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Shocking Choice: Trade Shocks, Local Labor Markets and Vocational Occupation Choices*

Abstract

Whether individuals choose occupations that teach general or specific skills can have important implications on how protected they are from changing conditions on the labor market. This paper looks at the impact of growing up in a region exposed to structural change caused by import competition on vocational occupation choices using longitudinal social security data for Germany. Results show that individuals enter more skill-specific occupations like manufacturing and less general occupations like services if exposed to higher local import competition. Lifetime earnings are adversely affected, which can be attributed to vocational occupation choices.

JEL code: J24, J21, F14
Keywords: Trade shocks, occupational choice, vocational education, occupational skill specificity, local labor markets

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1 Introduction

How do individuals cope with changing economic conditions and structures? Understanding how individuals prepare for and react to change is a central economic question because it determines how they fare on the labor market. Economies transition from agricultural, to manufacturing, to service-based economies; a phenomenon commonly referred to as structural change. With these transitions, the composition of labor markets changes in terms of the shares of individuals working in agriculture, manufacturing or services, depending on the stage of development of an economy.[1] At least two factors contribute to this transition: technological progress (Levy and Murnane, 1992) and globalization (Dauth and Suedekum, 2016). Technological progress leads to automation and changes the modes of production and globalization with international trade leads to products being produced all over the world and traded. In such transition times, education is ever more important, because it enables the labor force to adapt to change, both in terms of technological advancement and new required skills (Nelson and Phelps, 1966). In particular, general, rather than specific skills are valuable, because they are transferable and widely applicable. Therefore, they insure the individual from unemployment (Krueger and Kumar, 2004).

This paper looks at the impact of growing up in a region exposed to structural change on individuals' occupation choices. Do individuals enter vocational occupations that teach them specific or general skills? The focus lies on occupations of young adults in Germany who enter vocational education training through an apprenticeship. The main hypothesis is that individuals exposed to structural unemployment due to plant closures or mass layoffs in their local labor market may be inclined to choose occupations that shelter them from such forces by teaching adaptable and transferable skills. If individuals fail to update their choices given the state of their local labor market and enter skill-specific occupations, this may have important economic consequences on their future labor market outcomes as they will be less able to adjust to potential new jobs and skill requirements.

To obtain causal evidence of the effects of growing up exposed to structural change, this paper uses local labor market exposure to import competition (trade shocks) from China and Eastern Europe as an exogenous source of variation, following the seminal paper by Autor,

[1] Between 1980 and 2010, the US manufacturing employment share has decreased by 52.0% from 21.0% to 10.1% and for Germany, with traditionally higher manufacturing employment shares, it has still declined by 40.9%, from 34.0% to 20.1%. (U.S. Bureau of Labor Statistics, Percent of Employment in Manufacturing in the United States and Germany, retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/USAPEFANA, [accessed 8 August, 2018].)

Levy and Murnane (2003). Local labor market exposure to import competition has been shown to decrease local manufacturing employment shares (e.g. Autor, Dorn and Hanson, 2013; Dauth, Findeisen and Suedekum, 2014). This loss in manufacturing employment is the implicit first stage to the reduced form regressions of the effect of import competition on vocational occupation choice in this paper.

Using longitudinal individual-level administrative social security data, the paper analyzes the causal effect of local import competition exposure at the age of 15 on vocational occupation choices and subsequent labor market outcomes. The data, a 2%-sample of all individuals in Germany subject to social security, provide detailed information on individuals' occupational history, including the occupation during apprenticeship, earnings, age and which county they work in. My sample contains 192,025 individuals which includes occupational choices made between 1991 and 2013. I exploit the exogenous rise in trade volumes with both China, following the accession to the WTO and Eastern Europe, after the fall of the iron curtain as an exogenous supply shock of manufacturing good imports to Germany (Dauth, Findeisen and Suedekum, 2014).

The measure of local labor market exposure to import competition is defined as the 10-year change in Chinese and Eastern European import exposure per worker in a county. Imports are apportioned to the county according to its share of national industry employment. Variation stems from initial local industry structures with respect to manufacturing employment shares and within-manufacturing specialization patterns with respect to import-intensive industries. The import exposure measure is then the potential local per worker import exposure, given national industry import volumes, in the style of a shift-share measure (Bartik, 1991). In some manufacturing industries, such as textiles or toys in the case of China, or car parts and iron and steel in the case of Eastern Europe, these countries became competitive, started having a comparative advantage and exported goods to Germany, which then posed competitive pressure on regions specialized in these industries. I extend the literature on trade shocks by using time-varying local import exposure, exploiting both county-level and time variation in import exposure. One concern with import exposure is that employment and imports may be positively correlated with unobserved shocks to domestic product demand. This is particularly problematic here, as individuals' vocational education occupation is of central interest, and push and pull factors stemming from labor demand should be shut down as much as possible. To isolate the supply-driven component of imports from China and Eastern Europe, I use imports (and exports) to other high income countries as instruments for Chinese and Eastern European trade with Germany (following

e.g., Autor, Dorn and Hanson, 2013; Dauth, Findeisen and Suedekum, 2014). Imports from China and Eastern Europe to other high income countries predict imports to Germany well, but are unrelated to German local labor supply and demand structures.

There is little evidence on adolescents' occupation choices and how they are affected, in particular in vocational education.[2] Vocational education training is the relevant point of entry into a broad class of middle-skill occupations that represent well over half of the German labor force (Statistisches Bundesamt, 2018).[3] Occupations can be classified in terms of their generality and skill-specificity in a detailed and consistent manner. I differentiate between skill-specific and general occupations using a skill-weights-based occupational specificity measure (Lazear, 2009), with which I show that manufacturing and craft occupations are more skill-specific than service and merchant occupations. The paper analyzes to what extent individuals protect themselves from future unemployment from structural change by possessing skills which are transferable and applicable to changing technology or new occupations. For instance, jobs with a high share of computer use will teach the individual transferable skills of IT knowledge that could be applied in another job, if the current one becomes obsolete due to structural change. Since computation is such a central element of technological change, one outcome is whether individuals choose occupations with high computer use. I also look at whether the occupation is manual labor, as manual labor tends to be highly skill-specific. In a second step, this paper analyzes the impact of import exposure on later life labor market outcomes in terms of earnings, unemployment as well as occupational and regional mobility.

The results show that import exposure makes adolescents choose more skill-specific occupation groups in manufacturing and crafts, more import-intensive manufacturing industries in particular, and less general occupations in services and commerce (as merchants). This suggests that individuals do not shelter themselves from future import competition or automation because they do not enter occupations which impart general skills. This also implies that individuals do not adjust away from the predominant industry structure of the county they grew up in. The results also show that in terms of the task content of occupations, individuals exposed to more import competition are less likely to enter occupations with high computer use, and more likely to enter manual occupations.

[2]See Wolter and Ryan (2011) for a review on the existing literature on vocational education training.

[3]Keeping the level of education fixed at vocational education has the advantage that career paths are comparable and no potential income effects from trade shocks bias the results, since all vocational occupation trainings pay similar wages and are similar in length.

Moreover, I find that individuals exposed to import competition in their adolescence who enter vocational education are adversely affected on the labor market in later life. They earn less 5 and 10 years after their apprenticeships and also experience less earnings growth. They are surprisingly more mobile in terms of occupational mobility, but less mobile regionally. At least, there is no negative effect on lifetime unemployment duration and they are more likely to be employed immediately following their apprenticeship. This result is in line with the finding from the general versus vocational education literature which shows that skill-specific education makes the transition from schooling to the labor market easier, but increases risk of unemployment in later life and leads to earning losses (Hanushek et al., 2017*a*; Hampf and Woessmann, 2017). I do not find evidence that it increases unemployment later in life, but I do find losses in earnings instead. While the negative labor market outcomes cannot be directly causally linked to the vocational occupation choices due to biases caused by self-selection, suggestive evidence shows that general skill occupation groups shelter individuals from the adverse effects of import competition on earnings growth. The negative effects of import competition on earnings growth seem to be entirely driven by those entering manufacturing occupations.

An obvious channel as to why individuals still enter these occupations that affect them adversely are parents. I show suggestive evidence that while parental occupation is an important driver in adolescents' occupation choices (i.e. individuals enter the same occupation as their parents), having a father that worked in manufacturing and growing up in regions exposed to import competition, actually decreases the probability of individuals to enter a skill-specific manufacturing job. This suggests that potential first-hand negative experiences of job or income loss due to import competition within a family, may work to dissuade individuals from taking up skill-specific occupations.

In terms of threats to identification, I show that the effects are not biased by endogenous sub-sample sorting in the sense of differential sorting into different educational tracks due to trade shocks. Moreover, using data on local supply and demand ratios of apprenticeship positions, I confirm that the effects are not purely labor demand driven. The results are further robust to various alternative definitions of import exposure. As far as effect heterogeneities go, I find that men and woman make very different choices when exposed to import competition. Women, as opposed to men, are more likely to enter service and merchant occupations when exposed to local import competition during adolescence. They also choose occupations with higher computer use. However, women are nevertheless still adversely affected by import competition in terms of later labor market outcomes.

The paper is related to and contributes to several strands of literature: the literature on (1) general versus skill-specific education, (2) occupational skill-specificity, (3) the effect of business cycles on education choices and other outcomes, and of course (4) the impacts of trade shocks on individuals. It has been shown that general education, in the sense of higher education at university, versus skill-specific apprenticeship-based or vocational education, teaches more transferable skills that allow better adaptation to changing technologies, and therefore act as an insurance against later unemployment. Krueger and Kumar (2004) show that on a country level, economies that favor vocational education grow slower than countries that focus on general education, due to slower adaptations of new technologies, in particular when the pace of technological advancement increases. At the individual level, Hanushek et al. (2017*a*) and Hampf and Woessmann (2017) show that vocational education eases entry into the labor market for young individuals but increases the risk of unemployment in later life and also reduces lifetime income. This paper contributes to the literature by providing a much more detailed approach to general versus skill-specific education than the dichotomy of vocational versus university education by looking at the skill-specificity across occupations.

I construct an occupational skill-specificity measure based on skill-weights using occupational skills and tasks from a German employment survey to categorize occupation groups by their specificity similar to Gathmann and Schönberg (2010); Geel and Backes-Gellner (2011). Eggenberger, Rinawi and Backes-Gellner (2018) using skill requirements in Swiss training curricula, find that there is a trade-off between higher wages in more specific occupations but lower occupational mobility and therefore higher risk of unemployment. To my knowledge, my paper is the first to look at the impact of economic conditions on the skill-specificity of occupation choices.

Business cycle conditions have been found to affect individuals' schooling decisions and later life outcomes. Dellas and Koubi (2003) find that schooling decisions follow a countercyclical pattern, showing that reduced opportunity costs during recessions play a major role in education decisions of individuals, and Adamopoulou and Tanzi (2017) find that in recessions the likelihood of university students to drop out decreases and on-time graduation increases. Many studies have further shown that economic conditions at the point of labor market entry can have long and persistent effects on individual labor market outcomes. Studies by Kahn (2010) and Oreopoulos, von Wachter and Heisz (2012) show that college graduates in the United States experience income losses that persist for up to ten years when graduating during a recession. The predominant reason for this is the lower quality of the first job placement and skill-mismatch. Altonji, Kahn and Speer (2016) show

that higher paying majors are sheltered from the negative effects of a recession. This paper contributes to that literature because it investigates the effect of trade induced structural change (*i.e.,* a more permanent change in economic conditions) on individual occupation decisions and the effects on later life outcomes.

Lastly, this paper contributes to the literature on trade shocks. In their seminal paper, Autor, Dorn and Hanson (2013) show that import exposure from China can explain large shares of the declines in manufacturing employment in local labor markets in the US. For Germany, Dauth, Findeisen and Suedekum (2014) looking at trade with both China and Eastern Europe, show that although net exports have actually retained employment within manufacturing because of increased export opportunities, local labor markets with high import competition have still seen decreasing employment in manufacturing and other industries. Import exposure has sped up structural change in German regions which specialized in import intensive industries and suffered clear employment losses (Dauth and Suedekum, 2016). Much of the literature on trade shocks has focused on the impact of regional aggregate employment patterns (Autor, Dorn and Hanson, 2013; Dauth, Findeisen and Suedekum, 2014, 2017), explaining manufacturing employment changes through Chinese (and Eastern European) import competition. Dauth and Suedekum (2016) show that import exposure, driven by large initial shares of import manufacturing industries, speeds up regional structural change, *i.e.,* the decline in manufacturing employment. Several papers look at the effects of trade shocks on individuals, namely on incumbent workers exposed to import competition at the level of their industry. Autor et al. (2014) find that workers more exposed to trade with China through their industry of employment exhibit lower cumulative earnings and employment and higher receipt of disability insurance. In another paper at the individual incumbent worker level for Germany, Dauth, Findeisen and Suedekum (2018) show that imports reduce earnings and induce workers to leave their industry. In contrast, this paper is the first to look at the effect of local labor market import shocks on individuals (not incumbent workers in manufacturing industries), focusing on local import exposure for young labor market entrants and their choice of vocational education occupation.

The rest of the paper is structured as follows: Section 2 explains the institutional background of the vocational education training system in Germany and derives a conceptual framework with relation to the literature. Section 3 introduces the empirical set up, including the empirical identification strategy, the definitions of import exposure and occupational specificity and describes the data. Section 4 then presents and discusses the results in turn. Section 5 provides concluding remarks.

2 Conceptual Framework on Trade Shocks and Vocational Occupation Choices with Relation to the Literature

The aim of this paper is to provide causal evidence on the effect of regional import competition exposure in adolescence on the vocational occupation an individual enters. It focuses on analyzing which type of occupation the person enters, what the task content of that occupation is, and what the subsequent labor market outcomes are. This section derives a conceptual framework based on the existing literature on how structural change induced by import competition may affect vocational occupation choices and to which extent these may shelter individuals from structural unemployment. I begin by providing context to the institutional background of the German dual vocational education training system.

