBardeleben, J. (1988). "The future has already begun": Environmental damage and protection in the GDR. *International Journal of Sociology 18*(3–4), 144–164.

DellaVigna, S., R. Enikolopov, V. Mironova, M. Petrova, and E. Zhuravskaya (2014). Cross-border media and nationalism: Evidence from Serbian radio in Croatia. *American Economic Journal: Applied Economics 6*(3), 103–132.

DellaVigna, S. and E. Kaplan (2007). The Fox News effect: Media bias and voting. *The Quarterly Journal of Economics 122*(3), 1187–1234.

DellaVigna, S. and E. La Ferrara (2015). Economic and social impacts of the media. In S. P. Anderson, J. Waldfogel, and D. Strömberg (Eds.), *Handbook of media economics*, pp. 723–768. Amsterdam: Elsevier.

Deutsches Historisches Museum Berlin (2016). Zuwanderungsland Deutschland. https://www.dhm.de/archiv/ausstellungen/zuwanderungsland-deutschland/migrationen/rooms/0603.htm. Accessed on September 2, 2022.

Dinas, E., K. Matakos, D. Xefteris, and D. Hangartner (2019). Waking up the golden dawn: Does exposure to the refugee crisis increase support for extreme-right parties? *Political Analysis 27*(2), 244–254.

Diriwaechter, P. and E. Shvartsman (2018). The anticipation and adaptation effects of intra- and interpersonal wage changes on job satisfaction. *Journal of Economic Behavior & Organization 146*, 116–140.

Dobbelaere, S. (2004). Estimation of price-cost margins and union bargaining power for Belgian manufacturing. *International Journal of Industrial Organization 22*(10), 1381–1398.

Dobbelaere, S. and R. I. Luttens (2016). Gradual collective wage bargaining. *Labour Economics 40*, 37–42.

Dölling, I. (1993). Gespaltenes Bewußtsein: Frauen- und Männerbilder in der DDR. In Helwig, Gisela and Nickel, Hildegard M. (Ed.), *Frauen in Deutschland 1945-1992*, pp. 23–52. Bonn: Bundeszentrale für Politische Bildung.

Dorfleitner, G., L. Hornuf, and M. Weber (2018). Dynamics of investor communication in equity crowdfunding. *Electronic Markets 28*(4), 523–540.

Dovidio, J. F., A. Eller, and M. Hewstone (2011). Improving intergroup relations through direct, extended and other forms of indirect contact. *Group Processes & Intergroup Relations 14*(2), 147–160.

Drakopoulos, S. A. and J. D. F. Skåtun (1997). Altruism, union utility and outsiders. *Journal of Economic Studies 24*(6), 392–401.

Duesenberry, J. S. (1949). *Income, saving, and the theory of consumer behavior*. Cambridge MA: Harvard University Press.

Durante, R., P. Pinotti, and A. Tesei (2019). The political legacy of entertainment TV. *American Economic Review 109*(7), 2497–2530.

Dustmann, C. and I. P. Preston (2007). Racial and economic factors in attitudes to immigration. *The B.E. Journal of Economic Analysis and Policy 7*(1), 1–41.

Dynan, K. E. (2000). Habit formation in consumer preferences: Evidence from panel data. *American Economic Review 90*(3), 391–406.

Easterlin, R. A. (2001). Income and happiness: Towards a unified theory. *The Economic Journal 111*(473), 465–484.

Ebbinghaus, B. and C. Göbel (2014). Mitgliederrückgang und Organisationsstrategien deutscher Gewerkschaften. In W. Schroeder (Ed.), *Handbuch Gewerkschaften in Deutschland*, pp. 207–239. Wiesbaden: Springer Fachmedien.

Eisenbeiss, M., R. Wilken, B. Skiera, and M. Cornelissen (2015). What makes deal-of-the-day promotions really effective? The interplay of discount and time constraint with product type. *International Journal of Research in Marketing 32*(4), 387–397.

Engelhardt-Wölfler, H., H. Trappe, and J. Dronkers (2002). Differences in family policies and the intergenerational transmission of divorce: A comparison between the former East and West Germany. *Demographic Research 6*(11), 295–324.

Engesser, S., N. Ernst, F. Esser, and F. Büchel (2017). Populism and social media: How politicians spread a fragmented ideology. *Information, Communication & Society 20*(8), 1109–1126.

Enikolopov, R., M. Petrova, and E. Zhuravskaya (2011). Media and political persuasion: Evidence from Russia. *American Economic Review 101*(7), 3253–3285.

European Environment Agency (2021). Health impacts of air pollution in Europe, 2021. https://www.eea.europa.eu/publications/air-quality-in-europe-2021/health-impacts-of-air-pollution. Accessed on September 2, 2022.

Faccini, G. and A. M. Mayda (2009). Does the welfare state affect individual attitudes toward immigrants? Evidence across countries. *The Review of Economics and Statistics 91*(2), 295–314.

Falk, A. and N. Szech (2013). Morals and markets. *Science 340*(6133), 707–711.

Farrelly, M. C., J. Nonnemaker, K. C. Davis, and A. Hussin (2009). The influence of the national truth campaign on smoking initiation. *American Journal of Preventive Medicine 36*(5), 379–384.

