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Gender-Specific Effects of Import Competition on Individual Fertility Decisions

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Abstract

This paper studies the effects of import competition from China and Eastern Europe (EE) on the fertility decisions of individuals in German manufacturing. Through the lens of gender, the paper uniquely contributes to the literature by linking import competition to longitudinal individual data to examine individual fertility. Two separate measures of import exposure are computed for competition from China and EE (amassing five countries), whose trade volumes with Germany have increased remarkably during the panel years.

Fixed-effects instrumental variable (FEIV) estimation results show that individual fertility decreases by 1.6 p.p. and by 2.0 p.p. with rising competition from China and EE, respectively. The effects are robust and consistent across different subgroups of individuals.

Effects of import competition are then inspected by *gender*, alongside potential mechanisms underlying fertility decisions. Both male and female workers' fertility is affected via reduced earnings, though differently. The effect on male fertility is negative, with shortened employment duration. Conversely, the effect on female workers' fertility is positive, with worsened working conditions. Furthermore, in line with family economics theory, these results suggest that there is a substitution effect in the labour supply of women, here prevalently concentrated in low-technology sectors: as female earnings fall and their opportunity cost of work is lower, the prospect of having children possibly becomes a more rewarding alternative.

Keywords: trade-induced shocks, labour market conditions, import competition, individual fertility, female labour supply, FEIV estimation, Germany.

JEL classification: F14, F16, J11, J13, J16.

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1. Introduction

Over the last decades, the world economy has seen a rise in interaction and integration among people, markets and institutions. This phenomenon is known as *globalisation*, and national economies have not only undergone social and cultural changes but have also confronted different dynamics of politics and foreign affairs.

A catalyst in the global integration among markets is the support for freer trade. As seen in the most recent years of the history of globalisation, the growth of international trade volumes is an outcome of globalisation, with advanced economies experiencing productivity gains due to the use of inputs from low-income countries.

Although there may be gains from trade, import competition was shown to have caused the manufacturing sector in advanced economies to slump into contraction (Autor et al., 2013; Acemoglu et al., 2016). Given the social challenges posed by a globalising world, household dynamics attain a distinct level of complexity, and fertility decision patterns are noticeably changing. Consequently, as society is trying to address these challenges amidst population ageing and different labour market conditions, individual fertility decisions belong to the core of the discussion on globalisation.

By drawing on previous evidence, this paper investigates how shocks from a rising import exposure in Germany can affect individual fertility decisions and how these effects differ for men and women in the labour market. Trade-induced shocks to German manufacturing are explored in relation to China and Eastern Europe (EE), whose import volumes in Germany have sharply increased during the panel years (Figure 1). Fertility decisions are represented by birth events observed the year that a child was born within German households where either one or both parents are or have been employed in manufacturing.

This paper distinctly contributes to the literature by exploring *individual* fertility when manufacturing industry workers are exposed to rising imports, then disentangles the different mechanisms that may lie behind fertility decisions and finally investigates heterogeneous effects of import exposure *by gender*.

In studying the causal effects of import competition from both China and Eastern Europe (EE), data on German individuals are sourced from the German Socio-Economic Panel (GSOEP). Individuals are assigned measures of exposure to Chinese and EE imports based on their

industry and state of employment for every year from 1995 to 2016. Individual fertility decisions (understood as new birth events within households) are assumed to vary across industries and states of employment.

Differently from Autor et al. (2013), this paper breaks down the regional variation in import penetration into variation by industry of employment. The industry dimension of a region's yearly exposure to Chinese and EE imports matters, in that it may be easier for individuals to entertain the prospect of child rearing depending on their industry of work.

Competition from China is instrumented with a monetary measure of exposure to Chinese imports into other high-income countries¹. The same approach is pursued separately for import-competitive pressures from EE. In doing so, the instrument isolates the supply-driven component of imports from China and EE.

Monetary measures for import exposure to China and EE are computed for 22 manufacturing industries and 16 federal states over 22 years between 1995 and 2016. The final sample contains 39,666 observations belonging to 6,440 individuals that were employed in a manufacturing industry for at least one year in the panel period².

The baseline specification estimates a Linear Probability Model (LPM) of observing a birth event per household, and results show that the probability of having a new-born decreases by 1.6 percentage points and by 2.0 percentage points with an increase of EUR 100 in import competition from China and Eastern Europe, respectively³. The resulting negative effects are robust to various checks and consistent across different subgroups of individuals.

General potential mechanisms underlying individual fertility decisions are explored. Results suggest that the probability of having a new-born is negatively affected by import competition via reduced second job earnings, lower satisfaction with personal income and shortened employment duration. The effects are stronger when it comes to competition from China rather than EE.

¹ Namely, Australia, Canada and Japan.

² The final sample considers all employees that have ever worked in a manufacturing industry for at least one year between 1995 and 2016. Given the yearly nature of the monetary measure for exposure, doing this ensures that workers who have changed their employment sector to services or went into non-employment due to rising import competition are also included.

³ An increase of EUR 100 is within 1.54 standard deviations of the mean Chinese import exposure and, respectively, within 0.67 standard deviations away for EE.

When broken down by gender, the effects of Chinese and EE competition remain negative for men but are positive for women. The negative effects on male fertility are much stronger and outweigh the effects for women in this sample. Import exposure affects both male and female fertility via reduced earnings, though effects are negative for men and positive for women. Besides the negative income effect, men have a shorter job tenure while women have a lower job autonomy (worsened working conditions) upon rising import competition⁴, but these effects have different meanings for gender-specific fertility decisions. Most notably, results indicate that, while males have an impaired earning capacity, the female opportunity cost of work also falls (as does income) and women appear to substitute work with having children.

Moreover, the resulting *positive* effect on female fertility behaviour via reduced female earnings and lower job autonomy is in line with theory (Becker, 1973; Becker, 1974) and current evidence (Gries and Grundmann, 2014; Cigno et al., 2018). Notably, early evidence documents that women in manufacturing are over-represented in low-wage positions that do not grant them much autonomy (Kirmeyer and Shirom, 1986) and that there is reduced job autonomy for female workers in the European Union (Fagan and Burchell, 2002). Since most female workers in the sample are concentrated in low-technology industries (ergo, low-wage employment), this paper also studies the effect of import exposure on the probability of having children for this specific subgroup. The positive effect on female fertility is considerably larger than the baseline effect when considering women in low-technology industries upon rising competition from both China and EE. This is backed up by results showing a decline in hourly wage of 55.5% and 22.3% on sample average upon a EUR 100 increase in import competition from China and, respectively, from Eastern Europe.

Accordingly, the results show that there is a *substitution effect* in the labour supply of female workers, whose opportunity cost of work is lower and the prospect of having children possibly becomes a more rewarding alternative. The effect is stronger for women in low-technology industries.

Besides competition from abroad, one must be aware that there is a variety of job stressors beyond on-the-job autonomy, such as working in the occupation for which one has trained

⁴ The negative income effect on males is significant for Chinese competition only, while that on employment duration (job tenure) is significant for both Chinese and EE competition. By contrast, the effect of import competition on female income and autonomy is significant for China only.

initially, job insecurity and time pressures. Although not studied here, these may affect a couple's dynamics by interfering with their prospect of having children.

Following the introduction in Section 1, Section 2 outlines related evidence on fertility and individual fertility decisions. Section 3 describes the methodology used in obtaining the results, while Section 4 presents the baseline results backed up by robustness and heterogeneity checks. Section 5 examines potential mechanisms by which import exposure may affect individual fertility. Section 6 investigates import exposure effects by gender: it first studies the gender-specific mechanisms that may explain individual fertility, then it parallels the mechanisms to the baseline results while deploying further checks. Section 7 concludes and reviews implications for gender-specific dynamics affecting individual fertility behaviour in the context of globalisation.

2. Related Literature

This section examines the range of effects beyond those on local labour markets, which were documented by Autor et al. (2013). In linking import penetration to individual fertility, the section starts with general evidence on female labour participation in industrialised countries then reviews specific evidence on changes in employment relationships, labour market conditions and economic opportunities upon higher import competition.

This paper relates in part to the inequality literature and changes in the wage structure of advanced countries (Bound and Johnson, 1989; Katz and Murphy, 1992; Murphy and Welch, 1992; Juhn et al., 1993), but also to the more recent influential studies on the labour market effects of rising import penetration of Autor et al. (2013) for the United States and that of Dauth et al. (2014) for Germany.

The link between import competition and individual fertility has been explored only to a small degree so far, though previous research raises some important questions that together seem to point in the same direction. Early evidence links Total Fertility Rate (TFR) with female labour participation rates (Brewster and Rindfuss, 2000; Ahn and Mira, 2002; Adsera, 2004) and points to the role of working women in advanced economies to explain shifting macro fertility patterns. On the other hand, more recent literature relates *individual* unemployment to fertility behaviour (Adsera, 2005; Adsera 2011), whereby job displacement from exogenous shocks is shown to affect fertility behaviour negatively (Lindo, 2010; Del Bono et al., 2012).

