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GLOBALIZATION, FERTILITY AND MARITAL BEHAVIOR IN A LOWEST-LOW FERTILITY SETTING

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ABSTRACT

Using longitudinal data from the German Socio-Economic Panel, we analyze the effects of exposure to globalization on the fertility and marital behavior in Germany, until recently a lowest-low fertility setting. We find that exposure to greater import competition from Eastern Europe led to worse labor market outcomes and lower fertility rates. In contrast, workers in industries that benefited from increased exports had better employment prospects and higher fertility. These effects are driven by low-educated, married men, and full-time workers and reflect changes in the likelihood of having any child (extensive margin). While there is evidence of some fertility postponement, we find significant effects on completed fertility. There is instead little evidence of any significant impact on marital behavior.

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An online appendix is available at http://www.nber.org/data-appendix/w30119

1 Introduction

Over recent decades, major concerns about the growing inequality in labor market outcomes (employment opportunities and earnings) have arisen within advanced economies (Autor, 2014). Many studies document how trade with China and other emerging economies have contributed to the rise in earnings inequality in the Western world (see Autor et al. (2016) for a review of the evidence). The decline in marriage and fertility rates in many developed countries has also fostered a voluminous research debate and increasing policy attention (Stevenson and Wolfers, 2007; Kohler et al., 2002). Several studies have analyzed the possible relationship between labor demand shocks and fertility choices. Wilson (1996) and Wilson et al. (1986) highlight the role played by job losses, and in particular by the secular decline of manufacturing, in reshaping family structure. More recently, Autor et al. (2019) document how the negative impacts of labor market shocks induced by increasing import competition from China have affected the marriage-market value of men, and in turn marriage and fertility rates in the US. In a different setting, Keller and Utar (2022) find instead that marriage and fertility rates increased among Danish female workers more exposed to fierce Chinese competition.

In spite of this recent work, we still know relatively little about how these relationships hold in other developed countries exposed to different population dynamics and different trade-induced labor market shifts. The main goal of this paper is to study how the labor market shocks driven by trade with Eastern Europe and China have affected fertility and marital behaviors in Germany, a country which was until recently in a "lowest-low" fertility setting (Kohler et al., 2002; Billari and Kohler, 2004; Haub, 2012; Anderson and Kohler, 2015).

Germany provides an interesting case study, since trade flows with Eastern Europe and, to a lesser extent, China have increased dramatically in the 2000s, and previous research has shown that the effects on the labor market outcomes have been different from those observed in the US (Dauth et al., 2014, 2017). Furthermore, over the period under consideration (1991-2018), Germany had one of the lowest total fertility rates in Europe, dipping as low as 1.2, but had stabilized around 1.35 by the late 2000s (Haub, 2012).

In this paper, we investigate how labor demand shocks stemming from rising exposure to trade competition can influence family choices in Germany. We use longitudinal data at the

individual-level from the German Socio-Economic Panel (SOEP), which allows us to investigate the labor market dynamics underlying the relationship between trade integration and family choices. We focus on the variation in exposure to trade between Germany and Eastern Europe, which is quantitatively more important than trade with China, as shown by Dauth et al. (2014). To identify trade effects, we rely on previous works by, e.g., Autor et al. (2019) and Dauth et al. (2014, 2017), who, respectively, use trade flows with other high-income countries as instruments for the trade flows to the US and Germany. Differently from Autor et al. (2019), we exploit individual-level variation from our longitudinal data on German individuals. We perform a short-panel analysis that captures the effects of year-to-year changes in exposure to trade on fertility and marital outcomes. Keller and Utar (2022) also use a yearly analysis when exploiting a quasi-experimental design based on the effects on Denmark of the textile trade liberalization as China benefited from the removal of textile quotas by entering the WTO. In their economy-wide empirical analysis Keller and Utar (2022) adopt a long-difference (2009-1999) specification with individual-level data exploring variation in the exposure to Chinese imports. Our economy-wide yearly analysis identifies both import and export shocks between Germany and Eastern Europe, whereas only the import shock was relevant to the Denmark-China case.

Our identification strategy consists in an instrumental variable (IV) approach that leverages variation in trade between China and Eastern Europe and other countries. We closely follow the worker-level analysis used by Dauth et al. (2014) and Huber and Winkler (2019) to analyze the impact of trade on labor market outcomes in Germany, and construct an instrument based on the initial industry of employment of the individual and on the variation in exposure to trade within industries over time. By using the initial industry of employment to assign trade exposure, we mitigate the selection bias due to movement of workers across industries in response to trade shocks. Our specification include occupation-by-year fixed effects, which account for occupation-specific shocks (e.g., technological change) that may be correlated with trade exposure and with the outcomes of interest.

Consistent with previous evidence for Germany (Dauth et al., 2014; Huber and Winkler, 2019), we find that both import and export shocks have significant effects on labor market outcomes and that they operate in opposite directions. Greater import competition lowers wages, hours worked and the likelihood of being employed, whereas greater export opportunities yield positive effects

on labor market outcomes. On net, the positive effects of export exposure more than offset the negative ones of import competition. The labor market impacts are mostly driven by the rising trade relationship between Germany and Eastern Europe. In line with previous studies, we also find that workers in Germany were less affected by trade with China.

The import and export effects on labor market outcomes are concentrated among low-educated individuals and driven by full-time employees. This evidence accords well with the prediction of theoretical frameworks where different types of low-skill labor cannot easily move across industries, and hence are affected by industry-specific import competition and rising export opportunities. In the analysis by gender, we find that the labor market effects are also concentrated on men, whereas the effects on women become smaller and less precisely estimated. These patterns are in line with the evidence for the US from Autor et al. (2019) highlighting negative gender-specific employment effects of imports shocks.

Our findings point to significant effects of trade exposure on fertility behavior. Consistent with the evidence on labor market outcomes, the impact varies with exposure to import competition or export opportunities, and with the education level of the individual. While we detect non-significant effects on marital behavior (i.e., marriage, divorce, and cohabitation), the average change in imports from Eastern Europe through the period (1991–2018) decreased fertility by 1.6 percentage points. The effects are concentrated among low-educated individuals and men (-1.8 percentage points) and driven by changes in marital fertility, while we find no evidence of significant effects on nonmarital fertility. Exposure to imports led to a 1.5 percentage points reduction on the extensive margin (i.e., the probability of having a child), while we do not find significant impacts on the probability of having more than one child (intensive margin). Although there is some evidence of a fertility postponement, we show that exposure to import competition had significant negative effects on completed fertility. These results are consistent with recent evidence documenting the relationship between uncertainty and fertility decisions (Orsal and Goldstein, 2010; Comolli, 2017). These negative fertility effects are partly offset by exposure to greater exports to Eastern Europe. Our estimates reveal that the average change in exposure to exports during our sample period led to a 1.1 percentage points increase in the likelihood of having a child, although the effect is precisely estimated only when focusing on low-educated individuals. The beneficial effects of exports on fertility were again concentrated in these groups and driven

by married individuals. Similarly to what found for imports, the results on export exposure reflect the increase in the likelihood of having any child (i.e., the extensive margin). Increased export exposure led to a significant rise in completed fertility, offsetting the adverse impact of import competition. Compared to situations where only import shocks matter (Autor et al., 2019; Keller and Utar, 2022), our results from Germany suggest a more nuanced role of trade-induced labor market shifts in family choices.

The findings are robust to a battery of sensitivity checks. We confirm a negative effect of import exposure and a positive impact of export exposure on fertility when using exposure to trade flows at the regional level. Furthermore, our results are stable when excluding the years after 2008, when trade patterns and labor market outcomes were affected by the Great Recession. We then conduct a falsification test using lagged data for all our outcomes of interest. Reassuringly, we find no evidence of significant effects of current trade exposure, thereby supporting a causal interpretation of our main results. We also show that the results hold to the inclusion of region-by-year fixed effects.