Federal Agency for Civic Education (2012). Umgang mit Minderheiten in der DDR. https://www.bpb.de/themen/deutschlandarchiv/126678/umgang-mit-minderheiten-in-der-ddr/. Accessed on September 2, 2022.

Federal Agency for Civic Education (2016). Zwischen Etablierung und Neuorientierung. https://www.bpb.de/themen/deutschlandarchiv/222312/zwischen-etablierung-und-neuorientierung/. Accessed on September 2, 2022.

Federal Agency for Civic Education (2017). Umweltschutz als Opposition von Kirchen und Gruppen in der späten DDR. https://www.bpb.de/themen/deutschlandarchiv/260210/umweltschutz-als-opposition-von-kirchen-und-gruppen-in-der-spaeten-ddr. Accessed on September 2, 2022.

Federal Institute for Research on Building, Urban Affairs and Spatial Development (2020). Inkar (Indikatoren und Karten zur Raum- und Stadtentwicklung). https://www.inkar.de/. Accessed on September 2, 2022.

Federal Statistical Office and the Statistical Offices of the Länder (2014). Religious affiliation. https://ergebnisse.zensus2011.de/?locale=en. Accessed on September 2, 2022.

Fehr, E. and K. Hoff (2011). Introduction: Tastes, castes and culture: The influence of society on preferences. *The Economic Journal 121*(556), F396–F412.

Fehr, E. and K. M. Schmidt (1999). A theory of fairness, competition, and cooperation. *The Quarterly Journal of Economics 114*(3), 817–868.

Festinger, L. (1954). A theory of social comparison processes. *Human Relations 7*(2), 117–140.

Förster, P. (1995). Die deutsche Frage im Bewusstsein der Bevölkerung in beiden Teilen Deutschlands. Das Zusammengehörigkeitsgefühl der Deutschen. Einstellungen junger Menschen in der DDR. In Deutscher Bundestag (Ed.), *Materialien der Enquete-Kommission 'Aufarbeitung von Geschichte und Folgen der SED-Diktatur in Deutschland'*, Volume V/2, pp. 1212–1380. Baden-Baden: Nomos Verlag.

Friedrich, W. (1990). Mentalitätswandlungen der Jugend in der DDR. *Aus Politik und Zeitgeschichte 16*(17), 25–37.

Friehe, T. and M. Mechtel (2014). Conspicuous consumption and political regimes: Evidence from East and West Germany. *European Economic Review 67*, 62–81.

Friehe, T., H. Müller, and F. Neumeier (2018). The effect of Western TV on crime: Evidence from East Germany. *European Journal of Political Economy 55*, 346 – 372.

Friehe, T., H. Müller, and F. Neumeier (2020). Media's role in the making of a democrat: Evidence from East Germany. *Journal of Comparative Economics 48*(4), 866–890.

Friehe, T. and M. Pannenberg (2020). Time preferences and political regimes: Evidence from reunified Germany. *Journal of Population Economics 33*(1), 349–387.

Frindte, W., D. Geschke, N. Haußecker, and F. Schmidtke (2016). Ein systematisierender Überblick über Entwicklungslinien der Rechtsextremismusforschung von 1990 bis 2013. In W. Frindte, D. Geschke, N. Haußecker, and F. Schmidtke (Eds.), *Rechtsextremismus und Nationalsozialistischer Untergrund. Interdisziplinäre Debatten, Befunde und Bilanzen*, pp. 25–96. Wiesbaden: Springer.

Fuhrer, J. C. (2000). Habit formation in consumption and its implications for monetary-policy models. *American Economic Review 90*(3), 367–390.

García-Valiñas, M. A., A. Macintyre, and B. Torgler (2012). Volunteering, pro-environmental attitudes and norms. *The Journal of Socio-Economics 41*(4), 455–467.

Gentzkow, M. (2006). Television and voter turnout. *The Quarterly Journal of Economics 121*(3), 931–972.

Gentzkow, M. and J. M. Shapiro (2004). Media, education and anti-Americanism in the Muslim world. *Journal of Economic Perspectives 18*(3), 117–133.

Gentzkow, M. and J. M. Shapiro (2008). Preschool television viewing and adolescent test scores: Historical evidence from the Coleman study. *The Quarterly Journal of Economics 123*(1), 279–323.

Gentzkow, M. and J. M. Shapiro (2010). What drives media slant? Evidence from U.S. daily newspapers. *Econometrica 78*(1), 35–71.

Gerbner, G. and L. Gross (1976). Living with television: The violence profile. *Journal of Communication 26*(2), 172–199.

Giuliano, P. and A. Spilimbergo (2013). Growing up in a recession. *Review of Economic Studies 81*(2), 787–817.

Gläßel, C. and K. Paula (2020). Sometimes less is more: Censorship, news falsification, and disapproval in 1989 East Germany. *American Journal of Political Science 64*(3), 682–698.

Goebel, J., M. M. Grabka, S. Liebig, M. Kroh, D. Richter, C. Schröder, and J. Schupp (2019). The German Socio-Economic Panel (SOEP). *Jahrbücher für Nationalökonomie und Statistik 239*(2), 345–360.