2.1 Institutional Background on the Vocational Education System in Germany

The German Vocational Education Training (VET) system, also sometimes called the dual system, is an important and firmly established part of the German education system. Its central feature is cooperation between mainly small and medium sized companies, on the one hand, and publicly funded vocational schools, on the other hand. Individuals in VET spend part of their time working as an apprentice at a company and the other part at a vocational school. It is up to the individual to apply to and find an apprenticeship position at a company. VET usually lasts two to three-and-a-half years. The cooperation, contracts and training curricula are regulated by the federal states. The German education system tracks its students from an early age into different school tracks that determine their further course of education and working life (Hanushek and Woessmann, 2006). Usually at the age of 10, at the end of primary school, students are divided into an academic track that will enable them to attend university if completed, and a lower or middle track, upon completion of which students normally go on to vocational education. While the share of individuals in any cohort in VET used to be substantially higher, up to 70% during the 1970s, this share was still at 40% in 2016 (Statistisches Bundesamt, 2018). There are over 320 different occupations that require vocational education, which range from manual and technological to service, merchants or public service related occupations. Apprentices consistently make

up about 5% of the Germany social security based labor force. In 2016, 28% of firms in Germany offered apprenticeships and 68% of apprentices were offered a full employment contract at their training firm upon completion of VET (BIBB, 2016).

2.2 Vocational Occupation Choices

General versus Skill-Specific Education The central idea is that in the broad spectrum of 320 different occupations that individuals enter through VET, some occupations are more skill-specific and some more general in the skills they teach, so that they shelter individuals from structural unemployment caused by automation and trade because of transferable and widely applicable skills. In the literature, it has long been recognized that education is important because it enables adaptation to change, be it in terms of technological advancement, structural change or economic conditions (Nelson and Phelps, 1966). Hanushek et al. (2017*b*) show that returns to skills are larger in faster growing economies, lending evidence to the hypothesis that education enables better adaptation of skills to technologies. The literature further recognizes that general, rather than vocational education is better suited to reap the benefits of education in terms of better adaptation to change, because more general and therefore transferable skills are taught. By general education, the literature usually refers to tertiary education in the form of university education, while skill-, technology-, and occupational-specific education refers to vocational and apprenticeship based education (Ryan, 2003). Krueger and Kumar (2004) show that on a country level, economies that favor vocational education grow slower than countries that focus on general education, due to slower adaptations of new technologies, in particular when the pace of technological advancement increases. The authors offer this as potential explanation for differential growth rates between the United States (more general education) and European countries (more vocational focus), since the rate of technological advancement has picked up since the 1980s. At the individual level, Hanushek et al. (2017*a*) and Hampf and Woessmann (2017) show that vocational education eases entry into the labor market for young individuals but increases the risk of unemployment in later life and also reduces lifetime income. The reason is that while vocational education provides a more seamless transition from the apprenticeship into regular employment, it does not impart enough adaptive skills in case of unemployment later in life. With general education and transferable skills, the risk of unemployment is reduced because individuals are better able to adapt to new occupations and new tasks. In times of globalization, structural change and skill-biased technological change, this trade-off

becomes particularly relevant, where whole occupations may cease to exist due to automation processes or are off-shored to other countries.

This paper applies the same logic of general and skill-specific education horizontally within the vocational education system of Germany, namely through the vocational occupation choice of individuals. While there has been much attention in research on college enrollment and returns to college degrees (for a review see e.g. Oreopoulos and Petronijevic, 2013), or major choices (e.g. Altonji, Arcidiacono and Maurel, 2016; Card and Payne, 2017) and major-specific returns (Kirkeboen, Leuven and Mogstad, 2016; Hastings, Neilson and Zimmerman, 2013), very little attention has been paid to outcomes within vocational education training. Holding a vocational education degree versus not having a professional degree at all is associated with a premium of about 15% (Kugler, Piopiunik and Woessmann, 2017). However, very little is known about the different occupations within vocational education, who chooses them and why and which effects they have on individuals' labor market outcomes. Determinants of education and occupational choices are naturally very difficult to pin down, due to the highly personal, multidimensional and therefore endogenous nature of this choice. Causal evidence on the returns to higher versus vocational education would be hard to obtain, due to issues of selection into either higher general education or vocational training, which as in Germany, is often determined by choices at much earlier points in life (Ryan and Unwin, 2001). This paper investigates individuals' vocational education and career paths, holding the level of education fixed at the level of vocational education training. I argue, that just as with general versus vocational education, there are differences in the generality and skill-, technology- and occupational specificity *within* vocational educations. With these differences, the same argument in terms of adaptation to change, in particular skill-biased technological change holds. For example, while vocational training in manufacturing occupations will offer production-technology specific skills, vocational training in more business or service oriented jobs will offer more transferable skills such as communication or quantitative skills, that are broadly applicable in other occupations. Looking only at vocational education further has the advantage that individuals' level of education is kept fixed and career paths are comparable. The choice of higher versus vocational education would introduce an income question, and trade shocks per se may impact family incomes and therefore distort the effects. In the robustness checks, I investigate whether individuals select intro different education tracks which may lead to higher education differentially, but do not find any effects.

Occupational Specificity The differentiation between general and specific education along the lines of tertiary university versus vocational education, is very simplistic. Instead, this paper distinguishes skill-specificity between occupations that require VET. Some occupations teach more general skills that are transferable and can be applied in other occupations or other industries. Such skill transferability is particularly important in times of structural change, in which with trade and automation, many occupations are either off-shored or cease to exist due to automation altogether. Lazear (2009) provides a useful framework for occupational specificity, called skill-weights approach, which assumes that occupations use different skills with different weights attached, so called skill bundles. The skill bundles of occupations have different distances to the skill bundle of the labor market on average. The further away a skill bundle is from the average of the labor market, the more specific that occupation is and the more costly it is for a person with such skills to change occupations. Skill bundles that are similar to the labor market on average, mean that people in such occupations should find it easy to switch occupation. Geel and Backes-Gellner (2011) operationalize the skill-weights approach for German occupation using skills from a German employment survey and construct a measure for occupational specificity using total absolute rank differences in skills in an occupation compared to the labor market on average. They find that the more specific an occupation is, the higher the apprentice training cost for the firm and the lower the occupational mobility. Gathmann and Schönberg (2010) use tasks rather than skills in the same employment survey, and they construct an angular distance measure of task-specific human capital. Eggenberger, Rinawi and Backes-Gellner (2018) look at skill requirements in training curricula for Switzerland. They find a clear trade-off between higher wages in more specific occupations but lower occupational mobility and therefore higher risk of unemployment. I construct a measure for occupational specificity using information on occupational skills and tasks in order to rank occupational groups by their skill-specificity and show that manufacturing and craft occupations are more specific than service or merchant occupations.

2.3 Impact of Economic Conditions on Young Individuals

We know from the literature that economic circumstances during childhood and adolescence impact individual education paths and later life outcomes. An extensive literature investigates the impact of the business cycle on individuals' behavior and choices and how these effect lifetime outcomes. Because of the short-term character of booms and recessions,

meaning that normally the economy will again return to its previous state, it would be optimal for individuals to not change their behavior Nevertheless, there is ample evidence, that being exposed to a recession during youth, changes individuals' beliefs, education choices and later economic outcomes. In terms of beliefs, Giuliano and Spilimbergo (2014) find that individuals who experienced a recession when young believe that success in life depends more on luck than effort, support more government redistribution, and tend to vote for left-wing parties. Malmendier and Nagel (2011) find that recessions during adolescence lead to lower participation in the stock market, lower willingness to take financial risk and lower investments as well as increased pessimism about future stock returns. As far as the impact on education choices go, there is evidence that schooling decisions follow a countercyclical pattern because of reduced opportunity costs of education. When the economy is in a downturn and good job opportunities become scarce, going to school is less costly in terms of forgone earnings. This effect seems to outweigh the income effect of a recession (Dellas and Koubi, 2003). From this follows that enrollment to college increases with economic downturns (Betts and McFarland, 1995) and the likelihood of drop-outs decrease (Adamopoulou and Tanzi, 2017). College students also tend to choose high return majors such as STEM fields more often rather than business related studies when the economic situation is brittle (Liu, Sun and Winters, 2017; Blom, Cadena and Keys, 2015). Nagler, Piopiunik and West (2015) show that teacher quality increases during recessions, as labor market entrants face less certain outside options vis-à-vis the relatively safe teaching profession. Despite higher college enrollment rates, lifetime labor market incomes are actually shown to be adversely affected by recessions. Graduating from high-school, college or graduate school during a recession can have long-lasting detrimental effects on lifetime earnings and other outcomes (Raaum and Røed, 2006; Oreopoulos, von Wachter and Heisz, 2012; Kahn, 2010; Oyer, 2006), predominantly caused by a lower quality of first job placement. Also cyclical skill-mismatch has been found as a reason for adverse effects of graduating during a recession (Liu, Salvanes and Sørensen, 2012). On the other hand, Altonji, Kahn and Speer (2016) show that higher paying majors are sheltered from the negative effects of a recession. This paper contributes to the literature in that it looks at the effect of a more permanent change in economic conditions on education choices and later labor market outcomes, namely structural change. If the business cycle impacts individuals' choices, then a more permanent, though slower change is expected to also have an impact.

2.4 Structural Change and Trade Shocks

Structural change Structural change, *i.e.,* the slow change from a predominantly manufacturing to service based economy, started in Germany like in most Western countries in the 1970s. It can be said to be driven by both automation and trade, in that routine tasks become automated and goods get produced where it is cheapest to do so. Structural unemployment is then caused by a permanent mismatch between the skills of the workforce and the changing mode of production in the economy, because the demand for skills changes. Automation of production processes implies that routine tasks, which are programmable, become increasingly redundant while more computational, communication and other generally transferable skills are more sought after (e.g. Autor, Levy and Murnane, 2003; Autor, Katz and Krueger, 1998). This phenomenon is referred to as skill-biased technological change. Autor, Levy and Murnane (2003) argue that as computers take over routine tasks, they increase demand for workers who perform 'non-routine' tasks that are complementary to the automated processes. Since computation is such a central element of technological change, this paper also tests whether individuals choose occupations with high computer use. Computer use in occupations comes with many general skills, that are transferable to other occupations, such as programming, communication or analysis. Spitz-Oener (2006) finds that occupations with high computer use see most pronounced changes in skill requirements. The author generally shows that task complexity within occupations has increased since the nineteen-eighties and the need for manual routine tasks has plummeted in Germany.

Trade shocks Other than automation, international trade is often said to be the other important factor driving structural change. Between 1993 and 2013, Germany has seen an over 20% decline in manufacturing employment (e.g. Dauth, Findeisen and Suedekum, 2017). In the literature, the unexpected and rapid rise in Chinese productivity and the associated rise in trade with China and the rest of the world, has been keenly exploited as an exogenous shock in global trade. In their seminal paper, Autor, Dorn and Hanson (2013) analyze the impact of Chinese import competition on US local labor markets and show that trade with China explains one third of the decline in manufacturing in local labor markets. Identification stems from differential initial industry structures across local labor markets. They also instrument trade volumes between the US and China with trade volumes between China and other high income countries. They find that local markets more exposed to Chinese import competition see higher unemployment, lower labor force participation, and

reduced wages. In another paper, Autor et al. (2014) analyze the impact of industry trade exposure on labor market outcomes of incumbent workers. They find that workers more exposed to trade with China through their industry of employment exhibit lower cumulative earnings and employment and higher receipt of disability insurance.

In Germany, import competition from China has also led to decreases in manufacturing employment. Dauth, Findeisen and Suedekum (2014) estimate the local labor market effects of trade with "the East" for Germany. They not only use trade with China, but also investigate trade with Eastern Europe, which for Germany constituted another unexpected and sharp rise in trade after the fall of the iron curtain. The results for Germany differ substantially from those of the US, since Germany has a total current account surplus and more balanced trade with China and Eastern Europe than the US. They find that net export exposure (exports minus imports) has actually slowed down the decline in manufacturing employment and regions specialized in export industries have seen increases in employment. Nevertheless, they also find that regions specialized in import competing industries have seen substantial employment losses both in manufacturing and in other industries. They find that a 10-year change in local import exposure of 1000 Euros per worker reduced manufacturing employment relative to overall employment by 0.19 percentage points. In another paper, Dauth and Suedekum (2016) show that large import exposure, driven by large initial shares of import manufacturing, sped up structural change, i.e the decline in manufacturing employment. This finding represents the implicit first stage to the reduced form regression of import competition on occupation choices in this paper. Generally, manufacturing employment has been on a secular decline in Germany. Dauth, Findeisen and Suedekum (2017) show that the transition from manufacturing to services is fueled by new labor market entrants as well as unemployed who re-enter the labor market. They show that net exports pulled labor market entrants more into manufacturing and into export-oriented firms more generally. There is no direct switching between employment in manufacturing and service without first undergoing unemployment. These estimates are based on county aggregates. In another paper at the individual incumbent worker level, Dauth, Findeisen and Suedekum (2018) find that imports reduce earnings and induces workers to leave their industry. This paper contributes to the literature, as it analyzes the impact of imports competition on individuals, focusing on regional import exposure for young labor market entrants and their choice of vocational education occupation.

3 Empirical Set-Up

This section describes the empirical model and identification strategy, how trade shocks and occupational specificity are constructed, the various data sources used, and provides a descriptive overview of the data.