Our paper speaks to a growing literature on the impact of labor demand shocks on life-course choices (Autor et al., 2019; Keller and Utar, 2022; Black et al., 2013; Ananat et al., 2013; Currie and Schwandt, 2014; Kearney and Wilson, 2018; Schaller, 2016; Lindo, 2010; Anelli et al., 2021). In particular, our work is closely related to two studies on the labor market effects of exposure to trade using German data, i.e., Dauth et al. (2014) and Huber and Winkler (2019). Dauth et al. (2014) find that the unprecedented rise in trade between Germany and the "East" (Eastern Europe and China) between 1988 and 2008 caused substantial job losses in import-competing industries, whereas regions specialized in export-oriented industries had even stronger employment gains. The authors find that most of these effects are driven by the trade with Eastern European countries. Moreover, using individual-level data, they show that trade overall had a stabilizing effect on employment relationship. Huber and Winkler (2019) examine the role of risk sharing between partners in mitigating the distributional effects of international trade. Their findings suggest that risk sharing substantially reduced the inequality-increasing effect of trade. While our identification strategy is closely related to the one adopted in these previous studies, Keller and Utar (2022) is, to the best of our knowledge, the only study that employs longitudinal data at the individual level to analyze how trade liberalization affected fertility and family

choices. They use micro data on Danish firms and workers, and find that worse labor market opportunities due to Chinese import competition led to higher parental leave taking, higher fertility, more marriages and fewer divorces. This pro-family shift is driven by women in their late thirties, and the authors highlight the role of the biological clock in explaining the findings.[1]

Our analysis and results complement these recent papers, by providing evidence from a low-fertility setting where the labor market effects of trade shocks have been shown to be different compared to those observed in the US or in other advanced economies. Overall, we find that globalization had a small negative effect on fertility, as the negative impact of import competition more than offsets the positive contribution of greater export opportunities.

Our results on the import effects are different from those obtained by Keller and Utar (2022) in Denmark, who find that greater import competition led to a "return" to the family (e.g., higher fertility). As explained above, differences in the empirical strategy (i.e., they use a long-difference specification) might be behind this divergence. Differences in family-oriented policies, parental leaves and subsidies for childcare between Germany and Denmark during the period under investigation (Seeleib-Kaiser and Toivonen, 2011; Ziefle and Gangl, 2014; Apps and Rees, 2004) can also explain the different results.

We also find no evidence of significant effects on marital behavior, although there is some evidence that imports led to a decline in divorce among women. The lack of significant effects on marital behavior contrasts with Autor et al. (2019), who find negative effects of trade exposure on marriage rates, but is consistent with Kearney and Wilson (2018). We instead find a decreasing effect of import competition on cohabitation, although not statistically significant. These differences are likely to be explained by social norms prevalent in a context like Germany characterized by relatively low marriage rates (Adler, 1997).

Our results inform the public debate on fertility rates in "lowest-low -fertility" settings such as Germany during the period under investigation (Kohler et al., 2002). The effects of labor demand shocks on fertility behavior should not be neglected. Policies tackling the demographic deficit by

[1]Our work relates to two other papers that investigate the relationship between trade and fertility choices at a more aggregate level. Bignon and Garcia-Penalosa (2018) find that fertility increased in French regions more exposed to protectionism in the agricultural sector during the 19th century. The mechanism behind their result is different from ours and is based on the quantity-quality trade-off (Galor and Weil, 2000): trade protection in the agricultural sector weakened incentives to invest in education (quality), and hence led to have more children (quantity). Do et al. (2016) show that countries with a comparative advantage in female-intensive sectors (and hence a higher female-to-male wage ratio, which raises the opportunity costs of having children) exhibit lower fertility rates.

extending parental leave or increasing child allowances may mitigate the adverse demographic impact of labor demand shocks.

The remainder of this paper is structured as follows. Section 2 provides the theoretical and empirical background and the main hypotheses of this study. Section 3 describes the empirical strategy. We present the data in Section 4. In Section 5, we report our main results, and provide a set of robustness checks and heterogeneity analyses. Concluding remarks are in Section 6.

2 Theoretical Framework

Labor demand shifts (e.g., due to exposure to trade shocks) can influence fertility choices through changes in income and in the opportunity costs of having children. Neoclassical models of fertility suggest that since children are not easily substitutable, changes in income or economic opportunities will mostly result in income effects on fertility decisions. The prediction is that as family income rises, fertility should increase (see Becker (1960); and Doepke (2015) for a recent review). However, the trade-off in parents' preferences over quantity and quality of children (as proxied by investments in each child at a given price) may weaken the relationship between income and fertility. Furthermore, previous studies show that improved economic opportunities may have different effects by gender. Given the monetary and time costs associated with fertility, labor market improvements may also lead to a fertility decline as the opportunity cost of having children increases. Women may be more responsive than men to changes in these opportunity costs because of the traditional division of chores within the household. As this brief discussion suggests, labor demand shocks may have a negative or a positive impact on fertility, depending on the strength of income and substitution effects.

The impact on fertility of greater exposure to international trade, going through labor demand, is thus uncertain and is ultimately an empirical question. Furthermore, the fertility elasticity with respect to demand shocks may be very different in low-fertility settings (Kohler et al., 2002). In fact, Billari and Kohler (2004) highlight how the emergence of lowest-low fertility during the 1990s changed significantly the relationship between traditional determinants of fertility and fertility outcomes.

In a similar vein, it is not clear how trade integration should alter marriage decisions. Worse

economic opportunities for men may lower their value on the marriage market, and hence can have a negative impact on marriage rates (Autor et al., 2019; Anelli et al., 2021). At the same time, declined opportunities for women could result in lower opportunity costs of family life and induce women to specialize in household activities within more traditional societies. However, recent research suggests that in more modern societies family formation may be less sensitive to economic conditions, since the share of women specializing in domestic activities is decreasing and more responsive to social norms (Kearney and Wilson, 2018). Again, the effects of trade on marriage may be very different in a country like Germany, where the importance of marriage has been declining over the last decades, particularly in East Germany (Klärner, 2015).

The effects of trade-induced labor market shocks on fertility choices and marital status can differ substantially across gender and education. Men are expected to be more affected than women because they are employed in more tradable sectors. This hypothesis is supported by the evidence showing that men suffered larger negative consequences of labor demand shocks (rising import competition and automation) compared to women (Autor et al., 2019; Kearney and Wilson, 2018; Anelli et al., 2021). These changes in the relative market opportunities of men and women may have implications for fertility decisions (Ananat et al., 2013; Kearney and Wilson, 2018; Schaller, 2016; Shenhav, 2020). For instance, consistent with the prediction of neoclassical economic theory, Schaller (2016) shows that improvements in men's labor market conditions are associated with increases in fertility, whereas improvements in women's labor market conditions have a fertility-decreasing impact (see also Autor et al. (2019); and Gaddis and Pieters (2017)). As for marriage, the neoclassical marriage models predict that as the earning differential between men and women goes down, marriage rates may become less prevalent (Becker and Lewis, 1973; Bertrand et al., 2015, 2016). In their study on Denmark, Keller and Utar (2022) find that increased exposure to competition from Chinese products has deteriorated the labor market outcomes of female workers (relative to men), and raised marriage and fertility rates, thus corroborating the predictions of the Becker and Lewis (1973) theory. Previous studies suggest that the labor market consequences of trade exposure should be greater for men (Autor et al., 2019). Assuming that children are normal goods, fertility should move with the income effects. Gender-specific shocks may also affect the likelihood of being in a stable relationship (marriage or cohabitation). The decline in the relative economic stature of men may lead to a reduction in marriage (Anelli et al.,

2021; Dorn et al., 2019). However, marriage patterns have been shown to be importantly shaped by context and social norms (Kearney and Wilson, 2018; Bertrand et al., 2016). Furthermore, recent literature on worker-level trade adjustment highlights the role of gender differences in the market versus family choice in determining adjustment costs. Keller and Utar (2022) find that labor demand shocks may result in significant long-run gender inequality, with children penalizing women more and with differential effects along the skill distribution.