Furthermore, using exchange-rate movements to generate exogenous variation in import competition, Bertrand (2004) finds that higher import competition induces a shift away from implicit wage agreements, implying that workers are more susceptible to larger changes to wage-unemployment elasticities. Generally, wages drop as unemployment rates increase upon rising import penetration. Specifically, the author finds evidence that workers' wages are (1) more sensitive to the current unemployment rate as import competition increases, and (2) less sensitive to the unemployment rate prevailing upon hire. The findings overall suggest that the flexibility of wages over the business cycle increases when industries face higher competitive pressures from imports. One mechanism that drives the effects underlined above is a higher financial pressure on employers resulting from rising import competition (Bertrand, 2004).

The evidence above suggests that not only a country's wage structure is affected by rising import penetration, but also employment relationships change. This may imply that individuals may decide differently about having children and about other aspects of their life that used to be traditionally compatible with work. Increased global competition and rising competitive pressures from cheaper imports may trigger conflict in this balance, thus potentially concealing different and more complex individual decision dynamics concerning fertility and the marriage market.

Consequently, evidence from Europe shows that childbearing decisions do envelop less obvious aspects such as delaying motherhood. In a study spanning several European countries, Bratti and Tatsiramos (2012) decompose effects of delaying motherhood into a catch-up effect (in countries where the career effect is large) and a postponement effect (in countries where the opportunity cost of childbearing is relatively high⁵). Hence, there is a role for various frictions that influence fertility decisions and lead women to delay motherhood.

To analyse the effects of increased import competition on individual fertility by means of the factors involved in the decision-making dynamics, the paper corroborates evidence from the U.S. marriage market, also. In a similar fashion, fertility-related decisions for manufacturing workers in the U.S. appear to be suggestive of shifts in the marriage market and children's living circumstances away from the conventional.

Moreover, changes in children's living circumstances are a documented phenomenon in studying the link between local labour markets, marriage and fertility. On the background of negative shocks to the steel and coal industries, Black et al. (2003) note an increase in the number of children being raised in single-mother households in the 1980s, with a bigger fraction of female-headed, child-rearing households living in poverty.

More recent evidence from the U.S. looks at trade-induced labour demand shocks by gender. Autor et al. (2015, 2018) disaggregate trade shocks into components affecting male versus female employment (Autor et al., 2015; Autor et al., 2018). The authors parallel this to Becker's model of household specialisation (Becker, 1973), and show that import shocks to male employment reduce male earnings and employment opportunities, and further lead to a decline in marriage rates and fertility, an increase in teen motherhood rates and a rise in the proportion

⁵ Higher opportunity cost of childbearing due to the lack of family-friendly institutions and cultural influences.

of children living in poverty or in single-headed households⁶. The findings of Autor et al. (2018) additionally indicate that such trade shocks increase male idleness and widen the male-female mortality gap, thus affecting fertility eventually due to decreasing male employment opportunities.

Hence, trade shocks that result in fewer employment opportunities for men (Autor et al., 2018) and reduced skill premium in non-developing countries (Cigno et al., 2018) may thus impair male social function and will eventually affect fertility, as males with a lower economic status become less attractive marriage partners. As opposed, Kearney and Wilson (2018) test an inverse marriageable men hypothesis by exploiting the positive economic shock from a U.S. fracking boom in the 2000s, and find that both marital and nonmarital birth rates go up as wages and jobs for non-college educated men increase yet there is no positive change in marriage rates.

Evidence so far supports the idea that male social function is thought to be a driver of fertility and is often studied in relation to the economic opportunities available to men. However, having children is usually a shared decision and, therefore, evidence on female workers must also be explored.

Given that women have a relatively less stable labour participation over the course of life, there is little evidence to link trade-induced shocks to female manufacturing employment with fertility decisions. Nevertheless, factors that contribute to female employment conditions and job satisfaction may reveal part of the dynamics involved in fertility. For instance, Fagan and Burchell (2002) show there is reduced job autonomy for female workers in the European Union, while Kirmeyer and Shirom (1986) give evidence that women in manufacturing are over-represented in low-wage positions that do not grant them much autonomy.

In a Becker's family economics tradition, children are "produced" by each family through inputs of various market goods and services and the time of family members (Becker, 1974). Becker further adds that a married woman is more likely to be in the labour force when her own wage rate is higher or when her husband's wage rate is lower (ibid).

Accordingly, as females working in manufacturing may face more difficulties of reconciling work with life in jobs that they might not find particularly rewarding, it would be plausible to hypothesise a lower opportunity cost of work and even leaving work to have a child, or anything

⁶ Results in Autor et al. (2015, 2018) are based on census data.

in between. Nonetheless, observed births often reflect personal decisions and not readily noticeable aspects on how individuals see the prospect of having a child.

It follows that examining the *perception* mechanisms through which trade exposure may affect fertility is essential. Evidence hitherto allows to conclude that it is primarily men whose prospect of having children is impaired because of a negative income effect from trade shocks, whereas the mechanism underlying female fertility decision might point in a different direction given labour market conditions and female labour supply dynamics.

Finally, in order to complete the review, the need is to transgress the gender-specific paradigms involved in fertility decisions and consider also individual perceptions and market expectations, as these may be rooted in reason to some extent. An econometric analysis by Geishecker et al. (2012) shows there is an increasingly important role for job insecurity among German workers and greater job loss fears caused by offshoring to low-wage countries. Therefore, irrespective of gender, job insecurity might hinder fertility intentions, though it is unclear how.

3. Methodology

This section covers the empirical framework, data and the empirical specification used in the paper. First, it explains how import penetration is formulated to give a yearly monetary measure of import exposure which varies with industry and state of employment. Second, it constructs an instrument which isolates the exogenous variation in rising imports from China and Eastern Europe. Third, data sources and the final sample of individuals are described, while briefly referring to how import data is matched with individual data. Last, it presents the empirical specification that gives the baseline results, and that is later used throughout the paper to disentangle the main effect.

3.1. Empirical Framework

This paper reformulates the approach in Autor et al. (2013) to give an industry-state variation year on year⁷. Two separate monetary measures of exposure to Chinese and EE imports are constructed for sixteen German federal states (NUTS 1 level) and twenty-two manufacturing industries (2-digit level industries as per the Statistical Classification of Economic Activities Revision 1, hereafter NACE Rev. 1) over twenty-two years from 1995 to 2016. The resulting import exposure measures for China and Eastern Europe will be further applied to individual data.

As an original contribution, this different computation of import exposure is matched with individual fertility decisions. Fertility behaviour is hereby measured by new birth events within households, a dichotomous variable capturing the probability of having a new-born. This probability is based on the observed birth event of a child in a household where at least one parent was employed in manufacturing for at least one year during the panel period 1995-2016. The import exposure measure is formulated as follows:

$$IE_{jkt} = \frac{E_{jkt}}{E_{jt}} * \frac{M_{kt}}{E_{kt}} \quad (1)$$

⁷ Reasons for exploiting this industry-state-year variation have been in part provided in the introduction, i.e. some industries may be more sought after than others as more childbearing-friendly. Moreover, some industries outperform others in certain areas, hence it makes relatively more sense to consider a variation that is more in tune with yearly regional economic performance, where an industry shock is weighed by a regional weight. It should also be noted that the differentials between federal states may be important in post-reunification Germany where the dynamics of the East were different from those of the West.

E_{jkt} is the number of employees working in region j and industry k at time t , while E_{jt} is the yearly number of employees working in region j . M_{kt} is the yearly import value for an industry k as mapped from Standard International Trade Classification Revision 3 (SITC Rev. 3) to NACE Rev. 1. E_{kt} is an industry's employment level at time t . For all levels employed in the analysis, t runs from 1995 to 2016.

The resulting measure is the yearly EUR value for exposure to Chinese imports, and separately to EE imports, for employees working in region j and industry k at time t .

To put it more simply, the first ratio gives the share of an industry k 's employment in regional employment at time t , while the second ratio can be seen as the import shock per employee in industry k at time t .

Import exposure is calculated for China and separately for Eastern Europe as in equation (1). The Eastern European countries considered in the computation of the EE exposure measure are Poland, Hungary, the Czech Republic, Slovakia and Romania⁸.

Moreover, equation (1) is instrumented with a measure of exposure that is computed using Chinese and EE imports into three high-income countries, i.e. Australia, Canada and Japan. The countries in the instrument group were chosen such that the instrument would capture the supply-driven variation in rising import competition, as China and Eastern Europe increased trade with the world following their transition from a centrally planned economy to a decentralised market economy. This transition is concomitant with the years considered in this panel. Instrumenting for import competition from China and Eastern Europe is performed as per the following equation:

$$INST_{jkt} = \frac{E_{j,k,t-1}}{E_{j,t-1}} * \frac{M_{k,t}^{AUS/CAN/JPN}}{E_{k,t-1}} \quad (2)$$

A separate instrument measure is built for each of China and Eastern Europe. Equation (2) uses lagged industry and regional employment levels to mitigate against any shocks which simultaneously impact on the country's imports and regional performance variables.

⁸ As mentioned previously, these countries form a geographical corridor and share a similar history.

In sum, since unobserved demand shocks may increase imports simultaneously with the probability of having children in Germany, the instruments isolate the exogenous variation in the supply-driven component of imports from China and EE.

3.2. Data

Figure 1 shows the upward trend in Germany's imports from China and Eastern Europe since mid-1990s. Imports from both China and EE fell during the great recession, yet they picked up shortly after the crisis to exceed pre-crisis levels. Imports from China since 2014 have decreased due to sanctions and tariffs imposed. EE imports amass five countries, and Poland and the Czech Republic are the main source of import competition in Germany, as they alone make up much of the imports to levels which are similar to those from China.