Goerke, L. (2021). Habit formation and wage determination. *Managerial and Decision Economics 42*(1), 61–76.

Goerke, L. and I. Hillesheim (2013). Relative consumption, working time, and trade unions. *Labour Economics 24*, 170–179.

Goerke, L., M. Pannenberg, and H. W. Ursprung (2010). A positive theory of the earnings relationship of unemployment benefits. *Public Choice 145*(1), 137–163.

Goh, T.-T., Z. Xin, and D. Jin (2019). Habit formation in social media consumption: A case of political engagement. *Behaviour & Information Technology 38*(3), 273–288.

Gómez, M. A. (2012). Equilibrium dynamics in the neoclassical growth model with habit formation and elastic labor supply. *Theoretical Economic Letters 2*(5), 465–469.

Green, M. C. (2006). Narratives and cancer communication. *Journal of Communication 56*(1), 163–183.

Grewal, D., H. Marmorstein, and A. Sharma (1996). Communicating price information through semantic cues: The moderating effects of situation and discount size. *Journal of Consumer Research 23*(2), 148–155.

Grishchenko, O. V. (2010). Internal vs. external habit formation: The relative importance for asset pricing. *Journal of Economics and Business 62*(3), 176–194.

Großmann, T. (2015). *Fernsehen, Revolution und das Ende der DDR*. Göttingen: Wallstein Verlag.

Grundmann, S. (1998). *Bevölkerungsentwicklung in Ostdeutschland: Demographische Strukturen und räumliche Wandlungsprozesse auf dem Gebiet der neuen Bundesländer (1945 bis zur Gegenwart)*. Opladen: Leske und Budrich.

Grønhøj, A. and J. Thøgersen (2009). Like father, like son? Intergenerational ttransmission of values, attitudes, and behaviours in the environmental domain. *Journal of Environmental Psychology 29*(4), 414–421.

Guiso, L., P. Sapienza, and L. Zingales (2016). Long-term persistence. *Journal of the European Economic Association 14*(6), 1401–1436.

Guo, J.-T. and A. Krause (2011). Optimal nonlinear income taxation with habit formation. *Journal of Public Economic Theory 13*(3), 463–480.

Hager, C. J. (1992). Environmentalism and democracy in the two Germanies. *German Politics 1*(1), 95–118.

Hainmueller, J., M. J. Hiscox, and Y. Margalit (2015). Do concerns about labor market competition shape attitudes toward immigration? New evidence. *Journal of International Economics 97*(1), 193–207.

Hangartner, D., E. Dinas, M. Marbach, K. Matakos, and D. Xefteris (2019). Does exposure to the refugee crisis make natives more hostile? *American Political Science Review 113*(2), 442–455.

Hannover, I. and A. Birkenstock (2005). *Familienbilder im Fernsehen: Familienbilder und Familienthemen in fiktionalen und nichtfiktionalen Fernsehsendungen*. Marl: Adolf Grimme Institut.

Hase, V., D. Mahl, M. S. Schäfer, and T. R. Keller (2021). Climate change in news media across the globe: An automated analysis of issue attention and themes in climate change coverage in 10 countries (2006–2018). *Global Environmental Change 70*, 102353.

Havranek, T., M. Rusnak, and A. Sokolova (2017). Habit formation in consumption: A meta-analysis. *European Economic Review 95*, 142–167.

Heer, B. and A. Morgenstern (2005). The labor market effects of indexing unemployment benefits to previous earnings. *Public Finance Review 33*(3), 385–402.

Heineck, G. and B. Süssmuth (2013). A different look at Lenin's legacy: Social capital and risk taking in the two Germanies. *Journal of Comparative Economics 41*(3), 789–803.

Helfferich, C., H. Klindworth, and S. Bühler (2016). *Frauen Leben. 3-Familienplanung im Lebenslauf von Frauen. Schwerpunkt: Ungewollte Schwangerschaften*. Köln: Bundeszentrale für gesundheitliche Aufklärung BZgA.

Hellofs, L. L. and R. Jacobson (1999). Market share and customers' perceptions of quality: When can firms grow their way to higher versus lower quality? *Journal of Marketing 63*(1), 16–25.

Hennighausen, T. (2015). Exposure to television and individual beliefs: Evidence from a natural experiment. *Journal of Comparative Economics 43*(4), 956–980.

Henrich, J., J. Ensminger, R. McElreath, A. Barr, C. Barrett, A. Bolyanatz, J. C. Cardenas, M. Gurven, E. Gwako, N. Henrich, C. Lesorogol, F. Marlowe, D. Tracer, and J. Ziker (2011). Markets, religion, community size, and the evolution of fairness and punishment. *Science 327*(5972), 1480–1484.

Hesse, K. R. (1990). Cross-border mass communication from West to East Germany. *European Journal of Communication 5*(2), 355–371.

Hirsch, B. and C. Schnabel (2014). What can we learn from bargaining models about union power? The decline in union power in Germany, 1992–2009. *The Manchester School 82*(3), 347–362.

Holbert, R. L., N. Kwak, and D. V. Shah (2003). Environmental concern, patterns of television viewing, and pro-environmental behaviors: Integrating models of media consumption and effects. *Journal of Broadcasting & Electronic Media 47*(2), 177–196.