The labor market effects of exposure to international trade are likely to vary with the skill level of workers, as suggested by both factor proportions (Heckscher-Ohlin and specific factors) and firm-level theories of trade (Adao et al., 2020; Kim and Vogel, 2020; Helpman, 2017; Wood, 2018). If low-skilled workers are more 'specific' to an industry than high-skilled workers (e.g., because of less general knowledge or human capital that could be used in different industries), they should be more affected by industry-specific trade shocks. We thus expect significant heterogeneity by education in the impacts of trade on demographic outcomes through the labor market, with the low-skilled workers being more affected by trade shocks than the high-skilled ones.

3 Empirical Strategy

Previous studies analyzing the impact of trade largely rely on measures of geographical exposure to trade, instrumenting imports and exports exposure with a Bartik instrument that uses the initial industry distribution of employment across regions to build a measure of regional exposure to import and export shocks. While in the Appendix we present results obtained using the regional exposure to imports and exports, our baseline specification exploits the longitudinal nature of the data relying on the variation in industry exposure to trade over time (see also Huber and Winkler (2019)). We use a short-run panel approach relating year-to-year changes in trade exposure to changes in labor market, fertility and marital outcomes. To conduct this analysis, we rely on an unbalanced panel of workers observed from 1991 to 2018. To construct our measure of trade exposure, we follow Dauth et al. (2014) and compute the degree to which a 2-digit industry is directly exposed to import competition and export expansions.[2] Both the the export and the

[2]This is a limitation of our data, particularly compared to other studies in the literature that could rely on employee-employer datasets and more granular industry classifications. Unfortunately, the SOEP data does not include narrower industry definitions.

import dimensions have been shown to be relevant to the German setting. We thus estimate the effects of both import and export exposures on fertility and other family life choices. We assign to each individual the exposure to trade that is associated with the initial industry the worker was observed in our sample. To mitigate the concerns that the rising importance of trade with Eastern Europe and China in the 1990s and most notably in the early 2000s – as Figure 1 later shows – may have affected the self-selection of workers into their initial industry, we restrict the sample to individuals who entered the labor market before the year 2000.[3]

Similar to Huber and Winkler (2019) and Dauth et al. (2014), we normalize the trade flows by the industry wage bill in the first year the individual enters the sample to control for size differences between industries.[4] The wage variable is kept fixed at the base year to rule out any composition effects (i.e., changes in the relative labor demand at the industry level), which could be influenced by trade exposure. We estimate the following equation:

$$Y_{ijst} = \beta_1 IM_{jt-1} + \beta_2 EX_{jt-1} + \alpha X_{ijst} + \gamma_i + \delta_{st} + \theta_k + \lambda_{ot} + \epsilon_{ijst} \tag{1}$$

where Y_{ijst} denotes the outcome of interest (labor market outcomes: earnings, hours worked, employment and labor force participation; and family choices: fertility behavior, marriage, divorce, and cohabitation) for individual i, whose first job was in a NACE 2-digit industry j, residing in federal state s when entering the SOEP panel, and interviewed in year t.

Our two main explanatory variables, IM_{jt-1} and EX_{jt-1}, measure trade exposure to the "East" (i.e., Eastern Europe and, in additional estimations, China) at the industry level. They equal the value of imports (IM) and exports (EX) normalized by the total wage bill in the industry in the first year the individual enters the sample. The trade variables are one-year lagged. For both imports (IM) and exports (EX), we sum the value of "direct" trade flows (i.e., those in the (manufacturing) industry j) to that of "indirect" trade flows through input-output linkages to downstream buyers and upstream sellers.[5] Adding indirect exposure through input-output

[3]Restricting the sample to individuals who entered the SOEP before 1995 (or 1990) yields similar results (see Section 5.3).

[4]Other studies normalize trade flows by domestic absorption (Keller and Utar, 2022).

[5]Each type of indirect exposure (downstream and upstream in the supply chain) is a weighted sum of trade flows in all other (manufacturing) industries, with weights equal to the share of industry j's output used as inputs in a purchasing industry – downstream exposure – and of industry j's input bought from a selling industry – upstream exposure (Acemoglu et al., 2016).

linkages allows us to include individuals initially employed in service industries, whose exposure is only indirect through their sales to and purchases from manufacturing industries, because we do not have data on services trade flows in our sample period.

The coefficients of interest are β_1 and β_2, which capture, respectively, the effects of import and export exposures. We focus on Eastern Europe and China as key trading partners because, as already found in previous works by Dauth et al. (2014), Autor et al. (2019) and Huber and Winkler (2019), the rapid increase in trade with those countries (especially with Eastern Europe) has led to important changes in the German labor demand over the past decades, which might have implications for family choices.[6]

In our analysis, we will also estimate Equation (1) by education level (college degree or higher vs. high school diploma at most)[7] and by gender, as the discussion of the possible theoretical mechanisms points to the importance of these two dimensions of heterogeneity. Given the heavy prevalence of part-time workers among women in Germany, we investigate the sensitivity of the results to the exclusion of part-time workers. Furthermore, we asses whether trade had any effect on the likelihood of working part-time.

The term X_{ijst} collects a set of control variables, including age and age squared, household size, and in the regressions on the full sample, dummies for the individual's education.[8] All our estimates include individual fixed effects in the γ_i term, which absorbs the influence of any unobserved time-invariant individual heterogeneity. The individual fixed effects net out important confounding factors that could bias our estimates. For example, individuals might sort themselves into industries of different levels of trade exposure on the basis of some pre-determined characteristics, which can at the same time affect their family choices. Individual fixed effects account for this selection bias. At the same time, our choice to assign the trade exposure of the initial industry of employment and to keep only individuals entering the sample before the year 2000–and hence before trade flows between Germany and the East really took off–further mitigates the selection concerns regarding the movement of workers across industries in

[6]Unlike Huber and Winkler (2019), we do not take into account partner's exposure to trade (see also footnote 23).

[7]In a sensitivity analysis, we have also considered an alternative definition of education based on the school track choice (see Section 5.3 for more details). Furthermore, we have examined the heterogeneity of the effects of interest by occupational type comparing blue vs. white collar workers (see Section 5.3).

[8]Excluding the education dummies from Equation (1) does not significantly alter the results. Approximately 14% of the individuals changed their education during the sample period.

response to trade exposure. Because of these fixed effects, the identifying variation for our coefficients of interest comes from changes in import and export exposures within industries and over time.

Our specification also includes federal state $\times$ year fixed effects (initial state of residence in the panel, to rule out the influence of between-state migration endogenous to trade exposure), δ_{st}, which are meant to control for all possible time-varying factors at the state level, thereby accounting for the fact that regions specialized in different industries may be subject to different time-varying shocks.[9] One natural concern is that technological progress over the period 1991-2018 is correlated with our measures of trade exposure. This may be particularly relevant to our case, since it has been shown that women are over-represented in non-manual routine jobs (Gundert and Mayer, 2012). To alleviate concerns of a bias from technological progress, we add two sets of fixed effects to our specification. First, we include 1-digit industry fixed effects, θ_k, thereby exploiting only variation in trade exposure among individuals working in the same 1-digit industry. These fixed effects absorb the influence of any changes in technologies across 1-digit industries that occurred during the period. Second, all our estimates control for 1-digit ISCO occupation $\times$ year fixed effects (occupation in the first year the individual is observed, to net out a possible bias from selection into occupation endogenous to trade exposure), λ_{ot}, which account for initial occupation-specific shocks over time. This set of fixed effects control for the impact of technology on workers employed in occupations with different task content (e.g., how routine the tasks are hence how susceptible to automation/computerization). Finally, ϵ_{ijst} represents an idiosyncratic error term. Throughout the analysis, we cluster standard errors at the 2-digit industry level. A linear estimator is employed for all regressions, even if the outcome variable is binary in most models. This choice accommodates the large dimensionality of the fixed effects used in the specifications.