3.2.1. Data Sources

Data on German individuals are sourced from the German Socio-Economic Panel (GSOEP), where individuals' industries of employment come coded as NACE Rev. 1. Import data come from the UN Comtrade Database and the OECD Structural Analysis Database (OECD, 2018), which have been sourced in the form of SITC Rev. 3 manufacturing goods and then mapped to NACE Rev. 1 in order to be matched with individual data⁹. Import values were retrieved in USD then converted to EUR according to the Deutsche Bundesbank (2006) daily exchange rates in 2006.

Annual state-level employment numbers (E_{jt}) and industry-level employment (E_{kt}), as well as annual statistics of employees working in state j and industry k (E_{jkt}) are sourced from Eurostat and the Federal Statistical Office of Germany (Destatis). The time window is 1995 to 2016. Specifically, the industry-related figures E_{kt} and E_{jkt} were retrieved from the European Commission's Structural Business Statistics database, coded in the form of NACE Rev. 1 till 2007 and NACE Rev. 2 after 2008, and were converted to NACE Rev. 1 as per Eurostat (2018d) ensuring consistency in converting¹⁰. Lagged employment levels for the computation of the instruments in equation (2) were sourced from the OECD Structural Analysis Database¹¹ (OECD, 2018), while import data come from the UN Comtrade Database.

⁹ The mapping was performed to obtain the two separate import exposure measures (China and EE) as well as for their instruments, for every country in the EE group and for every country in the instrument group.

¹⁰ See Tables A1-A3 in the Appendix for further details.

¹¹ OECD, 2018 as classifications in the form of International Standard Industrial Classification (ISIC) Rev. 3 and Rev. 4 which hereto have been mapped to NACE Rev. 1 as per the Reference and Management of Nomenclatures

3.2.2. *Final Sample*

The final sample contains 39,666 observations corresponding to 6,440 individuals who are observed on average for 9 years and who belong to 5,892 households. Individuals are aged between 17-50 when first observed in the panel (i.e. reproductive age) and they live in households where they are reported as either ‘head of household’ or ‘partner’.

The sample consists of all individuals who were employed in a manufacturing industry at least once during the panel period. These are individuals who (1) have stayed in the same manufacturing industry throughout the panel period, (2) have transitioned to a different manufacturing industry, or (3) have entered either the service sector or non-employment¹².

Moreover, the industry of employment for those that in a given year no longer work in a manufacturing industry (i.e. went out of manufacturing) was rewound to their prior manufacturing industry. Thus, workers who went out of manufacturing were given import exposure values corresponding to their manufacturing industry and federal state of employment from the year leading to the change. The monetary values of import exposure were left to vary year on year provided the allocation above. On the other hand, workers who stay in manufacturing but change industries within manufacturing are given exposure values corresponding to their current industry and state of employment, and these vary year on year.

3.2.3 *Descriptive Statistics*

The dependent variable that captures individual fertility behaviour is an observed birth event (i.e. having a new-born) within a household in a certain year. This is a dichotomous variable which equals 1 if there is an observed birth event in a household in the year that a child was born to the parents of that household and equals 0 otherwise. The dependent variable is estimated with a Linear Probability Model (LPM), as detailed in Section 3.3.

Table 1 shows individual level descriptive statistics. The probability of a birth event is 0.044 on average, with a standard deviation of 0.204. The mean age of the individual is 39 years and 4

(RAMON) correspondence tables (Eurostat, 2018c). Second, import data have also been converted from SITC Rev. 3 to NACE Rev. 1 in a similar fashion to the mapping performed for the endogenous import exposure.

¹² This is obtained based on the universe of all SOEP employees who ever worked in a manufacturing sector for at least one year, then labour market transitions have been computed for all pre-sampled individuals (Table A.4 in the Appendix) and a time-invariant industry is assigned to individuals who change sector to either services or non-employment (intersectoral mobility in Table A.5 in the Appendix) while reverting to the time-variant industry for those who switch between manufacturing industries. These workers are subsequently matched with a measure of import exposure based on their industry and state of employment.

months, while the average age at the observed birth event is 33 years and 8 months. The shares of men and women in the sample are 69.1% and 30.9%, respectively. The average number years spent in education is 12 years. Most individuals in the sample are married (i.e. 70.7%), while 15.6% are single and about 10% all together are divorced, separated or widowed. Individual annual earnings are EUR 34,954 on average, with an average number of annual work hours around 2,086. Additionally, Table A.6 in the Appendix details the distribution of birth events for males and females and the individual's age at the birth event.

Tables 2-4 present statistics on import exposure. Exposure to Chinese imports is EUR 49 on average, and EUR 123 for Eastern Europe (Table 2). It follows that any EUR 100 increase in Chinese and, separately, EE competition will be interpreted as an increase of 1.54 and 0.67 standard deviations of the mean, respectively¹³. The industries that are the most exposed to Chinese imports are high-tech and medium-high tech industries (Table 3), whereas the most exposed to EE competition are medium-high tech¹⁴.

3.3. Empirical Specification

The effect of import competition on individual fertility decisions is estimated with a Linear Probability Model (LPM) using the following specification:

$$birth_{ijkt} = \alpha_i + \alpha_t + \beta_1 * IE_{jkt} + \gamma I_{it} + \delta E_{kt} + \tau S_{jt} + \varepsilon_{ijkt} \quad (3)$$

where the dependent variable is the observed birth event (dichotomous) for an individual i working in region j and manufacturing industry k at time t . Measures of exposure to Chinese and EE imports are defined as in equation (1), and the coefficient on import exposure estimates the *causal* effect on individual fertility upon rising import exposure to China and to EE, respectively, at jkt level. Since there are differences in fertility behaviour across individuals and years, individual and year fixed effects are included so as to absorb unobserved shocks. I , E and S are vectors of controls for individual, industry and state characteristics, and an error term is included also (ε_{ijkt}).

Time-invariant differences in fertility between individuals are absorbed by the individual fixed effects. The specification allows to exploit the within-individual changes in fertility behaviour while controlling for shocks in different time periods. Vectors of control variables include

¹³ EE exposure is roughly 2.5 times higher than Chinese exposure, for it amasses five countries.

¹⁴ The technological intensity by occupation is set by the European Commission (Eurostat, 2018a).

individual, industry and state time-varying observable characteristics. The model is thus identified by changes in import penetration over time.

As for the first stage in the IV estimation, import exposure for each of China and EE is instrumented with a variable constructed as in equation (2) correspondingly. The instrument is valid if (1) it affects individual fertility choices only through import exposure, (2) demand shocks in the destination countries are uncorrelated with shocks in the origin countries that generate exogenous variation in the trade volume, and (3) conditional on the control vectors, there is no unobserved factor correlated with the instrument.

4. Results

Table 5 reports coefficient point estimates of baseline equation (3) for Chinese import exposure. In column (1), the OLS coefficient on import exposure is strongly significant when individual fixed effects and the full set of controls are included. The estimates give a 1.9 percentage points decrease in an individual's probability of having a new-born upon increasing competition from Chinese imports by EUR 100¹⁵.

Furthermore, when including time effects in an OLS estimation (column 2), the effect on birth stays negative but it becomes insignificantly different from zero. In other words, in an OLS setting, controlling for shocks in different time periods has no explanatory power in terms of individual fertility. That is, the within-year variation cannot explain the effect on individual fertility. With a dichotomous dependent variable that is observed sporadically, such as a birth event, absorbing unobservable time shocks would not be of much help in an OLS estimation. In such a context, most controls would be absorbed into fixed effects since they exhibit low time variation, hence it is likely that individual fixed effects and time dummies capture all variation in the data.

Columns (3)-(5) estimate the baseline specification in equation (3) by a fixed-effects instrumental variable regression (FEIV, or FE2SLS). With individual controls and individual fixed effects, the probability of having a new-born decreases by 1.3 percentage points from a EUR 100 increase in Chinese import competition (column 3). When adding further industry and state controls, the effect remains negative and becomes more significant, giving a 1.6 percentage points decrease in fertility (column 4).

The final specification of the baseline model is presented in Table 5, column (5), which further includes year fixed effects in addition to the individual fixed effects and all controls, focusing thus on time variation within individual while leveraging an individual's state and industry variation. The coefficient stays negative, has the same size as in column (4) and is significant at 5%.

Table 5 also reports first stage statistics and robust standard errors, as well as KP F-tests which are indicative of a strong instrument for Chinese import competition. Additionally, all

¹⁵ A hundred-euro increase is within 1.54 standard deviations of the mean.

specifications allow standard errors to be correlated between workers within the same industry and state.

Similarly, Table 6 shows results of EE import competition on individual fertility. Columns (1) and (2) show estimates from an OLS regression with the specification in equation (3). As in China's case, OLS estimates are negative also for EE import exposure. Further along, fixed-effects IV estimates in columns (3)-(5) exhibit a stronger effect from EE competition than from China. The final specification in column (5) gives that a EUR 100 increase in EE import exposure lowers individual fertility by 2 percentage points¹⁶.

4.1. Robustness

This section performs several checks which suggest that baseline coefficients are robust. Table 7 summarises the robustness checks performed. Panel (a) adds state effects to the baseline specification. Coefficient point estimates in Tables 5-6 do not change, indicating that within-state variation does not influence changes in fertility across individuals employed in industry k and state j at time t .