3.1 Empirical Model

An individual growing up in a county exposed to stronger imports during his adolescence, experiencing unemployment in manufacturing, lay-offs or plant closures, may choose a different vocational occupation than otherwise. The regression analysis is a reduced form regression of local import exposure on education choices, with local structural change (reductions in manufacturing employment) being the conceptual first stage or channel driving the results. The regression estimation is therefore:

$$y_i^{r,t} = \beta_1 \Delta ImportExposure_{rt}^{Ger \leftarrow C+EE} + \beta_2 \Delta ExportExposure_{rt}^{Ger \rightarrow C+EE} + \beta_3 X_i + \beta_4 X_r + \gamma_{t*s} + \epsilon_i \quad (1)$$

where $y_i^{r,t}$ is individual i's outcome in terms of vocational occupation type, task content or later labor market outcomes (which depends on county r and year t but does not vary by them), $\Delta ImportExposure_{rt}$ is the import exposure per worker in county r and year t when individual i is 15, $\Delta ExportExposure_{rt}$ is export exposure per worker in county r and year$t$ when individual i is 15, X_i are individual controls, X_r are county controls, γ_{t*s} are year by state dummies, and ϵ_i is an error term. Import and export exposures vary per year on the level of 402 counties. Standard errors are clustered at the county level. The model is estimated using OLS linear probability models for most outcomes which are binary[4]. β_1 therefore denotes our coefficient of interest, namely the increase in the probability of an individual having outcome y, when import exposure increases by 1000 Euros per worker in county r at year t when individual i is 15.

[4]all except age at apprenticeship start and income

3.2 Identification

The increases in trade with China and Eastern Europe can be said to have been exogenous from the point of view of German regions, as it stemmed from the respective domestic increases in productivity and competitiveness. China's accession to the WTO in 2001 and the fall of the iron curtain in Eastern Europe and its subsequent transition to democracy and market oriented economies in 1990, were mostly exogenous supply shocks to the world economy.

From the point of view of a German region with high shares of employment in an industry in which China or Eastern Europe started having a comparative advantage in and therefore started exporting to Germany, import competition is as good as random. Identification comes from different initial industry specializations across counties. Take the example of two counties with similar shares of employment in manufacturing in 1980. One county has high shares of employment in the textile industry, while the other specialists in the automotive industry. The county with high textile specialization experiences a strong import shock from China, as textile is one of the industries China has become competitive in. This county may experience closures of textile manufacturing plants and mass lay-offs, with subsequently high shares of unemployment. The other county with the automotive industry on the other hand, actually benefits from trade with China due to increasing export opportunities, as Germany retained the competitive advantage in the car industry. The local trade shocks are constructed by using a shift-share measure (Bartik, 1991), where national industry trade is apportioned by initial local industry employment structures (explained in detail in Section 3.3).

Nevertheless, a major concern with trade shocks is that employment and imports may be positively correlated with unobserved shocks to domestic product demand, in which case the effect on manufacturing employment, *i.e.,* the implicit first stage to the reduced form regression in Equation 1 would be underestimated. This is particularly problematic here, as the choice of vocational education occupation is of central interest, and push and pull factors stemming from labor demand should be shut down as much as possible. To isolate the supply-driven component of imports and exports from China and Eastern Europe, I use imports and exports to and from other high income countries with China and Eastern Europe (following e.g. Autor, Dorn and Hanson, 2013; Dauth, Findeisen and Suedekum, 2014). For the exclusion restriction to hold, it is important that while those third group countries should be similar to Germany, they should not be exposed to the same demand shocks as

Germany nor should their trade flows with China and Eastern Europe affect counties in Germany other than through exogenous increases in imports. This is why no Euro area country or immediate neighboring country is included. I use trade with Australia, Canada, Japan, Norway, New Zealand, Sweden, Singapore and the UK as instruments, as in Dauth, Findeisen and Suedekum (2014). This way, the exogenous part of increased Chinese and Eastern European competitiveness is extracted, shutting down factors that affect imports and regions at the same time, such as demand shocks. Trade flows of these third group high income countries with China and Eastern Europe are therefore used to instrument trade flows of Germany with China and Eastern Europe. I run the following two-stage least squares regressions, to instrument both import and export exposure.
First stages:

$$\begin{aligned}\Delta InstImportExposure_{rt}^{Ger\leftarrow C+EE} = \zeta_1 \Delta ImportExposure_{rt}^{Other\leftarrow C+EE} + \\ \zeta_2 \Delta ExportExposure_{rt}^{Ger\rightarrow C+EE} + \zeta_3 X_i + \zeta_4 X_r + \gamma_{t*s} + v_i\end{aligned} \tag{2}$$

$$\begin{aligned}\Delta InstExportExposure_{rt}^{Ger\rightarrow C+EE} = \zeta_1 \Delta ImportExposure_{rt}^{Ger\leftarrow C+EE} + \\ \zeta_2 \Delta ExportExposure_{rt}^{Other\rightarrow C+EE} + \zeta_3 X_i + \zeta_4 X_r + \gamma_{t*s} + v_i\end{aligned} \tag{3}$$

Where $\Delta InstImportExposure_{rt}^{Ger\leftarrow C+EE}$ and $\Delta InstExportExposure_{rt}^{Ger\rightarrow C+EE}$ represent the instrumented import and export exposure, respectively and $\Delta ImportExposure_{rt}^{Other\leftarrow C+EE}$ and $\Delta ExportExposure_{rt}^{Other\rightarrow C+EE}$ denote the respective trade flow of China and Eastern Europe to and from the third group high income countries. The second stage can be written as:

$$\begin{aligned}y_i^{r,t} = \beta_1 \Delta InstImportExposure_{rt}^{Ger\leftarrow C+EE} + \beta_2 \Delta InstExportExposure_{rt}^{Ger\rightarrow C+EE} + \\ \beta_3 X_i + \beta_4 X_r + \gamma_{t*s} + \epsilon_i\end{aligned} \tag{4}$$

For the estimation to produce the true, unbiased causal effect of growing up in a county with high exposure to import competition on the vocational occupation choice and the subsequent career path, other than the instruments being valid, several further identifying assumptions need to hold. First, it needs to hold that counties developed along similar trends in terms of apprenticeships before import exposure. One wants to make sure, that regions more exposed to imports later were not on a differential trend in terms of vocational education

initially anyway, since the effect of import exposure on vocational occupation would then capture other underlying factors that had nothing to do with import competition. Figure 1 plots shares of apprentices over the whole local working population for different quantiles of import exposure in 2000. As the "treatment" of import exposure is continuous, *i.e.,* represents a treatment intensity, counties are split into five quantiles of 20 percent along their 2000 import exposure from both China and Eastern Europe. In Figure 2 one can see, that imports from China and Eastern Europe are mostly flat until 1990, therefore one would not want to see differences in trends of apprenticeship numbers in counties. Unsurprisingly, there exist differences in levels, since import exposure is based on the initial industry structures (explained in detail below in 3.3), meaning that counties with high initial shares of manufacturing are later more exposed to import competition and also tend to have higher shares of apprentices among their working population. However, Figures 1a and 1b show no evidence that counties saw differential trends in (a) total shares of apprentices, nor in (b) manufacturing apprentices. For numbers of manufacturing apprentices, the quantiles move further apart, but there are no large differences in general trends.

Another assumption that needs to hold, is that there are no large adjustments via interregional migration due to trade shocks. In the analysis, individuals are fixed to a county and assumed to be "treated" by their county trade shock according to the first county in which they ever appear in the social security records. For the majority of individuals, this is the year they start their apprenticeship. These individuals are "treated" by the trade shock in their county in the year they are 15 years old, *i.e.,* their year of birth plus 15 years. Therefore, an important assumption of the analysis is that individuals do not change counties for their apprenticeships and more importantly, that this does not happen differentially due to trade shocks. This also implies that there is no differential migration of the families due to trade shocks. First one should note that apprenticeships are an inherently local market and mobility for apprentices in Germany is very low (Stockinger and Zwick, 2017). Furthermore, interregional adjustments through migration are generally sluggish in Germany. For example, the rate of German interregional migration was at only at 1.2% in 1995 (Tatsiramos, 2009). Lastly, Dauth, Findeisen and Suedekum (2014) find no effects of import and export exposure on population shifts, showing that regional adjustment in Germany does not pose a major concern.

3.3 Local Labor Market Import Exposure

Import exposure, as used in Equation 1 is defined as follows:

$$\Delta ImportExposure_{rt} = \sum_j \frac{L_{rjt-10}}{L_{jt-10}} \frac{\Delta Imp_{jt}^{GER \leftarrow C+EE}}{L_{rt-10}} \tag{5}$$

where $\Delta ImportExposure_{rt}$ can be thought of as the change in per worker imports in 1000 Euros in county r at time t. L_{rjt-10} is employment in county r, industry j at time $t-10$, L_{jt-10} is employment in industry j at time $t-10$ nationally and L_{rt-10} is employment in county r at time $t-10$. $\Delta Imp_{jt}^{C+EE \leftarrow GER}$ are changes in import volumes between t and $t-10$ in industry j from China and Eastern Europe."Eastern Europe" includes Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia and all countries of the former USSR[5]. The total 10-year change in industry j's imports from China and Eastern Europe to Germany is apportioned to county r according to county r's share in national industry j employment. The measure closely follows Dauth, Findeisen and Suedekum (2014), but extends their measure by introducing yearly varying import exposures with 10-year rolling window changes. I use the initial industry structure at the beginning of each period $(t-10)$. For example, trade exposure in 2000 refers to the change in import between 1990 and 2000 using the 1990 industry structure to apportion national industry trade volumes. In the robustness checks, I define alternative industry baselines, such as fixing them at 1990 (1993 for Eastern Germany) for all years as well as lagging them by 10 years. The results are robust to using either. Export exposure per worker is defined along the same lines, using export volumes from Germany to China and Eastern Europe.

Figure 3 shows import exposure for each region in 1990, 2000, 2003 and 2014 from import exposure from both China and Eastern Europe. With the availability of regional industry data, 2003 (2004 for instruments) import exposure for formerly German Democratic Republic (GDR) counties is the earliest year possible. I analyze Eastern European and Chinese import shocks jointly in most analyzes[6]. The maps show that there is considerable variation in import exposure both across regions and time. Average import exposure per worker increases from 840 Euros 1990 (*i.e.,* the increase between 1980 and 1990), to 5814 Euros in 2000 and 7082 Euros in 2007, where it peaks and then slowly ebbs down (which is natural, seeing as these are changes, the level is steadily increasing as we saw in Figure 3.)

[5]Russia, Belarus, Estonia, Latvia, Lithuania, Moldova, Ukraine, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.

[6]For the main regression I do also analyze Eastern European and Chinese import shocks separately

The 10-year rolling window changes used in this paper exploit the fact that trade volumes have increased steadily and smoothly since the 1990s, while the other papers in the literature usually only look at one or two different time intervals.

The instrumental variable of third group high income country import exposure used in Equation 2 is constructed in the same manner as import exposure in 5:

$$\Delta InstImportExposure_{rt} = \sum_{j} \frac{L_{rjt-11}}{L_{jt-11}} \frac{\Delta Imp_{jt-11}^{\sum Other \leftarrow C+EE}}{L_{rt-11}} \tag{6}$$

where now $\Delta Imp_{jt-11}^{\sum Other \leftarrow C+EE}$ are imports from China and Eastern Europe to other high income countries. For the instrument import and export exposure lagged industry employment shares are used, at $t-11$ (for change in trade between t and $t-10$) to limit potential reverse causality in terms of employment due to anticipation in future trade exposure. Again, export exposure is defined analogously.

3.4 Occupational Specificity Measure

To establish whether an occupation is general or specific, I construct a skill-specificity measure based on various elements from Eggenberger, Rinawi and Backes-Gellner (2018); Gathmann and Schönberg (2010); Geel and Backes-Gellner (2011). The measure leans on Lazear (2009)'s skill-weights approach, which assumes that occupations use different skills with different weights attached (skill bundles) that makes them more or less general. Using information from a German employment survey on required skills and tasks performed in the individuals' occupation, I construct a specificity measure for each occupation, by comparing skill-weights in every occupation with skill-weights for the labor market on average. Table A2 reports the tasks and skills covered in the survey. Both tasks and skills are combined, in order to use more available information and because skills and tasks are highly complementary.[7] The occupational specificity measure is a skill-distance measure in that a higher skill distance implies a lower overlap in the skill bundle from one occupation to the general labor market skill bundle. In a first step, the 31 tasks and skills are aggregated at the occupation level, which provides the skill-weights for each occupation. These are normalized to sum

[7]Despite Acemoglu and Autor (2011)'s distinction between *tasks* and *skills* in that a *skill* is a unit of work activity that produces output, while a *skill* is a workers endowment of capabilities, in this paper I treat them as interchangeable. You cannot perform a task without having the skill and stating that one requires a skill for the daily job, implies that one performs the task attached to the skill. The way in which the survey is asked, the task requirements and skills hardly overlap, as one focuses more on operational tasks and the other on conceptional skills. Using both provides broader information about each occupation.

to one dividing by their sum, in order to take out skill-level effects. Then, tasks and skills are aggregated for the labor market on average, using the survey weights to ensure skills weights are aggregated to be representative of the labor market. I then construct an angular distance measure, similar to Gathmann and Schönberg (2010); Eggenberger, Rinawi and Backes-Gellner (2018):

$$SpecDist_{jl} = 1 - \frac{\sum_{i=1}^{n} x_{ji} * x_{li}}{\sqrt{\sum_{i=1}^{n} x_{ji}^2 * \sum_{i=1}^{n} x_{li}^2}}$$

where i is a skill, x is the skill weight of skill i in occupation j and l denotes the general labor market. To obtain skill distance rather than similarity of skill bundles, the angular distance is reversed by subtracting it from one. The larger the skill distance, the more specific and specialized an occupation is and therefore the lower the transferability of skills to another occupation. While highly specialized occupations may come with a wage premium, they are also riskier, because if an individual becomes unemployed who was in a highly specific occupation, he or she will find it more difficult to find a new occupation to which the specific skill bundle can be applied.

Figure 4 ranks the four main outcome occupation groups by their skill specificity. Manufacturing occupations are the most specific, followed by craftsmen. Service occupations and merchants are less specific, meaning that the skills in those occupations are closer to those of the labor market on average.

3.5 Data Sources

Various high quality data sources are required to implement this empirical analysis, including individual administrative data, administrative firm data, data on trade flows, as well as information on skills and tasks within occupations, among other data sources.