Industry-level, time-varying demand and productivity shocks may be correlated both with trade exposure and individual outcomes. Thus, even though our specification accounts for time-invariant unobserved heterogeneity through the individual fixed effects, our model may still suffer from endogeneity bias. To alleviate this concern, we adopt the IV approach proposed by

[9] In a sensitivity analysis, we also show that the results are similar when we include regional policy regions $\times$ year fixed effects, which are meant to control for time-specific shocks at a finer geographical level than the federal state (see Section 5.3).

Autor et al. (2013) and Autor et al. (2014). In particular, we follow closely Dauth et al. (2014) and Huber and Winkler (2019), who adapt this IV strategy to the German context. We instrument trade flows with Germany with the trade with a group of other countries (i.e., Australia, Canada, Japan, Norway, New Zealand, Sweden, Singapore, and the United Kingdom). For import exposure, the objective is to isolate supply-driven changes in exports from China and Eastern Europe. The instrument is thus the (direct and indirect) exports of China and Eastern Europe to the group of other countries, normalized by the industry wage bill in the base period.[10] Therefore, the underlying identification assumption requires that demand shocks in the group of other developed countries are largely uncorrelated with demand shocks in Germany – the β_1 coefficient would rely on variation in the supply-side component of exports from the "East". For export exposure, we aim to net out the German supply part from the total variation in German exports to the East. Exports from the group of other developed countries to China and Eastern Europe are thus a valid instrument under the assumption that supply influences in those origin countries are orthogonal to the German supply.

The IV strategy hinges on the assumption that the variation in trade with Eastern Europe and China picked up by the instrument is uncorrelated with German demand and supply shocks. Productivity changes in China and Eastern Europe are the main candidates to explain the validity of the instrument. Autor et al. (2016) explain how the rise of China in the world economy was the combined results of productivity increases (e.g., related to internal reforms and migration) and lower trade costs (China's WTO entry). Similarly, Dauth et al. (2014) argue how the sudden and unexpected fall of the iron curtain exposed Germany to the transformation of former socialist countries in Eastern Europe into market economies. The transformation of the former socialist block triggered substantial productivity gains in those economies (Burda and Severgnini, 2009). At the same time, these countries also faced lower trade costs starting from the mid-1990s, following their entry into the WTO in 1995. Therefore, increasing German export and import volumes with Eastern Europe stemmed largely from the strongly rising productivity and accessibility of those trading partners rather than by changes in the German economy.

To capture these productivity and trade cost shocks, we follow Dauth et al. (2014) and include the trade between Eastern European countries and developed countries with a similar income

[10] In computing indirect trade flows, we always use the national input-output matrix for Germany.

level as Germany, but we exclude all direct neighbors as well as all members of the European Monetary Union. Thus, we exclude countries such as France or Austria that would be likely experiencing shocks that are similar to those in Germany challenging our identification strategy. Our final instrument group consists of Australia, Canada, Japan, Norway, New Zealand, Sweden, Singapore, and the United Kingdom. We show that the trade flows of those countries with the East represent a relevant instrument for the German trade exposure, with the first stage F-statistic being well above the conventional levels in all our estimates.

4 Data

In our empirical analysis, we employ data from two main sources: the German Socio-Economic Panel (SOEP) and the United Nations Commodity Trade Statistics Database (Comtrade).

4.1 SOEP Data

We use data from the SOEP, a representative longitudinal dataset which surveys households and individuals in Germany since 1984. The SOEP consists of several subsamples and is constructed to ensure the representativeness of the entire population in Germany. A detailed description of the survey can be found in Wagner et al. (2007) and Goebel et al. (2019). A unique feature of this data source lies in its wide range of information at the individual and household level, including, for instance, socio-demographic characteristics, labor market outcomes, and health-related measures.

Of particular importance for our study is the fact that the SOEP data collect information on household structure, marital status, and fertility histories. We use this information to create our main demographic outcomes of interest, namely, a dummy for having a child in a given year, and indicators for the marital status of the individual: being married, divorced or a cohabiting individual at time t. Furthermore, our dataset contains information on individuals' labor market outcomes, such as their wage, working hours, employment and labor force participation. Given that we expect trade exposure to affect labor market outcomes, these variables permit us to investigate the potential mechanisms through which trade exposure affects fertility and marital

behavior. We use four main labor market indicators: earnings, hours worked, employment and labor force participation. Both annual labor earnings and hours worked refer to the year before the time of the survey, whereas the labor market status variables are measured at the time of the survey.[11] The SOEP provides information on the industry in which the worker is employed based on the NACE 2-digit classification – in our sample, we have data for 56 industries. For each individual, we consider the first industry of employment observed in the SOEP data and we keep it fixed over time.

Our working sample is constructed as follows. We consider the survey years 1991-2018 – after Germany's reunification and up to the latest available year of data. We keep only individuals aged 20-44 during the years in which the outcomes were measured, because this is the age interval mostly relevant to fertility (at least for women).[12] Given our focus on labor market channels, we apply additional data restrictions, as in Huber and Winkler (2019). We drop the self-employed, retired, civil servants and students at the time of the survey. Finally, as mentioned earlier in the text, we restrict the sample to individuals who entered the SOEP and had non-missing information on their occupation before 2000.

After these restrictions, we obtain a final longitudinal sample that contains approximately 55,000 person-year observations with non-missing occupation information resulting from about 6,500 individuals – the exact size of the sample depending on the outcome variable used in the regression model.[13] Table A.1 in the Appendix displays the descriptive statistics on the main variables used in the regressions. Approximately, 4% of individuals in the sample report a birth in a given year (5.2% marital fertility and 2.2% nonmarital fertility). The proportion of married and divorced people is 62% and 6%, respectively. Approximately, 22% of individuals are cohabiting. About 25% of individuals have a college degree, which identifies the high-skilled workers in our heterogeneity analysis by education. On average, workers report a wage of about 23 thousands euros in a given year, and work close to 38 hours per week.

[11] We purposefully consider employment status rather than transitions to and from employment only (e.g., to identify transitions into employment, we should use an indicator for the first year of an employment spell), in order to identify how exposure to trade can affect also the persistency of employment.

[12] In a sensitivity analysis, we show that the results are qualitatively similar when we consider individuals aged 20 to 40, 20 to 50, or 17 to 44 at the time of the interview.

[13] Note that the sample is larger when analyzing employment transitions (approximately 70,000 observations resulting from 7,000 individuals), as we include individuals with missing information on their current occupation.

4.2 Trade and Other Data

Data on international trade flows are drawn from the Comtrade database and cover the 1990–2018 period. These include detailed information on commodity trade from more than 170 countries. Using the correspondence between the SITC rev.3 product codes and NACE codes provided by the UN Statistics Division, we harmonize industry and product classification to match these data with the NACE 2-digit industry information available in the SOEP data. Trade flows for non-service industries are converted in current euros and then combined with the German input-output table for the year 1995 in order to compute indirect trade flows for each industry (for details, see Section 3).[14]

Consistent with the literature on the labor market consequences of trade in Germany (e.g., Dauth et al. (2014, 2017)), we consider two sets of trading partners: Eastern Europe and China. Figure 1 plots the evolution of total German exports to and imports from these two groups of countries over the entire period under investigation. Two important facts emerge. First, Germany's trade with these trading partners has increased substantially starting from the early 2000s. To minimize the risk of trade driving selection into industry, we thus consider only individuals who entered the sample before 2000 and keep their industry of employment in the first year fixed over time. Second, the role of imports and exports with Eastern Europe has been consistently more important than that of trade with China. As shown by Dauth et al. (2014), this difference in quantitative importance is also reflected in its labor market effects – trade with Eastern Europe has been found to have a more robust impact than trade with China. We thus follow this existing evidence and focus on imports to and exports from Eastern Europe in our baseline regression analysis, and discuss the effects (indeed less important) of trade with China.