Panel (b) adds industry fixed effects to the baseline equation, thus focusing on within-industry variation over time for the same individual. The effects on fertility remain negative, although not significantly different from zero for Chinese import competition¹⁵ and only weakly significant for EE competition. This suggests that most explanatory power in fertility behaviour comes from the between-industry variation, which is seemingly relevant for the probability of having children. Within reason, individuals may be choosing those industries that make child rearing easier, for various reasons and in line with their preferences.

Panel (c) in Table 7 adds individual-industry fixed effects. In this case, the coefficient of interest is identified from the time variation and the geographical variation in individual fertility decisions (i.e. the realisation of a birth event) and import exposure with its instrument for a given manufacturing worker while employed in the same industry. Remarkably, for workers staying in the same industries, the probability of having children decreases by 3.1 percentage points, roughly double the baseline effect.

¹⁶ Notably, adding time effects in column (5) lowers the total effect of EE competition from 2.7 p.p. to 2.0 p.p. This shows that time effects purged any unobserved simultaneous time shocks and the effect is such that the within-year variation still explains the variation in individual fertility behaviour at a 5% level of significance, conditional on individual, industry and state characteristics. ¹⁵Coefficient on IE China loses significance, with p-value=0.12.

This section performs a further check to show that the effect in the baseline is not driven by individuals who may be more susceptible to union disruption (i.e. individuals who change marital status from married to divorced), and who would therefore compromise on their probability to have children. Here, the sample is restricted on the individuals who enter the panel as ‘married’ and stay married until exit and those who enter as ‘other than married’ (e.g. single, divorced, separated) and possibly change their marital status before exit or remain as such.

Results in Table 7, panel (d) show that the effect on the probability of having a new-born remains negative and slightly increases in size. Therefore, these findings indicate that the effect would be driven by the bulk of individuals who would theoretically be more likely to have children, i.e. those who are in marital unions for the entire period they participate in the panel, or individuals who enter the panel as single and possibly marry before exiting the panel.

4.2. Heterogeneity

In Tables 8 and 9, import exposure is interacted with a series of dummies for female, education level, part-time irregular worker dummy, short and long tenure with current employer and various levels of technological intensity according to the industry of work, e.g. medium-low, medium-high and high technology (Eurostat, 2018a).

The coefficient on Chinese import competition stays negative and significant across all subgroups of individuals (Table 8). Most interestingly, the effect is larger for individuals in high-tech industries by almost a half on its baseline estimate¹⁷ on increasing import competition from China by EUR 100.

As for competition from EE, estimates in Table 9 are similar to those in the baseline, indicating that a EUR 100 increase in import exposure decreases individual fertility by 2 percentage points, roughly. The strongest effect is found for medium-low technology workers, whose fertility goes down by 3.1 percentage points upon a EUR 100 increase in exposure to EE imports. Regressions in both Tables 8 and 9 include the same set of controls as in Tables 5 and 6, column (5).

¹⁷ 2.2 versus baseline 1.6 percentage points decrease upon rising import competition from China by EUR 100.

5. Potential Mechanisms

Since having children is seen as an investment by couples, it would be sensible to investigate how increased competition from Chinese and EE imports affects individual fertility. This section outlines some of the mechanisms that lie behind individual childbearing decisions.

First of all, since fertility decisions are highly endogenous in how they materialise for different individuals, channels that are mostly related to an individual's main income may be difficult to follow. For this reason, effects of import competition on second job income are examined here, as income from secondary employment might capture some of the couple's dynamics that other variables do not capture.

Table 10 shows that income from secondary employment decreases by EUR 88.43¹⁸ with an increase of EUR 100 in exposure to Chinese imports, but no effect is found for EE. Similarly, rising import competition from China lowers individual satisfaction with personal income by 2.7 percentage points, while effects of EE competition are inconclusive¹⁹.

Furthermore, the probability that workers hold a short tenure of 0 to 5 years with their current employers decreases by 2.6 percentage points only in the case of competition from Eastern Europe. However, this does not necessarily imply that workers have more secure jobs, especially as the first years in the panel (1995-2002) were a period of high unemployment in Germany. These results reflect not only effects on individuals who are unemployed but also those who become unemployed over the sample period, as detailed in the section on the final sample.

The last mechanism examined is a variable to express employee contentment; that is, working in an occupation for which one has trained initially, here seen as a potential job stressor that might affect individual fertility decisions. Coefficients for both China and Eastern Europe are negative but insignificant, although the p-value for the China coefficient is 0.11, indicating that there may be a weakly significant effect.

Overall, import competition may affect fertility decisions, irrespective of the gender of the individual, via reduced second job earnings, lower satisfaction with personal income and

¹⁸ Equivalent to a 36.7% decrease on sample average of second job income.

¹⁹ The coefficient point estimate on EE competition in Table 10 column (2) is insignificant, though his p-value is equal to 0.11, so the effect from EE would not be significantly different from zero.

shortened employment duration. Effects from Chinese competition prevail over those from EE. However, as decisions to have children vary across individuals, currently examined effects might not fully reflect some decision factors that are gender-specific.

Since both males and females play a role in contemporary household decision-making, the paper now focuses on studying what lies behind each gender's fertility decisions in this framework.

6. Differences in Fertility Decisions: Inspecting the Mechanisms for Male and Female Workers

Baseline results and the mechanisms proposed so far have provided a first glimpse into what might drive individual fertility decisions. Consequently, in order to reveal what else lies behind decisions to have children, this section inspects the effects obtained in the baseline estimation by gender.

Table 11 investigates effects of import exposure by gender. Import exposure measures for male and, separately, female employees are obtained by interacting import exposure with a male dummy and a female dummy, respectively. As seen in the baseline results (Tables 5-6), the total effect on birth is negative for both Chinese and EE competition. When examining by gender, the effect on male workers' fertility is in line with baseline results and still negative, though positive for female workers.

An increase of EUR 100 in import competition from China and Eastern Europe decreases male workers' probability of having children by 2.8 and 3.0 percentage points, respectively, while increasing it for female workers (2.3 and 2.0 percentage points for China and EE, respectively).

All in all, these findings suggest that there is potentially a substitution effect in labour supply for female workers upon rising import competition. This effect would imply that female employees may associate a lower opportunity cost to working, to the extent that the prospect of having children becomes an option and, possibly, a more rewarding alternative.

6.1. Male Fertility: Inspecting the Mechanisms

Overall results in Table 12 show that the male component of import exposure negatively affects the probability of having a new-born via reduced earnings and shortened employment duration. In particular, second job earnings drop by EUR 84,91²⁰ resulting from a EUR 100 increase in Chinese import competition, whereas the effect of higher EE competition on male employees' fertility remains negative but insignificant (Table 12, panel a). These findings are consistent with findings for the mechanisms involved in the overall probability of observing a birth event from Table 10.

²⁰ Corresponding to 35.3% on mean second job earnings.

Differently from Table 10, where no effect on employment duration was found from China total exposure, there is now a negative effect on male employment. Specifically, male workers' probability of holding a longer tenure with their employers falls by 2.1, respectively 3.3 percentage points for China and Eastern Europe.

On the one hand, higher competition from China reduces male earnings as opposed to Eastern Europe. On the other hand, increasing EE competition has a larger effect on male fertility behaviour than China, and this may be due to a stronger perception towards EE competition so that male employees stick to their manufacturing industry more tightly, yet to the same result.

In support of this, Table 14 investigates heterogeneous effects by gender, now adding individual-industry fixed effects. That is, the focus is now on time variation and geographical variation for a given worker while employed in the same industry. Effects on the fertility behaviour of male workers are much stronger for individuals employed in the same industry, implying a decrease of 9.4 percentage points in male fertility (Table 14, panel a) with higher Chinese competition²¹, while EE competition decreases male fertility by 5.3 percentage points (Table 14, panel b).

Hence, it is worth noting hereby that results on mechanisms affecting male fertility in Table 12 (i.e. reduced earnings and shorter employment duration upon higher import exposure) parallel in point of fact (and to a large extent) the results on the fertility decisions of male workers within the same industry in Table 14.

6.2. Female Fertility: Inspecting the Mechanisms

This section distinguishes between two parts of female import exposure, where one part may negatively affect female fertility decisions while the second element (most predominant) affects female fertility positively.

In Table 13 panel (a), import exposure affects female employees' fertility negatively via lower earnings. Rising Chinese import competition decreases female second job earnings by EUR 126.84, corresponding to a 52.7% decrease on average income from secondary employment. The effect on secondary income from EE competition is negative though not significant. Income

²¹ i.e. a hundred-euro increase

from secondary employment can therefore seemingly affect female fertility both positively and negatively.

Panel (b) in Table 13 shows that rising import competition from China reduces female autonomy on the job by 2.7 percentage points²². In turn, this may imply that females may derive lower satisfaction from work, as lower job autonomy and reduced earnings from secondary-employment would lower the opportunity cost of work to the point where having children would become an option. This would explain the positive effect on female fertility (Table 11) which is nevertheless not as strong as that on male employees due to mechanisms affecting male fertility presented in Table 12.

In addition, a parallel with Table 14 can be drawn also here, as with male fertility decisions above. Table 14 shows that coefficients on the female component of import exposure remain positive and robust for female workers in the same industry, although China has a larger effect on female fertility by about a half as opposed to results for all female workers across industries in Table 11.