Individual Social Security Data The main data on individual vocational occupations and career paths stem from the German Social Security system. The Sample of Integrated Labor Market Biographies (SIAB)[8] is a representative two-percent random sample drawn from the population of individuals subject to social security (*i.e.,* employed, officially job

[8]This study uses the weakly anonymous Sample of Integrated Labor Market Biographies (Years 1975-2014). Data access was provided via on-site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) and subsequently remote data access.

seeking etc.; it excludes self-employed and civil servants) in Germany, assembled by the Institute for Employment Research (IAB) (Antoni, Ganzer and vom Berge, 2016). The data provide detailed administrative information, on individuals' occupations, employment status, earnings and importantly on where a person works and lives on the county level. Since the apprenticeship in the vocational education system is subject to social security, I observe individuals in this educational track at the start of their labor market career. I assume that the county I first observe them in, is the county the individuals grew up in, since apprenticeship markets are highly localized and individuals rarely leave their parental home for their apprenticeship. Each individual is kept only once, in order to observe the type occupation the individual first enters for his or her apprenticeship. Further life labor market outcomes are reported as cumulations. Individuals are included when they are aged 15 between 1990 and 2014 in western counties, and between 2003 and 2014 for eastern counties. This is because ten years earlier are the earliest years for which I can observe initial industry structures in the counties to construct the trade shocks. The person is "treated" at the county where she is first observed in the data for the year she is 15 years old. I choose age 15, because it is the year before individuals usually enter vocational education when they finish the middle track school. Here, the person has observed changed imports over 10 years since the age of 5, and has been "treated" by the import shock in the sense that she has been exposed to the structural change and declining employment in manufacturing in her home county. She has witnessed increased levels of structural unemployment in her local labor market, perhaps even of her parents or friends (note that unfortunately, I have no information on family ties in the data).

Administrative Firm Data To calculate yearly county-level per worker trade shocks by apportioning the national industry trade shock to the local employment share of that industry, detailed county-level data on employment in each industry is required. I use the Establishment History Panel (BHP) (Schmucker et al., 2016)[9], which is a 50% sample of all firms in Germany, providing yearly information on the number of employees, industry classification and county of operation. I use the years 1980-2014 for Western Germany and 1993-2014 for Eastern Germany.[10]

[9]This study uses the weakly anonymous Establishment History Panel (Years 1975 2014). Data access was provided via on site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) and remote data access.

[10]1993 is the first year for which data for Eastern Germany was reliably recorded post reunification.

Trade Volumes I use trade volumes from the United Nations' Comtrade database, which provides extensive information on bilateral trade volumes, following Autor, Dorn and Hanson (2013) and Dauth, Findeisen and Suedekum (2014). Trade volumes between Germany and China, Germany and Eastern Europe, as well as between China and Eastern Europe and the eight high income countries for the instrument are being used. Product-level (SITC Rev.3) Comtrade trade volumes are mapped into 3-digit German Industry Classifications, version 93 (Federal Statistical Office, 2003) using a crosswalk[11]. I identify 93 manufacturing sectors, dropping industries related to fuel, oil and gas. Trade volumes are converted into 2010 Euros. This data is then aggregated to yearly (1980-2014) import and export volumes for each manufacturing industry. It is then merged to the administrative firm data, for the trade shock to be apportioned by regional industry employment shares.

Data on Computer Use, Skills and Tasks To classify the extent of computer use within occupation, I use four waves of a survey lead by the Federal Institute for Vocational Education and Training (BIBB) on individuals' employment careers and occupation (the BIBB/IAB Qualification and Occupational Career Surveys 1992 and 1999 and BIBB/BAuA Employment Survey 2006, 2012). I aggregate the question on whether working with a computer is a daily task on the job on the level of 3-digit Occupation Classification 1993, and merge the occupation averages to the occupations in the SIAB social security data. For the skill specificity measure, I further use the BIBB/IAB Qualification and Occupational Career Survey 1999 wave, which provides extensive details on the tasks and skills required in an individual's occupation. I use the 1999 survey wave because it inquires on a larger set of skills and tasks compared to other waves, and because it represents a central year of when occupational decisions are taken in my sample. Unfortunately, the survey waves are rather inconsistent in the tasks and skills inquired over time, which makes comparing occupational specificity difficult across years.

Miscellaneous Data Sources Further, numbers of students and graduates stem from the Regional Statistical Data Catalogue of the Federal Statistical Office and the statistical offices of the Länder. Lastly, information on regional supply and demand ratios stem from the Federal Institute for Vocational Education and Training. This data is collected at the job centre level, a labor market region which is comprised of 2 to 4 counties. The data is available on occupational level only between 2004 to 2011. Total supply-demand apprenticeship ratios

[11]The crosswalk was kindly provided by Wolfgang Dauth

are available from 1998 to 2011. I also use data from the German Socio-Economic Panel to look at the impact of parental occupations[12].

3.6 Descriptive Overview

Figure 2 plots total import volumes from China and Eastern Europe over time, showing large, but fairly smooth increases over the past two decades. It illustrates why having yearly 10-year rolling window changes in import exposure as treatment provides added value compared to using only one or two non-overlapping 10-year increases. Table 1 reports summary statistics for all variables; import and export exposures, individual and regional characteristics as well as all outcomes. Average import exposure over the entire time span is 4180 Euros. 46% of the sample is female and 92% are German citizens. Table A1 shows that the states in which I observe the individuals at age 15 are distributed as one would expect in terms of general populations and given the fact that Eastern German states are only included as of 2003. The years in which individuals are "treated" by import exposure at the age of 15 range from 1991 to 2013, with again quite an even distribution and the early 2000s being represented the most.

Outcomes The paper looks at a number of different outcomes, to describe which kind of vocational training occupations individuals exposed to import competition enter, and what their labor market outcomes are. The outcomes can be classified into three categories: (1) occupational groups, describing the type of occupation, (2) occupational task characteristics, describing what tasks the job entails, and (3) labor market outcomes, describing how individuals do during and after their vocational education. The occupational groups are dummy variables for whether an occupation is in manufacturing, represents a craft occupation, is in services, or is a merchant occupation.[13] Import-intensive manufacturing industries are identified as a manufacturing industry exposed to imports above the median. 35.5% of individuals in the sample are in manufacturing, 24.6% in craft occupations, 57.1% in service occupations, and 18.2% in merchant occupations. These occupations can be ordered according to their occupational specificity, as shown in Figure 4. The specificity measure

[12]Socio-Economic Panel (SOEP), data for years 1984-2013, version 30, SOEP, 2013, doi:10.5684/soep.v30.

[13]Manufacturing and Service occupations are identified based on occupational grouping of the German Classification of Occupations 1988 (Federal Employment Agency, 1998). Crafts occupations are identified based on the German Trade and Crafts Code, using the same procedure as in Lergetporer, Ruhose and Simon (2018). Merchant occupations are identified using the official classification of vocational training occupations of the Federal Institute for Vocational Education and Training.

ranges between 0 and 1, with one being highly specific, meaning that there is no overlap in the skill bundles of that occupation and the general labor market, and 0 meaning the occupation is very general, with perfect overlapping skill bundles. Average skill specificity in the sample is 0.118; manufacturing has a skill specificity of 0.20, craft occupation of 0.165, service of 0.136 and craft occupations of 0.129. Manufacturing and craft occupations being the more skill-specific, provide less potential for switching occupations, because the skills in these occupations are not as transferable. Therefore, they provide less sheltering from the forces of structural change, such as trade and automation. Note that these occupational groups do not sum to 1, as they are not mutually exclusive. While manufacturing and services are mutually exclusive, crafts and merchant occupations are subsets of both these groups. 12.8% of individuals work in import manufacturing industries.

Considering what is known about increasing skill requirements and task-complexity within occupations (Spitz-Oener, 2006), I further look at what the chosen occupations entail in terms of tasks. First, the extent of computer use in an occupation from the survey of the Federal Institute for Vocational Education and Training is used[14]. This measure changes within occupations over time. 42% of occupations have frequent computer use. Further, I use Blossfeld (1987) to classify whether an occupation is "manual" (24% on average), "easy manual' (3% on average) or "qualified manual" (21% on average).

Finally, the following labor market outcomes are considered: the individuals' earnings during the apprenticeship (24 Euros gross daily earnings on average), what earnings are one, five and ten years after finishing the apprenticeship (24.58, 50.83, 70.62 Euros gross daily earnings on average, respectively) as well as the earnings growth rates over five (127%) and ten years (162%). Moreover, I also look at the age at which an individual starts the apprenticeship (19 on average), whether the person is employed the first year after the apprenticeship (63%), whether the person starts working in a different county after the apprenticeship (29%), how many occupational switches the person performs in their career (2.6 times on average), how many years the person is unemployed (0.77) and how many times she moves counties (1.25 times on average).

[14]The computer use on the job variable is taken from the occupation averages of four waves of the BIBB/IAB Qualification and Occupational Career Survey (1992, 1999) and BIBB/BAuA Employment Survey (2006, 2012). The averages for the survey year are used for occupations in the SIAB data for five years surrounding the survey year, such that the averages from 1992 are applied to occupations in the years 1990-1995, from 1999 to 1996-2001, from 2006 to 2003-2008 and from 2012 to 2009-2014. The results are not sensitive to changing around how these years are attributed.

4 Impacts of Import Exposure on Vocational Occupation Choice and Labor Market Outcomes

This section presents and discusses results from the main regression on the three groups of outcomes: (1) occupational type, (2) occupational tasks and (3) labor market outcomes. It then checks for threats to identification in terms of endogenous sample selection and labor demand. Further, results from robustness checks and heterogeneous effects across gender are reported.

4.1 Skill-Specific Versus General Skills Occupation Type

Table 2 reports the effects of local labor market import exposure on the choice of vocational occupation type. All regressions control for export exposure and include individual and regional controls as well as state by year fixed effects, meaning that the effects are identified within year and state. Panel A reports OLS results, panel B reports 2SLS IV results for the same outcomes. The coefficients can be interpreted as the effect of a 1000 Euros increase in per worker import exposure on the likelihood of the outcomes in question. Column 1 shows that higher import exposure increases the likelihood of an individual to enter a manufacturing VET occupation. OLS gives a coefficient of 0.14% increase per 1000 Euros per worker increase in import exposure and the 2SLS IV coefficient gives a larger coefficient of 0.23% likelihood increase. Column 2 reports the coefficients on the likelihood of an individual entering a craftsmen VET occupation. The coefficients are positive, and the 2SLS coefficient implies a 0.19% increase in the likelihood of entering a craft occupation for a 1000 Euros per worker increase in import exposure. Columns 3 and 4 report the effects on entering a service and merchant occupation. Contrary to the previous columns, these coefficients are negative, implying a reduction in the likelihood of entering a service or merchant occupation. Column 5 finally shows effect of import exposure on entering an import manufacturing industry, *i.e.*, one of the industries that cause the trade shock. Perhaps unsurprisingly but disappointingly, adolescents enter more import-intensive industries that are prevalent in their labor market. This implies that they expose themselves to even more import competition in the future, and may be subject to uncertain employment prospects.

Since outcomes in Columns 1-4 of Table 2 are ordered from left to right by their occupational skill specificity, it becomes quickly evident that the effect of import exposure induces individuals to enter more specific occupation groups (manufacturing and crafts) and

less the more general occupation groups (service and merchant). Additionally, individuals choose to work more in the manufacturing industries, that will expose them even more to import competition and therefore risk of future unemployment. The results imply that despite import competition and resulting local structural unemployment as shown in Dauth, Findeisen and Suedekum (2014), (1) individuals go more into occupations that are threatened by import competition and (2) into occupations that do not provide easily transferable skill bundles to facilitate occupational mobility in case of future unemployment. I control for manufacturing employment per county, which means that the effects are not purely reflecting the fact that individuals enter whatever industry structure is prevalent in their county. With these vocational education occupations, individuals expose themselves even more to imports in the future instead of sheltering themselves from it, which may have detrimental effects on their later labor market outcomes.

In terms of the magnitude of the effects, the average import exposure per worker is 4180 Euro, which means the marginal effect given by the coefficients should be multiplied by 4.18 to get the average effect. In the case of manufacturing, the likelihood was increased on average by (4.18*0.23% $\approx$) 1%. The difference between counties at the 75th and 25th percentile of import exposure is 3591 Euros (Table A3 reports mean import exposures across different years and quantiles) in 2000, giving a difference in effects of 0.86 percentage points. Comparing the size of 2SLS IV and OLS coefficients, OLS coefficients tend to be consistently smaller (in absolute terms) than 2SLS coefficients, pointing to the fact that there is a positive correlation between import demand shocks and labor demand, which means that OLS underestimates the true effects.

In Appendix Table A4, I present results for considering import exposure from China and Eastern Europe separately. The results show that the overall, *i.e.,* combined effects of import exposure from China and Eastern Europe in the main effects are predominantly driven by China, not Eastern Europe. This might be explained by the fact that for Eastern Europe, import and export exposure are highly correlated with a correlation coefficient of 0.77. This suggests that there is much inter-industry trade and that therefore more employment opportunities may have been retained for industries exposed to Eastern European imports, and therefore do not pose much of a shock. On the other hand, Chinese import and export only have a correlation coefficient of 0.19, meaning that Germany does not export to China in the same industries as China exports to Germany. This can imply that only the import shock from China actually impacted individual's vocational education and labor market outcomes. Contrary to my results, Dauth, Findeisen and Suedekum (2014) find that trade

with Eastern Europe caused much stronger industry employment displacement effects than trade with China, due to the fact that trade with Eastern Europe increased earlier, as well as in other industries in which German counties had more initial specialization

4.2 Occupation Tasks: Computer Use and Manual Labor

The previous section establishes that individuals enter more skill-specific occupations and more import exposed manufacturing industries. To further understand what that means in terms of the skills and tasks required within the occupations an individual choose, Table 3 reports results for computer use within occupations and whether the occupations is a manual, easy manual or qualified manual occupation. The table reports IV results. Column 1 reports the probability of entering an occupation with above median computer. Increased import competition reduces the probability of an individual entering an occupation with computer use and the size of the coefficient (0.2%) is similar to that of entering manufacturing. Computer use is of such central importance in technological progress and at the heart of the skill-biased technological change idea (Card and DiNardo, 2002) and those able to use a computer can learn to control machines, analyze or communicate, even as manufacturing becomes increasingly automated. Despite the globalization forces and structural change the individuals in this sample are exposed to, they do no enter professions that may teach them important IT skills such as communication, data analysis or coding. This would act as an insurance against unemployment, in case the industry in which the individual is employed, is subject to further import competition or automation.