Holbert, R. L., D. V. Shah, and N. Kwak (2003). Political implications of prime-time drama and sitcom use: Genres of representation and opinions concerning women's rights. *Journal of Communication 53*(1), 45–60.

Hömberg, W. (2002). *Deutschland - einig Medienland?: Erfahrungen und Analysen*. Münster: Lit Verlag.

Hornuf, L., M. O. Rieger, and S. A. Hartmann (2022). Can television reduce xenophobia? The case of East Germany. *CESifo Working Paper* No. 6632.

Hornuf, L., M. Schmitt, and E. Stenzhorn (2022). The local bias in equity crowdfunding: Behavioral anomaly or rational preference? *Journal of Economics & Management Strategy 31*(3), 693–733.

Hornuf, L. and A. Schwienbacher (2018). Market mechanisms and funding dynamics in equity crowdfunding. *Journal of Corporate Finance 50*, 556–574.

Hörzu (1981). *Listings magazine*. FUNKE Programmzeitschriften GmbH. Number 33.

Hunt, J. (2006). Staunching emigration from East Germany: Age and the determinants of migration. *Journal of the European Economic Association 4*(5), 1014–1037.

Hunter, L. M., A. Hatch, and A. Johnson (2004). Cross-national gender variation in environmental behaviors. *Social Science Quarterly 85*(3), 677–694.

Hyll, W. and L. Schneider (2013). The causal effect of watching TV on material aspirations: Evidence from the "valley of the innocent". *Journal of Economic Behavior & Organization 86*, 37–51.

Hyll, W. and L. Schneider (2018). Income comparisons and attitudes towards foreigners - Evidence from a natural experiment. *Journal of Comparative Economics 46*(2), 634–655.

Inman, J. J., A. C. Peter, and P. Raghubir (1997). Framing the deal: The role of restrictions in accentuating deal value. *Journal of Consumer Research 24*(1), 68–79.

Institut für Soziologie und Sozialpolitik an der Akademie der Wissenschaften der DDR (1987). Desire for children 1987 - Objective and subjective factors of birth development. *GESIS data archive*, ZA6869, data file version 1.0.0.

International Federation of Journalists (2019). IFJ global charter of ethics for journalists. https://www.ifj.org/who/rules-and-policy/global-charter-of-ethics-for-journalists.html. Accessed on September 2, 2022.

Ioannou, M., A. Al Ramiah, and M. Hewstone (2018). An experimental comparison of direct and indirect intergroup contact. *Journal of Experimental Social Psychology 76*, 393–403.

Jacobsen, G. D. (2011). The Al Gore effect: An inconvenient truth and voluntary carbon offsets. *Journal of Environmental Economics and Management 61*(1), 67–78.

Jalan, J. and E. Somanathan (2008). The importance of being informed: Experimental evidence on demand for environmental quality. *Journal of Development Economics 87*(1), 14–28.

Jensen, R. and E. Oster (2009). The power of TV: Cable television and women's status in India. *The Quarterly Journal of Economics 124*(3), 1057–1094.

Jiao, P., A. Veiga, and A. Walther (2020). Social media, news media and the stock market. *Journal of Economic Behavior & Organization 176*, 63–90.

Jolly, S. K. and G. M. DiGiusto (2014). Xenophobia and immigrant contact: French public attitudes toward immigration. *The Social Science Journal 51*(3), 464–473.

Jones, S. R. G. (1987). Union membership and employment dynamics. *Economics Letters 25*(2), 197–200.

Jones, S. R. G. and C. J. McKenna (1989). The effect of outsiders on union contracts. *European Economic Review 33*(8), 1567–1573.

Jones, S. R. G. and C. J. McKenna (1994). A dynamic model of union membership and employment. *Economica 61*(242), 179–189.

Joyce, N. and J. Harwood (2014). Improving intergroup attitudes through televised vicarious intergroup contact: Social cognitive processing of ingroup and outgroup information. *Communication Research 41*(5), 627–643.

Kahneman, D. and A. Tversky (1979). Prospect theory: An analysis of decision under risk. *Econometrica 47*(2), 263–291.

Katz-Gerro, T., I. Greenspan, F. Handy, and Y. Vered (2020). Environmental behavior in three countries: The role of intergenerational transmission and domains of socialization. *Journal of Environmental Psychology 71*, 101343.

Kearney, M. S. and P. B. Levine (2015). Media influences on social outcomes: The impact of MTV's 16 and pregnant on teen childbearing. *American Economic Review 105*(12), 3597–3632.

Kearney, M. S. and P. B. Levine (2019). Early childhood education by television: Lessons from Sesame Street. *American Economic Journal: Applied Economics 11*(1), 318–350.

Keefer, P. and S. Khemani (2014). Mass media and public education: The effects of access to community radio in Benin. *Journal of Development Economics 109*, 57–72.

Keele, L. J. and R. Titiunik (2015). Geographic boundaries as regression discontinuities. *Political Analysis 23*(1), 127–155.

Kennedy, M. G., A. O'Leary, V. Beck, K. Pollard, and P. Simpson (2004). Increases in calls to the CDC national STD and AIDS hotline following AIDS-related episodes in a soap opera. *Journal of Communication 54*(2), 287–301.