6.3. Substitution Effect: Further Evidence on Female Fertility

This section corroborates evidence so far and gives further information. The hypothesis of a positive effect on female fertility via lower job autonomy and reduced earnings simultaneously is perfectly in line with theory and evidence on female participation in the labour market.

Fagan and Burchell (2002) note that female workers in the European Union have reduced autonomy on the job compared to their male counterparts. Alongside, Kirmeyer and Shirom (1986) document that women in manufacturing are over-represented in low-wage positions that do not grant them much autonomy. Reduced job autonomy can thus affect female fertility in part, though the effect is unclear.

As a result, since the majority of the female workers in the sample are concentrated in low-technology industries (ergo, low-wage employment), the paper moves on to study the effect of import exposure on the probability of having children in this subgroup.

Panel (a) in Table 15 shows that the effect on giving birth for a given female worker in a low-technology industry is much larger than in the gender-specific set of effects (Table 11).

²² Coefficient estimates are not significant for Eastern Europe.

Specifically, for female workers in low-tech industries, the probability of having children increases by 31 and by 15 percentage points with a EUR 100 rise in import competition from China and Eastern Europe, respectively.

Accordingly, panel (b) backs up the results above and finds a large decline in hourly wage for female workers in low-tech industries. Upon rising exposure in the female component of import competition by EUR 100, hourly wage declines by EUR 9.23 (i.e. 55.5% of mean hourly wage) with Chinese competition, and respectively declines by EUR 3.70 (i.e. 22.3% on mean wage per hour) with EE competition.

Therefore, the results point to a substitution effect in labour supply for female workers in low-technology industries, whose opportunity cost is lower and the prospect of having children possibly becomes a more rewarding alternative. This result is in line with evidence from Gries and Grundmann (2014), who find a positive effect on fertility from trade in low-skill-intensive sectors.

As Brewster and Rindfuss (2000) emphasise, women labour force participation has been traditionally less stable, and fertility decisions do not imply solely childbearing but also *child rearing* (i.e. the act of bringing up children). The latter may be particularly difficult in roles where work and personal decisions are incompatible, yet role incompatibility depends highly on institutional factors characteristic to the country.

Although Germany has a strong commitment towards families, backed by child and housing allowances along with generous maternal leave packages, Hantrais (1997) points out that such family-friendly policies have not been matched by high rates of female economic activity among women of childbearing age nor high birth rates. In sum, welfare cannot entirely compensate for the lost economic opportunities of women, while men are subject to trade-induced shocks that affect their employment and economic opportunities.

7. Concluding Remarks

This paper studies the effect of globalisation, understood as import penetration, on individual fertility decisions. Data on individuals come from the German Socio-Economic Panel (GSOEP) and are matched with monetary measures of exposure to Chinese and Eastern European imports based on the industry and state of employment of every individual in the panel period 1995-2016. Yearly exposure measures are computed for 22 manufacturing industries and 16 federal states for competition from China, and separately for Eastern Europe which amasses five countries. The resulting values of exposure vary by industry, state and year, and are instrumented with measures of Chinese and EE import penetration into other high-income countries.

Baseline results show a negative effect on individual fertility due to rising import competition. The effects are robust and consistent across different subgroups of individuals and remain negative. As for mechanisms potentially driving these effects, findings show that import penetration affects individual fertility via reduced income from secondary employment, lower satisfaction with personal income and shortened employment duration, and that effects of Chinese competition prevail.

In further linking import exposure to individual fertility, the analysis proceeds by looking at effects of import exposure by gender. The rationale is that some decisional aspects of fertility might be gender-specific. Accordingly, results indicate that import exposure to China and EE negatively affects male fertility, whereas the effect on female workers is positive.

Furthermore, different mechanisms that underlie female and male fertility decisions as related to import exposure are inspected. On the one hand, findings show that higher import exposure negatively affects male workers' probability of having children via reduced earnings and employment duration. Effects are larger for male workers who stick to the same industry of employment.

On the other hand, rising import competition affects female fertility decisions via reduced earnings and worsened working conditions (lower job autonomy), though positively. In support of this, evidence that female workers are concentrated in low-wage and low-autonomy positions is provided. It is shown that less job autonomy and reduced earnings might determine women

to reconsider their opportunity cost of work, now lower, so that having children would become a more rewarding alternative (i.e. substitution effect).

Summing up, this paper offers the first GSOEP-based evidence on gender-specific fertility behaviour in the context of import penetration and globalisation. Since the final sample includes individuals who were employed in manufacturing at least once during the panel period (irrespective of their destinations thereafter), the effects summarised in the course of the paper cannot be generalised to women not participating in the labour market but refer to employed women.

Fertility decisions do not encompass solely childbearing but also the act of bringing up children. Where incompatibility between work and family is perceived, generous welfare cannot entirely make up for lost economic opportunities, especially as increased import competition poses additional pressure on the financial security of individuals.

A full comprehension of gender dynamics would require an enhanced understanding of what determines fertility behaviour in a globalising world. A less obvious implication in the course of the analysis is gender polarisation. The effective functioning of social groups with regard to building better relationships, sharing a sense of identity, common values and cooperation is what defines social capital. By means of globalisation, gender polarisation adds a distinct level of complexity which poses challenges in continuing the process of social capital formation.

In conclusion, social policy which aims at *protecting* and *enhancing* social capital must cultivate social norms centred around inclusion, response, accountability, virtue and individuality. Thus, social policy will contribute effectively to close the gender gap eventually.

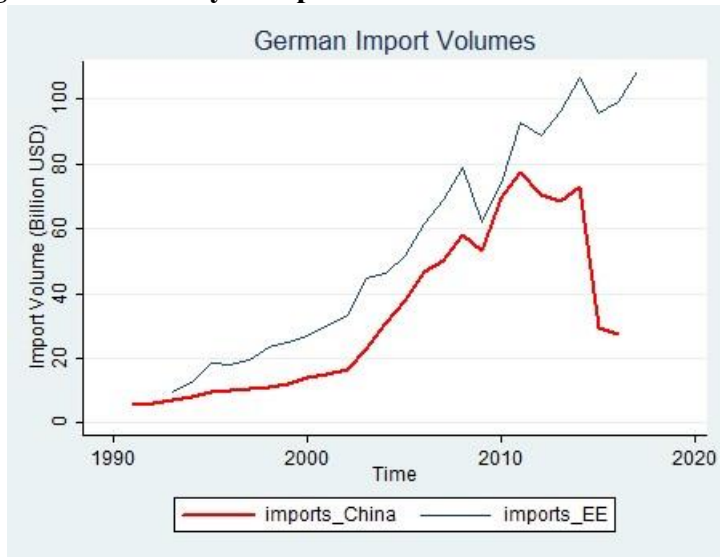
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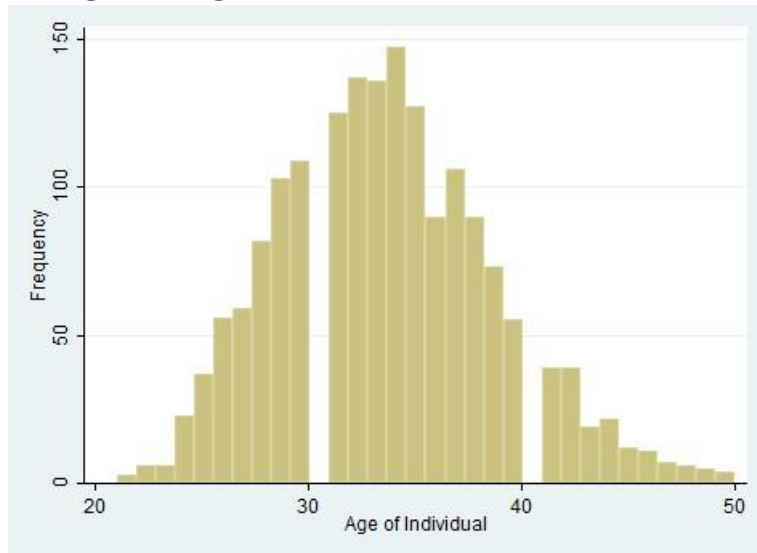
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Figure 1: Germany's Imports from China and Eastern Europe



Source: Author's computations based on import data from UN Comtrade

Figure 2: Age of Individual at Birth Event



Source: Author's computations based on final sample

Table 1: Descriptive Statistics on Individual-Level Variables

Variable	Mean	Std. Dev.	N
Birth event within HH	0.044	0.204	39666
Age of Individual	39.306	6.925	39666
Age of Individual at Birth Event	33.657	5.103	1734
Male	0.691	0.462	39666
Female	0.309	0.462	39666
Number of Years of Education	12.137	2.536	39666
German National	0.883	0.322	39666
Number of Persons in HH	3.171	1.301	39666
Number of Children in HH	1.089	1.083	39666
College Degree	0.176	0.38	39666
High School Degree	0.699	0.458	39666
Less Than High School Degree	0.125	0.331	39666
Married	0.707	0.455	39666
Single	0.156	0.363	39666
Divorced	0.069	0.253	39666
Separated	0.022	0.147	39666
Widowed	0.004	0.064	39666
East Germany	0.162	0.368	39666
Employed Full Time	0.856	0.351	39666
Employed Part Time Regular	0.11	0.312	39666
Employed Part Time Irregular	0.031	0.174	39666
Employed in Vocational Training	0.002	0.049	39666
Years at Current Employer	9.646	8.045	39633
Annual Work Hours of Individual	2085.705	645.717	39666
Hourly Wage	16.619	10.776	39666
Individual Labor Earnings	34953.858	24453.464	39666
Income from Secondary Employment	240.857	1494.569	39666
Income from Self-Employment	2109.341	11826.407	39666
Unemployment Benefit	101.61	779.458	39666
Maternity Benefit	38.584	509.439	39666
Child Allowance	2257.966	2223.692	39666
Housing Benefit	40.552	298.616	39666
HH Labor Income	52906.796	32359.745	39666
HH Imputed Rent	1284.147	2556.185	39666
Total HH Taxes	18643.695	15340.31	39666