Column 2 shows the impact of import exposure on entering a manual occupation. Again, the coefficient is very much in line with the size of the coefficient on manufacturing, which is unsurprising since manufacturing is inherently manual in nature. In Columns 3 and 4, manual work is further split up into easy manual and qualified manual occupations. The results show that, at least, import exposure pulls individuals more into qualified manual labor, and there is a null effect for easy/unqualified occupations. This finding is reassuring, since apprentices go into vocational education to learn a somewhat skilled occupation. This means that while growing up in import competition exposed counties pulls individuals more into manual, less computerized vocational occupations, these occupations are at least those requiring qualifications and skills, and are not just simple manual labor.

4.3 Later Labor Market Outcomes

This section discusses the effects of import exposure on individual labor market outcomes. The upper panel of Table 4 reports effects on (log daily gross) earnings at different stages. Being exposed to 1000 Euros per worker higher import exposure in their county than elsewhere when 15 (for those who enter vocational education subsequently) affects individuals negatively, in that they earn 0.14% less during their apprenticeship, not significantly less a year after finishing their apprenticeship, 0.44% less five years after finishing their apprenticeship and 1.1% less ten years after finishing their apprenticeship[15]. Comparing these marginal effects to the average increase in import exposure of 4180 Euro, the average loss in income 10 years post apprenticeship due to import exposure amounts to 4.6%, which is a substantial reduction in income. Column 6 shows that 1000 Euros import exposure leads to 5.7 percentage points lower earnings growth over 10 years, which is also quite a sizable negative effect. These effects are independent of which occupations individuals choose, the only restriction being that individuals enter vocational education. The effects can be compared to the literature on adverse effects of growing up in a recession, or growing up in a poor neighborhood Oreopoulos, von Wachter and Heisz (2012) find that graduating from college in a recession causes earnings losses for individuals for over ten years. An unemployment rate of 5% implies an earnings loss of 9% initially, which slowly fades away over a ten year period. Here by contrast we see that being exposed to import competition and corresponding structural unemployment, causes losses in lifetime earnings that become larger over time.

The bottom panel of Table 4 shows the effects of import exposure on some additional labor market outcomes, which may provide potential channels explaining these adverse income effects. The results show, that individuals in more import exposed counties enter apprenticeships at an earlier age. This may be because individuals leave school earlier and enter VET with a lower degree. I find no evidence for this in Section 4.4 however, where I check for differential selection into education tracks. Another explanation is that individuals find apprenticeship places faster or do not take time off, but rather that their path ahead is clear and does not deviate from what is and has been prevalent in the local labor market.

Column 8 of Table 4 indicates that import exposure makes individuals more likely to be employed the year immediately after finishing their apprenticeship. This result is in line with the finding from Hanushek et al. (2017*a*), who show that "skill-specific" education helps

[15]Duration of apprenticeships is not differentially affected, so these effects do not stem from differential firm tenure post apprenticeship

with the transition from schooling to the labor market. The result here suggests that this also seems to hold for general versus skill-specific occupations *within* vocational education. There is no significant effect on the number of years of unemployment, which shows that although individuals take wage cuts, they are not more likely to be unemployed. Lastly, the results show that individuals are less mobile in terms of regional (inter-county) mobility, but instead more mobile in terms of occupational mobility. These results are in line with Dauth, Findeisen and Suedekum (2014) who show that there are no adjustments through interregional migration due to trade shocks.

Note that the above results just show the effect of import exposure on labor market outcomes, but ideally one would be interested in how the choice of VET occupation affects labor market outcomes, in particular, whether individuals are sheltered from trade and automation. In other words, does the hypothesis that individuals in service and merchant occupations are more sheltered and therefore experience less adverse earnings outcomes due to import exposure? It would be very difficult to provide causal evidence on the effect of vocational occupation choice on labor market outcomes, because occupation choice is an endogenous variable that is correlated with unobserved individual characteristics such as talent or motivation. A regression linking vocational occupation choice and labor market outcomes would suffer from selection bias, because a highly motivated individual, may take the rational occupation choice and have a high income, but that same individual may have fared just as well in any other occupation and the seeming positive relationship would be due to the unobserved factor motivation.

Nevertheless, Table 5 presents suggestive evidence showing the effects of import exposure and import exposure interacted with the vocational education occupation choice on 10-year earnings growth. Column 1 shows the results when import exposure is interacted with whether an individual chooses a manufacturing occupation. The level effect of import exposure is insignificant, while the interaction term shows a decline of 8 percentage points on 10-year earnings growth for 1000 Euros import exposure if an individual pursued VET in a manufacturing occupation. This implies that the adverse effect of import exposure is entirely driven by individuals in manufacturing occupations and is zero for all other occupations.

In Column 2, both the level effect as well as the interaction term of import exposure with craft occupations is negative. Contrary to this, in Columns 3 and 4 the interaction terms for service and merchant occupations respectively are positive and of similar magnitude as the level effect of import exposure, implying that the adverse effect on ten year earnings growth cancels out. The results although not causal, suggest that indeed more general occupations

in services and as merchants have a sheltering effect from the negative effects of import exposure during adolescence.

An obvious channel as to why individuals still enter these occupations that affect them adversely would be their parents. Table A5 shows evidence from the German Socio-Economic Panel, which allows to link family ties and also asks about youth's occupational aspirations. Results in Panel A columns 1 and 2 show that the general results for occupation choices hold also in this data (though the effects are not significant due to small sample sizes). Aspirations of young individuals however, are affected in the opposite directions, and as one would have expected in the first place, namely choosing less manufacturing and more service occupations when exposed to import competition. Therefore, there seems to be a mismatch between aspirations and actual choices. Panel B shows the impact of parental occupations on vocational occupation choices. Columns 1 and 2 show that while parental occupation is an important driver in adolescents' occupation choices meaning that individuals enter the same occupation as their parents, columns 3 and 4 show that having a father that worked in manufacturing and growing up in regions exposed to import competition, actually decreases the probability of individuals to enter a skill-specific manufacturing job. This suggests that potential first-hand negative experiences of job or income loss due to import competition within a family, may work to dissuade individuals from taking up skill-specific occupations.

4.4 Not an Endogenous Subsample

This paper focuses on young individuals who self-select into apprenticeships, rather than going to university. Since this is a non-random subgroup of individuals, there must not be any differential and therefore endogenous selection into this subgroup because of trade exposure; as this would introduce a bias into the estimations. Table 6 Column 1 shows the effect of imports at time t on transitions from elementary school to higher school tracks at $t-5$. Since the "treatment" of import exposure concerns 15 year-olds, these same individuals should not have selected into academic track or middle track school differentially at the age of 10. As the coefficients show, there is no evidence of this. Columns 2 and 3 show the effects of import exposure at time t on 7th graders in academic and middle track schools at $t-3$ and also show no effect. Column 4 presents the effect on graduates from the middle track at time t, again showing no effect. Most importantly, there is also no effect on total numbers of apprentices at t+1 from trade. This robustness check shows, that there was no differential selection into different education levels due to the trade shock. With no

educational upgrading, it is clear that keeping the level of education fixed at the vocational level and investigating individual vocational education occupation choices, is the relevant research question and therefore relevant level of analysis.

4.5 Choice or No Choice?

So far, it is unclear whether the occupational paths on which young individuals embark can be called "choices", or whether they are entirely driven by labor demand. Since "choosing" an apprentice occupation differs importantly from choosing a university major in the sense that it strongly depends on local availability of a firm offering an apprentice positions in such an occupation, this is a major concern. Unavoidably a certain portion of the type of vocational occupation individuals enter, is due to their local industry structure. Nevertheless, any county will also have service and merchant related apprenticeship positions on offer, for example as accountants, tax consultants or procurement specialists. One wants to know whether limitations in apprenticeship choice are systematically related to trade shocks: if the same firms, which are hit by import competition now also offer less apprentice positions, or employ more apprentices as a way of having cheaper labor, any of the findings may be purely driven by the labor demand side and have nothing to do with individual choices. Knowing which is the driver makes an important difference for policy implications, *i.e.,* whether an information intervention in schools, or a policy aimed at the firm side would be effective in teaching more transferable skills to young adults.

The results speak against the fact that individuals have no real choice in their apprenticeship and have to take what is available on the local labor market, because the effects show that young adults still go into manufacturing and import manufacturing despite the firms being exposed to import competition and may see higher unemployment and firm closures. Moreover, it has been found that firms, at least in the short run, do not adjust the number of apprentice places according to the business cycle (Luethi and Wolter, 2018), which speaks for the fact that numbers of apprenticeship positions should be fairly stable. To further investigate this issue, I look at local supply-demand relations of apprenticeship positions. These statistics provide information, on exactly how many apprentice places were offered, how many new contracts were signed, how many candidates looked for an apprenticeship and how many were left without a spot. These data are available at the level of labor market regions of job centers, which are constituted of two to four counties. While there are 402 counties, there are 176 job center labor market regions, which are sometimes referred to

as German commuting zones. This data are available for all occupations aggregated from 1998 to 2011, while between 2004 and 2011 they are also available on the occupation level. Table 7 shows results for the effect of import exposure (aggregated up to the labor market regions), on outcomes concerned with supply-demand-ratios of apprenticeship positions for all occupations together. The supply-demand ratio in Column 1, is calculated by adding up all apprenticeship positions offered (new apprenticeship contracts (*i.e.,* matches) plus unfilled positions) and dividing them by all apprenticeship positions searched (new apprenticeship contracts plus unsuccessful candidates). A supply-demand ratio of 1 means that there is perfect clearing on the apprenticeship market; a number larger than one indicates excess supply, a number less than one indicates excess demand of apprenticeship positions. Column 2 looks at the numbers of unfilled apprentice positions, Column 3 at the number of successfully signed new contracts and Column 4 at the number of unsuccessful apprenticeship candidates in the given year. There are no significant effects of import exposure on any of these measures. These null-effects are robust to trying different timings of the import shock, *i.e.,* taking the lagged import shock, for example.

In Table 8, unsuccessful candidates by different occupational groups are analyzed. For Columns 1 and 2, vocational education occupations are split among manual or office-based. For Columns 3, 4 and 5, I use the available information of which "chamber" the vocational education is administered by (Chamber of Crafts and Trade; Chamber of Industry and Commerce or Public Services). There are no effects on the number of unsuccessful candidates for the occupational categories of manual, office, craftsmen nor for industry and commerce. This shows, that there is no acute shortage of office jobs even in import-exposed regions. This means that there is no evidence that young individuals searching for apprenticeship places who really wanted to get an office job were forced to take a manufacturing apprenticeship. The only coefficient which is significant is public service, meaning that there is an oversupply of candidates for public service apprenticeships compared to the amount of places offered. While this shows that there is increased interest in public service, or perhaps just a shortage of apprenticeship position where import exposures are stronger, it is unlikely that this effect on unsuccessful public service apprenticeship places drives our main results, since the share of apprenticeships in public service is below 4% (BIBB, 2016). This analysis provides evidence that local apprenticeship markets cleared well even in import exposed regions and that the results are indeed likely to be driven by individual choices, rather than only by labor demand.

4.6 Robustness Check: Alternative Measures of Import Shocks

To make sure that the results are not solely produced by the definition of import exposure I choose, Table 9, presents results of alternative definitions of import shocks. Coefficients are shown for a selection of outcomes: manufacturing occupation, crafts occupation, import industry, computer use and 10-year earnings growth.[16]

Each cell in Table 9 refers to a separate regression. There are four different import exposure definitions, "baseline" being the same as in the main analysis, namely the 10-year rolling window changes between t and $t-10$, with $t-10$ as base year for the industry employment structures. "Cumulative" refers to 10-year rolling window cumulated import volumes apportioned by initial $(t-10)$ regional industry structures. "Current year" refers to the current year total import exposure apportioned by initial regional industry structures at $t-10$. "Fixed baseline" refers to 10-year changes, like in baseline, but with fixed initial industry structure at 1980 for the Western Germany and with 1993 for Eastern Germany. The alternative measures of import exposure produce very similar results to the baseline, meaning that the results do not hinge on just the 10-year year rolling window changes and $t-10$ industry structure that are used in the main analysis. Using cumulative import shocks, *i.e.,* adding up all the import volumes over ten years naturally produces a smaller coefficient per 1000 Euros per worker, because the shock is numerically a lot larger (by a factor a little less than tenfold). The current-year import exposure gives very similar effects as the baseline in both significance and magnitude, indicating that the baseline results are driven by the large increases in trade volumes in later years, not by the starting levels, which where close to zero in all regions. Fixing the baseline at 1990 or 1993 also gives very similar results though with a little smaller effect sizes. Not allowing the initial industry structure to vary at all over 20 years gives probably cleaner in terms of endogenous adaptation of counties but also less realistic representations of the real trade shock. However, the results are still very similar that this does not give reason for concern.

In a another robustness check, I investigate whether "shocking" individuals with trade shocks at different ages changes the the results. The effects same identical to the estimates of assignment the trade shock at the age of 15, or at 13 or 14 and 16 and 17.[17] Since the trade "shock" constitutes a ten year change in import exposure and individuals are exposed before and after the same, it is not surprising that the results are the same. I choose to

[16]The table shows only a selection of outcomes, the alternative measures work similarly well for all outcomes. The results are available upon request.