Kern, H. L. (2011). Foreign media and protest diffusion in authoritarian regimes: The case of the 1989 East German revolution. *Comparative Political Studies 44*(9), 1179–1205.

Kern, H. L. and J. Hainmueller (2009). Opium for the masses: How foreign media can stabilize authoritarian regimes. *Political Analysis 17*(4), 377–399.

Kidd, D. P. and A. J. Oswald (1987). A dynamic model of trade union behaviour. *Economica 54*(215), 355–365.

Klier, F. (1994). Die DDR-Deutschen und die Fremden. In H. Eichel (Ed.), *Hass & Gewalt - halt!*, pp. 105–115. Frankfurt am Main: Brovi-Konzepte.

Kochanowski, K., S. Trültzsch, and R. Viehoff (2012). An evening with friends and enemies: Political indoctrination in popular East German family series. In *Popular Television in Eastern Europe During and Since Socialism*, pp. 93–114. Routledge.

Koehne, S. and M. Kuhn (2015). Optimal taxation in a habit formation economy. *Journal of Public Economics 122*, 31–39.

Kotelmann, J. and L. Mikos (1981). *Frühjahrsputz und Südseezauber: Die Darstellung der Frau in der Fernsehwerbung und das Bewusstsein von Zuschauerinnen*. Baden-Baden: E. Baur.

Kraft, K. (2018). Productivity and distribution effects of codetermination in an efficient bargaining model. *International Journal of Industrial Organization 59*, 458–485.

Kranz, S. (2005). Women's role in the German Democratic Republic and the state's policy toward women. *Journal of International Women's Studies 7*(1), 69–83.

Küchenhoff, E. (1975). *Die Darstellung der Frau und die Behandlung von Frauenfragen im Fernsehen*. Stuttgart: Kohlhammer.

Kuschel, F. (2016). *Schwarzhörer, Schwarzseher und heimliche Leser: Die DDR und die Westmedien*. Göttingen: Wallstein Verlag.

La Ferrara, E. (2016). Mass media and social change: Can we use television to fight poverty? *Journal of the European Economic Association 14*(4), 791–827.

La Ferrara, E., A. Chong, and S. Duryea (2012). Soap operas and fertility: Evidence from Brazil. *American Economic Journal: Applied Economics 4*(4), 1–31.

Lavidge, R. J. and G. A. Steiner (1961). A model for predictive measurements of advertising effectiveness. *Journal of Marketing 25*(6), 59–62.

Lesch, H. (2004). Trade union density in international comparison. *CESifo Forum 5*(4), 12–18.

Lewis, P. (1989). The unemployed and trade union membership. *Industrial Relations Journal 20*(4), 271–279.

Lienemann, B. A. and H. T. Stopp (2013). The association between media exposure of interracial relationships and attitudes toward interracial relationships. *Journal of Applied Social Psychology 43*(2), E398–E415.

Lindbeck, A. and D. J. Snower (1987). Union activity, unemployment persistence and wage-employment ratchets. *European Economic Review 31*(1), 157–167.

Lockwood, B. and A. Manning (1989). Dynamic wage-employment bargaining with employment adjustment costs. *The Economic Journal 99*(398), 1143–1158.

Loewenstein, G., T. O'Donoghue, and M. Rabin (2003). Projection bias in predicting future utility. *The Quarterly Journal of Economics 118*(4), 1209–1248.

Luttmer, E. F. P. (2005). Neighbors as negatives: Relative earnings and well-being. *The Quarterly Journal of Economics 120*(3), 963–1002.

Macinnis, D. J., A. G. Rao, and A. M. Weiss (2002). Assessing when increased media weight of real-world advertisements helps sales. *Journal of Marketing Research 39*(4), 391–407.

Madajewicz, M., A. Pfaff, A. van Geen, J. Graziano, I. Hussein, H. Momotaj, R. Sylvi, and H. Ahsan (2007). Can information alone change behavior? Response to arsenic contamination of groundwater in Bangladesh. *Journal of Development Economics 84*(2), 731–754.

Madsen, J. and M. Niessner (2019). Is investor attention for sale? The role of advertising in financial markets. *Journal of Accounting Research 57*(3), 763–795.

Mauleon, A., V. Vannetelbosch, and C. Vergari (2014). Union's relative concerns and strikes in wage bargaining. *Bulletin of Economic Research 66*(4), 374–383.

Mayda, A. M. (2006). Who is against immigration? A cross-country investigation of individual attitudes toward immigrants. *The Review of Economics and Statistics 88*(3), 510–530.

McBride, M. (2001). Relative-income effects on subjective well-being in the cross-section. *Journal of Economic Behavior & Organization 45*(3), 251–278.

McDonald, I. M. and R. M. Solow (1981). Wage bargaining and employment. *American Economic Review 71*(5), 896–908.

McDonald, I. M. and R. M. Solow (1984). Union wage policies: Reply. *American Economic Review 74*(4), 759–761.