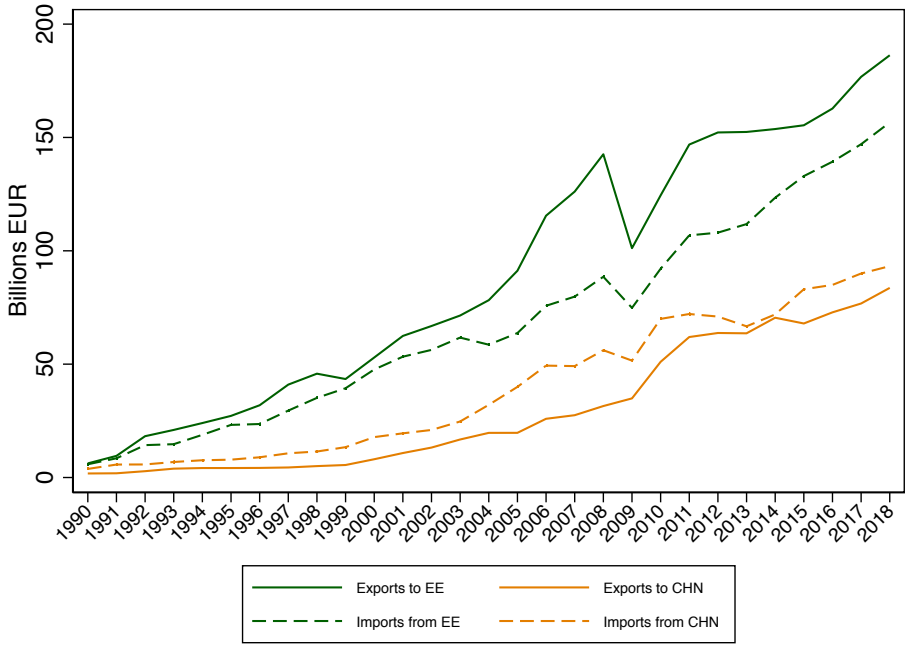
In the export and import variables used in Equation (1), industry-level trade flows are normalized by the industry wage bill in the base period (i.e., the first year the individual enters the sample). Data on total compensation of employees by industry are sourced from the Eurostat.[15,16]

[14] We source the national input-output table for Germany from the World Input-Output Table database. We choose the earliest available year of data, i.e., 1995.

[15] The industry classification used in the wage bill data is in NACE rev. 2. We convert it to NACE rev. 1 (the classification used in SOEP and in Comtrade), and allocate NACE rev. 2 industries that span multiple NACE rev. 1 industries using trade shares. The data on total compensation of employees by industry are available starting from 1995. We thus give the wage bill of that year to the first-year industry of individuals who entered before 1995.

[16] To make sure that our results are not influenced by outliers, we drop the top 1% of the trade regressors. These are implausibly large values that occur mainly in the last year of the sample (i.e., 2018). Adding these outliers only

Figure 1: Trade between Germany and Eastern Europe and China



Notes - Trade values are in billions of current euros. The trade variables equal the sum of the direct and indirect (through input-output linkages) components.

To identify the most dynamic industries in terms of trade patterns, Figures A.1 and A.2 in the Appendix display, respectively, the average yearly percent change in the import and export variables (normalized by the wage bill – i.e., IM and EX in Equation (1)) with Eastern Europe. This yearly variation within industries closely relates to the variation that we exploit to identify our estimates of interest in regression (1). Two main observations are worth noting. First, trade between Germany and Eastern Europe has been increasing in all industries during the period of study, with some variation in the speed of the yearly increase across industries. Second, manufacturing industries are among the most exposed to both imports and exports. There is a strong, albeit far from perfect, correlation between the export and import variables (the Spearman rank correlation coefficient between the two average yearly changes is 0.57), suggesting that, while we can empirically distinguish the effects of the two variables, it is important to consider also the overall impact of exposure to imports and exports.

scales down the point estimates without altering their statistical significance and the associated magnitudes.

5 Results

In this section, we present our main results. First, we analyze the effects of trade exposure on labor market outcomes, including wages, worked hours, employment and labor force participation. We then estimate the effects of trade on demographic outcomes, such as fertility, marriage, divorce and cohabitation. Finally, we provide a set of robustness checks and some heterogeneity analyses.

5.1 Effects of Trade Exposure on Labor Market Behavior

We first re-examine the impact of trade exposure on the labor market outcomes of German workers in our sample period (1991–2018 – Huber and Winkler (2019) perform a similar analysis for the years up to 2008). As described in Section 3, in each regression we include a set of individual-level controls, worker fixed effects, federal state $\times$ year fixed effects, 1-digit industry fixed effects, and occupation $\times$ year fixed effects.

Table 1 reports the 2SLS estimates of the effects of trade exposure on wages (in logs, see Panel A), hours worked (in logs, see Panel B), and employment (see Panel C) for the full sample as well as separated by education group and by gender. As mentioned in Section 2 and in light of the previous evidence, we expect low-skilled workers to be more affected by trade exposure.[17]

We find that increased exposure to import competition from Eastern Europe has a significant negative effect on wages, hours worked and the probability of being employed. We instead find an opposite effect of greater export opportunities – higher income, more hours worked, and a higher likelihood of being employed.

To gauge the quantitative relevance of the estimated effects, we use our point estimates – which are semi-elasticities in the regressions with log wages and log hours worked as outcome variables – to simulate the average change in wages and hours worked that would arise if individuals where exposed to the mean variation in the trade exposure variables between 1991 and 2018.[18] The estimates using the pooled sample in column 1 of Panel A imply that rising im-

[17] The first stage F-statistics reported at the bottom of each Panel of Table 1 show that our instruments are well above the conventional thresholds for strong instruments.

[18] We take the average of simulated changes across individuals throughout the period of study. The average change

Table 1: Effects of Trade Exposure on Labor Market Outcomes, by Education and Gender - 2SLS Estimates

	(1) Pooled	(2) Low-educated	(3) High-educated	(4) Males	(5) Females
Panel A: Income					
Import exposure	-0.352**	-0.336**	-0.079	-0.436***	0.087
(Eastern Europe)	(0.137)	(0.161)	(0.183)	(0.116)	(0.356)
Export exposure	0.286***	0.293**	0.063	0.335***	-0.015
(Eastern Europe)	(0.092)	(0.111)	(0.131)	(0.082)	(0.219)
Observations	52,180	39,185	12,784	28,525	23,634
Mean of dep. var.	23,075	20,456	31,190	27,778	17,398
Std. dev. of dep. var.	14,701	11,694	19,288	15,610	11,129
First stage F-statistic Import	89.3	92.1	27.4	110.9	25.78
First stage F-statistic Export	79.2	66.8	31.4	76.9	56.9
Panel B: Hours Worked					
Import exposure	-0.255**	-0.178	-0.201	-0.297***	0.001
(Eastern Europe)	(0.116)	(0.141)	(0.175)	(0.100)	(0.299)
Export exposure	0.191**	0.154*	0.128	0.235***	0.007
(Eastern Europe)	(0.075)	(0.091)	(0.128)	(0.072)	(0.174)
Observations	54,080	40,622	13,255	29,166	24,894
Mean of dep. var.	38.13	37.37	40.50	42.56	32.93
Std. dev. of dep. var.	12.88	12.69	13.08	10.66	13.30
First stage F-statistic Import	96.3	97.7	29.1	112.3	32.04
First stage F-statistic Export	78.6	68.3	32.8	77.9	59.9
Panel C: Employment					
Import exposure	-0.285***	-0.385***	-0.045	-0.226**	-0.206
(Eastern Europe)	(0.094)	(0.105)	(0.155)	(0.108)	(0.208)
Export exposure	0.171**	0.234***	-0.006	0.151*	0.093
(Eastern Europe)	(0.071)	(0.080)	(0.108)	(0.085)	(0.136)
Observations	70,893	54,981	15,713	34,667	36,211
Mean of dep. var.	0.740	0.710	0.846	0.834	0.649
Std. dev. of dep. var.	0.439	0.454	0.361	0.372	0.477
First stage F-statistic Import	52.7	54.6	34	99.2	17.2
First stage F-statistic Export	70.5	60.8	34.6	76.5	53.3

Notes - Standard errors are reported in parentheses and are clustered at the industry level. All models include individual, year × federal state, year × occupation, and 1-digit industry fixed effects. Further controls include age and its quadratic term, indicators for education, and household size.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

port exposure from Eastern Europe is responsible for a 5 percent loss in wages over the period, whereas rising export exposure increases wages by 5.5 percent. The net positive income effect of trade exposure on German workers is in line with the results of Huber and Winkler (2019) obtained on different demographics group (e.g., they include individuals up to 65 years of age) and period (1994–2008, whereas we extend to sample to 1991-2018). The effects on hours worked are reported in Panel B. Considering the pooled sample in column 1, the average exposure to imports leads to a 3.5 percent reduction in working hours, which is offset by the percent increase predicted by the average rise in exposure to exports.