[17]Results available upon request.

assign the treatment at the age of 15, because it is usually a year or two before an adolescent in middle school tracks choose their apprenticeship occupation.

4.7 Heterogeneities Across Gender

Males and females make inherently different labor market decisions, in particular in the middle-skill section of vocational education, where more than in high-skilled jobs, occupations are strongly fragmented by gender. Whether women react differently than men to growing up in an import exposed county, is therefore an interesting question. I therefore estimate the following regression equation:

$$\begin{aligned} y_i^{r,t} = \beta_1 \Delta ImportExposure_{rt}^{Ger \leftarrow C+EE} + \beta_2 \Delta ExportExposure_{rt}^{Ger \rightarrow C+EE} + \\ \beta_3 female_i + \beta_4 \Delta ImportExposure_{rt}^{Ger \leftarrow C+EE} x female_i + \\ \beta_5 X_i + \beta_6 X_r + \gamma_{t*s} + \epsilon_i. \end{aligned} \tag{7}$$

If the individual is female, $\beta_1 + \beta_4$ is the effect of import exposure and only β_1 if the individual is male. Table 10 reports selected results from heterogeneity analyzes of interacting 10-year changes in import exposure with the individual being female.[18] The top panels shows heterogeneous effects for occupation type and tasks. There is no differential effect of import exposure for women on entering manufacturing, crafts or service occupations. While there are of course large level differences of men and women as can be seen from the female coefficient, exposure to import competition does not induce a different behavior from men for those occupation categories. However, females exposed to import competition enter merchant occupations more and also occupations with more computer use. Females also choose relatively less manual but more qualified manual occupations when exposed to imports. These results suggest that females shelter themselves more from import exposure, because they do chose slightly more general occupations with more computer use and less manual labor. However, this is not reflected in the labor market outcomes of females. The lower panel of Table 10 shows heterogeneous effects of labor market outcomes. Import exposure affects females more adversely than men. In terms of earnings, females are worse off during the apprenticeship, one year after and ten years after finishing the apprenticeship. They are also less likely to be unemployed the year after finishing their apprenticeship and

[18] The variables were demeaned before building their interactions.

are unemployed for more years throughout their careers. They are however, more mobile in terms of both occupational as well as regional mobility.

The results suggest that females are more adversely affected by import competition than men in terms of labor market outcomes, a finding that is also found in the graduating in a recession literature (e.g. Hershbein, 2009) and an important aspect for policy implications.

5 Concluding Remarks

In this paper, I investigate the impact on growing up in a German region exposed to import competition from China and Eastern Europe. Looking at the choice of vocational occupation as the relevant point of labor market entry and to keep the educational level constant, the paper provides caused evidence on the effect of local import shocks on (1) the type of vocational occupation, (2) the task content of the occupation, and (3) the effect on further life labor market outcomes. The paper uses individual-level longitudinal social security data and other high quality data sources such as administrative firm data, bilateral trade data and data on apprenticeship position for this empirical investigation.

The results show that import competition perpetuates vocational occupation choices of individuals, rather than leading to adjustments into more general and service oriented occupations. First, I find that greater exposure to import competition pulls individuals more into manufacturing occupations, more into craftsmen occupations and import industries in particular, and less into service and commerce occupations. The results imply that individuals do not adjust away from the predominant industry structure of the county they grew up in, and therefore do not protect themselves from future further forces of globalization through more import competition. Secondly, I find that the task content of occupations individuals choose, does not teach them general and transferable skills. I find that increased import exposure makes adolescents less likely to enter occupations with high computer use, and more likely to enter manual occupations. Lastly, I find that individuals exposed to import competition in their adolescence who enter vocational education, are adversely affected on the labor market in later life. They earn less 5 and 10 years after their apprenticeships if finished and also see less earnings growth. They are more mobile in terms of occupational mobility, but less mobile regionally. While not causal, I demonstrate that these adverse labor market outcomes are at least partly related to choices of vocational occupation types. Analyzing occupational choices within vocational education is the right level of analysis for Germany, as there is no differential selection into different schooling tracks (academic versus

non-academic track) in response to import shocks. Furthermore, looking at supply-demand ratios of apprenticeship positions, I show that the results are not purely labor market demand driven. The results are also robust to various import definitions.

I find that the effects are very heterogeneous across genders. Women, as opposed to men are more likely to enter service oriented and merchant based occupations when exposed to local import competition during adolescents. They also choose occupations more computer use. However, women are nevertheless still adversely affected by import competition in terms of later labor market outcomes.

This paper has contributed to the existing literature in several ways. It is the first paper to look at the effect of local import exposure on individuals who grew up in exposed regions. It uses yearly variation in import exposure in addition to regional variation. It is also the first paper to bring together the impact of trade shocks and occupation choice at labor market entry. It extends the literature on general versus skill specific education and applies it horizontally to vocational education by combining it with occupational skill-specificity measures. It also contributes to the literature on the impact of economic conditions such as recession on schooling decisions and later life outcomes, by showing the effect of structural change on personal vocational occupation choices and later life outcomes.

The paper suggests that the adjustment of occupational choices into more service-oriented occupations in response to import exposure does not take place at the level of young individuals growing up in import exposed regions. Rather, initial industry structures seems to be perpetuated by young labor market entrants, in that they are still more likely to choose manufacturing and import industries when having been exposed to more import competition at the age of 15. In terms of policy implications this calls for better informational access when individuals choose their apprenticeship positions. More job fares or better information about the 320 different possible occupations requiring vocational education may pose avenues for potential policies targeted at young individuals.

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A Tables

Table 1: Summary Statistics

	Mean	Std. Dev	Min	Max
County level				
Import Exposure Eastern Europe	2.56	2.58	-1.36	52.05
Import Exposure China	1.62	2.43	-0.20	48.41
Import Exposure Overall	4.18	4.11	0.00	61.90
Export Exposure Eastern Europe	3.47	3.12	-5.22	50.00
Export Exposure China	0.84	1.31	-3.03	51.21
Export Exposure Overall	4.31	4.09	-5.18	71.79
Manufacturing employed	196025	18254	20021	575
Individuals				
Female	0.46		0	1
German	0.93		0	1
Occupation Category				
Manufacturing	0.35	0.48	0	1
Service	0.57	0.49	0	1
Craftsmen	0.25	0.43	0	1
Merchant	0.18	0.39	0	1
Import Industry	0.13	0.85		0
Tasks				
Computer Use	0.42	0.35	0	1
Manual	0.34	0.47	0	1
Easy Manual	0.03	0.17	0	1
Qualified Manual	0.22	0.41	0	1
Labour Market				
Age at apprenticeship	19.33	2.36	14	39
Employed first year after	0.63	0.48	0	1
Different County after	0.29	0.46	0	1
Occupation switches	0.42	0.49	0	1
County Switches	1.26	1.45	0	16
Years unemployed	0.77	1.67	0	21
Gross daily Earnings				
During	24.58	10.14	0.00	1390.00
One year after	50.83	28.44	0.00	622.00
5 years after	70.62	35.71	0.00	440.00
10 years after	80.88	43.93	0.00	366.31
Growth after 5 years	1.27	6.52	-1.00	991.92
Growth after 5 years	1.63	7.42	-1.00	913.09
Observations	196,025			

Table 2: Effects of Import Exposure on Vocational Education Occupation Types

Panel A: OLS					
	(1)	(2)	(3)	(4)	(5)
	Manufacturing	Craftsmen	Service	Merchant	Import Manufacturing
Import Exposure	0.0014*	0.0015**	-0.0011**	-0.0009**	0.0016***
	(0.0008)	(0.0006)	(0.0005)	(0.0004)	(0.0006)
N	196025	196025	196025	196025	196025
R-squared	0.007	0.286	0.104	0.297	0.021
Panel B: IV					
	(1)	(2)	(3)	(4)	(5)
	Manufacturing	Craftsmen	Service	Merchant	Import Manufacturing
Import Exposure	0.0023**	0.0019**	-0.0016**	-0.0009**	0.0023***
	(0.0011)	(0.0008)	(0.0007)	(0.0006)	(0.0007)
N	180000	180000	180000	180000	180000

Note: Panel A refers to OLS regressions, Panel B to 2SLS IV regressions. The F-statistic for the first stage regression in the 2SLS (Panel B) is 127.86. The outcome in column 1 is a dummy for whether the occupation an individual enters in in manufacturing, in column 2 a crafts occupation, in column 3 a service, in column 4 a merchant occupation. The outcome in column 5 is a dummy for whether the occupation in a import-intensive manufacturing industry. The unit of observation is the individual, observed in the data once. The individual is "treated" by the import shock in the county she is first observed in, in the year she is 15. The treatment refers to import exposure per worker (in 1000 Euro) at county level (402 counties) from both China and Eastern Europe. All regressions also control for the respective export exposure. All regressions control for the following covariates: manufacturing employment in the county, and dummies for whether the individual is female or non-German. All regressions include state-by-year fixed effects. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Individual social security (SIAB) data

Table 3: Effects of Import Exposure on Occupation Task Characteristics

	(1) Computer use	(2) Manual	(3) Easy Manual	(4) Qualified Manual
Import Exposure	-0.0020***	0.0029**	-0.0003	0.0015**
	(0.0006)	(0.0012)	(0.0002)	(0.0007)
N	180000	180000	180000	180000
F-Stat 1^{st} stage	129.61	127.86	127.86	127.86

Note: The outcome computer use stems from the BIBB occupation survey with four waves between 1992-2012 and refers to a dummy indicating whether the majority of individuals in an occupation state they use computers often or very often in their job. Outcomes in columns 2-4 refer to dummies whether the classification is "manual", "easy manual" or "qualified manual", as classified by Bloosfeld. All results stem from 2SLS IV regressions. The unit of observation is the individual, observed in the data once. The individual is "treated" by the import shock in the county she is first observed in, in the year she is 15. The treatment refers to import exposure per worker (in 1000 Euro) at county level (402 counties) from both China and Eastern Europe. All regressions also control for the respective export exposure. All regressions control for the following covariates: manufacturing employment in the county, and dummies for whether the individual is female or non-German. All regressions include state-by-year fixed effects. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Individual social security (SIAB) data

Table 4: Effects of Import Exposure on Earnings and Other Labor Market Outcomes

	Gross daily Earnings					
Panel A	(1) During apprenticeship	(2) 1 year after apprenticeship	(3) 5 years after apprenticeship	(4) 10 years after apprenticeship	(5) Growth after 5 years	(6) Growth after 10 years
Import Exposure	-0.0014**	-0.0013	-0.0044**	-0.0110***	-0.0112	-0.0579***
	(0.0006)	(0.0011)	(0.0018)	(0.0033)	(0.0082)	(0.0192)
N	180000	150000	80000	44000	77000	43000
Fstat 1st Stage	127.86	91.79	233.42	315.33	229.64	311.79
	Other Labor Market Outcomes					
Panel B	(7) Age at apprenticeships start	(8) Employed first year after apprenticeship	(9) Years unemployed	(10) Times county switched	(11) Occupation switches	
Import Exposure	-0.0100**	0.0012**	0.0008	-0.0044**	0.0050**	
	(0.0046)	(0.0006)	(0.0017)	(0.0022)	(0.0025)	
N	180000	180000	180000	180000	180000	
F-Stat 1^{st} stage	127.86	127.86	127.86	127.86	127.86	

Note: Each cell refers to a separate regression. Outcomes in panel A columns 1-4 refer to gross daily earnings, during, one year upon completing the apprenticeship, 5 and 10 years after the apprenticeship, respectively. The outcome in column 5 (6) refers to growth between the first year and the fifth (tenth) year after finishing the apprenticeship. In Panel B, the outcome in column 7 refers to the age at which an individual begins his apprenticeship, column 8 is a dummy for whether the individual is employed the year after finishing the apprenticeship, column 9 refers to the number of years an individual is unemployed throughout his life, column 10 to the number of times the individual moves county and 11 the number of times the individual switches occupations. All results stem from 2SLS IV regressions. The unit of observation is the individual, observed in the data once. The individual is "treated" by the import shock in the county she is first observed in, in the year she is 15. The treatment refers to import exposure per worker (in 1000 Euro) at county level (402 counties) from both China and Eastern Europe. All regressions also control for the respective export exposure. All regressions control for the following covariates: manufacturing employment in the county, and dummies for whether the individual is female or non-German. All regressions include state-by-year fixed effects. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Individual social security (SIAB) data

Table 5: 10-Year Earnings Growth by Vocational Occupation Choice

	(1) Manufacturing	(2) Craftsmen	(3) Service	(4) Merchant	(5) Import Manuf
Import Expore	-0.0113	-0.0333*	-0.0896***	-0.0884***	-0.0637***
	(0.0208)	(0.0191)	(0.0219)	(0.0224)	(0.0193)
Import Exposure x Occ Category	-0.0866***	-0.0662***	0.0780***	0.0665***	0.0516
	(0.0219)	(0.0248)	(0.0192)	(0.0197)	(0.0720)
N	43000	43000	43000	43000	43000
F-Stat 1^{st} stage	205.56	197.36	201.11	200.65	207.17

Note: The results refer to the effects of import exposure on 10-year earnings growth, and the interaction of having chosen the respective occupation type. All results refer to 2SLS IV regressions. The unit of observation is the individual, observed in the data once. The individual is "treated" by the import shock in the county she is first observed in, in the year she is 15. The treatment refers to import exposure per worker (in 1000 Euro) at county level (402 counties) from both China and Eastern Europe. All regressions also control for the respective export exposure. All regressions control for the following covariates: manufacturing employment in the county, and dummies for whether the individual is female or non-German. All regressions include state-by-year fixed effects. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Individual social security (SIAB) data