Meltzer, C. E., C. Schemer, H. G. Boomgaarden, J. Strömbäck, E. Jacob-Moritz, N. Theorin, and T. Heidenreich (2017). *Media effects on attitudes toward migration and mobility in the EU: A comprehensive literature review*. Mainz: Compas/Reminder.

Mikami, S., T. Takeshita, and M. Kawabata (1999). Influence of the mass media on the public awareness of global environmental issues in Japan. *Asian Geographer 18*(1–2), 87–97.

Mitteldeutscher Rundfunk (2019). Umweltsünden in der DDR "Bitteres aus Bitterfeld". https://www.mdr.de/geschichte/umweltverschmutzung-ddr-bitterfeld100.html. Accessed on September 2, 2022.

Mitteldeutscher Rundfunk (2022). Studium in der DDR. https://www.mdr.de/geschichte/ddr/alltag/erziehung-bildung/studium-studieren-ddr-100.html. Accessed on September 2, 2022.

Mocan, N. and C. Raschke (2016). Economic well-being and anti-semitic, xenophobic, and racist attitudes in Germany. *European Journal of Law and Economics 41*(1), 1–63.

Modesto, L. and J. P. Thomas (2001). An analysis of labour adjustment costs in unionized economies. *Labour Economics 8*(4), 475–501.

Moreno, L. and D. Rodríguez (2011). Markups, bargaining power and offshoring: An empirical assessment. *The World Economy 34*(9), 1593–1627.

Müller, K. and C. Schwarz (2020). From hashtag to hate crime: Twitter and anti-minority sentiment. *SSRN* No. 3149103.

Müller, R. (1990). From public to private: Television in the Federal Republic of Germany. *New German Critique 50*, 41–55.

Müller, S. (2000). *Von der Mangel- zur Marktwirtschaft: Analyse der Konsumbedingungen und des Konsumverhaltens in der DDR*. Leipzig: IM.

Newman, N., R. Fletcher, C. Robertson, K. Eddy, and R. Nielsen (2022). *Reuters Institute digital news report 2022*. Reuters Institute for the Study of Journalism.

Ng, Y.-K. (1987). Relative-income effects and the appropriate level of public expenditure. *Oxford Economic Papers 39*(2), 293–300.

Nickell, S. J. and M. Andrews (1983). Unions, real wages and employment in Britain 1951-79. *Oxford Economic Papers 35*, 183–206.

OECD (2019a). OECD family database: Marriage and divorce rates. http://www.oecd.org/els/family/database.htm. Accessed on September 2, 2022.

OECD (2019b). OECD family database: Fertility rates. http://www.oecd.org/els/family/database.htm. Accessed on September 2, 2022.

OECD (2019c). OECD family database. https://www.oecd.org/els/family/database.htm, OECD Family Database,. Accessed on September 2, 2022.

OECD (2019d). *Negotiating our way up - Collective bargaining in a world of work*. Paris: OECD Publishing.

Oehmig, R. (2017). *"Besorgt mal Filme!": Der internationale Programmhandel des DDR-Fernsehens*. Göttingen: Wallstein Verlag.

Olken, B. A. (2009). Do television and radio destroy social capital? Evidence from Indonesian villages. *American Economic Journal: Applied Economics 1*(4), 1–33.

Ortiz, M. and J. Harwood (2007). A social cognitive theory approach to the effects of mediated intergroup contact on intergroup attitudes. *Journal of Broadcasting & Electronic Media 51*(4), 615–631.

Oswald, A. J. (1979). Wage determination in an economy with many trade unions. *Oxford Economic Papers 31*(3), 369–385.

Oswald, A. J. (1983). Altruism, jealousy and the theory of optimal non-linear taxation. *Journal of Public Economics 20*(1), 77–87.

Oswald, A. J. (1985). The economic theory of trade unions: An introductory survey. *The Scandinavian Journal of Economics 87*(2), 160–193.

Pariser, E. (2011). *The filter bubble: What the Internet is hiding from you*. UK: Penguin Press.

Pencavel, J. H. (1991). *Labor markets under trade unionism: Employment, wages, and hours*. Oxford: Blackwell.

Pettigrew, T. F. and L. R. Tropp (2006). A meta-analytic test of intergroup contact theory. *Journal of Personality and Social Psychology 90*(5), 751–783.

Pettigrew, T. F., L. R. Tropp, U. Wagner, and O. Christ (2011). Recent advances in intergroup contact theory. *International Journal of Intercultural Relations 35*(3), 271–280.

Petty, R. E. and J. T. Cacioppo (1986). The elaboration likelihood model of persuasion. In R. E. Petty and J. T. Cacioppo (Eds.), *Communication and persuasion: Central and peripheral routes to attitude change*, pp. 1–24. New York: Springer.

Pienaar, E. F., D. K. Lew, and K. Wallmo (2015). The importance of survey content: Testing for the context dependency of the new ecological paradigm scale. *Social Science Research 51*, 338–349.

Pollak, R. A. (1970). Habit formation and dynamic demand functions. *Journal of Political Economy 78*(4), 745–763.

Pollak, R. A. (1976). Interdependent preferences. *American Economic Review 66*(3), 309–320.

Pollak, R. A. (1978). Endogenous tastes in demand and welfare analysis. *American Economic Review 68*(2), 374–379.