We also find that trade with Eastern Europe has also significant labor market effects on the extensive margin. Specifically, being exposed to more import competition from Eastern Europe reduces the likelihood of being employed in a given year by 4 percentage points (see column 1 of Panel C). This negative effect is partially offset by the positive one of greater export opportunities (+3.3 percentage points). These results suggesting that trade exposure has affected mostly the income and job stability of German workers accord well with the evidence on the wage premium by exporting firms (Egger et al., 2013), and on job stabilizing effect of exposure to trade in Germany (Dauth et al., 2014). In the Appendix, we also provide evidence that import exposure leads to a decline in labor force participation, whereas the effect of export exposure is less precisely estimated than the one on the employment margin (see Table A.2).

As shown in column 2 of Panel A, the trade-induced impacts are most visible for low-educated workers (i.e., those without a college degree). These impacts are instead smaller and statistically indistinguishable from zero among the high-skilled workers (see column 3). The effect on hours worked (i.e, the intensive margin) is less precisely estimated when reporting separate results by education (see columns 2 and 3). We, instead, find a slightly more important effect on employment rates among low-skilled workers compared to what observed in the full sample.

In columns 4 and 5 of Table 1, we explore the heterogeneity of trade exposure by gender.[19] Overall, we find that men experienced the largest effects on income, hours worked, and employment – they drive the negative effects obtained in the full sample. Among men, rising import

in our measure of import (export) exposure with Eastern Europe is 0.139 (0.193).

[19]See also Table A.3 in the Appendix for the breakdown by education and gender.

competition in our sample leads on average to a 6 percent decline in wages. These losses are fully compensated by the gains due to rising export opportunities.[20]

As an additional margin of adjustment in the labor markets, in Table A.7 in the Appendix we report the effects of our trade variables on the likelihood of working part-time. We find that exposure to imports leads to a reduction in part-time work, whereas exports, if anything, increase it. Our results on labor market outcomes are largely driven by full-time workers (see columns 1 and 2 of Table A.8 in the Appendix).

We focus on trade flows with Eastern Europe, since previous research documented that the impact on the German labor markets of trade exposure with Eastern Europe was significantly larger than the opening to trade with China (Dauth et al., 2014, 2017). In the Appendix, we present the main results analyzing the effects of opening of trade with China (see Tables A.9 and A.10 in the Appendix). The results tend in the same direction, but the implied effects become smaller and are not precisely estimated compared to the ones of trade with Eastern Europe.

In sum, these results confirm the previous evidence by Dauth et al. (2014) and Huber and Winkler (2019), who show that in Germany both import and export exposures matter in assessing the labor market effects of trade with Eastern Europe. Consistent with the existing literature, we also show that the beneficial effects of export exposure on income are slightly larger than the negative ones of import competition. The net impact on employment and work hours is instead close to null. All the labor market effects are concentrated among low-skill workers and men.

5.2 Effects on Fertility and Marital Behavior

Table 2 displays the 2SLS estimates of the effects of trade exposure on fertility outcomes by education group and by gender. Consistent with what observed for the labor market outcomes (see Table 1), we find heterogeneous impacts between import and export exposure with Eastern Europe.[21]

We find that increased import competition reduces fertility, whereas exposure to greater export opportunities increases fertility, although the latter effect is less precisely estimated and only significant when focusing on low-skilled workers. The estimates in column 1 of Table 2 imply

[20] We report the corresponding OLS estimates in Tables A.5 and A.6 in the Appendix.
[21] The corresponding OLS estimates are presented in Table A.11 in the Appendix.

Table 2: Effects of Trade Exposure on Fertility, by Education and Gender - 2SLS Estimates

	(1) Pooled	(2) Low-educated	(3) High-educated	(4) Males	(5) Females
Panel A: Overall Fertility					
Import exposure	-0.120**	-0.128**	-0.110	-0.125**	-0.078
(Eastern Europe)	(0.046)	(0.055)	(0.137)	(0.051)	(0.081)
Export exposure	0.061*	0.070*	0.032	0.057	0.043
(Eastern Europe)	(0.033)	(0.041)	(0.089)	(0.038)	(0.055)
Observations	51,664	38,609	12,868	26,181	25,463
Mean of dep. var.	0.042	0.040	0.049	0.053	0.030
Std. dev. of dep. var.	0.202	0.197	0.216	0.225	0.173
First stage F-statistic Import	95.1	96.1	29.1	116	32.1
First stage F-statistic Export	81.9	70.6	33.4	82.7	61
Panel B: Marital Fertility					
Import exposure	-0.123*	-0.124*	-0.126	-0.151**	-0.065
(Eastern Europe)	(0.064)	(0.065)	(0.139)	(0.072)	(0.085)
Export exposure	0.079*	0.086*	0.053	0.096*	0.038
(Eastern Europe)	(0.046)	(0.050)	(0.095)	(0.055)	(0.058)
Observations	35,597	25,982	9,521	17,789	17,766
Mean of dep. var.	0.051	0.049	0.056	0.068	0.033
Std. dev. of dep. var.	0.220	0.216	0.231	0.252	0.181
First stage F-statistic Import	120.2	129.9	22.4	96.2	71.7
First stage F-statistic Export	89.7	97.5	22.8	69.1	177.4
Panel C: Nonmarital Fertility					
Import exposure	-0.021	-0.060	0.011	-0.013	0.069
(Eastern Europe)	(0.067)	(0.063)	(0.208)	(0.088)	(0.143)
Export exposure	0.003	0.018	0.011	-0.014	-0.057
(Eastern Europe)	(0.048)	(0.047)	(0.120)	(0.061)	(0.096)
Observations	15,634	12,267	3,150	8,157	7,410
Mean of dep. var.	0.022	0.021	0.024	0.022	0.022
Std. dev. of dep. var.	0.145	0.142	0.155	0.145	0.146
First stage F-statistic Import	26.1	22.4	14.7	54.1	8.9
First stage F-statistic Export	29.2	21.5	22.6	65.2	9.6

Notes - Standard errors are reported in parentheses and are clustered at the industry level. All models include individual, year × federal state, year × occupation, and 1-digit industry fixed effects. Further controls include age and its quadratic term, indicators for education, and household size.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

that the average exposure to imports throughout the 1991–2018 period reduces the probability of a birth by 1.6 percentage points – or equivalently a 0.06 percentage points reduction per year. The rise in exports to Eastern Europe implies an increase in the probability of a birth of 1.1 percentage points (or equivalently 0.04 percentage points per year). These effects are larger among the low-educated individuals (see column 2) and among men (see column 4), while they are smaller and less precisely estimated among high-educated (see column 3) and women (see column 5).[22] [23]

The negative (positive) effects of import (export) exposure are driven by the effect on marital fertility (see Panel B), whereas there is no evidence of significant effects of import or export exposure on nonmarital fertility (see Panel C), a result consistent with the study by Autor et al. (2019) in the US. These findings are also in line with the Becker's model where children are "normal goods", and confirm the evidence from previous studies analyzing the effects of income shocks on fertility (Lindo, 2010; Dettling and Kearney, 2014; Lovenheim and Mumford, 2013; Black et al., 2013).