Table 2: Descriptive Statistics on Import Exposure (EUR)

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
Exposure to Chinese Imports	49	65	0	841	39666
Exposure to EE Imports	123	150	0	1080	39666

Table 3: Descriptive Statistics on Chinese Import Exposure

Industries with the lowest import exposure per worker (j,k,t)	Value (EUR)
16 Manuf. of Tobacco	0.2
23 Manuf. of Coke, Refined Petroleum Prod, Nuclear Fuel	8.68
22 Publishing, Printing and Reproduction of Recorded Media	9.28
21 Manuf. of Pulp, Paper and Paper Products	9.77
20 Manuf. of Wood Products (Exc. Furniture)	25.70
j=region, k=industry, t=time	
Industries with the highest import exposure per worker (j,k,t)	Value (EUR)
18 Manuf. of Wearing Apparel; Dressing And Dyeing Of Fur	266.45
31 Manuf. Electrical Machinery And Apparatus NEC	292.84
29 Manuf. of Machinery And Equipment n.e.c.	330.79
32 Manuf. of Radio, Television And Communication Equipment	661.50
35 Manuf. Other Transport Equipment	841.48
j=region, k=industry, t=time	
	Obs. 39666

Table 4: Descriptive Statistics on EE Import Exposure

Industries with the lowest import exposure per worker (j,k,t)	Value (EUR)
16 Manuf. of Tobacco	6.66
22 Publishing, Printing and Reproduction of Recorded Media	20.11
23 Manuf. of Coke, Refined Petroleum Prod, Nuclear Fuel	24.19
30 Manuf. Office Machinery And Computers	38.62
19 Tanning, Dressing of Leather, Luggage, Footwear	53.84
j=region, k=industry, t=time	
Industries with the highest import exposure per worker (j,k,t)	Value (EUR)
24 Manuf. of Chemicals and Chemical Products	344.96
31 Manuf. Electrical Machinery And Apparatus NEC	455.98
29 Manuf. of Machinery And Equipment n.e.c.	495.34
27 Manuf. of Basic Metals	846.91
34 Manuf. Motor Vehicles, Trailers And Semi-trailers	1079.81
j=region, k=industry, t=time	
	Obs. 39666

Table 5: Baseline Estimates - Individual Fertility and Exposure to Chinese Imports

	(1)	(2)	(3)	(4)	(5)
IE China	-0.019*** [0.003]	-0.001 [0.004]	-0.013* [0.007]	-0.016** [0.007]	-0.016** [0.008]
Estimator	OLS	OLS	FEIV	FEIV	FEIV
Individual controls	yes	yes	yes	yes	yes
Industry controls	yes	yes	no	yes	yes
State controls	yes	yes	no	yes	yes
Individual effects	yes	yes	yes	yes	yes
Year effects	no	yes	no	no	yes
Observations	39666	39666	39664	39664	39664
First-stage results			0.047*** [0.0008]	0.051*** [0.0009]	0.047*** [0.0008]
Kleibergen-Paap F-statistic			3579.6	3458.4	3161.6

* p<0.10, ** p<0.05, *** p<0.01

The dependent variable is birth, i.e. a dichotomous variable which gives value 1 if there is a birth event within a household in a certain year, or zero otherwise.

IE China is the yearly monetary exposure (measured in hundreds) to Chinese imports for an employee working in region j industry k at time t.

Individual controls include age squared, years of education, dummies for education level, marital status and nationality (if German national or foreign national).

Industry and state controls include the share of employment in manufacturing by industry, the number of workers engaged by manufacturing industry and the share of manufacturing workers by state of employment.

OLS estimates in col. (1) include the full set of controls as in col. (5), except for time effects. Estimations in cols. (2) and (5) add time dummies.

Standard errors are clustered to allow for correlation between workers within the same industry and state. Robust standard errors reported in brackets.

Table 6: Baseline Estimates - Individual Fertility and Exposure to EE Imports

	(1)	(2)	(3)	(4)	(5)
IE Eastern Europe	-0.019*** [0.002]	-0.003 [0.002]	-0.020*** [0.007]	-0.027*** [0.045]	-0.020** [0.009]
Estimator	OLS	OLS	FEIV	FEIV	FEIV
Individual controls	yes	yes	yes	yes	yes
Industry controls	yes	yes	no	yes	yes
State controls	yes	yes	no	yes	yes
Individual effects	yes	yes	yes	yes	yes
Year effects	no	yes	no	no	yes
Observations	39666	39666	39666	39666	39666
First-stage results			0.739*** [0.027]	0.650*** [0.027]	0.640*** [0.027]
Kleibergen-Paap F-statistic			755.0	579.8	545.7

* p<0.10, ** p<0.05, *** p<0.01

The dependent variable is birth, i.e. a dichotomous variable which gives value 1 if there is a birth event within a household in a certain year, or zero otherwise.

IE EE is the yearly monetary exposure (measured in hundreds) to Eastern European imports for an employee working in region j industry k at time t.

Individual controls include age squared, years of education, dummies for education level, marital status and nationality (if German national or foreign national).

Industry and state controls include the share of employment in manufacturing by industry, the number of workers engaged by manufacturing industry and the share of manufacturing workers by state of employment.

OLS estimates in col. (1) include the full set of controls as in col. (5), except for time effects. When time dummies are included, the OLS coefficient point estimates in (2) are not significantly different from zero, although close to the 10% threshold (p-value=0.13). Estimations in cols. (2) and (5) add time dummies.

Standard errors are clustered to allow for correlation between workers within the same industry and state. Robust standard errors reported in brackets.

Table 7: Robustness Checks

	Coeff.	Std. Error	KP F-stat	First stage	Obs.
(a) Adding state effects					
IE China	-0.016**	0.008	3142.0	0.047***	39664
IE EE	-0.020**	0.009	536.0	0.633***	39666
(b) Adding industry effects					
IE China	-0.015	0.010	4021.0	0.039***	39664
IE EE	-0.014*	0.008	1222.5	0.719***	39666
(c) Individual-industry fixed effects					
IE China	-0.031**	0.015	1942.0	0.031***	38605
IE EE	-0.031**	0.014	823.2	0.554***	38607
(d) Change of marital status					
IE China	-0.017**	0.008	3017.2	0.047***	37613
IE EE	-0.021**	0.009	525.0	0.640***	37615

* p<0.10, ** p<0.05, *** p<0.01

The dependent variable is birth, i.e. a dichotomous variable which gives value 1 if there is a birth event within a household in a certain year, or zero otherwise. Import exposure is the yearly monetary exposure (measured in hundreds) for an employee working in region j industry k at time t.

Panel (a) adds state effects. The coefficient point estimates do not change.

Panel (b) adds industry effects. The coefficients remain negative, yet not significantly different from zero for Chinese import exposure, and weakly significant for EE exposure. This suggests that between-industry variation is relevant for the probability of having children, as individuals may be choosing those industries that make child rearing easier for various reasons.

Panel (c) further adds individual-industry fixed effects. The effect is much larger. To show that the effect is not driven by union disruption, panel (d) restricts the sample on individuals who enter the panel as married and remain so at the exit, as well as individuals who enter as single/divorced/separated and change status. Coefficients are robust. Standard errors are clustered to allow for correlation between workers within the same industry and state.

Table 8: Heterogeneity - China

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IE EE	-0.015*	-0.016**	-0.016**	-0.018**	-0.018**	-0.022***	-0.025**
	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.009]	[0.011]
IE x Ed.<HS)	-0.019						-0.017
	[0.016]						[0.016]
IE x Part Time Irreg.		0.030					0.031
		[0.022]					[0.021]
IE x Ten 0-5 yrs.			-0.0001				0.0001
			[0.009]				[0.010]
IE x Ten 11-20 yrs.				0.006			0.008
				[0.009]			[0.009]
IE x Medlow Tech					-0.006		-0.002
					[0.020]		[0.020]
IE x High Tech						0.032***	0.033***
						[0.010]	[0.011]
Dummy < HS	-0.019						-0.021
	[0.023]						[0.023]
Dummy PT irreg.		-0.030**					-0.032**
		[0.014]					[0.014]
Dummy 0-5 yrs tenure			-0.003				-0.004
			[0.006]				[0.006]
Dummy 11-20 yrs tenure				-0.008			-0.009*
				[0.005]			[0.005]
Dummy med-low tech					-0.004		-0.006
					[0.009]		[0.009]
Dummy high tech						-0.020	-0.022
						[0.014]	[0.014]
Obs.	39664	39664	39626	39626	39664	39664	39626
KP F-stat	1512.3	52.6	1112.4	1535.2	807.6	2408.9	188.9

* p<0.10, ** p<0.05, *** p<0.01

The dependent variable is birth, equal to 1 if there is a birth event within a HH in a certain year. IE China is the monetary exposure to Chinese imports for an employee working in region j industry k at time t . Variables in interactions are dummies for education level (less than high school), PT irregular work, short tenure (0-5 years with current employers), long tenure (11-20 years), dummies for technological intensity (if working in a medium-low technology or a high tech industry). All regressions include the same controls and effects as in Table 5, column (5). The coefficients reported are estimated by FEIV. Standard errors are clustered at industry-state level. Robust standard errors reported in brackets.