Price, J. and G. B. Dahl (2012). Using natural experiments to study the impact of media on the family. *Family Relations 61*(3), 363–373.

Qin, C., J. Xu, G. Wong-Parodi, and L. Xue (2020). Change in public concern and responsive behaviors toward air pollution under the dome. *Risk Analysis 40*(10), 1983–2001.

Raaum, O. (1986). Wage formation in a two-sector open economy with two strong unions. *Louvain Economic Review 52*(3–4), 283–311.

Rosenfeld, R. A., H. Trappe, and J. C. Gornick (2004). Gender and work in Germany: Before and after reunification. *Annual Review of Sociology 30*, 103–124.

Roupakias, S. and S. Dimou (2021). Immigration, diversity and institutions. *Kyklos 74*(3), 396–416.

Ruiz-Verdú, P. (2007). The economics of union organization: Efficiency, information and profitability. *Labour Economics 14*(5), 848–868.

Sampei, Y. and M. Aoyagi-Usui (2009). Mass-media coverage, its influence on public awareness of climate-change issues, and implications for Japan's national campaign to reduce greenhouse gas emissions. *Global Environmental Change 19*(2), 203–212.

Sanfey, P. J. (1995). Insiders and outsiders in union models. *Journal of Economic Surveys 9*(3), 255–284.

Santilli, P. C. (1983). The informative and persuasive functions of advertising: A moral appraisal. *Journal of Business Ethics 2*(1), 27–33.

Schaller, J. (2013). For richer, if not for poorer? Marriage and divorce over the business cycle. *Journal of Population Economics 26*(3), 1007–1033.

Scheve, K. F. and M. J. Slaughter (2001). Labor-market competition and individual preferences over immigration policy. *The Review of Economics and Statistics 83*(1), 133–145.

Schiappa, E., P. B. Gregg, and D. E. Hewes (2005). The parasocial contact hypothesis. *Communication Monographs 72*(1), 92–115.

Schindler, D. and M. Westcott (2020). Shocking racial attitudes: Black G.I.s in Europe. *The Review of Economic Studies 88*(1), 489–520.

Schmidt, A., A. Ivanova, and M. S. Schäfer (2013). Media attention for climate change around the world: A comparative analysis of newspaper coverage in 27 countries. *Global Environmental Change 23*(5), 1233–1248.

Schmidt, P. and S. Weick (1998). Starke Zunahme von Kontakten und Ehen zwischen Deutschen und Ausländern. Studie zur Zuwanderung, Einbürgerung und sozialen Integration von Migranten. *Informationsdienst Soziale Indikatoren 19*, 1–5.

Schnabel, C. (2003). Determinants of trade union membership. In J. T. Addison and C. Schnabel (Eds.), *International handbook of trade unions*, pp. 13–43. Cheltenham: Edward Elgar Publishing.

Shanahan, J., M. Morgan, and M. Stenbjerre (1997). Green or brown? Television and the cultivation of environmental concern. *Journal of Broadcasting & Electronic Media 41*(3), 305–323.

Signorielli, N. (1990). Children, television, and gender roles: Messages and impact. *Journal of Adolescent Health Care 11*(1), 50–58.

Siikanen, M., K. Baltakys, J. Kanniainen, R. Vatrapu, R. Mukkamala, and A. Hussain (2018). Facebook drives behavior of passive households in stock markets. *Finance Research Letters 27*, 208–213.

Slavtchev, V. and M. Wyrwich (2017). TV and entrepreneurship. *IWH Discussion Papers* No. 17.

Sobotka, T., V. Skirbekk, and D. Philipov (2011). Economic recession and fertility in the developed world. *Population and Development Review 37*(2), 267–306.

Society of Professional Journalists (2014). SPJ code of ethics. https://www.spj.org/ethicscode.asp. Accessed on September 2, 2022.

Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics 87*(3), 355–374.

Staatliche Zentralverwaltung für Statistik (1990). *Statistisches Jahrbuch der Deutschen Demokratischen Republik*. Staatsverlag der Deutschen Demokratischen Republik.

Steinmayr, A. (2021). Contact versus exposure: Refugee presence and voting for the far right. *Review of Economics and Statistics 103*(2), 310–327.

Stiehler, H.-J. (1999). Das Tal der Ahnungslosen. Erforschung der TV-Rezeption zur Zeit der DDR. In W. Klingler, G. Roters, and M. Gerhards (Eds.), *Medienrezeption seit 1954: Forschungsbilanz und Forschungsperspektiven* (2. ed.)., pp. 193–207. Baden-Baden: Nomos.

Stiehler, H.-J. (2001). *Leben ohne Westfernsehen: Studien zur Medienwirkung und Mediennutzung in der Region Dresden in den 80er Jahren*. Leipzig: Leipziger Universitätsverlag.

Stinglwagner, W. (1999). Die Energiepolitik der DDR und ihre wirtschaftlichen und ökologischen Folgen. In E. Kuhrt, H. F. Buck, and G. Holzweißig (Eds.), *Die Endzeit der DDR-Wirtschaft – Analysen zur Wirtschafts-, Sozial- und Umweltpolitik*, pp. 189–223. Opladen: Leske und Budrich.