Interestingly, as shown in Table 3, these results are driven by the effects on the likelihood of having any child (i.e., extensive margin). Column 1 presents the estimates on the pooled sample – same of column 1 in Panel A of Table 1. The effect is substantially unchanged when restricting the analysis to the event of having the first child (see column 2).[24] We instead find no evidence of a significant effect when we restrict the sample to those with at least one child and consider the likelihood of having more than one child (i.e., intensive margin, see column 3). The average increase in exposure to exports led to a 1.1 percentage points increase in the probability of having the first child. We report the analysis by gender in Table A.13 in the Appendix. The estimates are more precisely estimated for men than for women, but they are not significantly different across

[22] In Table A.12 in the Appendix, we present the breakdown of the results by gender and education. Because of our sample restrictions, the double split by education and gender produces fairly small samples for high-educated individuals. The point estimates in the corresponding subgroups are high (in absolute value), but very imprecisely estimated. For this reason, these results have to be interpreted with caution and are presented only in the appendix

[23] Our empirical analysis takes the worker as the unit of observation. Huber and Winkler (2019) adopt an household approach and find that trade shock led to significant risk sharing effects reducing the worker-level impact of trade shocks on earnings inequality. Our conceptual framework suggests that changes in labor market opportunities and income can affect family choices irrespective of the individual's position in the income distribution. Empirically, our results indicate that *individuals'* labor market outcomes respond significantly to trade shocks even with any risk sharing intra-household adjustment operating in the background.

[24] We restricted the sample to individuals reporting their first child or who reported to have no children in the year of the interview.

the subsamples.

In Table A.8 in the Appendix, we find that consistent with what observed for labor market outcomes, our main results on fertility are driven by full-time workers (see columns 3 to 5).

Table 3: Effects of Trade Exposure on First Child vs. Higher-order Children - 2SLS Estimates

	(1) Pooled	(2) First child	(3) Second or more
Import exposure (Eastern Europe)	-0.120**	-0.107**	0.024
	(0.046)	(0.050)	(0.086)
Export exposure (Eastern Europe)	0.061*	0.061*	-0.065
	(0.033)	(0.035)	(0.058)
Observations	51,664	31,708	19,667
Mean of dep. var.	0.042	0.032	0.055
Std. dev. of dep. var.	0.202	0.177	0.228
First stage F-statistic Import	95.1	57.1	80.8
First stage F-statistic Export	81.9	59.4	94.8

Notes - Standard errors are reported in parentheses and are clustered at the industry level. All models include individual, year × federal state, year × occupation, and 1-digit industry fixed effects. Further controls include age and its quadratic term, indicators for education, and household size.
* Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4 shows that these results hold when focusing on completed fertility by restricting the sample to individuals born before 1974, i.e., individuals at least 45 years old before the end of our study period.[25] We examine the effect of trade exposure on completed fertility at the individual level keeping the trade variables at the first year an individual is observed in the sample. The average increase in exposure to imports throughout the period analyzed reduced completed fertility (measured as the number of children in the last year an individual is observed in the panel) by 8 percent among workers, whereas exposure to exports led to a 12 percent increase in completed fertility, thereby suggesting a net percent increase in overall completed fertility as a result of trade exposure. Consistent with the rest of the analysis, the results on completed fertility are driven by men (see columns 2 and 3). Using the average exposure to imports and exports for each individual throughout the sample period (instead of the exposure at the first year an

[25] In our sample, 95% of men who had a child did so before the age of 44. Among women, 95% of those who had a child were younger than 42 years old.

individual enters the sample), we obtained similar results (see Table A.14 in the Appendix).

Table 4: Effects of Trade Exposure on Completed Fertility – 2SLS Estimates

Dep. var.: Number of children	(1) Pooled	(2) Males	(3) Females
Import exposure	-0.471**	-0.486*	-0.295
(Eastern Europe)	(0.223)	(0.281)	(0.282)
Export exposure	0.614***	0.539**	0.320
(Eastern Europe)	(0.172)	(0.218)	(0.217)
Observations	10,482	4,950	5,532
Mean of dep. var.	0.823	1.006	0.660
Std. dev. of dep. var.	1.033	1.151	0.884
First stage F-statistic Import	337.4	292.2	75.4
First stage F-statistic Export	445.8	348.5	119.7

Notes - Robust standard errors are reported in parentheses. The sample is restricted to individuals born before 1974. All models include age and its quadratic term, indicators for education and state fixed effects.
* Significant at 10%; ** significant at 5%; *** significant at 1%.

Exposure to trade with Eastern Europe did not significantly affect marital behavior (see Table 5), except for a negative marginally significant effect on divorce. The result on divorce is driven by women and consistent with the notion that risk-sharing benefits of marriage are countercyclical (e.g., Shore (2010)). We find that import exposure led to some reductions in cohabitations (-6 percent), while export exposure led to an increase of approximately 11 percent. These results, although imprecisely estimated, are in line with recent findings that highlight the role of social norms and context in shaping family formation (see Adler (1997) and Kearney and Wilson (2018)).[26]

To sum up, the evidence suggests that workers who were more exposed to imports faced worse labor market outcomes and were less likely to have children. On the contrary, exposure to greater export opportunities enhanced the labor market prospects and increased fertility. Consistent with what shown for the labor market outcomes, we find no evidence of significant effects of exposure to trade with China on fertility and marital behavior (see Tables A.18 and A.19 in the Appendix). This evidence is consistent with income effects in fertility choices: the decision

[26]The corresponding OLS estimates are presented in Table A.16 in the Appendix. Table A.17 reports the breakdown by gender and education.

Table 5: Effects of Trade Exposure on Marital Behavior, by Education and Gender - 2SLS Estimates

	(1) Pooled	(2) Low-educated	(3) High-educated	(4) Males	(5) Females
Panel A: Marriage					
Import exposure	-0.019	0.053	-0.223	-0.020	0.178
(Eastern Europe)	(0.071)	(0.095)	(0.148)	(0.071)	(0.138)
Export exposure	-0.010	-0.026	0.064	-0.028	-0.114
(Eastern Europe)	(0.054)	(0.071)	(0.107)	(0.056)	(0.095)
Observations	51,941	38,473	13,265	27,713	24,208
Mean of dep. var.	0.619	0.595	0.692	0.620	0.618
Std. dev. of dep. var.	0.486	0.491	0.462	0.485	0.486
First stage F-statistic Import	90.5	92.6	30.2	132.3	31.3
First stage F-statistic Export	85.1	73.6	33.8	85.2	65.3
Panel B: Divorce					
Import exposure	-0.108*	-0.113	-0.091	-0.069	-0.227*
(Eastern Europe)	(0.062)	(0.079)	(0.098)	(0.055)	(0.130)
Export exposure	0.065	0.060	0.067	0.053	0.115
(Eastern Europe)	(0.047)	(0.060)	(0.059)	(0.042)	(0.094)
Observations	54,965	41,382	13,371	29,543	25,402
Mean of dep. var.	0.057	0.061	0.045	0.043	0.074
Std. dev. of dep. var.	0.233	0.240	0.208	0.203	0.262
First stage F-statistic Import	98.1	99	29.5	112.9	32.6
First stage F-statistic Export	79.8	69.1	33.4	78.6	60.9
Panel C: Cohabitation					
Import exposure	-0.101	-0.104	0.049	-0.106	-0.228
(Eastern Europe)	(0.121)	(0.123)	(0.204)	(0.138)	(0.197)
Export exposure	0.130	0.110	0.092	0.147	0.202
(Eastern Europe)	(0.097)	(0.097)	(0.142)	(0.125)	(0.132)
Observations	54,904	41,320	13,371	29,487	25,397
Mean of dep. var.	0.222	0.226	0.207	0.202	0.245
Std. dev. of dep. var.	0.416	0.418	0.405	0.402	0.430
First stage F-statistic Import	97.6	98.9	29.7	115.1	32.1
First stage F-statistic Export	79.8	69.2	33.7	78.9	61.1

Notes - Standard errors are reported in parentheses and are clustered at the industry level. All models include individual, year × federal state, year × occupation, and 1-digit industry fixed effects. Further controls include age and its quadratic term, indicators for education, and household size.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

to have children correlates with the direction of trade-induced income changes.