Table 9: Heterogeneity - Eastern Europe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IE EE	-0.020** [0.009]	-0.020** [0.009]	-0.021** [0.009]	-0.022** [0.010]	-0.031** [0.013]	-0.018** [0.009]	-0.031** [0.014]
IE x Ed.<(HS)	-0.005 [0.011]						-0.005 [0.012]
IE x Part Time Irreg.		0.013 [0.010]					0.015 [0.010]
IE x Ten 0-5 yrs.			0.002 [0.007]				0.004 [0.008]
IE x Ten 11-20 yrs.				0.005 [0.006]			0.007 [0.007]
IE x Medlow Tech					-0.004 [0.008]		-0.0009 [0.008]
IE x High Tech						0.085* [0.052]	0.087* [0.053]
Dummy < HS	-0.030** [0.015]						-0.018 [0.024]
Dummy PT irreg.		-0.027** [0.013]					-0.031** [0.012]
Dummy 0-5 yrs tenure			-0.005 [0.009]				-0.008 [0.009]
Dummy 11-20 yrs tenure				-0.011 [0.008]			-0.015* [0.009]
Dummy med-low tech					-0.025** [0.013]		-0.027** [0.014]
Dummy high tech						-0.052** [0.024]	-0.067*** [0.025]
Obs.	39666	39666	39628	39628	39666	39666	39628
KP F-stat	271.2	274.1	274.4	266.3	142.7	289.3	42.5

* p<0.10, ** p<0.05, *** p<0.01

The dependent variable is birth, equal to 1 if there is a birth event within a HH in a certain year. IE EE is the monetary exposure to Eastern European imports for an employee working in region j industry k at time t. Variables in interactions are dummies for education level (less than high school), PT irregular work, short tenure (0-5 years with current employers), long tenure (11-20 years), dummies for technological intensity (if working in a medium-low technology or a high tech industry). All regressions include the same controls and effects as in Table 6, column (5). The coefficients reported are estimated by FEIV. Standard errors are clustered at industry-state level. Robust standard errors reported in brackets.

Table 10: Potential Mechanisms

	Second job income	Income satisfaction	Tenure	Job stressor
	(1)	(2)	(3)	(4)
(a) IE China				
Coeff.	-88.43**	-0.027**	-0.008	-0.017
	[44.25]	[0.013]	[0.012]	[0.011]
KP F-stat	3163.9	2090.4	3154.8	3145.1
First stage	0.047***	0.045***	0.047***	0.047***
	[0.0008]	[0.001]	[0.0008]	[0.0008]
Obs.	39664	25913	39626	39482
(b) IE Eastern Europe				
Coeff.	-61.72	-0.027	-0.026*	-0.015
	[54.62]	[0.017]	[0.014]	[0.013]
KP F-stat	549.8	311.9	545.0	537.1
First stage	0.642***	0.542***	0.640***	0.639***
	[0.027]	[0.031]	[0.027]	[0.028]
Obs.	39666	25915	39628	39484

* p<0.10, ** p<0.05, *** p<0.01

The dependent variables are columns (1)-(4) on the RHS. Panels (a) and (b) report the coefficient on import exposure for China and separately for EE.

In col. (1), second job income is the monetary value reported by individuals. Col. (2) reports results for a dichotomous variable which equals 1 if the individual rates satisfaction with his personal income with any score from 6 to 10 and equals 0 if the score is 0-5. Col. (3) is a dichotomous variable which equals to 1 if the individual has been employed with their current employer for 0-5 years, and 0 otherwise. Col. (4) gives the estimates for a dichotomous variable standing for whether the individual is working in an occupation for which he has trained initially.

Second job income decreases upon rising import competition from China, but not from EE.

Individual satisfaction with personal income decreases by 2.7 p.p. yet results from EE are inconclusive (p-value=0.11). The probability of a short tenure decreases by 2.6% upon rising EE import competition but this does not necessarily mean individuals are better off, especially since 1995-2002 was a period of high unemployment in Germany. Coefficients in col. (4) are negative in size but insignificant, although the p-value for the China coefficient is 0.11, indicating that there may be a weakly significant effect.

The regression is estimated by FEIV. Standard errors are clustered at industry-state level. First-stage results are shown. Robust standard errors reported in brackets.

Table 11: Gender-Specific Effects: Male and Female Import Exposure

	Coeff.	Std. Error	KP F-stat	Obs.
(a) China				
Total import exposure	-0.016**	0.008	3161.6	39664
Male component	-0.028***	0.009	2783.4	39664
Female component	0.023***	0.008	912.8	39664
(b) Eastern Europe				
Total import exposure	-0.020**	0.009	545.7	39666
Male component	-0.030***	0.010	546.5	39666
Female component	0.020***	0.007	238.0	39666

* p<0.10, ** p<0.05, *** p<0.01

The dependent variable is birth, i.e. a dichotomous variable which gives value 1 if there is a birth event within a household in a certain year, or zero otherwise. Import exposure is the yearly monetary exposure (measured in hundreds) for an employee working in region j industry k at time t.

Panel (a) gives total Chinese import exposure, with its male and female components.

Panel (b) gives total exposure to EE imports, with its male and female components.

Regressions include the full set of controls as in col. (5), Tables 5 and 6.

When it comes to gender-specific effects, the effect is much larger for men, and males are driving the total effect. The effect is positive for female workers. This may be due to a lower opportunity cost of work.

Standard errors are clustered to allow for correlation between workers within the same industry and state. Robust standard errors are reported.

Table 12: Inspecting the Mechanism of Male Fertility Decisions

	Coeff.	Std. Error	KP F-stat	Obs.
(a) Second job income				
Male component for China exposure	-84.91*	48.76	2843.4	39664
Male component for EE exposure	-29.23	57.22	546.5	39666
(b) Tenure				
Male component for China exposure	-0.021*	0.012	2776.8	39626
Male component for EE exposure	-0.033**	0.014	545.9	39628

* p<0.10, ** p<0.05, *** p<0.01

The dependent variables in panels (a) and (b) are second job income (EUR) and employment duration (tenure), respectively.

The main independent variable (endogenous) is the male component of import exposure (measured in hundreds) for an employee working in region j industry k at time t . This is instrumented as equation (2) for China and separately for EE. Results show decreased male earnings from a second job upon rising Chinese import exposure but not for EE. Also, there is lower employment duration because of both Chinese and EE competition. These findings are consistent with the coefficient estimates in Table 10. Differently from Table 10, where no effect on employment duration was found from China total exposure, there is now a negative effect on male employment when decomposed. Regressions include the full set of controls as in col. (5), Tables 5-6.

Standard errors are clustered to allow for correlation between workers within the same industry and state. Robust standard errors are reported.

Table 13: Inspecting the Mechanism of Female Fertility Decisions

	Coeff.	Std. Error	KP F-stat	Obs.
(a) Second job income				
Female component for China exposure	-126.84*	73.95	912.8	39664
Female component for EE exposure	-80.59	63.62	238.0	39666
(b) Autonomy on the job				
Female component for China exposure	-0.027**	0.013	940.0	39601
Female component for EE exposure	-0.012	0.011	260.8	39603

* p<0.10, ** p<0.05, *** p<0.01

The dependent variables in panels (a) and (b) are second job income (EUR) and autonomy on the job, respectively.

The main independent variable (endogenous) is the female component of import exposure (measured in hundreds) for an employee working in region j industry k at time t . This is instrumented as equation (2) for China and separately for EE. Results show decreased female earnings from a second job upon rising Chinese import exposure but not for EE. Notably, the effects are stronger than for males (Table 12). In panel (b), women seem to have lower autonomy on the job upon rising competition from China only. These findings would imply that females would derive lower satisfaction from work, as lower autonomy on the job and decreased second job earnings would lower the opportunity cost of work to the point where having children would become an option. This would explain the positive effect of the female exposure component on birth (Table 11) but this does not offset the negative effect of the male component due to mechanisms presented in Table 12. As a result, the total effect on birth (Tables 5 and 6) is negative. Regressions include the full set of controls as in col. (5), Tables 5 and 6.

Standard errors are clustered to allow for correlation between workers within the same industry and state. Robust standard errors are reported.

Table 14: Within individual-industry variation

	Coeff.	Std. Error	KP F-stat	Obs.
Individual-industry FEs				
(a) China				
Total import exposure	-0.031**	0.015	1941.9	38605
Male component	-0.094***	0.037	481.8	38605
Female component	0.034***	0.013	609.4	38605
(b) Eastern Europe				
Total import exposure	-0.031**	0.014	823.2	38607
Male component	-0.053**	0.027	196.7	38607
Female component	0.020***	0.010	232.7	38607

* p<0.10, ** p<0.05, *** p<0.01

The dependent variable is birth, i.e. a dichotomous variable which gives value 1 if there is a birth event within a household in a certain year, or zero otherwise. Import exposure is the yearly monetary exposure (measured in hundreds) for an employee working in region j industry k at time t.