Stoll, J. (2022a). Number of TV households worldwide 2010-2026. https://www.statista.com/statistics/268695/number-of-tv-households-worldwide/. Accessed on September 2, 2022.

Stoll, J. (2022b). Daily television viewing time in European countries 2020. https://www.statista.com/statistics/422719/tv-daily-viewing-time-europe/. Accessed on September 2, 2022.

Stone, T. (1990). Wanted: A kindler, gentler Germany. *The New York Times*.

Strifler, M. and T. Beissinger (2016). Fairness considerations in labor union wage setting – A theoretical analysis. *Scottish Journal of Political Economy 63*(3), 303–330.

Stroppe, A.-K. and N. Jungmann (2022). Stadt, Land, Wahl: Welchen Einfluss hat der Wohnort auf die Wahlentscheidung bei der Bundestagswahl 2021? *easy social sciences 67*, 49–60.

Strömberg, D. (2004). Radio's impact on public spending. *The Quarterly Journal of Economics 119*(1), 189–221.

Taschereau-Dumouchel, M. (2020). The union threat. *The Review of Economic Studies 87*(6), 2859–2892.

The Federal Returning Officer (2019). Bundestag election 1969. https://www.bundeswahlleiter.de/en/bundestagswahlen/1969.html. Accessed on September 2, 2022.

Thomas, B. (2003). What the world's poor watch on TV. *World Press Review 50*(3).

Tsai, Y.-L. and E. Honka (2021). Informational and noninformational advertising content. *Marketing Science 40*(6), 1030–1058.

Tu, M., B. Zhang, J. Xu, and F. Lu (2020). Mass media, information and demand for environmental quality: Evidence from the "under the dome". *Journal of Development Economics 143*, 102402.

Tuomala, M. and S. Tenhunen (2013). On the design of an optimal non-linear tax/pension system with habit formation. *International Tax and Public Finance 20*(3), 485–512.

Ulph, A. and D. Ulph (1989). Union bargaining: A survey of recent work. In D. Sapsford and Z. Tzannatos (Eds.), *Current issues in labour economics*, pp. 86–125. London: Macmillan.

Vijlbrief, H. and R. van de Wijngaert (1995). Unemployment insurance policy and union wage formation. *Labour 9*(2), 233–251.

Visser, J. (2006). Union membership statistics in 24 countries. *Monthly Labor Review 129*(1), 38–49.

Voigtländer, N. and H.-J. Voth (2012). Persecution perpetuated: The medieval origins of anti-semitic violence in Nazi Germany. *The Quarterly Journal of Economics 127*(3), 1339–1392.

Voigtländer, N. and H.-J. Voth (2015). Nazi indoctrination and anti-semitic beliefs in Germany. *Proceedings of the National Academy of Sciences 112*(26), 7931–7936.

Vu, H. T., Y. Liu, and D. V. Tran (2019). Nationalizing a global phenomenon: A study of how the press in 45 countries and territories portrays climate change. *Global Environmental Change 58*, 101942.

Watts, M. W. (1996). Political xenophobia in the transition from socialism: Threat, racism and ideology among East German youth. *Political Psychology 17*(1), 97–126.

Weber, T. (2011). Exit, voice, and cyclicality: A micrologic of midterm effects in European Parliament elections. *American Journal of Political Science 55*(4), 907–922.

Weiderer, M. and C. Faltenbacher (1994). Das Frauen-und Männerbild in Familienserien des deutschen Fernsehens: Inhaltsanalytische Untersuchung und Folgerungen für die Pädagogik. *Medien und Erziehung 38*, 208–214.

Welfens, M. J. (1993). *Umweltprobleme und Umweltpolitik in Mittel- und Osteuropa: Ökonomie, Ökologie und Systemwandel*. Heidelberg: Physica-Verlag.

Wensierski, P. (1986). *Von oben nach unten wächst gar nichts: Umwelt Zerstörung und Protest in der DDR*. Frankfurt am Main: Fischer-Taschenbuch-Verlag.

Wesleyan Media Project (2020). Presidential general election ad spending tops $ 1.5 billion. https://mediaproject.wesleyan.edu/releases-102920,. Accessed on September 2, 2022.

Wojcieszak, M. and R. Azrout (2016). I saw you in the news: Mediated and direct intergroup contact improve outgroup attitudes. *Journal of Communication 66*(6), 1032–1060.

Wolff, F. (2002). *Glasnost erst kurz vor Sendeschluss: Die letzten Jahre des DDR-Fernsehens: (1985 - 1989/90)*. Köln: Böhlau.

Wolle, S. (2013). *Die heile Welt der Diktatur: Alltag und Herrschaft in der DDR 1971–1989* (4 ed.). Berlin: Links.

Wylie, C. (2019). *Mindf*ck: Inside Cambridge Analytica's plot to break the world*. London: Profile Books.

Yu, Y., W. Duan, and Q. Cao (2013). The impact of social and conventional media on firm equity value: A sentiment analysis approach. *Decision Support Systems 55*(4), 919–926.

Zentralinstitut für Jugendforschung (1989). Political climate and social conditions in the GDR 1988/89. *GESIS data archive*, ZA6008, data file version 1.0.0.