5.3 Robustness Checks and Heterogeneity Analyses

In what follows, we conduct a number of sensitivity checks and present some heterogeneity analyses along several dimensions.

Table A.15 in the Appendix presents the estimates of the effects of imports and exports exposure on labor market outcomes and fertility leveraging the local variation in trade exposure at the level of regional policy regions (*Raumordungsregionen, ROR*) in 1996. This alternative empirical strategy follows the commuting-zone approach of Autor et al. (2013). The trade values varying by industry and year are allocated to regions according to the distribution of employment across regions and industry in 1996.[27] Employment data are drawn from the Federal Employment Agency Statistics (*Bundesagentur für Arbeit Statistik*). Since 1996 is the first year for which these data are available at a finer geographical level than the federal state, we cannot use earlier years as a base to construct our trade exposure variables at the regional level. Following Autor et al. (2013) and Dauth et al. (2014), we use the import (export) flows of other countries as an instrument for local import (export) exposure in Germany.[28]

Results confirm the negative effects of imports on labor market outcomes and fertility (see columns 1-5 of Table A.15 in the Appendix). The implied magnitudes are larger than those in our baseline specification, suggesting that local general equilibrium effects (i.e., outside the individual's industry of initial employment) exacerbate the direct ones. In particular, we find that the average change in exposure to imports throughout the period leads to a 13.8 percent reduction in wages and a 3.4 percentage points decline (4 percent relative to the sample mean) in the likelihood of being employed. The average exposure to exports yields a 10.5 percent increase

[27] Our measure of import exposure is calculated as follows:

$$\sum \lambda_{j,r,1996} * IMP_{GER,jt} \tag{2}$$

where λ is the ROR's (r) share of workers in industry j in 1996. While $IMP_{GER,jt}$ is the national level of imports in industry j in year t. Similarly, our measure of export exposure is:

$$\sum \lambda_{j,r,1996} * EXP_{GER,jt} \tag{3}$$

[28] There are 96 regional policy regions throughout Germany, and these are defined by the Federal Office for Building and Regional Planning based on their economic inter-linkages. For detailed information on SOEP regional data, see Knies and Spiess (2007).

in income and a 3.8 percentage points increase in the employment probability.[29] When examining fertility, we find that the average exposure to imports from Eastern Europe throughout the period leads to a 3.2 percentage points decrease in fertility (or equivalently 0.13 percentage points per year), whereas the average exposure to exports increases fertility by 2.6 percentage points (or equivalently 0.10 percentage points per year). We also confirm the lack of significant effects of trade on marital outcomes (see columns 6 to 9).

A potential concern is that our findings may be confounded by the effects of the Great Recession.[30] To dispel this concern, in Tables A.20 to A.23 in the Appendix, we report our main results when we exclude the entire 2008-2018 period from the sample. The estimated coefficients on the trade variables remain fairly stable relative to the benchmark specification.

In the Appendix, we also include results on fertility behavior obtained using alternative age groups, i.e, 17-44 (see Table A.24), 20-40 (see Table A.25) and 20-50 years old (see Table A.26). The results are overall very similar to those obtained using our baseline sample of individuals aged 20-44 (see Table 2). In our benchmark specification, we use one-year lagged values of the exposure to imports and exports to predict its effects on labor market outcomes and family behavior. In Table A.27 in the Appendix, we consider a longer lag structure.[31] The point estimates of the effect of imports on labor market outcomes are overall similar. The effect of imports on fertility, if anything, increases in absolute value. In contrast, the effect of exports on labor market outcomes is smaller and less precisely estimated, while the point-estimates of the effect of exports on fertility are similar.

In Table A.28 in the Appendix, we document the heterogeneity of the results using an alternative definition of education based on the tracking decision pupils made at the transition from primary to secondary school (Krause and Schüller, 2014; Zimmermann et al., 2013). Specifically, we define as 'highly educated' those individuals with higher (academic) or intermediate secondary education, and as 'less educated' those with lower secondary education (basic track or *Hauptschulabschluss*). Results confirm that the less skilled individuals are more affected by the labor market consequences of trade (both on the import and exports sides) with Eastern Eu-

[29] The average change in our measure of regional import (export) exposure from Eastern Europe is 2.9 (3.2).

[30] In contrast to other European countries, Germany recorded a very mild recession as measured by unemployment and GDP changes.

[31] Note that the inclusion of additional lags further restricts our sample size.

rope, which also reflects into a larger negative effect (in absolute value) of imports on fertility (see columns 4 and 5 of Panels A and B). In addition, we examine the heterogeneous effects by occupational type comparing blue vs. white collar workers. Columns 6 and 7 of Panels A and B show that the effects of trade exposure on labor market outcomes and fertility are concentrated among individuals in blue collar jobs.

Reassuringly, in Tables A.29, A.30, A.31 and A.32 in the Appendix we show that the main results are not affected by the inclusion of ROR $\times$ year fixed effects (instead of the more aggregated federal state $\times$ year fixed effects), which account for any time-specific shocks at the ROR-level.

We also experimented with earlier cutoff years of entry to define our working sample. Table A.33 in the Appendix shows the robustness of our main findings for income and fertility, when restricting attention to individuals entering the SOEP before 1995 (or 1990). Overall, we find very similar results.

Finally, we conduct a falsification test using lagged data for all our labor market and demographic outcomes of interest. We estimate the impact of trade exposure on lagged outcomes (i.e., lagged by 10 years). Importantly, we find no evidence of significant effects of trade exposure (see Tables A.34, A.35, A.36 and A.37 in the Appendix). This placebo test lends further support to a causal interpretation of the effect of trade on labor market and demographic behavior.

6 Conclusion

In this paper, we investigated the effects of globalization on the labor markets, and fertility and marital behavior exploiting longitudinal data and within-worker variation in exposure to trade. Previous studies have not examined the impacts of trade on fertility and marital behavior in a lowest-low fertility, high-income context – the one of Germany.

To identify the effects of trade flows, we followed the strategy adopted by Autor et al. (2014) and Autor et al. (2019). We first confirm the results of previous studies finding heterogeneous effects of import and export on the German labor market. Our main contribution is to explore the consequences of globalization on fertility and marital behavior. We find that exposures to

imports and exports have very different effects on family choices. Increased exposure to import competition from Eastern Europe lowers fertility. This effect is at least partly offset by the positive impact of exposure to greater export opportunities. These effects are largely driven by the low-educated workers and men. We also show that the fertility effect is mostly on the probability of having any child (extensive margin), and while there is evidence of some fertility postponement, exposure to imports negatively affected completed fertility – an effect that is again compensated by the positive influence of exports. At the same time, we find no evidence of significant changes in marital patterns, although there is some evidence that imports led to a decline in divorce among women. These findings are consistent with neoclassical fertility models that highlight the role of income effects: workers that experience negative labor market outcomes because of import competition reduce fertility, whereas workers that improve their labor market stance thanks to greater export opportunities increase fertility. Because German trade with Eastern Europe is primarily intra-industry, most workers are likely to experience both effects to some extent: negative from the import side, and positive from the export side.

Germany's low natality rate has been a major source of concern for politicians for decades. The effects of negative labor demand shocks due, for instance, to import competition on fertility behavior should not be neglected. Our analysis omits the possible influence of domestic policies on the impact of labor market shifts on family choices. Future research might thus investigate the role of family-oriented policies in mediating the effects of labor market shocks on demographic behavior and life-course choices.

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