Table 6: Non-Endogenous Subsample: Selection into School Tracks

	4th grade transitions	7th grade		Graduates		Apprentices
	Academic track	Middle school	Academic track	Middle school	Academic track	
	(1)	(2)	(3)	(4)	(5)	(6)
Import Exposure	-0.0005	-0.00057	-0.00017	-0.00015	-0.00001	0.0011
	(0.0012)	(0.00051)	(0.00021)	(0.00028)	(0.00026)	(0.0016)
N	422	6320	6320	7318	5748	8736
R-squared	0.235	0.024	0.561	0.277	0.549	0.077

Note: Data for this analysis is at the county-year level for 402 counties across varying amounts of years, according to data availability. The outcomes represent shares of students over the total at the respective level. Import exposure is used at the respectively correct time to test non-differential selection into subsamples due to the treatment. In column (1) it is tested whether the trade shock at t+6 (referring to the change of t-(t-10) in trade exposure), lead pupils to differentially select into the academic track high-school after fourth grade, at t. In columns 2 and 3 the outcomes are shares of seventh graders in the middle track and academic track high-school at t, and the import shock refers to t+3. Columns 4 and 5 refer to graduates from middle school (with import at t) and academic track high-school (with trade shock at t-4). All regressions include year and individual fixed effects and also control for export exposure. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Regional Statistical Data Catalogue of the Federal Statistical Office and the statistical offices of the Länder

Table 7: Suppy-Demand Relations for Apprenticeship Positions for All Occupations

	(1) Supply-demand	(2) Non-filled positions	(3) New contracts	(4) Unsuccessful applicants
Import Exposure	-0.0000	-0.6203	-30.6334	0.2827
	(0.0004)	(1.0808)	(22.0862)	(1.1758)
N	4793	4793	4793	4793
R-squared	0.193	0.193	0.463	0.712

Note: Analysis on the level of 176 job centre labor market regions. Outcomes refer to supply and demand of apprentice positions in labor market regions. Column 1 refers to the suppy-demand ratio of apprenticeship positions, with all supplied apprenticeship positions (new contracts and unfilled positions) over all demanded positions (new contracts and unsuccessful candidate). Column 2 refers to non-filled positions, column 3 to new apprenticeship contracts agreed and column 4 to the number of unsuccessful applicants. Years 1998-2011 are included. All regressions include year and labor market region fixed effects. All regressions include state-by-year fixed effects. Robust standard errors clustered on labor market region level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Federal Institute for Vocational Education and Training

Table 8: Unsuccessful Apprenticeship Candidates by Occupation Category

	(1)	(2)	(3)	(4)	(5)
	Manual	Office	Craftsmen	Industry and Commerce	Public Service
Import Exposure	0.2569	0.2589	0.1456	0.3794	0.0176**
	(0.2437)	(0.2941)	(0.1927)	(0.4094)	(0.0077)
N	1168	1168	1168	1168	1168
R-squared	0.548	0.532	0.554	0.534	0.458

Note: Analysis on the level of 176 job centre labor market regions. Outcomes refer to supply and demand of apprentice positions in labor market regions. The outcome are unsuccessful apprenticeship applicants in each labor market region. Years 2004-2011 are included. All regressions include state-by-year fixed effects. Robust standard errors clustered on labor market region level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Federal Institute for Vocational Education and Training

Table 9: Robustness Check: Using Different Import Exposure Definitions

	(1) Manufacturing	(2) Craftsmen	(3) Import Industry	(4) Computer	(5) 10 Year Earnings Growth
Baseline	0.0014*	0.0016**	-0.0043***	-0.0017***	-0.0652***
	(0.0008)	(0.0007)	(0.0016)	(0.0005)	(0.0202)
Cumulative	0.0002**	0.0003***	-0.0010***	-0.0002***	-0.0093***
	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0026)
Current Year	0.0013*	0.0017***	-0.0057***	-0.0016***	-0.0586***
	(0.0007)	(0.0006)	(0.0017)	(0.0004)	(0.0159)
Fixed Baseline	0.0014	0.0012*	-0.0033**	-0.0014***	-0.0573***
	(0.0009)	(0.0006)	(0.0015)	(0.0005)	(0.0204)

Note: Each cell refers to separate regression. The alternative import exposure measures are: *Baseline* refers to our ten year rolling window changes in trade exposure such as in the main results. *Cumulative* refers to rolling window ten year cumulated import volumes apportioned by initial (t-10) regional industry structures. *Current year* refers to the current year total import exposure apportioned by initial regional industry structures at t-10. *Fixed baseline* refers to ten year changes, like in baseline, but with fixed initial industry structure at 1980 for the West and with 1993 for the East. All regressions are OLS. The unit of observation is the individual, observed in the data once. The individual is "treated" by the import shock in the county she is first observed in, in the year she is 15. The treatment refers to import exposure per worker (in 1000 Euro) at county level (402 counties) from both China and Eastern Europe. All regressions also control for the respective export exposure. All regressions control for the following covariates: manufacturing employment in the county, and dummies for whether the individual is female or non-German. All regressions include state-by-year fixed effects. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Individual social security (SIAB) data

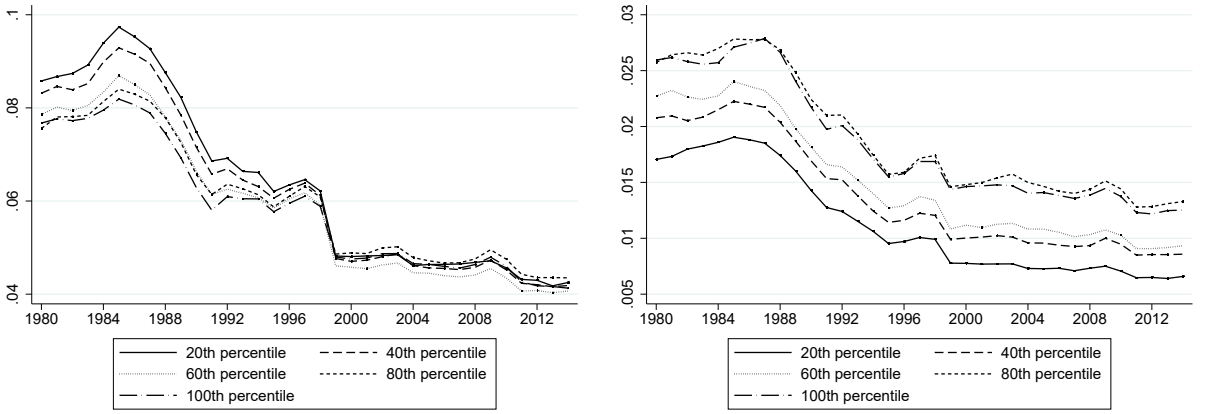
Table 10: Heterogeneity Analysis by Gender

	(1) Manufacturing	(2) Craftsmen	(3) Service	(4) Merchant	(5) Computer	(6) Manual	(7) Qualified Manual
Imp Exp	0.0013*	0.0015**	-0.0012**	-0.0010**	-0.0016***	0.0016*	0.0012**
	(0.0008)	(0.0006)	(0.0005)	(0.0005)	(0.0004)	(0.0009)	(0.0005)
Female	-0.5085***	-0.2708***	0.5317***	0.5182***	0.1505***	-0.4997***	-0.3161***
	(0.0063)	(0.0039)	(0.0062)	(0.0068)	(0.0020)	(0.0065)	(0.0043)
Imp Exp x Female	-0.0008	-0.0005	0.0011	0.0014*	0.0014**	-0.0018*	0.0021***
	(0.0008)	(0.0006)	(0.0007)	(0.0007)	(0.0005)	(0.0009)	(0.0007)
	(8) Earnings during apprenticeship	(9) Earnings 1 year after apprenticeship	(10) Earnings 10 years after apprenticeship	(11) Employed after apprenticeship	(12) Occupation switches	(13) Years unemployed	(14) Times counties switched
Imp Exp	-0.0011**	-0.0014	-0.0128***	0.0005	0.0040**	0.0010	-0.0027
	(0.0005)	(0.0008)	(0.0035)	(0.0006)	(0.0019)	(0.0015)	(0.0020)
Female	-0.0448***	-0.1539***	-0.5632***	-0.0073**	-0.3848***	-0.0568***	-0.0415***
	(0.0030)	(0.0079)	(0.0148)	(0.0036)	(0.0127)	(0.0103)	(0.0088)
Imp Exp x Female	-0.0009*	-0.0040***	-0.0121**	-0.0024***	0.0212***	0.0132***	0.0137***
	(0.0005)	(0.0011)	(0.0054)	(0.0007)	(0.0061)	(0.0036)	(0.0030)

Note: This tables reports the coefficients of interest from interactions; import exposure, female, and their interaction. The results refer to OLS regressions. The unit of observation is the individual, observed in the data once. The individual is "treated" by the import shock in the county she is first observed in, in the year she is 15. The treatment refers to import exposure per worker (in 1000 Euro) at county level (402 counties) from both China and Eastern Europe. All regressions also control for the respective export exposure. All regressions control for the following covariates: manufacturing employment in the county, and dummies for whether the individual is female or non-German. All regressions include state-by-year fixed effects. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Individual social security (SIAB) data

B Figures

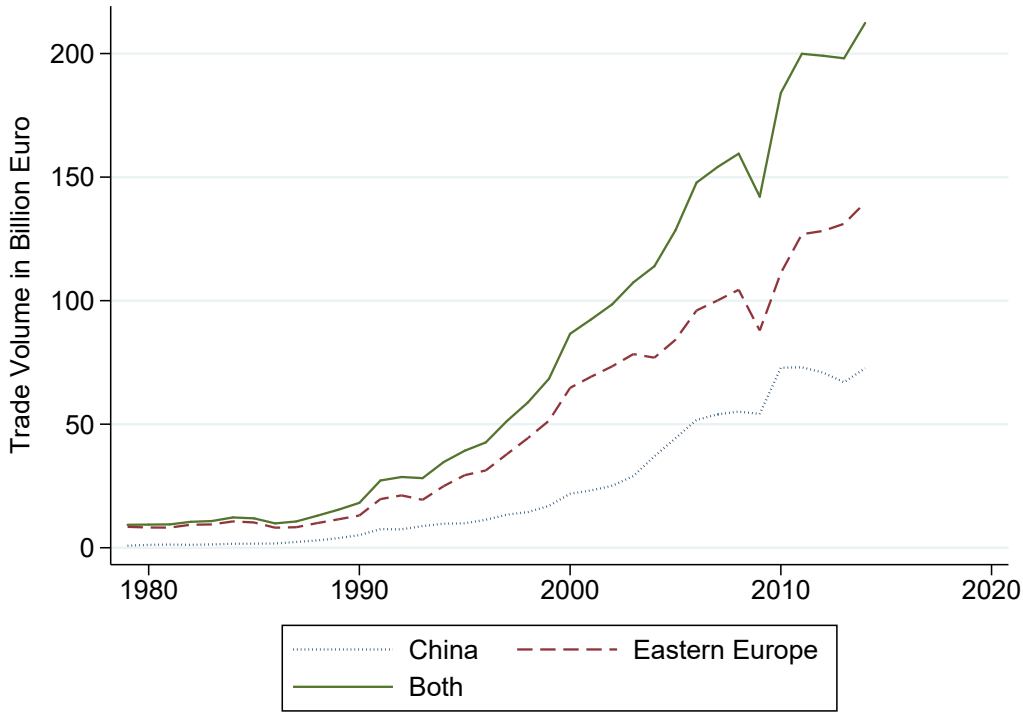
Figure 1: Apprentice Shares by Quantiles of Import Exposure in 2000



(a) All apprentices **(b)** Manufacturing apprentices

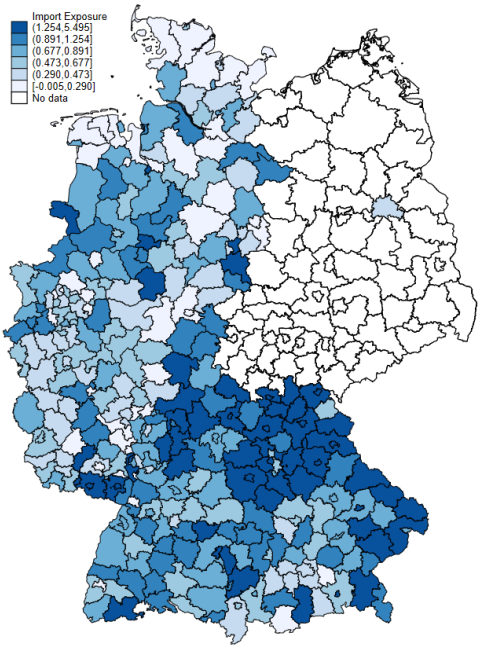
Note: Shares of apprentices among all workers within a county. Counties divided into 5 quantiles along import exposures in 2000. Figure (a) refers to apprentices in all occupations, Figure (b) to apprentices in manufacturing occupations.
Source: Establishment History Panel.