Panel (a) gives total Chinese import exposure, with its male and female components.

Panel (b) gives total exposure to EE imports, with its male and female components. Regressions include the full set of controls as in col. (5), Tables 5 and 6. When decomposed, effects are much larger for men compared to the baseline decomposition results in Table 11, thus males are driving the total effect. Compared to Table 11, the effect is much larger for female workers with Chinese exposure, while the effect of EE exposure stays the same. Coefficients on both female components (China and EE) are positive. Again, this may be due to a lower opportunity cost of work.

Standard errors are clustered to allow for correlation between workers within the same industry and state. Robust standard errors are reported.

Table 15: Substitution Effect: Giving birth becomes an option

	Coeff.	Std. Error	KP F-stat	Obs.
Women in low technology industries				
(a) Birth event				
Female component for China exposure	0.310***	0.116	51.5	31770
Female component for EE exposure	0.131***	0.034	1154.0	31772
(b) Hourly wage				
Female component for China exposure	-9.23***	2.95	78.6	31770
Female component for EE exposure	-3.70***	0.877	1433.3	31772

* p<0.10, ** p<0.05, *** p<0.01

This step restricts the sample on the women who work in low technology industries and who make up the majority of total females (36% of the 12,274 women in the sample).

The dependent variables in panel (a) is birth, where birth equal to 1 if there is a birth event within a household in a certain year. Coefficient estimates show a much larger effect than in the baseline decomposition of the total effect of exposure (Table 11).

In panel (b), hourly wage is the dependent variable and results show a decline of EUR 9.23 (i.e. 55.5% on sample hourly wage average) with rising competition from China and, respectively, a EUR 3.70 decrease (i.e. 22.3% on sample average) due to rising import competition from EE. Both panels use the same specification as in col. 5, Tables 5 and 6.

The main independent variable (endogenous) is the female component of import exposure (measured in hundreds) for an employee working in region j industry k at time t. This is instrumented as equation (2) for China and separately for EE.

As hinted before, with a lower opportunity cost of work, these findings would imply that giving birth would become an option for women in low tech industries (the majority of all females in the sample).

Regressions include the full set of controls as in col. (5), Tables 5 and 6. Standard errors are clustered to allow for correlation between workers within the same industry and state. Robust standard errors are reported.

Appendix

Table A.1: The States of Germany

- [1] Schleswig-Holstein
 - [2] Hamburg
 - [3] Lower Saxony
 - [4] Bremen
 - [5] North-Rhine-Westfalia
 - [6] Hessen
 - [7] Rheinland-Pfalz
 - [8] Baden-Wuerttemberg
 - [9] [Bavaria]
 - [10] Saarland
 - [11] Berlin
 - [12] Brandenburg
 - [13] Mecklenburgh-Vorpommern
 - [14] Saxony
 - [15] Saxony-Anhalt
 - [16] Thuringia
-
-

Table A.2: 2-Digit NACE Industry Individual Statistics

Industry
[15] Manuf Food Products And Beverages
[16] Manuf Tobacco Products
[17] Manuf Textiles
[18] Manuf Wearing Apparel; Dressing And Dyeing Of Fur
[19] Tanning, Dressing Of Leather; Manuf Luggage, Footwear
[20] Manuf Wood Products, Except Furniture
[21] Manuf Pulp, Paper And Paper Products
[22] Publishing, Printing And Reproduction Of Recorded Media
[23] Manuf Coke, Refined Petroleum Prod, Nuclear Fuel
[24] Manuf Chemicals And Chemical Products
[25] Manuf Rubber And Plastic Products
[26] Manuf Other Non-metallic Mineral Products
[27] Manuf Basic Metals
[28] Manuf Fabricated Metal Prod., Ex. Machinery And Equip
[29] Manuf Machinery And Equipment NEC
[30] Manuf Office Machinery And Computers
[31] Manuf Electrical Machinery And Apparatus NEC
[32] Manuf Radio, Television And Communication Equipment
[33] Manuf Medical, Precision And Optical Instruments
[34] Manuf Motor Vehicles, Trailers And Semi-trailers
[35] Manuf Other Transport Equipment
[36] Manuf Furniture; Manufacturing NEC

Source: All 2-digit level NACE Rev. 1 manufacturing industries, also in the final sample

Table A.3: 2-Digit NACE Rev. 2 Industries of Occupation

Industry
[10] Manuf Food Products
[11] Manuf of Beverages
[12] Manuf Tobacco Products
[13] Manuf Textiles
[14] Manuf Wearing Apparel; Dressing And Dyeing Of Fur
[15] Manuf of Leather and Related Products
[16] Manuf of Wood and of Wood Products, Ex. Furniture; Straw and Plating Mats
[17] Manuf Pulp, Paper And Paper Products
[18] Printing and Reproduction of Recorded Media
[19] Manuf of Coke and Refined Petroleum Products
[20] Manuf Chemicals And Chemical Products
[21] Manuf of Basic Pharmaceutical Products and Pharmaceutical Preparations
[22] Manuf Rubber And Plastic Products ³
[23] Manuf Other Non-metallic Mineral Products
[24] Manuf Basic Metals
[25] Manuf Fabricated Metal Prod., Ex. Machinery And Equip
[26] Manuf of Computer, Electronic and Optical products
[27] Manuf of Electrical Equipment
[28] Manuf Machinery And Equipment n.e.c.
[29] Manuf Motor Vehicles, Trailers And Semi-trailers
[30] Manuf Other Transport Equipment
[31] Manuf of Furniture
[32] Other Manufacturing
[33] Repair and Installation of Machinery and Equipment

Source: Eurostat (2018a)

Table A.4: Labour Market Transitions

Origin t-1	Destination t	Manuf (%)	Services (%)	Non-employment (%)
1995	1996	89.16	10.29	0.56
1996	1997	80.91	18.61	0.48
1997	1998	83.04	16.35	0.61
1998	1999	89.81	9.90	0.28
1999	2000	78.48	17.96	3.57
2000	2001	90.09	9.10	0.82
2001	2002	81.0	18.23	0.77
2002	2003	90.01	8.96	1.03
2003	2004	81.11	17.46	1.43
2004	2005	90.97	7.31	1.72
2005	2006	91.97	6.93	1.09
2006	2007	83.50	15.26	1.24
2007	2008	92.17	6.36	1.47
2008	2009	80.56	17.89	1.55
2009	2010	88.79	8.73	2.48
2010	2011	83.97	13.65	2.38
2011	2012	87.25	11.54	1.21
2012	2013	80.72	17.53	1.75
2013	2014	90.19	8.53	1.29
2014	2015	80.23	18.56	1.21
2015	2016	90.98	8.33	0.69

No. people	n=13,980
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Intersectoral mobility is calculated for each year (origin and destination year).

The number of all workers that have ever worked in manufacturing for at least one year in the panel period is 13,980.

The probability of staying in manufacturing in the next period is generally high. For example, 89.2% of the people working in manufacturing in 1995 are likely to stay in manufacturing in the next period, with 10.3% moving to services and 0.56% moving into non-employment (inactive, unemployed).

The next most likely destination of manufacturing workers in the next period is services. These transition probabilities have been computed for *all* individuals who had worked in manufacturing at least once in the panel period before obtaining the final sample with time-invariant manufacturing industries for those that left manufacturing.

Table A.5: In-Out Manufacturing Transitions Probabilities

Origin t-1	Destination t	Stay in manuf (%)	Stay outside manuf (%)
1995	1996	90.35	81.10
1996	1997	81.68	94.27
1997	1998	88.62	87.32
1998	1999	90.77	80.93
1999	2000	79.89	94.71
2000	2001	92.55	67.71
2001	2002	81.35	93.10
2002	2003	91.02	85.43
2003	2004	81.36	95.07
2004	2005	91.44	77.62
2005	2006	91.83	94.74
2006	2007	83.93	90.41
2007	2008	92.06	81.84
2008	2009	81.73	94.39
2009	2010	88.83	81.10
2010	2011	81.64	77.88
2011	2012	86.90	76.22
2012	2013	83.45	83.82
2013	2014	91.51	83.34
2014	2015	80.18	91.47
2015	2016	90.85	76.04
No. people			n=13,980

The probability of staying in manufacturing is calculated for each year (origin and destination year).

The number of all workers that have ever worked in manufacturing for at least one year in the panel period is 13,980.

The probability of staying employed in manufacturing in the next period is generally very high. On the other hand, the probability of someone outside manufacturing staying outside manufacturing in the next period is also high, except for 5 years in the panel period when it drops below 80%, yet never below 65%.

Table A.6: Observed Birth Events Among Males and Females

Male		
Observed Birth Event	Freq.	Perc.
No (0)	25,936	94.68
Yes (1)	1,456	5.32
Total	27,392	100.00
Male average age on birth event		33.97 years
Standard deviation		5.147 years
Obs.		1,456

Female		
Observed Birth Event	Freq.	Perc.
No (0)	11,996	97.74
Yes (1)	278	2.26
Total	12,274	100.00
Female average age on birth event		32.04 years
Standard deviation		4.537 years
Obs.		278