Figure 2: Total Trade Volumes in Billions of 2010 Euro

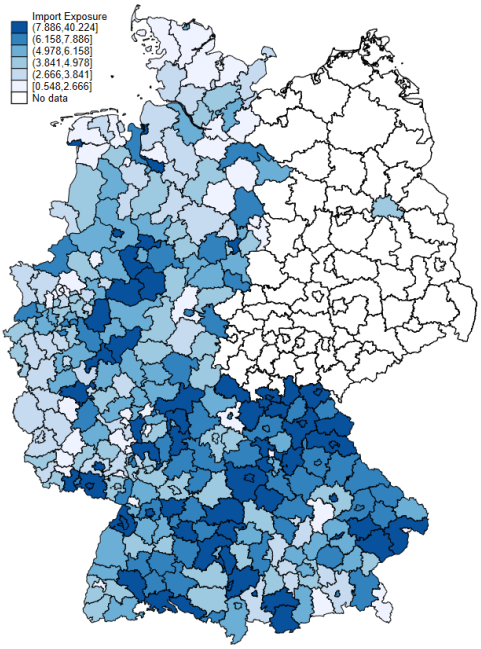


Note: Import volumes from China, Eastern Europe and the two combined in 2010 billions of Euros.
Source: UN Comtrade Data

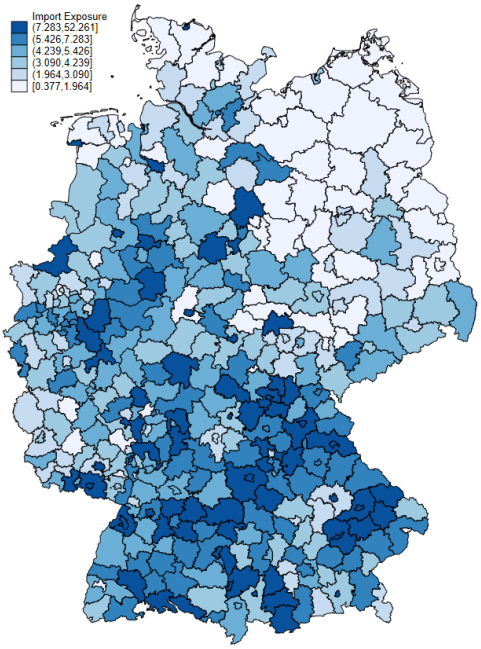
Figure 3: 10-year Changes in Import Exposure Per Worker



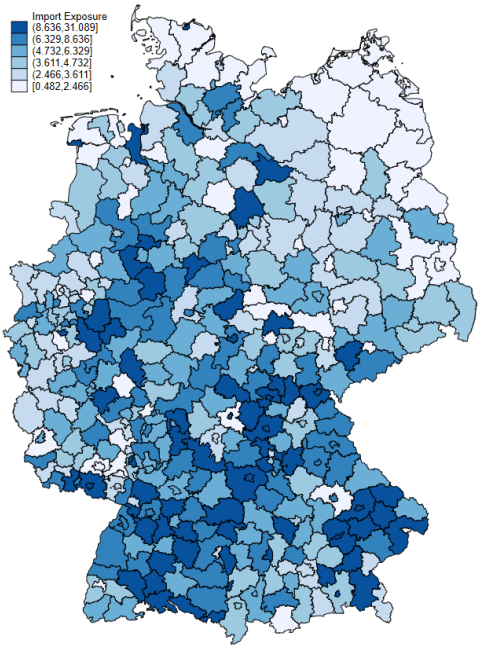
(a) 1990: change from 1980-1990



(b) 2000: change from 1990-2000



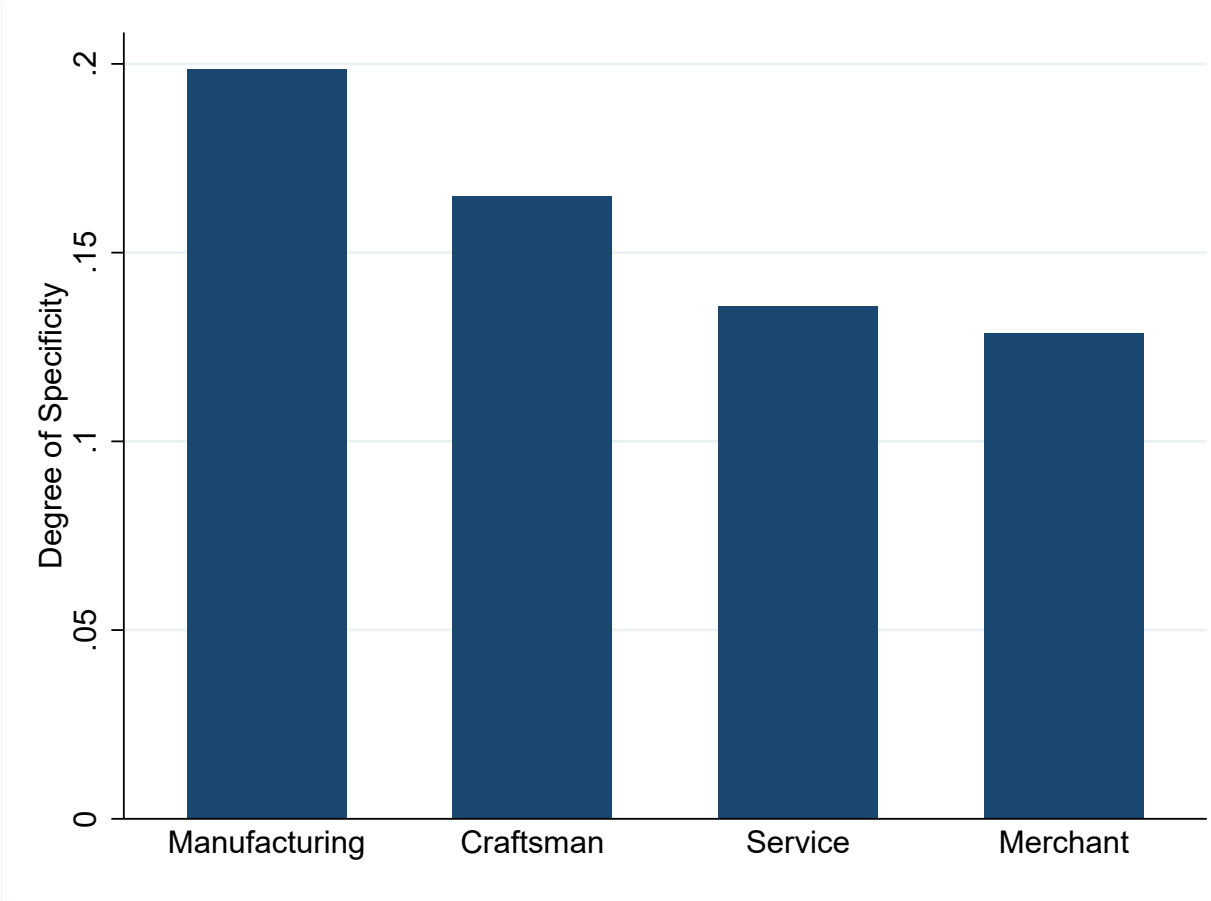
(c) 2003: change from 1993-2003



(d) 2014: change from 2004-2014

Note: 10-year changes in import exposure per worker in 1000 Euros. Figures (a) and (b) exclude former Eastern German counties due to data availability.
Source: UN Comtrade Data and Establishment History Panel, own calculations

Figure 4: Occupational specificity by Occupation Group



Notes: The figure shows the average skill-specificity measures in the four occupational groups manufacturing, craftsmen, services and merchants. The skill-specificity is an angular distance measure representing the distance in skill bundles between an occupation and the average labor market;see Section 3.4. Source: BIB/AB Qualification and Occupational Career Surveys 1999, own calculations.

C Appendix Tables

Table A1: Summary Statistics II: Distribution of States and Years

	Mean
State	
Schleswig-Holstein	0.038
Hamburg	0.021
Lower Saxony	0.111
Bremen	0.009
Northrhine-Westphalia	0.230
Hesse	0.078
Rhineland-Palatine	0.056
Baden-Wurttemberg	0.153
Bavaria	0.189
Saarland	0.015
Berlin	0.037
Brandenburg	0.010
Mecklenburg-Vorpommern	0.009
Saxony	0.020
Saxony Anhalt	0.011
Thuringa	0.011
Years	
1991	0.049
1992	0.047
1993	0.047
1994	0.047
1995	0.048
1996	0.048
1997	0.048
1998	0.047
1999	0.047
2000	0.045
2001	0.047
2002	0.058
2003	0.059
2004	0.056
2005	0.055
2006	0.048
2007	0.043
2008	0.038
2009	0.031
2010	0.022
2011	0.015
2012	0.006
2013	0.001

Table A2: List of Tasks and Skills from BIBB Survey used for Skill Specificity Measure

Tasks	
	Teach
	Consult
	Measure examine
	Monitor
	Repare
	Sell, Buy
	Organise
	Marketing
	Evaluate Information
	Negotiate
	Develop
	Produce
	Tend to people
Skills	
	Maths
	German
	Presentation
	Foreign Languages
	Sales, Marketing, PR
	Design
	Programme application
	Software Development
	Computer literacy
	Other technical knowledge
	Labor Law
	Other legal knowledge
	Management
	Finance
	Controlling
	Protection of Labor
	Medical Science
	Other Skills

Table A3: Change in Import Exposure Per Worker by Quantiles and Years

	Percentiles			
Overall	25th	50th	75th	100th
1990	0.2546	0.5360	0.8616	1.7166
2000	2.3595	4.2749	5.9510	10.7129
2008	2.1580	4.1540	6.2708	13.3473
2014	2.1811	4.0019	6.0587	10.8712
Eastern Europe	25th	50th	75th	100th
1990	0.0832	0.2070	0.3230	0.6704
2000	1.7070	3.0035	4.2051	7.9448
2008	0.8035	1.7979	3.1105	6.5117
2014	1.0852	2.1264	3.5001	6.6666
China	25th	50th	75th	100th
1990	0.1257	0.2836	0.5075	1.1694
2000	0.5148	0.9946	1.5671	3.3654
2008	0.9402	1.8356	3.0902	7.8451
2014	0.8376	1.5215	2.3445	5.0357

Note: Table refers to mean 10 year changes in per worker trade exposure from Eastern Europe, China and both in 1000 Euro. Division into quantiles is different by each respective year to show total increases.

Table A4: Results for Occupation Categories for Eastern Europe and China, IV and OLS

Panel A: OLS	(1)	(2)	(3)	(4)	(5)
Eastern Europe	Manufacturing	Craftsmen	Service	Merchant	Import Manufacturing
Import Exposure	0.0017	0.0021*	-0.0013	-0.0064	0.0067*
	(0.0017)	(0.0012)	(0.0011)	(0.0039)	(0.0035)
N	196025	196025	196025	180000	180000
R-squared	0.295	0.104	0.295	0.2798	0.021
Panel B: IV	(1)	(2)	(3)	(4)	(5)
Eastern Europe	Manufacturing	Craftsmen	Service	Merchant	Import Manufacturing
Import Exposure	0.0122**	0.0103***	-0.0067*	-0.0064	0.0025*
	(0.0048)	(0.0036)	(0.0039)	(0.0039)	(0.0036)
N	180000	180000	180000	180000	180000
F stat First Stage	17.51	17.51	17.51	17.51	17.51
Panel C: OLS	(1)	(2)	(3)	(4)	(5)
China	Manufacturing	Craftsmen	Service	Merchant	Import Manufacturing
Import Exposure	0.0017*	0.0026**	-0.0016**	-0.0014**	0.0033
	(0.0010)	(0.0012)	(0.0007)	(0.0006)	(0.0023)
N	196025	0.1000	196025	196025	196025
R-squared	0.292	180000	0.295	0.286	0.021
Panel D: IV	(1)	(2)	(3)	(4)	(5)
China	Manufacturing	Craftsmen	Service	Merchant	Import Manufacturing
Import Exposure	0.0037**	0.0026**	-0.0030***	-0.0025***	0.0051*
	(0.0017)	(0.0012)	(0.0011)	(0.0010)	(0.0029)
N	180000	180000	180000	180000	180000
F stat First Stage	15.34	15.34	15.34	15.34	15.34

Note: This table presents results from separate regression by Eastern Europe and China, OLS and IV regressions. The treatment in Panel A (OLS) and B (IV) refers to Import Exposure per worker (in 1000 Euro) at county level from Eastern Europe, in Panel C (OLS) and D (IV) from China.The outcome in column 1 is a dummy for whether the occupation an individual enters in in manufacturing, in column 2 a crafts occupation, in column 3 a service, in column 4 a merchant occupation. The outcome in column 5 is a dummy for whether the occupation in a import-intensive manufacturing industry. The unit of observation is the individual, observed in the data once. The individual is "treated" by the import shock in the county she is first observed in, in the year she is 15. The treatment refers to import exposure per worker (in 1000 Euro) at county level (402 counties) from both China and Eastern Europe. All regressions also control for the respective export exposure. All regressions control for the following covariates: manufacturing employment in the county, and dummies for whether the individual is female or non-German. All regressions include state-by-year fixed effects. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01. *Source:* Individual social security (SIAB) data

Table A5: Evidence on Youths Aspirations and Effects of Parental Occupations

	Adult occupations		Youths' aspirations	
Panel A	(1)	(2)	(3)	(4)
	Manufacturing	Service	Manufacturing	Service
Import Exposure	0.0010	-0.0010	-0.0008	0.0010
	(0.0031)	(0.0023)	(0.0013)	(0.0014)
N	4302	4302	2090	2090
R-squared	0.194	0.207	0.249	0.290

			Adult occupations	
Panel B	(1)	(2)	(3)	(4)
	Manufacturing	Service	Manufacturing	Service
Import Exosure	0.0015	0.0002	0.0032	-0.0022
	(0.0030)	(0.0031)	(0.0028)	(0.0029)
Father Manufacturing	0.1142***	-0.0841***	0.1316***	-0.1081***
	(0.0174)	(0.0181)	(0.0186)	(0.0194)
Imp Exp x Father Manuf			-0.0046**	0.0064***
			(0.0021)	(0.0018)
N	2762	2762	2762	2762
R-squared	0.219	0.214	0.221	0.217

Note: This table presents results from the German Socio-Economic panel. The household survey allows to link families together. In Panel A columns 1 and 2, the outcome refers to the vocational occupation choice of all adults in the survey. The outcomes in Panel A columns 3 and 4 refer to occupational aspirations of 17 year olds in the household. Outcomes in Panel B refer again to adult occupations. Import Exposure treatment is aggregated up to 96 German planning regions. The unit of observation is the individual, observed in the data once. The individual is "treated" by the import shock in the county she is first observed in, in the year she is 15. The treatment refers to import exposure per worker (in 1000 Euro) from both China and Eastern Europe. All regressions also control for the respective export exposure. All regressions control for the following covariates: manufacturing employment in the region, and dummies for whether the individual is female or non-German. All regressions include state and year fixed effects. Robust standard errors clustered on county level in parenthesis. Significance level: * p<0.10, ** p<0.05, *** p<0.01.
Source: German Socio-economic panel data

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